Green Bay Ming Mine Project Environmental Registration

April 2025

FireFly METALS

Legal Statements

FireFly Metals Ltd (**Company**), the ultimate parent company of FireFly, is a publicly listed company, listed on the ASX and TSX and makes the following statements as a matter of legal compliance.

1. Conceptual Design

The statements that appear throughout this document regarding future production, life of mine, capital expenditure, revenues, and similar matters are at this time early stage. Such statements are based on a conceptual design and are not production targets or forecast financial information for the purposes of applicable law and stock exchange regulation, including the ASX Listing Rules and applicable Australian law and the rules of the TSX and applicable Canadian law. Further work and studies are required before the Company will be in a position to issue such production targets or forecast financial information.

The information presented in this document represents the current conceptual design. As the detailed design of the Green Bay Ming Mine Project progresses, refinements will likely occur to address the results of further studies and input received from regulators, the public and stakeholders through the environmental assessment and permitting processes.

The Company cautions investors who may access this document against making investment decisions based on any aspirational statements included in this document.

No Competent Person, for the purposes of the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, or Qualified Person, for the purposes of Canadian National Instrument 43-101 - Standards of Disclosure for Mineral Projects, has approved the information included in this document.

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This document contains certain forward-looking statements and projections, including statements regarding the Company's plans, forecasts and projections with respect to FireFly's mineral properties and programs. Forward-looking statements may be identified by the use of words such as "may", "might", "could", "would", "will", "expect", "intend", "believe", "forecast", "milestone", "objective", "predict", "plan", "scheduled", "estimate", "anticipate", "continue", or other similar words and may include, without limitation, statements regarding plans, strategies and objectives.

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Executive Summary

In 2023, FireFly Metals Canada Ltd. (FireFly) wholly acquired the existing and approved Ming Mine, which had been placed in care and maintenance by the previous owners. FireFly has renamed this mine to be the Green Bay Copper-Gold Project, which is comprised of the Ming Mine site, Nugget Pond milling facility, Goodyear's Cove concentrate storage and port, Little Deer / Whalesback property, and the adjacent landholdings acquired from Gold Hunter Resource Inc.

Following a technical review of the existing and approved mine, FireFly determined that while the total life of mine remaining at its approved production rate is estimated to be 20 years, the operation in its current state is not economically viable. This is due to the scale of the underground operation, mining methods, transportation distance of ore and concentrate, and the size of the mill.

FireFly is therefore proposing the Green Bay Ming Mine Project (the Project), which is an expansion of the existing approved underground mine. The Project is located on the Baie Verte peninsula in the province of Newfoundland and Labrador (NL), Canada.

The Project comprises expansion of underground mine works and increase in the annual production rate from 1,350 tonnes per day (tpd) to 4,800 tpd. The Project also proposes a new process plant and tailing management facility (TMF) to be constructed adjacent to the mine, thereby improving the Project economics, and reducing environmental impacts and promoting sustainability.

The Project will involve the extraction of copper-rich critical minerals by expanding its current operation and includes the following components:

- Associated underground mining infrastructure
- Process plant and TMF
- Surface infrastructure, including haul roads, transmission lines, and water intake
- Concentrate storage and handling
- Accommodation and camp facilities

The Project is subject to provincial environmental assessment (EA) requirements under the NL *Environmental Protection Act* (NL EPA) and associated *Environmental Assessment Regulations*. This document is a Registration for the Project and has been prepared in accordance with the NL Department of Environment and Climate Change's Environmental Assessment – A Guide to the Process.

Engagement

FireFly believes in transparency and actively engaging with the community, organizations, governments, Indigenous organizations and other groups to support sustainable development and integrate environmental, social, and governance considerations into all aspects of decision-making. FireFly engages the community with the goals of achieving sustainable outcomes, equitable decision-making processes, and deepening relationships and trust between the community and the company.

FireFly has engaged with local communities and the general public, Indigenous groups, government agencies, non-government organizations, and industry partners prior to drafting and submitting this document. Feedback received during engagement has helped inform the scope of the Environmental Registration. FireFly remains committed to continuing to actively engage with the public and stakeholder organizations following submission of the Environmental Registration, and throughout the EA process, detailed design, and environmental permitting.

Environmental Setting

The Project is located in a rural area in Northern Newfoundland, on the Baie Verte Peninsula, approximately 7 kilometres (km) from Mings Bight, accessed via Route 418. The Baie Verte Peninsula is sparsely populated with small towns, the largest of which is the town of Baie Verte, located approximately 8 km from the Project. The Baie Verte Peninsula has a long history of mining, with activity of modern mining dating from the late 1800s due to the mineral deposits in the area. In addition to mining activity, there are several small commercial and local businesses, fisheries, logging and sawmill operations, and forestry activities.

The Project is located near the border of the Central Newfoundland Forest - Northcentral Subregion and the North Shore Forest Ecoregion and the climate is generally drier and warmer than in other ecoregions on the Island. The region is characterized by a rolling topography, where terrain (i.e., topography and landforms) varies and includes boggy areas and moss-dominated forests, with scattered wetlands, specifically fens, common in the Project Area and surrounding areas. This region provides habitat for a variety of wildlife species commonly found in the boreal forest on the Island of Newfoundland.

Hunting (bear, moose, duck, muskrat, and fox) and inland fishing (trout and salmon) activities are known to occur in the region, with limited use within the Project Area. There are no protected areas (e.g., provincial and national parks, wildlife, ecological and wilderness reserves) within the Project Area.

Scope and Methods

The approach for this assessment is based on methods developed by Stantec to fulfill requirements of the provincial NL EPA for an Environmental Registration document. The scope of assessment considers: the proposed Project components and activities; knowledge of the existing conditions and sensitivities of the surrounding environment; applicable regulations, policies and guidelines; the influence of engagement conducted thus far; and professional experience and expertise of FireFly and its consultants. The approach assumes a precautionary, conservative approach with assumptions generally applied to overestimate potential adverse effects.

The Environmental Registration examines the effects or changes to the physical, biological and socio-economic environment that could result from the Project. The assessment focuses on valued components (VCs), which were selected based on several factors, including requirements of the provincial guidelines, results of engagement, the role of the VC in the ecosystem, and the importance placed on it by local communities, Indigenous groups and stakeholders. Based on this, the following VCs were assessed:

- Atmospheric Environment
- Groundwater Resources
- Surface Water Resources
- Fish and Fish Habitat
- Terrestrial Environment (including species at risk [SAR] and species of conservation concern [SOCC])
- Communities
- Land and Resource Use
- Historic Resources

The environmental effects assessment considers the degree and nature of change that Project activities may have on the existing environment for each VC. To help understand the existing conditions for each VC, baseline studies / environmental programs completed over the past 15 years for the previous owner were reviewed, and numerous baseline studies were conducted in 2024. Note that in some cases, analysis and reporting of these 2024 data are not yet available and will be provided to regulators prior to construction or as part of applicable permit applications. Potential interactions between the Project and VCs have been identified, and residual effects described in recognition of mitigation to be applied. For each VC, mitigation measures are proposed to reduce or eliminate potential adverse effects that may result from the Project. Many of the potential adverse environmental effects can be managed by following accepted mining procedures and best management practices and FireFly's commitment to comply with regulatory standards. The significance of adverse residual environmental effects is then determined using criteria developed for each VC. Where there may be data gaps or some uncertainty around an effects prediction or effectiveness of mitigation, follow-up and monitoring is proposed.

Summary of Residual Effects

For each of the VCs assessed for the Project, the Environmental Registration:

- Defines the scope of the VC
- Characterizes existing conditions within the spatial boundaries of each VC
- Employs conservative assumptions so that potential adverse effects are generally overestimated rather than underestimated

- Identifies mitigation and environmental protection measures to reduce or eliminate adverse effects, recognizing that many of these measures are currently in place for the existing, approved mine operation
- Describes residual environmental effects, including a determination of their significance

The assessment of residual effects considered the following key factors:

- The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining, logging and quarry activities. Impacted streams and ponds contain low pH, elevated concentrations of metals and no longer support fish, unimpacted streams and ponds contain neutral pH, baseline concentrations of metals and support fish populations.
- FireFly will use previously disturbed / cleared areas for Project development to the extent possible; however, the 6 km port access road represents a new linear feature on the landscape.
- The nearest potential seasonal / residential receptor (i.e., cabin user) is located approximately 168 metres from the Project Area, with additional cabin users located along Highway 418. These residents (both permanent and seasonal) have lived or recently built adjacent to the existing mine operation and in an area known for active mining. There have been no complaints by the nearby residents for the past operation or current activities of FireFly.
- FireFly has incorporated the port access road into their Project design to limit Project-related traffic along Highway 418. While noise and air quality modelling have not yet been completed, they will be completed pre-construction. FireFly understands that additional mitigation may be required if noise or air quality concerns are identified at off-site receptors.
- Placement of mine waste has been purposely designed to avoid overprinting waterbodies to avoid waters frequented by fish. The location of mine infrastructure and waste has been designed for better water management and reducing the overall footprint and impact to surface water and groundwater systems.
- Due to the ongoing activities at the mine site, the residual effects resulting from sensory disturbances (e.g., noise, light, dust, vibrations, human presence) associated with the Project are not new. Instead, they represent potential incremental increases in the intensity or extent of existing disturbances. Ongoing activity at the Project site has likely resulted in avoidance of the area by some wildlife and habituation / accommodation of the activities by other wildlife.
- FireFly will work towards returning the Project Area to as close to pre-Project conditions as practical, with due consideration to the aesthetics that existed pre-mining by FireFly.
- There is a long mining history in the Baie Verte Peninsula, with an experienced workforce locally available. At peak operation activity, the previous mine employed over 250 full-time employees, with the majority from local communities. Based on past projects in the region, including Rambler Mine, it is estimated that up to 60% of FireFly's employees and 20% to 30% of the contracted employees will be from local communities.

The environmental assessment predicts that Project activities will not cause significant adverse environmental effects on the VCs. The general results of the assessment for Project activities are summarized below.

- **Atmospheric Environment:** The atmosphere is an important pathway for the transport of emissions and particulates from the Project to the freshwater, terrestrial, and human environments. Activities associated with the construction, operation, and decommissioning, rehabilitation and closure of the Project have the potential to interact with the environment in such a way that could adversely affect air quality, greenhouse gas emissions, sound quality, and ambient light levels. Based on application of mitigation measures and FireFly's commitment to comply with regulatory standards, residual environmental effects on the Atmospheric Environment are predicted to be not significant. This prediction will be validated through the completion of air contaminant dispersion modelling and noise modelling, which will be presented in the Atmospheric Technical Report, to be completed prior to the start of Project construction. Based on the results of this quantitative modelling, FireFly will apply additional mitigation through Project design if needed to manage effects on the Atmospheric Environment.
- **Groundwater Resources:** A change in groundwater quality or quantity could result in changes in baseflow to streams for ecological habitat and freshwater supply for human and industrial / commercial uses. Groundwater quantity effects can include potential lowering of local water levels, with consequent reduction in water levels in water supply wells drilled for the Project, reduction in domestic well yield in proximity to Project activities, and reduction in local streamflow. Groundwater quality effects can include changes in groundwater chemistry near site infrastructure and may adversely affect groundwater quality in wells should they be located in proximity to Project activities. Based on application of the mitigation measures (e.g., the monitoring and adaptive management of groundwater) and FireFly's commitment to comply with regulatory standards, residual environmental effects on groundwater resources are likely to be not significant. This prediction will be confirmed through the completion of groundwater flow modelling and groundwater contaminant transport modelling prior to the start of Project construction. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed to maintain not significant adverse effects on Groundwater Resources.
- **Surface Water Resources:** Routine activities throughout the life of the Project may interact with the local surface water receiving environment, resulting in changes to surface water quality and/or quantity. Surface water is an integral part of the regional environment, providing habitat for fish, vegetation and aquatic populations, and contributing to local socio-economic drivers. Existing mitigation measures and contingency plans identified in the Environmental Protection Plan (EPP) will continue to be in place for the Project and will serve to avoid or reduce potential residual effects on Surface Water Resources. Based on application of the mitigation measures and the commitment by FireFly to comply with regulatory standards, residual environmental effects on surface water quantity and surface water quality are likely to be not significant. This prediction has been confirmed through the completion of an assimilative capacity study, and flow assessments. Based on application of the mitigation measures and best management practices and FireFly's commitment to comply with regulatory standards, residual environmental effects on the surface water quantity and quality are predicted to be not significant.

- **Fish and Fish Habitat:** Fish and fish habitat can be affected by Project-related activities resulting in changes to groundwater and surface water, including alterations to stream flow from water withdrawal or water management infrastructure, the introduction of sediments and other substances harmful to fish, injury or death of fish from heavy equipment and the impingement/entrainment of fish at water intakes. A substantial portion of the Local Assessment Areas (LAA) / Regional Assessment Area (RAA) in the South Brook watershed has been impacted by historical mining activities, resulting in poor water quality that is unsuitable for supporting fish. In addition, physical barriers including natural falls and chemical barriers such as low pH limit the distribution of fish species and populations in the LAA / RAA. The Project is an expansion of an existing mine and standard mitigation and adaptive management will be applied to manage potential effects in streams and ponds. During all phases of the Project, it is anticipated that discharges will be managed to meet regulatory requirements and/or site-specific guidelines. The Project has been designed to avoid the loss of fish habitat, to the extent practicable; however, fish and fish habitat that are lost because of the Project will be counterbalanced through implementation of an Offsetting Plan. Given the existing mitigation measures, the Project is not anticipated to affect the long-term survival or sustainability of fish populations. With avoidance, mitigation, offsetting, and environmental protection measures in place, the residual adverse environmental effects on Fish and Fish Habitat are predicted to be not significant.
- **Terrestrial Environment:** Activities associated with the construction and operation of the Project have the potential to interact with the environment in such a way that could adversely affect vegetation, wetlands, avifauna, and other wildlife (including SAR and SOCC). Mitigation measures and best practices will reduce the total amount of vegetation communities and habitat lost or altered, directly and indirectly, throughout the life of the Project. This includes a Project design that maximizes the use of the current (i.e., previously disturbed) footprint and the implementation of standard mitigation to reduce potential adverse effects from dust, noise, light, and vibrations. To the extent practicable, sensitive areas, if identified in the Project Area, including wetlands, rare plant occurrences, hibernacula, roosts, and nests, will be buffered in accordance with regulatory standards. With mitigation, including timing Project construction activities to avoid the breeding season, the implementation of speed limits, limiting the amount of on-site lighting, and prohibiting the hunting or harassment of avifauna and other wildlife by on-site Project personnel, the likelihood of increased mortality risk will be low and the Project is not expected to result in a measurable change in the baseline conditions for avifauna and other wildlife. This risk is also considered low for SAR, given their limited occurrence in the Project Area and therefore low potential for direct interactions. Based on application of the mitigation measures and best management practices and FireFly's commitment to comply with regulatory standards, residual environmental effects on the Terrestrial Environment (including SAR) are predicted to be not significant.

- **Communities:** Project activities can create positive and adverse effects to nearby communities, including to community services and infrastructure, community well-being, employment and the economy. Potential adverse effects will be largely mitigated by the provision of on-site accommodations for the non-local labour force. FireFly's commitment to hire most of the Project labour force from local communities will reduce demands on housing and temporary accommodations, as well as other community services and infrastructure, such as health and education. In addition, the port access road will reduce Project-related traffic on local roads and highways. As a result, there may be a change in use of local infrastructure and services, but that level of use will be within their existing capacity.

  FireFly will aim to enhance positive effects by hiring a local labour force and reduce adverse effects by continuing to develop and implement policies with an aim to promoting work / life balance, providing a working environment that is free from harassment and discrimination, and discouraging negative coping mechanisms. FireFly is prepared to explore opportunities to promote gender and cultural diversity in the workplace with the goal of increasing awareness and integration of diversity into non-traditional roles. Seventeen percent of the FireFly workforce is female, which aligns with the continued efforts of FireFly to implement their industry best practice workforce diversity plan. FireFly is committed to a workplace that provides equal opportunities with competitive benefits and compensation. FireFly will continue to work with contractors hired on the Project to promote the Diversity Plan and its initiatives. Based on application of the mitigation and management measures, residual environmental effects on Communities are likely to be not significant.
- **Land and Resource Use:** The Project can affect the use of the land and resources in and near the Project Area and their socio-economic value to the region. Project activities can change the use of lands through the loss of area and the restriction of access to designated lands (i.e., municipal boundaries, wildlife management areas), and lands used for resource or recreational uses. Residual effects on land and resource use are not anticipated to exceed or contravene established federal, provincial, or municipal land use designations, policies, or by-laws and/or create a change or disruption that restricts or degrades present land and resource use capacity to a point where activities cannot continue at or near current levels over the long term. The Project is located in a remote area at an existing mine site, which is reflective of the low levels of resource (other than mining) and recreational use in the Project Area. During reclamation, FireFly will work towards returning the Project Area to as close to pre-Project conditions as practical, with due consideration to the aesthetics that existed pre-mining by FireFly. Based on application of the mitigation measures, including ongoing communication with local land and resource users, and FireFly's commitment to comply with regulatory standards, residual environmental effects on Land and Resources Use are likely to be not significant.

- **Historic Resources:** Ground disturbance activities may disturb or destroy objects of historical value and, equally importantly, may disturb or destroy the context (the horizontal and vertical depositional relationships between historical objects) from which they derive much of their value. Construction of the Project is unlikely to result in residual effects on Historic Resources primarily because there are no known registered archaeological sites within the Project Area, which has previously been disturbed by mining operation. Areas of archeological potential were identified during the Historic Resources Overview Assessment, and these areas should be avoided by Project construction activities to the extent practical. The Historic Resources Overview Assessment identified the need for field verification. Due to seasonal restrictions (i.e., the need for snow-free ground conditions), this field verification will occur once ground conditions allow, likely in the spring of 2025 and prior to Project construction activities. Many of the standard mitigation measures identified in the EPP also will serve to avoid or reduce potential effects on Historic Resources, including measures that would be implemented in the event of an unexpected discovery of historic resources. Based on application of the mitigation measures and FireFly's commitment to comply with regulatory standards, residual environmental effects on Historic Resources are likely to be not significant.

FireFly's current environmental management tools for operation include management plans, mitigation measures, response plans, and follow-up and monitoring, which will allow for permitting conditions and the commitments made in this Environmental Registration to be implemented, monitored and adapted as needed throughout the life of the Project. Management plans that have been developed and updated for this Project include an EPP, Inclusion, Diversity, Equity, and Accessibility Plan, Waste Management Plan, Environmental Contingency Plan, Avifauna Management Plan, Emergency Response Plan (ERP), Operation Management & Surveillance Manual, and Rehabilitation and Closure Plan.

FireFly has an established ERP and supporting procedures that define the responsibilities and duties of employees, contractors, visitors and third-party / external responders in the event of an emergency at the Project site. Potential emergencies include: underground accidental event; TMF malfunction; overburden, ore, and waste rock stockpiles slope failure; fuel and hazardous materials spill; unplanned release of contact water; fire / explosion; and vehicle accident. General mitigation to reduce risk associated with these potential malfunctions and accidental events includes:

- Implementation of proper training, awareness, education
- Regular equipment inspection and maintenance
- Incorporation of inherently safe designs into the Project
- Update and implementation of current site environmental management plans, including effective and efficient ERPs
- Periodic assessment of accident and malfunction risks during Project life cycles, including detailed design, construction, operation, and closure

Management plans, ERPs, and contingency plans previously developed for the approved mine will be updated as needed to address Project components and activities and to reflect input from regulatory agencies.

Conclusion

Existing mitigation measures and contingency plans identified in the EPP, as well as several management plans and policies, will continue to be in place for the Project and will serve to avoid or reduce potential residual effects on the VCs. The effects assessment predicts that routine Project activities will not cause significant adverse environmental effects on the VCs. Noise, air quality, groundwater, and surface water modelling will be conducted prior to construction to confirm adequate mitigation measures have been employed to reduce adverse effects to VCs. If modelling indicates effects greater than those identified in the effects assessment, FireFly will work with regulators to develop and apply additional mitigation measures, as required, to manage these effects.

FireFly is committed to the sustainable and responsible development of the Project as reflected in its corporate values and the Sustainability Management System. Following successful acquisition of the Project in 2023, FireFly was able to commence a large-scale exploration drilling program, technical studies, and environmental baseline studies. Based on past projects in the region and in consideration of recent commencement of mining operations in the area and Island of Newfoundland, including the former operation of Ming Mine, it is planned, and likely, that the majority of employees will come from local communities. The total employment income could exceed $1.5 billion, and the NL government could receive close to $1 billion in direct, indirect, and induced taxes, over the life of the Project. At the same time, the Project would unlock critical metals identified as a priority by the province and the Government of Canada. The development of the Project in NL is crucial for several reasons, particularly in the context of both the province and Canada's critical mineral strategy, efforts to reduce carbon emissions, fill the gap between supply and demand of copper and gold, and create substantial socio-economic benefits.

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Appendix 8.A Project Related Documents (1995-2024)

Acronyms / Abbreviations

%	percent
%HA	percent highly annoyed
°C	degrees Celsius
µg/L	microgram per litre
µg/m³	micrograms per cubic metre
2SLGBTQQIA+	two-spirit, lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual, and all other sexual orientations and genders
AAC	allocated annual cut
AC	assimilative capacity
AC CDC	Atlantic Canada Conservation Data Centre
AMP	Avifauna Management Plan
ANFO	ammonium nitrate / fuel oil
APA	Archaeological Potential Areas
AQMS	Air Quality Management System
ARU	autonomous recording device
ATV	all-terrain vehicle
Aρ	size of the luminaire
BACT	best available control technology
BBS	Breeding Bird Surveys
bcm	bank cubic metres
BMA	Bruce Management Area
BMP	Best Management Practices
BMU	Bear Management Unit
BOD	Board of Directors
BP	Before Present
ca.	circa
CAAQS	Canadian Ambient Air Quality Standards
CAD	Canadian dollar
CALPUFF	California PUFF
CCAA	*Companies Creditors Arrangement Act*
CCIN	Central Continuous Improvement Network
CCME	Canadian Council of Ministers of the Environment
cd	candela
CDA	Canadian Dam Association
CEO	Chief Executive Officer
CH_4	methane
CIE	Commission Internationale de L'Éclairage
CIM-MRR	Canadian Institute of Mining, Metallurgy and Petroleum - Mineral Resources Review
CME	Canadian Manufacturers and Exporters

CMIP6	Coupled-Model Intercomparison Project 6
CNF	Central Newfoundland Forest
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CoA	Certificate of Approval
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
CSI	crime severity index
CSQG PEL	Canadian Sediment Quality Guideline Probable Effects Limit
CuEq	copper equivalent
CWQG-FAL	Canadian Water Quality Guidelines for the Protection of Aquatic Life
d	luminaire
dB	decibel
dBA	A-weighted dB scale
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EAP	Employee Assistance Program
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
EML	Exempt Mineral Land
ENR	Environment and Natural Resources
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
ESA	Environmental Site Assessment
ESG	environmental, social, and governance
ET	evapotranspiration
FAA	*Fisheries Act* Authorization
FDP	final discharge point
FIFO	fly in / fly out
FireFly	FireFly Metals Canada Ltd.
FMD	Forest Management District
FTE	full time equivalent
GCDWQ	Guidelines for Canadian Drinking Water Quality
GDP	gross domestic product
GEMTEC	GEMTEC Consulting Engineers and Scientists Limited
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
GIS	Geographic Information System
GIS	Geographic Information System
GWP	global warming potential
ha	hectare

HADD	harmful alteration, disruption or destruction
HDPE	high-density polyethylene
hp	horsepower
HR	Human Resources
HRA	*Historic Resources Act* (1985)
HRIA	Historic Resources Impact Assessment
HROA	Historic Resources Overview Assessment
HYFRAN	hydrological frequency analysis
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada
IDF	intensity-duration-frequency
IPCC	Intergovernmental Panel on Climate Change
ISEE	International Society of Explosives Engineers
I-TEQ	The International Total Equivalent Quotient
JORC	Joint Ore Reserves Committee
km	kilometre
km²	square kilometre
kV	kilovolt
kVA	kilovolt-amperes
kW	kilowatt
L	litre
L/min	litre per minute
LAA	Local Assessment Area
Ld	daytime equivalent sound level
LFZ	Lower Footwall Zone
LiDAR	Light Detection and Ranging
Ln	nighttime equivalent sound level
LoM	life of mine
LRU	Land and Resource Use
lux	one lumen per square metre
m	metre
m/s	metre per second
m²	square metre
m³	cubic metre
m³/hr	cubic metre per hour
m³/s	cubic metre per second
m³/yr	cubic metre/year
MAC	Mining Association of Canada
MAF	mean annual flow
mag/arcsec²	magnitudes per square arcsecond
masl	metre above sea level
MBCA	*Migratory Birds Convention Act*

mbgs	metres below ground surface
MDMER	*Metal and Diamond Mining Effluent Regulations*
mg/kg	milligram per kilogram
mg/L	milligram per litre
MGGA	NL *Management of Greenhouse Gas Act*
MGGR	NL *Management of Greenhouse Gas Regulations*
ML/ARD	metal leaching / acid rock drainage
mm	millimetre
Mm^3/yr	million cubic metres of water per year
MMA	Moose Management Area
MMF	mean monthly flow
mRL	metres Relative Level
Mt	Million tonnes
MW	megawatt
MWh	megawatt hour
N_2O	nitrous oxide
NAPS	National Air Pollutant Surveillance
NBBA	Newfoundland Breeding Bird Atlas
NBDELG	New Brunswick Department of Environment and Local Government
NL	Newfoundland and Labrador
NL AQS	Newfoundland and Labrador Air Quality Standards
NL EPA	Newfoundland and Labrador *Environmental Protection Act*
NL ESA	Newfoundland and Labrador *Endangered Species Act*
NLDECC	Newfoundland and Labrador Department of Environment and Climate Change
NLDFFA	Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture
NLDFLR	Newfoundland and Labrador Department of Fisheries and Land Resources
NLDIET	Newfoundland and Labrador Department of Industry Energy and Technology
NLDMAE	Newfoundland and Labrador Department of Municipal Affairs and Environment
NLDOEC	Newfoundland and Labrador Department of Environment and Conservation
NLEPA	NL *Environmental Protection Act*
NO_2	nitrogen dioxide
NOC	National Occupation Classifications
NPRI	National Pollutant Release Inventory
NTD	Note to draft
NWWG	National Wetlands Working Group
O_3	ozone
OMS	Operation Management and Surveillance
ONMECP	Ontario Ministry of Environment Conservation and Parks
ORP	oxidation reduction potential
PAG	potentially acid generating
PAO	Provincial Archaeology Office
PM_{10}	particulate matter with aerodynamic particle diameter less than or equal to 2.5 microns

$PM_{2.5}$	particulate matter with aerodynamic particle diameter less than or equal to 10 microns
PoPC	Parameters of Potential Concern
ppb	parts per billion
RAA	Regional Assessment Area
RBCA	Risk Based Corrective Action
RCP	Rehabilitation and Closure Plan
RCP	representative concentration pathways
ROM	run-of-mill
SAR	species at risk
SARA	*Species at Risk Act*
SB	South Brook
SISP	Sales and Investment Solicitation Process
SMS	Sustainability Management System
SO_2	sulphur dioxide
SOCC	species of conservation concern
SSP	Socioeconomic Pathways
Stantec	Stantec Consulting Ltd.
t	tonne
TB	Trimms Brook
The Project	Green Bay Ming Mine Project
TMF	tailings management facility
tpd	tonnes per day
TSP	total suspended particulate
TSS	total suspended solids
ULR	upward light ratio
USD	United States (of America) Dollar
USGS	United States Geological Survey
UTV	utility task vehicle
UV	utility vehicle
VC	valued component
VMS	volcanogenic massive sulphide
VP	Vice President
WMO	World Metrological Organization
WMP	Waste Management Plan
WRDC	Women in Resource Development Corporation
WSC	Water Survey of Canada
WWMP	wastewater management plant

1 Introduction

1.1 Overview

In 2023, FireFly Metals Canada Ltd. (FireFly) wholly acquired the existing and approved Ming Mine, which had been placed in care and maintenance by the previous owners. FireFly has renamed this mine to be the Green Bay Copper-Gold Project, which is comprised of the Ming Mine site, Nugget Pond milling facility, Goodyear's Cove concentrate storage and port, Little Deer / Whalesback property and the adjacent landholdings acquired from Gold Hunter Resource Inc. (Figure 1.1.1).

Following a feasibility review of the existing and approved mine, FireFly determined that while the total life of mine (LoM) remaining is estimated to be 20 years, the operation in its current state is not economically viable. This is due to the scale of the underground operation, mining methods, transportation distance of ore and concentrate, and the size of the mill.

FireFly is therefore proposing the Green Bay Ming Mine Project (the Project), which is an expansion of the existing approved underground mine. The Project is located on the Baie Verte peninsula in the province of Newfoundland and Labrador (NL), Canada (Figure 1.1.2).

The Project comprises expansion of underground mine works and increase in the annual production rate from 1,350 tonnes per day (tpd) to 4,800 tpd. The Project also proposes a new process plant and tailings management facility (TMF) to be constructed adjacent to the mine, thereby improving the Project economics, and reducing environmental impacts and promoting sustainability.

The Project therefore includes construction and operation of the following key components:

- Associated underground mining infrastructure
- Process plant and TMF
- Surface infrastructure, including haul roads, transmission lines, water intake, waste rock and other stockpiles
- Concentrate storage and handling
- Accommodation and camp facilities

As part of the Project, FireFly has completed an access agreement with Maritime Resources for the use of the Pine Cove Port, located approximately 6 kilometres (km) from the mine site. A 4.7-km port access road will be constructed and maintained by FireFly to connect with a third-party road to access the port.

This Environmental Registration serves to initiate the environmental assessment (EA) process for the Project, as per the NL *Environmental Protection Act* (NL EPA). Section 1.5 provides further information on this process.

Figure No.
1.1.1
Title
Green Bay Copper-Gold Project Location

Client/Project 121418199_1_003
FireFly Metals Ltd
Green Bay Ming Mine Project

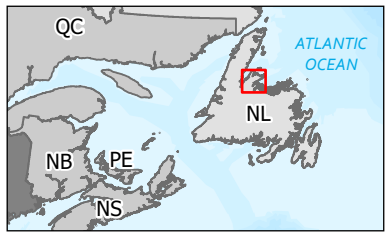
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-03
Revised 2025-03-19

N

0 6 12 Kilometres
(At original document size of 8.5x11)
1:500,000

- Goodyear's Cove
- Ming Mine
- Nugget Pond
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local
- Powerline



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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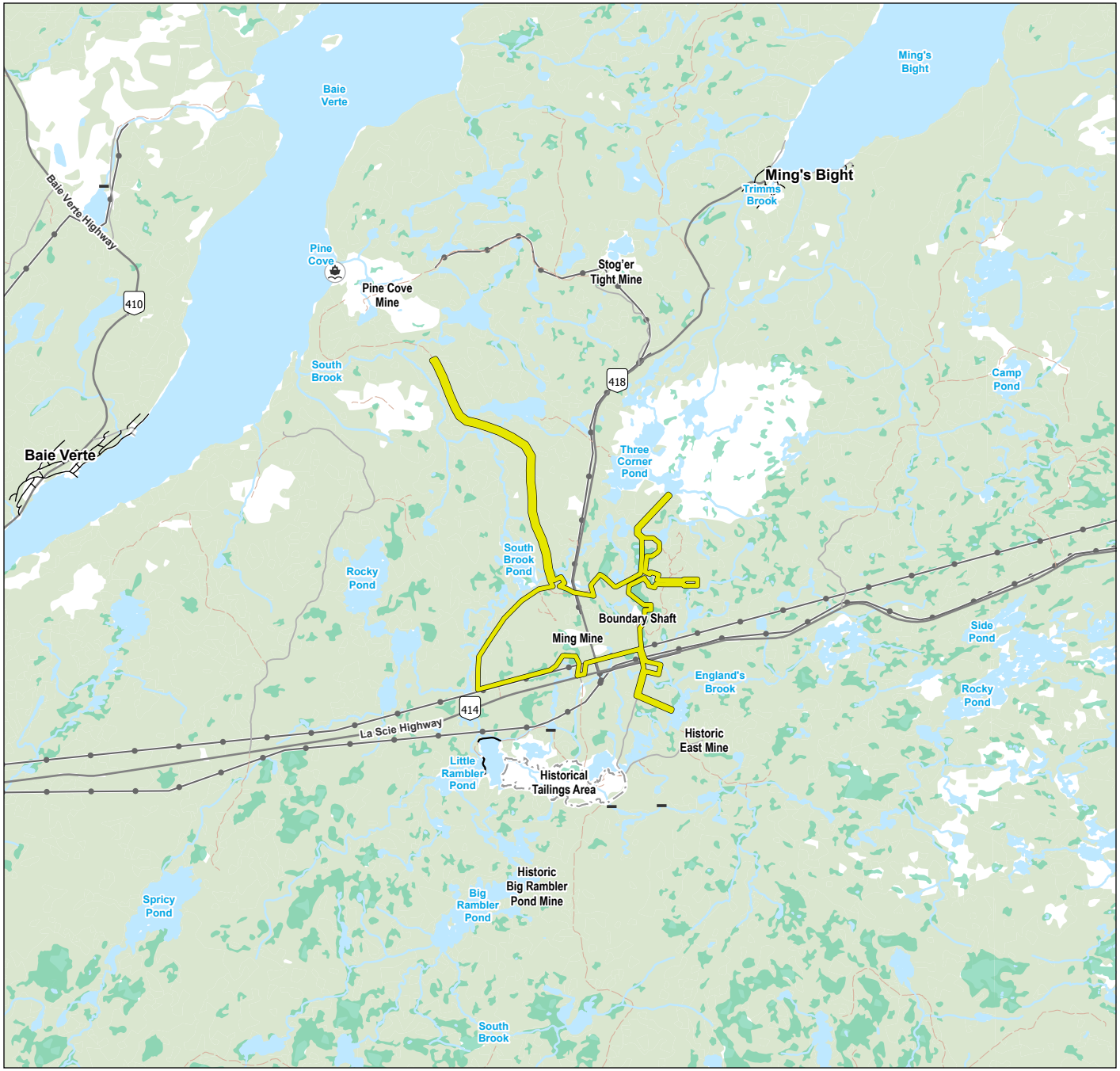


Figure No.
1.1.2
Title
Green Bay Ming Mine Project Location

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project
121418199_1_006

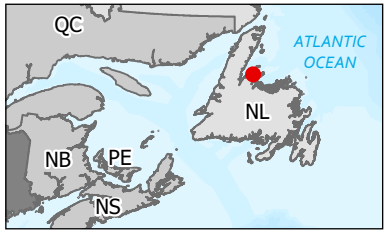
Project Location
Baie Verte, NL

Prepared by MB on 2024-12-09
Revised 2025-03-19
TR by NW on 2025-01-07

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Project Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
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3. Background: NRCan CanVec, GovNL, OpenStreetMap

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1.2 Name of the Undertaking

Green Bay Ming Mine Project

1.3 Proponent

FireFly (or the "Company") is the proponent for the Project. FireFly is a publicly listed copper and gold exploration company, with its registered office located near Ming's Bight, NL. FireFly has 100% ownership of the Project and will be the entity that will develop, manage and operate the Project. The existing underground mine and milling operation (i.e., the Green Bay Copper-Gold Project; Figure 1.1.1) was owned by Rambler Metals and Mining PLC (Rambler Metal and Mining), which, on April 11, 2023, was announced as being insolvent. Through a Sales and Investment Solicitation Process by the Supreme Court of NL and a transaction under the *Companies Creditors Arrangement Act*, FireFly announced the successful acquisition of the Green Bay Copper-Gold Project on October 19, 2023.

The address and contact information for the proponent is:

(Registered Office Address and Project Office) FireFly Metals Canada Limited Route 418 Ming's Bight Road Ming's Bight, NL Canada A0OK 3S0	(Mailing Address) P.O. Box 610 Baie Verte, NL Canada A0K 1B0
Email: comments@fireflymetals.ca Website: www.fireflymetals.ca	

The Chief Executive Officer (CEO) of FireFly is Darren Cooke. For the purpose of the EA process, the primary contacts at FireFly are:

Tabatha LeBlanc Vice President of Environment and Community FireFly Metals Canada Limited. comments@fireflymetals.ca	Gus Simbanegavi Vice President of Operations and General Manager FireFly Metals Canada Limited. comments@fireflymetals.ca

FireFly is a subsidiary, 100% owned by FireFly Metals Ltd. (FFM), formerly AuTECO Mineral Ltd, an Australian based company listed on the Australian Stock Exchange and recently, the Toronto Stock Exchange (TSX). FireFly was incorporated under the *Corporations Act* in Newfoundland and Labrador, with an amendment on October 26, 2023. The Corporation is in good standing in NL (see figure / screenshot of company info).

Detailed Company Information

Company Name: Firefly Metals Canada Limited

In Good Standing

Company Number:	51190	**Corporation Type:**	Company
Status:	Active	**Category:**	Local
Last Annual Return:	2024-01-31	**Business Type:**	With Share Capital
Incorporation Jurisdiction:	NL	**Filing Type:**	Incorporation With Share Capital
Incorporation Date:	2005-02-22	**Min/Max Directors:**	1 / 10

Additional Information:

(Latest addresses on file)

Registered Office:
Stewart McKelvey
PO Box 5038
Suite 1100, Cabot Place
100 New Gower Street
St. John's
NL Canada
A1C 6K3

Mailing Address:
Corporate Services Department
Stewart McKelvey
PO Box 5038
St. John's
NL Canada
A1C 5V3

Obtain a Certificate of Good Standing (Fee $10.00) Return

[Previous Names] [Amalgamated Information] [Current Directors] [Historical Remarks]

Previous Names

Name	Date Changed
51190 NEWFOUNDLAND & LABRADOR INC.	2006-11-14
RAMBLER METALS AND MINING CANADA LIMITED	2023-10-20

Current Directors

Records Found: 3 Viewing Records: 1-3

Director Name
Darren Cooke
Michael Dylan Naylor
Kevin Tomlinson

▲Return to top

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FireFly's CEO and Chief Financial Officer report to FFM's Board of Directors, which consists of five members. In turn, FireFly's management team (Group Chief Geologist, Vice President (VP) of Operations, VP Metallurgy, Exploration Manager, VP Human Resources, and VP Environment and Community) reports to the CEO. Members of the FireFly Management Team and FFM's Board of Directors comprise management committees responsible for corporate due diligence and ethical oversight to make decisions for the organization are sustainable and unbiased. The organization and business practices are audited annually by a third party.

Upon taking control of the Green Bay Copper-Gold Project, FireFly took the Ming Mine out of care and maintenance and immediately began an exploration program. FireFly retained the remaining approximately 35 workers of the past operator. With their knowledge, history and the expertise of the site, they were a valuable addition to support the success of the exploration program and Project.

The cost of the Project will be funded privately by FireFly Metals Ltd., which is the parent company of FireFly Metals Canada Limited.

1.4 The Undertaking

1.4.1 Project Location

The Project is located approximately 7 km southwest of the Town of Ming's Bight and 8 km east of the Town of Baie Verte, NL, in the Baie Verte mining district (Figure 1.1.1). It is located within the municipal boundary of the Town of Baie Verte. Distances to the existing Ming Mine operations and the Project Area boundary from the municipalities of Baie Verte and Ming's Bight are provided in Table 1.4.1.

Table 1.4.1 Distances to Communities

Location	Distance to Baie Verte (km)	Distance to Ming's Bight (km)
Straight Line Distance from Centre of Municipality to Existing Ming Mine Operation	8.2	7.4
Straight Line Distance from Centre of Municipality to Nearest Project Area Boundary	5.8 (closest point is around the port access road)	5.0 (closest point is around water intake)
Driving Distance from Centre of Municipality to Existing Ming Mine Operations	18	8.5
Distance from Municipal Boundary to Nearest Project Area Boundary	Within Baie Verte Municipal Boundary	3.7

Project mineral claims are illustrated in Figure 1.4.1. UTM Coordinates (NAD1983, UTM Zone 21N) for indicated locations on Figure 1.4.1 are provided in Table 1.4.2.

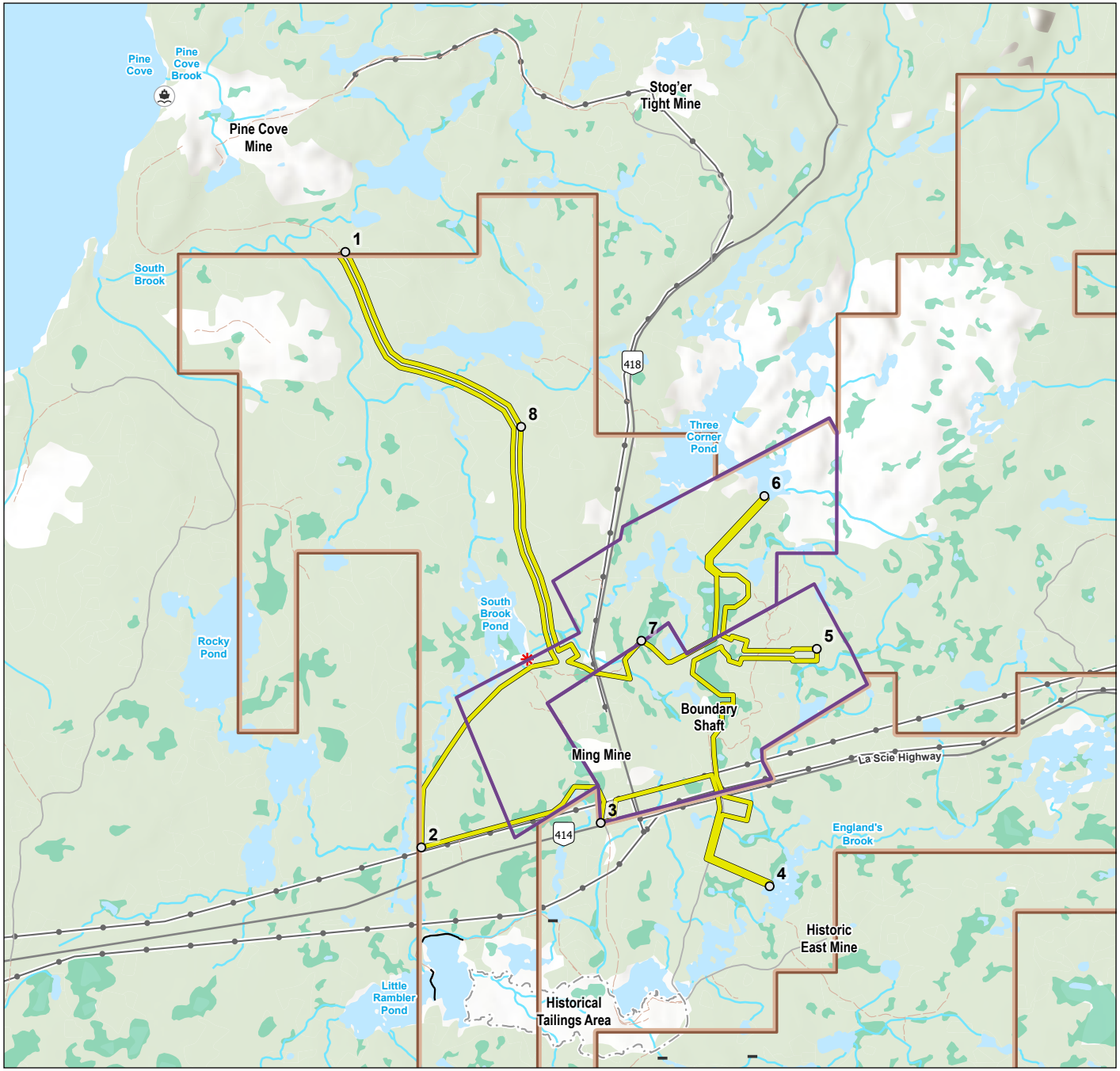


Figure No.
1.4.1
Title
Project Location and Leases

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_1_001

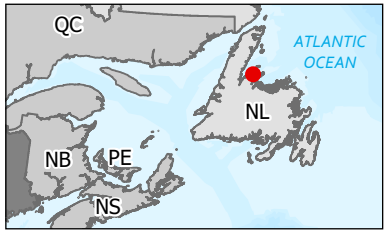
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-19

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:50,000

- Project Area Vertex
- Final Discharge Point (FDP)
- Project Area
- Mining Lease
- Exploration License
- Port
- Dam
- Resource Road / Trail
- Highway
- Arterial / Collector
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 1.4.2 Coordinates for Points Indicated in Figure 1.4.1

ID	Easting	Northing
1	563459	5533734
2	564093	5528761
3	565592	5528967
4	567002	5528438
5	567396	5530419
6	566958	5531695
7	565931	5530487
8	564927	5532274

1.4.2 Overview of Project History and Proposed Development

The existing and approved mine that was acquired by FireFly included more than 20 km of underground development, supporting underground infrastructure, shaft, mine rock storage, a processing plant and TMF (located at Nugget Pond; Figure 1.1.1), workshops, offices, a 50-person camp, water treatment plants, and port facility (located at Goodyear's Cove). The underground mined 1,350 tpd and transported the ore 50 km by road to the processing plant, where it was crushed, milled and put through a flotation and MaxGold collector process to recover the copper and gold. The nominal process rate of the mill was 1,500 tpd. The concentrate was then transported 140 km from the mill to the port for shipping to a smelter refinery.

Based on *Feasibility Study: Ming Mine Resource [2010 and 2018]*, Rambler Metal and Mining reported the reserves were 30.2 Mt at 1.83% Copper (547 kt) and 0.4 g/t of gold (351 koz), with 85% of the copper measured and an indicated resource. The total LoM at that time was estimated to be 20 years remaining. However, due to the scale of the underground operation, mining methods, transportation distance of ore and concentrate, and the size of the mill, the operation in its current state is not economical.

In October 2023, FireFly commenced Phase 1 of exploration, with 40,000 metres (m) of exploration diamond drilling and 750 m of development drilling to confirm and update the current resource, and increase confidence and knowledge of the deposit. Preliminary engineering studies have demonstrated the mine is feasible with 28.3 million tonnes (Mt) (ore resource / reserve measured, proven, probable), allowing expansion of the current operation to a rate of 4,800 tpd, constructing an onsite processing plant and TMF, expanding underground operation, and using renewable energy for operation and for the underground fleet.

Phase 2 of exploration began in May 2024, with a proposed 90,000 m of exploration diamond drilling and 1,200 m of development underground. This exploration phase is outside of the current Ming Mine Resource. With any mine operation, there is the potential that the LoM could be extended, and the Project could undergo additional expansion in the future.

The Project is located primarily on brownfield sites with a history of mining operations. The Project will involve the extraction of copper-rich critical minerals by expanding its current operation and is comprised of the following activities (Figure 1.4.2):

- Expanding underground mine operation
- Creating a waste rock stockpile and low-grade ore stockpiles
- Operating an ore sorting, primary crusher and mill processing plant at 4,800 tpd mill feed
- Installing a TMF and associated water management features including settling ponds, catchment structures and water treatment using the same final discharge point as registered for the current operation

The ore from underground will be transported to the primary crusher and fed into the process plant with a flotation circuit to produce a copper-gold concentrate. Tailings will be deposited in a TMF west of the mine. The concentrate will be transported (conveyor / truck) along a newly constructed port access road to Pine Cove Port, currently owned and operated by a third party.

As the Port is currently approved and being operated by a third party (i.e., it is not under the care and control of FireFly; FireFly and the port operator will have a typical supplier-customer commercial arrangement), transportation of concentrate has not been included within the scope of the Project and the EA. This would be similar to use of any of the approved ports that service developments across the province. As indicated in Appendix 1.A, the port operator has indicated that modifications to the port are not required to accommodate transportation of copper concentrate from the Project. It is incumbent on the Port operator to operate in compliance with existing approvals and should the port operator choose to expand their port in the future, they would be required to obtain applicable approvals for their planned activities.

FireFly intends to install a substation at the site to increase use of hydroelectric energy to support the use of a potential electric mining fleet and will use wi-fi-enabled underground technologies to promote equipment efficiency to move towards a carbon-neutral operation. The anticipated power requirement for the expansion is 30 megawatts (MW). NL Hydro has confirmed there is sufficient power being generated and capacity of the existing electrical grid to support the expansion of the Project. To provide operational continuity during power outages, the substation will be equipped with two 4.0 Mega Volt-Amperes diesel generators. One 750 kilovolt-amperes (kVA) generator will also be installed at the accommodations / camp facilities. The generators will be used primarily for emergency power requirements in the event of total power supply failure or maintenance.

Based on current designs and planned production rates, the LoM for the Project is approximately 15 years. Over the course of the Project, a total of approximately 326,000 tonnes (t) of copper in concentrate and 329,000 ounces of gold in concentrate is expected to be produced. An initial capital expenditure of between approximately CAD 320 million and CAD 350 million is required to cover the cost over the 12- to 18-month Project construction phase.

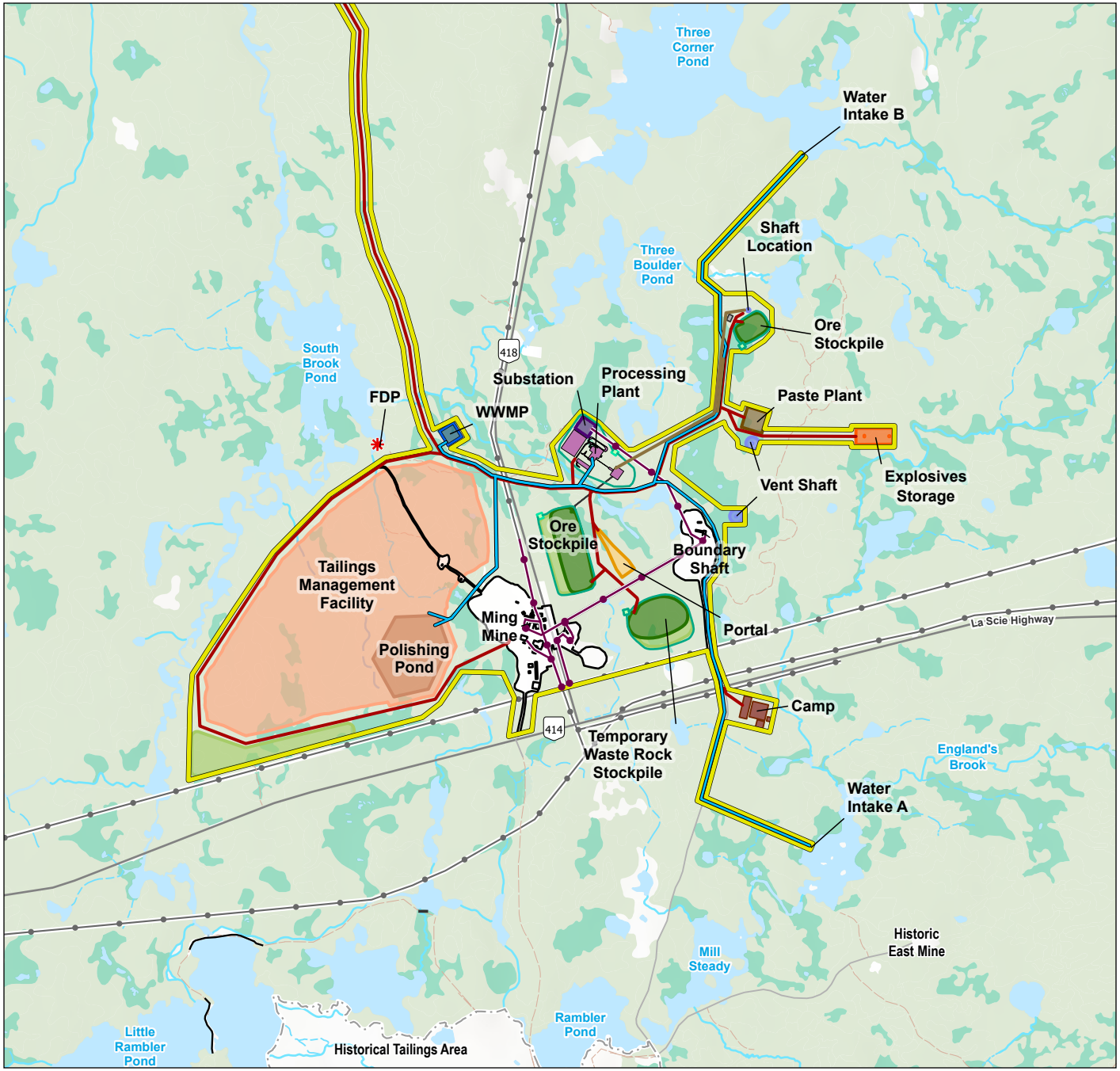


Figure No.
1.4.2
Title
Project Features

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_1_001a

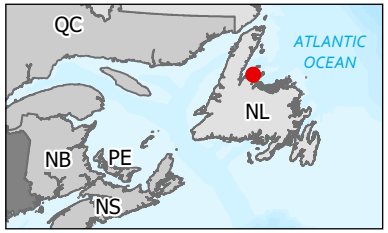
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-19

N

0 400 800 Metres
(At original document size of 8.5x11)
1:28,000

- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Camp
- Catch Basin
- Explosives Storage
- Ming Mine Operation
- Processing Plant Infrastructure
- Substation
- Stockpile
- Organic Laydown
- Paste Plant
- Portal Location
- Shaft Location
- Polishing Pond
- Tailings Management Facility (TMF)
- Wastewater Management Plant (WWMP)
- Other Features
- Final Discharge Point (FDP)
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
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2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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1.4.3 Purpose / Rationale / Need for the Project

As indicated in Section 1.4.2, the existing Ming Mine operation, in its current state, has been proven to not be economically viable. There were several factors affecting its viability including the scale of the underground operation, mining methods, transportation distance of ore to Nugget Pond and concentrate to Goodyear's Cove, and the size of the mill. Expansion of the existing underground mine is essential to creating a sustainable, viable and operationally efficient mine.

The development of the Project in NL is crucial for several reasons, particularly in the context of both the province and Canada's critical mineral strategy, efforts to reduce carbon emissions, fill the gap between supply and demand, and create substantial socioeconomic benefits.

1.4.3.1 Critical Mineral Strategies

The Project aligns with both Canada's (Government of Canada 2022) and NL's (Government of NL 2023) critical mineral strategies. Copper has been identified as a critical mineral in the province's critical mineral plan; the plan acknowledges the mining industry as a significant contributor to the provincial economy, as well as the need for government support for critical mineral projects to facilitate timely and efficient permitting. The Government of NL (2023) plan outlines the intent to strategically position the province as a key supplier of critical minerals, provide economic security for NL, and support the transition to green energy.

Copper, identified by both NL and Canada as a critical mineral, is used extensively in renewable energy technologies, such as wind turbines and solar panels, as well as in electric vehicles and energy storage systems. Gold (while not on Canada or NL's critical mineral list) is vital for electronics, medical applications, and environmental technologies. Gold has played a vital role in society; it has been used as a store of value for centuries. It is considered a safe-haven asset, especially during times of economic uncertainty (World Gold Council n.d.). NL's rich copper and gold deposits can help Canada secure a stable supply of these vital minerals, reducing dependence on imports and enhancing economic resilience.

As described in Section 2.1.3, the Project hosts total of 21.5 Mt at 1.8% copper equivalent in the Measured and Indicated Resource categories and 28.3 Mt at 2% in the Inferred Resource category. The Project would unlock a secure source of critical metals for NL and the Government of Canada.

1.4.3.2 Contribution to Carbon Emissions Reduction

Decarbonizing the economy is an important facet of addressing climate change. Copper plays a pivotal role in enabling the infrastructure needed for a low-carbon future. It is a key component in the production of low-carbon technologies, including electric vehicles, which are crucial for reducing greenhouse gas emissions from the transportation sector. Additionally, copper's high conductivity makes it ideal for improving the efficiency of renewable energy systems. The global push towards electrification and renewable energy sources has significantly increased the demand for copper. Gold is used in clean technologies that help reduce carbon emissions, such as fuel cells and hydrogen production.

Modern copper and gold mining operations are increasingly adopting sustainable practices to reduce environmental impacts. This includes using renewable energy sources for mining operations, recycling water, and reducing waste. These practices align with global efforts to decarbonize the mining sector and contribute to overall emissions reduction.

The Project is being designed and developed and will be operated sustainably. The development of a plant and TMF onsite and use of a third-party port, in close proximity to the mine, reduces the carbon intensity of the operation by reducing transport distances and associated greenhouse gas emissions.

1.4.3.3 Supply and Demand

The demand for copper is expected to rise dramatically due to the global push towards decarbonization and electrification. According to the consultancy firm McKinsey and Company, global electrification is projected to increase annual copper demand to 36.6 Mt by 2031, up from the current demand of roughly 25 Mt (Mills 2023). This surge is driven by the need for copper in wind turbines, solar panels, electric vehicles, and energy storage systems.

The International Copper Study Group's studies (2023) feature the growing demand for copper driven by the global energy transition and the need for sustainable technologies. The report underscores the importance of expanding copper production to meet future demand while also addressing the environmental challenges associated with mining. This aligns with NL's potential to become an important player in the global copper market, supporting both economic and environmental goals.

Despite the rising demand, copper supply is struggling to keep pace. The International Copper Study Group reports that global copper mine production was approximately 22 Mt in 2022 (Home 2023), which is insufficient to meet even the current demand. The ICSG projects that global copper demand will increase substantially due to the energy transition. For example, the demand for copper in renewable energy applications is expected to rise from 4% of total copper consumption in 2020 to 17% by 2030. S&P Global Market Intelligence projects that annual global copper demand will nearly double to 50 Mt by 2035, while supply is expected to reach only 31 Mt if current trends continue (Mills 2023). Research groups, trends and industry experts are forecasting a gap between the supply and demand of copper. Although recycling copper helps fill the gap, the demand outweighs the ability to recycle. The shortage can be addressed by increasing copper production, as proposed by the Project, which will assist in supporting the energy transition.

The global gold market, like copper, faces substantial supply-demand dynamics that highlight the importance of developing new gold mines, including those in NL. Gold is highly valued for its diverse applications, including jewelry, technology, and as a financial asset. The demand for gold remains robust due to its role as a safe-haven investment, especially during economic uncertainties. In addition to its financial stability and economic growth, it has electronics and medical applications due to its unique properties. Gold is an excellent conductor of electricity and is highly resistant to corrosion, making it ideal for use in electronic components, such as connectors, switches, and relay contacts. It is also used in the production of semiconductors and printed circuit boards. It is used in medical devices and diagnostics. It is biocompatible, meaning it does not cause adverse reactions when used in the human body. Gold nanoparticles are used in targeted drug delivery systems, cancer treatments, and diagnostic tests (World Gold Council 2018).

According to the World Gold Council, global gold demand reached approximately 4,400 million tons in 2023 (Statitista 2023). Similar to copper, global gold supply is primarily sourced from mining and recycling. In 2023, global gold mine production was approximately 3,000 t. However, the supply from mines has been relatively stagnant, with limited discoveries and declining ore grades in existing mines. This creates a supply gap that needs to be addressed to meet future demand.

Canada has seen a decline in copper production over the recent years. By developing a new copper-gold mine, such as the Project, NL and Canada can secure a stable supply of these vital minerals, reduce dependence on imports, and support the global energy transition. This aligns with both the provincial and federal Critical Minerals Strategy, which aim to promote economic growth, enhance national security, and position Canada as a leader in sustainable and responsible mining practices.

1.4.3.4 Socioeconomic Benefits

The development of a new copper-gold mine in NL is poised to bring substantial socioeconomic benefits to the local and regional economy, create substantial employment opportunities, and provide numerous advantages to the surrounding communities. The following summarizes the socioeconomic benefits from new and expanding mines:

- **Economic Growth**: The mining industry is a major contributor to NL's economy. In 2022, the gross value of mineral shipments from the province was approximately CAD 4.3 billion (Government of NL 2024). The Project will further boost this figure by generating additional revenue through the extraction and processing of these valuable minerals.
- **Revenue Generation**: Mining activities generate substantial revenue for the provincial government through taxes, royalties, and other payments. This revenue can be reinvested in community development projects, such as education, healthcare, and public infrastructure, enhancing the overall quality of life for residents.
- **Foreign Direct Investment**: New mining projects attract foreign direct investment, bringing advanced technologies, expertise, and best practices to the province. This enhances the efficiency and sustainability of mining operations and contributes to broader economic development (Turner 2019).
- **Economic Diversification**: The development of mining projects can lead to economic diversification by stimulating the growth of ancillary industries. This reduces the region's dependence on a single economic activity and enhances economic resilience (Turner 2019).
- **Direct Employment**: The mining industry in NL directly employs over 7,000 people. The Project will create numerous direct jobs in various roles, including exploration, extraction, processing, and management. These jobs often offer competitive wages and benefits, contributing to the local economy.
- **Indirect Employment**: The industry also supports numerous indirect jobs in sectors such as construction, transportation, and equipment manufacturing. For every direct job in mining, several additional jobs are created in related industries. This includes jobs in the supply chain, such as those in construction, transportation, and equipment manufacturing.

- **Induced Employment**: The increased income from direct and indirect employment leads to higher spending in the local economy, which in turn creates induced jobs. These are jobs in retail, hospitality, healthcare, and other services that cater to the needs of mine workers and their families.
- **Skills Development and Capacity Building**: Mining projects often include training programs for local workers, leading to skills development and capacity building. This not only improves the employability of individuals but also strengthens the local workforce, making it more resilient and adaptable to future economic opportunities.
- **Infrastructure Development**: Mining projects often lead to the development of essential infrastructure, benefiting local communities. This includes improvements in roads, power supplies, and water systems, which facilitate better access to remote areas and enhance connectivity and economic opportunities.
- **Community Development**: Many mining companies engage in corporate social responsibility initiatives, investing in community development projects. These initiatives can include building schools, healthcare facilities, and recreational areas, as well as supporting local businesses and entrepreneurship (Turner 2019).
- **Enhanced Public Services**: The revenue generated from mining can be used to improve public services such as education, healthcare, and transportation. This can lead to better living standards and increased opportunities for local communities.
- **Social Stability**: By providing employment and economic opportunities, mining projects can contribute to social stability. This can reduce poverty, decrease migration, and improve social cohesion within communities.

The Project is poised to provide benefits to the local and regional economy, create substantial employment opportunities, and provide numerous advantages to the surrounding communities. NL and local communities can leverage the benefits of the Project to support economic growth, create jobs, and improve the quality of life for local communities. FireFly has been engaging extensively with the community on the Project as detailed in Chapter 3, and to date, has received 33 letters of support from communities and vendors in the region (Appendix 3.B). These letters of support acknowledge the positive socio-economic benefits that the Project will bring to the local area.

1.5 Approval of the Undertaking

The Project is subject to provincial EA requirements under the NL EPA and associated *Environmental Assessment Regulations*. The Project is captured under section 33(2) and therefore requires that a Registration be submitted to the NL EA Division.

> *33(2) An undertaking that will be engaged in the mining, beneficiating and preparing of a mineral as defined in the Mineral Act whether or not these operations are to be performed in conjunction with a mine or at mills that will be operated separately shall be registered.*

It is also considered a designated undertaking in relation to construction of site roads as per Section 35(1):

> *35. (1) An undertaking that will be engaged in construction projects other than buildings that involve the*
>
> *(b) construction of roads or the relocation or realignment of existing roads where a portion of the road will be more than 500 metres from an existing right of way shall be registered.*

This Environmental Registration has been prepared in accordance with the Environmental Assessment – A Guide to the Process (NL Department of Environment and Climate Change [NLDECC] 2023). Table 1.5.1 is a table of concordance with Appendix 1 of the Guide.

Table 1.5.1 Concordance with Requirements for an Environmental Registration

Registration Requirement	Reference Location
Name of the Undertaking	Section 1.2
Proponent Information	Section 1.3
Purpose / Rationale / Need for the Undertaking	Section 1.4.3
Description of the Undertaking (Project Description), including:	
• Geographic location	Section 1.4.1; Figures 1.1.2 and 1.4.1
• Physical and biological environment	Section 4
• Construction phase activities, including waste streams and potential "resource conflicts"; describe public and Indigenous consultation that was conducted to address construction concerns	Section 2.6 and 2.10, Chapter 3 and Chapter 4
• Operation / maintenance phase activities, including waste streams and potential "resource conflicts"; describe public and Indigenous consultation that was conducted to address operation concerns	Section 2.7 and 2.10, Chapter 3 and Chapter 4
• Occupations for construction and operation phases; identify how employment equity will be addressed relative to age and gender.	Section 2.9.1
• Alternative means to carrying out the project	Section 2.13
• Project Expansion-related documents	Section 8
Approval of the Undertaking (i.e., required permits, approvals that the Project Expansion may require)	Section 1.5
Schedule	Section 2.4
Capital Cost and Funding (source of Project Expansion funding)	Sections 2.9.2 and 7

The Project does not include activities requiring federal assessment as listed in the *Physical Activities Regulations* under the *Impact Assessment Act*. FireFly has engaged with the Impact Assessment Agency of Canada (IAAC) on this issue and received a letter (Appendix 1.B) confirming that *"Based on the information provided to IAAC regarding the Project, it is IAAC's view that the Project is not a designated project as described in the Regulations."* Refer to Section 3.2 for further details on regulatory engagement with IAAC. In addition to provincial release from the EA process, the Project is subject to other federal and provincial legislation (Table 1.5.2). Further information on this legislation is provided in Sections 6.1 to 6.8 as applicable to specific Valued Components.

Table 1.5.2 Federal and Provincial Legislation that Could Apply to the Project

Federal Legislation	Provincial Legislation
Fisheries Act	*Water Resources Act*
Canadian Environmental Protection Act	*Wild Life Act* and *Regulations*
Species at Risk Act	*Historic Resources Act (1985)*
Migratory Birds Convention Act, 1994	*Lands Act*
Metal and Diamond Mining Effluent Regulations	*Management of Greenhouse Gases Act*
Newfoundland and Labrador Fishery Regulations	*Environmental Control Water and Sewage Regulations, 2003*
Canadian Navigable Waters Act	*Endangered Species Act*
	Air Pollution Control Regulations, 2022
	Forestry Act
	Mineral Act 1999
	Urban and Rural Planning Act
	Migratory Birds Hunting Regulations
	Town of Baie Verte Development Regulations [Municipal]

Table 1.5.3 provides a list of key provincial and federal environmental approvals, authorizations and permits that may be required from various provincial and federal agencies for the Project. Note that as the Project is an expansion of an existing mine, it is anticipated that some of the existing permits and approvals will require an update, in other cases, new approvals will be required. This list is not considered exhaustive.

Table 1.5.3 Provincial and Federal Environmental Approvals, Authorizations and Permits Potentially Required for the Project

Environmental Permit, Approval or Authorization Activity for Approved Project	Required for Project	Issuing / Approval Agency
Provincial		
Release from EA Process	Yes	NLDECC – Minister
Environmental Protection Plan	Update Required	
Certificate of Approval for Construction and Operation (Industrial Processing Works)	Update Required	NLDECC – Pollution Prevention Division
Certificate of Approval for Generators	Update Required	
Approval of Environmental Contingency Plan / Emergency Spill Response	Update Required	
Approval of Best Available Control Technology (BACT) Plan	Yes	NLDECC – Climate Change Division
Permit to Alter a Body of Water	Update Required	

Table 1.5.3 Provincial and Federal Environmental Approvals, Authorizations and Permits Potentially Required for the Project

Environmental Permit, Approval or Authorization Activity for Approved Project	Required for Project	Issuing / Approval Agency
Water Use Licence	Updated/As Required	NLDECC – Water Resources Management Division
Permit to Construct a Potable Water System	Yes	
Permit to Control Nuisance Animals	As Required	NLDFFA – Wildlife Division
Operating Permit to Carry out an Industrial Operation During Forest Fire Season on Crown Land	Update Required	NLDFFA – Forestry and Agrifoods Agency
Commercial Cutting Permit	Update Required	
Permit to Burn	Update Required	
Licence to Occupy	Potentially Required	NLDFFA – Crown Lands
Surface and Mining Leases	Update Required	NL Department of Industry, Energy and Technology – Mineral Development and Mineral Lands Division
Development Plan	Update Required	
Rehabilitation and Closure Plan	Update Required	
Financial Assurance	Update Required	
Mill Licence	Update Required	
Quarry Development Permit	As Required (local sources available)	
Policy for Highway Access Management	It is the applicant's responsibility to review the Department's Access policy to determine conformance with the policy requirements for access.	NL Department of Transportation and Infrastructure
Work within La Scie Highway or Ming's Bight rights-of-way	Work for this development that is within Route. 414 (La Scie Highway) right-of-way, 20 m from centre line or Route. 418 (Ming's Bight Road) right-of-way 15 from centre line, will require approval from this Department before any work takes place	
Blasters Safety Certificate	Update Required	Department of Digital Government and Service NL – Government Service Centre
Explosive Magazine Permit	Update Required	
Approval for Storage and Handling of Gasoline and Associated Products	Update Required	
Fuel Storage Tank Registration	Update Required	
Propane Use	Update Required	
Waste Management Plan	Update Required	
Certificate of Approval for a Sewage/Septic System	Yes	

Table 1.5.3 Provincial and Federal Environmental Approvals, Authorizations and Permits Potentially Required for the Project

Environmental Permit, Approval or Authorization Activity for Approved Project	Required for Project	Issuing / Approval Agency
Application to Develop Land for Septic	Yes	
National Building Code – Fire, Life Safety and Building Safety	Update Required	
Buildings Accessibility Registration and Permit	Update Required	
Food Establishment Licence	Update Required	
Mine Rescue Certification	Update Required	Workplace NL
Federal		
Fisheries Act Authorization	Updated or new authorization and/or letter of advice may be required based on engagement with Fisheries and Oceans Canada (DFO)	DFO
Initiate *Metal and Diamond Mining Effluent Regulations* authorization and reporting processes with Environment and Climate Change Canada including notification, identification of final discharge point(s), and required components of effluent monitoring, and environmental effects monitoring	Update Required	
Approval of *Metal and Diamond Mining Effluent Regulations* Emergency Response Plan	Update Required	
Approval to Interfere with Navigation	To be determined in engagement with Transport Canada	Transport Canada
Licence to Store, Manufacture, or Handle Explosives (Magazine Licence)	Update Required	Natural Resources Canada

Additionally, given the Project is located within the Town of Baie Verte Planning Area Boundary, as described in the 2022-2032 Municipal Plan and associated Development Regulations, municipal permits are anticipated. The Project is mainly located within the Industrial Mining Zone with the road extending into the Rural Zone. A development permit is typically required for projects in the Industrial Mining Zone and should include a Mineral Working Development Plan and Mining Reclamation Plan, as detailed in the Development Regulations. At the discretion of Council, temporary worker residence(s) may be permitted on the mine site and are required to be restored to its original condition at the end of the temporary period. Developers may also be required to enter into a legal agreement with Council to provide financial guarantees with respect to the terms relating to temporary occupancy and reinstatement of the site upon expiration of the approved temporary occupancy.

2 Project Description

As described in Section 1, FireFly is proposing the Green Bay Ming Mine Project (the Project; Figure 1.4.2), which is an expansion of the existing approved underground mine. The following chapter provides a description of the Project, including the following:

- Overview of mineralization and the mineral resource and reserve
- Site history
- Current site activities and existing mine infrastructure
- Project schedule
- Project components
- Project activities associated with construction, operation and decommissioning, rehabilitation and closure
- Employment and expenditures
- Emissions, discharges and wastes
- Environmental management
- Emergency response and contingency planning
- Project alternatives including alternatives to the Project and alternative means of carrying out the Project

Note that as further discussed in Section 2.3, the scope of the Project for the purposes of Environmental Assessment (EA) is limited to the new and modified activities and components located within the Project Area (Figure 1.4.2). While the Goodyear's Cove Port and Nugget Pond Mill and tailings management facility (TMF) (Figure 1.1.1) are part of the currently approved mine (i.e., the full Green Bay Copper Gold Project), FireFly is currently not planning for these facilities to be modified as part of the operation of this Project (i.e., the Green Bay Ming Mine Project), although future use may be considered. The facilities at Goodyear's Cove and Nugget Pond were placed in care and maintenance by the previous owners, and FireFly will retain these facilities in this status for now. If FireFly were to contemplate modification to these facilities in the future beyond the scope of their current Certificate of Approval (CoA), it is understood that those modifications would need to be evaluated to determine if they would require provincial EA registration as a designated undertaking or if associated changes to the Project may result in regulatory requirements under the *Impact Assessment Act*.

The Project presented in this chapter following sections represents the current conceptual design. As detailed design of the Project progresses, refinements will likely occur to address the results of further studies, such as geotechnical programs, and input received from regulators, the public and stakeholders through the EA and permitting processes. For instance, the footprints of infrastructure may shift slightly to account for constructability issues identified during geotechnical surveys, or construction methods may be refined based on equipment availability and/or seasonal considerations. Additional refinements may be made during construction, and as production is optimized during the operation phase. Adaptive management (i.e., learning from monitoring and adjusting mitigation and monitoring accordingly) and engagement with regulators, the public and stakeholders may also result in refinements during the life of the Project.

Through detailed design of the Project, FireFly will continue to follow several key design considerations:

- FireFly will use previously disturbed / cleared areas for Project development to the extent possible.
- Placement of mine waste will be purposely designed to avoid overprinting waters frequented by fish. The location of mine infrastructure and waste will be designed for better water management and reducing the overall footprint and impact to surface water and groundwater systems.
- FireFly will work towards returning the Project Area to as close to pre-Project conditions as practical, with due consideration to the aesthetics that existed prior to mining by FireFly.
- FireFly will continue to identify opportunities to reduce the carbon intensity of the Project.

To address the potential for continued Project refinements, the approach within this Environmental Registration has been to take a conservative approach to the assessment presented in Chapter 6 and to identify mitigation measures and follow-up programs that would be applicable and effective, regardless of the specific nature of Project refinements. As further Project planning and engineering design work are completed, FireFly will continue to engage with appropriate provincial and federal regulators as part of the EA and permitting processes.

2.1 Overview of Mineral Resource

2.1.1 Mineralization

The Property is a Noranda-type volcanogenic massive sulphide (VMS) deposit hosted by Cambrian-Ordovician metavolcanic and metasedimentary rocks of the Pacquet Harbour Group. The style of mineralization, alteration, host rock, and tectonism most closely resemble other VMS deposits throughout the world. The polymetallic sulphide deposits in the Ming Mine area are known to contain copper, zinc and minor lead, gold and silver along with traces of other metals. Mineralization in the deposits can be classified as either massive sulphide or footwall stringer.

There are two dominant types of mineralization in the Ming Mine deposit:

- VMS
- Disseminated stringers of sulphides in the Lower Footwall Zone (LFZ).

Polymetallic VMS are copper-gold-silver dominated massive sulphides lenses formed on the sea floor via the accumulation of precipitated sulphides around subaqueous volcanic vents. The sulphides are dominantly pyrite and chalcopyrite with lesser sphalerite. The channel-like geometry results in lenses that are between 3 metres (m) and 15 m in true thickness and widths of 100 m laterally. The strike of these lenses at Ming exceeds 2 kilometres (km) and remains open. Mineralization from the Ming North is shown in Figure 2.1.1.

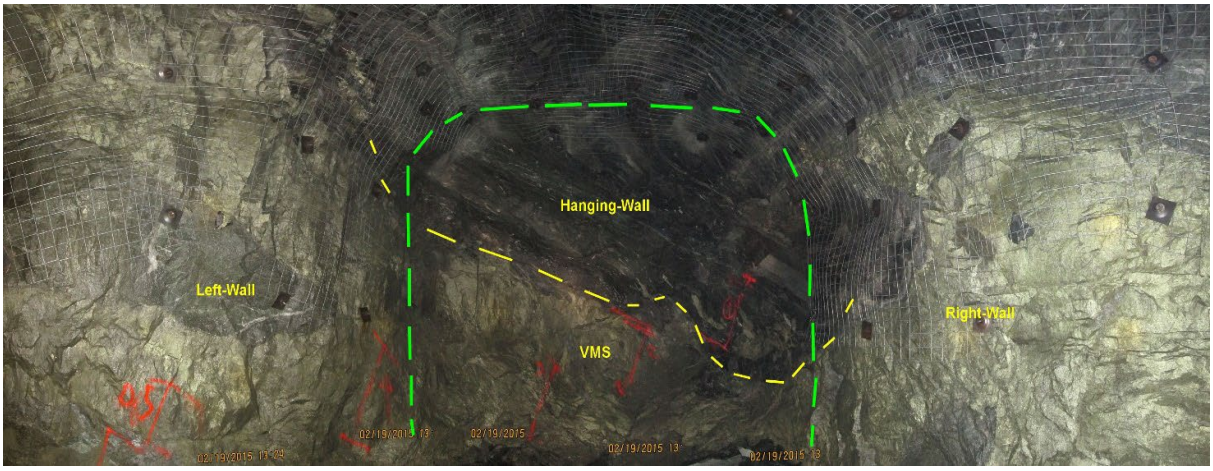


Figure 2.1.1 Typical Volcanogenic Massive Sulphide Mineralization

The three different VMS ore types are:

- Massive pyrite ore, which is less than 70% pyrite, with chalcopyrite and minor amounts of galena, sphalerite, and silicate minerals
- Banded ore consists of alternating bands of pyrite and chalcopyrite-quartz-actinolite-biotite
- Massive chalcopyrite-pyrrhotite ore occurs as lenses and layers with up to 80% chalcopyrite

Minor amounts of arsenopyrite, galena, tetrahedrite, native gold, tennantite, and cubanite occur locally. There is up to 10% disseminated pyrite in the immediate footwall.

LFZ broad footwall stringer-style mineralization**,** centimeter-scale veins of pyrite, chalcopyrite and pyrrhotite are interpreted to have formed as part of the hydrothermal feeder system below the sea floor. The sulphide stringers have been locally deformed and characteristically follow the foliation. The host rock is typically rhyolite that is intensely chlorite-altered reflecting the temperature and fluid pressure at formation (Figure 2.1.2). The zone of stringer mineralization contains grades locally reaching beyond 2% copper.

Figure 2.1.2 Stringer Lower Footwall Mineralization with Chalcopyrite Stringers in Chlorite-altered Rhyolite

The LFZ is a mineralized horizon that lies approximately 100 m below the VMS horizon. The LFZ strike length is approximately 2,100 m and has a thickness that varies from 200 to 300 m. The extent of the LFZ is unknown as it is open both up and down plunge. Recent drilling has traced mineralization 2,000 m down plunge.

2.1.2 Condemnation

The current portal to the mine is located on the west side of Highway 418; the Ming Deposit trends to the northeast. The focus of historic and current exploration was on the deposit east of Highway 418. The geology of the Ming deposit and associated rock types are well documented. Historic surface diamond drill holes were located in the footprint of the process plant and no mineralization was identified in this area. In spring 2024, FireFly completed additional geophysical surveys on ground and aerial. The geophysical survey results indicated low potential for mineralization near surface in the vicinity of the Boundary Shaft in the proposed footprint of supporting infrastructure to on the east side of Highway 418.

Limited exploration has been conducted west of the mine site. Rock core collected from boreholes drilled for groundwater monitoring wells throughout the Project Area, with five installed on the west side of Highway 418 in the footprint of the TMF, were logged and sampled. The preliminary results indicated low mineralization potential. A condemnation and geotechnical program were conducted within the footprint of the proposed TMF in November 2024. The data gathered has confirmed that there is no resource overprinted by that infrastructure.

2.1.3 Mineral Resource and Reserve

FireFly has been carrying out an extensive exploration and drilling campaign since November 2023, which remains ongoing. A preliminary internal mineral resource estimate was completed in May 2024 and further refined in October 2024. This model was used as the basis to prepare a revised mine plan. The updated mineral resource estimate is based upon FireFly's drilling database, which includes both the historical drilling and new drilling results since November 2023. Geology modelling was conducted in-house by FireFly staff and audited by an independent Qualified Person. The Mineral Resource Estimate was completed by Brian Wolfe of International Resource Solutions Pty Ltd.

Mineral resources and reserves presented are based on the current Canadian Institute of Mining (2014) Definition Standards for Mineral Resources and Mineral Reserves as follows:

- A **Mineral Resource** is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity with reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.
- An **Inferred Mineral Resource** is that part of a Mineral Resource for which quantity and grade or quality are estimated based on limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity.
- An **Indicated Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation.
- A **Measured Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation.

The commodities of economic interest at the Project are primarily copper and gold, with secondary recoveries of silver. A summary graph of the grade tonnage analysis of the resource model is provided in Figure 2.1.3.

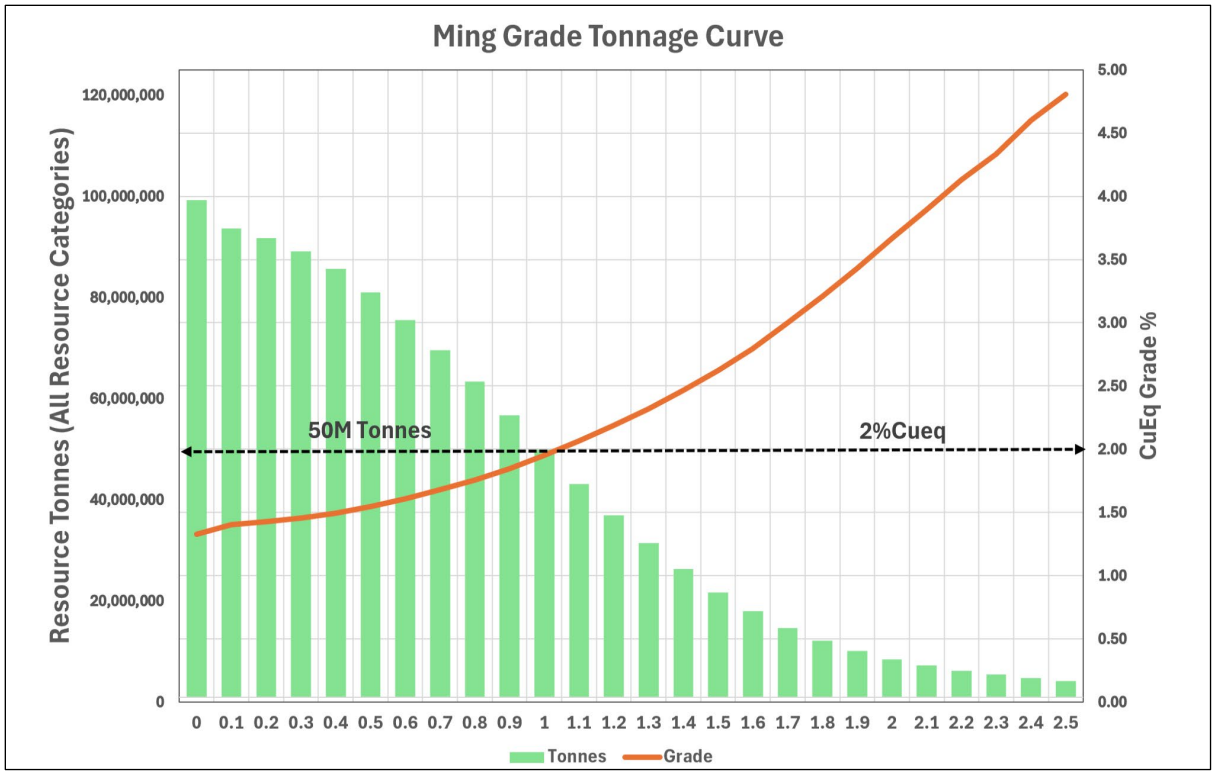


Figure 2.1.3 Ming Mine Grade Tonnage Curve

The resource reported is NI 43-101 compliant and effective as of October 29, 2024, and has been tabulated in terms of underground mining shapes. Conceptual mining shapes were applied as constraints to demonstrate reasonable prospects for eventual economic extraction. Cut-off grades for constrained resources are 1.0% copper grade. A summary showing the full resource estimates and resource categories as per Canadian Institute of Mining standards and requirements for reporting is provided in Table 2.1.1.

The parameters used to develop the constraints and cut-off grades for a reasonable prospect of economic extraction are provided primarily through benchmarking of similar projects. A copper price of USD$8,750, gold price of USD$2,500, and silver price of USD$25, with a USD:CAD exchange rate of 1.35, was used to derive the 1% copper cut-off grade. Mining costs were CAD$50/tonne (t) and processing costs were CAD$16/t. Mining costs assumed in the cut-off grades calculation assume a combination of transverse and longitudinal long hole open stoping with paste backfill. Processing costs were estimated using benchmarked operations that use flotation to produce a copper-gold concentrate for external extraction. General & Administrative cost assumption was CAD$12/t. Concentrate freight: mine to port USD$5/t, port to smelter ocean freight USD$60/t. Smelter treatment charges were USD$75/t, copper refining was USD$0.08/pound, USD$15/ounce gold, and USD$0.5/ounce silver.

Table 2.1.1 Mineral Resource Summary

Element	MEASURED			INDICATED			TOTAL M&I RESOURCE			INFERRED		
	Tonnes	Grade	Metal	Tonnes	Grade	Metal	Tonnes	Grade	Metal	Tonnes	Grade	Metal
Copper	4.7 Mt	1.7%	77 kt	16.8 Mt	1.6%	266 kt	21.5 Mt	1.6%	343 kt	28.3 Mt	1.7%	482 kt
Gold		0.3 g/t	45 koz		0.3 g/t	145 koz		0.3 g/t	190 koz		0.4 g/t	338 koz
Silver		2.3 g/t	0.3 Moz		2.4 g/t	1.3 Moz		2.4 g/t	1.6 Moz		3.3 g/t	3.0 Moz
CuEq	4.7 Mt	1.9%	89 kt	16.8 Mt	1.8%	307 kt	21.5 Mt	1.8%	396 kt	28.3 Mt	2.0%	576 kt

Notes:
CuEq = Copper equivalent
Mt = Million tonnes
g/t = grams per tonne
kt = kilotonne
koz = thousand ounce
Moz = million ounces
M&I = measured and indicated

2.2 Site History

2.2.1 History of Site Ownership and Development

Exploration of the Project dates to the early 1900s with the discovery of auriferous sulphide mineralization. Several phases of mining took place with the mine eventually going into care and maintenance in March 2023. Below is the chronology of events and timing of the activities until the recent acquisition by FireFly in October 2023 (Table 2.2.1).

Table 2.2.1 History of Ownership – Ming Mine Property

Date	Owner
1900s to 1930s	Enos England
1944	Rambler Mines Corp.
1945 - 1951	Gold Mines
1951 - 1960	Falconbridge Nickel Mines Ltd.
1961 - 1987	Consolidated Rambler Mines Ltd.
1988 - 1993	Rambler Joint Venture Group
1994 - 2001	Ming Minerals Inc.
2001 - 2005	Altius Minerals
2005 - 2023	Rambler Metals and Mining PLC
2023 - Present	FireFly Metals Canada Limited

Historically, the Ming Mine has been mined since the early 1950s before shutting down in 1982 and being handed over to the Crown. Activities resumed in 2010 after an exploration program by Rambler Metals and Mining and the purchase of the Nugget Pond processing and TMF. In 2010, the Project's previous owner began the process of reactivating the historical Ming Mine, proposing the use of the Nugget Pond Mill (located in Snook's Arm, approximately 40 km by road from the Ming Mine site) to process the extracted ore. On April 12, 2010, the combined project sites entered EA registration. The project was then conditionally released from EA on June 2, 2010. Per the conditions of the EA release, Rambler submitted an Environmental Protection Plan (EPP) in February of 2011, which was then accepted on March 24, 2011.

Mining and processing continued from 2010 until 2017 at a mining rate of approximately 1000 tpd. In 2017, due to the planned increase in production rate from additional confirmed high-grade copper resources, Rambler initiated plans to expand the TMF at the Nugget Pond mill site to accommodate the anticipated increased volume of produced tailings. The Nugget Pond TMF expansion plan entered EA registration on December 13, 2017. An Environmental Preview Report was requested by the Department of Environment and Climate Change, formerly the Department of Municipal Affairs and Environment, which was submitted on May 10, 2018, and the expansion was released from EA on July 5, 2018.

In addition, the existing current operation and site components received a CoA, as well as numerous other permits for the current operation and exploration activities. The Goodyear's Cove port facility and Nugget Pond mill are included in the CoA and are fully permitted operations.

Operation for mining continued until recently (March 2023) when the mine was placed on care and maintenance due to financial challenges of the previous owners, Rambler Metals and Mining. The Nugget Pond mill and TMF and the Goodyear's Cove port were also placed on care and maintenance.

2.2.2 Historical Mine Works in the Area

As indicated above, the Project site was subject to previous mining activity at the former producing Ming and Ming West copper-gold deposits (Figure 2.2.1). The former Ming Mine last operated in 1982, while Ming West operated for a short period in 1996. Historical mine workings in the immediate vicinity of the Project include:

- Boundary Shaft – directly east of Mine Ming and the shaft extends directly above the orebody connecting it to the surface
- Ming Mine – open pit beneath the existing waste rock pile and underground mine undergoing exploration and exploration development and location of ore body to be mined as part of the Project
- Ming West – underground mine that extends from the current ramp portal of the Ming Mine and being utilized to store excess water and solids from the wastewater management plant as part of the dewatering the underground mine workings of Ming Mine
- Historic East Mine – underground workings southeast of the Project site (associated vent raises and shafts were capped)
- Historic Big Rambler Pond Mine – underground workings south of the Project site (associated vent raises and shafts were capped)
- Rambler Consolidated Tailings (Historical Tailings Area on Figure 2.2.1) – resulted from the operation of the concentrator on the former Consolidated Rambler property, which processed ore from four historic mines from 1964 to 1982 and again briefly in 1995 to 1996. Approximately 4.3 Mt of ore was mined and milled from the four deposits, producing 3.8 Mt of acid-generating sulphide tailings. Approximately half of the Rambler Consolidated Tailings area, 25.885 ha, is held in an Exempt Mineral Land (EML), owned and managed by the Government of NL.

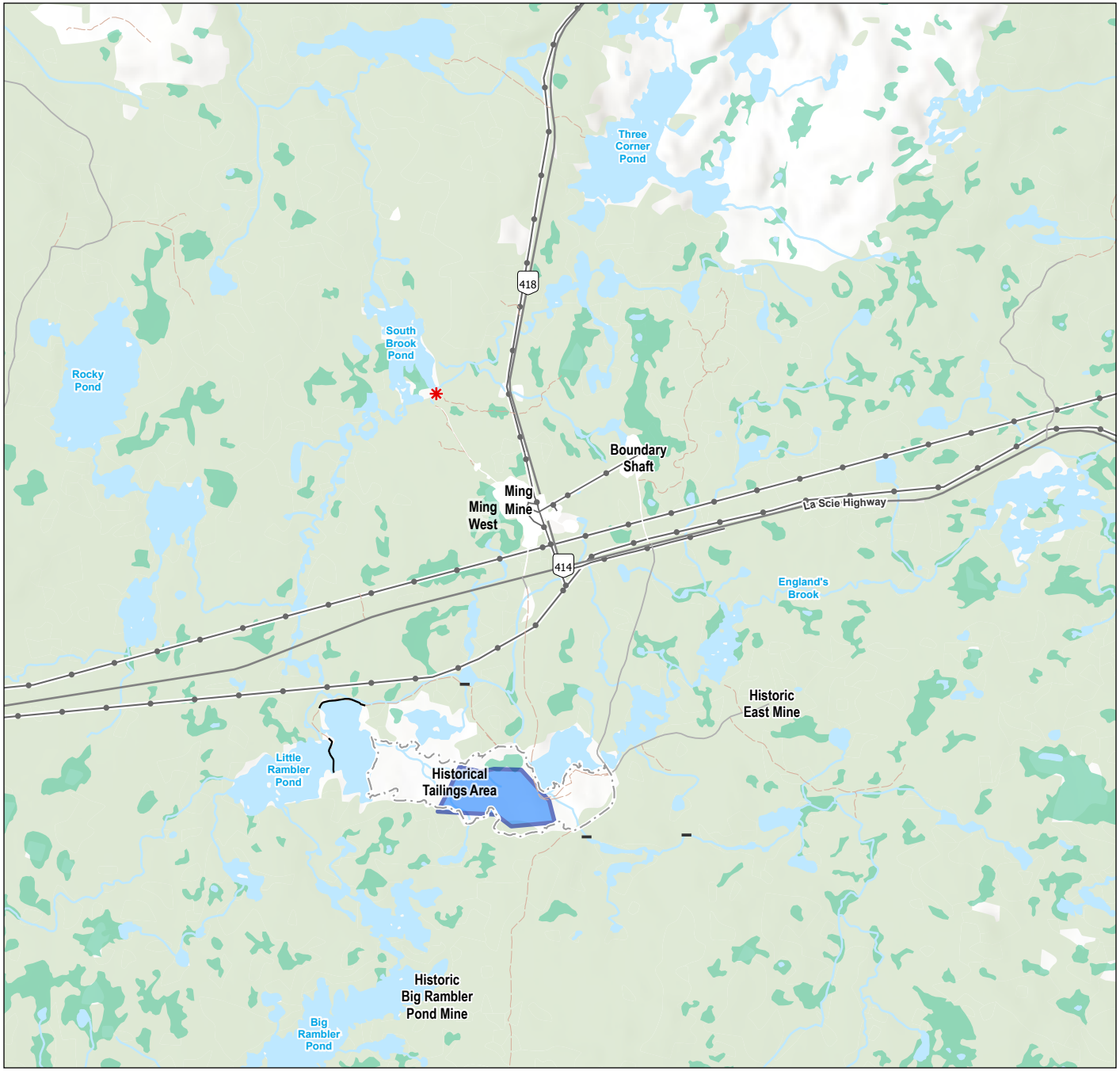


Figure No.
2.2.1

Title
Historical Mining Legacies in the Vicinity of Ming Mine (Stantec 2024)

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_1_007

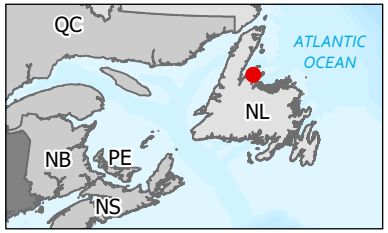
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-26

N

0 400 800
Metres
(At original document size of 8.5x11)
1:45,000

- Final Discharge Point (FDP)
- Rambler Tailings Exempt Mineral Land
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Abandoned open pit mines, underground workings, waste rock piles and associated infrastructure existed on site prior to the reactivation of the Ming mine operation in 2006. According to the 2016 Request for Proposals issued by the Department of Natural Resources for the Rambler Exempt Mineral Land, all mine shafts and vent raises are capped with engineered concrete slabs (Government of NL 2016, pg.5). A historical waste rock area known as Boundary Shaft (Mining Lease 141) to the east of Ming Mine drains water with low pH and high concentrations of metals to Three Boulder Pond Brook, which empties into South Brook Pond, a short distance downstream of the final discharge point (FDP) for treated effluent from the current Ming Mine operation (Stantec Consulting Ltd. [Stantec] 2024).

Likewise, acid rock drainage from historical tailings and waste rock associated with the former East Mine and Rambler Mine, known today as the Rambler Consolidated Tailings site (Historical Tailings Area on Figure 2.2.1), results in low pH (generally below 4) and high concentrations of metals (notably copper and zinc) and affects several waterbodies, including South Brook from the former mining area to South Brook Pond (within the South Brook drainage system) and all the way downstream to where South Brook discharges into Baie Verte.

2.2.2.1 Boundary Shaft Site History

The Boundary Shaft and headframe is located approximately 700 m east of the current Ming Mine and will be within the footprint of the Project (Figure 2.2.1). It is currently accessed via a gravel road connecting to provincial Highway Route 414. The Boundary Shaft allows access to the underground mine and is approximately 580 m deep. Historically the shaft was used for skipping ore and transporting miners underground; however, for the existing operation, the shaft is used for ventilation intake and as a second means of egress from the mine with a re-established man way. The former shaft structure and headframe have been dismantled, and all that remains at the Boundary Shaft site is the original collar house, which is used for storage, as well as several concrete foundations associated with former site buildings.

The Boundary Shaft site is comprised of waste rock material from historical mining operations, and measures approximately 34,000 square metres (m²) in area. The approximately 1.2 km gravel access road leading into the site is also thought to be constructed of the same waste rock material and represents an area of approximately 8,500 m². In 2019, GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by the former operator to carry out a metals leaching / acid rock drainage (ML/ARD) Assessment (GEMTEC 2019) at the Boundary Shaft site. Based on the acid base accounting testing, all the waste rock material in both areas (road and waste rock pad) are considered to be acid-generating material. The impacts of the ML/ARD from the waste rock are visible and captured in the baseline studies for the Project. The waste rock pad is generally flat surrounded by a wetland (bog) and wooded areas. Surface drainage and shallow groundwater flow follows the general slope and a drainage swale, into an unnamed tributary flowing northwest towards the South Brook Pond, located within the South Brook drainage system, approximately 1.5 km from the site.

In correspondence in 2010 and later 2017 (Government of NL 2010, 2017) with former operators, the NL Department of Industry Energy and Technology (NLDIET) provided guidance on the development of the Boundary Shaft site (Mining Lease 141) so that an operator was not held responsible for historic impacts, outside of degradation caused by their activities.

The previous operator was permitted to install a propane tank and ventilation equipment, requiring only on-grade concrete pads, with only responsibility for surface disturbance related to these installations. If more significant site disturbance would be caused by construction, NLDIET could recommend that the operator not be held responsible for historic impacts, outside of degradation caused by their activities,

The operator was able to use the site for mine operation and future development if the following conditions were met:

1. Characterization of the existing site conditions through water and soil / rock sampling and quantification of the amounts of acid-generating material at the Boundary Shaft
2. Use of the Boundary Shaft acid-generating material as underground backfill once waste rock currently stockpiled near the portal has been returned underground; and
3. Directing or diverting clean water away from the acid-generating material.

As mentioned, the Boundary Shaft is used by the existing operation; the shaft is used for ventilation exhaust, and as a second means of egress from the mine with a re-established man way. Although no significant disturbance of the historic site has occurred, GEMTEC completed the characterization of existing site conditions in 2019, and the operator committed in the Updated Rehabilitation and Closure Plan (RCP) (Rambler Metals and Mining Canada Limited. 2018) to use waste rock currently stockpiled at the portal for underground backfill. FireFly intends to use the site for various infrastructure, such as haul roads, temporary waste rock stockpiles and explosive magazine storage and a possible laydown area for storage of mine / mill equipment associated with the construction phase. Areas of the Boundary Shaft would be capped or covered, with no substantial disturbance to the historic ML/ARD waste rock. Capping or covering some of the acid generating material with clean construction material and concrete will reduce further ML/ARD of historic material.

2.2.2.2 History of Rambler Consolidated Tailings Site

Rambler Consolidated Tailings site is approximately 2 km south of the Ming Mine (Figure 2.2.1). Although no Project components are proposed at the Rambler Consolidated Tailings site, tailings stored outside the EML may be used to supply the paste plant (Section 2.3.9) and baseline conditions at the Project site and the FDP are influenced by the historic ML/ARD tailings. The FDP for the current operation and the proposed Project is South Brook Pond, which is downstream of the Rambler Consolidated Tailings site.

Water quality impairment of South Brook has been well documented in several studies, including previous environmental effects monitoring studies for Ming Mine. An environmental site assessment of the former Rambler Mine from 2005 (Davies Engineering & Associates Ltd. 2005) documents impacts from tailings dating back to the 1970s based on aerial photographs. This report includes records from regulatory agencies dating back to the 1980s of acute lethality to rainbow trout of water samples and water quality showing low pH and levels of metals that would be acutely toxic to aquatic life. Environment Canada (now Environment and Climate Change Canada [ECCC]) took a tailings pond effluent sample in 2001 and found it to be acutely lethal to fish with a pH of 3.2 and a high concentration of metals (Davies Engineering & Associates Ltd. 2005).

Studies conducted and reported by McConnell (1995, 2002 [Appendix 2.A]) document the profound impact of ARD associated with the former Rambler Consolidated Tailings and downstream. Water geochemistry was examined over an eight-year period (1993-2001) at multiple locations. Results showed that ARD is widespread and affects several waterbodies, including South Brook from the former mining area down to its mouth at Baie Verte. The study shows the distribution of high levels of copper and zinc and low pH (typically <4), with a clear pattern of highly impaired water quality downstream of historical mining sites. Peak levels of copper and zinc were recorded in Three Boulder Pond Brook from waste rock runoff and in the North Diversion Ditch that carries upstream water around historical tailings in Little Rambler Pond and exits to South Brook.

The historical impacts of ARD date back decades and the legacy effects to surface water, groundwater, fish and fish habitat are well documented. Due to the potential interaction of these historic impacts on the Project, additional effort has been made to characterize the baseline conditions of these legacy sites.

2.3 Current Site Activities and Existing Mine Infrastructure

The following section describes the current site activities and mine status since acquired by FireFly, and the existing and approved infrastructure at the mine site. As part of the 2018 assessment, there were also approved and permitted components of the mine that were not constructed. These are identified in Section 2.3.9.

The Green Bay Copper-Gold Project has approved operation and infrastructure that were released from EA in 2010 and 2018. The Ming Mine was in production from 2011 to 2023. Past and current operation at the Ming Mine has included mining of relatively high-grade copper ore. Later in life of mine (LoM), higher-grade ore in addition to the mining of a new zone (LFZ) was blended for an overall higher production rate of 1,250 metric tonnes per day. The LoM in 2017 was estimated to be 20 years.

The ore was extracted from the Ming Mine and hauled by truck 40 km west to the Nugget Pond mill and TMF, where it was processed into a copper gold concentrate (Figure 1.1.1). From there, the copper concentrate was hauled by truck to Goodyear's Cove, located approximately 140 km south, near the town of South Brook. From the Goodyear's Cove port facility, it was conveyed onto ships and delivered to various external refineries. As indicated in Section 2.2.1, the Goodyear's Cove Port and Nugget Pond mill and TMF are part of the currently approved mine. FireFly, however, is currently not planning for these facilities to be part of this Project. FireFly will retain these facilities on care and maintenance for future consideration. As these are both part of the existing and approved operation and no changes are being proposed to these facilities (i.e., both will be maintained in their current care and maintenance status), these facilities are not considered to be within the scope of the Project and are not further discussed in this EA. If FireFly were to contemplate modification to these facilities in the future, it is understood that those modifications would need to be evaluated to determine if they would require EA registration as a designated undertaking, or if associated changes to the Project may result in regulatory requirements under the *Impact Assessment Act*.

2.3.1 Current Site Activities and Mine Status

As indicated in Section 2.2.1, the mine was placed in care and maintenance by the former owner in March 2023. Following a successful Sales and Investment Solicitation Process by the Supreme Court of NL and the sale of the assets were approved under the *Companies Creditors Arrangement Act* process. In October 2023, when FireFly took control of the mine, the Ming Mine section of the operation was taken out of care and maintenance but only to conduct exploration activities and not for production.

Under the approved CoA and permitted activities, FireFly's ongoing activities include the following:

- Extensive underground diamond core drilling from platforms established within the existing underground mine infrastructure, which commenced in October 2023
- Development mining of new exploration drifts and drilling platforms onsite, which commenced in October 2023. Mining is primarily for exploration drift establishment with waste rock generated being hauled and backfilled in previously mined voids underground
- Ensuring the underground workings and supporting infrastructure are maintained, ventilated and dewatered
- Maintaining and managing equipment, power supply and distribution (back-up power generators), fuel and propane storage, communication systems and other auxiliary equipment to support underground exploration activities
- Project design, engineering, baseline and technical studies
- Maintaining access control and security at the mine site, with a fully staffed security gate 24/7
- Managing and staffing of employees, contractors and visitors
- Operating a camp and kitchen to house the workforce
- Ensuring Health, Safety and Environmental (HSE) and statutory obligations and documented commitments are met
- Conducting compliance/environmental monitoring in line with the approved activities
- Developing and conducting a community engagement program as further described in Chapter 3 of this Environmental Registration

At the end of 2024, FireFly had 85 employees at its current operation, with the contractor workforce fluctuating between 20 to 30 people depending on activities at the time.

In addition, FireFly has implemented policies, procedures and management plans to ensure the health, safety and security of workers and the reduction and management of potential environmental effects of its activities. These documents are continually reviewed and modified to reflect the conditions onsite. Further detail on FireFly's existing approach to health and safety, and environmental management and how these plans and procedures will be modified to address the proposed Project are described in Sections 2.9 and 2.11.

2.3.2 Ming Mine Underground Works

The current mine contains more than 12 km of ramp development in addition to lateral development previously used to access various levels of the mine. These workings date back to the initial stages of mining when the Ming Mine was operational between 1972 to 1982, as well as the resumption of mining in 2012. Throughout the duration of this activity, multiple ore zones were exploited, each of which had its own characteristics and design parameters. These zones include the following: 1807; 1806; Ming South; Ming North; LFZ; and Upper Footwall Zone.

The main classification of these zones can be broken down into either high-grade massive sulphide, VMS zones, or lower grade chalcopyrite stringer zones (LFZ), as shown on Figure 2.3.1 The ramp was originally driven 5.0 m wide and 2.5 m high, but later slashed to 5.0 m wide and 5.0 m high, descending at 16% to 18% gradient. The portal elevation is160 metres Relative Level (mRL) to minus 850 mRL, representing a total mine depth of 1,010 m connected by a decline development length of +12,000 m, enabling access to the mining areas. Figures 2.3.2 and 2.3.3 are plan views of the existing mine workings that consist of the following components:

- Levels are nominally spaced at 30 m (100 feet) vertically.
- Mined out stopes are predominantly not backfilled, with a small number filled with unconsolidated waste rock.
- The Boundary Shaft has three timbered compartments (two skip compartments and one service / man-way compartment) extending from surface to 600 mRL Level. The outside timber dimensions are 6.0 m by 2.3 m. The shaft was flooded from 1982 until 2008 and then was subsequently dewatered. The shaft is currently being used for secondary egress and ventilation intake airway.

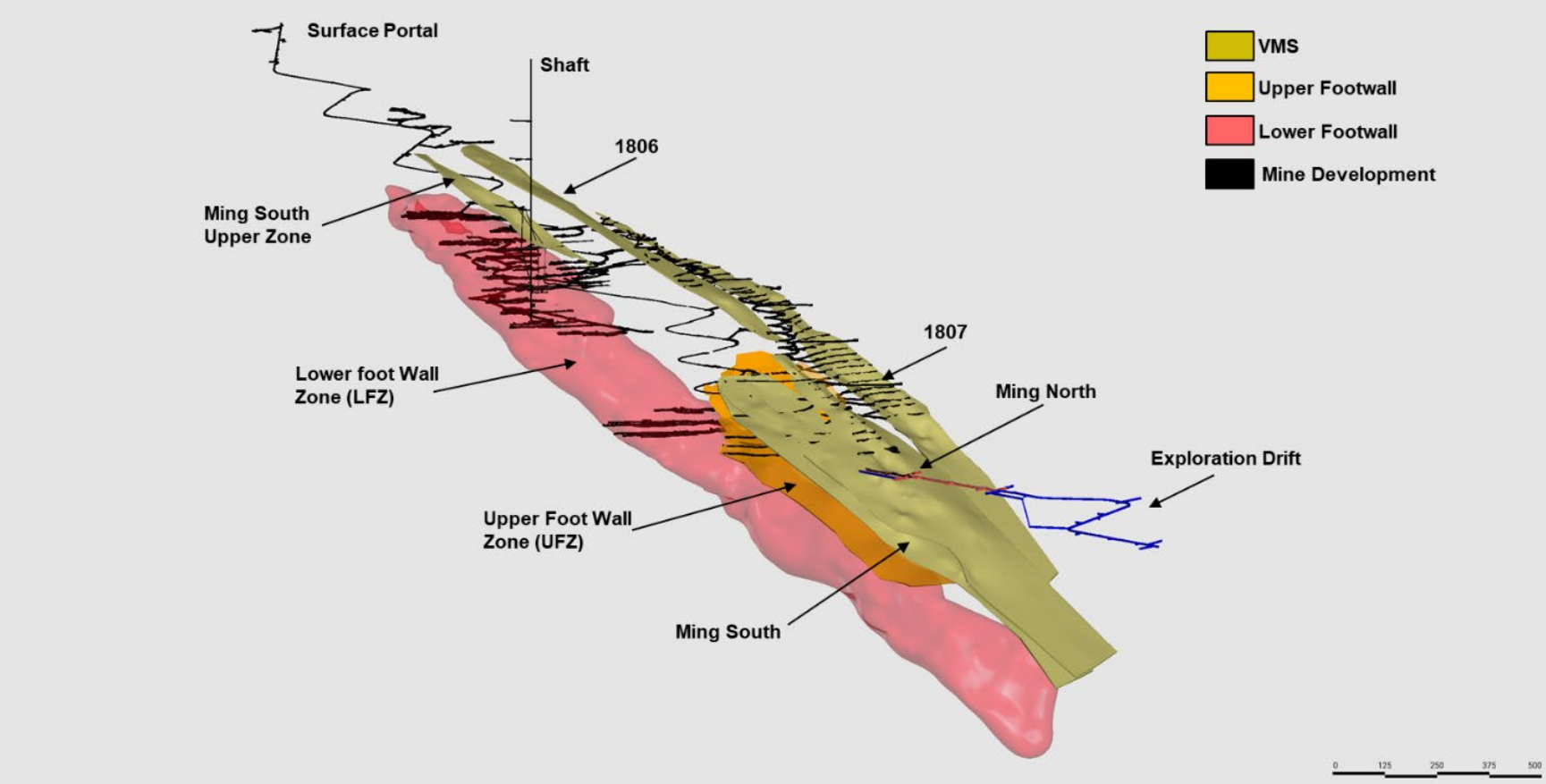


Figure 2.3.1 Ming Mine Deposits

Figure 2.3.2 Existing Mine Workings

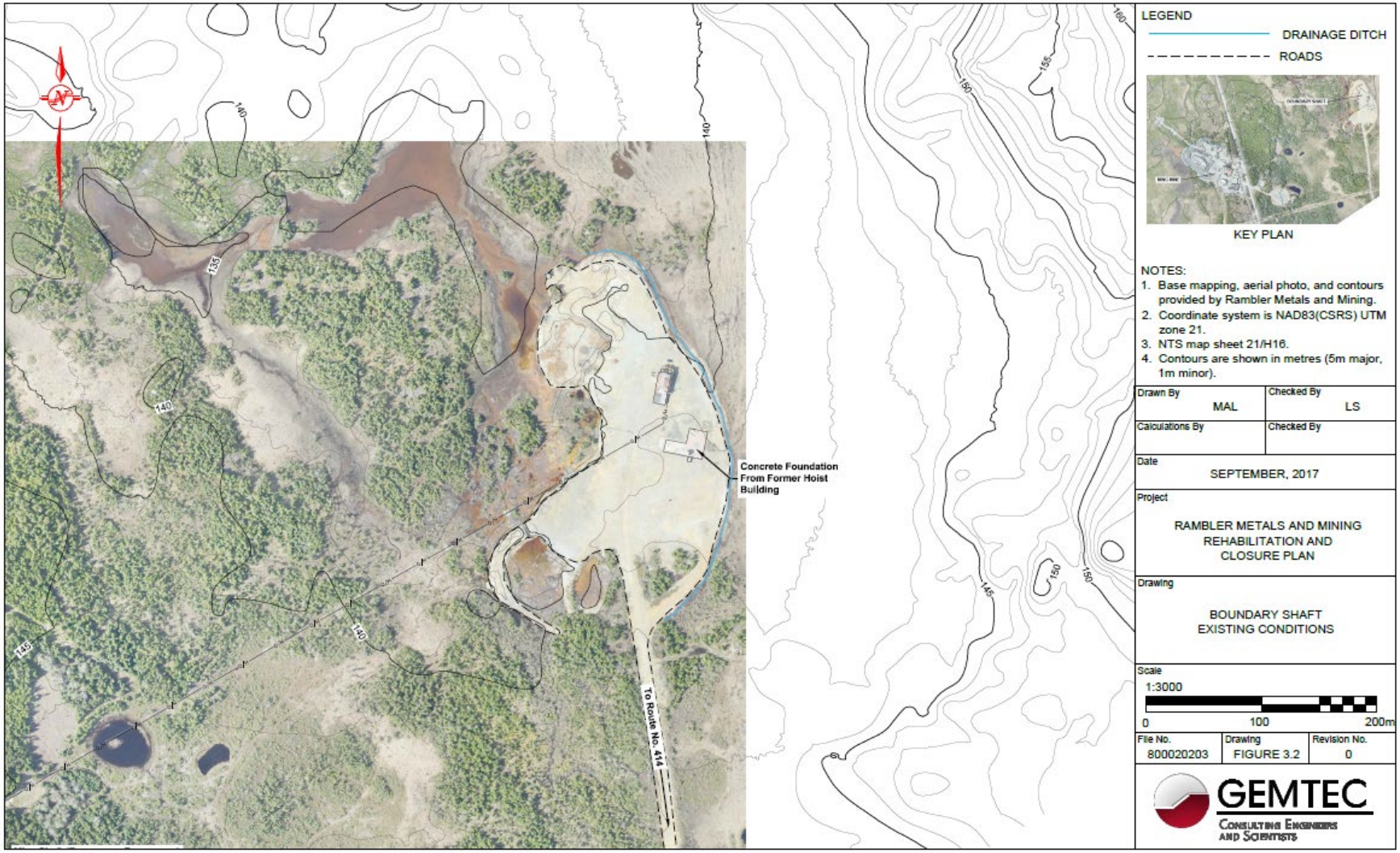


Figure 2.3.3 Boundary Site Shaft Location

2.3.3 Mine Dewatering

The mine dewatering system for the exploration development is the system that was in place during former production periods (Figure 2.3.4). The equipment handles approximately 950 to 1,135 litres per minute (L/min) (570 L/min natural inflow – 380 L/min from exploration operation). The current pumping system consists of 16 permanent sumps in addition to various temporary sumps. Some water is used underground to support drilling and dust suppression, and the remaining water is pumped through a 150 millimetre (mm) diameter pipeline with a reported system capacity of 2,450 L/min to surface. The water from underground is managed through the wastewater management plant located on surface adjacent to the portal entrance.

2.3.4 Surface Infrastructure

Figure 2.3.5 illustrates the current surface infrastructure at the site. The current infrastructure on surface and underground is planned to continue to be used in some capacity for the Project.

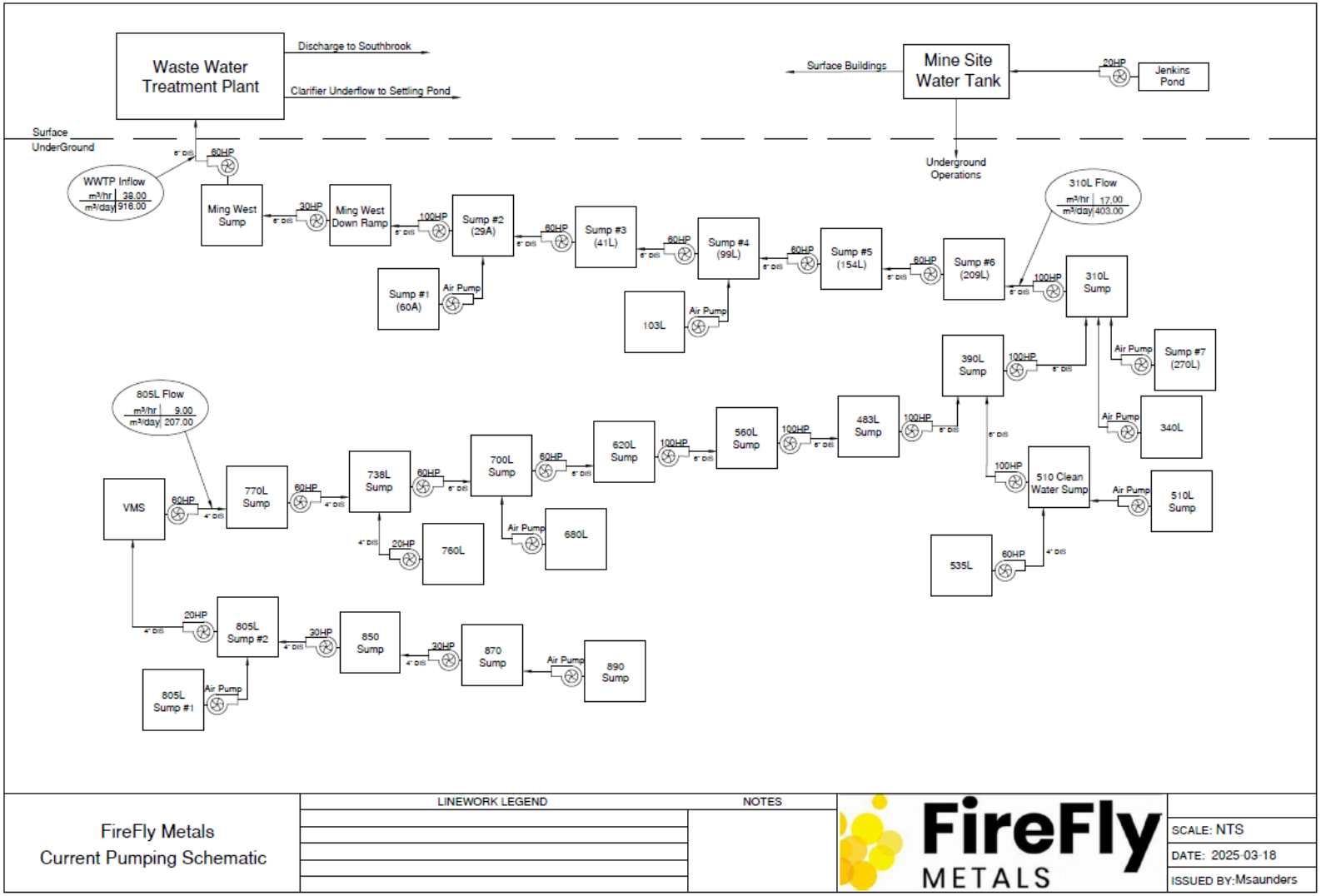


Figure 2.3.4 Current Underground Dewatering System

Figure 2.3.5 Current Surface Infrastructure at Site

2.3.5 Buildings

The Ming Mine site includes the buildings required to operate the underground exploration and exploration development activities, such as the administration office, employee housing / kitchen / dining hall building and kitchen staff camp buildings, core shed and warehouse building, maintenance shop, scale / scale house, wastewater management plant, welding shop, generator house, and electrical substation.

Existing Ming Mine surface buildings and infrastructure are shown on Figure 2.3.5. A detailed breakdown of the existing buildings and infrastructure is provided below.

- **Administration Office:** The administration office includes a 180-male and 25-female mine dry complete with lockers and showers, fully equipped mine rescue room, and offices. The building is located near the south entrance. The building is a 44 m (long) x 40 m (wide) engineered wooden structure supported on reinforced concrete foundations. The ground floor consists of a reinforced concrete slab on grade
- **Employee housing / Kitchen / Dining Hall Building and Kitchen Staff Camp Buildings**: The site currently has a parking lot and workforce housing. The building consists of modular trailers measuring a total of 80 m (long) x 8.7 m (wide). There are 60 rooms for employee and contractor accommodations. The kitchen/dining hall consists of modular trailers measuring a total of 14.7 m (long) x 18.5 m (wide) which sits adjacent to the kitchen staff camp building which consists of modular trailers measuring a total of 9.1 m (long) x 7.4 m (wide). These two buildings are not owned by FireFly and are leased from a private supplier.
- **Core Shed and Warehouse Building:** The core logging and storage warehouse building is a wood frame structure with metal siding and roofing, with dimensions of approximately 24 m (long) x 17 m (wide). It accommodates activities associated with core logging and storage. Additional core storage space is provided outside at various locations around the site using cross piled stacking and on core racks. Core storage areas are developed or relocated on site as needed
- **Maintenance Shop:** The maintenance shop is a pre-engineered light steel structure supported on reinforced concrete foundations, which is located near the south side mine area entrance. The ground floor consists of a reinforced concrete slab on grade. A five-tonne overhead crane is supported on steel beams connected to the pre-engineered steel structure. The structure is enclosed with an interior liners sheet, insulation and exterior steel wall cladding. Metal personnel doors and overhead doors are located around the perimeter of the building. The roof consists of a standing seam roof system with 3 main door bays with a combined, dimensions of 30 m (long) x 20 m (wide).
- **Scale / Scale House:** A portable, heavy duty, truck scale is located along the roadway at the north of the site, that was used for weighing the ore transfer trucks prior to their departure to the processing site at Nugget Pond. A timber framed 4 m (long) x 4 m (wide) scale house sits adjacent to the scales.

- **Wastewater Management Plant:** The north shop building is a pre-engineering light steel framed structure with metal siding and roofing. The building also accommodates the Wastewater Management Plant which was designed to neutralizes and treat effluent at a continuous flow rate of up to 160 m³/hr. The plant is used to manage and treat wastewater streams from mine dewatering, building sumps, storm water and surface runoff directed to the Ming West catchment area, currently averaging 45 to 50 m³/hr. A 76 m² wood structure houses the clarifier and is attached to the west side of the building. The electrical substation is also connected to the west side of the building. In total, the building dimensions were estimated to be 40 m (long) x 20 m (wide).
- **Welding Shop:** The welding shop is located in the north building and is connected to the wastewater management plant.
- **Generator house and Electrical Substation:** The substation comprises of a 25 kV incoming NL Hydro line, equipped with a 5-Megawatt (MW) transformer stepping down the power to a 4,160 high-voltage feed distribution to the wastewater management plant, underground shaft and other mine site stepdown transformers. A 1.5 MW diesel generator is connected to the power infrastructure and mainly used for emergency purposes.

2.3.6 Supporting Infrastructure

To support surface and underground activities, a network of roads, power supply and transmission, communication, fuel storage areas, propane tanks and other auxiliary systems are in place and detailed below:

- **Diesel Fuel Supply and Storage:** There are two diesel storage tanks installed at the Ming mine premises, each with 60,000 and 18,000 litres (L) capacity respectively. The 60,000-L tank is used as the main fuel station for equipment with the smaller 18,000 L used as an emergency fuel tank for the surface generator. These Satstat diesel storage tanks are equipped with dispensing facilities, which are self-dyked to 110% capacity. Fuel requirements for the underground fixed equipment is drawn from the primary tank using a mobile DUX utility vehicle fueling unit equipment with a 2,000-L capacity.
- **Propane:** Two propane tanks are leased by North Atlantic Services and installed at the portal and boundary shaft entrance. The tanks are 18,000 and 30,000 L for the portal and Boundary shaft, respectively. The tanks are connected directly to the respective heating burners used to heat up the air intake into the mine during the winter seasons.
- **Power Supply and Distribution:** Power supply to the mine site is through the already existing 25 kV NL Hydro line, passing through the Project Area. In addition, a 138 kV line also passes through the property, although it's currently not being used by the operation. Power is supplied on surface to the underground mine workings. The existing underground mine electrical distribution system is designed on a 4,160 high-voltage feed into the mine, with distribution down the Boundary Shaft. Mining equipment, such as jumbos, production drills, bolters, pumps, and ventilation fans, operate at 600 volts and are equipped with ground fault protection systems. The step-down transformers required are presently in place and operational. One 1.5 MW generator exists on site to provide emergency backup power.

- **Explosives Storage and Handling:** Permitted surface explosives storage magazines on site are operated and monitored by explosives vendors / contractors in accordance with the applicable federal and provincial regulations and the *Occupational Health and Safety Act*. Transportation of explosives to and from the surface magazines are carried out in compliance with applicable regulations. The surface explosives magazines are located approximately 250 m west of the waste rock stockpile area. Explosives orders are replenished on a weekly basis to maintain stored explosives within the approved limits. Transportation of explosives underground is also done to an underground explosive storage area located underground at 480 Level. Transportation of explosives to and from the underground magazines is in conformance with applicable regulations.
- **Compressed Air and Process Water Supply:** The mine currently has compressed air and water installed in the main ramp down to the 2600 level. There are two 125 horsepower (hp) air compressors presently in use at the mine, and they can be supplemented by a spare 100 hp air compressor. The mine intake water is supplied from a surface pump-house located at Jenkins Pond feeding the main holding tank before distributing through a 6" inch pipeline in the decline. The reported daily requirements are estimated to be 442,000 litres/day or 161,330 cubic metres/year (m^3/yr). Note that FireFly's current water use license allows for the extraction of 355,000 m^3/yr.
- **Communication:** An underground communication system is established using a leaky feeder system with a head-end in the office complex. The leaky feeder cable is installed throughout the mine with repeaters on surface and will be extended as development advances.
- **Roads and Site Access:** Primary access to the Ming Mine site, which is located approximately 18 km by road east of the town of Baie Verte, is by the existing La Scie Highway (Route 414) and the Ming's Bight Road (Route 418). Access to the Baie Verte Peninsula is via Route 410 (Dorset Trail) exiting the Trans-Canada Highway. Access roads currently have proper signage, including posted speed limits and caution signs. The mine portal is located near the center of the site as shown on Figure 2.3.5. The portal provides access to the underground mine.

2.3.7 Ore and Waste Stockpiles

Two waste rock stockpiles, storing a combined 246,393 cubic metre (m^3) of waste material, are located approximately 100 m west of the portal. A 0.23 hectares surface ore laydown area with a storage capacity of 4,700 m^3 is located approximately 50 m west of the portal. Stockpile locations are shown on Figure 2.3.2. Stormwater is collected in a ditch at the toe of the stockpiles, and the contact water is collected and managed through the current wastewater management plant.

The mine currently has a waste rock stockpile located adjacent to the portal entrance. Although, the waste rock stockpiles are currently classified as "waste", they contain low grade mineralization with an economic value. The rock will be assessed and if classified as ore, will be hauled to the new process plant for concentrate. If determined to be waste rock, it will be backfilled underground or used to construct the lower base on the interior dam of the polishing pond mitigating risk of ML/ARD as it is an interior dam that will be covered by tailings and submerged below the water table for perpetuity.

2.3.8 Boundary Shaft Site

The existing Boundary Shaft is located approximately 600 m east of the Ming Mine site (Figure 2.3.4). It was used for ore extraction during historical mining operations. Currently, the shaft is used as a secondary egress from the 1800 level underground to surface and as a means for fresh air into the mine. The existing collar house is only used for storage. The shaft below 1800 level is currently flooded.

The Boundary Shaft is composed of three timbered compartments, two of which were used as hoisting compartments and one of which is a manway compartment. The shaft is 620 m (2,050 feet) in depth and is located on the eastern edge of the previously mined orebodies. Other than the collar house, the shaft timbers, and the refurbished manway compartment, the rest of the fixtures of the shaft (e.g. headframe, hoist, electrical equipment, and underground crusher) have been removed from site.

2.3.9 Other Approved Infrastructure

The Project site has been included in two past EAs, one completed in 2010 for a project called Ming Copper Gold Mine (Registration # 1487) and a second in 2017 titled Baie Verte Tailings Management Expansion (Registration #1939). Both projects were released by the Minister from further assessment. However, some components of these projects were not constructed: a freshwater intake source and a paste plant.

In 2010, the project No. 1487 contemplated the following:

> "a fresh water supply for showers, toilets, etc. will be pumped to the site from nearby Admiral's Brook (English / England Steady). A small intake and pump house will be constructed on Admiral's Brook using intake screens and arrangements as recommended by the Department of Fisheries and Oceans to protect fish and fish habitat. The water will be supplied to a storage tank on site via an estimated 100 mm diameter, above ground [high-density polyethylene] HDPE supply line. Water will be piped from the storage tank to areas around the site as required. The quantity of water required to supply the mine site is less than 1% of the flow in Admiral's Brook. As previously noted, drinking water will be imported to the site in large bottle format by local vendors (pg. 26)"

The location approved for use is downstream of the water taking location proposed for the Project (i.e., Water Intake Location A; Section 2.5). Both are located on England's Brook. It was never used for water taking, instead Jenkins Pond located just North of the mine site was used as a freshwater supply.

The past operator included consideration of the paste plant as part of the assessment for file No. 1939, 2017 Environmental Preview Report – Baie Verte Tailings Management Expansion, Ming Copper-Gold Mine submission. As follows:

> "[Rambler Metals and Mining] RMM requires tailings to produce paste backfill for the continuing Ming Mine operation. RMM is currently completing studies to determine an adequate tailings source to be used for this project. If tailings from RMM's Nugget Pond Mill production are selected, this material would need to be dewatered and backhauled to the mine site, thus potentially reducing the long term storage requirements of the TMF at Nugget Pond. Based on the current mine plan, an estimated 4.45 million tonnes of paste backfill will be required in the Ming Mine over the next 20 years, which will require approximately 2.8 million m³ of tailings, all of which could potentially be diverted from the Nugget Pond TMF. It is important to note that the use of potentially acid generating tailings, from any source, as paste backfill in an underground mine will ensure that these materials are permanently encapsulated and will never generate poor quality effluent." (pg.50)

Although not constructed, the internal studies were completed and showed paste backfill could be a viable option.

2.4 Project Schedule

The current anticipated commencement date of the Project is July 2026, subject to first receiving the relevant environmental approvals and permitting. The preliminary schedule (Figure 2.4.1) will be further detailed and updated during the implementation stage of the Project. The methodology envisaged is a systematic approach and will need to be refined to accommodate various aspects like construction management, procurement, inclement weather, lead times of critical components and safety aspects.

The Project will be implemented in four phases: early works and site preparation; construction; operation; and decommissioning and closure. The primary activities associated with each of the phases are described in Sections 2.6 to 2.8. Further details pertaining to specific activities, mine components and/or mine facilities are presented in Sections 2.5. A summary of the Project schedule for each phase is as follows:

- Site preparation and construction is estimated to be completed over an 18 to 24 month period. The work schedule will likely vary over this period according to the nature of the work that is being completed at any one time, but work will largely progress 7 days per week, with two shifts per day.
- During operation, the mine will operate on a 4-crew rotation system with two shifts (day and night) working 7 days on and 7 days off. This shift system will allow 24 hours operation, 365 days of the year.
- The operating LoM is estimated to be approximately 15 years.

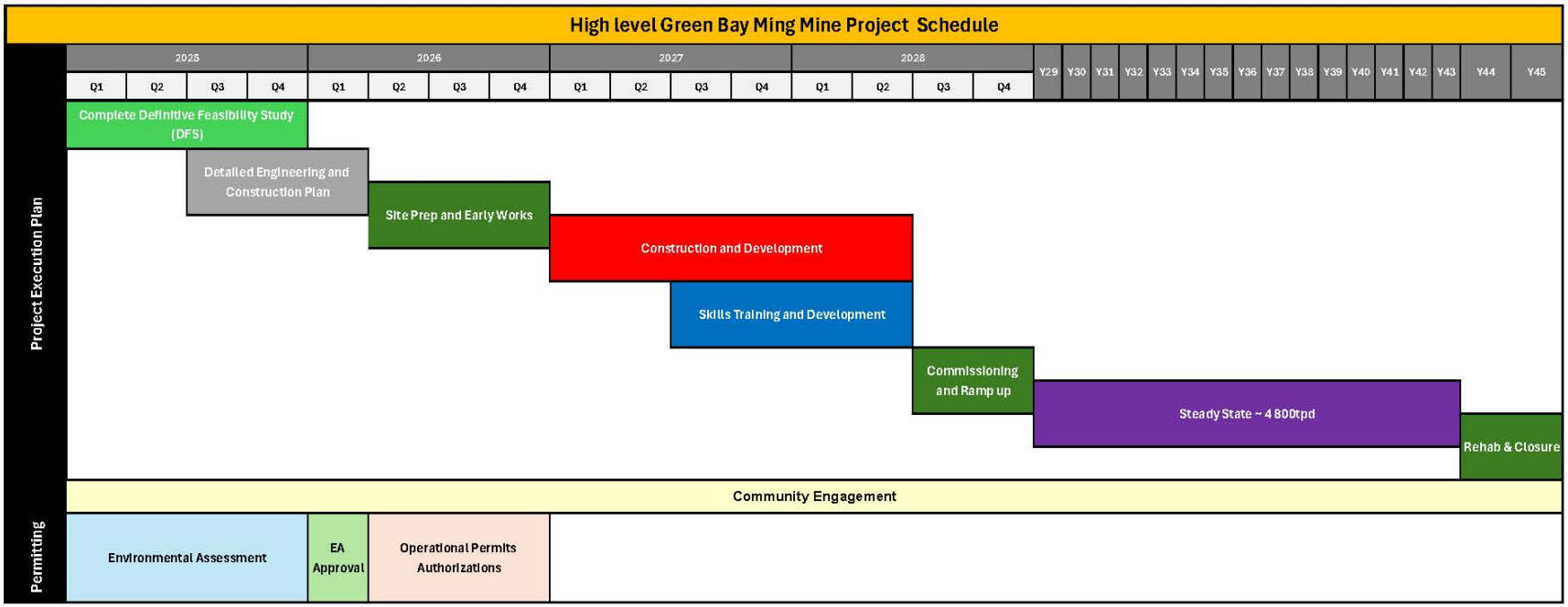


Figure 2.4.1 Proposed Project Timelines and Delivery

FireFly anticipates filing a Rehabilitation and Closure Plan, commercial cutting permit application and other necessary permit applications to commence “Early Works” site preparation immediately after being released from the EA process.

2.5 Project Components

The general site layout for the Project is provided in Figure 2.5.1, and further information on Project components is provided in Sections 2.5.1 to 2.5.13.

The Project will consist of three types of components and activities as summarized in Table 2.5.1:

- Existing, approved components and activities that will remain unchanged
- Existing components and activities that will require modification
- New components and activities

The latter two are within the scope of this Environmental Registration. As previously discussed, the facilities at Nugget Pond and Goodyear’s Cove are not considered within the scope of this assessment and are not discussed further in this assessment.

The Project layout lends itself to a separate area management strategy, with the main areas including:

- Mining and associate mining infrastructure development
- Process plant
- TMF
- Surface Infrastructure (e.g., haul road, power, water)
- Concentrate storage and handling
- Accommodation complex

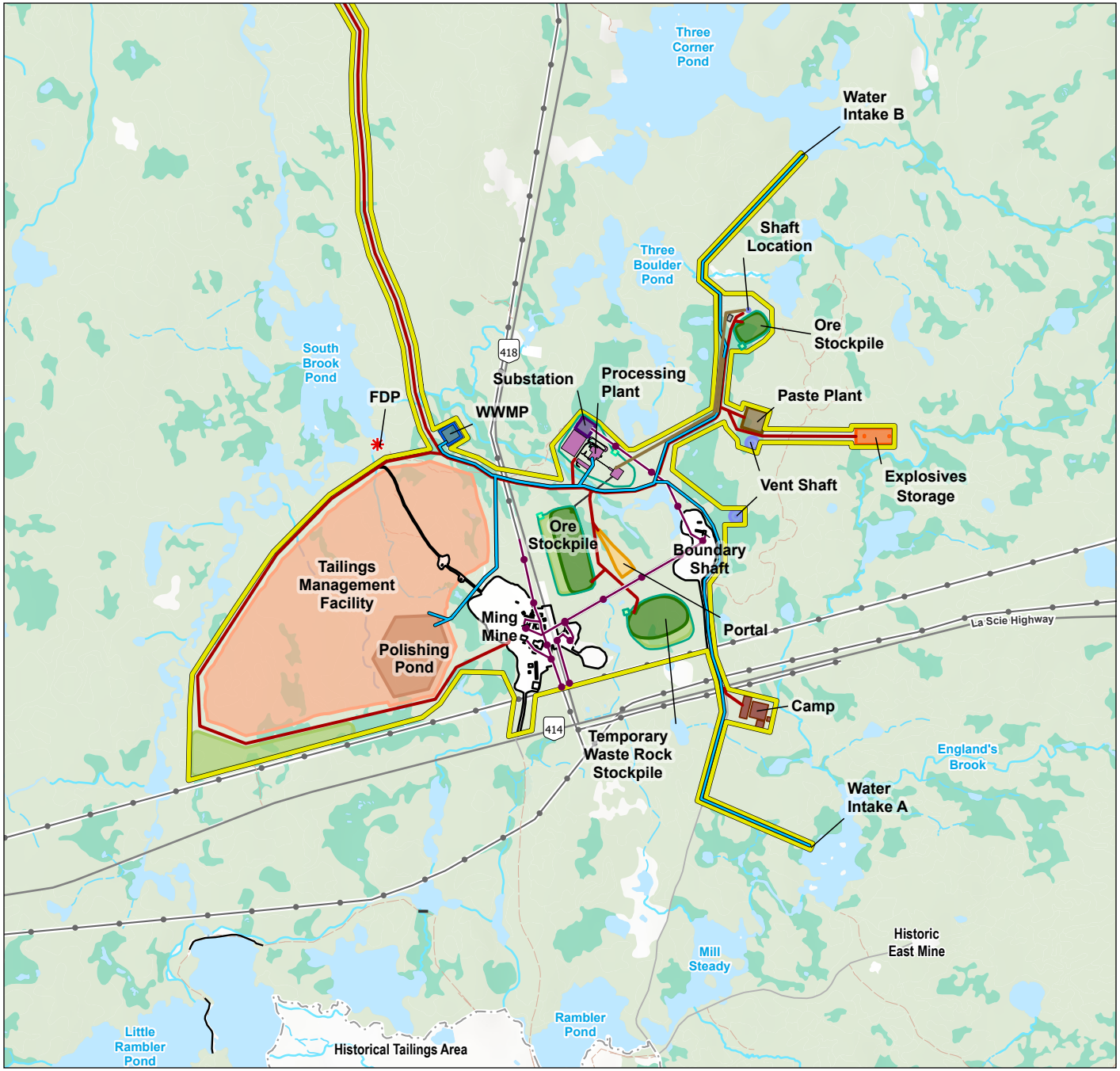


Figure No.
2.5.1
Title
General Project Site Layout

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_1_001b

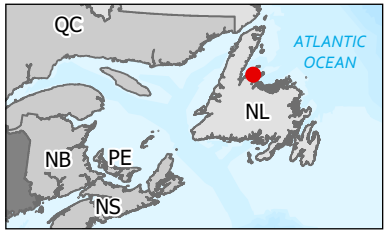
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-19

N

0 400 800 Metres
(At original document size of 8.5x11)
1:28,000

- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Camp
- Catch Basin
- Explosives Storage
- Ming Mine Operation
- Processing Plant Infrastructure
- Substation
- Stockpile
- Organic Laydown
- Paste Plant
- Portal Location
- Shaft Location
- Polishing Pond
- Tailings Management Facility (TMF)
- Wastewater Management Plant (WWMP)
- Other Features
- Final Discharge Point (FDP)
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 2.5.1 Summary of Types of Components and Activities

Component / Activity	Status	Within Scope of Project Expansion EA	Rationale
Underground Mining			
Underground mine works	Existing, but will be expanded	Yes	Underground workings will be expanded beyond that originally considered as part of the approved mine.
Existing Portal	Existing, but will be repurposed for the Project	Yes	Will be used during initial stages as a portal and then shift operation to a secondary egress and fresh air intake location.
New Portal	To be constructed and operated as part of the Project	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Shaft	To be constructed and operated as part of the Project	Yes	This is new infrastructure and associated with activities that will be assess as part of the Project. This will enable economic extraction of the deeper zones of the orebody and reduce the use of haulage trucks. The shaft development will include associated underground infrastructure for crushing and conveyance to the skip loading pockets.
Existing Vent Shaft (Boundary Shaft)	Existing, and will be maintained.	Yes	Existing vent shaft is being used and will be used for the future Project as ventilation air intake shaft.
Two new ventilation raises	To be constructed and operated as part of the Project	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Mining Activity	Sub-Level Longhole open stoping underground mining methods to include a combination of Waste rock and cemented paste backfill	Yes	This mining method allows for maximum ore body extraction while using both waste rock and tailings waste with the mine design. It therefore reduces the size of the TMF and temporary waste rock stockpiles and overall footprint of the Project

Table 2.5.1 Summary of Types of Components and Activities

Component / Activity	Status	Within Scope of Project Expansion EA	Rationale
Processing and Mine Waste Management			
Existing waste rock piles	Existing, but will be processed as low-grade ore or used for construction material for the TMF dam	Yes	The EA will address processing at the new mill and construction of the TMF dam as part of the Project
Temporary waste rock pile	To be developed as part of the Project	Yes	The temporary surface management of waste rock (which will eventually be backfilled) will be assessed as part of the Project
Topsoil, overburden and ore stockpiles	To be developed as part of the Project	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Crusher and conveying system	To be developed as part of the Project	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Processing plant and ore processing	To be constructed and operated as part of the Project	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Paste Plant	Not constructed but approved as part of the 2018 EA	Yes	This is new infrastructure associated with the Project but previously assessed.
Freshwater Intake Three Corner Pond (Location B)	To be developed as part of the Project – used to commission the process plant or supplemental water	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Freshwater Intake England's Brook (Location A)	Not constructed but water intake from England's Brook was approved as part of the 2018 EA. Intake to be used to supply water for the accommodation complex, commission the process plant or as supplemental water	Yes	This is new infrastructure associated with the Project but previously assessed.
Freshwater Intake (Jenkins)	Existing to supply the site with freshwater	Yes	Will be used to supply the process plant, mine and /or offices with fresh water for the offices, change rooms and lunchrooms
TMF and tailings management	To be constructed and operated as part of the Project	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project

Table 2.5.1 Summary of Types of Components and Activities

Component / Activity	Status	Within Scope of Project Expansion EA	Rationale
Supporting Infrastructure			
Shipping of concentrate at Pine Cove Port	To be operated by a third-party	No	This is an existing approved port under the care and maintenance of a third party.
Site roads	Existing but new roads will be developed	Yes	The road network will be expanded, the new sections of road will be assessed as part of the Project.
Transmission lines and substation	Existing the corridor will be extended, and a new substation will be developed	Yes	A transmission line connects the existing mine to NL Hydro but it will be expanded and a new substation constructed and associated activities that will be assessed as part of the Project
Two emergency generators	Back up power generators existing onsite, but two new emergency generators will be installed.	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project
Explosives Storage	Existing but will be relocated and upgraded	Yes	This is new infrastructure and associated activities that will be assessed as part of the Project

2.5.1 Underground Mining Works

The underground workings will be developed for mining and accessed through initially a new portal and decline ramp. The use of the existing portal and ramp as the primary access and haulage route was assessed; however, the profile is too small to accommodate the mobile fleet required to the facilitate the production rate. The existing decline will be used during the initial phase of mine life until the new proposed decline is established to surface. The new decline is required to accommodate for the larger production mine equipment that will be travelling from underground to surface. The existing decline will remain in place as a secondary egress and fresh air intake location. To ensure the health and safety of the underground workforce, two new ventilation raises will be established to meet the fresh airflow requirements underground (Figure 2.5.2). One ventilation airway will function as exhaust and the other as fresh air intake.

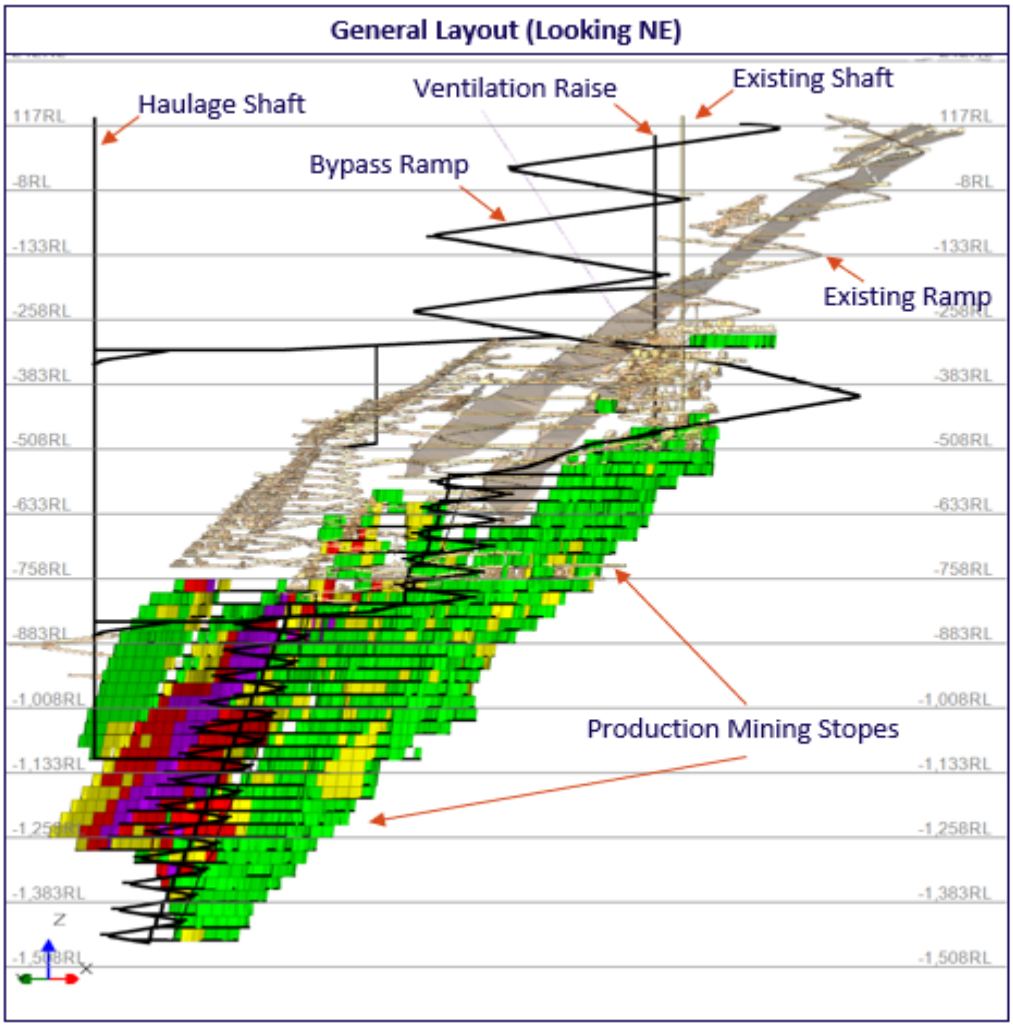


Figure 2.5.2 Underground Mine Schematic

The Project will consist of a mechanised underground mine which is planned to deliver an average of 4,800 tonnes of ore a day to a centralized run-of-mill (ROM) pad. A new portal access consisting of a 6.0 m wide x 5.8 m high decline will be developed to connect with the existing decline at 680 Level, this will later be replaced in project Year 6 by a new proposed vertical shaft system, which will be developed down to 1250 Level.

Mining will be done using conventional sublevel long hole mining methods using both longitudinal and transverse stoping methods (Figure 2.5.3). Development drifts will be mined at 5.0 m wide x 5.0 m high with sublevels spaced at 25 m interval to maximize orebody geometry and rock characteristics benefits and efficiencies. Ore will be drilled using long hole drills, blasted, and then mucked using load-haul-dump equipment. Mined out stope will be backfilled with a cement and tailings paste fill, delivered from the paste plant located on surface. The source of tailings for operations will be the onsite TMF, however there will be a lag between commissioning of the paste plant, the process plant and available of tailings. During this time, other nearby sources of tailings are being considered, such as the Nugget Pond Mill TMF and Old Rambler Consolidated Tailings site, stored outside of the EML. Additional studies are required to determine if those tailings are viable for use as paste, and discussions with NLDIET are required to understand the feasibility of these options. If these options are viable and feasible, using some of the tailings outside of the EML at Old Rambler Consolidated Tailings site for paste backfill underground could reduce some of the ML/ARD draining from that site.

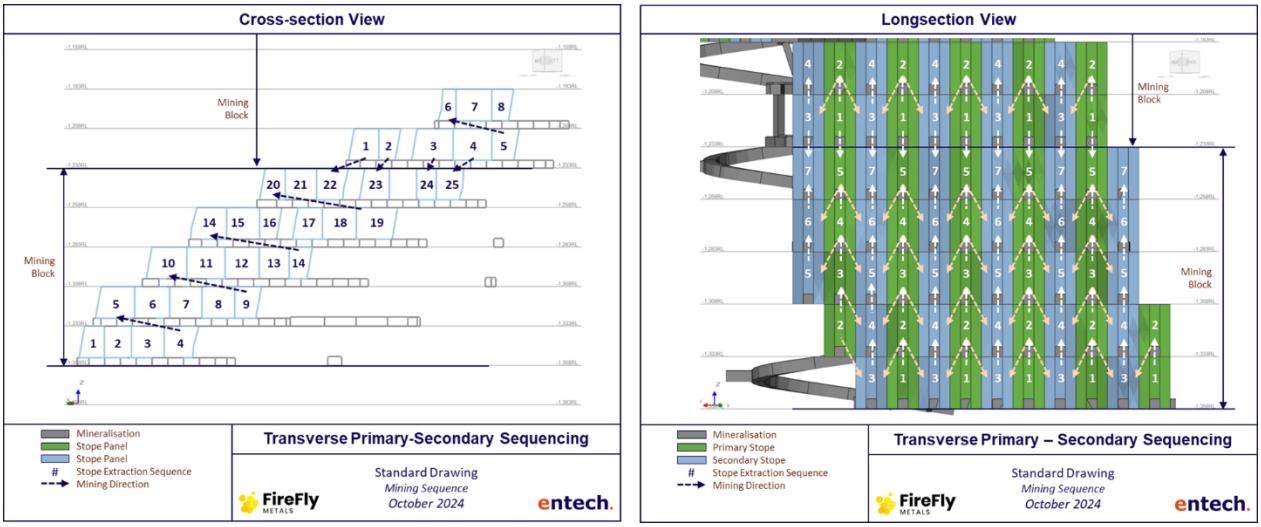


Figure 2.5.3 Long Hole Open Stoping and Paste Backfill Layout and Sequencing

Ore haulage to surface will be done using up to 65-t trucks for the first few years and thereafter hauled to the underground crushing and shaft material handling system for the reminder of the LoM production. The existing portal decline will be used as an alternate haulage and logistics access way for the smaller haulage trucks and service vehicles. Waste will be either hauled to surface or hauled to an active production level and combined with paste fill, where it will be used as backfill for support purposes.

The existing return airway through the old mining areas and a new 6.0 m diameter raise bore ventilation raise will be equipped with exhaust fans and used as return airways. Fresh air intake will be through the proposed new decline, existing decline and the boundary shaft. The ventilation system is designed to deliver 480 cubic metres per second (m^3/s) of air into the mine. This ventilation design and layout will be reviewed in future when the vertical shaft is commissioned.

2.5.2 Equipment Fleet

Table 2.5.2 provides a summary of the equipment fleet currently planned for the Project during early works, construction and operation. Most of the equipment that will be used for the operation will predominantly meet Tier 4 emissions standards except the emergency backup generators. Although the majority of the equipment will be diesel fuel, a small portion will run on regular gasoline. FireFly is currently conducting studies to assess alternatives (e.g., equipment electrification, bio energy, carbon dioxide (CO_2) capture and utilization) to benchmark their Scope 1 and 2 emissions and to reduce its carbon footprint. Further information on the GHG emission inventory for the Project is provided in Section 2.10.

Table 2.5.2 Project Equipment List

Mining and Underground			Earlyworks and Pre-Construction	Project Construction	Operation
	Engine (kW)	New / Existing	Estimated Units	Estimated Units	Estimated Units
Jumbo - DD321 Development Rig	74	N/E	1	3	3
Sandvik DS312 Bolter	74	N/E	2	4	5
Loader LH621~ 25 t	532	N	-	3	5
Loader LH514 ~ 15 t	256	N	3	3	3
Truck TH663 ~ 60 t	565	N	2	6	14
Truck AD30 ~ 30 t	425	N/E	2	3	3
Grader	71	N	1	1	1
Emulsion Explosives Charger -	84	N	1	2	2
Mobile Scissor Lift~ Utility Vehicle (UV)	73	N	2	3	3
Concrete Trans mixer~ UV	84	N	1	1	1
Shotcrete Sprayer~ UV	84	N	1	1	1
Personnel Carrier vehicle	75	N	3	5	5
Integrated Tool Carrier	75	N	1	2	2
Mine Services Truck	107	N	1	4	6
U/G Core Diamond Drill	90	N	4	2	2
U/G Spec Light Vehicles	75	N	4	10	15

Table 2.5.2 Project Equipment List

Mining and Underground			Earlyworks and Pre-Construction	Project Construction	Operation
	Engine (kW)	New / Existing	Estimated Units	Estimated Units	Estimated Units
Surface and Infrastructure					
Articulated Dump Trucks (50 t)	348	N	-	5	-
Articulated Dump Trucks (30 t)	254	N	5	6	
Tipper Bulk Earthworks Trucks	317	N	6	10	3
Excavators (60t / 45t / 30t)	308	N	6	10	3
Front End Loaders	214	N	2	6	4
Mobile cranes (90t / 60t / 45t)	270	N	1	3	1
Mobile Compactors	98	N	2	4	-
Surface Graders	120	N	1	2	1
Snow Ploughs Trucks (with Spreader)	317	N	1	2	2
Water Bowsers (50 000 L)	317	N	1	3	1
Mobile Diesel Pumps	74	N	3	6	1
Concrete mixer trucks	302	N	1	3	-
LDV Vehicles	223	N	10	20	15
Various Gear (Welding machines, etc.)	74	N	10	16	6
Generators (1.0 MVA equiv)	1,000	N	3	6	4

2.5.3 Waste Rock, Topsoil, and Overburden Stockpiles

A temporary waste rock pile shown on Figure 2.5.1 has been planned to initially accommodate the waste rock from the development of the portal and the waste rock generated during the development of the decline ramp. The ultimate footprint of the temporary waste rock pile will be approximately 6.0 hectares in size. Geochemical characterization has been conducted to allow for management of the waste rock extracted through underground mine operation. Grade control will confirm if the waste rock can be used for construction, and if not, it will be temporary managed on the waste rock stockpile. During the construction phase, waste rock that is considered potentially acid generating (PAG) may also be used for construction material on the starter dam, grade level interior portion of the TMF or polishing pond. Over the life of the Project, this PAG material would be covered by tailings and/or subaqueous, neutralizing the potential for ML/ARD generation from this waste rock.

The size of the temporary waste rock stockpile will fluctuate over the life of the mine, but it is being designed with three objectives in mind: maintaining physical stability over the life of the mine, maintaining control and treatment of run-off drainage as needed, and development and management of the stockpile in a safe and efficient manner (e.g. use of safety berms as needed).

In total, provision has been made for approximately 470,000 m³ of waste rock to be temporarily stored during the Project development phase. The waste rock pile has been designed to accommodate 150,000 m³ from the portal box cut, 170,000 m³ from the development of the main decline ramp and 78,000 m³ from the development of the shaft. The shaft development will be done through raise bore method, with the waste rock chips and infrastructure development waste rock backfilled into mined out stopes underground. A total of +110,000 m³ of waste rock will be backfilled underground from the development mine establishment mining. A summary of waste rock volumes to be generated is provided in Table 2.5.3.

Table 2.5.3 Summary of Waste Rock Volumes

	Waste Dump Volumes	
	Volume (m³)	**Tonnes (t)**
Portal Waste	150,000	315,000
Main Decline Waste	171,600	360,360
Main Shaft	78,057	163,919
Vent Shaft	30,022	63,046
Other	42,968	90,232
Total	**472,646**	**992,557**

On completion of the development, the waste rock will be relocated back underground and backfilled into the mining stopes. Material movement and balance for the Project is illustrated in Figure 2.5.4.

Vegetation will be grubbed and stored as organics. Limited topsoil is found at site, however what is available, to the extent possible topsoil will be stripped. Both topsoil and the overburden will be paddock stockpiled and stored adjacent to the temporary waste rock pile for future rehabilitation of the stockpile footprint after the waste rock has been relocated underground. Both the waste rock and ore stockpile designs have been limited to a maximum height of 30 m, at an average slope of 30 degrees (toe-crest).

Two ROM stockpiles have been planned for the Project: a process plant feed ROM pad adjacent to the process plant area, and a shaft spillage stockpile planned next to the main vertical shaft. The process plant feed ROM stockpile will have a maximum design capacity of 545,000 m³ (approximately 1.2 million tonnes [Mt]), while the shaft stockpile will have a maximum capacity of 125,000 m³ (approximately 260,000 t). The stockpiles provide capacity for planned shutdowns, and unplanned events that could interrupt operation (e.g., power outages, weather, labour disputes).

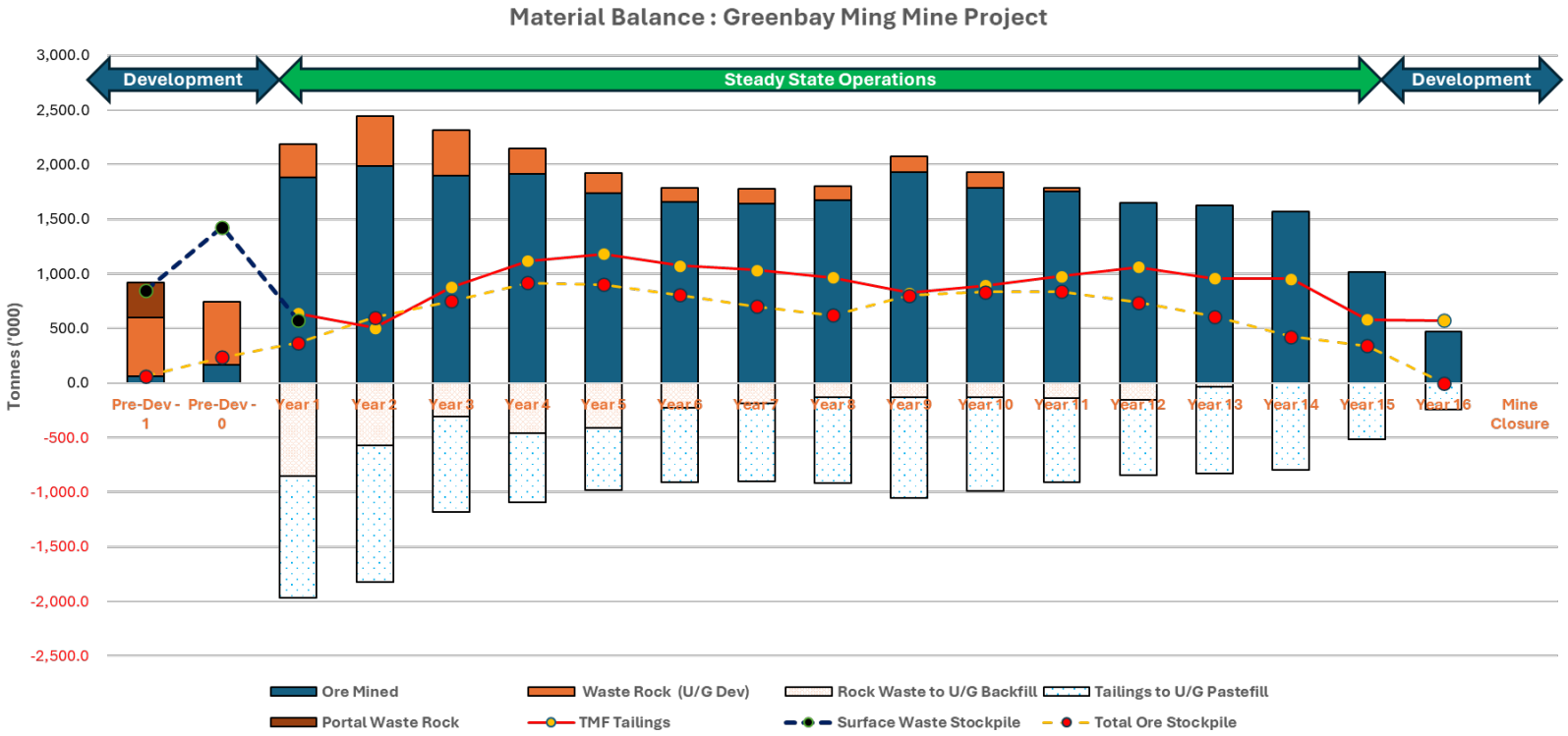


Figure 2.5.4 Material Balance Summary

Due to the acid-generating potential of both the waste and ore rock from the mine, the temporary waste rock and ore stockpile base will be profiled to collect runoff water into cut out drains and channel to collection sumps. The precipitation that comes into contact with the waste rock and ore (contact water), will then be pumped to the TMF. Excess water will be directed to the wastewater management plant (WWMP) for treatment as needed prior to discharge. On completion of mining activities, the stockpile footprint areas will be cladded with topsoil and revegetated as part of the mine closure activities and program.

2.5.4 Ore Crusher and Stockpiles

The crushing circuit consists of feeding ROM material into the ROM feed bin ahead of a 750 mm x 750 mm grizzly screen (Figure 2.5.5). The grizzly screen oversize feeds the primary jaw crusher, and the undersize is combined with the jaw crusher discharge to feed the double-deck secondary scalping screen. The screen's top deck oversize feeds the secondary cone crusher, and the middling stream feeds the tertiary cone crusher. Both crushers operate in closed circuits, recirculating to feed the scalping screen. The scalping screen undersize is collected in a fine ore stockpile. The crushing rate is planned to be between 300 to 310 t per hour at 65% crushing availability, with a final product size of P80 of 12 mm. Lower availability and utilization have been accounted for in the design of the crushing plant to allow for longer maintenance and inclement weather. The crusher building will be an enclosed structure with a dust collection system. The crushed material is transported through the crushing system by various sections of the feed conveyor network that would be either enclosed external to or within buildings to mitigate fugitive dust.

FireFly is currently studying options for ore sorting, either underground or at surface and if successful, may be considered for future operations.

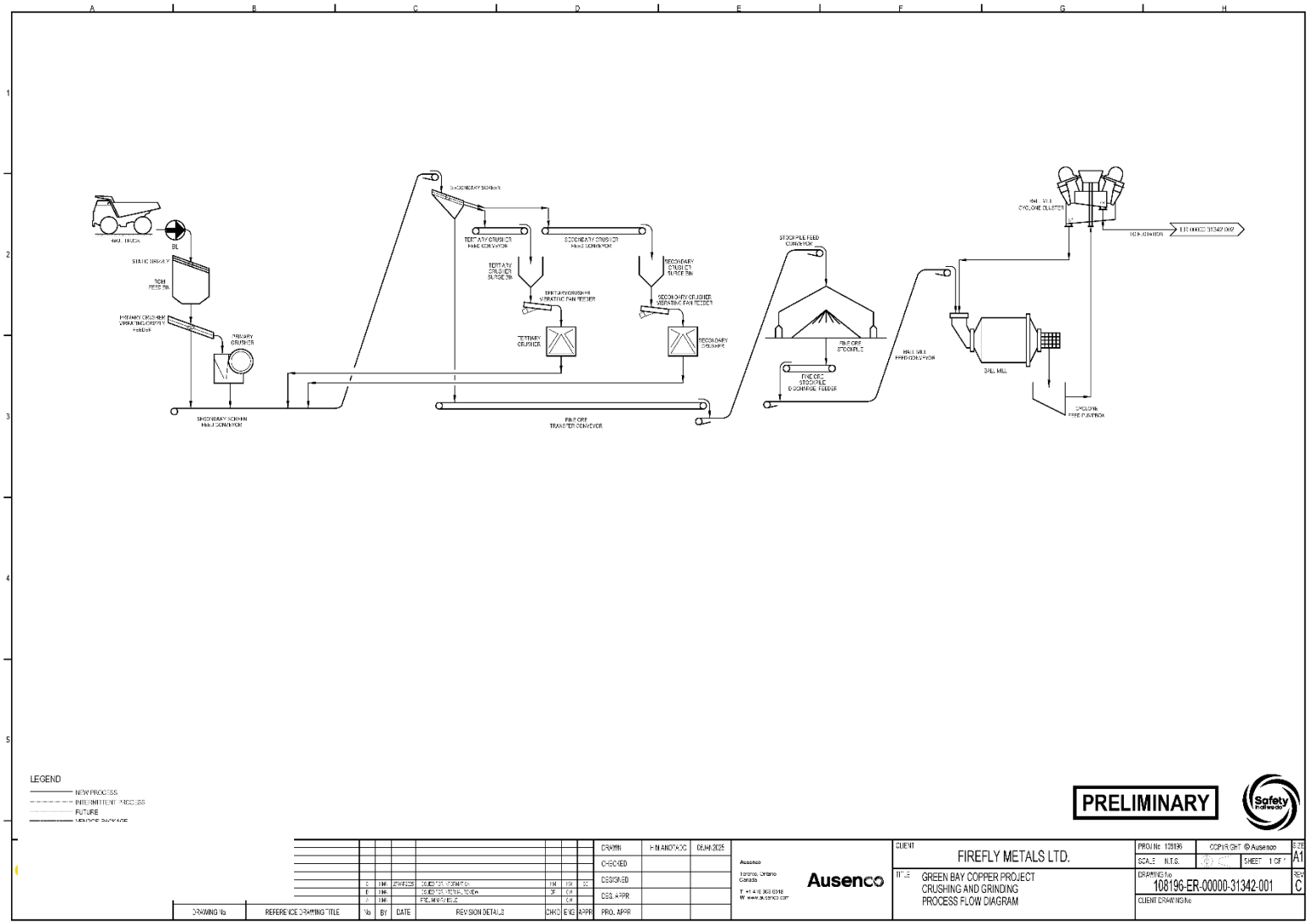


Figure 2.5.5 Crushing and Grinding Process Flow Diagram

2.5.5 Process Plant

The crushed material is reclaimed and fed to a 16 ft x 23 ft ball mill operating in closed circuit with hydro cyclones for classification. The process plant throughput is conceptually planned to be between 210 to 220 t per hour at 90% process plant availability. Cyclone underflow recirculates to the ball mill, whereas the overflow feeds the rougher flotation conditioning tank. The flotation circuit (Figure 2.5.6) operates in a typical rougher, primary cleaner, secondary cleaner, and tertiary cleaner configuration, where the rougher concentrate feeds the primary cleaner, and the rougher tails are combined with primary cleaner tails to feed the final tailings thickener.

The primary reagents that are being tested for potential use in the flotation process to produce the copper-gold concentrate include:

- Potassium amyl xanthate, a strong flotation copper collection
- Isoamyl di-thiophosphate (AERO 3501/3418A), a selective promoter collector
- Methyl isobutyl carbinol, an industrially applied frother
- Carboxymethylcellulose, a silicate depressant may be applied intermittently to reject and control magnesium silicate content in the copper concentrate
- Zinc sulphate
- Flocculants for suspended solids and settling
- Crushed calcium oxide, which will be slaked in the process plant for flotation circuit pH control to suppress iron sulphides in the process
- Although cyanide is currently not proposed as part of ore processing, future use could be considered to improve gold and silver recoveries.

Final tailings are deposited into the TMF. The tertiary cleaners produce the final copper concentrate, which is thickened and filtered ahead of concentrate storage in a stockpile by the process plant. The concentrate will be stored in a building and when ready for transport to the port, will either be loaded to trucks or containerized (e.g. bags, solid containers). Enclosing the concentrate storage in a building will reduce dust generated and facilitate the clean-up of material. The load-out area will be located on the ground floor of the process plant and will be a truck drive-through facility. Loading will only occur after the area is isolated. Depending on the final transport option, after filling, the trucks will be covered for transport for hauling on the port access road to a third-party port facility. It is estimated that approximately 12 truckloads of copper concentrate will be transported off site daily. At this time, FireFly is considering container storage for concentrate to limit product loss. The third-party management will oversee the loading of concentrate on the ships for transport to a smelter refinery.

The processing plant (Figure 2.5.7) will be housed in closed insulated buildings comprising:

- Crusher, stockpile areas connected by covered conveyors
- Covered stockpile area
- Grinding and flotation concentrate area
- Reagent and concentrate storage area

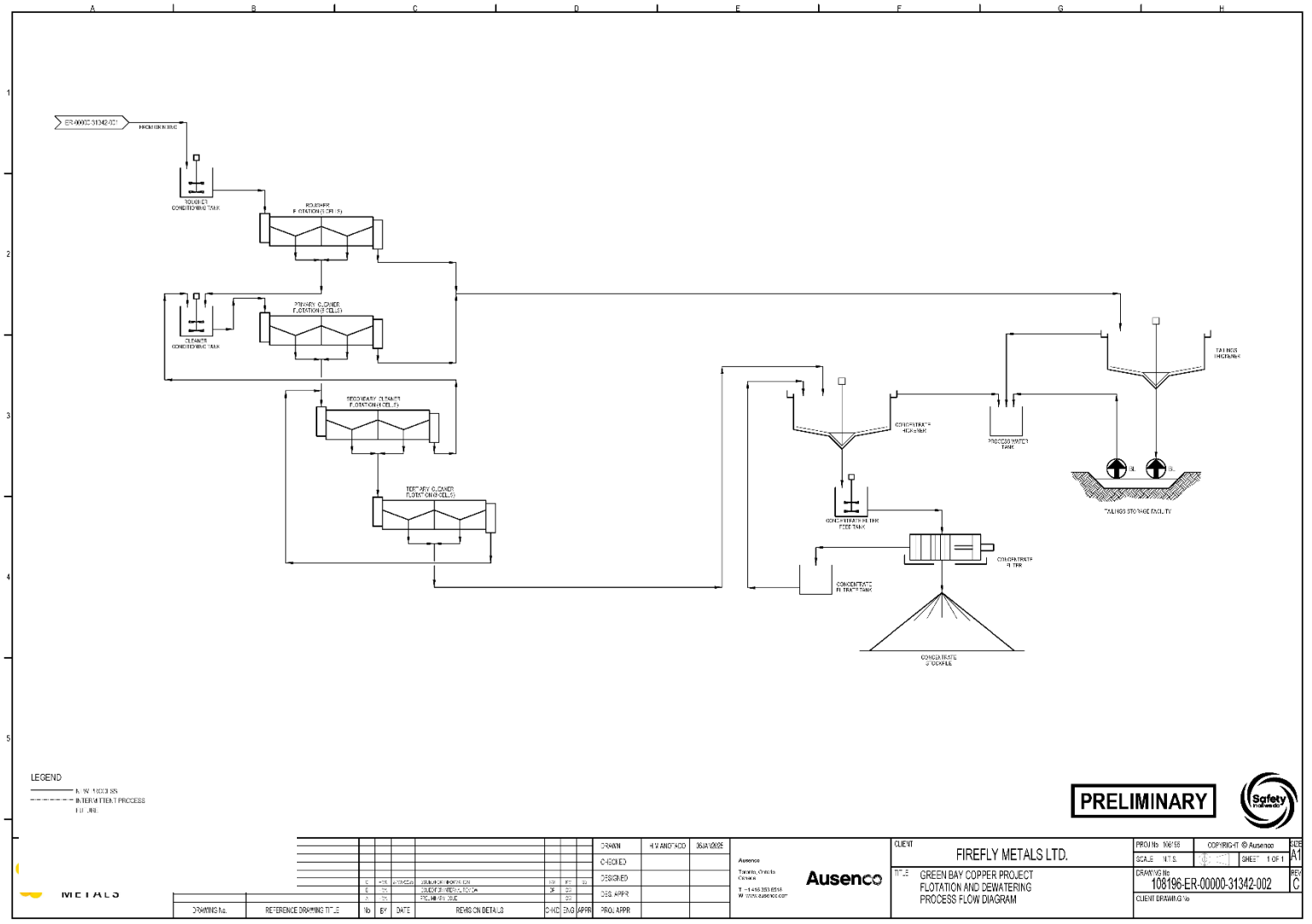


Figure 2.5.6 Flotation and Dewatering Process Flow Diagram

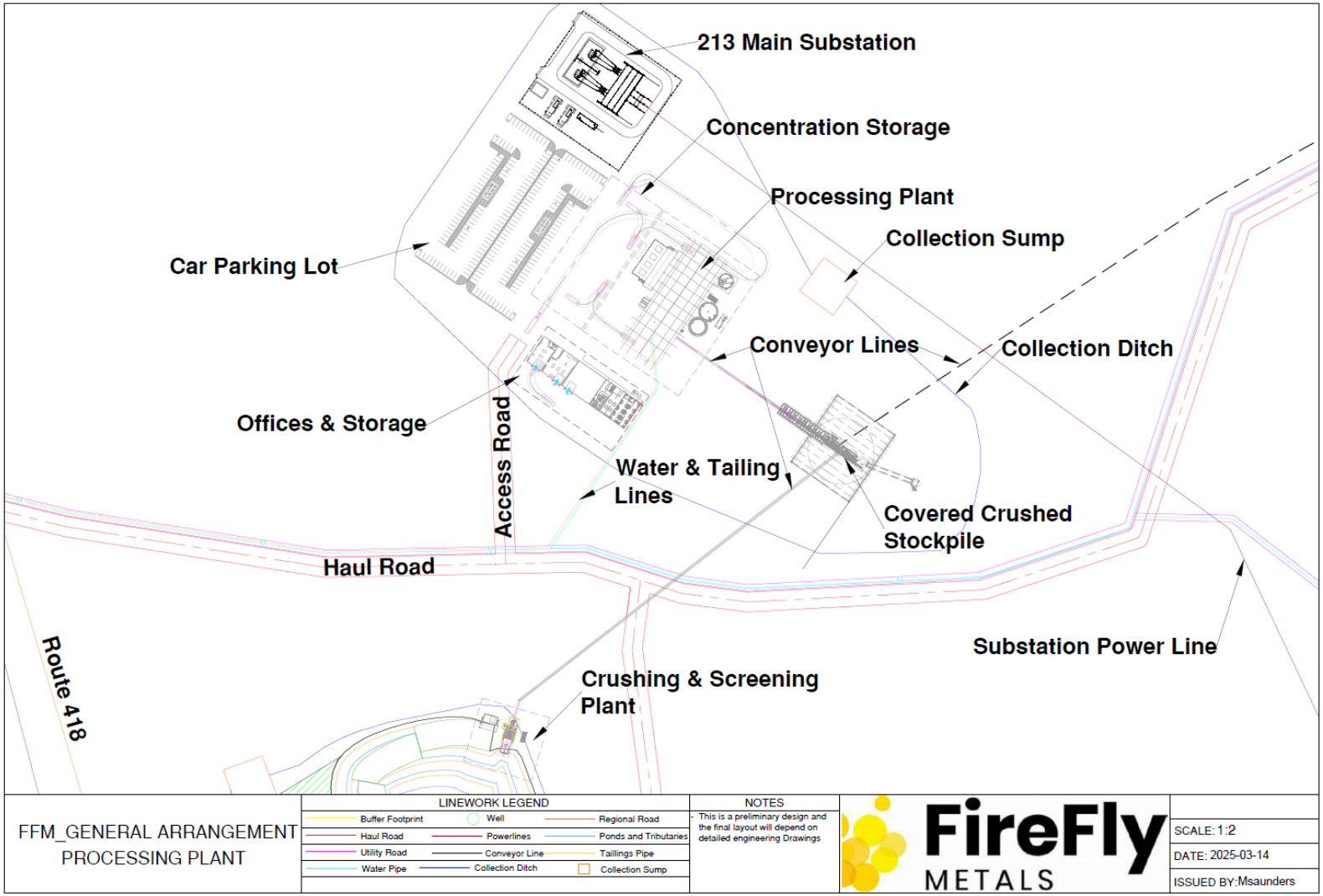


Figure 2.5.7 Process General Arrangement (4,800 tpd)

2.5.6 Freshwater Water Intake

Two options for freshwater intake points (Three Corner Pond and England's Brook [aka Admiral / England]) have been identified to supply water requirements for the operation, with Three Corner Pond (Location B) as the primary water feed. England's Brook (Location A) has been identified as a secondary water taking location (Figure 2.5.8). As mentioned in Section 2.3.9, a location on England's Brook but downstream of Location A was previously assessed as part of the EA in 2018. Note that England's Brook is located upstream of the historical Rambler tailings area and is comprised of a series of swift-flowing habitats and slower moving steadies or pond-like habitats. Over the life of the existing mine, some of the specific reaches of this brook have been referred to by different names or different naming conventions. For consistency amongst this EA and previous information, Mill Steady is also referred to as P14, Mill Pond as P29, specific reaches in England's Brook (or England's Brook) as S16 and S19, and England's Steady as Rambler Pond, P13, and Admiral's Brook.

Freshwater requirements for the processing plant were estimated and modelled by Ausenco Pty Ltd., the lead engineers in the design of the processing plant. Total process water was estimated at approximately 0.70 m^3/tonne ore processed equating to approximately 1.2 million cubic metres of water per year (1.2Mm^3/yr). During commission of the process plant, approximately 0.4 million cubic metres of water will be required to charge the process plant and depending on the timing of commissioning, water may be taken from both Three Corner Pond or England's Brook. Similarly, water requirements for the underground mine activities were estimated at 0.20 m^3/tonne mined equating to roughly 0.36Mm^3/yr. Water from the existing Jenkins Pond intake may be used to feed the portable water plant and subsequent distribution to the offices and camp facilities. FireFly is studying the potential need to apply for an increase in the current water use license.

A polishing pond with the capacity of 500,000 m^3 will be constructed and available upon commission of the process plant. During the operation phase, the water balance will be tracked, and precipitation monitored with the intent of using the water in the polishing pond as "reclaim water" and recycling over 70% of that reclaim water in the process plant. By reclaiming water, it will reduce the volume of freshwater required by the process plant and the volume of effluent discharged from the Project. Three Corner Pond will be used as supplemental water during the operation phase. The freshwater intake areas are shown in Figure 2.5.8.

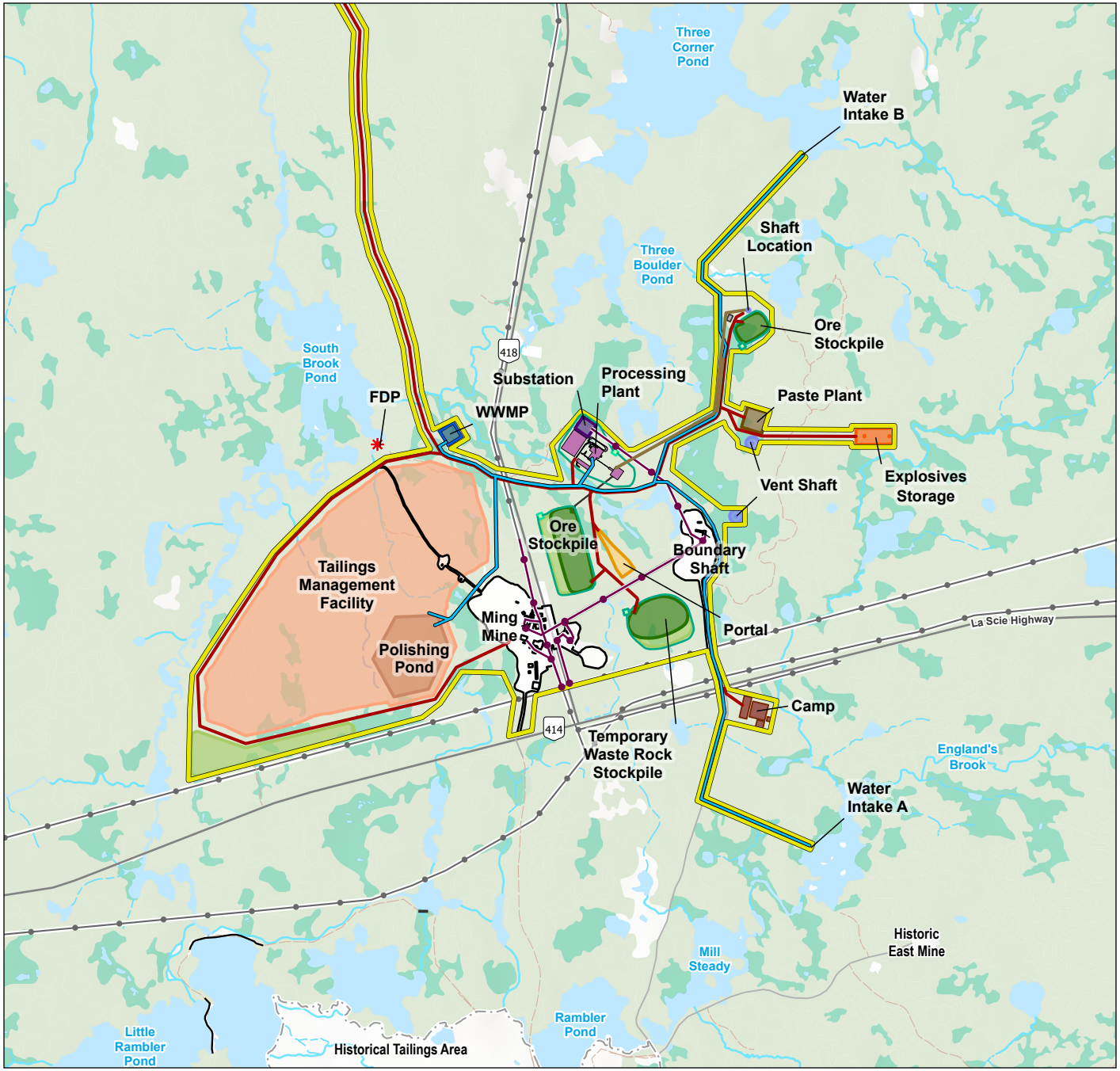


Figure No.
2.5.8
Title
Freshwater Intake Areas

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_1_001c

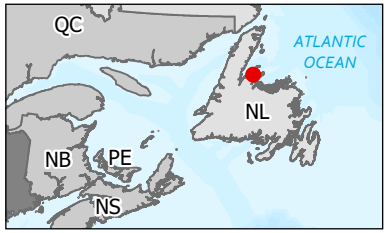
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-19

N

0 400 800 Metres
(At original document size of 8.5x11)
1:28,000

- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Camp
- Catch Basin
- Explosives Storage
- Ming Mine Operation
- Processing Plant Infrastructure
- Substation
- Stockpile
- Organic Laydown
- Paste Plant
- Portal Location
- Shaft Location
- Polishing Pond
- Tailings Management Facility (TMF)
- Wastewater Management Plant (WWMP)
- Other Features
- Final Discharge Point (FDP)
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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2.5.7 Tailings Management Facility

Knight Piesold Consulting carried out various trade off studies to evaluate the various tailings deposition strategies and location of a suitable TMF. The dam design was based on the Canadian Dam Association (CDA) 2013 Guidelines (CDA 2013). The overall design objective of the TMF is to protect the regional groundwater and surface water resources during both operation and long term (post-closure), achieve safe and efficient tailings storage and effluent management during operation, and to achieve effective rehabilitation upon mine closure. The current production plan indicates that approximately 26.2 Mt of tailings will be produced from the on-site mineral processing plant over the life-of-mine.

The design of the TMF has considered the following:

- Reducing the impact and risks to the surrounding environment
- Permanent, secure, and total confinement of solid waste materials within the engineered TMF
- Control, collection, and removal of effluent from the tailings during operation for recycling as process water to the maximum practical extent
- The inclusion of monitoring features for the facility to demonstrate performance goals are achieved and design criteria and assumptions are met
- Staged development of the TMF over the life of the Project to defer capital cost and allow for efficient use of waste materials from nearby aggregate and borrow pits as construction materials for the TMF

Approximately 10.5 Mt (approximately 40%) of the tailings will be thickened and mixed with a cement binder in the paste plant and used as underground backfill. The remaining 60%, approximately 15.8 Mt of tailings, will be pumped directly to the TMF (Figure 2.5.9).

Long-term storage of tailings involves sub-aqueous deposition in an engineered TMF. Alternate tailings streams are being tested and considered based on sulphur content. If pilot tests are successful, the bulk of the tailings will have a lower sulphur content, and another stream will have a higher sulphur content. The higher sulphur tailings will be managed to prevent oxidation and acid generation. They will be used for backfilling underground and/or will be stored underwater below the water table in the TMF. Additional testing is required to determine if high sulphur tails can be thickened, if so, it is anticipated that the majority of the higher sulphur tailings will be used for backfilling with a smaller portion roughly 10% to 15% of total tails being stored underwater in the TMF. If generating a higher sulphur stream is technically viable, it could result in the bulk of tailings being non-PAG, which would permit the TMF to be closed without a water cover and transformed at closure to a landform. Future studies will determine the technical viability of separating the higher sulphur from lower sulphur streams.

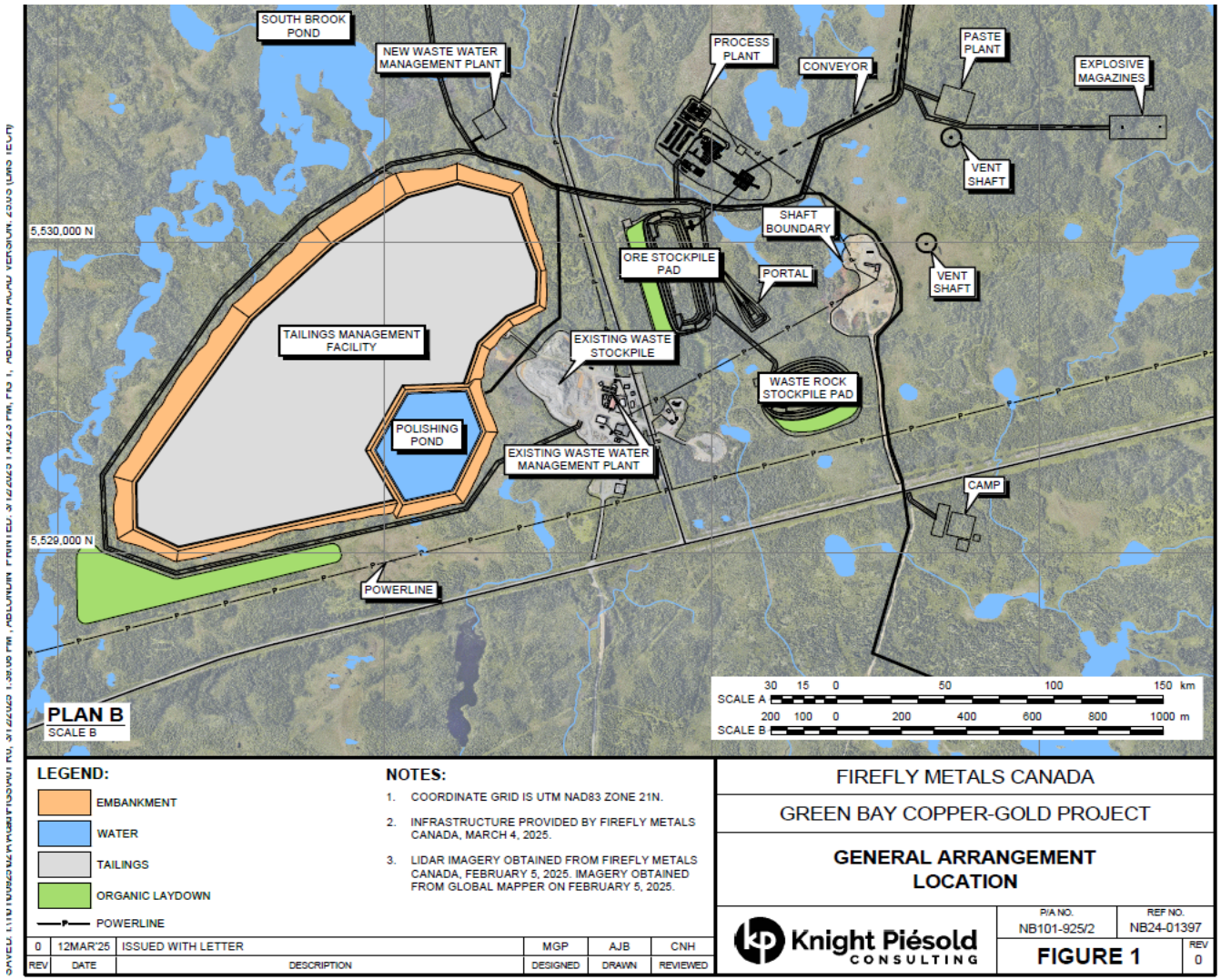


Figure 2.5.9 Tailings Management Facility Layout

The design criteria for the TMF, based on CDA Guidelines (CDA 2013), include:

- Total capacity of 26.3 Mt
  - 10.5 Mt (40%) to underground backfill; 15.8 Mt (60%) to TMF
- Tailings density of 1.3 to1.4 tonnes/m³
- Polishing pond capacity of 500,000 m³
- Facility details (Figure 2.5.10):
  - Embankment crest width 10 m
  - 2:1V embankment side slopes
  - 2 m freeboard allowance
  - Active water cover

Due to the PAG properties of the tailing's material, the TMF will be lined with a HDPE geomembrane. Drainage foundations at the toe of the dam will be lined and directed to collection points and pumped to the polish pond for treatment. It is anticipated that most of the water will be recirculated back to the process plant for use in the plant.

The embankments of the TMF (Figure 2.5.10 and 2.5.11) will be constructed in stages using non-potentially acid generating (non-PAG) mine rock to achieve the necessary storage capacity for process solids during ongoing mine development. The interior embankments of the TMF and polishing pond may be constructed from PAG material at the base, which will be subaqueous and covered by tailings. The primary storage area embankments will be constructed during the pre-operational period (Year -1), with additional elevation lifts proposed around Year 2, Year 5, and Year 15.

It is anticipated that the embankment wall for the dam will be done in three phases as outlined below (Figure 2.5.12), with the initial construction in the first 2 years being the polish pond and starter wall. An initial 820,000 m³ of non-PAG material is required for the polishing pond and the starter embankment for the first two-year phase. Two considerations have been allowed for the pending finalization of material rock characterization to confirm the PAG properties of the proposed waste rock source. There are many options for third-party aggregate and construction grade rock near the Project Area. The closest are three potential third-party sources: hauling from the existing Argyle and Pine Cove waste rock material located 6 km away from the TMF, outsourcing from an aggregate operation adjacent to Pine Cove, or extracting from a borrow pit approximately 2 km north of the Project site.

A fourth option is also available on the Project site: excavation of a waste rock quarry (borrow pit) located inside the footprint of the TMF. The rock type found within the footprint of the TMF site is predominantly comprised of Rhyolite and inter-layered ultramafic Basalt. This rock type is known to be non-PAG; however, testing is underway to confirm the material can be considered for the embankment. It is anticipated that a quarry with dimensions of 250 m x 200 m and 30 m deep would be needed to supply the required waste rock for TMF construction and other laydown areas for the Project, including road base.

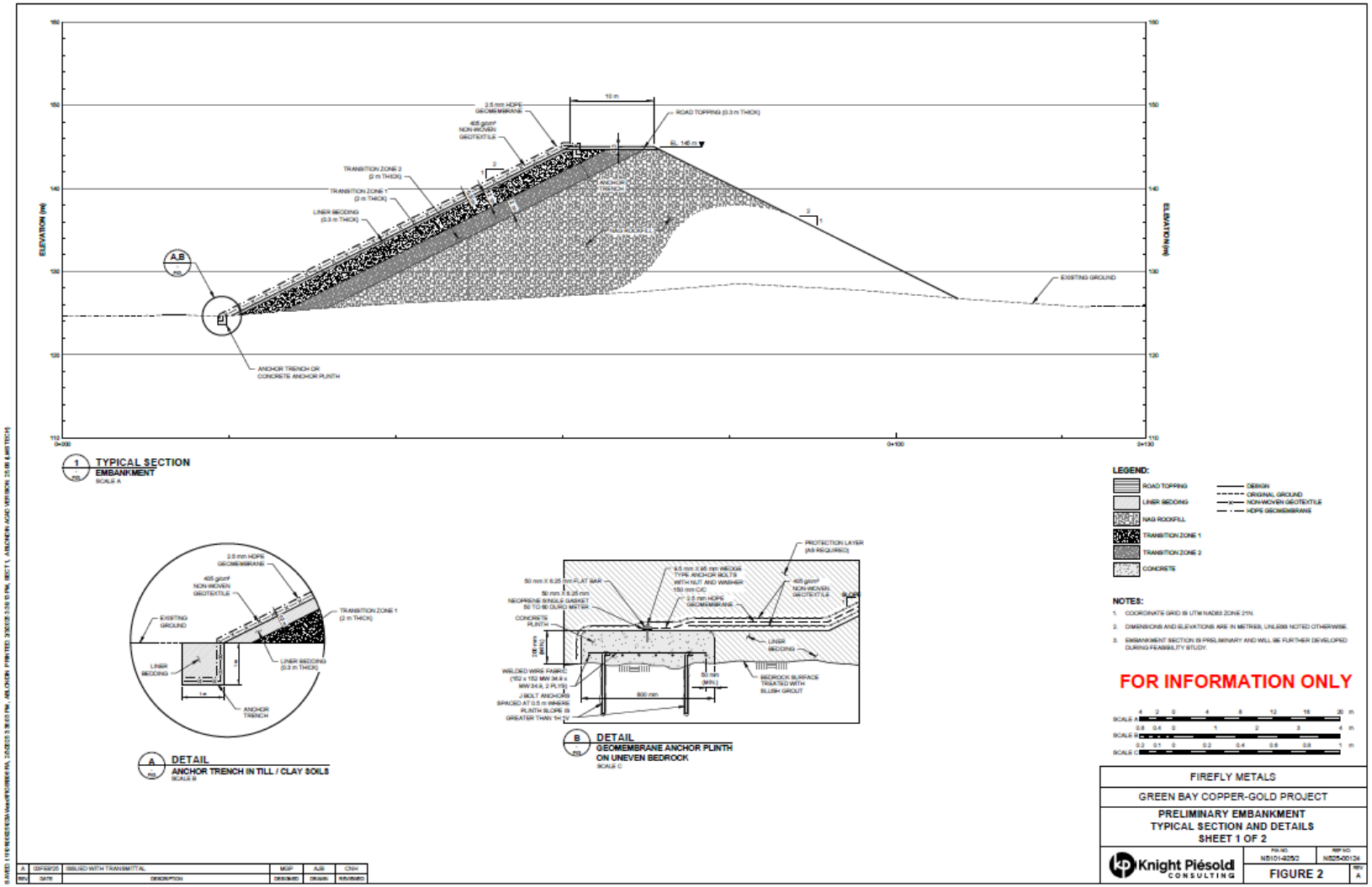


Figure 2.5.10 Tailings Dam Design Embankment Section (Sheet 1 of 2)

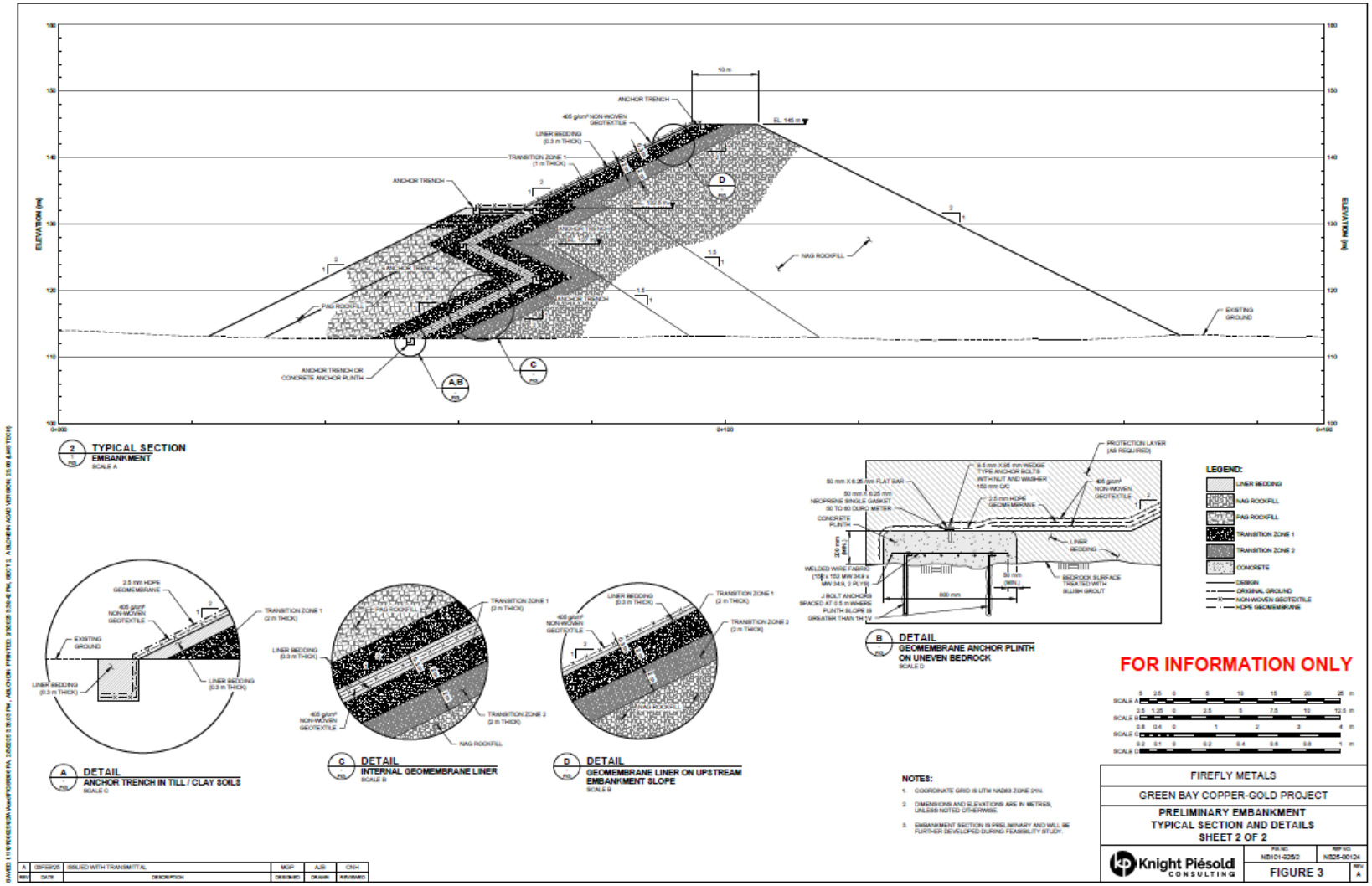


Figure 2.5.11 Tailings Dam Design Embankment Section (Sheet 2 of 2)

Figure 2.5.12 Tailings Management Facility Life of Mine Development Plan

Screening and sizing of the blasted material will be done using a mobile crushing plant which will be outsourced during the Project construction phase. Over the life of the Project, additional waste rock requirements for the site (e.g., road maintenance) will be from the Pine Cove waste rock pile and the Shoreline granite quarry located 6 km away from site.

2.5.8 Site Roads and Highway Access

A network of roads and access corridors will be constructed to access the proposed new infrastructure areas. Table 2.5.4 provides a summary of the proposed road network, with locations shown on Figure 2.5.13. The design road network focused on using existing road systems, staying within a disturbed footprint where possible, reducing transportation distances, and allowing for equipment to be maintained and operated efficiently to manage greenhouse gas (GHG) emissions.

Table 2.5.4 Proposed Corridors to Support Project Infrastructure

Location	Length (m)	Road Width (m)
Access Roads		
Portal Haul Road	325	12
Port Access Road	4,682	12
Additional Stockpile Access Roads	680	12
Explosive Magazine Access Road	500	12
Shaft Access Road	1,624	12
Mill Access Road	235	12
Total Roads	7,683	
Service Routes		
Three Corner Water Intake (Location B)	2,736	4
England's Brook Water Intake (Location A)	3,421	4
Total Service Routes	6,157	

The existing site road network will be improved around the office, mechanic shop, water treatment plant and extend to the TMF. A new road network around the process plant, portal, ventilation and waste rock stockpiles will be developed east of Highway 418. A new port access road will link the process plant to the port located approximately 6 km north of the Project and improvements to Highway 418 (Ming's Road) where the port access road crosses the Highway.

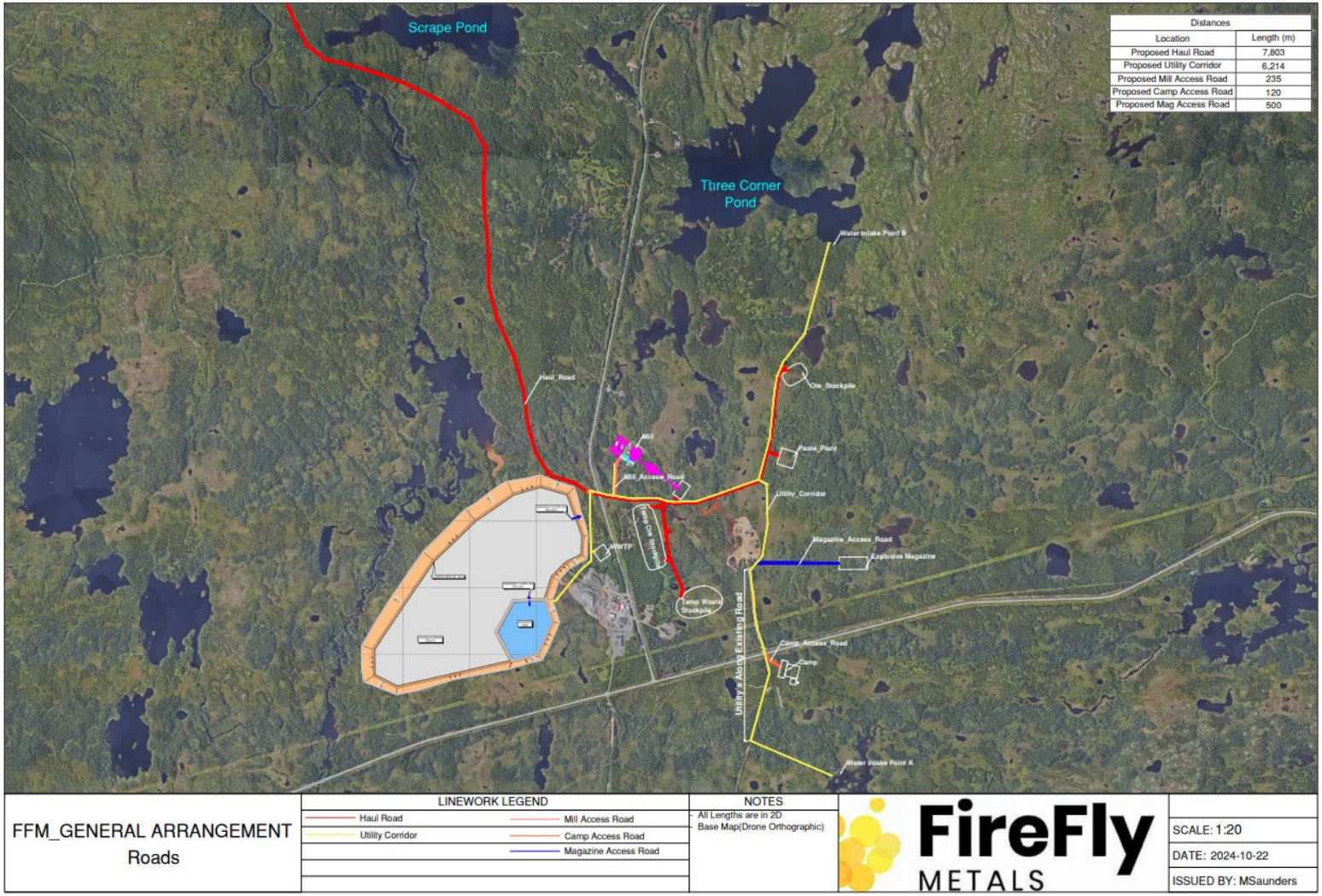


Figure 2.5.13 Project Access Road and Service Route Network

No additional modifications are anticipated at the intersection of Highway 414 and 418. It was and continues to be used by local industrial traffic including Shoreline Aggregates, Maritime Resources and Guy J Bailey's aggregate, as well as logging operations. The former operator of the Ming Mine utilized the intersection to haul ore to Nugget Pond. Additional upgrades may be necessary to accommodate mine-related traffic, at the main entrance of the mine and where the haul road to the port is proposed to cross Highway 418, and off Highway 414 to the accommodation complex, which will include brushing, installation / upgrades to culverts, and construction of an appropriate gravel roadbed. As described in Section 2.5.5, approximately 12 concentrate trucks per day will transport concentrate from the process plant, cross the intersection at Highway 418 and travel to the port facility. The proposed concentrate truck traffic volume is low and can be regulated to avoid peak traffic times on Highway 418.

Construction of the road will be through a non-PAG rock base covered with a compacted crushed rock top layer. This material will be sourced from either the onsite quarry or from the third-party sources described in Section 2.5.7. Best practices will be implemented to limit impacts on riparian vegetation. Culvert design, installation / upgrades and maintenance will follow and conform to appropriate Fisheries and Oceans Canada and NL operational statements, guidance, and protocols. Although some waterbodies and streams crossed by proposed roads are impacted by legacy mining and don't support fish, the culverts will be designed to maintain passage for fish, to allow streamflow and drainage through channels to direct non-contact water (i.e., water that does not come in contact with mine waste) to flow along existing natural pathways and not be obstructed, and to account for extreme high and low hydrological events. Progressive reclamation and sediment control measures would be implemented to mitigate impacts to surface water and to protect fish habitat, where present.

The priority was to use already disturbed corridors for new access roads and service routes. Where new corridors are required, the vegetation along the road alignment will be grubbed and topsoil or organics removed and stored adjacent to the road for future reclamation and rehabilitation. At initial closure, some site roads will be reclaimed and rehabilitated. Others will remain during the post closure phase to monitor the site. At final closure, culverts will be removed, and road reclamation and rehabilitation will be completed using topsoil or organics that were stored adjacent to the road.

Speed limits will vary but will be set in accordance with provincial regulations, industrial standards and FireFly's Occupational Health and Safety program. Posted speed limit signs will be placed on temporary and permanent roads, including the access road, site roads and haul roads. The control speed limits protect the health and safety of the workforce, improve fuel efficiency, reduce likelihood of wildlife interactions, protect the public and mitigate fugitive dust emissions from traffic on the road network. Weather influences potential fugitive dust generation, and FireFly will assess multiple factors (expected usage, weather, alternate routes, availability/types of dust applications) to determine if additional mitigation and the types of measures necessary to control fugitive dust.

A security building and gate will be located at the main entrance to the mine site. The security building and gate will be staffed 24 hours a day, providing restricted access to the site. Because the Project has road access at other points along Highway 414 (LaScie) and Highway 418 (Ming's), additional control checkpoints with either have security or gates to maintain restricted access to the site. The Project site would be an active mine, and safety of the FireFly's workforce and public are paramount. Therefore, signage and some areas of fencing will be erected to prevent public access to the Project site.

2.5.9 Electrical and Telecommunications Infrastructure

Power supply to the mine site is provided through an already existing 138 kV NL Hydro line passing through the Project Area, as well as a 1.5 MW generator exists onsite to provide backup emergency power to the mine. This power supply is sufficient to support current site activities and activities during early works and the construction phase. During the construction phase, a 30 MW substation is planned to be constructed adjacent to the processing plant. Upon completion, on site distribution will be through a stepdown 13.8 kV line feeding the various points of the Project Area.

For operations phase, the main substation will be energized through the 138 kV tap line. It will be equipped with two power transformers, and control and protection equipment. To provide operational continuity during power outages during the construction phase and through operations, the substation will be equipped with two new 4.0 MW diesel generators. A new 750 kilovolt-amperes (kVA) generator is proposed to provide backup at the accommodations complex. The generators will be used primarily for emergency power requirements in the event of total power supply failure or maintenance. Alternative types and models of generators are being investigated to reduce the overall GHG emissions caused by diesel generators. It is anticipated that the overall running time for the generators will not exceed 10% of total operating hours of 8 400hrs per annum.

FireFly and NL Hydro have met and entered into an agreement to initiate the System Impact Assessment. NL Hydro continues to assess potential upgrades to their system but has confirmed that power supply is available for the Project. Figure 2.5.14 was developed in collaboration with NL Hydro to illustrate where care and control of their infrastructure terminates and where FireFly takes responsibility for infrastructure, and this is the area included in the scope of the Project. It is understood for infrastructure owned and operated by NL Hydro, that if upgrades trigger an EA for NL Hydro, FireFly has gathered some baseline information around the Project site and will share that data, if applicable, with NL Hydro.

The mine is currently connected through a fibre network through one of the local telecommunication service providers. This existing line will be extended to the new process plant infrastructure to ensure connectivity across the entire site.

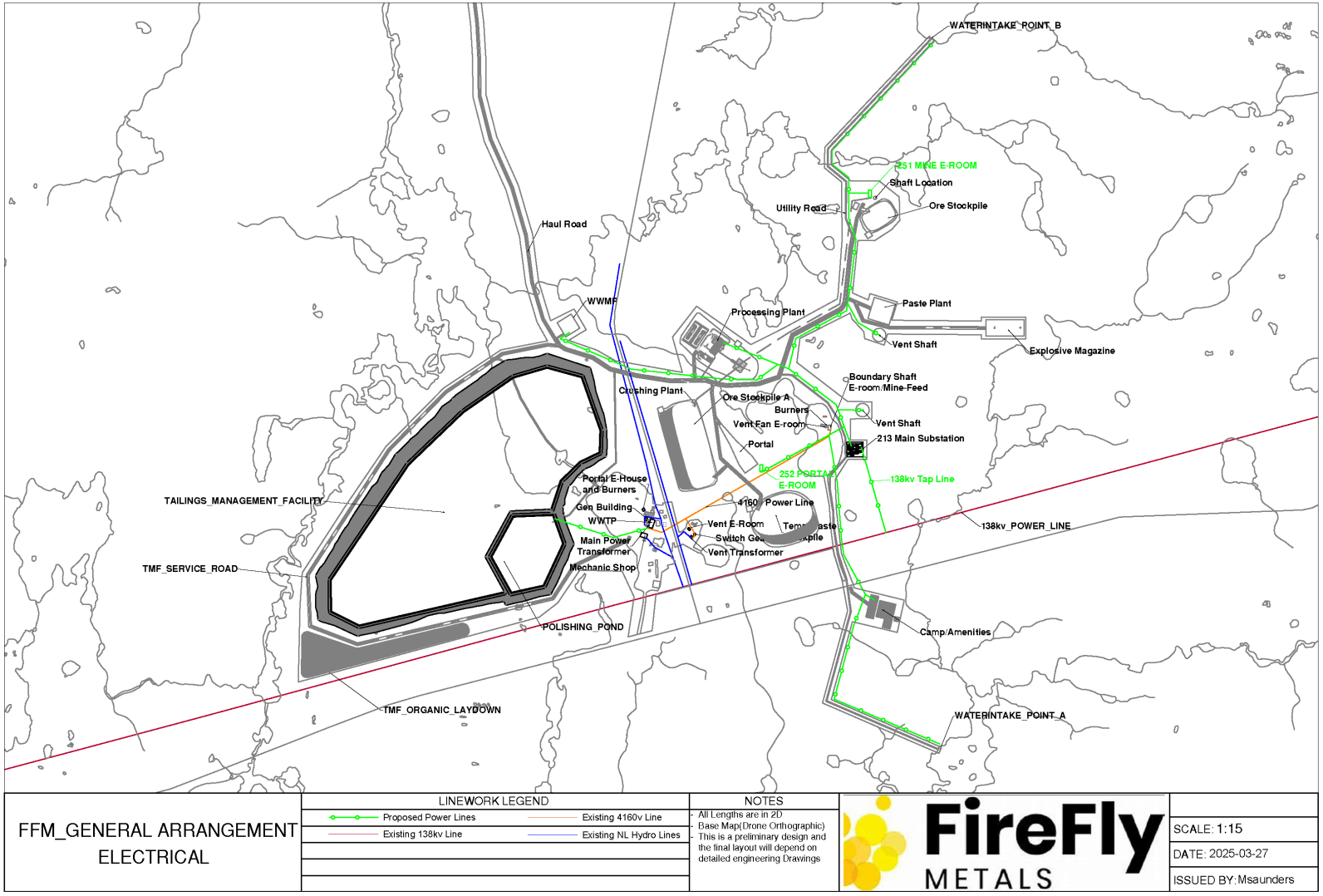


Figure 2.5.14 Electrical Distribution

2.5.10 Site Buildings and Facilities, Including Accommodations Complex

The existing surface buildings and infrastructure at the mine site are described in Sections 2.3.5 and 2.3.6. Table 2.5.5 describes if this infrastructure will be used as is or will require minor additions and/or modifications to meet the Project requirements.

Table 2.5.5 Proposed Additions or Modifications to Site Buildings and Facilities

Existing Infrastructure	Additions or Modifications Needed to Meet Project Requirements
Administrative Office(s)	The existing Admin buildings and offices will be used for the Project with no major changes. Minor internal additions of shelving and showers to the existing mining dry/washrooms will be done. The new process plant building will include a block of offices, washrooms and change house/dry area to accommodate the personnel requirements for the process plant.
Employee Housing / Kitchen / Dining Hall Building and Kitchen Staff Camp Buildings	Additional requirements related to accommodations are described in Section 2.5.12. Employee housing / kitchen and dining building exists onsite and will be used during the early works and site prep phase. In addition to some remodeling of the unit, additional modular units maybe set up at the current employee housing area until the new accommodation complex is constructed south of Highway 414.
Core Shed and Warehouse Building	The existing core shed, and warehouse will remain as they are with no major changes. Additional shelving will be extended on the existing warehouse section being used as core shed.
Maintenance Shop	Existing workshops and maintenance areas will be used primarily by underground operation. An extension of the existing maintenance shop will be done to add an additional two bays for maintenance. Site prep and construction contractors will use temporary laydown areas within the Project footprint.
Scale / Scale House	No major changes are proposed. The existing building will be spruced up and new weigh bridge software installed. No change is proposed to the physical building.
WWMP	The existing WWMP will be used until such time as the new plant is constructed and commissioned. Thereafter the equipment inside the existing building will be decommissioned, removed and used as spares where possible. The building will be used as a storeroom / warehouse for major mining heavy vehicle equipment spares.
Welding Shop	No changes anticipated.
Generator House and Electrical Substation	The existing 1.5 MW generator will remain unchanged and connected to the new underground electrical circuit.
Diesel Fuel Supply and Storage	An additional 65,000 L tank will be installed adjacent to the existing tank, including a roof cover and pad.

Table 2.5.5 Proposed Additions or Modifications to Site Buildings and Facilities

Existing Infrastructure	Additions or Modifications Needed to Meet Project Requirements
Propane	No changes to the existing propane locations are proposed. Additional tanks will be installed at the new main ventilation shaft intake. Initial estimates are two x 50,000 L tanks. Investigations for alternative heating systems are under investigation which will reduce the required capacity and size of the propane storage. This proposed system will utilise electrical heating technology instead of propane.
Power Supply and Distribution	Additions and modifications required for the Project are described in Section 2.5.8.
Explosives Storage and Handling	Additions and modifications required for the Project are described in Section 2.5.10.
Compressed Air and Process Water Supply	The existing compressor house will remain unchanged. Two additional compressors will be installed underground.
Communication	An additional fibre communication line will be run and extended from the existing Admin office block to the new process plant building.
Roads and Site Access	Additions and modifications required for the Project are described in Section 2.5.7.

2.5.11 Explosives Storage Facility

While there is an existing approved explosives storage facility onsite, it will need to be moved to accommodate development of the TMF. A site has been selected on the east side of the Project Area which allows appropriate setbacks from a safety perspective (Figure 2.5.1). Bulk explosives and associated consumables on the surface will be managed by an explosive contractor, including explosive storage facilities and delivery trucks. The primary storage and manufacture of explosives is planned to be done at the service provider's manufacturing plant in Corner Brook, approximately 170 km from the Project site. Minimum quantities of approximately 30 to 50 t of emulsion will be kept on site in the magazine storage units. It is estimated that approximately 3.5 to 4.2 t (3,500 to 4,200 kg) of explosives will be used daily to support the anticipated production rates of 4,800 tpd operation.

Bulk emulsion is planned to be used for blasting activities, and the storage of this material will be in engineered designed totes, to be supplied by the explosive contractor. The storage containers are shown in Figure 2.5.15. Explosive magazines will be Type 4 magazines designed to comply with associated provincial and federal regulations.

All transport, storage, and loading of explosives underground will be handled by FireFly employees. The design of site infrastructure will be in accordance with applicable provincial and federal regulations including the associated buffer distances. Magazine storage units will meet the requirements of the "Storage Standards for Industrial Explosives" published by the Explosives Division of Natural Resources Canada. Both explosive and detonator systems will be stored in separate magazine storage areas as depicted on the general site drawing.

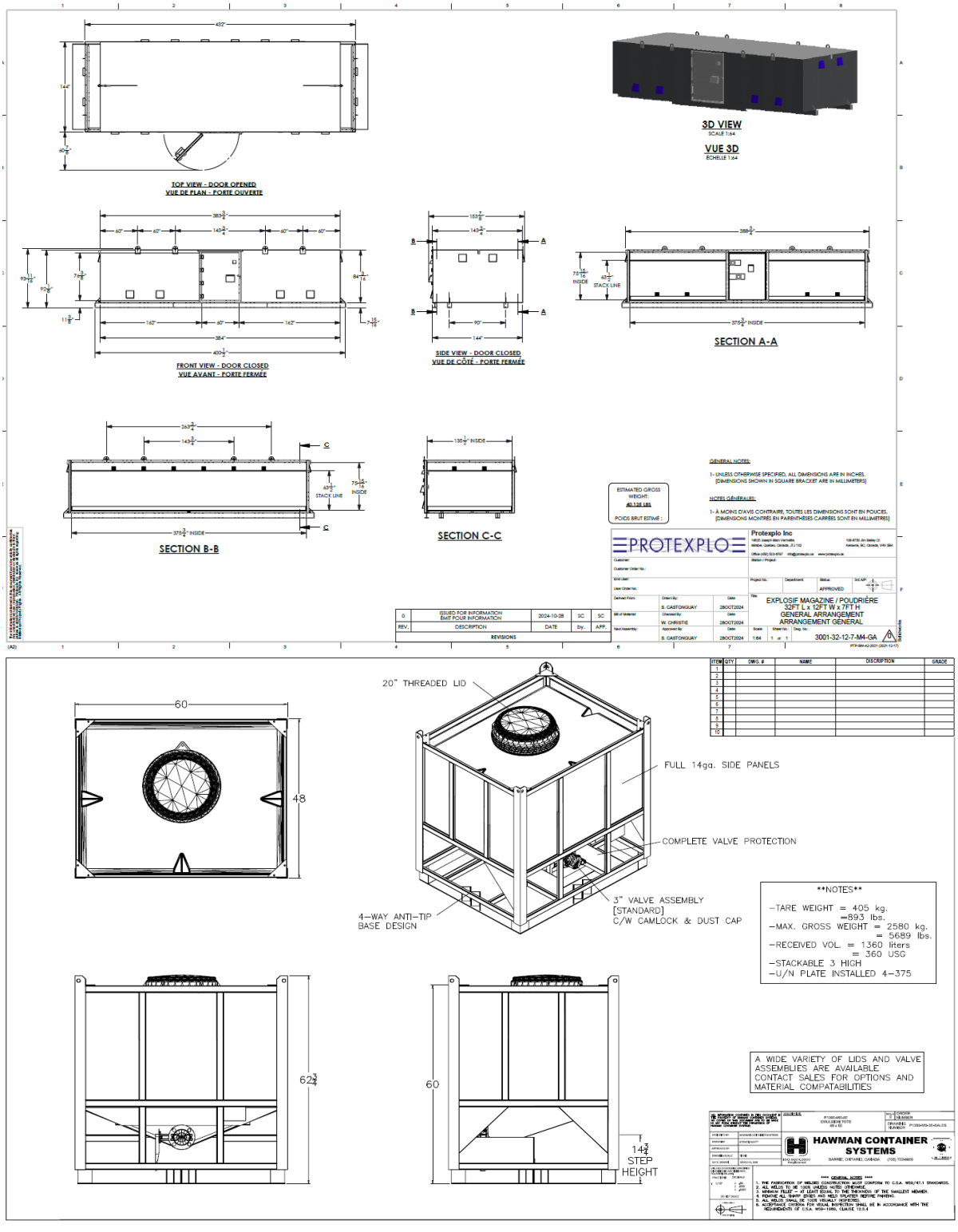


Figure 2.5.15 Potable Explosive Storage Container Design and Construction

2.5.12 Accommodations Complex

A modular accommodations complex (Figure 2.5.16) with a capacity of approximately 250 people will be constructed on the south side of Highway 414, roughly 2 km from the mine administration office. The accommodations complex will be used for the duration of the Project and will consist of 250 rooms with associated amenities like washrooms, dining rooms, entertainment areas and a vehicle parking area.

The larger accommodations complex is required for the peak construction workforce of the construction phase. The modular design of the complex will enable the rooms to be converted into modern operation accommodation complex for future FireFly employees that are Regional or Fly In / Fly Out (FIFO), and local employees during poor weather conditions and for future shutdowns or maintenance requiring contractors onsite. The accommodations complex will mitigate the potential effects of the influx of people into the region, and for the peak construction phase there are hotels, and housing available in the surrounding communities. The site also has a camp / kitchen / dining building already in place that will be used for exploration activities and will be used during the early works and site prep phase until the new accommodation complex is ready. The existing accommodation facilities can be used for overflow if required. The accommodations complex also ensures the health, safety and security of the workers and surrounding communities.

The proposed domestic sewage system for the accommodation complex considers the treatment of sewage with on-site membrane bioreactor and leach field and/or will be collected for off-site disposal at an existing, approved sewage disposal facility.

Freshwater is currently supplied by Jenkins Pond and is used for non-potable purposes in the camp/kitchen and dining building. It will continue to be used for offices and the camp. A new freshwater source is proposed for the accommodation complex from England's Brook (Location A). Water intake from England's Brook was previously approved for use in 2018 (refer to Section 2.5.6 for further details). Potable water will be supplied to the accommodation complex through a water treatment plant or by bulk water supplier.

Figure 2.5.16 General Arrangement for the Accommodations Camp

2.5.13 Water Management

Knight Piesold Consulting (Knight Piesold) has been contracted to develop the conceptual site water management plan and strategy. The water management strategy for the site will include collection and treatment of water, including contact water from various areas of the proposed new mine development, and diversion of runoff from undisturbed areas. Contact water is defined as water that has been in contact with mining activities, mined material, and/or underground mine inflows. The strategy has been developed in consideration of the federal *Metal and Diamond Mining Effluent Regulations* (MDMER, 2024) and provincial *Environmental Control Water and Sewage Regulations* (NLR 65/03).

The water management strategy will include the following:

- Diversion of runoff from undisturbed areas around proposed disturbance areas to limit the amount of contact water required to be managed through the site water management systems.
- Avoidance of areas impacted by historic mining activities to maintain existing water courses.
- During construction, contact water from disturbances associated with the mine development (runoff from cleared and stripped areas, overburden, roads and pads constructed of clean aggregate and revegetated areas) will have erosion and sediment control measures installed, such as silt fence and/or haybales, around the perimeter of disturbance areas for local sediment control. Local drainage will be maintained to the extent feasible to remain within existing sub-watershed areas.
- During operations, contact water from disturbance areas will be routed to the polishing pond and used to supplement process water or treated (as required) and discharged to the environment via the existing FDP.
- Potentially impacted runoff water from the process plant area, ore stockpile pad, waste rock stockpile pad, mine shaft area stockpile, portal area, and other areas will be collected and transferred to the polishing pond. The polishing pond will be primarily used to supply process water to the process plant. Excess water from the polishing pond will be treated (as required) and discharged to the environment via the existing FDP.
- Supernatant water (process water plus meteoric water) from the TMF will be transferred to the polishing pond or pumped directly to the process plant for use as process water.
- Water management infrastructure, including ponds and catch basins, will be sized to manage the runoff resulting from the 1-in-100 year and 1-in 25-year, 24-hour storm events, respectively.

Potentially impacted waters will be collected, monitored, treated (as required) and discharged to the environment once water quality objectives have been demonstrated. The TMF will consist of two areas: the primary tailings storage cell; and a separate polishing pond. The storage cell will provide permanent and secure storage for tailings from the process plant. Contact water from the site will primarily be managed within the polishing pond. The polishing pond will be located at the southeast corner of the TMF and will function as the primary contact water management pond, as well as a reclaim water source for the process plant. This pond will be constructed during the pre-operational period (Year -2) and will initially serve as a storage pond for construction dewatering. Contact water from the mine site-including

water from the underground workings, waste and ore rock stockpiles, the process plant, and the TMF-will be transferred to the polishing pond, which will have a capacity of approximately 500,000 m³. Water will be reclaimed to the process plant on an ongoing basis. Any overflow from the polishing pond will be managed within the storage cell of the TMF. Excess water will be redirected from the polishing pond to the WWMP located near the TMF, where it will be treated as necessary before being discharged into South Brook (the FDP) via a HDPE pipeline equipped with a diffuser.

The waste rock, ore, and overburden stockpiles are situated around the proposed portal, process plant, and shaft, east of Highway 418. Contact water from these stockpiles will be collected in catch basins established at the base of the piles. These catch basins will be constructed during the site preparation phase. Water collected in the catch basins will be pumped to the polishing pond through HDPE pipelines, with the collection system designed to manage a 1-in 25-year rainfall event. In the instances where the 1-in 25-year rainfall event may be exceeded, excess water will be managed onsite and discharged to the environment if it meets MDMER criteria. The polishing pond is designed to overflow into the TMF catchment, which will be constructed with an overflow spillway sized to accommodate a 1-in-100-year rainfall event. The redirected water will flow toward a catch basin near the FDP and ultimately into South Brook.

Surface water runoff from site and groundwater inflow into the underground workings will be collected by various sumps, catch basins, and pumps, and conveyed to the polishing pond through HDPE pipelines. Stormwater runoff from each of the water management areas has been estimated using site-specific hydrology data developed by Knight Piesold as part of the conceptual site water management plan. Conceptual water management catchment areas are provided in Figure 2.5.17. The water management areas will cover the following:

- Existing waste rock stockpile and admin infrastructure
- Temporary waste rock stockpile
- New process plant
- New shaft and ore stockpile area
- Portal and ore stockpile area

Contact water from these areas will be managed through water collection drainage and pumping directly to the TMF and polishing pond. The TMF and pond are complete with transfer works (pumps and pipelines). Groundwater that comes into contact with underground mine workings will be collected. Non-contact water runoff from the Project site will drain through the existing Boundary Shaft drainage channel or as surface runoff to South Brook and its tributaries.

A maximum discharge of approximately 1.7 Mm³ (at a constant rate of approximately 200 m³/hr) has been allowed for in the WWMP plant design. A site-wide water balance was calculated and estimated for three main phases of the Project: the construction phase (Figure 2.5.18); initial production build-up to year 7 (Figure 2.5.19); and LoM water balance requirement (Figure 2.5.20).

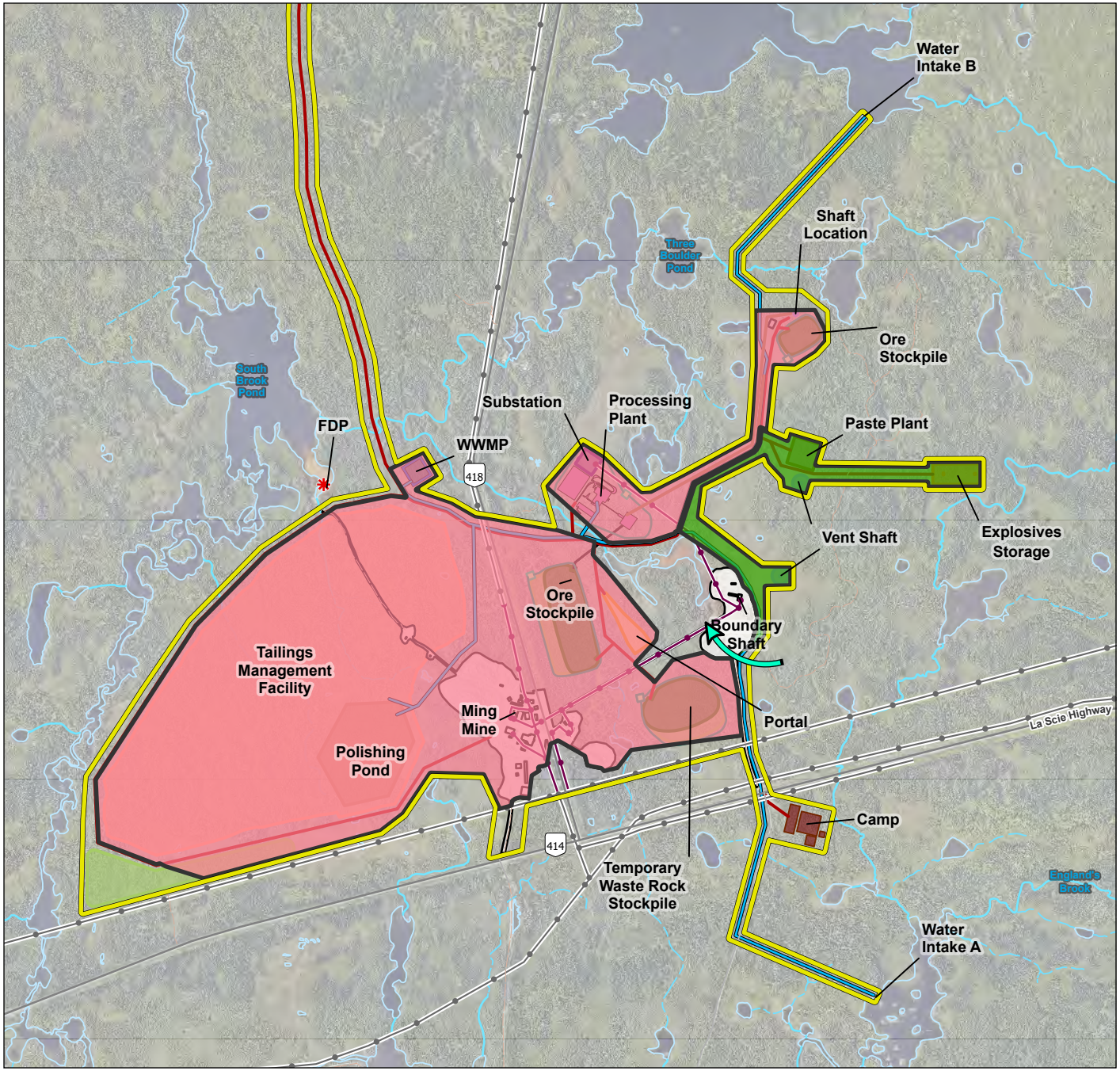


Figure No.
2.5.17

Title
Conceptual Water Management Catchment Areas

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_009

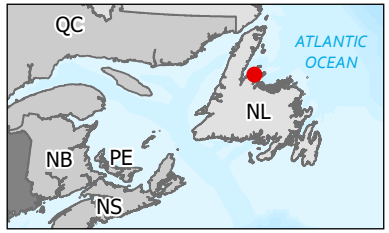
Project Location
Baie Verte, NL

Prepared by MB on 2025-03-09
Revised 2025-03-26
IR by AS 2025-04-07

N

0 300 600 Metres
(At original document size of 8.5x11)
1:22,000

- Final Discharge Point (FDP)
- Project Area
- Site Drainage to Wastewater Management Plant (WWMP)
- Site Drainage to WWMP or FDP
- Flow Direction
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL

Stantec

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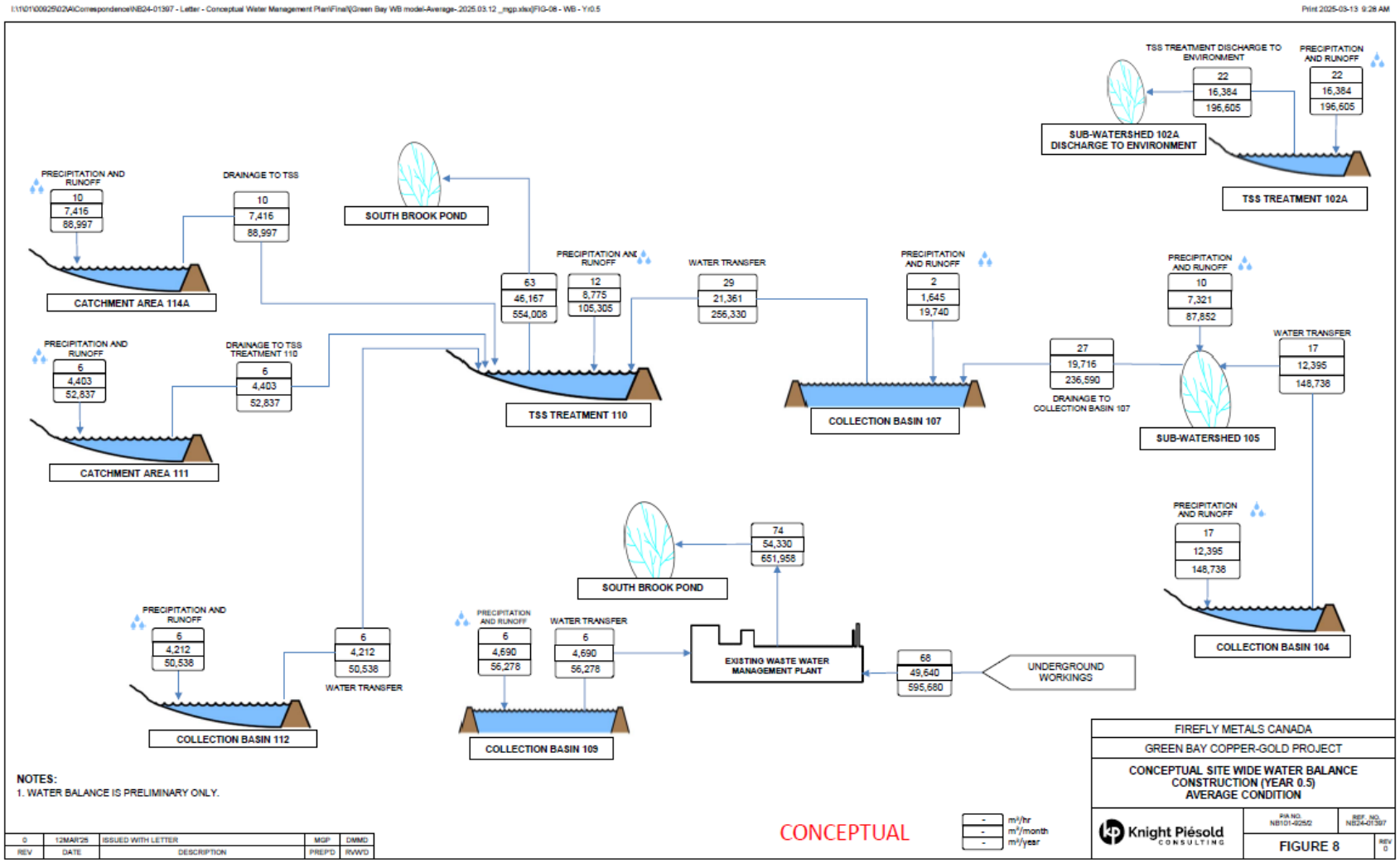


Figure 2.5.18 Water Balance at Construction Concept

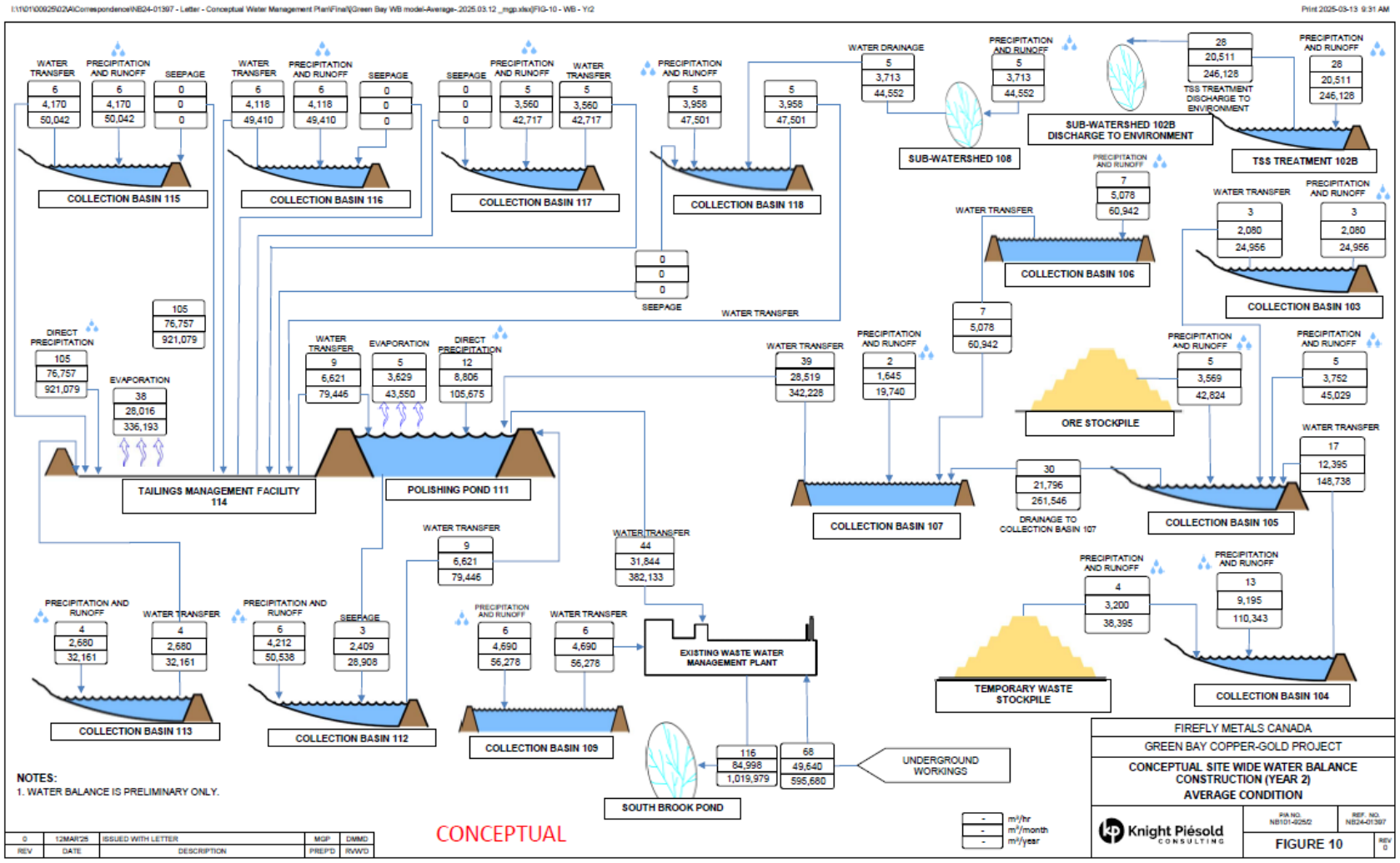


Figure 2.5.19 Water Balance at Year 2 Concept

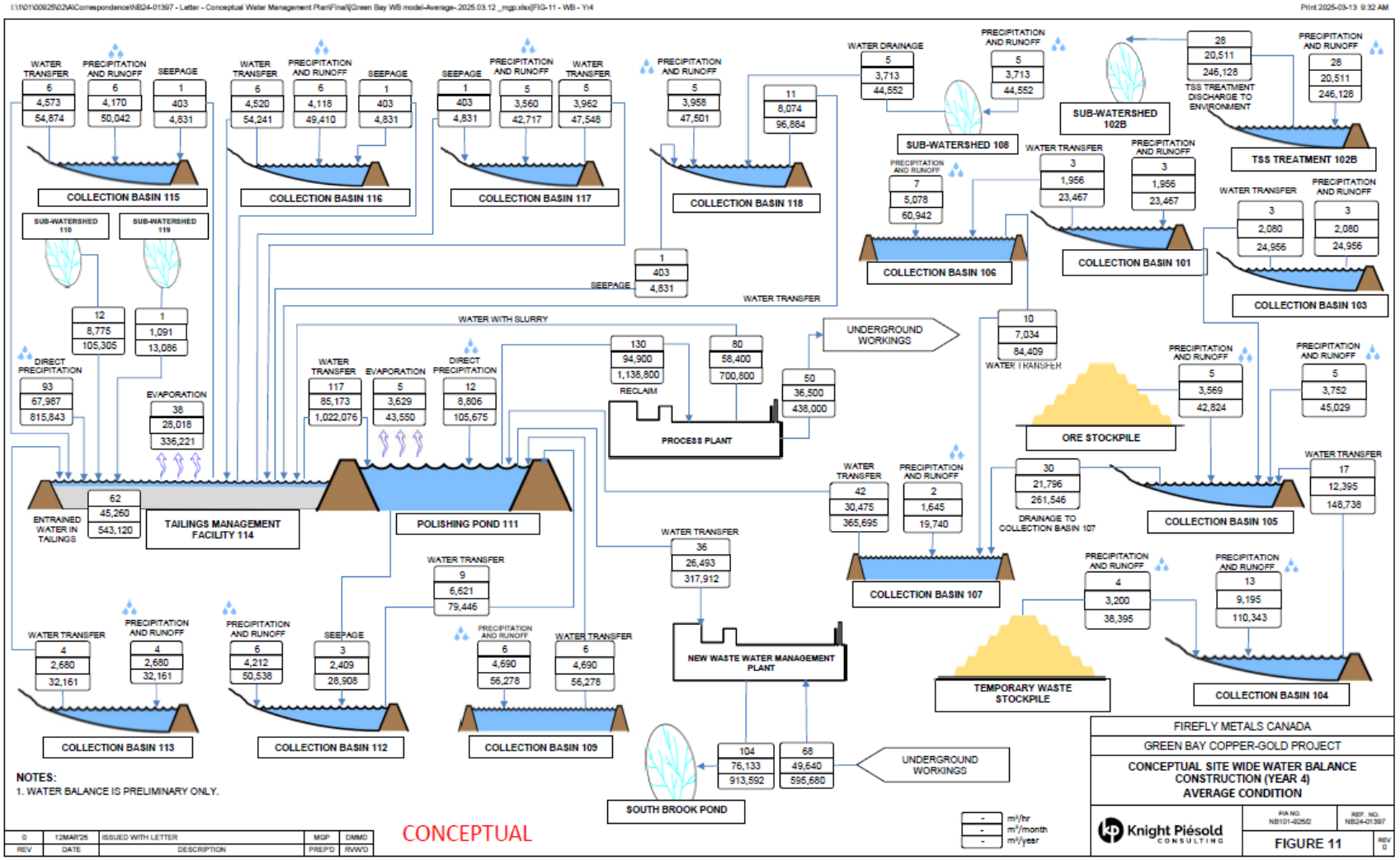


Figure 2.5.20 Water Balance at Life of Mine Concept

2.6 Site Preparation and Construction

2.6.1 Early Works –Site Preparation

Before construction begins, several preparatory activities are necessary for the Project site. These site preparation activities are considered “Early Works” and crucial for adequately preparing the site for construction, they are summarized in Table 2.6.1. The approximate footprint of the areas to be developed (cleared) to accommodate the expansion of the mine and related infrastructure is approximately 1.5 km² as shown in Figure 2.6.1. While FireFly is committed to reducing areas of new ground disturbance, the Project is also still in the early stages of design and there are several constructability factors (e.g., geotechnical, environmental and logistical considerations) that could cause the footprints to shift or expand as further design studies are completed (e.g., there could be a requirement for additional temporary laydown areas to support construction activities). For this reason, FireFly has assumed a 15% buffer on the area to be cleared (i.e., the total area of new ground disturbance / clearing could be approximately 2 km²). Note that the assessment of Project effects presented in Chapter 6 conservatively assumes that all habitat within the Project Area (i.e., 3 km²) will be directly lost or disturbed, in addition to potential indirect effects.

Table 2.6.1 Summary of Key Early Works / Site Preparation Phase Activities

Activity	Description
Clearing	Clearing involves the removal and disposal of vegetation, including trees, brush, shrubs, and other foliage. Trees will be cut down, transported, and stacked in the cleared area. Merchantable timber (if present) from these sites will be salvaged and sold, provided market conditions allow. Unsellable cuttings may be disposed of through chipping and piling, and alternative beneficial uses for slash and non-marketable timber will also be explored. The clearing is necessary to facilitate the development of the process plant, TMF, site and port access roads, explosives storage facilities, and the new transmission line corridor.
Grubbing	Grubbing involves the removal of roots, stumps, embedded logs, and debris. Stumps may be removed using machinery or heavy equipment. Whenever possible, the materials removed during grubbing will be stockpiled with the overburden and later used as biomass to restore disturbed areas after construction. No grubbing is anticipated within the area along the transmission corridor.
Stripping	Stripping involves removing topsoil and other organic materials. Whenever possible, the stripped topsoil will be stockpiled in the same area as the overburden. This topsoil will be used after construction during the mine's operation for progressive reclamation and closure, aimed at restoring disturbed areas. No stripping is anticipated for roads or the transmission line corridor.
Grading	Grading involves the removal and relocation of overburden, which will be carried out using a bulldozer, excavator, or scraper. The graded material will be temporarily stored in one of the previously cleared areas. If the excavated materials are suitable for reuse, they will be placed in areas that require fill, such as during the construction of roads and the process plant site. If the materials are not suitable for reuse due to issues like permeability or high moisture content, they may be placed in an overburden stockpile for reclamation purposes.

Table 2.6.1 Summary of Key Early Works / Site Preparation Phase Activities

Activity	Description
Drilling and Blasting	Drilling and blasting will also be required for site preparation (e.g., process plant road and dam construction). Blast holes will be drilled using conventional drills. Explosives will range from pre-packaged design to ANFO and/or emulsion-based products for large blasts.
Underground Development	During the first year of underground development, waste rock will be excavated in preparation for the commencement of mining operation. The geological model and geochemical characterization studies of the different rock types will have determined which zones in the mine are PAG. The PAG material will be segregated so that its drainage will be contained and managed as required. Non-PAG material will be used for dam and road construction, and/or pads and other infrastructure-related development. A crusher will be used to reduce mine rock to aggregate of various sizes for use in construction.
Development of the Site Road Network	The proposed road network for the Project is described in Section 2.5.8 along with information on road design and construction methods. Generally, the roads will be for slow traffic (max 50 kilomtres per hour) on site and gravel roads will be constructed from important fill material as base, with a fine crusher top cover compacted to design specifications. Roads will be constructed to various dimensions and standard depending on the purpose of the road (refer to Section 2.5.8). At this time, it is proposed that the port access road will be developed from both ends of the road to expedite the development of the road to have it available for potential transport of aggregate and rock from third-party sources.
Development of the Electrical Power Transmission Corridor	The current power supply to site is 25 kV, additional power supply is required to support the Project (Section 2.5.9). A new connection from the existing 138 kV will be constructed, requiring a 1.1 km cleared corridor to the new proposed substation. In addition to using the current power supply for site, generators will be required to supplement power during this phase.
Preparation of Construction Surfaces	Where possible reclaimed graded material will be used, but it is limited. Import fill material will be needed for infrastructure pads and roads. A borrow pit is proposed within the footprint of the TMF. The geochemical characterization of this material is ongoing, but if determined to be non-PAG, inert and construction grade, it will be used to construct the TMF. If the material is found to be PAG, it will be backfilled or can be used to construct the interior sections of the TMF and polishing pond as they will be submerged and covered by tailings and water. Other rock that might be excavated, such as material around the Portal is also being characterized and pending the results maybe used for construction. In addition to mine rock on site, material from the nearby Argyle/Pine cove rock stockpiles and the Shoreline granite aggregate have been classified as inert construction grade that is non-PAG fill material. All large fills will be done with well drained granular materials, placed and compacted in layers/lifts where stability is critical mainly for the TMF embankment. Temporary construction support facilities, such as construction offices and laydown areas, will be constructed onsite to service machinery used during the site preparation and construction phase and storage area for construction material.
Power Supply	It is estimated that 10 MW of power will be required during the early works-site preparation phase. Electrical power needed during initial site preparation will be provided by the existing transmission 25 kV line and corridor. The site has an emergency power supply with 1.5 MW diesel generator and during this phase additional supplemented power may be required with two additional 0.5 MW diesel generator(s), specially to support the accommodation complex, laydown areas and other auxiliary work area/activities.

Table 2.6.1 Summary of Key Early Works / Site Preparation Phase Activities

Activity	Description
Maintenance Shop	Existing workshops and maintenance areas will be used primarily by underground operation. Site prep and construction contractors will used temporary laydown areas within the Project footprint.
Offices, Security and Communication	Existing offices, security and communication infrastructure will be used. The temporary site prep/construction area established for contractors will have modular offices, communication and temporary security established.
Development of the Waste Rock and ore Stockpiles	The basic infrastructure of the waste rock stockpiles, and ore stockpiles will be developed during the site preparation phase so that the area is ready to begin accepting material at the onset of operation. Most of the non-PAG waste rock generated through pre-stripping or underground development will be used to construct roads, laydown areas and pads for infrastructure. PAG rock identified through the geological modelling and geochemical characterization studies will be temporarily stockpiled in an area so that runoff from this material will be contained and managed, as required. As part of the waste rock management program, confirmatory testing will be done as required.
Water Management System	Water management onsite will be expanded during the site preparation phase so that runoff from disturbed areas can be appropriately managed. The existing water treatment plant will be used during this phase until the new WWMP is constructed.
Development of the TMF	The basic infrastructure of the TMF will be developed during the site preparation phase so that the area is ready for dam construction at the next phase of development.
Waste Management	Most solid non-hazardous waste generated during site preparation will be recyclable. Scrap metal, wood, paper and cardboard, where not reusable, will be segregated and trucked offsite to appropriate facilities. These wastes generated during site preparation will be collected in temporary collection areas (areas that have been disturbed by clearing) and subsequently trucked off site to a licensed disposal site. Hazardous waste will be collected, stored on site temporarily as appropriate and trucked offsite to appropriate licensed facilities. Grey water and sewage from temporary bathroom facilities will be collected in above ground storage containers. These biological wastes will be transported by a provincially licensed company to an approved facility.

Figure No.
2.6.1

Title
Approximate Footprint of the Areas to be Developed (Cleared) to Accommodate the Project

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_1_008

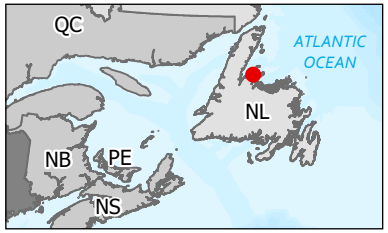
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-19

N

0 400 800 Metres
(At original document size of 8.5x11)
1:28,000

- Final Discharge Point (FDP)
- Project Area
- Existing Development
- New Development
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

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2.6.1.1 Schedule

Site preparation, in combination with construction (described farther below), is estimated to be completed over a 18- to 24-month period. The work schedule will likely vary over this period according to the nature of the work that is being completed at any one time, but work will largely progress 7 days per week, with two shifts per day.

2.6.1.2 Workforce

During this period, the workforce will consist of approximately 120 employees and an average construction workforce of about 150 to 175 workers. Based on past operations, it is estimated that 60% of FireFly's employees and 20% of the construction workforce will be from local communities and will not require accommodation. The composition of workers at this phase are provided in Table 2.6.2. Local communities are those within a 100 km radius or driving distance from the mine (includes Springdale). Regional and FIFO workers are those located outside of this radius. Employing most of the workforce from NL is a priority for FireFly. As detailed in Section 6.6.4.1.1, FireFly has reviewed current operations and future projects labour requirements, and the overall demand for skilled labour in the region will be high. The competition from other mining operations and advancing projects, exploration activities, and competing industries will make it challenging to achieve over 60% NL employment during construction.

Table 2.6.2 Early Works – Site Preparation Workforce

Workforce	Anticipated Workers	Local % (NL 100km)	Regional % (NL)	FIFO %	Maximum No. Accommodations Required
Operation / Employees	120	60	20	20	48 (Days only)
Construction	100 to 175	30	30	40	123 (24 hours)*
Total Rooms					171

Note:
*assumes peak construction workforce working 24 hours, sharing rooms with two beds between night and day shift.

2.6.1.3 Project-Related Traffic

Many local employees will drive to the mine site, and it is estimated that 60 passenger vehicles will be traveling to and from the site within a 24-hour (hr) period at shift changes. Traffic volumes would increase when rotations change or during day and night shift changes. FireFly will have a bus to take workers from the Accommodation Complex to the mine site. Carpooling and shuttle stations will be established at key locations, to bus workers and to encourage carpooling. A scheduled shuttle bus will be available from Deer Lake airport to transport FIFO / regional workers to and from the Project site. Transport requirements will be reviewed throughout the site preparation and construction phase to identify opportunities to reduce traffic volumes and the overall carbon footprint of the Project during this phase.

On the Project site, construction equipment will be operating in some areas 24 hrs per day, 7 days per week, to clear timber, strip and grade the site to prepare it for construction. Various types of equipment will be located throughout the Project site at different times. The port access road will be developed from both ends of the road to expedite the development of the road to have it available for potential transport of aggregate and rock from third-party sources.

2.6.2 Construction Phase

Similar to the early works and site preparation phase, the site currently has active exploration development underground, site service and administration support on surface. The Project design reduces the requirement for new ground disturbance and site clearing by using existing buildings, cleared areas and pads, were practicable. Key and substantial additions to the proposed Project are the construction of the process plant and TMF onsite, with a port access road north, to a third party owned and operated facility.

The construction phase will be completed in part concurrently with site preparation. During construction, site infrastructure, such as the electrical transmission line, the waste rock stockpiles and the water management system will continue to be developed. The construction phase as described herein however largely focuses on the process plant, development of the TMF dams and constructing the explosives magazine storage, and domestic sewage treatment water treatment plants (wastewater, potable water). The infrastructure necessary to operate the mine will be completed and commissioned by the end of this phase. Vehicle traffic estimates, staffing projections, and number of rooms required for workforce accommodation will slightly increase during this phase, as described further below.

The following list summarizes key aspects of the construction phase:

- Finer details of the construction methods are still being finalized; however, it is anticipated that the equipment identified in Section 2.5.2 will be used during the construction phase.
- A new WWMP is proposed to replace the current plant in operation. Studies are underway to determine if the new WWMP will be a modular unit or multiple components within a building.
- It is anticipated that the 10 MW power installed during the early works period through the existing 25 kV powerline will be adequate for the construction phase. Generators will only be used for emergency purposes only.
- Concrete suppliers are currently located within 100 km of the Project site; a concrete batch plant may or may not be required."
- The temporary laydown area will be the ROM pad area adjacent to the process plant location. This limits the extent of impacted areas which will require rehabilitation and restoration.
- Although there is an existing waste rock aggregate manufacturing facility within 6 km of the Project site at Shoreline and Pine Cove site, there is testing underway within the footprint of the TMF to confirm the viability of a temporary quarry for the material for dam and site construction. Additional geochemical studies are underway for various rock types within the mine, and pending the results, the material may meet construction grade requirements, not classified as waste rock and will be processed onsite and used for road bases and other construction material.

2.6.2.1 Schedule

Site preparation and construction are expected to be completed over an 18- to 24-month period. Work will take place seven days a week, with two shifts each day. However, the schedule may vary based on the nature of the ongoing tasks.

2.6.2.2 Workforce

During this phase, the construction workforce is expected to peak between 400 to 700 workers. FireFly employee workforce will increase to roughly 180 employees. Although past operators were able to achieve over 80% hire from local workforces, FireFly anticipates being able to hire 60% from the local workforce and 20% for the construction workforce, as further discussed in Section 2.6.1.2. Table 2.6.3 provides the anticipated composition of the workforce at this phase.

Table 2.6.3 Construction Phase Workforce

Workforce	Anticipated Workers	Local % (NL 100km)	Regional % (NL)	FIFO %	Maximum No. Accommodations Required
Operation / Employees	180	60	20	20	72 (days only)
Construction	400 to 700	20	40	40	560 (280) day / night*
		352			

Note:
*assumes peak construction workforce working 24 hrs, sharing rooms with two beds between night and day shift.

Additional accommodation, such as hotels, apartments or temporary construction trailers, will be used to house workers. Vehicle traffic volumes will be managed through encouraging carpooling and offering shuttles or bus services at keep commuter pick up locations.

2.6.2.3 Project-Related Traffic

Approximately 100 passenger vehicles are anticipated in a 24-hr period, with peak traffic during day and night shift change and rotation changes. As described in Section 2.6.1.3, FireFly will have a bus to take workers from the Accommodation Complex to the mine site. Carpooling and shuttle stations will be established at key locations, to bus workers and to encourage carpooling. A scheduled shuttle bus will be available from Deer Lake airport to transport fly-in/fly-out FIFO/Regional workers to and from the Project site. Transport requirements will be reviewed throughout the site preparation and construction phase to identify opportunities to reduce traffic volumes and the overall carbon footprint of the Project during this phase.

At this phase of the Project, the port access road should be developed and the focus for construction traffic should be on the TMF, Process Plant and haulage of waste rock from underground to surface. Construction activities would occur 24 hours per day, 7 days a week. This phase would see peak traffic volumes and movement at the Project site, with the increase of workforce and as materials and supplies arrive and are transported to various locations on site to support the construction of infrastructure onsite.

During construction, larger fabricated equipment and components will be shipped and transported from either Port aux Basques or Corner Brook. It is anticipated that the majority of this equipment will be in smaller transportable sizes for normal road transportation, however a few components will be “over size” and will require escort while being transported on the highway. No major highway/road disruptions are anticipated.

Security is already in place at the current site, however with shipping of major equipment and supplies for construction and the increased influx of construction workforce, increased security and access control measures will be paramount during this phase of the Project. Additional security rooms and check points will be established at the points below to control and manage access to the Project site:

- Existing mine and administration, which will be the main Project office base
- Process plant construction pad, which will be used for managing access for all personnel, contractors carrying out the construction work
- Camp access control, which will manage access in and out of the camp accommodation facilities
- All control points will be managed by 24-hr coverage consisting of both security personnel, video camera and biometric access systems

2.7 Operation

The operation phase of mine life includes further development of the existing underground mine, extraction of the ore body and the production of copper and gold concentrates. Process plant throughput for the operation will average 4,800 t per day. The operating LoM is estimated to be approximately 15 years.

The mining operation will consist of a mechanised underground mine which is planned to deliver 4,800 tpd to a centralised ROM pad. The main activities during operation will include:

- Underground mining
- Maintenance of mine equipment
- Crushing and processing of ore
- Project-related traffic including transport of concentrate to Pine Cove
- Maintaining site security and managing site access

Further information on these activities is included in the following sections, along with information on the Project schedule for the operation phase and workforce requirements. Table 2.7.1 summarizes the proposed Project operational facilities and activities in relation to the existing and approved Ming Mine.

Table 2.7.1 Key Mine, Maintenance and Administration Facilities and Activities Required for Operation of the Project in Comparison to the Existing Ming Mine

New Mine Facilities or Activities Associated with Operation Phase	Expansion and/or redesign of current Mine Facilities or Activities Associated with Operation Phase
Ore Process Plant / Mill Plant	Underground mine
Concentrate handling, storage, and transport	Waste Rock Management
Tailings Management (associated pipelines)	Water Supply
Paste Backfill Plant (the plant was previously approved but never constructed)	Water Management
Assay Lab	Water Discharge and Treatment
Concentrate Storage Building or pad to store sealed concentrate containers	Pipelines
Port Access Road	Site Road Network
	Explosives storage and transport
	Fuel Farm
	Mine Equipment & Maintenance Shop
	Core Shacks / Logging and Core Storage
	Propane Farm
	Upgrades to the Hwy 418 Ming's Bight Road and Hwy 414 LaScie Road
	Accommodation Complex

2.7.1 Schedule and Workforce

On completion of the construction phase, the Project will operate on a four-crew rotation system with two shifts (day and night) working seven days on and seven days off for the workforce, which is anticipated to be predominantly local Newfoundland and Baie Verte peninsula residents. This shift system will provide the operation with 24 hours coverage, 365 days a year.

During this period, the workforce will comprise approximately 300 workers. This includes approximately 60 to 80 full time sub-contractor employees for long term service contracts, mainly, security, specialised equipment maintenance, catering, haulage/transportation, and other specialise underground mining activities.

Workforce composition is provided in Table 2.7.2. The accommodations complex (see Section 2.5.12) will continue to house the portion of the workforce that is not derived from the local catchment (estimated to be equivalent to about a 100-km one way commute). For the operational phase, employees located outside of the catchment will be encouraged through hiring incentives to relocate locally. Vacancy rates, classroom sizes, health care and municipal services have capacity to accommodate a gradual increase to the population. FireFly will work with municipalities to identify opportunities to reduce negative impacts of the rapid population growth and to increase positive socio-economic benefits throughout the Baie Verte Peninsula.

Table 2.7.2 Operation Workforce

Workforce	Anticipated Workers	Local % (NL 100 km)	Regional % (NL)	FIFO %	Maximum No. Accommodations Required
Operation / Employees	350 to 400	60	20	20	160

Note:
All employees will have private rooms. The accommodation complex was constructed as modular unit, allowing for two bedrooms to be modified to single occupancy. Extra rooms are available for shutdowns and maintenance, and some modular units of the camp will not be required and will be removed for operational phase.

2.7.2 Underground Mining

A description of underground mine design and methods is provided in Section 2.5.1. The underground levels will be spaced at 25 m vertical intervals and a minimum 55-degree dip. Lateral development during the first two years of the Project will focus on establishing the initial production areas, key underground infrastructure, and establishing the main permanent ventilation system. The ventilation system will consist of a newly developed 650 m x 6.5 m diameter ventilation shaft which will be added to the existing Boundary shaft to serve as main ventilation return airways. A combined 480 m³/s of air is planned to be pumped and distributed throughout the mining operation. Air intake will be through the existing decline and the proposed new decline.

Drilling of development drifts will be done at 5.0 m wide x 5.0 m high profiles using electro-hydraulic jumbo drill rigs advancing approximately 4.2 m per each blast. Production drilling of stopes will be with ITH drill rigs to drill 3.5- to 4.0-inch diameter blast holes. These holes will be loaded with emulsion explosives and blasted as per mine production schedule. Stope drilling layout will be a combination of Transverse and Longitudinal layouts which will depend on the orebody geometry for the area. Ore will be hauled to surface for the initial five years using 65 t trucks through the new decline. Once the proposed vertical shaft is completed, trucking of ore will be to a central ore pass and crushing material handling system. The ore will then be hoisted to surface using the shaft winder.

Final designs for the headframe and winder are currently being finalized. However, it is anticipated that the vertical shaft will a 6.5 m diameter and consist of a double rock compartment and an additional man and equipment compartment. The shaft will be equipped with two x 20 to 30 t payload rock skips for hoisting the ore to surface. A material handling facility consisting of ore fed silos, crushers and loading flasks will be constructed at 1,250 mRL. Ore hoisting will be done from this level and tipped directly into a surface rock silo, conveyed overland to the process plant.

Waste generated from development and other capital excavations will be mixed with tailings paste fill and backfilled into mined out stopes. Initially, during the portal and decline development, approximately 320,000 bank cubic metres (bcm) of waste will be temporally hauled and stored at the surface waste rock stockpile. The material will be hauled back underground as backfill once production commences from Year 3 onwards. It is anticipated that no waste will be hauled or hoisted to surface after Year 3; however, if circumstance requires haulage to surface, this will be to the temporary waste rock stockpile for temporary storage before being hauled back underground.

2.7.3 Mine Equipment and Maintenance

A list of anticipate mine equipment is provided in Section 2.5.2. The existing mine workshop and maintenance facility will be extended with an extra two bays to accommodate the larger number of equipment. Underground mobile equipment will be driven up the existing ramp for repair and maintenance. A service bay will be constructed underground initially at 707 Level for minor services for slow moving equipment like drill rigs. All major repairs will be done in the surface workshop.

2.7.4 Crushing and Processing

The design of the crushing circuit is described in Section 2.5.4 The crushing rate is planned to be between 300 to 310 t per hour at 65% crushing availability with a final product size of P80 of 12mm.

The crushed material is reclaimed and fed to a 16 ft x 23 ft ball mill operating in closed circuit with hydro cyclones for classification. The design of the process plant is further described in Section 2.5.5. The mill throughput is planned to be between 210 to -220 tpd at 90% process plant availability. Cyclone underflow recirculates to the ball mill whereas the overflow feeds the rougher flotation conditioning tank. The flotation circuit operates in a typical rougher, primary cleaner, secondary cleaner, and tertiary cleaner configuration, where the rougher concentrate feeds the primary cleaner, and the rougher tails are combined with primary cleaner tails to feed the final tailings thickener. Final tailings are pumped to the paste fill plant for backfill paste requirements. Excess tailings will then be deposited into the TMF through a slurry line from the paste plant to the TMF. The tertiary cleaners produce the final copper concentrate, which is thickened and filtered ahead of concentrate storage in a stockpile.

The entire processing plant will be housed in a closed insulated building, laid out to have the four main areas mainly, thickeners, flotation banks, reagent storage and concentrate filtration and storage. The concentrate will be stored in a concentrate storage building, to be located by the process plant. The concentrate will be loaded daily into approximately 12 truck loads. At this time, FireFly is considering container storage for concentrate to limit product loss. Final concentrate will then be transported to a third-party port facility at Pine Cove (Maritime Resources/Shoreline Port) for shipping to final market, as further described in Section 2.5.5. A total estimate of approximately 95,000 tonnes of copper-gold concentrate will be produced per annum, with only one 10,000 t vessel shipped every 30 to 40 days cycle. Based on conversation with the owners and operators at the Pine Cove Port, the existing facilities have sufficient capacity to support the management of concentrate from the Project.

2.7.5 Project-Related Traffic

Carpooling will continue to be encouraged at this stage and a smaller shuttle van will be provided for FIFO from Deer Lake. It is estimated that 60 passenger vehicles will be coming to site for dayshift throughout the week and roughly 40 passenger vehicles for night shift. The majority of the traffic will be workers traveling to and from the site at the start and end of their shifts, with some general freight and equipment transport vehicles accessing the site throughout the day. The truck traffic will be primarily restricted to Highway 414 and Highway 418. The shift changes will likely occur during periods of the day that are outside of the regular work or school day, early in the morning or later in the evening, so any increase in traffic in local communities may not be apparent to the residents.

As described in Section 2.5.5, approximately 12 concentrate trucks per day will transport concentrate from the process plant, cross the intersection at Highway 418 and travel to the port facility. The proposed concentrate truck traffic volume is low and can be regulated to avoid peak traffic times on Highway 418.

2.7.6 Site Security and Access

During operation, security and access control will be reduced and focused to the following locations:

- Existing mine and administration which will be the main Project office base
- Process plant construction pad, which will be used for managing access for all personnel, visitors and contractors (maintenance or shutdowns)
- Camp access control, which will manage access in and out of the camp accommodation facilities

All control points will be managed by 24-hr coverage consisting of both security personnel, video camera and biometric access systems. The policies and procedures in place for the construction phase will be reviewed and programs established for the operation phase will ensure the health, safety and security of the workforce.

2.8 Decommissioning, Rehabilitation, and Closure

In 2018, a RCP was filed as required by the NL *Mining Act* and Section 7 of the pursuant *Mining Regulations* and accepted by the NL government. Financial assurance of $4.8 M has been bonded for the Ming Mine and Nugget Pond Mill. In 2023, FireFly committed to updating the RCP and financial assurance. At the time of writing this document, the RCP is under review by NLDIET. FireFly recognizes that further updates to the RCP will be necessary and the additional components for the Project will need to be incorporated into the design so that the Project site is decommissioned and closed in a way that reduces potential impacts on the social and natural environment. Additionally, the goal is to restore the site to an end use that is supported by communities, the public, and government.

There are three stages of rehabilitation activity that occur over the LOM:

- Progressive rehabilitation is considered to include rehabilitation activities completed, where possible or practical, throughout the mine operation stage prior to final closure. This would include activities that would contribute to the rehabilitation effort that would otherwise be carried out upon cessation of mining operation (closure rehabilitation).
- Closure rehabilitation would include the measures remaining upon end of operation, required to fully restore or reclaim the property as close as reasonably possible to its former condition or to an approved alternate condition. This would include activities required to achieve the requirements and goals detailed in the RCP.
- Post-closure monitoring and treatment includes activities carried out over a period of ‘post-closure monitoring’ upon completion of the closure rehabilitation activities. Post-closure monitoring is required to ensure that the rehabilitation activities are successful. Once it can be demonstrated that practical rehabilitation of the site has been successful, the site should be closed-out or released by NLDIET and the land relinquished to the owner or the Crown.

2.8.1 Progressive Rehabilitation

FireFly commits to addressing future progressive rehabilitation throughout the LOM with the goals sub-divided into short term (Years 1 to 5), medium term (Years 6 to 10), and long term (LOM) goals (within five years of closure). FireFly is committed to taking all reasonable steps to progressively rehabilitate the site wherever possible. This could include:

- Rehabilitation of areas as they are exhausted
- Rehabilitation of the temporary waste rock stockpile area by relocating material underground as backfill
- Rehabilitation, if required, of exploration drilling sites
- Vegetation studies / re-vegetation trials

2.8.2 Closure Rehabilitation

The closure timetable includes provisions for both short-term and long-term activities. The most intensive decommissioning of site infrastructure will take place immediately after operation ceases. During this time, as much of the site infrastructure will be removed as possible, while still retaining sufficient resources to facilitate ongoing closure and post-closure activities. Approximately 30 employees and an estimated 20 contractors will remain during the closure phase, which will be further reduced to 3 employees at post-closure. All employees will be from local communities and accommodations will be available for contractors in local communities.

The specific activities that will occur during this phase of the Project include:

- Decommissioning / removal of maintenance, administration and on-site support facilities
- Decommissioning / removal of off-site support infrastructure
- Decommissioning / removal of the process plant and associated ore processing equipment and facilities (pipelines, crushers, conveyors)
- Decommissioning / removal of the explosives factory and magazine facilities
- Removal of power lines and electrical equipment
- Decommissioning of the site road network
- Decommissioning of the potable water and sewage treatment systems
- Placement of any PAG material still on surface underground for permanent storage
- Regrading and stabilization of any stockpiles that are left on surface for the long term
- Reclamation of the TMF, non-PAG rock stockpiles, process plant site and other developed areas

Comments on specific elements of the closure activities listed above are provided below.

Prior to the closure of the port access road, FireFly will consult with the companies that are operating the port, aggregate and mine at Pine Cove and determine if the port access road could be an option for transportation route from their business to Highway 418. The residents of the Town of Ming's Bight have indicated they wish to preserve the integrity of the highway to their community and protect residents by keeping heavy traffic and larger vehicles off the highway. FireFly will work with the local companies, communities and NLDIET to determine an acceptable and beneficial outcome for the port access road.

The majority of the historic PAG waste rockpile at Boundary Shaft would have been capped and covered during the construction phase with non-PAG construction aggregate. That material will remain in place not to disturb the PAG material. New stream channels will be created to connect to the Three Boulder Pond stream that flows into South Brook Pond. Stockpiles of overburden material will be used to cover the surface for seeding. To reduce further generation of PAG from the historic waste rock pile, the preliminary closure strategy is to flood the area creating a large pond at closure. Rockfill can be placed at the outflow to increase the elevation, resulting in backup of water into the Boundary Shaft area. Maintaining a water cover over the historic waste rock would mitigate the risk of further ML/ARD from the site.

At this time, FireFly has assumed that the tailings are PAG and intends to store the material below water within the TMF for perpetuality. When the water quality is demonstrated to meet provincial and federal objectives, the spillway will be lowered so that approximately 1 m of water cover will remain. The 1 m accounts for fluctuations in climate and wave action that could be encountered. The WWMP will stay onsite until water from the TMF is permitted to flow naturally to the environment.

Closure of PAG waste rock stockpiles includes relocating the PAG rock underground. The construction of the TMF will require aggregate from local sources and the use of non-PAG waste rock. At the end of the LoM, no non-PAG waste rock should remain; however, in the unlikely event that non-PAG waste rock stockpiles remain, the primary objectives for their closure include:

- slope stability
- maintaining run-off drainage control on and around the rockpiles
- pursuing reclamation strategies that are consistent with or promote post closure land use

Reclamation of PAG and non-PAG waste rock stockpiles will be proactive. PAG waste rock will be brought underground and non-PAG material not used for TMF or construction, will be covered with overburden and/or topsoil and subsequently revegetated using native seed. Once it has been demonstrated that the water draining from site meets applicable regulatory requirements, the water collection system will be dismantled and natural flows will be returned, draining into South Brook.

2.8.3 Post-Closure Monitoring

In addition to the physical works that comprise decommissioning and closure, a phase-specific post-closure monitoring plan will also be developed. The programs will focus on evaluating the physical integrity of permanent man-made structures (e.g., dams safety inspections), the relative success of the implementation of closure and reclamation activities (e.g., revegetation success) and the potential effects of the closed mine site on the environment (e.g., surface water and groundwater quality monitoring). The nature and extent of these programs are currently available in the RCP for the Ming Mine and Nugget Pond site, but will be updated in the RCP for the Project.

2.9 Employment and Expenditures

2.9.1 Employment

While the Baie Verte Peninsula has faced economic challenges, particularly with the decline of the mining industry, the economy of the region was historically heavily reliant on mining. The discovery of asbestos in the 1950s led to the establishment of several mines, which became major employers in the region. Rambler Metals and Mining and Signal Gold Ltd. (formerly Anaconda) were major employers in the region. In 2021, Rambler Metals and Mining PLC had 251 employees and another 40 to 50 contractors at site, bringing the employment at the Ming Mine to over 300 employees.

In 2023 when Rambler Metals and Mining declared insolvency, the workforce was reduced to 35 employees to support care and maintenance at the mine, mill and port. Signal Gold Ltd also saw a reduction in the workforce when they placed their operation on care and maintenance. The operation was later sold to Maritime Resources Ltd and is still on care and maintenance. Although communities of the Baie Verte Peninsula are diversifying the economy and exploring tourism and other sustainable business, mining continues to be a key economic driver. Nationally, a 2019 report from the Mining Association of Canada states that the industry's direct and indirect employment exceeds 620,000 jobs, accounting for one in every 30 jobs in Canada.

Upon acquiring the Rambler assets in 2023, FireFly was able to commence a large-scale exploration drilling program, technical studies and baseline studies. When available, FireFly has hired local employees, contractors and consultants and, at the end of 2024, had 85 employees and approximately 30 contractors onsite. Information on workforce requirements for early works, construction and operation phases is contained in Sections 2.6.1.2, 2.6.2.2, and 2.7.1, respectively. Employing most of the workforce from NL is a priority for FireFly. As detailed in Section 6.6.4.1.1, FireFly has reviewed current operations and future projects labour requirements, and the overall demand for skilled labour in the region will be high. The competition from other mining operations and advancing projects, exploration activities, and competing industries will make it challenging to achieve over 60% NL employment during construction. The Project will have 350 to 400 workers during the operation phase.

A summary of FireFly's approach to employment is included below:

- FireFly is committed to hiring locals. This is evident in the number of local employees currently in our workforce (i.e., 85% of our workforce is local to NL). We will continue to hire locals whenever possible. We have developed a common core program to provide people with the tools, training, and information required to ensure the employee is successful in performing their job.
- FireFly has a diversity plan (Appendix 2.B) in place, which has encompassed a proactive approach to best industry practices geared towards a workplace culture supportive of a diverse workplace. FFM is committed to a workplace that provides equal opportunities with competitive benefits and compensation and continuous improvement in our diversity.
- FireFly is committed to a workplace design with policies in place to strengthen professional and career development opportunities. These policies promote moral fairness, enhance work/life balance, and provide a working environment that is free from harassment and discrimination. With an appreciation for gender differences and gender diversity, FireFly recognizes that having strong female leaders brings new perspectives to business challenges, which in turn create new approaches and solutions to these challenges. The Company is prepared to explore every opportunity to promote gender and cultural diversity in the workplace with the goal of increasing awareness and integration of this diversity into normally non-traditional roles.
- Currently 17% of FireFly workforce is female. As the company grows it is committed to exceeding that number wherever possible.
- FireFly provides opportunities for apprenticeships and have provided positions for such in our work plans.
- FireFly has a plan in place for on-the-job training. It includes the process of the Common Core Program to provide employees with the tools required to be successful in a position.
- FireFly sees great value and opportunity in providing students with co-op positions and internships each year.
- In the spring of 2024, FireFly provided 6 students with co-op/work terms to further their education. They all completed their full terms. Some of these students are still employed with us and have come to work part time while they continue their studies.
- FireFly is in regular communication with the apprenticeship board and with Apprenticeship Program Officers to ensure we are aware of who is available and to receive updates on who has completed their apprenticeships and is available for work.

As indicated in Section 2.3.1, FireFly already has extensive programs with policies and procedures in place to ensure the health, safety and security of workers today and at the proposed Project site. These documents are continually reviewed and modified to reflect the conditions onsite and will be reviewed and updated as needed to meet the requirements of the Project. This includes the following policies and plans:

- Contractor Policy and checklist of requirements before arriving onsite
- Respectful Workplace Policy

- Clean Shaven Policy
- Drug and Alcohol Policy
- Human Rights and Freedoms Policy
- Search Policy
- Camp Rules
- Early and Safe Return to Work Policy
- Issue Resolution Policy
- Harassment Policy
- Occupational Health and Safety and Environment Policy and Orientation and Training Policy
- Health, Safety and Environment Policy
- Environmental Protection Policy
- Diversity Policy
- Risk Management Policy
- Sustainability Policy

The Project will require a range of skilled personnel, typical for a mining project of this scale. Table 2.9.1 provides a description of Project personnel requirements and associated National Occupation Classifications (NOC) codes. As indicated above, additional details on employment during each phase of the Project were provided in Sections 2.6.1.2, 2.6.2.2, and 2.7.1.

Table 2.9.1 Skills and Labour Requirements by Project Phase and National Occupation Classifications Code

Position	Construction Requirements	Operation Requirements	NOC Code
Manager/Superintendent	2	2	80010
Technical Services Manager	1	1	20010
Project Managers	2	0	72014
Construction Managers	4	0	70010
Geology Manager	1	1	20011
HSE / CSR / HR Managers	4	4	10011
Commercial Manager	1	1	10022
Mine Engineers	3	5	21330
Mine Geologists	5	5	21102
Mechanical and Electrical Engineers	8	4	21301
Surveyors	9	5	21203

Table 2.9.1 Skills and Labour Requirements by Project Phase and National Occupation Classifications Code

Position	Construction Requirements	Operation Requirements	NOC Code
Mine Geotechnical Engineers	3	3	21331
Mine Technicians / Survey Assistants	2	4	75119
Geological and Mineral Technologists and Technicians	6	6	22101
Environmental Officer	1	2	22330
Data Analysts / Dispatch	2	4	20012
Underground production and development miners	102	128	83100
Underground mine service and support workers	88	110	84100
Maintenance Superintendent/Foreman	4	4	72020
Facility Operation and maintenance managers	9	9	70012
Heavy Duty Mechanic	30	52	72401
Welder	8	8	72106
Labour / Service Support	36	16	75110
Instrument Person	4	4	22312
Mill and Processing Manager / Superintendent	1	1	90010
Instrumentation Engineers	2	2	21310
Metallurgist / Process Engineers	2	2	21322
Process Supervisor	4	4	92011
Process / Mil Operators	32	32	93100
Maintenance Technicians / Mill Wrights	17	17	72400
Electricians	24	16	72201
Carpenters / Construction Tradesperson	36	2	75110
Laboratory Technicians	0	4	22101
Concentrate / Ship Operators	0	4	12013
General Manager	1	1	82020
Finance Manager	1	1	10010
Accountants	2	2	11100
HSE Coordinators	2	2	22232
Admin Clerks / Camp Coordinator	5	5	14100
IT Specialists	4	4	22221
Nurse / Health Practitioner	4	1	31301
HR and CSR Officers	1	1	12101
Drivers / Logistics	12	2	75201

2.9.2 Expenditures

As described in Section 2.8.1, the Baie Verte Peninsula has experienced economic challenges. Since FireFly acquired the larger Green Bay Copper-Gold Project and is now advancing the Project at Ming Mine, there has been substantial benefits to the local and regional economy. FireFly has made a commitment to ensure mutual benefits are experienced for the communities most effected by our operation. In the past year, FireFly has been able to keep over 50% of its good and services in NL. Table 2.9.2 shows the breakdown currently for goods and services obtained for the exploration activities. It is anticipated that both the local Baie Verte Peninsula and the greater Newfoundland communities and business will participate and provide services and product requirements for the Project. Areas identified will range from earthwork contracting companies, transportation and freight, goods and services, and hospitality services.

Table 2.9.2 Breakdown of Goods and Services

Goods (Materials and Supplies)	Business/Services
Local goods: 31%, (within 150 km) Regional goods: 22%, (NL) National goods: 45%, (Canada) International goods: 2% (Global)	Local business: 22%, (within 150 km) Regional business: 35%, (NL) National business: 34% (Canada) International business: 9% (Global)

The estimated operating costs associated with the Project is provided in Table 2.9.3. The capital expenditure for the Project is estimated to be between CAD $320 million and CAD $350 million. This provisional estimate will be refined and optimized through ongoing detailed studies. The Project costs will be privately funded by FireFly Metals Limited, the parent company of FireFly Metals Canada.

Table 2.9.3 Operating Costs

Mining Component	Ave Cost/t Milled ($/t. proc.)
Mining Development	8.77
Mining Production	46.77
Process Plant Cost	17.94
General Administration Cost	11.16
Conc Treatment & Freight Costs	10.42
Refining Costs	2.30
Total Opex Cost	**97.35**

Once the Project is in operation, it is anticipated to generate in excess of 350 million Canadian dollars per annum over the +15-year LoM.

2.10 Emissions, Discharges, and Waste

Emissions, discharges and wastes will result from Project activities. During initial design, FireFly has employed design principles and plans for best available control technologies (BACT), as applicable, to manage and mitigate emissions, effluents, and discharges. During Project execution, FireFly will adhere to mitigation measures based on industry standard best management practices (BMPs) to reduce emissions, discharges and wastes, as described in the applicable VC sections (Sections 6.1 to 6.8) as well as in the EPP (Appendix 2.C). The following sections describe the potential air emissions, sound emissions, lights emissions, effluent discharges, ML/ARD sources, and solid and hazardous wastes.

2.10.1 Air Emissions

2.10.1.1 Air Contaminants

Air contaminants may be released during construction activities in the form of combustion gases and particulate matter, from the operation of diesel- and gas-powered equipment and fugitive dust, from earth and material moving and handling activities, blasting, and equipment movements. In addition to those during construction, potential sources of emissions during Project operation will include dust generated from blasting and mining, and handling, stockpiling, and transporting ore, waste rock and overburden. Air contaminants released during decommissioning and abandonment are expected to be similar to, or less than, the emissions associated with construction and operation. An emissions inventory to support air dispersion modelling will be created based on available Project design information and published emission factors (i.e., ECCC and United States Environmental Protection Agency AP-42) to estimate air contaminant releases resulting from activities during construction and operation.

Project-related air contaminants and background concentrations are unlikely to exceed provincial or federal air quality objectives, but dispersion modelling will be conducted in 2025 prior to construction, and additional mitigation will be developed if required. Further discussion of potential Project effects on the atmospheric environment are discussed in Section 6.1 (Atmospheric Environment).

2.10.1.2 Greenhouse Gas Emissions

The main sources of direct GHG emissions during construction and operation of the Project include the off-road mobile and stationary equipment exhaust gases from the combustion of diesel. Lesser sources include propane and blasting, which will use an ammonium nitrate. Indirect GHG emissions are also expected to occur during construction and operation of the Project from the use of grid electricity generated offsite (noting that approximately 92% of grid electricity in the province is generated from renewable resources), as well as transport of supplies and products to and from site. Releases of GHG emissions will also occur during decommissioning, rehabilitation and closure activities. These releases are expected to be lower than those released during Project construction and operation due to the magnitude of required activities, and because lower GHG intensity options are expected to be more readily available at the time of these Project phases.

The Project is expected to be regulated under the NL *Management of Greenhouse Gas Regulations*, releasing at least 15,000 t carbon dioxide equivalent (CO_2e) per year from direct emissions sources during operation. It is also anticipated that the Project will be subject to BACT requirements for activities within its boundaries. FireFly will review options and prepare a BACT assessment for approval. A GHG inventory for the Project is provided in Section 6.1.4.2. During Project construction (18 months), direct GHG emissions are estimated to range from 53,062 t CO_2e (increased electricity scenario) to 68,007 t CO_2e (fossil fuel scenario). During operation of the Project, direct GHG emissions are estimated to range from 21,747 t CO_2e (increased electricity scenario) to 46,421 t CO_2e (fossil fuel scenario). The options for electrification are being reviewed to mitigate GHG emissions towards the low range presented. This will be finalized during the BACT assessment.

2.10.2 Sound Emissions

Project construction is expected to generate sound emissions from the operation of heavy mobile equipment and vehicles for land clearing, earth moving, and material handling, as well as other vehicle activities related to the port access road. Sound emissions will also result from blasting during construction. Blast energy that liberates into the atmosphere can generate air overpressure and noise. Blasting is expected to be limited to daytime hours and will follow BMPs outlined in guidance documents, such as the Blasters Handbook (International Society of Explosives Engineers (ISEE) 2016) and the Environmental Code of Practice for Metal Mines (ECCC 2009).

Activities during the Project operation phase will be similar but sound emissions are expected to be less than those during the construction phase because most activities will occur underground. Throughout the mining process, material handling and some heavy truck traffic will increase in proportion to an increase in production levels, the activities will be focused on underground mine development with haulage of ore and waste rock to the surface. During operation, there will also be blasting and rock breaking underground, with, crushing, and processing associated with the process plant at surface. Noise generated during the decommissioning of mine features and infrastructure, progressive rehabilitation, and closure rehabilitation is predicted to be less than that during construction and operation. FireFly will conduct detailed noise modelling in 2025, prior to construction. Further discussion of potential Project effects on the atmospheric environment are discussed in Section 6.1 (Atmospheric Environment).

2.10.3 Light Emissions

The major source of light emissions during construction activities will be through the use of mobile artificial lighting. Mobile artificial lighting may be used for short periods, mitigated by the use of directional lighting. The number of artificial lighting units and locations is unknown, but they are likely to be used throughout the Project Area for construction and infrastructure activities. Lighting used during construction will be designed using best practices to reduce light trespass, glare, and contributions to sky glow to acceptable levels.

During operation, nighttime safety lighting may be required on site roads, overburden and waste rock management, ore milling and processing, tailings and water management, and utilities and site infrastructure (i.e., accommodations camp and site buildings). The final lighting design is not complete; however, the final lighting design will be based on industry best practices to reduce environmental effects from lighting, such as those recommended by the United States Bureau of Land Management (2023).

With the implementation of mitigation and management measures, the levels of light trespass and glare from lighting during Project construction and operation are not expected to exceed Commission Internationale de L'Éclairage guidelines at nearby receptor locations. It is also expected that sky glow levels will remain similar to that of a relatively uninhabited rural area during Project construction and operation. Further discussion of potential Project effects on the atmospheric environment are discussed in Section 6.1 (Atmospheric Environment).

2.10.4 Effluent Discharges

Sources of effluent include the TMF, surface runoff (i.e., contact water), and grey water and sanitary sewage. A detailed description of the approach to managing process water and contact water is provided in Section 2.5.13. The assessment of Project-related effects on surface water, including details on sources of effluent, proposed mitigation measures and residual effects is provided in Section 6.3 (Surface Water Resources). Water quantity and quality modelling and assessment, and an assimilative capacity study will be completed prior to the start of Project construction and submitted as part of a CoA Application. This section therefore addressed grey water and sanitary water.

Grey water and sewage from temporary bathroom facilities will be collected in above ground storage containers. These biological wastes will be transported by a provincially licensed company to an approved facility.

During operation phase, the proposed domestic sewage system for the accommodation complex considers the treatment of sewage with on-site membrane bioreactor and leach field and/or will be collected for off-site disposal at an existing, approved sewage disposal facility. The sewage treatment and leach fields will be designed to comply with provincial standards and monitored to ensure they comply with regulatory requirements.

2.10.5 Metal Leaching and Acid Rock Drainage

The massive sulphide ore that has been mined and processed previously by the past operator is acid generating. Limited ML/ARD studies have been completed on the materials from Ming Mine, but the past operator managed the mine rock under the assumption that the resulting ore and waste materials will be PAG. The geochemical studies at boundary shaft (GEMTEC 2019) have determined that the historical waste rock stockpile at that site is PAG.

As a result of past mining operations, the existing Ming Mine site was constructed primarily from PAG material prior to purchase by Rambler in 2009. Studies were conducted to characterize the site and establish current conditions. Since 2009, Rambler carried out measures to reduce the effects of historical mining operations, including capping of disturbed surface with non-PAG material, and collection of contact water for treatment prior to release.

Rambler previously implemented environmental controls to manage ML/ARD effects on site so operation are conducted in a manner that reduces impacts to the environment as much as practicable. FireFly will maintain environmental controls and commits to updating and implementing new environmental controls based on the results of the ongoing ML/ARD studies upon the restart of operation at the mine. Existing controls include:

- An unknown percentage of waste rock generated from underground development is assumed to be PAG. This material will remain underground where possible to reduce surface storage. Until the results of the geochemical characterization studies are understood, the waste rock that must be brought to surface will be stored in the waste rock stockpile area. Site runoff will be directed toward the Ming West catchment, collected and managed through the WWMP until the polishing pond is constructed. Once the polishing pond is constructed, contact water from waste rock stockpiles will be pumped to the polishing pond and then managed through the WWMP
- Waste rock used to upgrade or construct site roads, pads or any other infrastructure area will be non-PAG material
- Historical PAG waste rock that is excavated for building foundations will be transported to the waste rock stockpile area
- Mine water will be transferred to the Ming West catchment through a series of sumps throughout the mine and treated and sampled (tested) prior to discharge. Once the polishing pond is constructed, the contact water will be directed to the TMF and then WWMP prior to discharge
- Continuous environmental monitoring and sampling of the effluent discharge water as well as surface water locations on and around the site

FireFly has engaged EcoMetrix to conduct rock characterization studies to delineate existing ML/ARD conditions on site as a result of historical mining and development. These studies will present detailed management and closure plans for the ML/ARD materials on site for future development and closure planning. The ongoing ML/ARD program will be carried out on waste, ore, tailings, and the more recently mined LFZ materials to properly identify and separate PAG and non-PAG materials. Until the results are received and understood, to be conservative, waste material will be considered PAG for the purpose of planning, handling, and storage requirements.

The study has been developed as a two-phase sampling program:

- Phase One - Integration of a geochemical characterization program into the ongoing exploration drilling program, which would complement the current assays (e.g., gold, copper, sulphur)
- Phase Two - Development of a geochemical characterization program that would serve as a foundation for the Project, in terms of requirements for permitting / approvals, mine waste and water management, as well as provide insights to closure strategies for the site as proactive consideration of closure is recommended at this stage

The program for waste rock characterization is principally related to Phase One pertaining to the characterization of materials from the ongoing exploration drilling program, as well as additional sampling of the waste rock material currently stored on surface. As historical drill core, ore, and tailings samples become increasingly available, additional characterization would be recommended on those materials as part of next steps or phase of this program.

The waste rock characterization is proposed to include a preliminary assessment of the potential for ML and an assessment of ARD associated with materials removed to access the ore deposit, that may be stored on surface, used as backfill or construction material, or that may otherwise require management.

The overall purpose of the characterization program that is planned for the existing and future drill core material(s) is to:

- Geochemically assess the drill core associated with the mining footprint. The assessment will account for consistency with the Ming deposit, lithological variation, spatial representativeness, and available drill-core sample limitations
- Reduce uncertainty with respect to the waste rock constituent loading rates and to inform forecasting of the potential net-acid onset delay
- Support the development of an ML/ARD management plan in terms of ongoing material characterization, management planning and potential for segregation, as well as supporting regulatory requirements
- Develop drill core sampling protocols and guidance to delineate suitable and representative characterization across the deposit

Potential future tailings characterization will be supported through ongoing collaboration with FireFly's site Geology Department. The objective of characterization work for any produced tailings materials is to:

- Identify and contextualize the potential risk(s) of ML/ARD for the TMF
- Contextualize potential risks and/or usage opportunities of tailings produced from various mining zones
- Develop loading rates from the tailings materials that can be applied to the ultimate TMF, to support quantification of short- and long-term drainage and runoff chemistry
- Support waste management and closure strategies for the ultimate TMF over the life of mine

2.10.6 Solid and Hazardous Waste

FireFly has an existing, approved Waste Management Plan (WMP) that provides direction on waste handling, storage, transport, treatment, and disposal of the various wastes currently produced at the site. The WMP will be updated to address the requirements of the Project and is attached as Appendix 2.D. The WMP provides a waste management system to deal with waste streams and allows for the implementation of reduction and diversion opportunities. It 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 foundation of the WMP is based on the regulatory framework for industrial waste management in NL, including legislation, regulations and guidelines at the federal, provincial, and municipal levels.

The goals of the WMP are to:

- Reduce adverse effects on the environment
- Incorporate and optimize the basic principles of waste management, including reduce, reuse, recycle, recovery and residual waste disposal
- Meet regulatory requirements for waste management

The WMP addresses the industrial / commercial / domestic wastes produced by the Project; however, does not currently cover mining wastes, such as waste rock from the underground exploration development. FireFly commits to updating the WMP to reflect the latest Project design.

The solid and hazardous waste streams that may be generated during the construction and operation of the Project are noted in Table 2.10.1. There is no on-site waste disposal at the mine site. Waste will be disposed of / recycled / reused off-site.

Table 2.10.1 Potential Waste Types and Disposal Methods

Category	Waste Type	Waste Origin	Waste Disposal Category
General	Domestic Waste (materials that cannot be recycled or reused)	All Areas	Landfill
	Phones, Computers, Monitors, Printers and Related Hardware	Offices	Contracted Removal for Recycling
	Printer and Copier Ink Cartridges	Offices	Recycled
Sewage	Biological (Sewage) Waste	Offices, Plant, and WWMP, Accommodations Camp	Removal by Contractor
Plastics and Rubber	Plastic Pails, Containers, or Parts	Maintenance Workshops, Storage Areas, Process Plant, Laboratory, and Kitchen / Dining / Recreation Area, WWMP	Recycled Where Possible / Removal by Contractor
	Conveyor Belts	Process Plant	Recycled / Reuse
	Used Tires	Maintenance Workshops (adhering to National Fire Code and National Building Code with regards to fire separation for indoor tire storage)	Recycled / Reuse Where Possible / Removal by Contractor
Recyclable Food and Drink Product Packaging	Aluminum cans Plastic drink and food containers Glass bottles Drink boxes Steel cans Gable top containers Alcoholic containers Other plastics (e.g., yogurt drinks, flavoured drink pouches, foil-topped juice, white juice jugs)	Offices, Kitchen / Dining / Recreation Areas	Recycled

Table 2.10.1 Potential Waste Types and Disposal Methods

Category	Waste Type	Waste Origin	Waste Disposal Category
Food Waste	Personnel Lunches and Kitchen Scraps	Offices, Kitchen / Dining / Recreation Area	Compost
Glass	Windows	Process Plant and Maintenance Workshops	Recycled
Wood and Paper	Pallets	Process Plant, Maintenance Workshops	Landfill
	Wire Spools	Process Plant	Recycled
	Scrap Wood	Process Plant and Maintenance Workshops	Landfill
	Cardboard and Paper	Mine, Maintenance Workshops, Offices	Recycled
Metals	Large Pieces of Machinery and Mobile Equipment	All Areas	Recycled Where Possible / Removal by Contractor
	Scrap Metal, Piping, Small Parts and Machinery, Non-recyclable Aluminum Cans	Mine, Process Plant, Maintenance Workshops	
	Coated Wire and Electrical Cable	Mine, Process Plant, Maintenance Workshop	
Hazardous Materials	Aerosol Cans	Maintenance Workshops and Kitchen / Dining / Recreation Area	Removal by Qualified Contractor
	Lithium / Nickel-Cadmium Batteries	Throughout Project Area	
	Bulbs (e.g., fluorescent, halogen)	Throughout Project Area	
	Plastic Drums Containing Contaminant Residues	Process Plant and Maintenance Workshops	
	Paint and Other Toxic Products Containers	Process Plant, Laboratory, Maintenance Workshops and Other Areas	
	Lab Chemicals	Laboratory	
	Bio-medical Waste (e.g., diabetic needles, materials such as bandages, gloves, dressings that have been in contact with blood	Offices	

Table 2.10.1 Potential Waste Types and Disposal Methods

Category	Waste Type	Waste Origin	Waste Disposal Category
Hydrocarbon Materials	Fuel and Oil Filters	Maintenance Workshops	Removal by Contractor
	Sweepings from Maintenance Workshop	Maintenance Workshops	
	Solvent / Oil Contaminated Rags, Workwear, and Absorbent Pads	Process Plant, Maintenance Workshop and Mobile Equipment	
	Petroleum Contaminated Soils	Throughout Project Area	
	Paint Filters	Maintenance Workshops	
	Grease Tube	Maintenance Workshop and Mobile Equipment	
	Hydraulic Hoses	Maintenance Workshops	
	Waste Grease	Maintenance Workshops	
	Solvents and Oils	Maintenance Workshops	
	Glycol	Maintenance Workshops	
	Used Oil	Process Plant, Maintenance Workshops and Mobile Equipment	

2.11 Environmental Management

2.11.1 FireFly's Approach to Environmental Management

FireFly is committed to the sustainable and responsible development of the Project as reflected in its corporate values and the Sustainability Management System (SMS) (under development). The purpose of this SMS is to ensure that FireFly operates in an environmentally and socially responsible manner, complying with relevant regulations and continuously improving its environmental and social performance. The SMS integrates environmental, social, and governance (ESG) considerations into all aspects of decision-making.

The parent company FireFly Metals Limited (the Company) Sustainability Policy is the foundation for establishing the Core Principles of FireFly's SMS. It recognizes the shared value for communities and other key stakeholders is paramount to any sustainable organization. The concept of shared value comes with a commitment to actively regenerate landscapes in line with the principles of the circular economy. The Company and subsidiaries commit to operating the business in line with the core principles of sustainable development, to deliver on the needs of the present, without compromising the needs of future generations and integrating environmental, social and governance considerations into all aspects of our decision-making.

The SMS is under development but includes five Core Principles to make the system effective:

1. Policy: FireFly currently has policies in place, including the Sustainability Policy (Appendix 2.E) and other policies for the Project that will be updated as the operation matures
2. Planning: ESG Hazards and Risk Identification, ESG Aspects, Legal and Regulatory Requirements, Objectives and Targets, Management Plans
3. Implementation and Operation: Structure and Responsibility, Competence, Training, and Awareness, Communication and Engagement, Documentation and Data Control, Operational Controls and Emergency Response and Preparedness
4. Checking and Corrective Action: Monitoring and Measurement, Evaluation of Compliance, Nonconformity, Corrective and Preventive Action, Control of Records and Internal Audit
5. Review: Management Review and update

The Sustainability Policy (Appendix 2.E) is integral in achieving the goal of being a globally important and socially responsible copper-gold producer contributing to a sustainable energy future. FireFly commits to operate the business in line with the core principles of sustainable development, to deliver on the needs of the present, without compromising the needs of future generations and integrating environmental, social and governance considerations into all aspects of our decision making. Specific commitments with respect to sustainability are outlined in the Sustainability Policy in Appendix 2.E.

FireFly's environmental management tools include management plans, mitigation measures, response plans, and follow-up and monitoring, which will allow for the commitments made in this Environmental Registration and permitting conditions to be implemented, monitored and adapted as needed throughout the life of the Project.

2.11.2 Management Plans

A series of management plans have been developed and encompass the environmental regulatory requirements and commitments made for the Project. This will include the formal conditions of the EA processes, as well as subsequent requirements of federal and provincial permitting processes required for the Project. They will also encompass commitments made in this Environmental Registration, which includes applicable compliance standards and/or industry BMPs. Table 2.11.1 details the management plans that are applicable to this Project; this list is not considered exhaustive, as the need for additional management plans may be identified through the permitting process.

Table 2.11.1 Management Plans

Management Plan	Comments
EPP Appendix 2.C	The EPP outlines practical procedures required for Project personnel (i.e., FireFly employees, contractors and suppliers) to reduce or eliminate potential adverse environmental effects associated with the construction and operation work across the Project sites. The EPP also includes measures to address potential incidents and unplanned situations (i.e., fuel and hazardous material spills, wildlife encounters, avifauna management, forest fires, and discovery of historic resources). Environmental protection procedures, including prevention and response actions, are provided for each of these scenarios. Note that detailed response measures for a fuel and hazardous materials spill are addressed in the stand-alone Environmental Contingency Plan (see below).
Inclusion, Diversity, Equity, and Accessibility Plan Appendix 2.B	An Inclusion, Diversity, Equity, and Accessibility Plan has been developed and encompasses a proactive approach to best industry practices geared towards a workplace culture supportive of a diverse workforce to attract and retain the talent for organizational success.
Waste Management Plan Appendix 2.D	This plan provides direction on waste handling, storage, transport, treatment, and disposal of the various wastes produced from the Project.
Environmental Contingency Plan Appendix 2.F	The Environmental Contingency Plan contains the specific response measures in the event of a fuel or hazardous materials spill.
Avifauna Management Plan (AMP)	The AMP has been designed to reduce the possibility of incidental take of active nests during construction activities associated with the Project. The AMP is based on the standards and requirements outlined by the *Migratory Birds Convention Act* and the provincial *Wild Life Act.* It is included within the EPP (Appendix 2.C)
MDMER Emergency Response Plan (ERP)	Under MDMER, there is a requirement for an emergency response plan that uses a risk-based approach to address the personnel and equipment, as well as procedures required to react to an unplanned release of tailings and/or effluent. In the case of a dam failure emergency, the MDMER ERP will be initiated.
ERP	The ERP and supporting procedures have been developed to manage, mitigate and remediate adverse effects resulting from accidental events or malfunctions (e.g., fire / explosion, chemical reagent release, medical emergencies, and severe weather). The structure and operation of the ERP will comply with various provincial and federal regulations and conditions of regulatory approvals.
Operation Management & Surveillance (OMS) Manual	The OMS manual offers guidance to operators and stakeholders on the operation, management, and surveillance of the TMF. This manual outlines the procedures and processes regarding the management, operation, and monitoring of this facility and follows the CDA Guidelines and the Mining Association of Canada (MAC) Guidelines.
Rehabilitation and Closure Plan	This plan currently outlines the proposed approaches to rehabilitation and closure of the Ming Mine Site, the Nugget Pond Mill, and the Goodyear's Cove Port Facility. These guidelines are based on the standards and requirements within the *Mining Act* of the Province. The plan will be updated to address the new components and activities associated with the Project.

2.11.3 Environmental Protection Plan

A proposed draft EPP has been prepared (Appendix 2.C) based on the current approved EPP. It covers the activities associated with the mine construction and operation on the properties associated with FireFly's mining activities, including the extraction of ore from the underground workings at the Ming Mine Site, the Nugget Pond Mill, and the Goodyear's Cove Port Facility. While Goodyear's Cove Port and Nugget Pond mill and TMF are part of the currently approved mine, FireFly is currently not planning for these facilities to be part of the operation of this Project. FireFly will retain these facilities on care and maintenance for future consideration. The proposed draft EPP therefore supports both the Project and these current operations and references combined facilities such as the process plants (including Nugget Mill and the new Process Plant at Ming Mine), the TMFs (at Nugget and the new TMF at Ming Mine) and ports (third party and Goodyear's Cove). Note that as the port at Pine Cove is owned and operated by a third-party, the third-party will be responsible for environmental protection measures at their site in accordance with their own permit and approval requirements. The EPP outlines practical procedures required for Project personnel (i.e., FireFly employees, contractors and suppliers) to reduce or eliminate potential adverse environmental effects associated with the construction and operation work across the Project sites, with the following objectives:

- Confirm commitments to reduce environmental effects
- Document environmental concerns and appropriate protection measures
- Provide a reference document for personnel when planning and/or conducting specific activities
- Provide direction for accidental events
- Communicate changes in the program through the EPP revision process
- Provide a reference to and instructions for personnel to understand applicable legal and other requirements
- Include a quick reference for both personnel and regulators to monitor compliance and recommend improvements
- Provide direction at the corporate level for confirming commitments made in policy statements are implemented and monitored

Table 2.11.2 provides an overview of the proposed draft EPP found in Appendix 2.C. It has been revised to include new or amended environmental protection procedures so that work activities conducted at the Project are completed properly and that the environmental aspects of the site are well managed. FireFly anticipates that further revisions to this proposed draft EPP may be required to reflect feedback from regulators and conditions of release from the EA process. Until the proposed draft EPP is finalized, the existing approved EPP remains in effect.

Table 2.11.2 Overview of the Environmental Protection Plan

Chapter	Sections	Description
1.0 Introduction	1.1 Purpose of the Environmental Protection Plan 1.2 Environmental Protection Plan Organization 1.3 Roles and Responsibilities 1.4 Environmental Orientation	Introduces the EPP. It outlines the EPP purpose and organization, roles and responsibilities and environmental orientation.
2.0 Construction and Operation Overview	2.1 Ming Mine Site 2.2 Process Plants 2.3 Port Facilities	Provides a description of potential site activities.
3.0 Regulatory Requirements and Commitments	3.1 Permits, Approvals, Authorizations 3.2 Environmental Compliance Monitoring 3.3 Rehabilitation and Closure 3.4 Reporting	Lists the permits, approvals and authorizations that may be required for the undertaking and provides an overview of compliance monitoring.
4.0 Environmental Protection Procedures	4.1 Surveying 4.2 Buffer Zones 4.3 Laydown and Storage Areas 4.4 Clearing Vegetation 4.5 Grubbing and Disposal of Related Debris 4.6 Overburden 4.7 Excavation, Embankment and Grading Environmental Concerns 4.8 Erosion Prevention and Sediment Control 4.9 Water Supply 4.10 Watercourse Crossings 4.11 Exploration Drilling 4.12 Pumps and Generators 4.13 Dewatering Work Areas and Site Drainage 4.14 Equipment Installation, Use, and Maintenance 4.15 Storage, Handling and Transfer of Fuel and Other Hazardous Material 4.16 Propane 4.17 Waste Disposal 4.18 Sewage Disposal 4.19 Hazardous Waste Disposal 4.20 Vehicle Traffic 4.21 Dust and Air Contaminant Control 4.22 Noise and Light Control 4.23 Road Maintenance 4.24 Building Construction 4.25 Drilling and Blasting 4.26 Waste Rock and Ore/Concentrate 4.27 Processing Activities	Describes environmental concerns and environmental protection procedures associated with work activities. The measures include standard mitigation and best practices for addressing these activities and has been previously reviewed and approved by regulators.

Table 2.11.2 Overview of the Environmental Protection Plan

Chapter	Sections	Description
5.0 Contingency and Management Plans	5.1 Fuel and Hazardous Material Spills 5.2 Wildlife Management 5.3 Avifauna Management during Site Activities and Phases 5.4 Forest Fires 5.5 Discovery of Historic Resources 5.6 Tailings Dam Failure 5.7 Mine Rescue and First Aid	Outlines the contingency plans for potential unplanned and accidental events.
6.0 Environmental Protection Plan Control Revisions		Describes procedures for revising the EPP.
7.0 Contact List		Contains a list of key Project and regulatory contacts.
8.0 Reference Material		Lists references cited in the EPP, as well as a number of sources of further information.
9.0 Signature Page		Contains a signature page for employee and contractor sign-off.

2.12 Accidental Events and Response Planning

2.12.1 Emergency Response Planning

FireFly has an established ERP and supporting procedures that define the responsibilities and duties of employees, contractors, visitors and third-party / external responders in the event of an emergency at the Project site. Potential emergencies include underground and surface emergencies (e.g., fire / explosion, chemical reagent release, medical emergencies, and severe weather). The priorities are the protection of life, limb and property / environment – in that order. FireFly's ERP includes several key components for preparedness and effective response to emergencies at the Project site. FireFly has also developed and implemented individual plans for the Nugget Pond and Goodyear's Cove sites; those plans remain in place while the facilities are on care and maintenance. FireFly is committed to preventing incidents and accidents and reducing health and safety risks by implementing best practices, which are outlined in the ERP, and will update the ERP as needed to address Project requirements.

The structure and operation of the ERP will continue to comply with the:

- *Occupational Heath and Safety Act*
  - Section 4, Employers' general duty
  - Section 5, Specific duties of employers
  - Section 5.1, Supervisors' general duty

  - Section 5.2, Specific duties of supervisors
  - Section 6, Workers' general duty
  - Section 7, Specific duties of workers
- *Occupational Health and Safety Regulations*
  - Section 12 (1)(j), Occupational health and safety program
  - Section 14, General duties of employers
  - Section 17, General duties of worker
  - Section 38, Emergency plan risk assessment
  - Section 39, Emergency procedures
  - Section 41, Emergency training
- *Mines Safety of Workers Regulations*
  - Section 565, escape exits from underground

Key components for the Project ERP include:

4. **Risk Assessment and Hazard Identification:**
   a. Identify potential emergency scenarios, such as fires, explosions, gas leaks, water inundation, chemical releases, and structural failures (e.g., buildings, underground, and dams).
   b. Assess the likelihood and potential impact of each identified hazard.
5. **Emergency Response Team:**
   a. Establish a dedicated emergency response team with clearly defined roles and responsibilities.
   b. Train and equip team members to handle various emergency situations.
6. **Communication Plan:**
   a. Develop a communication strategy for notifying relevant personnel, including miners, emergency responders, and external agencies.
   b. Include contact information for key personnel and emergency services.
   c. Establish protocols for internal and external communication during an emergency.
7. **Evacuation and Shelter-in-Place Procedures:**
   a. Outline clear evacuation routes and procedures for different types of emergencies.
   b. Designate safe assembly points and shelter-in-place locations.
   c. Conduct regular evacuation drills to familiarize personnel with the procedures.

8. **Emergency Equipment and Resources:**
    a. Maintain an inventory of emergency equipment, such as fire extinguishers, first aid kits, breathing apparatus, and rescue tools.
    b. Regularly inspect and maintain equipment in easily accessible areas.
9. **Incident Command System:**
    a. Implement an Incident Command System to coordinate the response efforts and manage resources effectively.
    b. Define the command structure and assign responsibilities for incident management.
10. **Training and Drills:**
    a. Provide regular training for personnel on emergency response procedures and the use of emergency equipment.
    b. Conduct periodic emergency drills to test the effectiveness of the ERP and improve response capabilities.
11. **Emergency Medical Response:**
    a. Establish protocols for providing first aid and medical treatment to injured personnel.
    b. Make trained medical personnel and necessary medical supplies available.
12. **Mine Rescue Operations**
    a. Develop specific procedures for mine rescue operations including the deployment of mine rescue teams.
    b. Develop mutual aid agreements to coordinate with external mine rescue services.
13. **Post-Incident Recovery and Review:**
    a. Outline steps for post-incident recovery, including site cleanup, damage assessment, and restoration of operation.
    b. Conduct a thorough review of the emergency response to identify lessons learned and areas for improvement.
    c. Update the ERP based on the findings from the review.
14. **Documentation and Reporting:**
    a. Maintain detailed records of emergency response activities, including incident reports, drill evaluations, and training records.
    b. Comply with regulatory reporting requirements.

In addition to the ERP, contingency plans have been developed in the EPP (Appendix 2.C) to address the following incidents and unplanned situations and will be modified as required throughout work activities associated with the Project:

- Fuel and Hazardous Material Spills: Fuel and hazardous materials can potentially be damaging to vegetation, soil, surface water, groundwater, wildlife, aquatic organisms, historic resources, and human health and safety. Note that that detailed response measures for a fuel and hazardous materials spill are addressed in a stand-alone Environmental Contingency Plan (Appendix 2.F).
- Wildlife Encounters: Wildlife encounters pose a potential risk for stress or injury to both wildlife and site personnel. Control measures and environmental protection procedures have been put in place to reduce this potential risk to wildlife and humans. Hunting, trapping or fishing by construction and operation personnel is not permitted.
- Avifauna Management during work activities: The AMP has been designed to reduce the possibility of incidental take of active nests during construction activities associated with the Project. FireFly will avoid adverse impacts on avifauna whenever possible. The construction footprint will be reduced to the extent possible and, whenever possible, FireFly will endeavor to complete required clearing outside the regional bird breeding season clearing (May 1-August 15).
- Forest Fires: Activities related to construction and/or operation could potentially result in a fire, which could spread to the surrounding area. Such events could potentially be damaging to vegetation and wildlife, air and water quality, human health and safety, and FireFly assets.
- Discovery of Historic Resources: Historic resource material that is disturbed, destroyed or improperly removed from a site represents a potential cultural loss of information and history that could otherwise be handled and interpreted in an efficient and appropriate manner.

Environmental protection procedures, including prevention and response actions are provided for each of these scenarios.

2.12.2 Summary of Accidental Event Scenarios

Table 2.12.1 describes potential malfunctions and accidents that could occur over the life of the Project as well as the key management measures.

Table 2.12.1 Potential Accidental Event Scenarios

Accident / Malfunction	Description of Scenario	Description of Potential Effects	Management Measures
Underground Accidental Event	Underground emergency is any unforeseen circumstances, unusual occurrences or resulting state that may endanger lives or the workings of the mine. This emergency may call for immediate action from management and or trained mine rescue, fire and first aid personnel. Emergencies may include personal injury, loss of life, unexpected / unintentional explosion, fire / heat / smoke, falls of ground, inrush of water, equipment failure, power failure, loss of main ventilation / contaminated atmosphere, major earthquake, and situations on the surface requiring evacuation of underground.	Accidental event scenarios were reviewed in FireFly's underground emergency response risk assessment. The scenarios are anticipated to be of "low risk" to workers because of: low probability and low frequency; low probability and moderate impact; moderate probability and low impact; or, in the case of a rock fall, extremely low probability and moderate to high impact. Probability of occurrences was based on statistical information (where available) and protective controls designed into the mine facility (such as secondary containment).	• In the event that an incident occurs, procedures have been established and are detailed within FireFly's Health and Safety ERP.
TMF Malfunction	A dam break could occur as a result of earthquakes, landslides, overtopping, internal erosion or piping, foundation failure, and slope failures.	In the event of a dam failure, liquid tailings would be released to the environment. Tailing solids could also be deposited along low-lying areas extending from the breach location, potentially causing localized infilling of vegetated areas and waterbodies. Adverse effects to vegetated areas and waterbodies could result in adverse effects to fish, wildlife, and resource users.	• FireFly will complete a Dam Breach Analysis prior to construction. • The OMS manual outlines the procedures and processes regarding the management, operation, and monitoring of the TMF and follows the CDA and MAC Guidelines. • In the event of an effluent release, procedures have been developed and established and are detailed within the FireFly's ERP for the Project as per the MDMER.
Overburden, Ore, and Waste Rock Piles Slope Failure	Failure or slumping of materials in stockpiles / waste rock piles would result in the release of waste rock, ore or soils outside the storage areas and increase the footprint of the stockpile.	There is the potential for the release of contaminants or contact water into surface water resources and fish habitat.	• Project design to reduce the potential for slumping, including displacement monitoring / surveys to identify potential instability and early movements.

Table 2.12.1 Potential Accidental Event Scenarios

Accident / Malfunction	Description of Scenario	Description of Potential Effects	Management Measures
Fuel and Hazardous Materials Spill	A fuel and hazardous material spill could occur as a result of equipment leakage / failure, storage tank leak or rupture, spill from vehicles on-site, and/or spill from vehicles off-site (i.e., along the access road).	A large spill may contaminate soil, groundwater and surface water resources, thereby potentially adversely affecting the quality of fish and fish habitat, and vegetated habitat, and resulting in the ingestion/uptake of contaminants by wildlife and affect access to these resources by land and resource users.	• Measures outlined in the Environmental Contingency Plan (Appendix 2.F) in the event of a fuel or hazardous materials spill.
Unplanned Release of Contact Water	Malfunction of the catchment sumps, ditches and channels, and sedimentation ponds could lead to the release of insufficiently treated contact water into the receiving environment.	Given that the water collection system is located throughout the Project Area, including near waterbodies, an unplanned release of contact water to the environment has the potential to adversely affect groundwater, surface water quality, fish and fish habitat, vegetation and wetlands.	• Measures outlined in the Environmental Contingency Plan (Appendix 2.F) in the event of a fuel or hazardous materials spill.
Fire / Explosions	Accidental events associated with Project activities, such as equipment malfunction or uncontrolled explosions could result in a fire related directly to Project infrastructure and facilities, or within the Project Area as a forest fire.	A fire could result in release of emissions to the atmosphere, affect surface water quality and fish habitat, affect forests and wildlife habitat adjacent to the Project Area, and restrict the ability of land in the surrounding area to support Indigenous and non-Indigenous resource users.	• Section 5.4 of the EPP (Appendix 2.C)
Vehicle Accident	Vehicle accidents, including single vehicle accidents, could result in the release of hazardous materials to the environment, and accidental collisions from the operation of Project vehicles or heavy equipment could also result in human mortality or injury.	A vehicle collision could adversely affect wildlife and/or members of the public using the access road.	• In the event of vehicle accidents procedures have been established and are detailed within FireFly's Health and Safety ERP.

General mitigation to reduce risk associated with these potential malfunctions and accidental events includes:

- Implementation of proper training, awareness, education
- Regular equipment inspection and maintenance
- Incorporation of inherently safe designs into the Project
- Update and implementation of current site environmental management plans, including effective and efficient emergency response plans
- Periodic assessment of accident and malfunction risks during all project life cycles, including detailed design, construction, operation and closure

Management plans, and emergency response and contingency plans previously developed for the approved mine will be updated as needed to address Project components and activities and to reflect input from regulatory agencies.

2.13 Project Alternatives

Below are the evaluations of the Project alternatives. This assessment includes a review of both the alternative options to the Project itself and the potential alternative methods for its implementation.

2.13.1 Alternatives to the Project

The purpose of the proposed Project is to expand the existing underground mine at the Ming Mine site, which will support the province and Canada's critical mineral strategy, efforts to reduce carbon emissions, fill the gap between supply and demand for copper and gold, and create substantial socio-economic benefits. There is no alternative to mining the copper and gold resource located at the Ming Mine site that would achieve the purpose and need for the Project. The "do nothing" scenario would result in the Ming Mine staying in care and maintenance and the continued loss of substantial socio-economic benefits to the region, as the mine is not economically viable at its current scale. There are alternatives to the methods employed to mine the resource that are described in the following sections.

2.13.2 Alternatives Means of Carrying out the Project

Alternative methods for executing a project include technically and economically feasible options for its implementation. These may include different locations for infrastructure, various routes for project components, diverse development and implementation methods, and potential mitigation measures.

Alternatives were assessed by comparing biophysical environment, socio-economic, technical, and cost factors as well as considerations associated with local communities and land and resource uses. Internal scoping studies assessed various alternative means to carry out the Project and applied these factors to identify options that are "preferred", "acceptable", or "unacceptable". Generally, alternatives were deemed "preferred" where a benefit was derived from implementing the alternative. A rating of "acceptable" was assigned when the option was deemed either technically and/or economically feasible though it could

have some impact on other factors (i.e., environment, socio-economic). However, with the implementation of Project mitigation measures, these impacts are not expected to result in a substantial change. Alternatives were deemed “unacceptable” where it would be unfeasible or would result in an unacceptably negative outcome.

Options for the location of most of the mine infrastructure facilities (existing assets) was dictated by the location of the deposit at Ming Mine. As the Project design evolved, efforts were made to reduce the overall footprint of the Project, and environmental mitigation strategies were incorporated where possible. Following the delineation of the sub-watershed boundaries, FireFly focused on keeping infrastructure within the same sub-watershed boundaries to reduce the number of sub-watersheds that would be influenced. FireFly also focused on placing infrastructure so as not to overprint waterbodies and to maintain a buffer where practical between the waterbodies and the structures. In addition to assessing alternatives to existing assets, FireFly reviewed alternatives for the following:

- Port access road locations
- Process plant locations and site access
- TMF locations

Alternatives means of carrying out the Project are discussed further in the sections below.

2.13.2.1 Existing Assets

Following acquisition of the Green Bay Copper-Gold Project, FireFly assessed the Nugget Pond Mill, TMF and Goodyear’s Cove Port to determine if the assets could be modified, relocated or upgraded to make them technically and economically viable options to process the ore and ship the concentrate. Preliminary results from the exploration activities in early 2024 indicated the resource would increase, therefore requiring higher process rates and an increase in storage capacity for tailings. Given the increase, and through initial scoping studies with Ausenco Limited, EnTech Mining and Knight Piesold, it was determined that the Nugget Pond mill and TMF would require expansion as it did not have the throughput capacity to support a larger operation.

As described in Section 2.3, Nugget Pond is 40 km to the east of Ming Mine and Goodyear’s Cove Port is 140 km’s south of the mill. The transport of higher volumes of ore and concentrate over those distances is not feasible and would increase the carbon footprint. The configuration of the mine, mill and port was technical and economically feasible in the past with lower production rates, but with an increase production rate it is not the preferred option. FireFly also engaged and consulted with local communities (Section 3) and the feedback received indicated that although communities found previous and current traffic for forestry, mining and transport of goods acceptable, substantial increases to the volumes of trucks on the highway could impact the condition of the highway.

Goodyear’s Cove Port and Nugget Pond mill and TMF remain part of the existing and approved operations, however, no changes are being proposed to these facilities (i.e., both will be maintained in their current care and maintenance status). These facilities were considered as alternative means to carry out the Project but are not technically or economically feasible for the scale of the proposed Project

operation. In consideration of the process rate and location, although these assets are acceptable, they are not the preferred options to carry out this Project. If FireFly were to consider modification to these facilities in the future, it is understood that those modifications would need to be evaluated to determine if they would require a provincial environmental registration as a designated undertaking or if associated changes to the Project may result in regulatory requirements under the *Impact Assessment Act*. The preferred options for the process plant and the TMF is described in Sections 2.5.5 and 2.5.7, respectively.

2.13.2.2 Port Access Road

As discussed above, FireFly determined that the Goodyear's Cove Port was not the preferred option to transport concentrate from NL for refining. There are a few existing, approved port facilities near the Project, the closest being Pine Cove Port. FireFly met with operators of the port facilities to understand current capacity and through those discussions determined that the current infrastructure at Pine Cove Port would support the volume of concentrate to be delivered, loaded and shipped. It is estimated that approximately 12 truckloads of concentrate will be transported off site daily.

With the Pine Cove Port identified as the preferred option, an access route to the port needed to be confirmed. There were three options assessed (Figure 2.13.1):

1. Ming's Bight Road (Highway 418)
2. A new access road located east of South Brook
3. A bridge across South Brook and connection to an old forestry road on the west side of South Brook

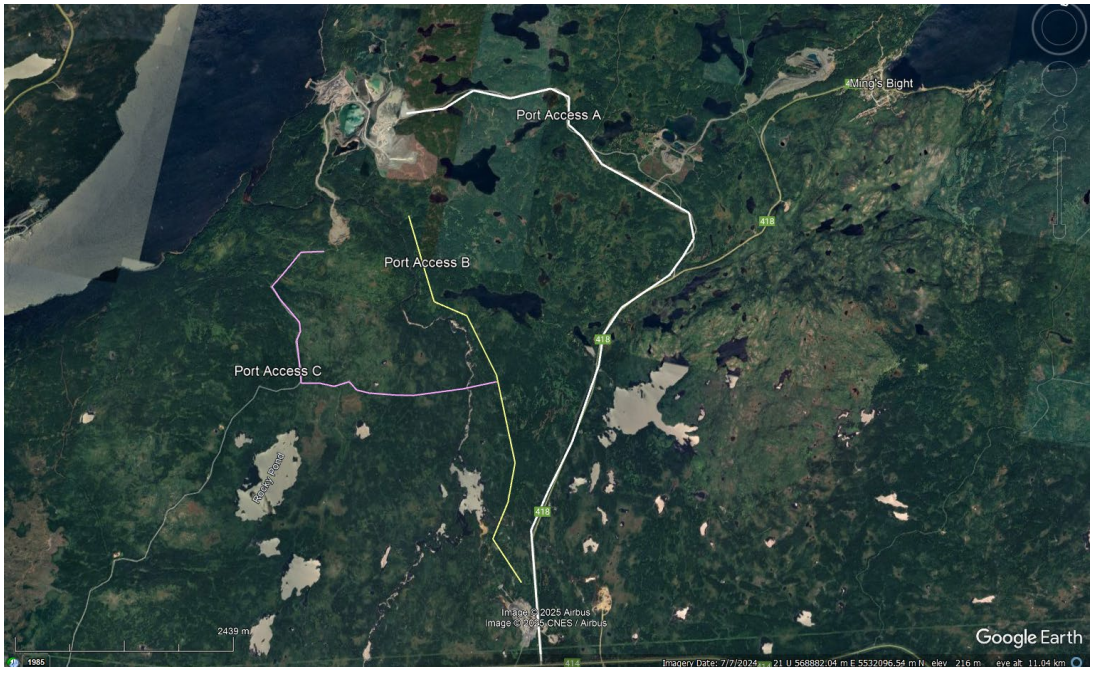


Figure 2.13.1 Location of Port Access A (white), Port Access B (yellow) and Port Access C (purple)

In consideration of feedback from the communities, Port Access A (Figure 2.13.1) was deemed acceptable as mitigation could be implemented to reduce the impacts to the highway and maintain public safety. With approximately 12 truckloads per day, it would allow FireFly to transport outside of peak traffic times. Speed limits and other options could be considered to reduce impact to the road surface and increase safety to make Port Access A an acceptable alternative.

Port Access B (Figure 2.13.1) was previously considered and had advanced to high-level engineering design with a corridor conceptually situated east of South Brook. This option would require the clearing of the corridor on mineral claims held by FireFly, as well as smaller water crossings that can be established with properly sized culverts. The access road was never developed by the past operator but is considered a viable option to access Pine Cove Port.

Port Access C (Figure 2.13.1) was also considered as an alternative means to carry out the Project. This option would require a large bridge construction over South Brook to connect to an existing forestry road that runs north to an aggregate operation. The requirement to construct a bridge to cross South Brook and the development of a Port Access route off FireFly property made this option unacceptable.

In consideration of community feedback regarding traffic volumes and maintaining the integrity of the road, and FireFly's commitment to mitigate impact and avoid waterbodies, Port Access B was selected as the preferred alternative for the Project. Table 2.13.1 provides a summary of the port access alternatives.

Table 2.13.1 Summary of Port Access Options

Determining Factors	Options Considered		
	Port Access A	**Port Access B**	**Port Access C**
Technically Feasible (including regulatory factors)	Yes	Yes	Yes
Economically Feasible (including market factors)	Yes	Yes	Requires construction of a bridge and outside FireFly property
Environmental Considerations	Can be addressed with mitigation	Can be addressed with mitigation	
Socio-economic Considerations	Increased public safety concerns	-	-
Preferred Option – carried forward in the assessment	-	✓	-

2.13.2.3 Process Plant and Site Access Road

The alternative means of carrying out the Project were assessed through scoping studies conducted by Ausenco Limited, EnTech Mining and Knight Piesold. Many of these studies were high-level and did not result in engineered drawings as the preliminary results clearly indicated a preferred option fairly early in the assessment. The key factors guiding the selection the preferred location of the process plant and site roads included reducing the sprawl of structures to limit number of affected watersheds, avoiding overprinting of waterbodies, shortening corridor length (power and roads), consideration of potential mineralization and orebody, and keeping infrastructure on FireFly's claims and leases.

Figures 2.13.2 to 2.13.4 illustrate the evolution of the alternative locations considered for the process plant and site access road alignment.

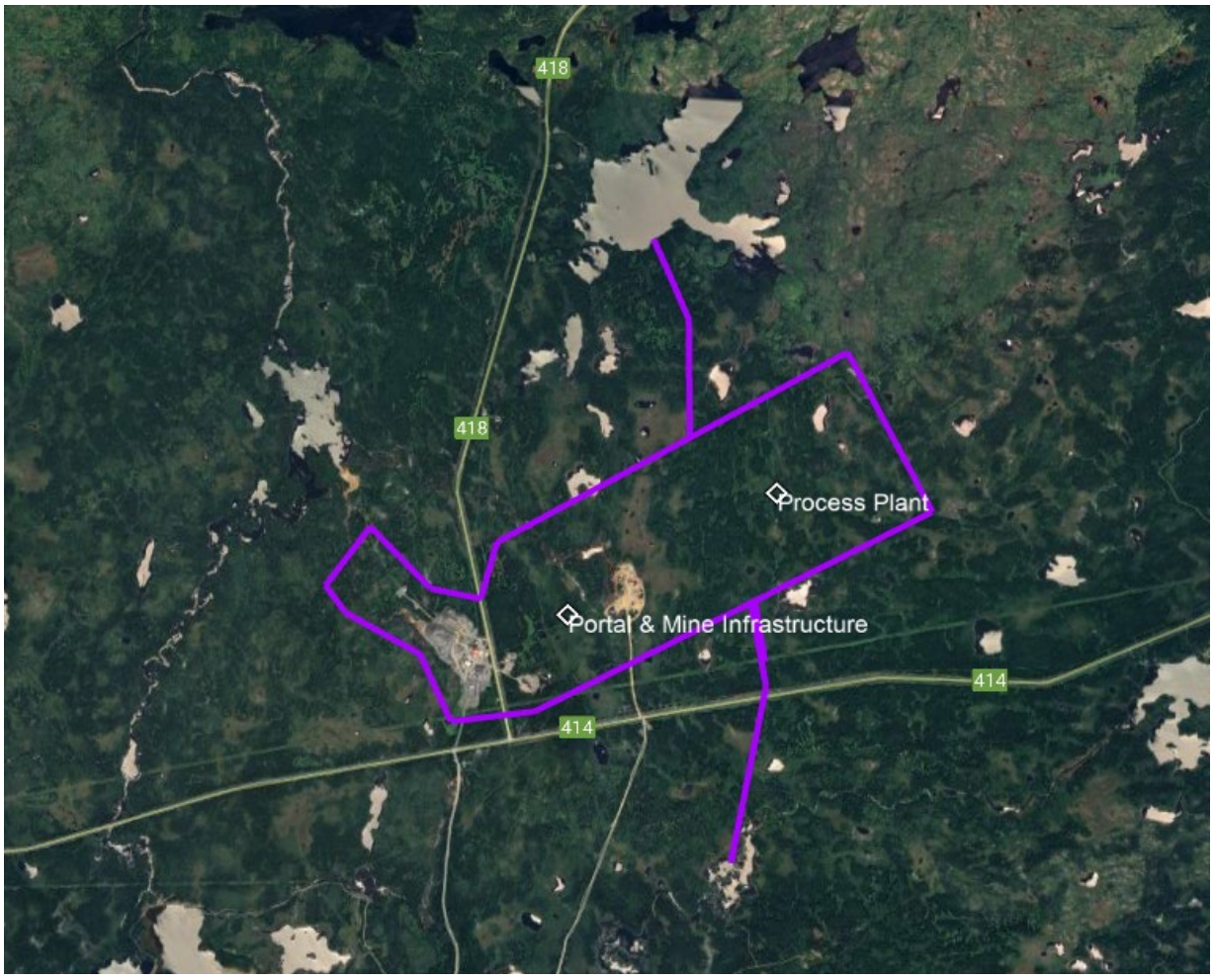


Figure 2.13.2 High Level Concept Process Plant Location A (May 2024)

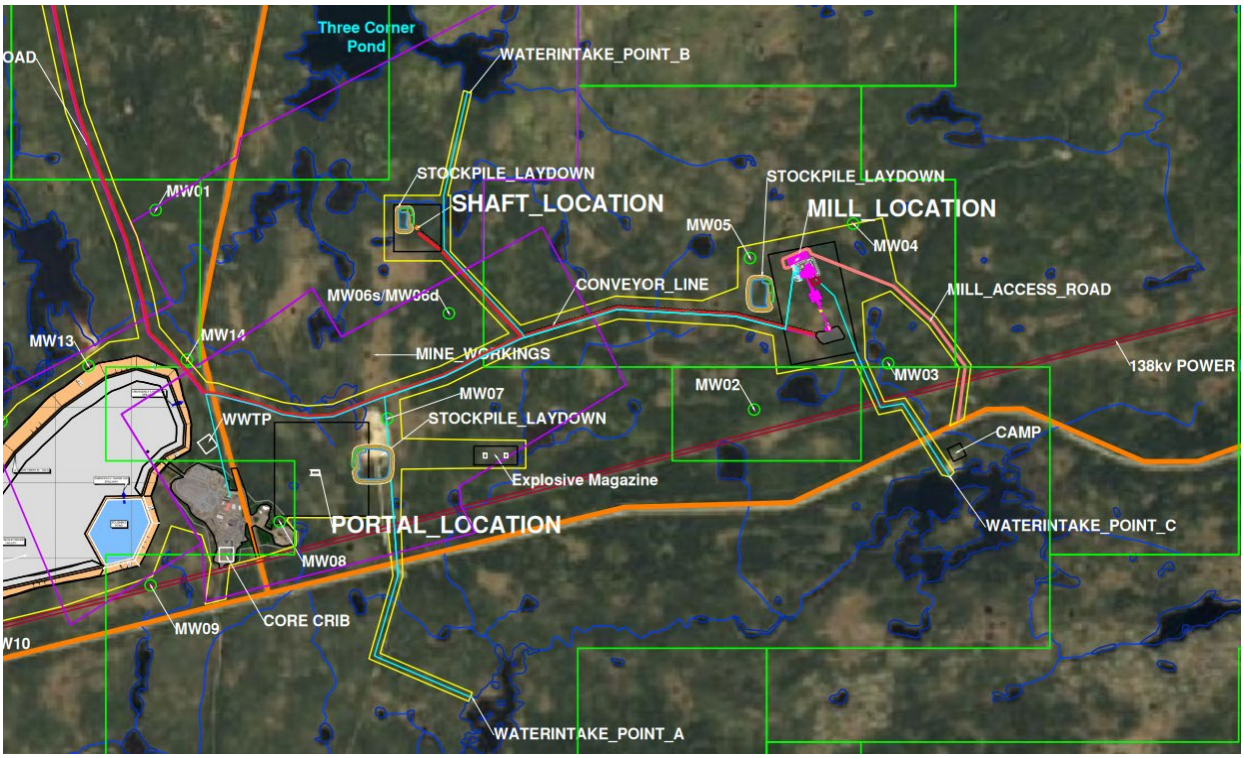


Figure 2.13.3 Process Plant Location B, Farthest East from Ming Mine (August 2024)

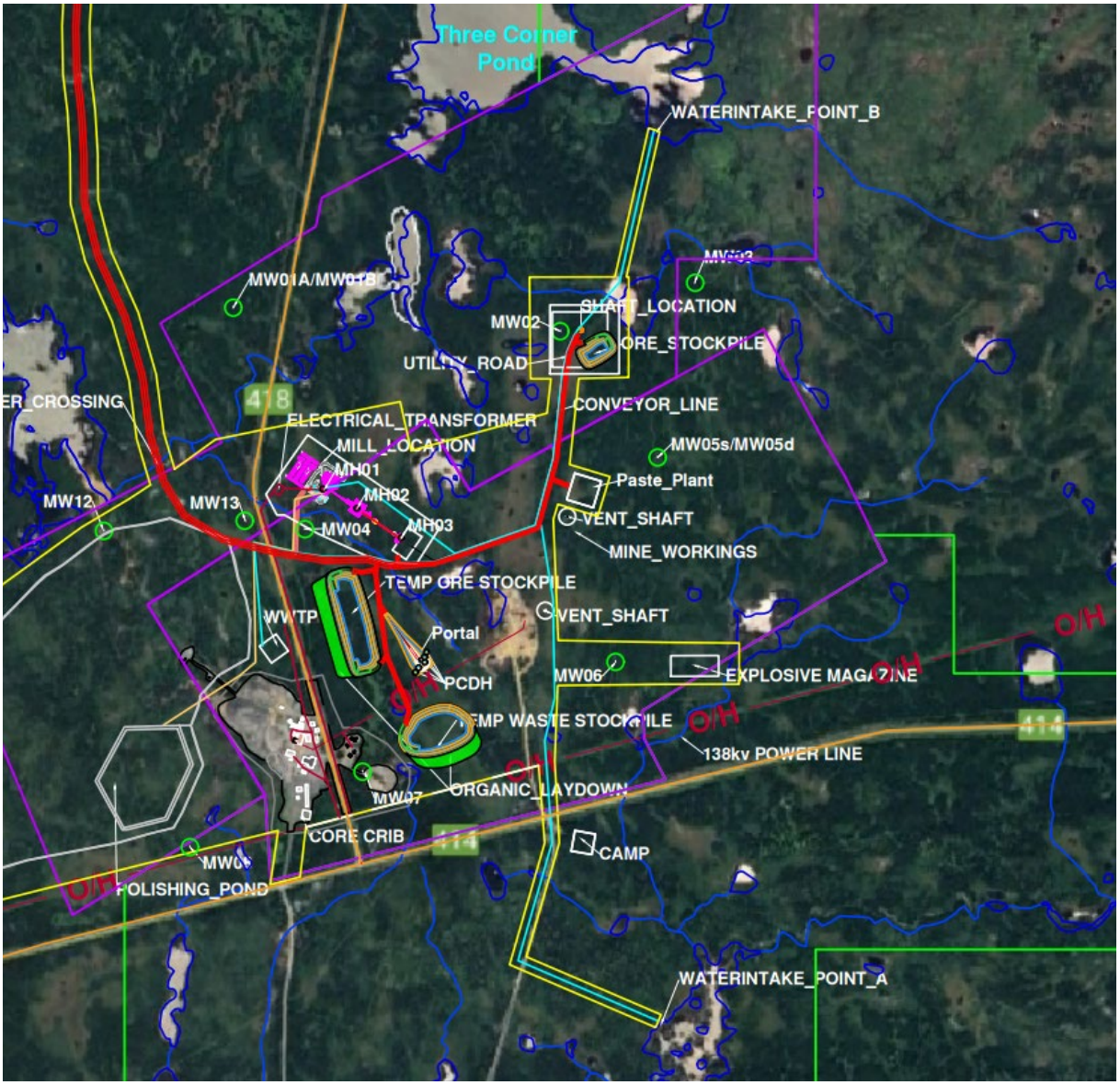


Figure 2.13.4 Process Plant Option C Closest to Ming Mine (October 2024)

The goal was mitigating environmental impacts and maintaining a small footprint. The process plant and site access road, described at Process Plant Option A and B were situated approximately 1.5 and 3.5 km, respectively east of the Ming Mine. Option A was quickly deemed unacceptable due to is proximity to the orebody. Option B was carried forward for further review in the scoping studies and considered an acceptable option. In reviewing the disturbance footprint, surface water bodies, corridors and potential influence on sub-watersheds, it was clear that the carbon footprint from a disturbance perspective (corridors, roads and pads) was increasing, as was vehicle traffic distances and the power consumption necessary to pump water or tailings. Option B was deemed acceptable, however, given environmental objectives, Option B is not the preferred alternative.

Additional field studies (environmental, geotechnical, condemnation) were conducted and the location for Process Plant Option C was identified. The location for Option C is approximately 800 m from the existing Ming Mine Ramp and 600 m from the proposed Portal to the mine. Due to the proximity to the mine, the length of the roads, corridors (electrical, pipelines), pumping distances and other auxiliary infrastructure connected to the process plant has been greatly reduced. The location is on FireFly property, does not overprint waterbodies and is compact, resulting in fewer sub-watersheds been influenced. In reviewing the assessment factors and objectives for the design, Process Plant Option C is the preferred alternative for the Project. Table 2.13.2 provides a summary of the process plant and site access alternatives.

Table 2.13.2 Summary of Process Plant and Site Access Options

Determining Factors	Options Considered		
	Process Plant A	**Process Plant B**	**Process Plant C**
Technically Feasible (including regulatory factors)	No – Proximity to orebody	Yes	Yes
Economically Feasible (including market factors)	-	Yes	Yes
Environmental Considerations	-	Increase footprint size, interaction on sub-watersheds, increased vehicle distance and resulting carbon footprint	-
Socio-economic Considerations	-	-	-
Preferred Option – carried forward in the assessment	-	-	✓

2.13.2.4 Tailings Management Facility

Specific public information sessions were held in communities to present alternatives for the TMF. As described in Section 3, four public information sessions were held on May 2, 6, and 7, 2024 in the day and evening at the communities of Ming's Bight and Baie Verte. During the sessions, a presentation was given outlining the progress of the Project concepts. The primary focus of the public information session was to get feedback from communities on land use and to discuss TMF options. There were opportunities to ask questions and comment cards were provided so individuals could submit their questions or statement in confidence. The key points from the community feedback (summarized in Table 3.1.6 in Section 3.1.7) were to use already disturbed areas, avoid disturbing fish habitat or overprinting waterbodies, and try to use legacy tailings or other available tailings sites if they are viable options.

Knight Piesold was retained to conduct a tailings alternatives assessment, which started with nine (9) options shown in Figure 2.13.5.

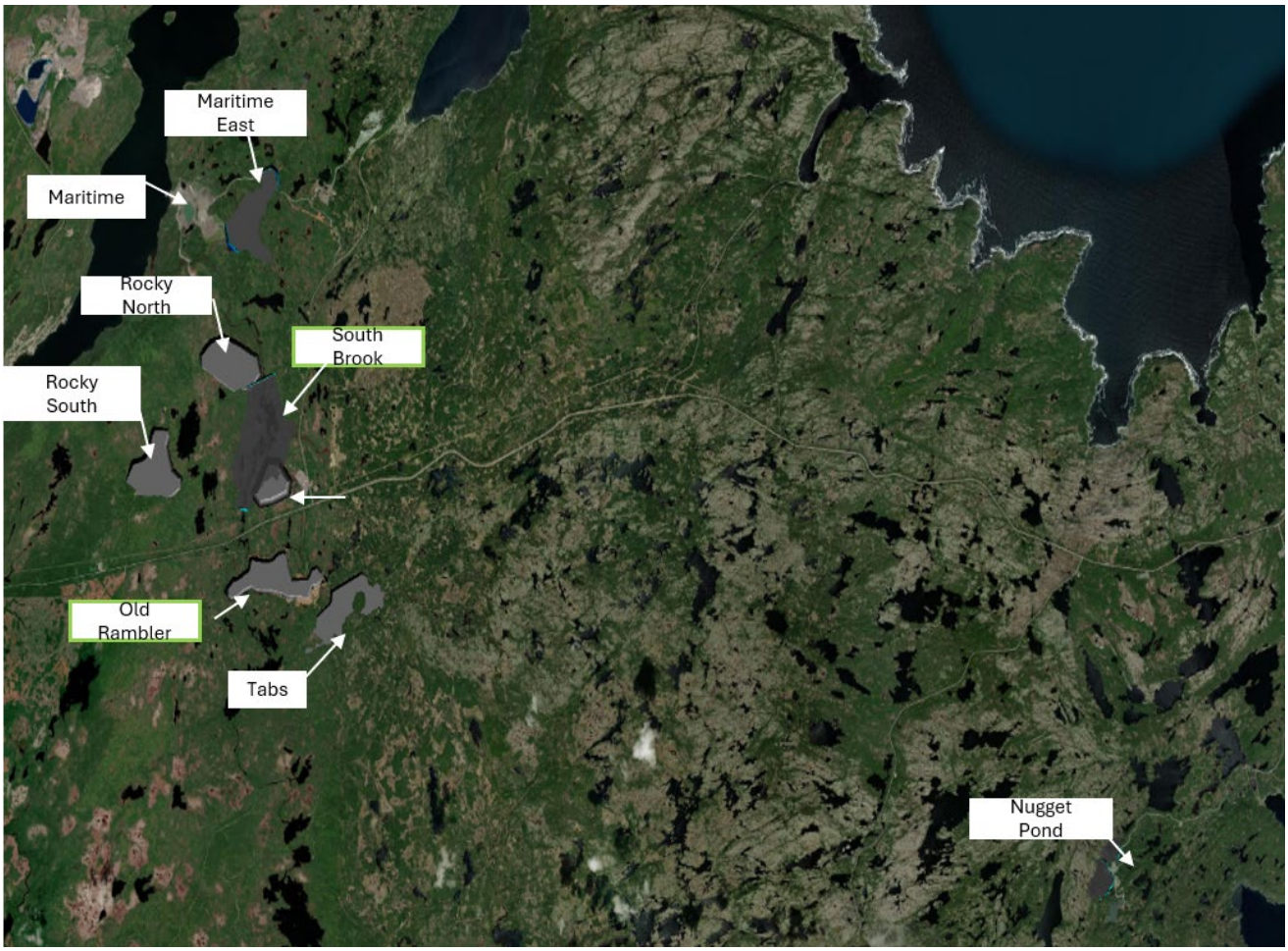


Figure 2.13.5 Nine Tailings Management Facility Alternatives Presented to Communities

The factors considered as part of the assessment for the TMF were as follows:

- Technical, Social, Environmental and Economically Feasible
- Reducing footprint disturbance
- Proximity to process plant/mill
- Feedback from communities during public information sessions, local meetings, newsletters and social media posts (use legacy sites, avoid new disturbance and recreational fishing)
- Preliminary results of the baseline studies
- Ownership and land tenure, situated on claims or leases held by FireFly

Using these factors, Knight Piesold and FireFly were able to screen out six (6) of the options shown. Rocky North and Rocky South would result in new disturbance and overprint a waterbody with potential fish present, the locations were not on property held by FireFly and determined to be unacceptable. Maritime and Maritime East were industrial sites but not owned by FireFly and determined to be

unacceptable. Nugget TMF was too far and did not have the capacity for the Project as discussed in Section 2.13.2.1. Although acceptable for a smaller scale operation, it is not viable for the Project and was screened out as an option. Tabs TMF Option would be a new disturbance and overprinted waterbodies that had potential fish presence, and due to these factors was considered unacceptable.

Three acceptable options remained (Figure 2.13.6) and were carried forward for further review: Old Rambler; South Brook; and Mings West.

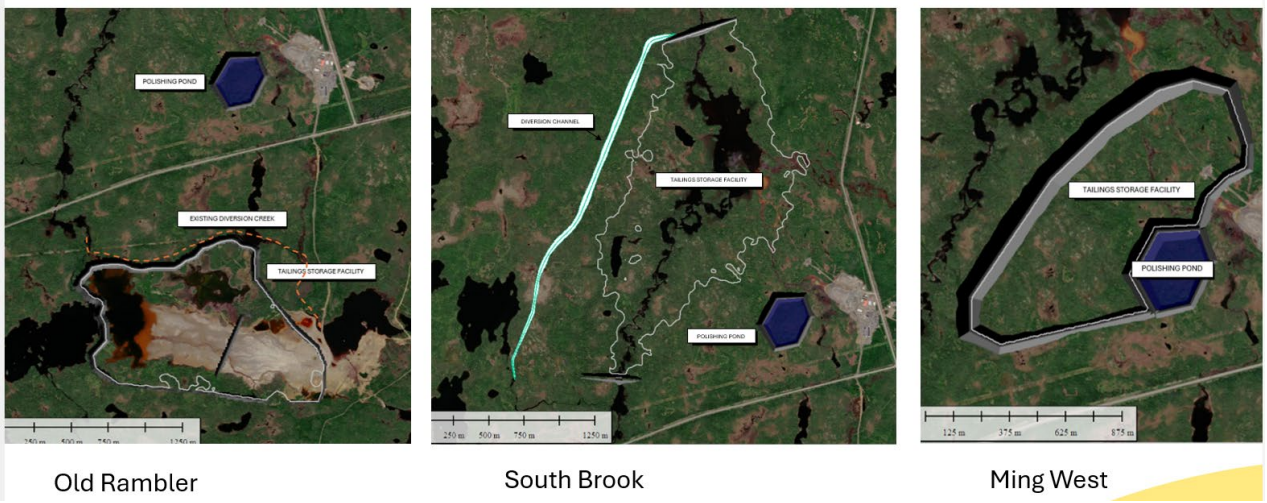


Figure 2.13.6 Three Tailings Management Facility Options Considered Acceptable as Alternatives

These three options were progressed to a conceptual level of design to understand capacity, preliminary alignment, dam heights, volume of material necessary to construct the facility, and ability to support a polishing pond. Table 2.13.3 provides a summary of the TMF alternatives.

Table 2.13.3 Comparison of the Three TMF Options

Option Name	Risks	Benefits
Old Rambler	• Not owned by FireFly, with approximately 25 ha situated on an EML area owned by NL, and requires public tender process • Highly impacted area, liability associated with the facility (groundwater, surface water) • Post-closure monitoring requirements / rehabilitation • Technical feasibility and stability of building new dam facility to encapsulate old, may not have 100% capacity for the Project • Across Highway 414, farthest from the process plant	• Current Land Use: Abandoned Tailings Facility – legacy contamination • Fisheries: No disturbances as structures would remain in existing impacted areas • Design can incorporate long-term cleanup of impacted area – timing and costs

Table 2.13.3 Comparison of the Three TMF Options

Option Name	Risks	Benefits
South Brook	• Would require a water diversion • Limited exploration and condemnation drilling in the area • Not entirely on FireFly mineral claims • No baseline studies west of South Brook • New disturbance • Overprinting of waterbodies	• Capacity for Project and potential expansion • Section of South Brook stream is heavily impacted by legacy tailings situated upstream, studies over multiple years, multiple seasons and sampling techniques have demonstrated this section of South Brook is not frequented by fish • Current Land Use: Open terrain • Potential to remove impacted section of stream from system and divert clean water around TMF
Ming West	• Economically least preferred • New disturbance • No large waterbodies being overprinted, however there is a small stream and intermittent field drains	• Capacity for the Project • Proximity to the process plant • Upstream catchment: Negligible • Although not developed, it was immediately adjacent to the existing Ming Mine • Condemnation and exploration conducted in footprint of TMF • Baseline studies conducted in area

In reviewing the earlier factors to assess the three TMF options that were acceptable after initial screening, the preferred option for the TMF location is Ming West. Although the South Brook and Old Rambler TMF options were acceptable, they did not meet the criteria, even with mitigation, to be deemed the preferred option. The Old Rambler TMF option proposes a dam structure be constructed over an area held in EML and not owned by FireFly. As such, it would require a public tendering process that could take years to progress, and FireFly has no guarantee that it would be awarded the land. In addition, there is limited exploration and condemnation drilling in the area to confirm presence/absence of mineralization. FireFly recognizes the benefits of developing a new TMF over the historic tailings site, but without owning the land and given limited knowledge of mineralization and geotechnical studies, it does not meet the criteria to be considered a preferred option at this time. FireFly is committed to gathering more information and investigating future opportunities to manage and mitigate the impacts that legacy site is having on the environment.

The location for Ming West has had condemnation drilling, is situated on FireFly claims / leases, is not in a pristine environment, and is the most proximate to the process plant. Of the three remaining options, Ming West is ranked higher technically, socially, and environmentally. While it may not be the most economical, with potential aggregate sources nearby, cost controls are available, making Ming West the preferred option for the Project. Table 2.13.4 provides a summary of TMF siting alternatives.

Table 2.13.4 Summary of Process Plant and Site Access Options

Determining Factors	Options Considered		
	Old Rambler	**South Brook**	**Ming West**
Technically Feasible (including regulatory factors)	Yes, but technical feasibility and stability of building new dam facility to encapsulate may not have 100% capacity for the Project	Yes	Yes, but potential aggregate sources nearby
Economically Feasible (including market factors)	Exempt Mineral License area owned by NL, and requires public tender process	Yes	Yes
Environmental Considerations	-	New disturbance Overprinting of waterbodies	Closest proximity to the process plant
Socio-economic Considerations	-	-	-
Preferred Option – carried forward in the assessment	-	-	✓

3 Community Engagement

3.1 Community and Stakeholder Engagement

3.1.1 Overview of Engagement Plan

FireFly believes in transparency and actively engaging with the community, organizations, governments, Indigenous organizations and other groups (collectively stakeholders) to support sustainable development and integrate environmental, social, and governance considerations into all aspects of decision-making. FireFly engages the community with the goals of achieving sustainable outcomes, equitable decision-making processes, and deepening relationships and trust between the community and the company.

FireFly's objectives for engagement include:

1. **Strengthen Relationships and Build Trust**: Provide transparency and open dialogue with the community.
2. **Consultation and Feedback**: Obtain feedback on aspects of operation to support development plans and permitting.
3. **Partnerships and Economic Opportunities**: Establish partnerships with communities and organizations to harness economic opportunities and contribute to the region's financial and social well-being.

Public and community participation has informed the Project design through the integration of knowledge on land and resource use and to identify components of the environment of importance to the communities and the public, which have been incorporated into the valued components (VCs) for the Project. FireFly recognizes the importance of inclusion and diversity, and for those reasons we consider the public, communities, and groups as part of the "Community". Engagement material is provided in Appendix 6.F.

The Community Engagement Plan has been divided into multiple phases:

- *Phase One*: Developing an engagement plan, stakeholder mapping and initial outreach
- *Phase Two:* Repair, grow and strengthen relationships and understand interest
- *Phase Three*: Initial planning and scoping studies
- *Phase Four:* Detailed design, Environmental Assessment (EA) and permitting
- *Phase Five:* Ongoing updates, foster relationships over Life of Mine

FireFly recognizes the importance of Indigenous people in Canada and their contribution to our knowledge and understanding of the environment. Understanding the history of Indigenous people in Newfoundland and Labrador (NL), and through engagement with communities, it was recognized that the Indigenous Organizations throughout NL have members living in communities in the Baie Verte Peninsula. FireFly's engagement plan does recognize Indigenous Peoples and Organizations for those to want to self-identify and as organizations who have an interest in the Project but under the umbrella of the overarching "Community Engagement" approach. Through our engagement efforts in Phases One and Two, some members have self-identified during larger community engagement events.

Following the announcement of the expanded resource and discussions with the EA Division in November 2024, FireFly confirmed with the Government of Newfoundland and Labrador's Office of Indigenous Affairs and Reconciliation which Indigenous Organizations who may wish to be engaged for the Project. FireFly will continue to reassess communities, organizations and stakeholders who are interested in the Project; the engagement plan is a living document that evolves as new information and feedback are received.

The Community Engagement Plan that has been developed and implemented by FireFly supports alignment of current and future operation with FireFly's sustainability policy, fosters positive relationships with stakeholders, and contributes to sustainable development. To date, 33 letters of support for the Project have been received from communities and vendors, they have been included in Appendix 3.B.

3.1.2 Phase One: Community Engagement Approach

3.1.2.1 Identify Stakeholders and Communities

The first step in community engagement is understanding the spatial extent of the potential Project effects and then conducting stakeholder mapping and analysis. This includes identifying key stakeholders, comprising of local communities, indigenous groups, government agencies, non-government organizations, and industry partners. This involves creating a comprehensive list of individuals, groups, and organizations that have an interest in, or are affected by, the Project. Identified stakeholders were assessed to understand their potential interests, concerns, and influence to help prioritize engagement efforts and tailor communication strategies.

During the early stages of Project design, multiple alternatives for the tailings management facility (TMF) and process plant were considered, including the use of the Nugget Pond Mill. Figure 3.1.1 illustrates how communities were mapped in consideration of using Nugget Pond Mill. The initial engagement for the Project was focused on 25-kilometre (km) radius from the proposed infrastructure. After the initial engagement and once the location of the TMF and process plant were confirmed, community engagement was extended to include larger communities within a 50 km radius of the Ming Mine, such as Springdale.

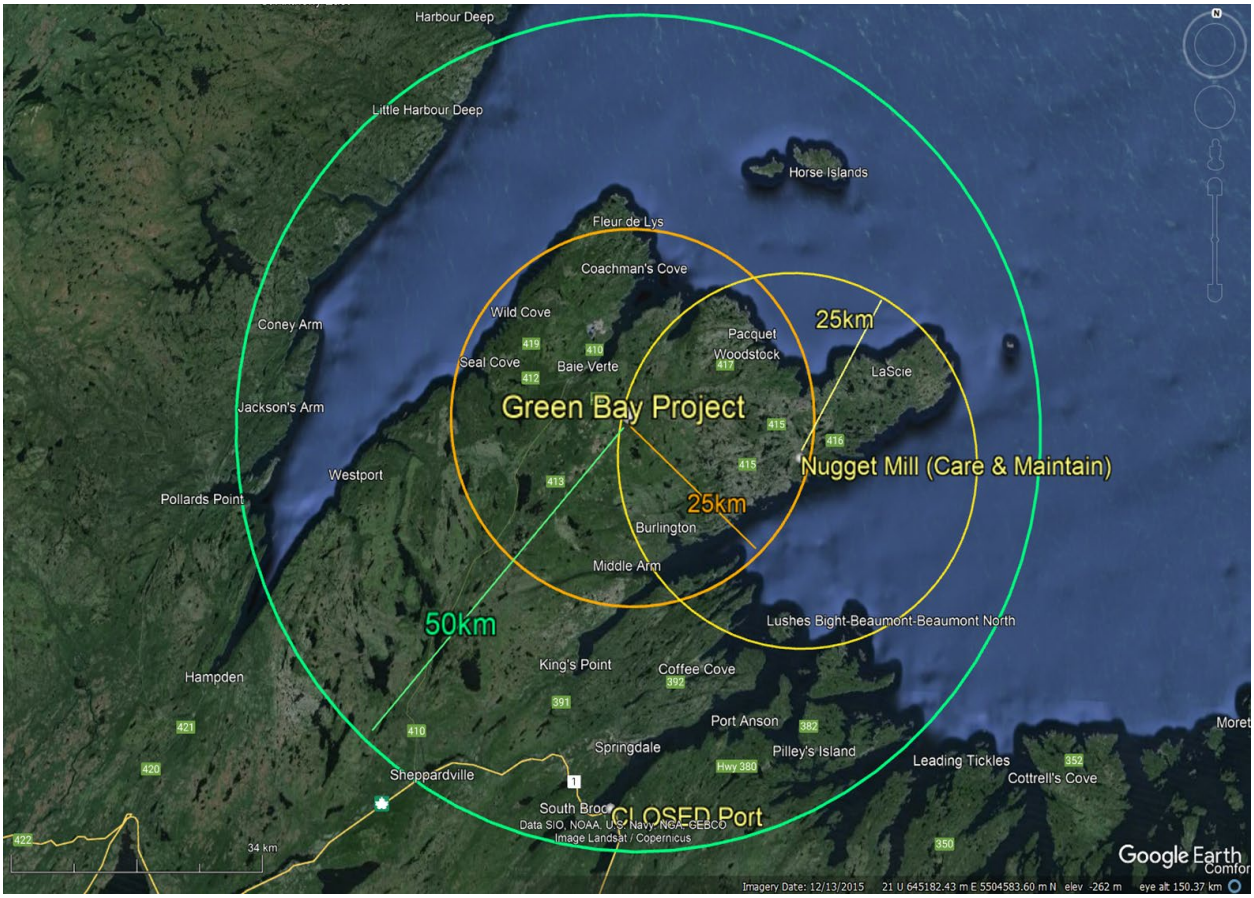


Figure 3.1.1 Stakeholder Mapping Including Nugget Pond Mill

Based on the stakeholder mapping, the initial engagement focused on the communities in Table 3.1.1. The nearest community from the Ming Mine by road and based on geographic proximity is Ming's Bight, followed by Baie Verte, Woodstock, Pacquet, Coachman's Cove, LaScie, Burlington, Seal Cove, Wild Cove, Fleur de Lys and Middle Arm. With the exception of LaScie, the communities identified are within the 50 km radius. They are all located within the Northern Newfoundland Watershed. Seal Cove and Wild Cove are located within the Southern and Eastern White Bay Sub-Watershed and the remainder of the communities are within the Western Notre Dame Bay Sub-Watershed (Table 3.1.1 and Figure 3.1.2). The Project has potential to interact with surface and groundwater and, therefore, is considered as part stakeholder mapping. Other effects (e.g., socio-economic, terrestrial and atmospheric) can occur outside of the watershed boundaries and therefore, the rationale to include most proximate communities that may fall outside of the watershed boundaries. The stakeholder mapping includes communities that have potential for direct and indirect interactions with the Project. Highway 410 is the only highway to access the Baie Verte Peninsula and is used by these communities, and is also used by the company, vendors, and contractors to access the Ming Mine.

Table 3.1.1 Communities Identified by Stakeholder Mapping

Name	Population (Census 2021)	Population (Census 2016)	Proximity[1] (km)	Proximity by Road[1] (km)	Sub-Watershed	Watershed	Current Road Use by Company[2] (Y/N)	Current Company Infrastructure (Y/N)	Employees Reside
Ming's Bight	298	319	7.0	8.0	Western Notre Dame Bay	Northern Newfoundland	Yes	No	Yes
Baie Verte	1,311	1,313	8.4	18.0	Western Notre Dame Bay	Northern Newfoundland	Yes	No	Yes
Woodstock	195	190	15.0	17.4	Western Notre Dame Bay	Northern Newfoundland	No	No	Yes
Pacquet	145	164	17.3	20.9	Western Notre Dame Bay	Northern Newfoundland	No	No	Yes
Coachman's Cove	111	105	16.6	38.3	Western Notre Dame Bay	Northern Newfoundland	No	No	Yes
LaScie	820	872	35.4	41.0	Western Notre Dame Bay	Northern Newfoundland	Yes	No	Yes
Burlington	304	314	18.5	48.2	Western Notre Dame Bay	Northern Newfoundland	No	No	Yes
Seal Cove	281	303	21.9	28.4	Southern and Eastern White Bay	Northern Newfoundland	Yes	Yes	Yes
Wild Cove	59	49	20.2	30.8	Southern and Eastern White Bay	Northern Newfoundland	Yes	No	Yes
Fleur de Lys	207	244	23.4	44.7	Western Notre Dame Bay	Northern Newfoundland	No	No	Yes
Middle Arm	443	474	23.4	56.2	Western Notre Dame Bay	Northern Newfoundland	No	No	Yes

Notes:

[1] Distances from Project centre

[2] Includes transport of goods and services

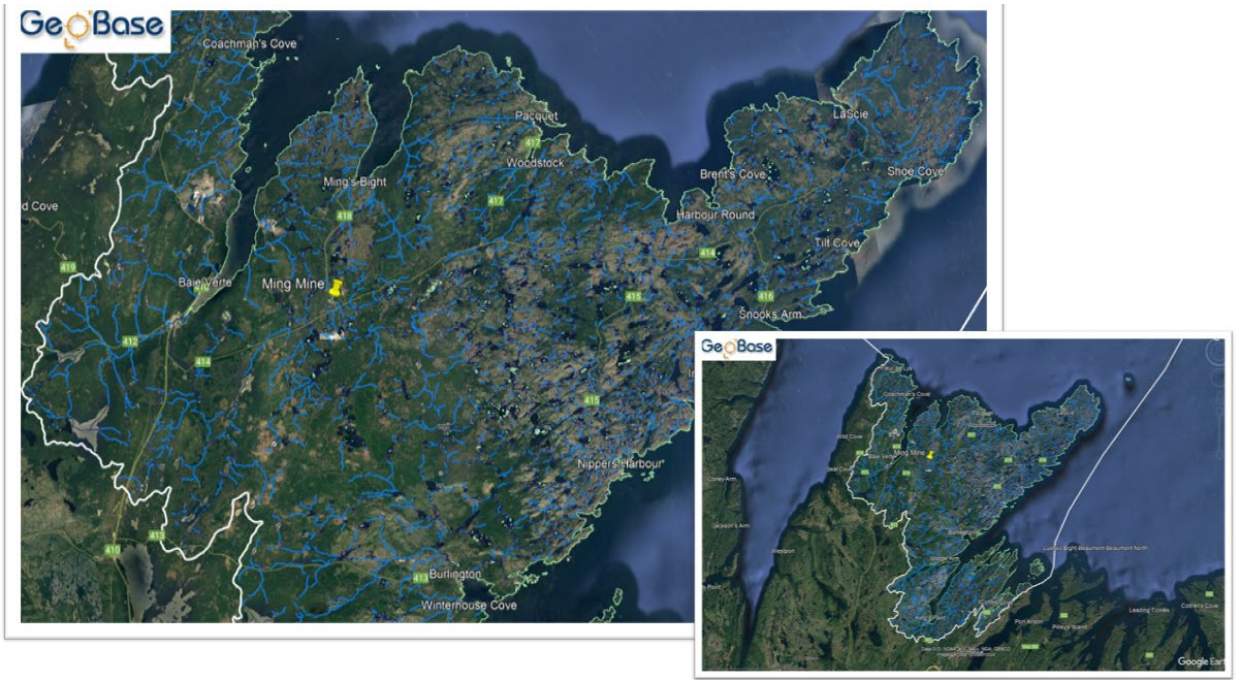


Figure 3.1.2 Communities Within the Same Watershed as the Project

FireFly's activities were not limited to engagement for the Project, but also included engagement in support of an exploration program that ran through the summer and into the fall of 2024. Engagement related to the exploration program expanded to include the communities of Springdale, and Coffee Cove, (Figure 3.1.1), as well as nearby Little Bay and Saint Patricks while exploration occurred in Whalesback and Little Deer. Although not directly related to the Project, building relationships with these communities is critical to building trust between the company and stakeholders, making sure people who can be influenced by our activities are informed, and part of the decision-making process to make our operation sustainable.

3.1.2.2 Framework for Engagement

At the early stages of the Project, prior to having the scoping studies and Project understanding, the focus of engagement was on repairing the damage done by the past operator, building relationships, and regaining trust. With the communities and stakeholders identified at this stage, FireFly focused on developing a communication strategy which considered the following factors:

- Timing and Type: Regular meetings, detailed briefings, and active involvement in decision-making processes
- Frequency: Periodic updates, formal reports, and occasional meetings
- Keep Informed: Newsletters, social media updates, public consultations, and community events
- Level of Effort: General communications and updates as needed

FireFly uses a mix of in-person meetings (various scales and types), virtual sessions, social media, and newsletters to reach a diversity of audiences. By using multiple channels, different segments of the community can be reached in ways that are most accessible and convenient for them, thereby increasing engagement and inclusivity.

In-person engagement methods used by FireFly included attending organization and community meetings, attending community events (parades, holiday events), school visits, hosted drop-in coffee meet and greets, formal in-person presentations, “pop up” information stands at stores and other key locations, and attending career fairs. A Land and Resource Use Survey (LRU Survey) was completed from August to September 2024; details of the LRU Survey are included in Section 6.7.

FireFly is active on social media, including Facebook, LinkedIn, Twitter/X, and Instagram. We have a community-based Facebook profile providing Project updates called “FireFly Newfoundland” with over 1,400 followers, and our corporate Facebook profile “FireFly Metals” has roughly 1,000 followers. On our FireFly Newfoundland profile, we post newsletters, community updates, exploration and site operational activities, promote and advertise FireFly events and share general updates on FireFly. We also established an email to receive feedback from community members (comments@fireflymetals.ca) to provide transparency and regular updates on Project progress and community initiatives. Keeping stakeholders informed about the Project's status and community-related activities helps to build trust and keeps everyone aligned with the Project's goals and developments.

3.1.2.3 Feedback, Monitoring and Reporting

FireFly established channels for receiving and addressing community feedback which included formal and informal ways for stakeholders to provide input, validating that their voices are heard, and that their concerns can be addressed promptly. At our in-person meetings, we provided comment cards, opportunities to ask questions, and provided the dedicated email address.

FireFly tracked engagement activities and outcomes, keeping detailed records of engagement efforts and feedback received. This includes documenting meetings, feedback received, and actions taken in response. Feedback received to date has helped inform Project design, types of engagement, frequency of engagement and overall effectiveness of the engagement strategy.

FireFly has a live Record of Engagement, which has been considered in the preparation of this Environmental Registration and will be used to report on progress and impact through annual sustainability reports. Regular reporting provides transparency and accountability, showing stakeholders how their input has influenced the Project and what progress has been made towards sustainability goals.

Through engagement efforts, FireFly has identified areas for Project and operation improvements. As well, how we engage communities is continually monitored and re-evaluated. The Engagement Plan is a living document that evolves as new information and feedback are received so that the strategy remains relevant and effective over time. FireFly fosters a culture of learning and adaptation within the organization. Encouraging a mindset of continuous improvement and flexibility helps the organization respond effectively to new challenges and opportunities, supporting long-term success and positive community relations.

3.1.3 Phase Two: Initial Engagement

The previous operator Rambler Metals and Mining assets entered the Sales and Investment Solicitation Process ("SISP") by the Supreme Court of Newfoundland and Labrador and the sale of the assets were approved under the *Companies Creditors Arrangement Act* ("CCAA") process. Following the conclusion of that process and review of claims, the Court distribution of the sale proceeds in accordance with the priority of the claims received. This process resulted in the payment to some businesses and organizations and not to others but settled the debts associated with the Rambler Metals and Mining assets.

FireFly recognized the financial and social impact the bankruptcy of the past operator, SISP and CCAA process had on communities and businesses locally and regionally. Immediately following the acquisition, FireFly's executive management team began meeting with effect groups and businesses. These meetings provided an opportunity for impacted parties to share the effect the SISP and CCAA process had on them and for FireFly to discuss the plans for the Project and collectively determine a path forward that was mutually beneficial. With the support of businesses and communities, exploration activities commenced at Ming Mine, providing positive financial and social effects to local communities and businesses that were negatively impacted by the past operator.

Phase Two of FireFly's community and stakeholder engagement plan focused on repairing, growing and strengthening relationships and understanding community interests and collective goals for communities listed in Table 3.1.1 from the Baie Verte Peninsula and vicinity. The FireFly team believes that being a good neighbour not only helps communities in the Baie Verte Peninsula, but it has a ripple effect that spreads positivity throughout communities which ultimately reaches our employees, and their families and makes everyone proud of their contribution to the region. Building this good neighbour culture improves community well-being, supports positive mental health, and typically improves employee retention and encourages others to join our team.

The purpose of Phase Two was to establish relationships, get feedback from communities and determine each community's level of interest. Engagement activities that occurred during Q4 2023 and Q1 2024 included:

- **Met with local businesses and municipalities:** Executive management team began meeting with effect groups and businesses and collectively determined a path forward that was mutually beneficial.
- **Developed a Community Facebook Page**: Created an individual page (not company-branded) to engage with the community.
- **Release 1st Edition Quarterly Newsletter**: Finalized and distributed the newsletter, introducing FireFly Metals Canada Ltd. and its initiatives.
- **Employee Communication**: Distributed an internal letter with corporate messaging.
- **Host Small-Scale Meet and Greet Events**: Organized events in Baie Verte, LaScie, and Ming's Bight to introduce the company and engage with the community.

- **Christmas Food Bank Initiative**: Partnered with local food banks in Ming's Bight and Baie Verte for a dollar-for-dollar contribution campaign.
- **Employee Christmas Lunch / Gathering**: Showed appreciation to employees with a Christmas lunch.
- **Engage with College of North Atlantic**: Discussed opportunities and synergies between the two organizations.
- **Release 2nd Edition Quarterly Newsletter**: Posted on the Community Facebook page and distributed by email to communities listed in Table 3.1.1.
- **Participated in Winter Community Events:** FireFly representatives attended a hockey and curling tournament at Baie Verte and LaScie Arena, engaging with residents and supporting local athletes.
- **Plan School Visit(s)**: Reached out to local schools to arrange visits in April or May and participate in careers fairs.
- **FireFly Volunteer Participation**: Encouraged management and employee team members to participate in community events or volunteer.

Table 3.1.2 provides a detailed chronological report on community engagement with the 11 communities in Table 3.1.1, including the locations of each engagement.

Table 3.1.2 Community Engagement Conducted during Phase Two

Community	Date	Method	Details
Ming's Bight	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	2-Dec-23	In-person	In-person social event (dart tournament and fundraiser)
	5-Dec-23	In-person	Public meet and greet at Townhall
	10-Jan-24	Email	Email offering regular meetings
Baie Verte	19-Oct-23	In-person	Public information session at Baie Vista (hotel in Baie Verte)
	27-Nov-23	Phone call	Phone call for introductions and upcoming event
	30-Nov-23	Email	Email invitation for Meet and Greet events
	2-Dec-23	In-person	Participation in a community parade
	4-Dec-23	In-person	Public meet and greet at Baie Vista (hotel in Baie Verte)
	7-Dec-23	In-person	Community event (food drive)
	8-Dec-23	In-person	Support for local senior men's hockey team
	8-Dec-23	In-person	Meeting at College of the North Atlantic Baie Verte Campus
	25-Feb-24	In-person	In-person social event (hockey game)

Table 3.1.2 Community Engagement Conducted during Phase Two

Community	Date	Method	Details
Woodstock	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	30-Nov-23	Phone call	Phone call returning email regarding Meet and Greet
	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	10-Jan-24	Email	Email suggesting an introductory meeting
	22-Jan-24	In-person	In-person meeting with Deputy Mayor
Pacquet	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	10-Jan-24	Email	Email suggesting an introductory meeting
	22-Jan-24	In-person	In-person meeting with Town Clerk
	5-Apr-24	Email	Email with 2nd Edition Newsletter and upcoming events
Coachman's Cove	27-Nov-23	Phone call	Phone call, no voicemail system
	30-Nov-23	Virtual	Facebook posting for Meet and Greet event
	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	18-Jan-24	Email	Email to council member for introductory meeting
LaScie	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	10-Jan-24	Email	Email exchange for introductory meeting
	25-Jan-24	In-person	In-person meeting with Mayor and Councillors
	9-Mar-24	In-person	Attended LaScie Curling Bonspiel
Burlington	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	4-Jan-24	Email	Email with holiday wishes and meeting interest
	10-Jan-24	Email	Email exchange for introductory meeting
	24-Jan-24	In-person	In-person meeting with Deputy Mayor and Councillors
Middle Arm	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	10-Jan-24	Email	Email exchange for introductory meeting
	24-Jan-24	In-person	In-person meeting with Town Clerk

Table 3.1.2 Community Engagement Conducted during Phase Two

Community	Date	Method	Details
Seal Cove	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	10-Jan-24	Email	Email exchange for introductory meeting
	22-Jan-24	Email	Email exchange confirming in-person meeting
	25-Jan-24	In-person	In-person meeting with Deputy Mayor and Councillors
Wild Cove	30-Nov-23	Email	Email invitation for Meet and Greet events
	10-Jan-24	Email	Email exchange looking for contacts
	24-Jan-24	Email	Email exchange confirming contact details
Fleur De Lys	27-Nov-23	Phone call	Phone call to introduce FireFly Metals
	30-Nov-23	Email	Email invitation for Meet and Greet events
	4-Jan-24	Phone call	Phone call with holiday wishes and meeting interest
	10-Jan-24	Email	Email exchange for introductory meeting
	23-Jan-24	In-person	In-person meeting with Mayor and Councillors
	5-Apr-24	Email	Email with 2nd Edition Newsletter and upcoming events

FireFly heard that communities want to receive updates, and each quarter, our newsletters are being sent by email to the primary contact in the municipal office of the community. A few municipalities had specific feedback during the initial meetings in January. We met with those communities who requested in-person meetings, shared our newsletter and contact details, and provided an update on the workplans for 2024. Table 3.1.3 provides some of the specific feedback received from these municipalities. Some municipalities such as Baie Verte, Ming's Bight, LaScie, Fleur De Lys, Burlington (and Middle Arm due to proximity) and Seal Cove (and Wild Cove due to proximity) noted that they would appreciate in-person meetings to hear major updates. At the "Meet and Greets" held on December 4 and 5, 2023, comment cards were available to allow participants to anonymously submit feedback about the company and our plans. A summary of the comments from each "Meet and Greet" information session are provided in Table 3.1.3.

Table 3.1.3 The Key Information Sessions and Meetings during this Phase– Summary of Comments

Activity	Date	Key Comments
Meet and Greet	Dec 4	Reopening of mine, timelines, employment and local economic opportunities
Meet and Greet	Dec 5	Reopening of mine, timelines and planning personnel direction based on restart of the mine
Municipal Meetings	Jan 22	Woodstock: timelines to restart the mine, provide regular updates
	Jan 22	Pacquet: COVID created financial hardships in community, municipality exploring wastewater and water treatment options, timelines to restart the mine, provide regular updates
	Jan 23	Fleur De Lys: The focus for the community is tourism, generating interest from the history of community, e.g. Dorset Quarry and museum. Also discussed geologists from Waterloo that will be staying in an upgraded Dorset building. Requested regular updates.
	Jan 24	Burlington: looking forward to mine reopening, timelines, Burlington is focused on growing tourism, build on success of last year's Come Home Festivals, develop more trails/ecotourism and other initiatives, provide regular updates
	Jan 24	Middle Arm: timelines for restart, provide updates
	Jan 25	La Scie: indicated their focus was rebuilding the fire hall that burned down, desire to attract more tourists, improve signage along highways and participate in the chamber of commerce. They also mentioned the upcoming curling bonspiel. Provide regular updates
	Jan 25	Seal Cove: the focus was building the potable water treatment refill station (H&R Culligan) and repairs to the dam for the town water supply. Pursuing tourism initiatives and will have Seal Cove day the last week of July. Provide updates, and FireFly confirmed they are keeping the building in Seal Cove used for housing during the pandemic. Provide regular updates

During the first “Meet and Greet” session (December 4, 2023), held in Baie Verte, 22 community members and 7 employees attended. The quarterly newsletter was handed out and a prize ballot for a chance to win a fuel gift card (17 community members participated in the draw). FireFly provided background information on the Green Bay Ming Mine Project, with a focus on exploration, building value and long-term plans, communicated our intention to provide regular updates to the community, and let attendees know how the Project is proceeding. Project timing and employment were primary topics of interest communicated by attendees. Specific questions from community members included:

- When will the site reopen for production?
- Hiring numbers if the new mine is built
- Timing for the different phases
- Suggestions to consider Little Deer and Whaleback
- Mention of a local dock to improve commerce and shipping in Baie Verte
- Discussion of keeping children home, sustainable operation, and working with the community to explore economic opportunities

On Tuesday, December 5, 2023, FireFly hosted another meet and greet at the Town Hall in Ming's Bight. There were 21 community members and 6 employees in attendance. Similarly to December 4, 2023, newsletters were handed out at this event. It was a less formal setting, with one-on-one conversations where people were more comfortable sharing their feedback. The main topics were hiring, how long exploration will take, and when will production restart. It was communicated to FireFly that many individuals wanted to plan their own future, and the timing of restart of production and hiring was important for them to understand.

Also during Phase Two, FireFly representatives began engaging in industry organizations, businesses and task forces. It was clear that many of these groups had similar goals and interests in the Baie Verte Peninsula and NL. FireFly continues to be part of several organizations so that we are well-informed about what is happening in the towns and in the province, to aid in our success, as well as the success of the area. These organizations include:

- **Representative on Women in Resource Development Corporation (WRDC) Board of Directors (BOD)** – will help us keep in tune with what is happening in the province with regards to women in resource development.
- **Representative on Canadian Manufacturers and Exporters (CME) BOD-** advocate for members interests, programs and services available to help business succeed.
- **CME Human Resources (HR) Committee Chairperson for Newfoundland** – Insight / collaboration with other business in NL as to how they are performing/dealing with issues such as recruitment and retention.
- **Representative on Central Continuous Improvement Network (CCIN) in Central NL** – community of businesses in Central NL committed to long term profitable growth through a culture of continuous improvement. Collaborate with each other sharing tools and learnings to accelerate our continuous improvement.
- **Member on Baie Verte and Area Chamber of Commerce** - Currently spearheading a taskforce (of which we have members) to better understand the community and regional capacity as it relates to mining. This will help determine where the focus needs to be on in the area and how to address it, to help the businesses and the community succeed (e.g., education, facilities, daycare, accommodations).

Although the primary goals of Phase Two were achieved, FireFly continues to build relations and assess the interests of communities, businesses and organizations through multiple communication channels. The communities identified in Table 3.1.1 during stakeholder mapping are dynamic and the list will change over the life of the Project as engagement progresses.

3.1.4 Phase Three: Initial Planning and Scoping Studies

The timeline for Phase Three was from April 2024 to the submission of this Environmental Registration. The objectives of this stage of engagement were to identify key areas of interest and valued components that could be directly or indirectly affected by the Project, and to present preliminary plans and scoping studies to the communities for input.

Managing expectations during this phase of engagement was crucial. We communicated to the communities that the Project was in the exploration stage to assess the resource, with no immediate plans to restart operation. During this time, scoping studies were being conducted, and the location of the infrastructure and the Project footprint were not yet finalized. FireFly took care not to raise expectations until the exploration results were received, interpreted, and confirmed.

On October 28, 2024, FireFly announced a 42 percent increase in the Mineral Resource Estimate ("Resource") for the larger Green Bay Copper Gold Project. The total Resource is now 59 metric tonnes (Mt) at 2% copper-equivalent (CuEq) for 1.2 Mt of contained metal. The Resource consists of two components, namely the Ming Mine (49.9Mt @ 2.0% CuEq) and the Little Deer deposit (9.1Mt @ 2.0% CuEq), both prepared per the Joint Ore Reserves Committee (JORC) Code (2012 Edition)[1].

The additional confidence and understanding of the Ming Deposit enabled FireFly to finalize the internal scoping studies and map out a pathway for the Project. The engagement expanded from local communities, groups and organizations to also include the provincial and federal governments. At this point the NL government provided direction on Indigenous Organization(s) to consult, and Qalipu First Nation was added to the stakeholder list in late November 2024. The community of Springdale was also included on the stakeholder list in December 2024, as we recognize many of our goods, services, employees and exploration activities have the potential to influence that community. A public information session day was scheduled in Springdale for January 2025.

Qalipu First Nation was invited in December 2024 to participate in the upcoming January information sessions and to inform their members who live in the Baie Verte Peninsula or use the area, of the January information sessions. A poster listing the dates, time and locations of the public information sessions was provided to Qalipu First Nation, who indicated they would publish the poster on their social media pages.

Engagement efforts for Phase Three included:

- April, May and June 2024
  - **Release 3rd Edition Quarterly Newsletter**: Posted on the Community Facebook page and distributed by email to communities listed in Table 3.1.1
  - **Open Houses**: Conducted a presentation and Project update in key communities and schools before summer holidays
  - **Participation**: Continued FireFly team involvement in community events or volunteer activities
  - **Advisory Committee**: Established an advisory committee with local community representatives to meet quarterly

[1] The JORC Code is the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. This is a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves (https://www.jorc.org/).

- July, August and September 2024
  - **Release 4th Edition Quarterly Newsletter**: Posted on the Community Facebook page and distributed by email to communities listed in Table 3.1.1
  - **Summer Event**: Organized an employee/community event during the summer
  - **Open Houses / Booths**: Was available to communities to discuss baseline activities and provide updates as needed
  - **Participation**: FireFly team involvement in community events or volunteer activities
- October, November and December 2024
  - **Release 5th Edition Quarterly Newsletter**: Posted on the Community Facebook page and distributed by email to communities listed in Table 3.1.1
  - **Road Show**: Conducted a presentation and Project update in key communities and schools in November
  - **School Events and Career Days**: Participated in school events and career days
  - **Canadian Institute of Mining, Metallurgy and Petroleum - Mineral Resources Review (CIM-MRR Attendance)**: Attended relevant conferences and events
  - **Christmas Event**: Organized or enrolled in a Christmas-related event, such as a food drive
  - **Participation:** FireFly team involvement in community events and volunteer activities
- January, February and March 2025
- **Release 6th Edition Quarterly Newsletter:** Posted on the Community Facebook page and distributed by email to communities listed in Table 3.1.1
- **Schedule Public Information Sessions:** Conducted six public information sessions in the communities of Baie Verte (2 Public Sessions), LaScie (1), Burlington (1), Ming's Bight (1) and Springdale (1)
- **Welcome Back** meetings (4 in total [1 per week per crew]) with the same Public Information Session information was presented to provide FireFly site workforce with updates on the Project
  - **Participation:** FireFly team involvement in community events or volunteer activities

Using the Phase Three strategy, FireFly implemented the consultation and engagement for this Phase. In addition to internal scoping studies, baseline field programs were being developed. FireFly used public information sessions, other events and feedback through email and social media to inform the baseline programs and preliminary planning for the Project. The specific feedback used is discussed in Section 2.13 (Alternatives for the Project).

Table 3.1.4 provides a detailed chronological report on community engagement with the communities listed in Table 3.1.1, as well as Qalipu First Nations and Springdale.

Table 3.1.4 Community Engagement Conducted during Phase Three

Date	Method	Details
5-Apr-24	Email	An email was sent to the communities listed in Table 3.1.1 sharing the third edition of the newsletter and announcing upcoming open houses and school visits
	Online	A Facebook post introduced the third edition of the quarterly newsletter, discussing FireFly's vision statement and progress on exploration
10-Apr-24	In-person	FireFly representatives attended the Chamber of Commerce annual general meeting in Baie Verte, presenting Project updates to 27 attendees
26-Apr-24	In-person	FireFly had a booth at the Central MinEx Industry Showcase in Gander, distributing brochures and engaging participants. Provided updates on the Project, focusing on environmental baseline, permitting and Project alternatives
30-Apr-24	Online	A Facebook post announced open houses to provide Project updates, with events held on May 2 in Ming's Bight, and May 6 and 7 in Baie Verte
1-May-24	In-person	FireFly representatives attended a Chamber of Commerce meeting in Baie Verte, discussing business developments
2-May-24	In-person	Public Information Session was held in Ming's Bight Townhall (evening) providing updates on the Project, focusing on environmental baseline, permitting and Project alternatives
	Virtual	FireFly participated in the CME HR Network Meeting online, discussing Project success strategies
6-May-24	In-person	Public Information Session was held in Baie Verte (evening) providing updates on the Project, focusing on environmental baseline, permitting and Project alternatives
7-May-24	In-person	Public Information Session was held in Baie Verte (daytime) providing updates on the Project, focusing on environmental baseline, permitting and Project alternatives
8-May-24	In-person	Attended Chamber of Commerce meeting in Baie Verte focused on economic development
22-May-24	Online	FireFly attended a BOD meeting for WRDC, discussing women in the workplace
23-May-24	Online	FireFly participated in a CCIN meeting, discussing HR improvements
29-May-24	In-person	FireFly presented at the Baie Verte Mining Conference, updating participants on the Project
11-Jun-24	Online	FireFly attended a CME BOD meeting, discussing company updates and planning
18-Jun-24	In-person	FireFly representatives visited the College of North Atlantic's Mine Engineering Technician class at the Corner Brook Campus, providing Project updates
19-Jun-24	Online	Attended WRDC BOD meeting focused on women in the workplace
26-Jun-24	In-person	FireFly attended a Chamber of Commerce meeting in Baie Verte, discussing economic development
11-Jul-24	In-person	FireFly participated in an Economic Development Committee Task Force roundtable in Baie Verte, discussing various community and economic topics
22-Jul-24	Email	An email was sent to communities in Table 3.1.1 on the Baie Verte Peninsula, sharing the fourth edition of the newsletter
24-Jul-24	Online	A Facebook post introduced the fourth edition of the quarterly newsletter
4-Aug-24	In-person	FireFly sponsored events at Spree By the Sea in Baie Verte, providing information to the local community

Table 3.1.4 Community Engagement Conducted during Phase Three

Date	Method	Details
16-Aug-24	Online	FireFly representatives met with the Deputy Minister of Rural and Regional Development, discussing economic development
2-Sep-24	Online	A Facebook post announced a regional exploration program in the Springdale area
11-Sep-24	In-person	FireFly attended a Chamber of Commerce meeting in Baie Verte, discussing economic development and the upcoming LRU Survey
17-Sep-24	Online	FireFly participated in a CCIN meeting, discussing HR improvements
18-Sep-24	In-person	FireFly attended an Immigration, Culture, and Intelligence Workshop in Springdale, discussing hiring foreign talent
19-Sep-24	Online	FireFly attended a CME BOD meeting, discussing company updates
	In-person	FireFly attended a Chamber of Commerce meeting in South Brook, discussing business support
25-Sep-24	In-person	FireFly representatives attended a career fair at College of the North Atlantic Corner Brook Campus, providing Project information to students
	Online	Attended WRDC BOD meeting focused on women in the workplace
26-Sep-24	Online	A Facebook post announced a land and resource use survey
8-Oct-24	Online	A Facebook post announced the LRU survey and upcoming community meetings
9-Oct-24	In-person	FireFly representatives engaged with residents at the Co-Op Grocery Store in Baie Verte, promoting the LRU survey
10-Oct-24	In-person	FireFly representatives engaged with residents at the UltraMar Gas Station and Co-Op Grocery Store in Baie Verte, promoting the LRU survey
15-Oct-24	Online	A Facebook post introduced the fifth edition of the quarterly newsletter
	Email	An email was sent to the communities in Table 3.1.1 on the Baie Verte Peninsula, sharing the fifth edition of the newsletter
18-Oct-24	Online	A Facebook post reminded followers to complete the LRU survey
23-Oct-24	In-person	FireFly representatives attended a community breakfast in Baie Verte, providing Project updates
	In-person	FireFly representatives attended a community luncheon in LaScie, providing Project updates
	Online	Attended WRDC BOD meeting focused on women in the workplace
24-Oct-24	Online	A Facebook post reminded followers to complete the LRU survey
5-Nov-24	In-person	FireFly representatives presented at the CIM-MRR conference in St. John's, discussing Project diversity
6-Nov-24	In-person Online	FireFly engaged with attendees at the CIM-MRR conference and posted updates on social media
7-Nov-24	In-person	FireFly representatives presented Project updates at the CIM-MRR conference
27-Nov-24	Online	FireFly attended the WRDC annual general meeting, discussing women in resource development
28-Nov-24	In-person	FireFly participated in a panel discussion at the CME conference in St. John's, focusing on recruitment and retention
14-Dec-24	Online	Facebook post of upcoming information sessions in January

Table 3.1.4 Community Engagement Conducted during Phase Three

Date	Method	Details
1-Jan-25	Online	Facebook post announcing Public Information Sessions in January. Poster includes dates, time, and location.
5-Jan-25	Online	A Facebook post introduced the sixth edition of the quarterly newsletter
7-Jan-25	Email	An email was sent to the communities in Table 3.1.1 on the Baie Verte Peninsula, sharing the sixth edition of the newsletter
5-Jan-25	Online	A Facebook post introduced the sixth edition of the quarterly newsletter
3-Jan-25	Public Postings	Placed the poster with public information session notices on the community bulletin board and Town hall and local grocery/convenience stores in Baie Verte, Ming's Bight, LaScie, Burlington and Springdale.
15-Jan-25	Online	Reminder of the Public Information Sessions in January. Poster includes dates, time and location.
16-Jan-25	In-person	Hosted Public Information sessions in Baie Verte (day time)
	In-person	Hosted Public Information sessions in Baie Verte (evening)
17-Jan-25	In-person	Hosted Public Information session in LaScie (evening)
20-Jan-25	In-person	Hosted Public Information session in Ming's Bight (evening)
21-Jan-25	In-person	Hosted Public Information session in Burlington/Middle Arm(evening)
22-Jan-25	In-person	Hosted Public Information session in Springdale (evening)
6-Feb-25	In-person	FireFly attended NL Futures meeting, providing input regarding labour market issues, productivity, and rural/regional development capacity
12-Feb-25	Online	FireFly member on BoD for Women in Resource Development and provided updates on the Project
13-Feb-25	Online	Facebook posting about Regional Exploration and throughout the month of February postings regarding corporate presentations with Project updates
2-Mar-25	In-Person	FireFly attended the Prospectors and Developers Association Conference in Toronto, Ontario. Two presentations were made, and pamphlets were provided with Project updates to attendees (government, vendors, prospectors and businesses)
14-Mar-25	Online	Facebook posting about Regional Exploration and throughout the month of February postings regarding corporate presentations with Project updates

The key events in Phase Three were attending the Baie Verte Chamber of Commerce and Task Force meetings, the public information sessions held in May 2024 and January 2025, attending Central MinEX (Gander) and CIM MRR (St. John's), and the pop-up information booths in September to promote the LRU Survey. At these events, FireFly provided a PowerPoint presentation with an update on the Project to attendees, handed out newsletters, and discussed the baseline studies, Project alternatives and options, and the scoping studies underway.

From April to September 2024, the results from community feedback and preliminary baseline information informed the location of the Project infrastructure, such as the preferred location of the TMF, the process plant and other corridors and buildings associated with the Project. Valued components were also identified during these public information sessions.

Based on community feedback, FireFly focused on the following factors for the design of the Project:

- Use the current disturbed areas around Ming Mine for new infrastructure
- Focus on keeping a small disturbance footprint and avoiding sensitive features, habitats and land uses where possible
- Use legacy contaminated basins (e.g., South Brook / Old Rambler Tailings where possible)
- Avoid disturbing new fish habitat
- Preferred TMF Options: Old Rambler, South Brook Basine, West Ming, or use of existing TMF / Industrial Site

The alternatives for the Project are discussed in detail in Section 2.13 and key comments from Phase Three Consultation and Engagement are provided in Table 3.1.5. Additional details around consultation and engagement are provided in the LRU Survey Report provided in Appendix 6.G, which also describes in detail the feedback and findings of the LRU survey. Overall, of the 418 households who completed the LRU survey, the Project has 99.5% support and approximately 71% of participants indicated they had been engaged on the Project through updates, community events and/or open houses.

Table 3.1.5 The Key Information Sessions and Meetings during this Phase– Summary of Comments

Activity	Date	Key Comments
Chamber of Commerce Annual General Meeting Baie Verte	April 10, 2024	Provided an update on the Project to attendees, key feedback focused on employment numbers, partnerships and economic opportunities, use of college campus, filling vacancies/using old buildings in communities and timelines
Central MinEx Industry Showcase	April 26, 2024	Provided a PowerPoint update on the Project to attendees, handed out pamphlets, and discussed project alternatives and options and studies underway. The feedback focused on timelines and employment numbers.
School Visits	May 1, 2 and 6, 2024	Visited M.S.B School on May 1, 2024, Copper Ridge Academy Baie Verte on May 2, 2024, and attended the regional career fair at Cape John Collegiate in LaScie on May 6, 2024. Shared newsletters, Project updates, illustrated the Project alternatives and discussed career opportunities with students, educators and other attendees. The feedback was focused on employment, timelines and different types of jobs in mining.
Public Information Session – Ming's Bight	May 2, 2024	Provided a PowerPoint update on the Project to attendees, handed out pamphlets, and discussed project alternatives and options and studies underway. Five comment cards provided feedback on the preferred TMF location: South Brook or Old Rambler. Topics raised included skidoo trails, cottages, fish habitat, keeping tailings in already disturbed areas, staying operational (employment opportunities)

Table 3.1.5 The Key Information Sessions and Meetings during this Phase– Summary of Comments

Activity	Date	Key Comments
Public Information Session – Baie Verte	May 6 and 7, 2024	Eight comment cards provided feedback on preferred TMF location: South Brook, Old Rambler, Ming West. Topics raised included restoration of South Brook River and keeping the community informed.
Info Booths – LRU Survey	Oct 9 and 10, 2024	11am to 2pm and 5pm to 7pm Co-op and 6am to 8am at Ultra Mar – info booths were set up. The booth included table, newsletters and FireFly reps greeted customers as they came into the store, explained the LRU survey and gave copies of the survey either QR code/website or hard copies with prepaid envelops to complete the survey. Also had a laptop computer to assist participants in completing the LRU survey.
CIM MRR	Nov 5 to 8, 2024	PowerPoint presentation with Project update, resource announcement and booth at the event to engage attendees. Comments focused on timelines, geology, employment numbers and business opportunities
Public Information Session – Baie Verte (Day 2pm to 3pm and Night 6pm to 7pm)	January 16, 2025	A PowerPoint presentation with the Project update was provided. Comments cards, newsletters, business cards and sign in book were available. The presentation was roughly 30 minutes with another 30 minutes of questions and answers at end. For both sessions a total of 32 people attended during the day and 10 people attended the evening session. The questions focused on Project timelines, availability of technical studies, number of jobs, and next steps were key topics for questions and answers. One participant had questions regarding their cottage north of the Project site. Reps from the Town of Baie Verte requested a map of the Project footprint. One comment card from the day session and one from the night session received. The question was regarding available childcare for female workforce and supporting community infrastructure.
Public Information Session – LaScie (night 6pm to 7pm)	January 17, 2025	A PowerPoint presentation with the Project update was provided. Comments cards, newsletters, business cards and sign in book were available. The presentation was roughly 30 minutes with another 30 minutes of questions and answers at end. A total of 9 people attended the session. The focus of the questions was around timelines for the Project, number of jobs, types of jobs and training. No comment cards were received.
Public Information Session – Ming's Bight (night 6pm to 7pm)	January 20, 2025	A PowerPoint presentation with the Project update was provided. Comments cards, newsletters, business cards and sign in book were available. The presentation was roughly 30 minutes with another 30 minutes of questions and answers at end. A total of 6 people attended the session. The focus of the questions was around timelines for the Project, number of jobs, types of jobs and the access road as one individual harvested timber in the area. Through the discussion it was determined that the road would not impact their timber harvesting. No comment cards were received.

Table 3.1.5 The Key Information Sessions and Meetings during this Phase– Summary of Comments

Activity	Date	Key Comments
Public Information Session – Burlington (night) 6pm to 7pm	January 21, 2025	A PowerPoint presentation with the Project update was provided. Comments cards, newsletters, business cards and sign in book were available. The presentation was roughly 30 minutes with another 30 minutes of questions and answers at end. A total of 15 people attended the session. The majority of the questions focused on power supply, availability of the registration document, technical studies, project timelines and jobs. The mayor of Burlington requested a copy of the presentation. No comment cards were received.
Public Information Session – Springdale (night) 6pm to 7pm	January 22, 2025	A PowerPoint presentation with the Project update was provided. Comments cards, newsletters, business cards and sign in book were available. The presentation was roughly 30 minutes with another 30 minutes of questions and answers at end. A total of 32 people attended the session. The majority of the questions focused on availability of the registration document, technical studies, project timelines, jobs, availability of local workforce, and accommodations. No comment cards were received.

3.1.5 Phase Four: Detailed Design, EA and Permitting Engagement

As part of Phase 4 engagement activities, FireFly is committed to ongoing engagement during and beyond EA approval and throughout the environmental permitting process. The overall objective of Phase 4 engagement is to seek support from communities on required permits, mitigation measures and the environmental monitoring approach. Information sharing will occur through a variety of methods and will be focused on promoting the following key values:

- **Communities** (Municipal, Indigenous Organizations and Groups): Continue to inform the Project's detailed design through consideration of the LRU survey results and feedback gathered through various communication and engagement channels. Support local community initiatives.
- **Land and Resources:** FireFly will be establishing access roads and corridors, which were designed and will be constructed to reduce impact to land and resource users. Public and employee safety is paramount, in most cases these access corridors will not be open to the public, however where safe to do so, we will work with land and resource users to provide access to important roads, waterways and forest resources.
- **Training and Education**: Collaborate with local taskforce and education providers to begin drafting education and training programs to build capacity and increase employability and job-ready skills. Proactively seek employment opportunities for local community members.
- **Jobs and Contracts:** Work with economic development groups to increase contracting opportunities for local businesses.
- **Environmental Protection:** Undertake environmental projects (e.g. local habitat restoration, garbage clean-ups, recycling programs) with direct community interests and support.

Phase 4 of Project consultation and engagement will include a series of collaborative meetings, as well as associated information sessions and release of public updates, which will be developed and held throughout 2025 and into 2026. The identified milestones for this phase of consultation and engagement are tied to regulatory approvals and Project design decisions. The following key milestones are identified for Phase 4 of the Project:

- **EA:** Throughout the remainder of the EA process, active engagement will continue with those communities, groups or organizations who have requested more regular updates or who have provided comments that need to be addressed. The feedback at this stage of the Project design will allow for robust protection of the environment and strengthened benefits to local communities.
- **Closure Planning:** A closure plan was filed for the larger Green Bay Copper-Gold Project; however, a specific plan will be prepared for the Project. FireFly will host information sessions to present the closure plan concept, to allow for information sharing and participation by communities. The rehabilitation and closure plan will be prepared considering the feedback received.
- **Certificate of Approval**: FireFly is committed to the protection of regional water and air quality and looking for opportunities to reduce greenhouse gas emissions and improve water quality that has been impacted by legacy mining activities. FireFly has included a wastewater management plant in the design of the Project and are reviewing opportunities to incorporate clean technologies to reduce emissions. We will continue to seek feedback from communities and organizations regarding the options for the Project.

FireFly is committed to engaging communities for support with permit applications and environmental management strategies. We focus on transparent information sharing, active involvement, and continuous adaptive management throughout these key milestones and permits.

3.1.6 Phase Five: Ongoing Engagement over Life of Mine

Following the EA and permitting process (Phase Four), FireFly will continue to actively consult with the public and stakeholder organizations throughout the life of the Project.

Key objectives of ongoing engagement with Project Stakeholders will include:

- Providing transparency about the Project's environmental management and social responsibility, long-term monitoring, and reclamation
- Providing opportunities to identify and resolve issues collaboratively
- Exploring opportunities related to employment, economic benefits, and community benefits that contribute to the broader community objectives

Ongoing engagement activities with communities will expand to include an updated website. We will continue to be active on social media and provide regular updates through our quarterly newsletters or social media posts. Notifications for future engagement activities will be published online, advertised through other available media or posted on community bulletin boards.

Throughout the life of the Project, FireFly will continue to welcome and address comments received on its website, through social media, by mail and email, and through public consultation at its office at the Project site. FireFly will continue to engage with local residents, Crown land title owners, cottage owners, and other recreational users regarding the Project, including the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them.

3.1.7 Summary of Issues and Concerns Raised During Engagement

In general, community feedback received to date has been positive, with perceived benefits in improved infrastructure, investment in local communities, increase in local, regional and provincial employment, and support for local businesses and organizations. Concerns raised during engagement is provided in Table 3.1.6, together with FireFly's response and the associated EIS reference.

Table 3.1.6 Summary of Issues and Concerns Raised During Engagement

Issue / Concern	FireFly's Response / Action / Mitigation	Registration Reference
Reduce Project footprint, using current disturbed areas where possible and avoid sensitive features, and habitats.	During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including area of vegetation clearing. Existing disturbed areas were incorporated into the Project Area to accommodate Project components and, where possible, to reduce direct effects on forest cover and other vegetation communities. Standard construction best practices will be used during the site preparation and construction phase to reduce potential negative interactions on vegetation, wildlife, and their habitats, including wetlands. Potential effects to vegetation, wetlands and wildlife are discussed in Section 6.5. With the implementation of mitigation measures (described in Section 6.5.3), Project-related residual effects are not expected to be significant.	Section 6.5
History of concerns associated with the mine's former project management	As noted above, FireFly recognized the financial and social impact the bankruptcy of the past operator, SISP and CCAA process had on communities and businesses locally and regionally. Immediately following the acquisition, FireFly's executive management team began meeting with affected groups and businesses. These meetings provided an opportunity for impacted parties to share the effect the SISP and CCAA process had on them and for FireFly to discuss the plans for the Project and collectively determine a path forward that was mutually beneficial. With the support of businesses and communities, exploration activities commenced at Ming Mine, ensuring positive financial and social effects are focused on local communities and businesses that were negatively impacted by the past operator.	Section 3.1.2
Use legacy contaminated basins (e.g., South Brook / Old Rambler Tailings where possible)	The preferred option for the TMF was immediately adjacent to the South Brook basin. FireFly will assess options, and will work with NL Department of Industry, Energy and Technology to conduct studies to determine if Old Rambler Tailings are a viable source to generate paste. If so, the legacy tailings maybe used to fill voids in the underground mine, allowing the Old Rambler Tailings to be submerged reducing metal leaching. acid rock drainage potential.	Section 2.13

Table 3.1.6 Summary of Issues and Concerns Raised During Engagement

Issue / Concern	FireFly's Response / Action / Mitigation	Registration Reference
Potential need to outsource employment opportunities due to a lack of local, regional or provincial workforce	Employing most of the workforce from NL is a priority for FireFly. As detailed in Section 6.6.4.1.1, FireFly has reviewed current operations and future projects labour requirements, and the overall demand for skilled labour in the region will be high. The competition from other mining operations and advancing projects, exploration activities, and competing industries will make it challenging to achieve over 60% NL employment during construction. During construction, it is anticipated that 20% will be local workforce, 40% from within the province and 40% to come from out of province. FireFly anticipates being able to hire 60% from the local workforce and 20% outside the local workforce but within the province for operation, with the remaining 20% expected to come from out of province. During consultation and engagement for the Project, FireFly heard that many skilled mine workers who were displaced from recent mine closures in the province have found employment outside the province and work away from home and the Baie Verte Peninsula via Fly In-Fly Out work arrangements. Several of these workers attended the public sessions and the desire to avail of employment opportunities near their home and their families was a recurring theme identified from the public. FireFly has also developed a common core program to provide people with the tools, training (including on-the-job training), and information required for successful employee performance. FireFly is focused on strengthening, mentoring and coaching structures that provide employees with the knowledge, skills and motivation to accomplish short and long terms goals within the industry. There are annual opportunities for apprenticeships, co-op positions and internships including opportunities to continue working for FireFly once a role is complete. FireFly has ongoing communication with relevant institutions, such as Trades NL and the Office to Advance Women Apprentices, to have information readily available regarding potential employees that have completed their apprenticeships and are available for work.	Section 2.9.1 Section 6.6
Potential lack of community infrastructure for increased workforce	With respect to the potential effects of the Project labour force on accommodations, during all Project phases, an accommodation complex located 1.5 km from the Project site will be available to house non-local workers. It is anticipated that the complex will fully accommodate FireFly's non-local rotational employees during the peak of the construction and operation phases. Additionally, FireFly's commitment to hire most of the Project labour force from local communities will reduce demands on housing and temporary accommodations, as well as other community services and infrastructure, such as health and education. Project vehicles will increase use of local roadways, which have historically been in poor condition; however, funding has been allocated by the provincial government for improvements to the highway in the region and FireFly will implement measures to reduce Project traffic through its Traffic Management Plan. In addition, the addition of a port access road will reduce Project-related traffic on local roads and highways. As a result, there may be a change in use of local infrastructure and services, but that level of use will be within their existing capacity. An assessment on infrastructure and services is provided in Section 6.6.	Section 6.6

Table 3.1.6 Summary of Issues and Concerns Raised During Engagement

Issue / Concern	FireFly's Response / Action / Mitigation	Registration Reference
Potential for deteriorating road conditions, particularly in relation to Highways 414 and 418 due to heavy truck traffic Potential for increased traffic and travel impediments	Project vehicles will increase use of local roadways, which have historically been in poor condition; however, funding has been allocated by the provincial government for improvements to the highway in the region and FireFly will implement measures to reduce Project traffic through its Traffic Management Plan. In addition, FireFly has incorporated a port access road into their Project design to limit Project-related traffic along public roads and highways. Vehicle traffic volumes will also be managed through traffic management measures, which will include the provision of shuttles or bus services at commuter pick up locations. FireFly will have a bus to take workers from the accommodation complex to the mine site. Carpooling will also be encouraged among local employees. It is anticipated that construction and operation will generate 100 passenger vehicles each day with peak traffic during day and night shift changes and rotation changes. Most of the traffic will be workers traveling to and from the site at the start and end of their shifts, with some general freight and equipment transport vehicles accessing the site throughout the day. The truck traffic will be primarily restricted to Highway 414 and Highway 418. The shift changes will likely occur during periods of the day that are outside of the regular work or school day, early in the morning or later in the evening, so an increase in traffic in local communities may not be apparent to the residents. An assessment on infrastructure and services is provided in Section 6.6.	Section 6.6
Concern for potential impacts to surface water and groundwater, and subsequent residual effects to vegetation and wildlife	VCs are assessed in Section 6. The environmental assessment predicts that Project activities will not cause significant adverse environmental effects on any of the VCs, including surface water resources, groundwater resources and the terrestrial environment.	Section 6.2 Section 6.3 Section 6.5
Potential disruption of recreational activities, including hunting and fishing activities in the LRU Survey Study Area	The Project is located in a remote area at an existing mine site, which is reflective of the low levels of resource and recreational use in the Project Area. Based on the LRU survey, limited resource and recreational use occurs within the Project Area (less than 5% of participants indicated that the Project Area is used for harvesting purposes). It is therefore presumed that historical and ongoing mining activity in the Project Area have altered the land use, leading hunting, trapping and fishing and other recreational activities to shift to other areas in the region. Given the long history of mining on the Baie Verte Peninsula and the current mining and exploration activities at the Ming Mine site, the expansion Project and associated activities align with ongoing activities in the region. As discussed further in Section 6.7, it is predicted that hunting, trapping, and fishing activities, as well as recreational activities in the region will be able to continue at or near current levels.	Section 6.7

3.2 Regulatory Engagement

Regulatory consultation has been ongoing in support of the existing mine for many years. Since FireFly became owner in 2023, FireFly began consultation on the Project in February 2024. FireFly first initiated consultation with government to obtain feedback on baseline studies being conducted in 2024. They also consulted EA Division in July 2024 to understand the best method to communicate the conceptual design of the Project and advise of their intent to register the Project. Following advice from EA Division, FireFly organized a meeting with applicable provincial and federal regulators on November 4, 2024. The purpose of the meeting was to present the Project concept and to request information and guidance from regulators to assist in preparation of this Environmental Registration. At this meeting, FireFly presented the Project as currently designed. Representatives of the provincial and federal departments asked questions about the Project and highlighted, from their department's perspective, key aspects and concerns upon which FireFly should focus the assessment.

FireFly continued to meet with representatives from individual departments and agencies. FireFly met with the Climate Change Branch on November 21, 2024, the Pollution Prevention Division and Water Resources Management Division on November 28, 2024, and the Wildlife Division on November 29, 2024. These meetings were focused on seeking guidance on various technical components. Outcomes of regulatory consultation to date have been incorporated as applicable throughout this Environmental Registration, including in VC selection, approach to baseline studies, proposed mitigation measures, and focus of the various VC assessments.

FireFly met with Impact Assessment Agency of Canada (IAAC) on December 19, 2024, and provided a similar presentation to what was presented to regulators on November 4, 2024. The intent of the meeting was to discuss the the *Physical Activities Regulations* (the Project List) and potential triggers under the *Impact Assessment Act* S.C. 2019, c. 28, s. 1 (the IAA). The components of the Project were discussed, outlining that the new mill being proposed will not have an ore input capacity of 5,000 tonnes per day or more. Although the expansion would result in the area of mining operation increasing above the 50% threshold, the total ore production capacity for the expanded operation does not exceed 5,000 tonnes per day. The Project therefore does not satisfy both requirements of section 19c) on the Project List or the requirements of section 18d) and would therefore not be classified as a Designated Project under the IAA.

During the meeting, the IAAC requested that FireFly confirm whether the Project could trigger other Physical Activities on the Project List. The Project will not require a water diversion or water projects (sections 58, 59, 60, or 61) and does not propose a new or expansion to an existing marine terminal (sections 52 and 53). As discussed, Pine Cove Port, which is owned and operated by a third party, will be used as a port and has the capacity in its current state to ship concentrate generated by the Project. The TMF structure will be on land immediately west of the Ming Mine and does not trigger sections related to water projects in the Project List. IAAC also stated they wanted a letter providing a summary of the Project with enough detail to confirm the Project does not trigger Physical Activities on the Project List and not fall under the IAA. On February 6, 2025, FireFly submitted a letter to IAAC with a summary of the Project and responded to questions from IAAC on February 26, 2025. After reviewing the information provided IAAC issued a letter stating "Based on the information provided to IAAC regarding the Project, it

is IAAC's view that the Project is not a designated project as described in the Regulations. As a result, you are not required to submit an Initial Project Description to IAAC." (Appendix 1.B). The Project is not subject to the requirements of the IAA.

FireFly will continue to consult with government departments and agencies throughout the EA review process and during preparation of follow-up and monitoring programs. To date, the following provincial and federal government departments have been involved in regulatory consultation on the Project:

- Government of NL
  - Department of Industry, Energy and Technology
    - Mineral Development
  - Department of Fisheries, Forestry and Agriculture
    - Wildlife Division
  - Department of Environment, Climate Change and Municipalities
    - Environmental Assessment Division
    - Climate Change Branch
    - Pollution Prevention Division
    - Water Resources Management Division
  - Department of Health and Community Services
  - Indigenous Affairs and Reconciliation
- Government of Canada
  - IAAC
  - Fisheries and Oceans Canada
  - Environment and Climate Change Canada

4 Environmental Setting and Potential Resource Conflicts

4.1 Environmental Setting

The Project is located in a rural area in Northern Newfoundland, on the Baie Verte Peninsula, approximately 8.5 kilometres (km) from Mings Bight, accessed via Route 414 (Figure 4.1.1). The Baie Verte Peninsula is sparsely populated with small towns, the largest of which is the town of Baie Verte, located approximately 18 km from the Project (by road). The Baie Verte Peninsula has a long history of mining, with activity dating from the late nineteenth century due to the extensive presence of mineral deposits found in the area. In addition to mining activity, there are several small commercial and local businesses, fishery and fish harvesters, logging and sawmill operations, and forestry activities.

An overview of the biophysical and socio-economic environmental settings is provided below. Detailed environmental conditions are provided in the respective valued component (VC sections).

4.1.1 Physical Environment

The Project is located near the border of the Central Newfoundland Forest (CNF) - Northcentral Subregion and the North Shore Forest Ecoregion, two of nine ecoregions on the Island of Newfoundland (Newfoundland and Labrador (NL) Department of Fisheries and Land Resources [NLDFLR] 2019). The climate in the CNF and North Shore Forest ecoregions is the most continental out of the nine ecoregions. The CNF ecoregion is generally drier and warmer than in other ecoregions on the island. Summer conditions generally occur from late June through early September, with historical average temperatures ranging from 10ºC to 15ºC (Environment and Natural Resources [ENR] 2021). Winter conditions generally persist from November to late March, with historical (1984-2007) average temperatures below zero throughout this period (ENR 2021). Spring and fall conditions are generally cool with frequent periods of rain. Average annual precipitation is approximately 900 to 1,200 millimetres (ENR 2021, Meades 1990a).

In 2016, ambient air quality monitoring was conducted in Baie Verte, NL, at two locations located upwind of Ming Mine and Nugget Pond. There were no exceedances of the provincial 24-hour air quality standards during the 13 24-hour monitoring periods. Ambient air quality monitoring was conducted within the Project Area for eight days over the period from July 11 to September 23, 2024, with measured concentrations below the regulatory standards, with the exception of the occasional exceedance of particulate matter. Occasionally, the concentration of air contaminants may be temporarily elevated and localized for a short period of time.

Sound levels in a rural environment are likely to be dominated by natural phenomena or activities, such as wind, rain, and wildlife. Sound pressure levels depend upon the distance from the source and the acoustic characteristics of the area in which it is located. In the Project Area, these are expected to be low as well most of the time. Local sources of sound may include forestry and exploration activities, vehicles, generators, snowmobiles / all-terrain vehicles, or recreational boat engines. These activities and sources are not likely to exceed regulatory thresholds.

Figure No.
4.1.1
Title
Environmental Setting

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_1_004

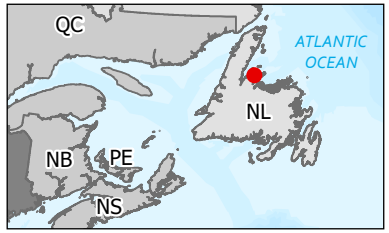
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-04
Revised 2025-03-19

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:120,000

- Project Area
- Trimms Brook Watershed
- South Brook Watershed
- Dam
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, GEMTEC, McConnel, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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The Project is primarily located in the South Brook Watershed, with a total area of approximately 116.4 square kilometres (km²). An alternative location for taking water is proposed at Three Corner Pond. If used a corridor and water intake from the Project would be situated in the Trimms Brook Watershed, which has a total area of 12.5 km² (Figure 4.1.1). The South Brook Watershed flows into Baie Verte and the Atlantic Ocean. Three Corner Pond is located in the headwaters of the Trimms Brook Watershed and flows through Kidney Pond and Trimms Brook into Mings Bight and then the Atlantic Ocean. The Project Area contains numerous ponds and streams; many are situated downstream of historical mining activities and tailings areas are contaminated and contain low pH and elevated concentrations of metals including arsenic, copper, lead, nickel and zinc (GEMTEC 2019; Stantec 2013, 2016, 2019). The substrate of ponds typically includes mostly fines with smaller quantities of coarse material (AMEC 2008). Ponds also include sparse amounts of aquatic vegetation. Streams are typically slow-moving steady habitats with predominantly fine substrates (AMEC 2008; Stantec 2013, 2016, 2019). The ponds and streams that are upstream or up gradient of historical mining activities and tailings contain neutral pH and concentrations of arsenic, copper, lead, nickel, and zinc that were not detectable (AMEC 2008).

4.1.2 Biological Environment

The North Shore Forest Ecoregion includes the coastal area of the Baie Verte Peninsula and is characterized by rugged terrain and elevations of up to 315 metres above sea level (NLDFLR 2019). Balsam fir and black spruce forests predominate the terrain of the North Shore Forest, with barrens dominating the coastal areas. The Northcentral Subregion of the CNF is characterized by a rolling topography, where terrain (i.e., topography and landforms) varies and includes boggy areas and moss-dominated forests. Scattered wetlands, specifically fens, are common in the Project Area and surrounding areas.

This region provides habitat for a variety of wildlife mammal species commonly found in the boreal forest on the Island of Newfoundland. Several wildlife species (e.g., large and small mammals, furbearers) are expected to occur in or near the Project Area including moose (*Alces alces*), black bear (*Ursus americanus*), Canada lynx (*Lynx canadensis*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), American marten (*Martes americana atrata*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), ermine (*Mustela erminea*), mink (*Neovison vison*), river otter (*Lontra canadensis*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), southern red-backed vole (*Myodes gapperi*), northern myotis (*Myotis septentrionalis*), and little brown myotis (*Myotis lucifugus*) (Meades 1990a, 1990b). The Project falls within the Baie Verte Newfoundland Moose Management Area 14.

This list includes three species at risk (SAR) that occur in or near the Project Area: American marten, little brown myotis, and northern myotis. There are also three species of migratory bats (hoary bat [*Lasiurus cinereus*], eastern red bat [*Lasiurus borealis*], and silver-haired bat [*Lasionycteris noctivagans*]), recently listed as Endangered under the NL *Endangered Species Act*, that may occur in the area during migration. Caribou (*Rangifer tarandus*), listed as Special Concern on Schedule 1 of the *Species at Risk Act*, is unlikely to occur on the Baie Verte Peninsula based on historical year-round caribou distributions (i.e., collar data and seasonal ranges) on the Island of Newfoundland (Weir et al. 2014, Government of NL 2015).

Avifauna common to the ecoregion(s) include shorebirds, waterfowl / waterbirds, landbirds (e.g., migratory passerines), and raptors. Avifauna SAR that may occur in the area include olive-sided flycatcher (*Contopus cooperi*), rusty blackbird (*Euphagus carolinus*), and evening grosbeak (*Coccothraustes vespertinus*). Potential avifauna species of conservation concern (SOCC) include bay-breasted warbler (*Setophaga castanea*), cape may warbler (*Setophaga tigrina*), and American kestrel (*Falco sparverius*) (Stantec unpublished).

The streams, brooks, and ponds within the Regional Assessment Area provide adequate spawning, rearing, migratory and overwintering habitat for brook trout, (*Salvelinus fontinalis*) Atlantic salmon (*Salmo salar*), threespine stickleback (*Gasterosteus aculeatus*), and American eel (*Anguilla rostrata*) to carry out their life processes in freshwater (Porter et al. 1974; Stantec 2013; NL Department of Fisheries, Forestry and Agriculture n.d.), as they occur, and as habitat quality permits. Atlantic salmon are only known to occur in the Trimms Brook Watershed. Ponds and streams including South Brook (S01 and S02), South Brook Pond (P01), Vincers Pond (P12), Noel Pond (P31), and streams S05 and S06 are impacted by historical mining activities and no longer contain habitat to support fish as a result of elevated metals and low pH (AMEC 2008; Stantec 2013, 2016, 2019, 2023).

England's Brook is located upstream of the historical Rambler tailings area. It is comprised of a series of swift-flowing habitats and slower moving steadies or pond-like habitats. Over the life of the existing mine, some of the specific reaches of this brook have been referred to by different names or different naming conventions. For consistency amongst this Registration and previous information, Mill Steady is also referred to as P14, Mill Pond as P29, specific reaches in England's Brook (or England's Brook) as S16 and S19, and England's Steady as Rambler Pond, Admiral's Brook, and P13. It should be noted that the previous operator obtained environmental assessment release in 2010 to take water from England's Brook.

4.1.3 Socio-economic Environment

The Project is located in a rural region on the Baie Verte Peninsula, with the nearest residential areas accessed by road being Ming's Bight (8.5 km) and Baie Verte (18 km) (Figure 4.1.1). The Project is within the municipal boundary of the community of Baie Verte. There is a long history of mineral exploration, including the discovery of asbestos and other ore bodies of copper, lead, zinc, and gold. The Terra Nova mine, a copper and sulfur mine, operated in the town of Baie Verte from 1860 until 1864 and again between 1901 and 1915, and was the site of the first railway track and locomotive in the province. In 1955, asbestos was discovered in the town, and the first (and only) productive asbestos mine in the province opened in 1963 and closed permanently in 1995. The Baie Verte Peninsula was also the location of the first ore smelter (Bett's Cove) and gold mine (Goldenville) in the province. Mines within 5 km of the Project include Big Rambler Pond Mine (closed), East Mine (closed), Pine Cove Mine (in care and maintenance), and Stog'er Tight Mine (in care and maintenance) (Figure 4.1.1).

Paul Parsons' 1960s pictorial map of Newfoundland, illustrates the rich mining history, with a picture of a miner holding a pick hammer located over the Baie Verte Peninsula.

Hunting (bear moose, duck, muskrat and fox) and inland fishing (trout and salmon) activities are known to occur in the region, with limited use within the Project Area. There are no protected areas (e.g., provincial and national parks, wildlife, ecological and wilderness reserves) within the Project Area. The nearest protected areas include the Waterway Provincial Park (approximately 170 km away) and Gros Morne National Park (approximately 195 km away).

Indigenous groups on the Island of Newfoundland include the Qalipu Mi'kmaq First Nation (Qalipu), with membership spread across 67 traditional Mi'kmaq communities and abroad, and the Miawpukek First Nation, with approximately 850 members living on-reserve in Conne River on the south coast of Newfoundland. The closest Qalipu community to the Project is Sop's Arm, located approximately 175 km from the Project. The Miawpukek Band Reserve in Conne River is approximately 350 km from the Project and there are currently no established traditional rights outside of the reserve boundaries.

Although no known historic resource sites have been inventoried within the Project Area, a review of archaeological data indicates that the Project Area has elevated potential for undiscovered historic resources, particularly those pertaining to specific aspects of the Pre-Contact Period, such as Maritime Archaic or Pre-Inuit activity as well for Historic Period hunting, trapping, logging, and early mining activities. Low to moderate potential exists for Recent and Historic Period Indigenous activity as well as for European and Newfoundlander settlement (Stantec unpublished).

4.2 Potential Resource Use Conflicts

Potential resource use conflicts with biophysical and socio-economic environments are described in Table 4.2.1. Where no potential resource conflicts are predicted or potential resource conflicts may exist but can be resolved with standard mitigation measures, no further assessment is considered warranted.

Table 4.2.1 Potential Resource Use Conflicts

Resource	Potential Interactions and Resource Use Conflicts	Registration Section Reference
Air Quality and Greenhouse Gases	The atmosphere is an important pathway for the transport of emissions and particulates from the Project to the freshwater, terrestrial and human environments. Some Project activities will result in the release of substances to the atmosphere that are classed as air contaminants. During each Project phase, Project activities will interact with air quality and climate through the emission of criteria air contaminants and greenhouse gas emissions from mobile equipment, mine operation, and Project-related traffic.	Section 6.1
Noise	Changes to the acoustic environment resulting from the Project can affect human health and wellbeing, and wildlife and wildlife habitat. During each Project phase, Project activities will interact with local receptors through noise emissions from the use of heavy equipment, Project-related traffic, and mining operation.	Section 6.1

Table 4.2.1 Potential Resource Use Conflicts

Resource	Potential Interactions and Resource Use Conflicts	Registration Section Reference
Light	Lighting can affect nighttime sky views and migrating wildlife, and result in visual aesthetic changes for, and physiological changes in, humans. During each Project phase, Project activities will interact with local receptors through light emissions from the use of heavy equipment, Project-related traffic, and mining operation.	Section 6.1
Geology / Soils	Mining activities can result in the exposure of potentially acid generating material, leading to metal leaching and acid rock drainage. Soils and terrain can also be affected through site preparation and clearing activities which removes vegetation and topsoil resulting in erosion, admixing, rutting and compaction. This could affect soil abundance and productivity. Soil chemistry can be altered through the deposition of fugitive dust and criteria air contaminants.	Section 2.10.5
Hydrogeology	During Project activities, there is the potential for release of hazardous products on-site, and potential contamination associated with mine and process water management. A change in groundwater quality or quantity could result in changes in baseflow to streams for ecological habitat and fresh water supply for human and industrial/commercial uses.	Section 6.2
Surface Water	Project activities throughout the life of the Project may interact with the local surface water receiving environment resulting in changes to surface water quality and/or quantity. Site preparation and clearing activities can result in erosion and sediment loading. Stockpiles can result in the discharge of elevated constituents of concern should they not be properly collected and treated prior to discharge. Unmitigated exposure to potentially acid generating material into the receiving environment can alter water quality.	Section 6.3
Fish and Fish Habitat	As fish are valued by resource users for recreational fishing activities and as a source of country foods, it is important to maintain stable populations within the region. Fish and fish habitat can be affected by Project-related activities resulting in changes to groundwater and surface water, including alterations to stream flow from water withdrawal or water management infrastructure, the introduction of sediments and other substances harmful to fish, injury or death of fish from heavy equipment and the impingement/entrainment of fish at water intakes.	Section 6.4
Wetlands	Wetlands provide important ecological (i.e., habitat, forage) and hydrological (i.e., erosion and flood control, groundwater control and recharge) functions that are important for maintaining the health of natural ecosystems. During each phase of the Project, Project activities could result in a change in wetland function through direct disturbance or through changes in hydrology. Such changes could result in a loss of, or disturbance to, the areal extent of wetland ecosystems or a change in wetland functions. These interactions are expected to occur primarily through mine site preparation and earthworks activities where wetlands will be lost or changed by vegetation clearing and disturbances to soils, such as removal of organic materials and overburden, and infilling. Potential effects on wetlands may result from the deposition of dust generated by activities such as mining operation, Project-related traffic, and mine rock disposal. Potential effect pathways to wetlands also exist through Project interactions with groundwater and surface water through changes to local hydrogeology, hydrology, groundwater quality and surface water quality.	Section 6.5

Table 4.2.1 Potential Resource Use Conflicts

Resource	Potential Interactions and Resource Use Conflicts	Registration Section Reference
Vegetation	The construction of the Project has the potential to affect the distribution and abundance of vegetation species (including SAR and SOCC) and communities. These interactions will occur primarily through the mine site preparation and earthworks activities and will result in the direct loss of vascular plant species within the Project Area, including SAR or SOCC that may be present as well as result in edge effects (i.e., abiotic changes such as an increase in available light and associated increased temperatures) on adjacent areas.	Section 6.5
Wildlife (including avifauna)	Access to wildlife is important to resource users that continue to practice harvesting and recreational activities, such as hunting and trapping, throughout the region. Direct changes to wildlife include the habitat loss and/or alteration and subsequent creation of new edges and edge effects which will occur during Project construction, through vegetation removal during site preparation and subsequent conversion of land cover type. Project activities during each phase can also result in indirect effects to wildlife through sensory disturbance (e.g., noise, light pollution, dust and vibrations).	Section 6.5
Community Services and Infrastructure	Community services and infrastructure (including housing and temporary accommodations, transportation, and local services and infrastructure (water, sewer, power, solid waste, education, recreation, safety, and health care) are used by residents and may be operated and maintained by municipal, provincial and/or federal government authorities. Project construction, operation, and decommissioning, rehabilitation and closure could increase demand for community services and infrastructure and affect (beneficially or adversely) community wellbeing. The Project also can result in positive effects if upgrades to existing infrastructure are made to address increased demand caused by the Project.	Section 6.6
Community Well-being	Community well-being is affected by a variety of factors, including residents' access to health services and infrastructure, ability to conduct daily activities, and participation in employment and business opportunities. The presence of the Project workforce could adversely affect the well-being of residents in communities close to the Project by altering demographics and disrupting community life. The health of Project workers could also be affected while on the job or as members of the local community (i.e., for local community residents who are employed by the Project). However, the Project may also contribute to positive effects on community well-being through employment and business opportunities, as well as other economic benefits (e.g., government revenue used, in part, to support social programs).	Section 6.6
Employment and Economy	Employment and business support the economic livelihoods of residents and provide associated social benefits stemming from earned income. Economic conditions may be affected by the construction, operation, and decommissioning, rehabilitation and closure of the Project. Beneficial effects stem from increased local employment during construction and operation phases, while adverse effects stem from losses in local employment due to decreased labour demand as the Project transitions from the operation phase through the decommissioning, rehabilitation and closure phase. Project spending will result in overall increased economic activity (i.e., Gross Domestic Product) in the region and will also contribute to provincial and federal government revenues through royalty payments and taxation on production, labour, goods, and services.	Section 6.6

Table 4.2.1 Potential Resource Use Conflicts

Resource	Potential Interactions and Resource Use Conflicts	Registration Section Reference
Land and Resource Use	The Project can affect the use of the land and resources in and nearby the Project Area and their socio-economic value to the region. Project activities can change the use of lands through the loss of area and the restriction of access to designed lands, and lands used for resource or recreational uses. The Project may result in a sensory disturbance (e.g., noise, visual) to nearby receptors, resource users and harvesting activities (hunting, trapping, outfitting, and fishing), and recreational users, potentially affecting the quality of the outdoor experience.	Section 6.7
Historic Resources	Historic resources can comprise the only physical information on Indigenous lifestyles prior to the arrival of Europeans in North America and help us understand the history, land-use, fossil record, and architectural history of a region. Moreover, they can provide insight into the interactions that took place between different cultural groups and the connections each had with the environment in which they lived. Ground disturbance may disturb or destroy objects of historical value and, equally importantly, may disturb or destroy the context (the horizontal and vertical depositional relationships between historical objects), from which they derive much of their value.	Section 6.8

Where potential resource conflicts may exist and additional analysis of effects is warranted to better understand the interaction and develop appropriate mitigation measures, further assessment is presented in Section 6.

5 Assessment Scope and Methods

5.1 Overall Approach

As discussed in Section 1.5, the expansion and operation of the mine will trigger provincial environmental assessment (EA) requirements under the Newfoundland and Labrador (NL) *Environmental Protection Act* (NL EPA). An EA is a planning and decision-making tool used to, among other things, predict environmental effects of a project prior to a project being carried out. This chapter describes the methods used to assess the effects of Project activities and components on the biophysical and socio-economic environments. The approach for this assessment is based on methods developed by Stantec to fulfill requirements of the provincial NL EPA for an Environmental Registration document.

The scope of assessment considers the proposed Project components and activities; knowledge of the existing conditions and sensitivities of the surrounding environment; applicable regulations, policies and guidelines; the influence of engagement conducted thus far; and professional experience and expertise of FireFly and its consultants. The approach assumes a precautionary, conservative approach with assumptions generally applied to overestimate potential adverse effects.

In recognition of spatial and temporal boundaries set for the assessment, baseline conditions are described for each Valued Component (VC), drawing heavily on publicly available data, including EA documents for other mine developments in the region, baseline studies / programs completed over the past 15 years for the previous owner, and available results from the Project-specific field program conducted in 2024. Note that in some cases, analysis and reporting of these data is not yet available and will be provided to regulators at a later date. Potential interactions between the Project and VCs are identified and residual effects described in recognition of mitigation to be applied. The significance of these residual effects is then determined against established criteria. Where there may be data gaps or some uncertainty around an effects prediction or effectiveness of mitigation, follow-up and monitoring is proposed. FireFly is committed to completing modelling pre-construction to verify effects and regulatory compliance. The following models will be completed prior to construction to verify effects predictions:

- Air dispersion model
- Noise model
- Groundwater model using MODFLOW
- Water quantity and water quality models
- Assimilative capacity model
- Dam breach analysis for the Tailings Management Facility (TMF)

5.2 Scope of the Assessment

5.2.1 Scope of the Project

The scope of the Project is defined by the components and activities required to construct and operate the Project's facilities, and ultimately the decommissioning, rehabilitation and closure of Project facilities at the end of the Project life. Project components and activities are described in Chapter 2. As the Port is currently approved and being operated by a third party (i.e., it is not under the care and control of FireFly; FireFly and the port operator will have a typical supplier-customer commercial arrangement), transportation of concentrate has not been included within the scope of the Project and the EA.

5.2.2 Selection of Valued Components

VCs upon which this assessment is focused, were selected in consideration of the following:

- Regulatory guidance and requirements (Section 1.5)
- Preliminary discussions with regulatory agencies prior to Registration
- Technical knowledge of the Project
- Existing conditions for the physical, biological and socio-economic environments and potential resource conflicts (Chapter 4)
- Lessons learned from previous similar EAs
- Professional judgement of the Study Team

The following VCs were selected for further assessment:

- Atmospheric Environment
- Groundwater Resources
- Surface Water Resources
- Fish and Fish Habitat
- Terrestrial Environment (including species at risk and species of conservation concern)
- Communities
- Land and Resource Use
- Historic Resources

5.2.3 Assessment Boundaries

The scope of the assessment is defined by spatial boundaries (i.e., geographic extent of potential effects) and temporal boundaries (i.e., timing of potential effects). The spatial boundaries reflect the geographic range over which potential environmental or socio-economic effects may occur, whereas temporal boundaries identify when an environmental or socio-economic effect may occur throughout the different phases of the Project. The spatial boundaries include the following:

- The Project Area encompasses the immediate area in which Project activities and components occur. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project.
- The Local Assessment Area (LAA) encompasses the area in which Project-related environmental effects (direct or indirect) can be predicted or measured for assessment. The LAA, which is specific to each VC, encompasses the Project Area and is selected in consideration of the geographic extent of effects on the given VC.
- The Regional Assessment Area (RAA) is the area established for context in the determination of significance of Project-specific effects. It is also the area in which accidental events are assessed and it informs the assessment of cumulative effects. The RAA is VC specific and encompasses both the Project Area and the LAA.

VC specific spatial boundaries are provided in Table 5.2.1 and mapping of the boundaries for each VC are provided in Chapter 6.

Table 5.2.1 Spatial Boundaries

VC Name	LAA	RAA	Figure Reference
Atmospheric Environment	The LAA for Atmospheric Environment is a 40 kilometre (km) by 40 km area, which includes the Project Area.	The RAA for Atmospheric Environment is a 40 km by 40 km area, which includes the Project Area.	Figure 6.1.1
Groundwater Resources	The LAA for Groundwater is based on the likely extent of drawdown dewatering of the underground workings, and changes to flow or groundwater quality due to recharge from the TMF and waste rock piles. The LAA boundaries will be confirmed through groundwater flow modelling, which will be completed prior to the start of construction.	The RAA for Groundwater is the same as the LAA.	Figure 6.2.2

Table 5.2.1 Spatial Boundaries

VC Name	LAA	RAA	Figure Reference
Surface Water Resources	The LAA incorporates the Project Area and watersheds that intersect with the Project Area. The LAA also includes portions of South Brook Watershed in the expected effluent mixing zone and stream reaches (sections) where there is the potential for changes in flow. The LAA includes the South Brook Watershed and Trimms Brook Watershed to the point downstream where they meet tidal waters. A 500 metre (m) buffer has also been applied to the access road to capture potential upstream and downstream effects related to construction (i.e., replacement of culverts and bridges) and operation and maintenance of the access road.	The RAA incorporates the Project Area and LAA and extends to include the watersheds within which potential Project interactions may be observed. This area encompasses the potential downstream receivers of surface water that may flow from the Project Area.	Figure 6.3.1
Fish and Fish Habitat			Figure 6.4.1
Terrestrial Environment	The LAA is defined as a 500 m buffer of the Project Area.	The RAA includes those sub-watersheds that encompass the LAA.	Figure 6.5.1
Communities	The LAA for Communities is the Towns of Baie Verte, Ming's Bight, and Springdale.	The RAA for Communities is Economic Zone 11, which encompasses the entire Baie Verte Peninsula as well as the Town of Springdale. This provincial scale was selected due to the way Project impacts are measured and the availability of granular data in NL.	Figure 6.6.1
Land and Resource Use	The LAA for Land and Resource Use is a 1 km buffer of the Project Area.	The RAA for Land and Resource Use is a 5 km buffer of the Project Area.	Figure 6.7.1
Historic Resources	The LAA for Historic Resources is the same as the Project Area.	The RAA for Historic Resources includes most of the Baie Verte Peninsula of northeast Newfoundland. It is bounded to the north by the Horse Islands, to the east by Notre Dame Bay, to the south by the community of King's Point, and to the west by White Bay.	Figure 6.8.1

Temporal boundaries for the assessment address the potential effects during the Project's construction, operation and decommissioning, rehabilitation and closure phases over relevant timescales. The overall Project schedule is presented in Section 2.4.

Pending release from EA, the temporal boundaries for the Project consist of the following phases:

- Construction: Approximately 24 to 27 months. Site preparation and early works are anticipated to be initiated in 2026 Q2 and be approximately nine months. Construction and development are anticipated to begin 2027 Q1 and extend to 2028 Q2.
- Operation and Maintenance: Commissioning is anticipated to occur in Q3 and Q4 2028 and operation initiated in 2029 with a life of mine being 15 years.
- Decommissioning, Reclamation and Closure: Approximately two years starting in 2044, following depletion of resources.

5.3 Potential Project Interactions

Table 5.3.1 indicates where there is a potential interaction between Project activities and the VCs identified for the assessment.

Table 5.3.1 Potential Projects Interactions with Valued Components

Project Activities	Atmospheric Environment	Groundwater Resources	Surface Water Resources	Fish and Fish Habitat	Terrestrial Environment	Communities	Land and Resource Use	Historic Resources
Construction								
Early Works / Site Preparation	-	✓	✓	✓	✓	-	✓	✓
Construction/Installation of Infrastructure and Equipment	-	✓	✓	✓	✓	-	✓	-
Construction-related Traffic	-	-	✓	✓	✓	✓	✓	-
Emissions, Discharges and Wastes[A]	✓	-	✓	✓	✓	✓	✓	-
Employment and Expenditures[B]	-		-	✓	✓	✓	✓	-
Operation								
Underground Mining	-	✓	✓	-	✓	-	-	-
Mine Equipment and Maintenance	-	✓	✓	✓	✓	✓	✓	-
Crushing and Processing	-	-	-	-	-	✓	✓	-
Topsoil, Overburden and Rock Management	-	✓	✓	✓	✓	-	✓	-
Tailings Management Facility	-	✓	✓	✓	✓	-	✓	-
Water Management	-	✓	✓	✓	✓	-	-	-
Utilities, Infrastructure and Other Facilities	-	✓	✓	✓	✓	-	-	-
Operation-related Traffic	-	-	✓	✓	✓	✓	✓	-
Emissions, Discharges and Wastes[A]	✓	-	✓	✓	✓	-	✓	-
Employment and Expenditures[B]	-	-	-	✓	✓	✓	✓	-

Table 5.3.1 Potential Projects Interactions with Valued Components

Project Activities	Atmospheric Environment	Groundwater Resources	Surface Water Resources	Fish and Fish Habitat	Terrestrial Environment	Communities	Land and Resource Use	Historic Resources
Decommissioning, Rehabilitation and Closure								
Decommissioning, Rehabilitation and Closure-related Traffic	-	-	✓	✓	✓	-	✓	-
Progressive Rehabilitation	-	✓	✓	✓	✓	-	-	-
Closure Rehabilitation	-	✓	✓	✓	✓	-	-	-
Post Closure	-	✓	-	-	✓	-	✓	-
Emissions, Discharges and Wastes[A]	✓	-	✓	✓	✓	-	✓	-
Employment and Expenditures[B]	-	-	-	✓	✓	✓	✓	-

Notes:
✓ = Potential interaction
– = No interaction
[A] Emissions, Discharges, and Wastes (e.g., air, waste, noise, light, liquid and solid effluents) are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, "Wastes and Emissions" is an additional component under each Project phase.
[B] Project employment and expenditures are generated by most Project activities and components and are the main drivers of many socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, "Employment and Expenditures" is an additional component under each Project phase.

5.4 Mitigation and Management Measures

Once potential effects are described for a VC, mitigation measures to reduce potential adverse environmental effects and improve positive effects are identified and described. Technically and economically feasible mitigation measures are proposed to eliminate (e.g., avoid), reduce, or control adverse environmental effects, to address public concerns, and/or to optimize beneficial effects. Mitigation measures may include standard management practices as well as VC-specific measures to address VC-specific issues, such as habitat offsetting/compensation, or planned environmental management and response measures. Standard environmental management measures are provided in Sections 2.11 and 2.12. Standard mitigation measures are also described in the Environmental Protection Plan (EPP) (Appendix 2.C). VC-specific mitigation is provided in the respective VC assessments (Chapter 6).

5.5 Residual Environmental Effects

The effects assessment considers relevant scientific literature, baseline and monitoring results and other available information (e.g., community, stakeholder, and Indigenous knowledge) in the analysis of potential Project-related environmental changes to the VC that may result through one or more mechanisms or pathways. The focus of the effects assessment is on residual effects, which are the effects that remain after application of planned mitigation. In consideration of applied mitigation, the discussion of residual effects considers the magnitude, geographic extent, duration, frequency, degree of reversibility, and possibility of occurrence. The significance of predicted residual effects is then determined in consideration of VC-specific thresholds, which, if a residual effect surpassed, would represent a significant effect.

5.6 Follow-up and Monitoring

Follow-up and monitoring programs are identified for each VC, where applicable. VC-specific follow-up and monitoring programs may be required to verify the accuracy of key EA predictions and the effectiveness of prescribed mitigation measures, as well as compliance monitoring that will be undertaken as necessary to verify compliance with applicable regulatory requirements, including the terms and conditions of any environmental permits, approvals, or authorizations that may be issued in support of the Project.

6 Environmental Effects Assessment

6.1 Atmospheric Environment

Atmospheric Environment was selected as a valued component (VC) because the Project will result in the release of emissions to the atmosphere. Activities associated with the construction, operation, and decommissioning, rehabilitation and closure of the Project have the potential to interact with the environment in such a way that could adversely affect air quality, greenhouse gas (GHG) emissions, sound quality, and ambient light levels. The atmosphere is an important pathway for the transport of contaminants to the freshwater, terrestrial and human environments.

Air quality is defined by the composition of the ambient air, including the presence and quantity of air contaminants that may have adverse effects on vegetation, wildlife, or human health. Air quality is highly influenced by local sources of air contaminants (e.g., nearby industrial facilities or vehicle traffic) and can also be influenced by air contaminants transported from sources that are farther away. The concentrations of contaminants in the ambient air can be compared to air quality criteria and objectives, which are established to protect the environment and human health.

The release of GHGs globally increases the worldwide concentrations of GHGs in the atmosphere over time, which contributes to climate change (Intergovernmental Panel on Climate Change [IPCC] 2023). The provincial government regulates industrial GHG emissions and has implemented several climate action initiatives and GHG emission reduction targets to align with global GHG reduction strategies and legislation. Emissions of GHGs from the construction and operation of a single project have a small or negligible effects on global climate change. However, these releases can be compared to provincial and national GHG releases and GHG reduction targets to establish relative magnitude.

Sound quality is characterized by the magnitude, frequency, and duration of sound. Noise is unwanted sound that can adversely affect wildlife or human health.

Ambient light is included in this assessment because exterior Project lighting can affect nighttime sky quality and physiological changes for humans and wildlife.

As described in Section 5.2.3 and shown on Figure 6.1.1, Project spatial boundaries for Atmospheric Environment include the Project Area (area of physical activities), the Local Assessment Area (LAA) and the Regional Assessment Area (RAA). The LAA and RAA are the same 40 kilometre (km) by 40 km area, which includes the Project Area.

Figure No.
6.1.1

Title
Local Assessment Area and Regional Assessment Area for the Atmospheric Environment

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_7_007

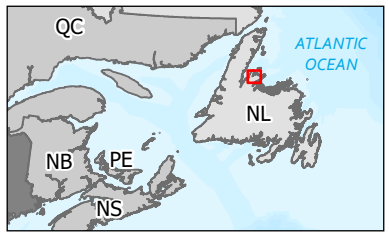
Project Location
Baie Verte, NL

Prepared by MB on 2024-12-18
Revised on 2025-03-17
TR by NW on 2025-03-17

N

0 2 4 Kilometres
(At original document size of 8.5x11)
1:275,000

- Local and Regional Assessment Area
- Project Area
- Highway
- Arterial / Collector
- Power Line
- Watercourse
- Forested Area
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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A significant residual adverse effect on the atmospheric environment for the Project is defined as any of the following:

- For air quality, the Project-related maximum ground level air contaminants released plus the background levels result in frequent exceedances of applicable ambient air quality objectives, guidelines or standards. Frequent is defined as once per week for one-hour objectives and once per month for 24-hour objectives.
- The significance of Project GHG emission totals will not be assessed as any one project's contribution to global climate change is considered not significant. Magnitude will be determined by comparing Project GHG emission estimates to provincial and national GHG annual emissions and established reduction targets. The use of Best Available Control Technology (BACT) during Project operation will also be evaluated.
- A significant residual adverse effect for sound quality is one where Project-related noise levels at noise-sensitive receptors are likely to exceed the annoyance and sleep disturbance thresholds recommended by Health Canada.
- A significant residual adverse effect on ambient light is defined as an increase in Project-related light emissions such that the Commission Internationale de L'Éclairage (Commission on Illumination, or CIE) guidelines for light trespass and glare in a rural environment are exceeded, and sky glow levels would be altered toward those of a suburban environment.

6.1.1 Existing Conditions

6.1.1.1 Regulatory and Policy Setting

6.1.1.1.1 Air Quality

Air quality in Newfoundland and Labrador (NL) is regulated by the *Air Pollution Control Regulations, 2022* under the NL *Environmental Protection Act* (NL EPA). The NL Air Quality Standards (NL AQS), prescribed under Schedule A of the *Air Pollution Control Regulations, 2022*, apply to ambient air contaminants and were originally established under NL EPA in 2004. The NL AQS values are shown in Table 6.1.1.

Table 6.1.1 Newfoundland and Labrador Air Quality Standards

Contaminant	Units	1-hour	3-hour	8-hour	24-hour	1 year
Air Quality Standards						
Ammonia	Parts per billion (ppb)	-	-	-	144	-
Asbestos (greater than 5 microns in length)	Fibres per cubic centimetre of air	-	-	-	0.04	-
Arsenic	micrograms per cubic metre (µg/m³)	-	-	-	0.3	-
Cadmium	µg/m³	-	-	-	2	-

Table 6.1.1 Newfoundland and Labrador Air Quality Standards

Contaminant	Units	1-hour	3-hour	8-hour	24-hour	1 year
Carbon monoxide	ppb	30,582	-	13,107	-	-
Copper	µg/m³	-	-	-	50	-
Hydrogen sulphide	ppb	11	-	-	4	-
Lead	µg/m³	-	-	-	2	-
Mercury	µg/m³	-	-	-	2	-
Nickel	µg/m³	-	-	-	2	-
Nitrogen dioxide	ppb	213	-	-	106	53(1)
Particulate matter < 2.5 microns	µg/m³	-	-	-	25(4)	8.8(1)(4)
Particulate matter < 10 microns	µg/m³	-	-	-	50	-
Particulate matter (total)	µg/m³	-	-	-	120	60(2)
Polychlorinated biphenyls	µg/m³	-	-	-	0.15	0.035(1)
Polychlorinated dibenzo -p-dioxins & polychlorinated dibenzo furans (I-TEQ)	Picograms (I-TEQ) per cubic metre of air	-	-	-	5(3)	-
Sulphur dioxide	ppb	344	229	-	115	23(1)
Vanadium	µg/m³	-	-	-	2	-
Zinc	µg/m³	-	-	-	120	-
Air Quality Standards for Air Zone Management						
Nitrogen dioxide (effective until December 31, 2024)	ppb	60(5)	-	-	-	17(1)
Nitrogen dioxide (Effective January 1, 2025)	ppb	42(5)	-	-	-	12(1)
Ozone	ppb	82	-	44	-	-
Particulate matter < 2.5 microns	µg/m³	-	-	-	25(4)	8.8(1) (4)
Sulphur dioxide (effective until December 31, 2024)	ppb	70(6)	-	-	-	5(1)
Sulphur dioxide (Effective January 1, 2025)	ppb	65(6)	-	-	-	4(1)

Notes:

(1) The arithmetic average over a single calendar year of all 1-hour average concentrations in the year.

(2) The geometric average over a single calendar year of all 1-hour average concentrations in the year.

(3) The International Total Equivalent Quotient (I-TEQ) concentration of polychlorinated dibenzodioxins and polychlorinated dibenzofurans is determined by multiplying the concentration of each congener listed in Column 1 of Table III by the corresponding toxicity factor set out in Column 2 of that item and by adding the products of them.

(4) At reference conditions, a dry gas temperature of 25 °Celsius and a gas pressure of 101.325 kilopascals

(5) The 3-year average of the annual 98th percentile of the NO_2 daily maximum 1 hour average concentrations.

(6) The 3-year average of the annual 99th percentile of the SO_2 daily maximum 1 hour average concentrations.

Source: NL Air Pollution Control Regulations, 2022

The applicable federal air quality criteria considered in the assessment are the Canadian Ambient Air Quality Standards (CAAQS). The CAAQS were established by the Canadian Council of Ministers of the Environment (Table 6.1.2).

Table 6.1.2 Canadian Ambient Air Quality Standards

Air Contaminant	Averaging Period	µg/m³	
		2020–2024	2025+
Ozone (O_3)	8-hour (1)	122	118
Nitrogen Dioxide (NO_2)	1-hour (2)	113	79
	1-year (3)	32	23
Sulphur Dioxide (SO_2)	1-hour (4)	183	170
	1-year (5)	13	10
Fine Particulate Matter ($PM_{2.5}$)	24-hour (6)	27	-
	1-year (7)	8.8	-

Notes:
(1) The 3-year average of the annual 4th highest of the daily maximum 8-hour average ozone concentrations
(2) The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
(3) The average over a single calendar year of all 1-hour average concentrations
(4) The 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations
(5) The average over a single calendar year of all 1-hour average SO_2 concentrations
(6) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
(7) The 3-year average of the annual average of the daily 24-hour average concentrations
Source: Canadian Council of Ministers of the Environment (CCME) (2024)

The Canadian Council of Ministers of the Environment (CCME) established a framework, the Air Quality Management System (AQMS), for reducing emissions of ambient air contaminants across Canada. The NL AQS (Table 6.1.1) specifies air quality standards for provincial air zone management. The AQMS categorizes air quality management into four levels for air zone management. Each management level has specific actions and objectives, as follows:

- Red management level, to reduce pollutant levels below the CAAQS through advanced air management actions
- Orange management level, to improve air quality through active air management and prevent exceedances of the CAAQS
- Yellow management level, to improve air quality using early and ongoing actions for continuous improvement
- Green management level, to maintain good air quality through proactive air management measures to keep clean areas clean

This air quality assessment considers substances that could be emitted from the Project for which there are applicable air quality objectives and standards. These include:

- Particulate matter with aerodynamic particle diameter less than or equal to 10 microns (PM_{10})
- Particulate matter with aerodynamic particle diameter less than or equal to 2.5 microns ($PM_{2.5}$)
- Total suspended particulate (TSP)
- Metals regulated by the NL AQS
- Combustion gases (nitrogen dioxide [NO_2], carbon monoxide [CO], and sulphur dioxide [SO_2])

Other air contaminants are also regulated provincially; however, these compounds are not expected to be released in substantive quantities from the Project and therefore exceedances of the NL AQS or CAAQS are not anticipated (i.e., ammonia, asbestos, polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzo furans).

The Government of NL's Guideline for Plume Dispersion Modelling (NLDMAE 2002) outlines dispersion modelling methods approved for determining compliance with provincial air quality standards. Modelling will be completed prior to construction in accordance with the requirements of the Guideline, including the use of CALMET/California PUFF (CALPUFF) modelling system (Scire et al. 2000) to determine the potential effects of air contaminant releases during construction and operation of the Project on ambient air quality in the LAA/RAA.

6.1.1.1.2 Greenhouse Gases

The NL government requires industrial facilities to report GHG emissions under the NL *Management of Greenhouse Gas Act* (MGGA) and its Regulations if the facility releases 15,000 tonnes (t) of carbon dioxide equivalent (CO_2e) or more per year from direct onsite GHG emissions sources during operation. Direct GHG emissions refer to those generated by sources or activities that are controlled/owned by a reporting entity or project (Government of Canada 2021). Examples include the combustion of fossil fuels, emissions from industrial processes, and flaring, venting and fugitive emissions. Indirect emissions result from a reporting entity or project activities but are controlled/owned by another organization (i.e., emissions associated with electricity consumption). Indirect emissions occur from sources or activities that are owned by another entity but are a result of a reporting entity's activities or project (e.g., the consumption of electricity generated off-site, or other off-site related GHG sources).

If a facility emits 15,000 t CO_2e or more per year from direct onsite GHG emissions sources during operation, it is subject to BACT requirements outlined in the *Management of Greenhouse Gas Regulations* (MGGR). Depending on the annual quantity of GHG emissions released by the Project, it may be required to report annual GHG emissions to both the provincial and federal government. There are also 3rd party verification requirements in NL for facilities emitting 25,000 t CO_2e or more per year from direct GHG emissions sources during operation.

The MGGR provides that targets established pursuant to section 5 of the MGGA do not apply to a facility during its construction and pre-production stages, or the facility's first three years of commercial operations. Targets are phased in from years four to eight of the facility's commercial operations.

The province of NL has committed to reducing GHG emissions and supporting the transition to a low carbon economy in NL with the following reduction targets:

- 30% reduction in provincial GHG emissions below 2005 levels by 2030 (Government of NL 2019)
- Net-zero emissions by 2050 (Government of Canada 2024b, Government of NL 2023)

Federally, industrial facilities that emit 10,000 t CO_2e or more per year (during operation) are required to report GHG emissions to the Environment and Climate Change Canada (ECCC) Greenhouse Gas Reporting Program (GHGRP). The federal government recently developed an Emissions Reduction Plan under the *Canadian Net-Zero Emissions Accountability Act*, which aims to reduce emissions across Canada by 40-45% below 2005 levels by 2030 (Government of Canada 2023a). The federal government has committed to achieving net-zero emissions by 2050 (Government of Canada 2024a). Several supporting regulations have been initiated in support of national GHG reductions that are expected to influence this Project over time indirectly. In 2024, the federal government established the *Clean Fuels Regulations*, which aim to increase the availability and use of lower carbon fuels and renewable energy sources in support of GHG reduction targets (Government of Canada 2022). The *Clean Fuels Regulations* incentivizes gasoline and diesel suppliers in the development and adoption of clean fuels, technologies and processes. The goal is to reduce GHG emissions by making fuels less GHG intensive over time, with a goal to reduce the carbon intensity of transportation fuels by approximately 15% in Canada by 2030 (Government of Canada 2024b).

The *Clean Electricity Regulations* are another federal initiative aimed at greening our electricity supply across Canada, towards achieving a net zero GHG economy by 2050. This regulation limits GHG emissions from generation of electricity for our provincial electrical grids from which the Project will draw energy to power operations.

6.1.1.1.3 Sound Quality

There are no regulations in place for sound quality in NL. Health Canada provides guidance for assessing noise in their Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise document (Health Canada 2023). Health Canada's approach to acoustic assessments is based on internally recognized standards for acoustics, including those published by the World Health Organization and the United States Environmental Protection Agency. Indicators of potential human health effects from noise include noise complaints, long-term annoyance, and sleep disturbance.

Health Canada recommend assessing nuisance effects from project-related noise through a metric known as the percent Highly Annoyed (%HA) (Health Canada 2023). The %HA is calculated based on noise emissions throughout the day and night, with additional emphasis on nighttime noise emissions. Noise mitigation measures are recommended by Health Canada when the change in %HA exceeds 6.5% (Health Canada 2023).

The noise guidance from Health Canada (Health Canada 2023) references the WHO guidelines and recommendations for community noise and night noise (WHO 1999, 2009). The corresponding outdoor sound level targets for sleep disturbance is 45 A-weighted dB scale (dBA) for quiet rural areas and susceptible populations, such as daycare centres, schools, places of worship, hospitals and/or seniors' residences.

6.1.1.1.4 Light

Light is known to have potential impacts on the environment through four mechanisms:

- Light trespass, which refers to the transmission of light from fixtures within a facility to the surrounding environment and receptors outside the facility. The unit of measure for light incidence either in or outside the facility is a lux. A lux is equal to one lumen lighting up an area of 1 square metre (m^2), or 1 lumen/m^2. A 60-watt incandescent light bulb emits approximately 800 lumens. In order to experience 1 lux from this light bulb, you would need to be approximately 8 meters away.
- Glare, which refers to intense, harsh or contrasting lighting conditions associated with incoming light that reduces the ability of humans, birds and other organisms to see clearly. For example, high-beam vehicle headlights can result in poor visibility for the driver coming towards the high-beam vehicle. The unit of measure is luminance, which is equal to lumens per steradian, and this is referred to as the candela (cd).
- Upward Light Ratio (ULR) refers to the percentage of light from a luminaire that is emitted directly into the sky. The ULR is calculated as the proportion of a luminaire's total luminous flux (light output) that is emitted directly upward above the horizontal plane. The ULR contributes to sky glow by allowing light to escape into the sky, where it scatters off atmospheric particles and clouds, creating a glow that obscures stars and brightens the night sky. Reference levels for ULR for roadways are presented in Table 6.1.7 (CIE 2017).
- Sky glow, which is the cumulative illumination of the sky or clouds by upward directed light sources. A small fraction of light that is directed or reflected towards the sky is scattered back towards the Earth’s surface by the atmosphere. As the number of light sources casting light upwards increases, the amount of scattered light increases, and can begin to obscure stars and other celestial objects in the night sky, and degrade the quality of dark skies. The most common unit of measure for the brightness of the sky, including sky glow, is magnitudes per square arcsecond (mag/arcsec^2). A sky glow measurement representative of a clear sky in a rural or dark area would be approximately 21 to 22 mag/arcsec^2, while a city or urban well-lit area could be approximately 18-19 mag/arcsec^2 (Berry 1976). Reference levels for sky glow are presented in Table 6.1.6 (Berry 1976).

The province of NL does not have regulations for ambient light from industrial facilities. The CIE, recognized by the International Organization and Standardization as an international standardization body, has guidelines and recommendations to limit ambient light and potential effects on wildlife and human health. The CIE has established five zones to define lighting environments; they are listed in Table 6.1.3. These lighting zones are used to establish guideline levels related to light trespass, glare, and sky glow. The sky glow conditions as described in Table 6.1.6 can also be used to establish the existing environmental lighting zone.

Table 6.1.3 Environmental Lighting Zones

Zone	Lighting Environment	Examples
E0	Intrinsically Dark	International Dark Sky Parks
E1	Dark	Relatively uninhabited rural areas
E2	Low district brightness	Sparsely inhabited rural areas
E3	Medium district brightness	Well inhabited rural and urban settlements
E4	High district brightness	Town and city centres and other commercial areas

Source: CIE (2017)

For light trespass, the CIE recommends maximum values of illumination for the environmental lighting zones. The nighttime and daytime recommendations are presented in Table 6.1.4.

Table 6.1.4 Recommended Maximum Values of Light Trespass (Illumination) per Environmental Zones

Time of Day	Environmental Zones				
	E0	E1	E2	E3	E4
19:00 – 23:00	n/a	2 lux	5 lux	10 lux	25 lux
23:00 – 6:00	n/a	< 0.1 lux	1 lux	2 lux	5 lux

Source: CIE (2017)

For glare, the CIE recommends maximum values for the intensity of luminaires for environmental lighting zones. The glare values depend on the brightness of the luminaire, the distance from it to the observer (*d*), and the size of the luminaire (*Ap*). The nighttime and daytime recommendations are presented in Table 6.1.5.

Table 6.1.5 Recommended Maximum Values for Glare (Intensity of Luminaires)

Light Technical Parameter	Application Conditions	Luminaire group (projected area $A\rho$ in m²)				
		$0<A\rho\leq0.002$	$0.002<A\rho\leq0.01$	$0.01<A\rho\leq0.03$	$0.03<A\rho\leq0.13$	$0.13<A\rho\leq0.50$
Maximum luminous intensity luminaire (*I* in cd)	Environmental Zone E0					
	Pre-curfew*:	0	0	0	0	0
	Post-curfew:	0	0	0	0	0
	Environmental Zone E1					
	Pre-curfew:	0.29·*d*	0.63·*d*	1.3·*d*	2.5·*d*	5.1·*d*
	Post-curfew:	0	0	0	0	0
	Environmental Zone E2					
	Pre-curfew:	0.57·*d*	1.3·*d*	2.5·*d*	5.0·*d*	10·*d*
	Post-curfew:	0.29·*d*	0.63 *d*	1.3·*d*	2.5·*d*	5.1·*d*
	Environmental Zone E3					
	Pre-curfew:	0.86·*d*	1.9·*d*	3.8·*d*	7.5·*d*	15·*d*
	Post-curfew:	0.29·*d*	0.63·*d*	1.3·*d*	2.5·*d*	5.1·*d*
	Environmental Zone E4					
	Pre-curfew:	1.4·*d*	3.1·*d*	6.3·*d*	13·d	26·*d*
	Post-curfew:	0.29·*d*	0.63·*d*	1.3·*d*	2.5·*d*	5.1·*d*

Note:
* Curfew refers to the time of day after which light requirements are more strict to control obtrusive light. Post-curfew typically refers to 11:00 PM and later. Pre-curfew is daytime hours up until post-curfew.
Source: CIE (2017)

Table 6.1.6 Reference Levels of Sky Glow

Sky Glow (mag/arcsec²)	Corresponding Appearance of the Sky
21.7 (Rural)	The sky is covered with stars that appear large and close. In the absence of haze, the Milky Way can be seen to the horizon. The clouds appear as black silhouettes against the sky.
21.6	Sky appearance similar to that defined for rural (above) but with a glow in the direction of one or more cities is seen on the horizon. Clouds are bright near the city glow.
21.1	The Milky Way is brilliant overhead but cannot be seen near the horizon. Clouds have a greyish glow at the zenith and appear bright in the direction of one or more prominent city glows.
20.4	The contrast to the Milky Way is reduced and detail is lost. Clouds are bright against the zenith sky. Stars no longer appear large and near.
19.5	Milky Way is marginally visible, only near the zenith. Sky is bright and discoloured near the horizon in the direction of cities. The sky looks dull grey.
(18.5 Urban)	Stars are weak and washed out and reduced to a few hundred. The sky is bright and discoloured everywhere.

Source: Berry (1976)

While CIE has not established guideline levels for sky glow, they do provide guidelines on upward light that directly contributes to sky glow. The CIE has guidelines for the upward light ratio, which is the fraction of light pointed towards the sky. The CIE maximum values of upward light ratio are presented in Table 6.1.7.

Table 6.1.7 Maximum Values of Upward Light Ratio of Installation

Light Parameter	Type of Installation	Environmental Lighting Zones				
		E0	E1	E2	E3	E4
Upward Flux Ratio (%)	Road	0	0	2.5	5	15

Source: CIE (2017)

6.1.1.2 Approach and Methods

6.1.1.2.1 Air Quality

The existing conditions for air quality are characterized with measured air ambient air quality data that was collected near the Project in 2016 and 2024, and a desktop review of available published data about releases of air contaminants from existing sources near the Project.

There is no substantive available measured data in the Project Area. The only historical study that was found to be relevant is from 2016. In 2016, ambient air quality monitoring was conducted at two locations near the Project, which was in relation to the mining activities being conducted at the time by Rambler Metals and Mining. The two locations were Ming Mine and the Nugget Pond Mill site (Nugget Pond (on care and maintenance; Figure 6.1.2). Nugget Pond is located approximately 50 km from Ming Mine by

road, whereas Ming Mine sampling site is located directly within the Project Area (Figure 6.1.2). The monitoring was conducted between August 16 and November 14, 2016, by GHD Limited (GHD 2017), using high volume air samplers installed upwind and downwind of each of the two sites (4 monitoring locations in total). A minimum of thirteen samples were measured at each monitoring location to capture conditions over a period of 24-hours each. The results collected upwind of Ming Mine and Nugget Pond (on care ad maintenance) are considered to be most representative of the baseline air quality conditions in the Project Area. This is in consideration that the measurements were collected upwind of mining activities. The air contaminants that were measured include TSP and select trace metals (cadmium, copper, lead, nickel, vanadium, and zinc).

Since there is limited measured baseline data available, additional baseline sampling was completed in 2024. Stantec conducted ambient air quality monitoring over three separate monitoring events to include seasonal variability in the sampling program. Ambient concentrations of particulate matter (TSP, $PM_{2.5}$, and PM_{10}), trace metals, SO_2 and NO_2 were measured at one location within the Project Area (Figure 6.1.2) in July, September, and December 2024. The sampling was conducted over four 24-hour samples for particulate matter and trace metals, and 7-days for SO_2 and NO_2 for each monitoring event. A summary of the results of sampling in July and September is included herein while December results are not yet available. Further details on the methods used by Stantec and results of the ambient air quality monitoring will be presented in the atmospheric baseline report to be completed and submitted later in 2025.

In addition to the ambient air quality data collected within the Project Area, the most recently available air quality data from the National Air Pollutant Surveillance (NAPS) program, published by the province in annual air quality reports and air zone management reports (NLDECC 2024a, 2024b), were obtained and considered in this assessment.

The federal government publishes inventories or releases, disposals and transfers for over 300 pollutants from industrial facilities across Canada in the National Pollutant Release Inventory (NPRI). The NPRI was reviewed to identify other reporting sites in the region that could contribute to cumulative effects on air quality. They only reporting sites in the area are the Ming Mine and the Nugget Pond (on care and maintenance) processing site. The NPRI data for Ming Mine and Nugget Pond are not considered relevant to potential cumulative sources as Nugget Pond will continue in care and maintenance. The historic data for Ming Mine is not considered relevant as it will be replaced with the updated emissions inventory and air modelling to reflect proposed activities and components of the Project. As the Project is an expansion of the Ming Mine, air quality in the area is expected to be mainly influenced by existing mine operations and the Project's future mining activities, as well as other human activities in the area such as on-road and off-road traffic, home heating, and natural events such as forest fires.

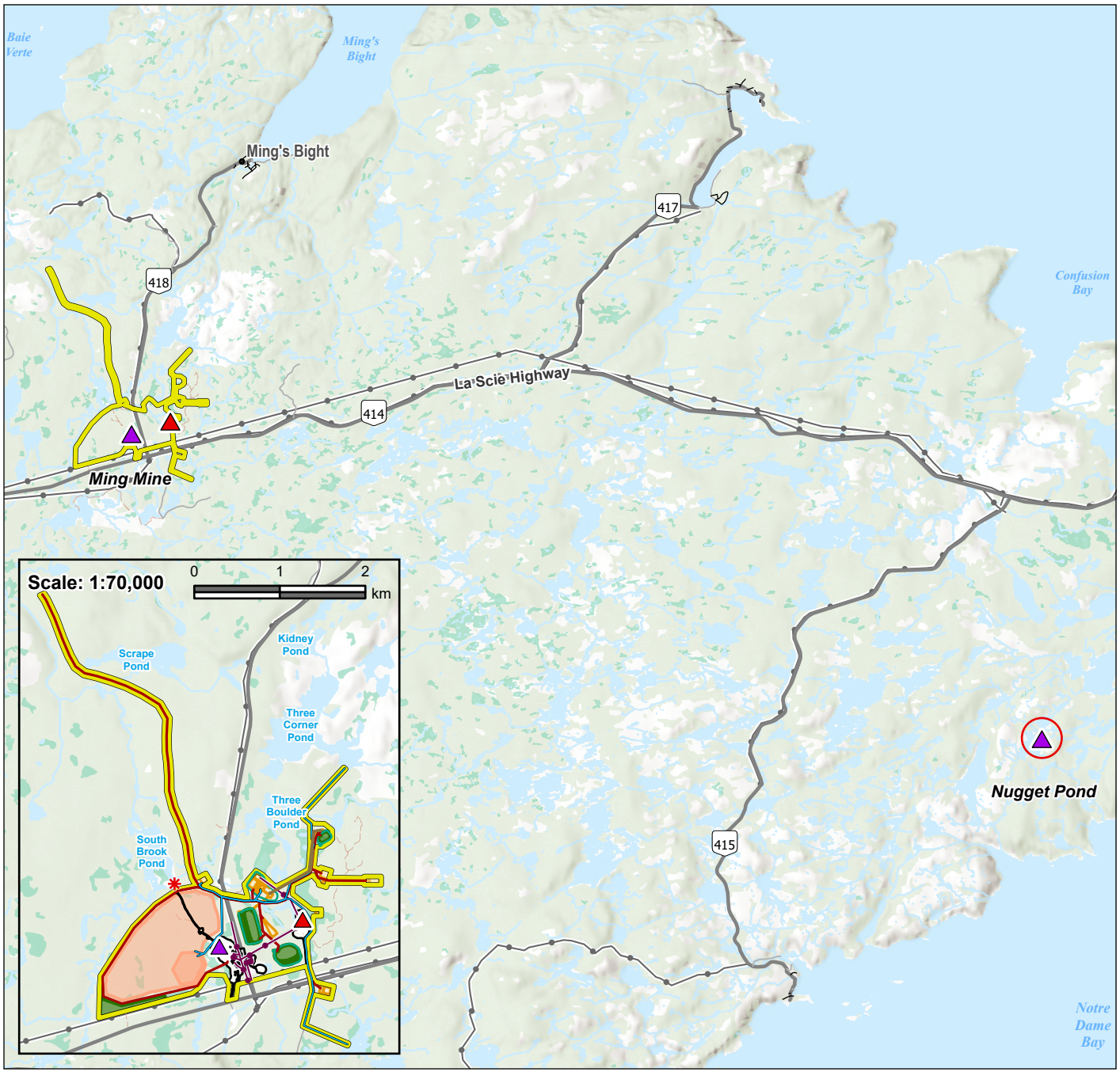

Figure No.
6.1.2
Title
Ambient Air Monitoring Locations

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_7_006

Project Location
Baie Verte, NL

Prepared by SC on 2024-12-05
Revised 2025-03-14
TR by NW on 2025-03-17

N

0 2 4 km

(At original document size of 8.5x11)
1:150,000

- Air Monitoring Station (GHD 2016)
- Air Monitoring Station (Stantec 2024)
- Final Discharge Point (FDP)
- Nugget Pond Reference Area
- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Ming Mine Operation
- Stockpile and Organic Laydown
- Other Site Infrastructure
- TMF and Polishing Pond
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Watercourse
- Wetland
- Waterbody
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, GHD, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.1.1.2.2 Greenhouse Gases

To characterize the existing conditions for GHGs, provincial and national GHG emissions data, published by ECCC in annual National Inventory Reports (ECCC 2024), and data pertaining to existing large-scale emissions of GHG in NL, acquired from the federal GHGRP (Government of Canada 2023b), is summarized.

6.1.1.2.3 Sound Quality

The existing conditions for sound quality are characterized using baseline data collected in the field during 2024.

Stantec conducted baseline sound quality monitoring survey between July 9 and 13, 2024 at four locations near the Project (Figure 6.1.3); the monitoring locations were chosen based on the presence of seasonal / residential receptors near Project components.

Ambient sound levels were measured using Type 1 Sound Pressure Level Meters, including one Larson Davis LxT meter and one 01dB Cube meter. Measurements were taken continuously over a period of between 1 to 3 days at each location. Each meter has been factory calibrated, and calibration checks were undertaken throughout the monitoring survey. Detailed methods used by Stantec and a summary of results of the noise monitoring will be provided in the atmospheric baseline report to be completed and submitted later in 2025.

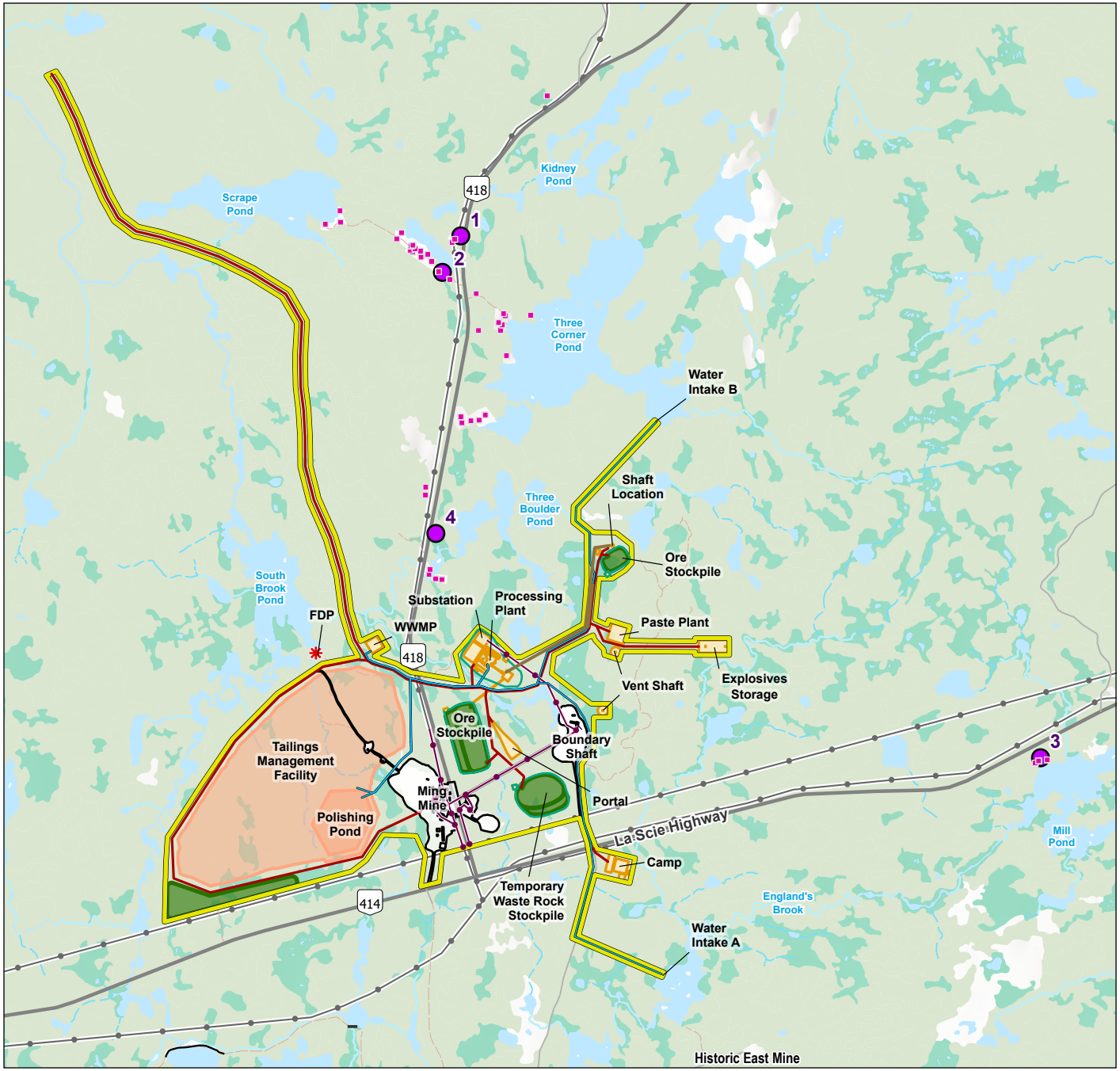

Figure No.
6.1.3
Title
Noise Monitoring Locations

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_7_002

Project Location
Baie Verte, NL

Prepared by SC on 2024-12-04
Revised 2025-03-17
TR by NW on 2025-03-17

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:35,000

- Noise Monitoring Station
- Potential Receptor
- Final Discharge Point (FDP)
- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Ming Mine Operation
- Stockpile and Organic Laydown
- Other Site Infrastructure
- TMF and Polishing Pond
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Power Line
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Forested Area
- Wetland
- Waterbody

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.1.1.2.4 Light

The existing conditions for light are characterized using baseline data collected in the field during 2024.

The baseline light monitoring survey was conducted on July 14, 2024 at two locations near the Project, shown in Figure 6.1.4; monitoring locations were chosen based on the presence of seasonal / residential receptors near Project components.

Illuminance was measured using a conventional, integrating hemispherical light meter (Extech EA33) with a resolution of 0.01 lux. Sky glow was measured using a Unihedron Sky Quality Meter (SQM-L). Detailed methods used by Stantec and a summary of results of the light monitoring will be presented in the atmospheric baseline report to be completed and submitted later in 2025.

Existing sky glow near the Project was also characterized using publicly available sky glow data for the region (World Atlas 2015).

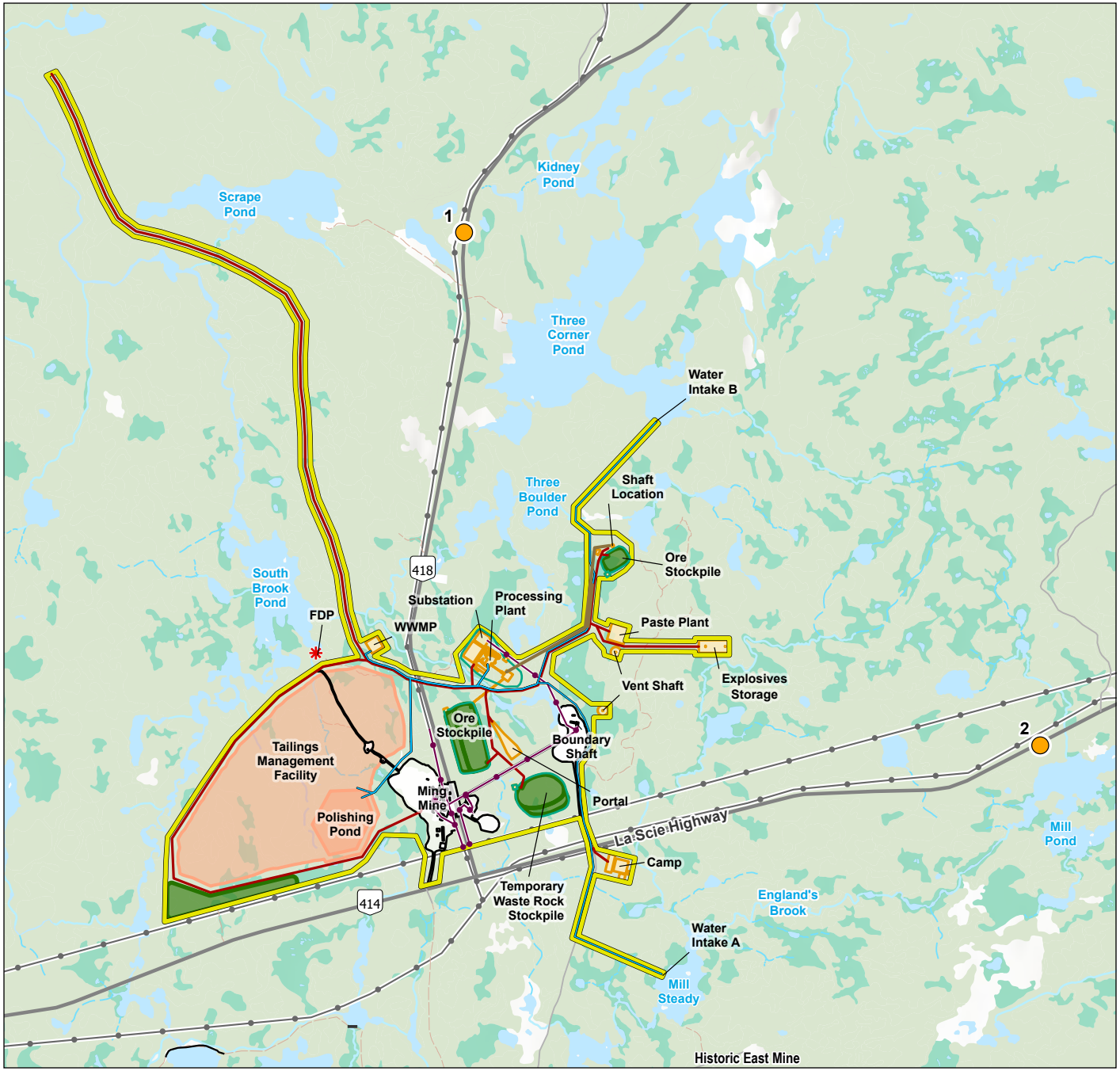


Figure No.
6.1.4
Title
Light Monitoring Locations

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_7_003

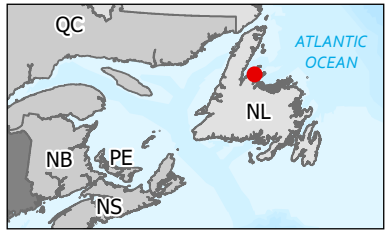
Project Location
Baie Verte, NL

Prepared by SC on 2024-12-04
Revised 2025-03-17
TR by MB on 2025-03-17

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:35,000

- Light Monitoring Location
- Final Discharge Point (FDP)
- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Ming Mine Operation
- Stockpile and Organic Laydown
- Other Site Infrastructure
- TMF and Polishing Pond
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Power Line
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Forested Area
- Wetland
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.1.1.3 Description of Existing Conditions

6.1.1.3.1 Air Quality

2016 Ambient Air Quality Monitoring

The results of the 2016 ambient air quality monitoring indicated that there were measurable concentrations of TSP, cadmium, copper, lead, nickel, vanadium, and zinc at both the Ming Mine and Nugget Pond (on care and maintenance) locations. The values measured upwind of both locations for TSP, cadmium, copper, lead, nickel, vanadium, and zinc were well below each of the air contaminants respective regulatory criteria in the NL AQS (GHD 2017) (Section 6.1.1.1). Measurements recorded downwind of Ming Mine and Nugget Pond had exceedances of TSP; one exceedance was measured downwind of Ming Mine and three exceedances were measured downwind of Nugget Pond. All other parameters were below the regulatory criteria in the NL AQS (GHD 2017).

2024 Ambient Air Quality Monitoring

A summary of results of the July and September 2024 ambient air quality monitoring are presented in this subsection.

For PM_{10}, a total of seven samples were collected and analyzed. The PM_{10} concentrations measured ranged from <1 µg/m³ (non-detect) to 93.9 µg/m³. One sample exceeded the NL AQS for PM_{10}; it was collected on September 17, 2024 with an average PM_{10} concentration of 93.9 µg/m³. It was noted during this period that site was more active than usual because groundwater monitoring wells were being drilled, requiring equipment to pass in close proximity to the sampler. Additionally, wind speeds were low and the majority of the winds were blowing from the south and southwest direction, which is influenced by the unpaved roads blowing in the direction of the samplers. It is suspected that there was a close pass-by of an all-terrain vehicle or truck on the unpaved surfaces nearby to cause this elevated concentration. On the same day, the $PM_{2.5}$ sampler (located within 5 metres (m) of the PM_{10} sampler) measured <1 µg/m³. The TSP sampler malfunctioned and can therefore not be used in the comparison. The other six measurements of PM_{10} were below the threshold limits of the NL AQS (50 µg/m³).

A total of eight samples of $PM_{2.5}$ were collected and analyzed. The $PM_{2.5}$ concentrations measured ranged from <1 µg/m³ (non-detect) to 4.4 µg/m³. The average measured concentration of $PM_{2.5}$ was 1.8 µg/m³; all measurements of $PM_{2.5}$ were below the threshold limits in CAAQS (27 µg/m³) and the NL AAQS (25 µg/m³).

A total of nine samples of TSP were collected and analyzed. The TSP concentrations measured ranged from 6 µg/m³ to 56.8 µg/m³. The average measured concentration of TSP was 22 µg/m³. All measurements of TSP were below the threshold limits in the NL AQS (120 µg/m³).

A total of nine samples of metals were collected and analyzed. The metals analyzed from the samples included arsenic, cadmium, copper, lead, mercury, nickel, vanadium, and zinc. The results of the 2024 ambient air monitoring onsite indicated that there were only measurable concentrations of copper, lead, and zinc, and other metals concentrations were consistently below the laboratory reportable detection limit. The 2024 measured metals concentrations were well below each of the air contaminants respective regulatory criteria in the NL AQS, and the detailed data will be presented in the atmospheric baseline report to be completed and submitted later in 2025.

For NO_2 and SO_2, three samples were collected and analyzed. The ambient concentrations of NO_2 and SO_2 measured were below the laboratory detection limits of 0.3 ppb for NO_2 and 0.5 ppb for SO_2 for July and September. NO_2 and SO_2 were measured over a period of 1-week; however, the regulatory criteria is based on a 24-hour period. As the 1-week average samples are well below the 24-hour regulatory criteria, it is not likely that the 24-hour criteria would have been exceeded during the sampling periods. The results of the ambient air monitoring for NO_2 and SO_2 were therefore considered very likely to be below the 24-hour threshold limits in the NL AAQS of 106 ppb for NO_2 and 115 ppb for SO_2.

Further details about the 2024 air quality monitoring results will be presented in the atmospheric technical report to be completed and submitted later in 2025.

Provincial Reporting, NAPS and NPRI

The province publishes annual ambient air quality monitoring reports, which include results from the NAPS Program, and results from the industrial monitoring network that exists across the province (NLDECC 2024a). The results from the annual ambient air quality monitoring results are also compiled into air zone management reports (NLDECC 2024b) The closest NAPS station to the Project is located in Grand Falls-Windsor, located approximately 120 km south-southwest from the Project. Although this monitoring location is not close enough to the Project Area to be considered representative of background concentrations there, data from the station is presented herein to provide context on how the air quality measured near the Project compares to the nearest provincial monitoring station. Data from this station will also be used for O_3 and CO background concentrations, since it is the best available data.

Pollutants measured at the Grand Falls-Windsor NAPS station include $PM_{2.5}$, PM_{10}, CO, O_3 and NO_2. There were some exceedances of the NL AQS (Table 6.1.1) in 2023, including 31 exceedances of the 8-hour O_3 air quality standard, and 69 and 126 exceedances, respectively, of the 24-hour $PM_{2.5}$ and PM_{10} air quality standards (NLDECC 2024a). Many of the PM_{10} and $PM_{2.5}$ exceedances in 2023 were attributed to long-range transport of particulate from wildfires in other provinces. The exceedances in 2023 appear to be uncommon; from 2021 to the end of 2022, there was only one instance exceedance of $PM_{2.5}$ and one exceedance of PM_{10} (NLDECC 2023). Air quality standards for CO and NO_2 were not exceeded in 2023.

The ambient air quality measured near the Project in 2016 and 2024 is comparable to the NAPS results from the Grand Falls-Winsor station for NO_2 (i.e., no exceedances of applicable air quality criteria).

The NL 2021-2023 Air Zone Report (NLDECC 2024b) compares NAPS monitoring results at the Grand Falls-Windsor station to federal management levels and the NL AQS air zone management thresholds. Results in the Air Zone Report were not presented for SO_2 or NO_2. These are presented in Table 6.1.8.

Table 6.1.8 Air Quality Results at the Grand Falls-Windsor Air Monitoring Station (2021-2023)

Reporting Year	Ozone (O_3) 8-hour (ppb)	$PM_{2.5}$ 24-hour (µg/m³)	$PM_{2.5}$ annual (µg/m³)
2021-2023	47	12	4.8
Air Quality Criteria			
NL AQS	122	27	8.8
CAAQS 2025*	60	27*	8.8*

Notes:
µg/m³ micrograms per cubic metre
ppb parts per billion
- not available
* The CAAQS 2025 do not have a criterion for $PM_{2.5}$, so the 2020 criterion is shown
Green Indicates parameter is in the green air zone management level range, meaning air quality is good and can be maintained through proactive air management measures to keep clean areas clean
Yellow Indicates parameter is in the yellow air zone management level range, meaning air quality could be improved using early and ongoing actions for continuous improvement
Source: CCME (2024); NLDECC (2024b)

The concentrations of O_3 are within the green management level, meaning air quality is good and can be maintained through proactive air management measures to keep clean areas clean. The concentrations of $PM_{2.5}$ are in the yellow management level, meaning air quality could be improved using early and ongoing actions for continuous improvement. In all cases, the average 2021-2023 concentrations reported in the Air Zone Report are below the NL AQS and CAAQS.

Summary

The following is a summary of the ambient air quality data collected near the Project in 2016, 2024, and data from the Grand Falls-Windsor NAPS station:

- The 2016 ambient air quality monitoring results sampled near the Project for cadmium, copper, lead, nickel, vanadium, zinc, and TSP were below the 24-hour NL AQS (GHD 2017) (Table 6.1.1)
- In 2024, ambient air quality monitoring was conducted in the Project Area for PM_{10}, $PM_{2.5}$, TSP, metals, and NO_2 and SO_2. Of the seven PM_{10} samples, one exceedance of the NL AQS was measured, although there were no exceedances of CAAQS or the NL AQS for $PM_{2.5}$ or TSP for any sampling period. For metals, NO_2 and SO_2, there were no measured values above the respective criteria in the NL AQS (Table 6.1.1).
- At the Grand Falls-Windsor NAPS station, $PM_{2.5}$, PM_{10}, CO, O_3 and NO_2 monitoring data is collected. There were no exceedances of applicable air quality criteria for CO and NO_2 in 2022 or 2023. However, there were exceedances of the NL AQS and CAAQS for 8-hour O_3 samples, and 24-hour samples of $PM_{2.5}$ and PM_{10} attributed to long-range transport of particulate from forest fires (Table 6.1.1 and Table 6.1.2). From 2021 to the end of 2022, there was only one $PM_{2.5}$ exceedance and one PM_{10} exceedance (NLDECC 2023)

Although the Grand Falls-Windsor monitoring location is not close enough to the Project to best represent background concentrations in the Project Area, the data are presented to compare air quality near the Project to the nearest provincial station. Data from this station will be used for O_3 and CO background concentrations, since it is the best data available. Details on establishment of the background concentrations for air dispersion modelling for the Project are presented in the following subsection.

Background Concentrations for Air Quality Modelling

Air quality modelling will be completed prior to construction using the CALMET/CALPUFF modelling system (Scire et al. 2000) to determine the potential effects of air contaminant releases during construction and operation of the Project on ambient air quality in the LAA/RAA.

Existing background conditions in the LAA will be characterized using ambient air quality data measured near the Project in 2016, 2024, and the ECCC NAPS Grand Falls-Windsor Ambient Air Quality Monitoring station. These background concentrations will be combined with the air quality dispersion modelling results to assess the potential cumulative effects of the Project when combined with other sources of emissions in the LAA and potential long-range transport of emissions.

- O_3 background concentrations will be based on the monthly average that have been derived for the province as a 5-year weighted average over all O_3 monitoring stations as presented in table 4.2.2 of the Government of NL's Guideline for Plume Dispersion Modelling document (NLDMAE 2002).
- CO background concentrations will be estimated using the ECCC NAPS Grand Falls-Windsor Ambient Air Quality Monitoring station. The 1-hour concentration will be based on using the 90th percentile of hourly concentrations measured over the 2021 to 2023 period. The 8-hour concentration will be based on the maximum 3-hour average with hourly values > the 90th percentile excluded from the 8-hour average calculation measured over the 2021 to 2023 period.

Background concentrations of TSP, PM_{10}, $PM_{2.5}$, SO_2, NO_2, and selected trace metals will be estimated based on the results of the sampling conducted within the Project Area from 2016 and 2024. The background concentration calculation basis are as follows:

- TSP, PM_{10}, $PM_{2.5}$, copper, lead, and zinc background concentrations will be the 90th percentile of the concentrations for the 24-hour averaging periods in the 2016 and 2024 monitoring events. If concentrations are reported as below the laboratory detection limit, the detection limit value will be used. As these samples were taken over a 24-hour period, the TSP, $PM_{2.5}$ 24- hour background concentrations will be scaled for annual background concentrations using the Ontario Ministry of Environment Conservation and Parks (ONMECP) recommended relationship (ONMECP 2018).
- Arsenic, cadmium, mercury, nickel, and vanadium were consistently below the laboratory detection limit. The 24-hour background concentration for these elements will be based on the laboratory detection limit.

- SO_2, NO_2 background concentrations will be estimated as the 90th percentile of the samples over the three monitoring periods in 2024. If concentrations are reported as being below the laboratory detection limit, the detection limit value will be used. Since these samples were taken over a 7-day period, the concentrations will be scaled using the ONMECP recommended relationship (ONMECP 2018) to align with the 1-hour, 3-hour, and annual NL AQS regulatory criteria.

Establishing background concentrations for CO, TSP, PM_{10}, $PM_{2.5}$, copper, lead, SO_2, NO_2, and zinc to use in dispersion modelling following these methods is consistent with the approach that is recommended in Alberta and will be applied for this assessment due to the absence of province specific guidance (AEPA 2021).

The detailed results of the 2024 ambient air quality monitoring will be presented in the baseline report, which will be completed prior to the start of Project construction.

6.1.1.3.2 Greenhouse Gases

The quantity of GHG emissions released to the atmosphere in Canada in 2022 (the most recently published data from Canada's National Inventory Reports) was 707,767 kilotonnes (kt) of CO_2e, of which 8,606 kt CO_2e were released in NL (ECCC 2024). Therefore, NL's GHG emissions represented approximately 1% of Canada's emissions in 2022. A breakdown of GHG emissions in NL over the last five years, by industry category, is presented in Table 6.1.9.

Table 6.1.9 Newfoundland and Labrador's Greenhouse Gas Emissions by Industry (2018-2022)

Industry Category		kt CO_2e by year				
		2022	**2021**	**2020**	**2019**	**2018**
Energy	Stationary Combustion (including mining)	3,260	3,202	3,694	4,884	4,561
	Transport	4,184	3,979	3,772	4,600	4,331
	Fugitive Sources	259	340	474	702	785
	Total Energy	**7,702**	**7,520**	**7,939**	**10,189**	**9,677**
Industrial Processes		208	228	237	220	243
Agriculture		78	79	81	81	81
Waste		618	606	214	615	615
Total		**8,606**	**8,433**	**8,880**	**11,102**	**10,616**

Note:
kt kilotonnes
Source: ECCC (2024)

GHG emissions in NL have been declining in recent years (8,606 kt CO_2e in 2022 compared to 10,616 kt CO_2e in 2018) (ECCC 2024).

Canada's GHGRP collects data on GHG emissions from facilities across Canada on an annual basis. It is a mandatory program for facilities that emit over 10,000 t CO_2e per year. In 2022 (the most recently published data from the GHGRP) the largest emitting facility in NL was IOC (Iron Ore Company of Canada), that is noted in the GHGRP as the "Carol Project" with 822,709 t CO_2e, followed by the Holyrood Thermal Generating Station, with 655,397 t CO_2e (Government of Canada 2023b).

The NL government committed to a 30% reduction in provincial GHG emissions below 2005 levels by 2030 in their Climate Change Action Plan (Government of NL 2019). In 2023, a mid-term update of the plan was published. Although the province has reduced GHG emissions since the initiation of the plan in 2019, the province is not expected to achieve its 2030 reduction target (Government of NL 2023).

6.1.1.3.3 Sound Quality

Average daytime (i.e., from 7 AM to 10 PM, daytime equivalent sound level [L_d]) and nighttime (i.e., from 10 PM to 7 AM, nighttime equivalent sound level [L_n]) sound levels that are based on the baseline sound quality surveys are presented in Table 6.1.10. The averages presented are based on the logarithmic average.

Table 6.1.10 Results from Baseline Noise Monitoring Near the Project

Monitoring Location	UTM Coordinates		Average Daytime Sound Level (L_d ,dBA)	Average Nighttime Sound Level (L_n ,dBA)
	Latitude	Longitude		
1	565825	5532772	49	40
2	565718	5532557	41	41
3	569214	5529720	45	37
4	565679	5531032	45	42

Sound levels were found to be highest at locations close to major roadways (monitoring location 1 and 4), and lowest in the secluded areas (monitoring location 2 and 3). The acoustic environment is representative of a rural area at the monitoring locations, and the predominant noise sources were related to road traffic and occasionally noise from existing mining operations.

6.1.1.3.4 Light

A summary of light monitoring measurements is presented in Table 6.1.11. Sky glow measurements were consistently above 21.2 mag/arcsec² at Location 1 and above 22 mag/arcsec² at Location 2, and so correspond to a pristine night sky environment typical of a sparsely populated rural area where many celestial objects, including the Milky Way, may be clearly visible. These sky glow measurements also align well with publicly available sky glow data available near the Project Area of 21.98 mag/arcsec² as presented in Figure 6.1.5 (World Atlas 2015).

Measurements of incident light were <0.01 lux for the three measurements taken at each location. Existing lighting was therefore considered to be representative of a relatively uninhabited rural area, or CIE Environmental Zone E1.

Table 6.1.11 Sky Glow and Illuminance Measurements Results

Monitoring Location	UTM 21 Coordinates		Sky Quality (mag/arcsec²)				Illuminance (lux)
	Easting	Northing	Reading 1	Reading 2	Reading 3	Average	
Location 1	565845.88	5532793.96	21.30	21.30	21.25	21.28	<0.01[1]
Location 2	569213.16	5529794.80	22.10	22.07	22.01	22.06	<0.01[1]

Note:
[1] Three measurements were taken for illuminance at each location, with each measurement recording less than the resolution of the monitor at <0.01 lux.

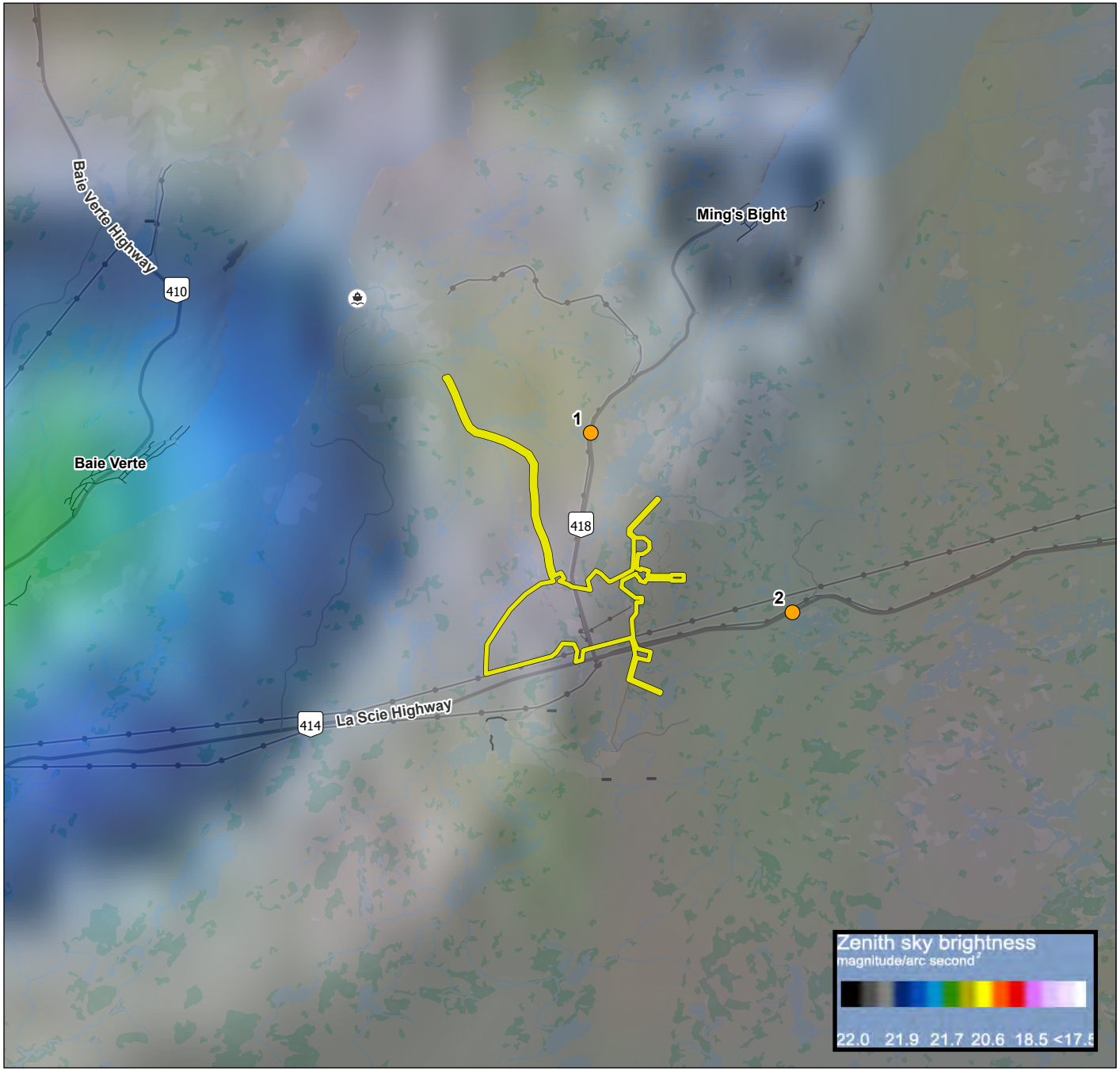


Figure No.
6.1.5

Title
Distribution of Artificial Lighting Within and Surrounding the Project

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_7_004

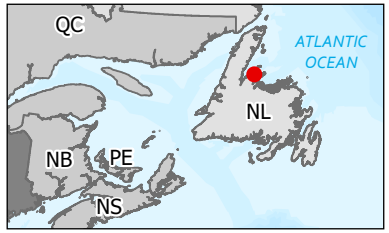
Project Location
Baie Verte, NL

Prepared by SC on 2024-12-04
Revised 2025-03-17
TR by MB on 2025-03-17

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:100,000

- Light Monitoring Location
- Project Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Watercourse
- Wetland
- Waterbody
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, The New World Atlas of Artificial Night Sky Brightness
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.1.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Atmospheric Environment is provided in Table 6.1.12. Potential environmental effects and effects pathways were selected based on the anticipated releases to air from the Project, review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.1.12 Potential Effects and Effect Pathways for Atmospheric Environment

Potential Effect	Effect Pathway(s)
Change in Air Quality	• Mobile and stationary equipment exhaust gases (particulate, NO_2, SO_2, CO) • Particulate matter (dust) generated by land clearing (construction), earth moving activities (during construction), and material handling and blasting (construction and operation) • Particulate matter (dust) and trace metals (within the dust) released during ore handling and crushing (material loading / unloading and transfer, ore and material hauling, crushing and screening) • Fugitive releases of particulate matter (dust) and trace metals (within the dust) due to wind erosion of ore stockpiles and waste rock pile surfaces (fugitive releases are characterized as those not originating from a stack or vent, released over an area or with an initial volume) • Fugitive releases of particulate matter (dust) and trace metals (within the dust) from the TMF due to wind erosion of dry, exposed tailings beach surfaces • Releases of particulate matter (dust), trace metals (within the dust)
Change in Greenhouse Gas Emissions	• Mobile and stationary equipment exhaust gases (CO_2, CH_4, N_2O) • Blasting using an ammonium nitrate / fuel oil (ANFO) emulsion (CO_2)
Change in Sound Quality	• Operation of heavy mobile equipment and vehicles for land clearing, earth moving activities and material handling • Sound emissions from rock breaking, and crushing and processing, and blasting activities
Change on Light Levels	• Lighting required on site roads, overburden and waste rock management, ore milling and processing, tailings and water management, and utilities and site infrastructure (i.e., accommodations camp and site buildings)

6.1.3 Mitigation and Management Measures

As discussed in Section 2.11.3, FireFly has revised the Ming Mine Environmental Protection Plan (EPP), including identification and addition of mitigation measures required to address new and / or expanded Project components as compared to the existing, approved operation (Appendix 2.C). Table 2.11.2 provides a guide to the EPP.

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on the atmospheric environment, including the measures identified for the following Project activities:

- Clearing Vegetation (Section 4.4 of the EPP)
- Exploration Drilling (Section 4.11 of the EPP)
- Vehicle Traffic (Section 4.20 of the EPP)
- Dust and Air Contaminant Control (Section 4.21 of the EPP)
- Noise and Light Control (Section 4.22 of the EPP)
- Drilling and Blasting (Section 4.25 of the EPP)
- Processing Activities (Section 4.27 of the EPP)

The following additional mitigation measures specific to the atmospheric environment have been identified for the Project:

- Project lighting will be limited to that which is necessary for safe and efficient Project activities. Lighting design guidelines will be followed, such as the Commission Internationale de L'Éclairage, International Dark Sky Association, Illuminating Engineering Society.
- Light fixtures will be located so that they are not directed toward oncoming traffic on nearby roads on or off site.
- Lighting will be designed to avoid excessive use of mobile flood lighting units and will be turned off when they are not needed.
- To the extent practicable, mobile and permanent lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside of the Project Area.
- Full cut-off luminaires will be used where practicable to reduce glare, light trespass and sky glow from the Project.
- Where practicable in accessible areas (e.g., along cleared rights-of-way), trees and other vegetation will be left in place or encouraged to grow to obstruct the view of Project facilities and act as a wind break to reduce the transportation of fugitive dust, reducing the change in viewshed and muffling nuisance noise as well as reducing GHGs released from land-use changes and maintaining carbon sequestration.
- Idling of equipment will be reduced, where practicable to reduce noise, air contaminant and GHG emissions.
- Haul distances to processing and shipment sites will be reduced where practical to reduce noise, air contaminant and GHG emissions; the previous processing plant (Nugget Pond, on care and maintenance) was approximately 50 km by road from the mine. The new processing plant will be located within the Project Area, much closer to the underground mine. The Project will use Pine Cove Port rather than Goodyears Cove (approximately 140 km away), which will substantially reduce shipping distances of concentrate. The new port access road further reduces distance by providing a direct route.

- Disturbed areas will be revegetated as soon as possible to limit dust emissions and already disturbed areas will be used for Project infrastructure where feasible to limit the extent of construction activities.
- Grid electricity, which is primarily generated from hydroelectric power in NL, will be used as the primary source of energy for the facility, reducing GHGs and air contaminant emissions.
- A BACT study will be conducted for direct GHG sources of the Project to identify and select the lowest GHG-emitting technologies currently deemed technically and economically feasible for the Project.
- Tier 4 engines are considered BACT for air contaminant emissions from diesel engines and will be used for mobile equipment and where available used for standby emergency generators.
- Enclosures, berms, or other barriers may be considered for activities involving excessive noise emissions.

6.1.4 Residual Environmental Effects

The expected residual environmental effects for changes in air quality, GHGs, sound and light are presented below. Residual effects (i.e., those remaining following implementation of mitigation [Section 6.1.4]) for each Project phase are evaluated below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining, logging, and quarry activities.
  - The 2016 and 2024 ambient air quality monitoring results, sampled near the Project, were below the NL AQS, with the exception of one exceedance of PM_{10} in 2024 (suspected to be related to a nearby pass of mobile equipment or other irregular influence since $PM_{2.5}$ was below detection on the same day nearby) and one exceedance of TSP recorded downwind of Ming Mine in 2016. Samples were also measured at Nugget Pond (i.e., previous processing site on care and maintenance) in 2016, and the results were also below the NL AQS, with the exception of three exceedances of TSP recorded downwind of Nugget Pond. At the Grand-Falls Windsor NAPS station, the NL AQS and CAAQS are generally not exceeded. Some exceedances were measured in 2023 due to the long-range transport of particulate from forest fires.
  - The acoustic environment is representative of a rural area and the predominant noise sources are related to road traffic and existing mining activity.
  - Existing lighting near the Project is considered to be representative of relatively uninhabited rural areas.
- The nearest potential seasonal / residential receptor (i.e., cabin user) is located approximately 130 m from the Project Area, with additional cabin users located along the Highway 418. These residents (both permanent and seasonal) have lived or recently built adjacent to the existing mine operations and an area known for historical mining. There have been no complaints by the nearby residents for the past operations or current activities of FireFly.

- FireFly has incorporated the port access road into their Project design to limit Project-related traffic along the highway, but noise and air quality modelling have not yet been completed. They will be completed pre-construction. FireFly understands that additional mitigation may be required if noise or air quality concerns are identified at off-site receptors.

6.1.4.1 Change in Air Quality

Project-related releases of air contaminants combined with existing background concentrations are not expected to exceed provincial or federal air quality objectives, guidelines or standards in consideration of the planned mitigation. However, this will be evaluated further via dispersion modelling, to be completed prior to the start of Project construction. If the modelling indicates provincial or federal objectives might be exceeded off-site, additional mitigation would be developed to manage the environmental effects. For example, increased dust management practices for above-ground infrastructure or design changes could be developed to mitigate specific air contaminant sources if needed.

Construction activities will include mine site preparation and earthworks, clearing and cutting of vegetation and removal of organic materials, development of roads, excavation and preparation of areas within the mine site, and grading for infrastructure construction, as well as construction along the port access road and the construction / installation of infrastructure and equipment. Air contaminants may be released during construction activities in the form of combustion gases (SO_2, nitrogen oxides, and CO) and particulate matter (TSP, PM_{10} and $PM_{2.5}$) from the operation of diesel- and gas-powered equipment and fugitive dust (particulate matter including TSP, PM_{10} and $PM_{2.5}$, trace metals) from earth and material moving and handling activities, blasting and equipment movements.

An emissions inventory to support air dispersion modelling will be created based on available Project design information to estimate air contaminant releases resulting from activities during construction. Releases will be estimated for blasting activities, fugitives from wind erosion of stockpile surfaces, material transfer (loading and unloading) at stockpiles, fugitives from travel on unpaved haul roads, and from fuel combustion in mobile heavy equipment. The releases will be estimated using design information provided by FireFly and published emission factors, such as those from ECCC and US EPA AP-42. The methods used in development of the emissions inventory will be detailed in the atmospheric technical report to be completed prior to the start of Project construction. Dispersion modelling for construction may be completed, if deemed necessary to assess the likelihood of exceedances of the standards during construction. Often, construction emissions are lower than those during operation and in consideration of that as well as the temporary nature of construction; only an operational model is completed as a worst-case assessment of air quality effects during the life of the Project. This will be further discussed in the technical report.

Changes to air quality as a result of the Project-related releases of air contaminants to the atmosphere during operation will be assessed using an atmospheric dispersion model in combination with ambient background air contaminant concentrations. The CALPUFF dispersion modelling system will be used to predict the maximum ground level concentrations of regulated air contaminants in the LAA/RAA during the normal operation of the Project.

Air contaminants released during decommissioning and abandonment are expected to be similar to, or less than, the emissions associated with construction and operation and therefore will not be assessed further.

6.1.4.2 Change in GHGs

The main sources of direct GHGs during construction and operation of the Project include the off-road mobile and stationary equipment exhaust gases from the combustion of diesel and to a much lesser extent propane, and blasting using an ammonium nitrate. These emissions consist primarily of CO_2, and smaller amounts of methane (CH_4) and nitrous oxide (N_2O). Releases of hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3) are expected in insubstantial amounts, or not at all, based on typical mining operations and design of the Project. The following GHGs are therefore considered further in this assessment: carbon dioxide (CO_2), CH_4, and N_2O (expressed in the form of t of CO_2e); other GHGs are excluded from further assessment because they are not expected to be released in substantive amounts.

Indirect GHG emissions are also expected to occur during construction and operation of the Project from the use of grid electricity generated offsite as well as transport of supplies and products to and from site. These emissions consist of CO_2, CH_4, and N_2O.

Releases of GHG emissions will also occur during decommissioning, rehabilitation and closure activities; these releases are expected to be lower than those released during Project construction and operation due to the magnitude of required activities, as well as because lower GHG intensity options are expected to be more readily available at the time of these Project phases.

A GHG emissions inventory was prepared to estimate GHG emissions from the construction and operation of the Project. The construction period is estimated to last approximately 27 months (i.e., nine months of site preparation and early works, and 18 months of Project construction). The GHG emissions associated with Project operation were estimated on an annual basis.

6.1.4.2.1 GHG Inventory

Tonnes of CO_2e is the standardized way to report GHG emissions. To calculate emissions in CO_2e, emissions from each specific GHG are multiplied by their 100-year global warming potential (GWP). The GWP of these GHGs applied in this assessment are as follows:

- Carbon dioxide (CO_2) = 1.0
- Methane (CH_4) = 28
- Nitrous oxide (N_2O) = 265

The GWPs are from the Intergovernmental Panel on Climate Change Fifth Assessment Report (AR5) (IPCC 2014). There is a sixth assessment report available from IPCC; however, the GWP in that report are not yet being used for GHG reporting provincially or nationally.

On this basis, carbon dioxide equivalents for the Project are calculated as:

$$CO_{2e} = (mass\ CO_2 \times 1.0) + (mass\ CH_4 \times 28) + (mass\ N_2O\ \times 265)$$

For example, for mining and underground stationary combustion during site preparation and early works occurring over nine months, the following sample calculation shows the conversion of the each GHG species emissions to CO_{2e}:

$$CO_{2e} = \left(704 \frac{\text{tonnes}}{9\ \text{months}}\ CO_2 \times 1.0\right) + \left(0.01 \frac{\text{tonnes}}{9\ \text{months}}\ CH_4 \times 28\right) + (0.05 \frac{\text{tonnes}}{9\ \text{months}} N_2O\ \times 265)$$

$$CO_{2e} = 717 \frac{tonnes}{9\ months}$$

Emissions from on- and off-road mobile and stationary equipment were estimated using diesel combustion emission factors published by the Government of NL for use when reporting GHG emissions (Government of NL 2017). The estimated fuel usages were provided by the design team and include fuel consumed in heavy mobile equipment, off-road vehicles, and stationary equipment for early works and pre-construction activities, Project construction and operation.

The mobile and stationary GHG emissions were calculated using the following equation:

$$Emissions\ \left[\frac{tonnes\ GHG}{time\ period}\right] = Emission\ Factor\ \left[\frac{g\ GHG}{L\ of\ fuel\ combusted}\right] \times\ Fuel\ Usage\ [L] \times Unit\ Convesion \left[\frac{1\ tonne}{10^6\ g}\right]$$

Where:

Emissions = Annual Emission Rate [tonnes/time period]
Emission Factor = Emission factor, specific to GHG species and vehicle class
Fuel Usage = Total amount of fuel used provided by design team, per activity and time period

There is insufficient information available to estimate the GHG emissions resulting from the transport of supplies and products to and from site; however, these would be completed by on-road vehicles which would be fueled by gasoline or diesel that would have the federal carbon tax applied. Those GHG emissions would therefore not be reportable under the NL GHG reporting program and would not be part of FireFly's GHG emissions during construction or operation.

During operation, electricity will be supplied from the NL grid with emergency generators onsite for unplanned grid electrical outages; these emissions will be negligible in comparison to other Project emissions during normal operation. Emissions from emergency generators are not required to be reported or verified under the MMGR unless they are over 10 megawatt (MW), and are therefore excluded from the GHG inventory. The generators during operation will include a 1.5 MW unit, currently existing at the mine, and two 4 MW generators to be installed at the processing plant and one 750 kilovolt-amperes (kVA) generator to be installed at the new accommodations camp.

The GHG emissions from explosives detonation during operation were estimated based on the estimated fuel volume consumed, and the carbon content per litre of fuel (provided by the fuel supplier):

$$Emissions\ \left[\frac{tonnes}{year}\right] = 3.664\ \left[\frac{tonnes\ CO2}{tonne\ of\ Carbon}\right] \times\ Fuel\ Usage\ [L] \times Carbon\ content\ \left[\frac{tonnes}{L}\right]$$

Where:

Emissions = Annual Emission Rate [tonnes/year]
3.664 = the ratio of tonnes CO_2 per tonne of Carbon
Fuel Usage = Total amount of fuel use per year, provided by design team
Carbon Content = The carbon content of the fuel, provided by the fuel supplier

The indirect GHG emissions from electricity consumption during construction and operation were estimated using the most recently available electricity consumption emission factor for NL (0.018 t CO_2e/MWh) from the ECCC National Inventory Report (ECCC 2024) and the estimated annual electricity usage at the site (an estimated 43,781 megawatt hour (MWh) during early works and pre-construction over nine months, 211,653 MWh during the construction period of 18 months up to completion of commissioning, and 238,899 MWh per year during operation).

$$Emissions\ \left[\frac{tonnes}{time\ period}\right] = Emission\ Factor\ \left[\frac{t\ CO_{2e}}{MWh}\right] \times\ Consumption\ [MWh]$$

Where:

Emissions = Annual Emission Rate [tonnes/time period]
Emission Factor = 18 g CO_{2e}/kWh, or 0.018 t CO_2e/MWh)
Consumption = estimated electricity consumption from the grid, provided by the design team

Emissions associated with early works and pre-construction are approximately 17,058 t CO_2e (16,270 t direct CO_2e and 788 t indirect CO_2e). The early works and pre-construction phase is expected to last for nine months. A range of estimated annual GHG emissions from Project construction and operation are presented below based on currently available information. The range is based on varying use of fossil fuels and electricity during construction and operation which the Project team is currently reviewing to confirm how much GHG mitigation can be technically and economically achieved.

During Project construction (18 months), direct GHG emissions are estimated to range from 53,062 t CO_2e (increased electricity scenario) to 68,007 t CO_2e (fossil fuel scenario). During operation of the Project, direct GHG emissions are estimated to range from 21,747 t CO_2e (increased electricity scenario) to 46,421 t CO_2e (fossil fuel scenario). The options for electrification are being reviewed to mitigate GHG emissions towards the low range presented. This will be finalized during the BACT assessment.

Table 6.1.13 Estimated Greenhouse Gas Emissions During Construction and Operation

Category	High Range (Fossil Fuel Scenario)	Low Range (Increased Electricity Scenario)
	t CO_2e	t CO_2e
Project Construction (18 months)		
Mining and Underground	31,568	16,623
Surface and Infrastructure	36,439	36,439
Total Direct	68,007	53,062
Total Indirect	3,810	3,810
TOTAL (direct and indirect)	70,817	56,872
Project Operation (4,800 Tonnes Per Day, Annual Emissions)		
Mining and Underground	34,492	9,958
Surface and Infrastructure	11,789	11,789
Total Direct	46,421	21,747
Total Indirect	4,300	4,300
TOTAL (direct and indirect)	50,581	26,047

It is anticipated that the Project will be regulated under the MGGR (i.e., the Project is expected to release more than 15,000 t CO_2e per year from direct emissions sources onsite during operation). The Project's annual GHG emissions during operation are not anticipated to be more than 0.6% of provincial GHG emissions, or 0.007% of total GHG emissions in Canada.

It is anticipated that the Project will be subject to BACT requirements for activities that occur within the Project's boundaries during operation. As such, FireFly will review options and prepare a BACT assessment for approval by Lieutenant-Governor in Council to demonstrate that the Project will employ BACT in onsite equipment that generate GHG emissions. The BACT study will focus on direct GHG emissions (i.e., before sequestration), as well as net GHG emissions (i.e., including sequestered CO_2 if applicable). Mitigation measures for GHG emissions are most-often related to lower fuel consumption (through improved efficiencies, increased electrification of the Project) and the use of alternate fuels (e.g., the use of biodiesel), which is directly proportional to lower GHG emissions.

A detailed GHG inventory for the Project GHG sources will be included as part of the BACT assessment, to be completed and submitted for government review in 2025.

6.1.4.3 Change in Sound Quality

During Project construction, sound emissions are expected from the operation of heavy mobile equipment and vehicles for land clearing, earth moving activities and material handling. Other vehicle activities, such as those associated with the access road (e.g., delivery of supplies, rotation changes), will also generate sound emissions. Sound emissions will also result from blasting during construction. Blast energy that liberates into the atmosphere can generate air overpressure and noise. Blasting is expected to be limited to daytime hours and will follow best management plans outlined in guidance documents such as the Blasters Handbook (ISEE 2016) and the Environmental Code of Practice for Metal Mines (ECCC 2009).

Sound emissions during Project operation will result from activities similar to those expected during construction. Material handling and earth moving will continue throughout mining, and some heavy truck traffic will increase relative to an increase in production levels in the initial few years of operation. Rock breaking, crushing and processing, and blasting will also occur during operation.

Sound emissions are also expected from the use of heavy equipment during the decommissioning of mine features and infrastructure, progressive rehabilitation, and closure rehabilitation. As the amount of heavy equipment operating during the decommissioning, rehabilitation and closure of the mine is expected to be less than that required during Project construction and operation, the resulting sound emissions are also anticipated to be lower.

With the implementation of mitigation measures, the Project will result in construction, operation and decommissioning noise effects that are not expected to exceed guidance levels. For example, the port access road was added to the Project design based on community feedback to help reduce truck traffic and associated noise levels to nearby receptors located on Highway 418. Detailed noise modelling will be conducted prior to the start of Project construction to estimate Project-related noise emissions at receptor locations.

6.1.4.4 Change in Light Levels

The major source of light emissions during construction activities will be through the use of mobile artificial lighting, which will be mitigated by using directional lighting to focus lighting on the work areas and reduce light trespass or glare effects. The number of artificial lighting units and locations are currently unknown. However, such equipment is likely to be used throughout the Project Area where construction and infrastructure activities will occur. Lighting used during construction will be designed using best practices to reduce light trespass, glare, and contributions to sky glow to acceptable levels.

During operation, nighttime safety lighting may be required on site roads, overburden, and waste rock management, ore milling and processing, tailings and water management, and utilities and site infrastructure (i.e., accommodations camp and site buildings). The final lighting design is not complete, however the final lighting design will be based on industry best practices to reduce environmental effects from lighting, such as those recommended by the United States Bureau of Land Management (US BLM 2023).

With the implementation of mitigation and management measures, the levels of light trespass and glare from lighting during Project construction and operation are not expected to exceed CIE guidelines at nearby receptor locations. It is also expected that sky glow levels will remain similar to that of a relatively uninhabited rural area during Project construction and operation.

6.1.4.5 Summary

Based on application of the mitigation measures identified in Section 6.1.4 and FireFly's commitment to comply with regulatory standards, residual environmental effects on the Atmospheric Environment are predicted to be not significant. This prediction will be validated through the completion of air contaminant dispersion modelling and noise modelling, which will be presented in the atmospheric technical report, to be completed prior to the start of Project construction. Based on the results of quantitative modelling, FireFly will apply additional mitigation through Project design if needed to manage effects on the Atmospheric Environment below the significance criteria.

6.1.4.5.1 Air Quality

Project-related releases of air contaminants combined with existing background concentrations are not expected to exceed provincial or federal air quality objectives, guidelines or standards in consideration of the planned mitigation. However, this will be evaluated further via dispersion modelling, to be completed prior to the start of Project construction. If the modelling indicates provincial or federal objectives might be exceeded, additional mitigation would be developed to manage the environmental effects.

When completing the dispersion modelling, a conservative approach will be used in, meaning the inputs that will be used will result in higher and more frequent emissions and predicted ambient concentrations than what will occur most of the time (worse-case scenario). Generally, dispersion model inputs are based on maximum quantities of air contaminants potentially released to the atmosphere from a specified project or activity. These would be assumed to occur continuously over a period of time for the model to identify / establish the potential maximum short-term concentrations that could occur. There are uncertainties associated with emissions estimates, the meteorological data, and the algorithms used to model plume dispersion; these will be discussed further in detail in the atmospheric technical report to be completed prior to the start of Project construction.

Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed to maintain not significant adverse effects on Air Quality.

6.1.4.5.2 GHG Emissions

Based on the application of the mitigation measures identified in Section 6.1.4, FireFly's commitment to comply with regulatory standards, residual environmental effects from GHG emissions are not substantive. Although GHG emissions from the operation of the Project are expected to be more than the provincial reporting threshold of 15,000 t CO_2e per year from direct emissions sources, and contribute approximately 0.6% to NL's provincial totals annually, they will be actively managed through the development of a BACT assessment for GHG emissions and comply with NL regulatory reporting and compliance obligations during operation. The GHG inventory will be reviewed and updated as needed

during the BACT assessment. Based on the results of the BACT assessment, FireFly will apply additional mitigation where needed to further manage GHG emissions and acknowledges that regulations and standards are evolving and is committed to remaining in compliance with provincial requirements over the life of mine.

6.1.4.5.3 Sound Quality

The estimation of noise emissions associated with construction, operation and decommissioning depends on the final design, processing approach, intensity of mining activity and required supporting infrastructure. Current sound quality conditions are based on sound pressure level monitoring data collected within the Project Area. Predicted sound pressure levels will be determined at nearby receptors using industry-standard modelling software that is routinely used for predicting environmental noise from industrial activities such as mining. The noise modelling methods will include conservative assumptions regarding the operation of mining equipment, such as by assuming that all equipment is operating at one time and at full capacity. The noise modelling will also make conservative assumptions regarding meteorological conditions that are conducive to sound propagation in the atmosphere. These assumptions typically result in predicted noise levels that are higher than what actually occurs during mining operations. With the implementation of mitigation measures, the Project will result in construction, operation and decommissioning noise effects that are not expected to exceed guidance levels. Noise modelling will be completed prior to the start of Project construction and presented in the atmospheric technical report. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed to maintain not significant adverse effects on Sound Quality.

6.1.4.5.4 Lighting

Future levels of light trespass, glare and sky glow related to the construction, operation and decommissioning of the Project are directly related to the lighting plan for the Project which has yet to be designed. However, the lighting plan will be prepared using industry best practices to reduce light trespass, glare, and sky glow. Therefore, predictions and conclusions made in this assessment are based on a medium level of confidence. With the implementation of mitigation measures, the Project will result in construction, operation and decommissioning lighting effects that are not expected to exceed guidance levels.

6.1.5 Follow-up and Monitoring Programs

6.1.5.1 Air Quality

Air quality modelling will be completed using the CALMET/CALPUFF modelling system (Scire et al. 2000) to estimate the potential effects of air contaminant releases during construction and operation of the Project on ambient air quality in the LAA/RAA. The results of the modelling will be presented in the atmospheric technical report to be completed prior to the start of Project construction.

Ambient air and meteorology monitoring will be implemented in conjunction with emissions mitigation to provide an understanding of the meteorological conditions and offsite concentrations and evaluate the need for more rigorous mitigation. Typical monitoring may include meteorological monitoring (wind speed and wind direction) and likely periodic monitoring of ambient particulate matter and trace metals concentrations. The monitoring plan will be confirmed through engagement with regulators and the community.

The results of the ambient monitoring will be used to assess the effectiveness of the dust mitigation and to evaluate the potential need for more rigorous dust mitigation. If the monitoring program indicates that ground-level concentrations are greater than the NL AQS, additional mitigation measures to reduce emissions will be implemented. Given that fugitive dust from the haul roads is likely to be the largest source of dust emissions, more frequent road watering or an application of a dust suppressant will be implemented.

6.1.5.2 Greenhouse Gases

A detailed GHG inventory and BACT assessment will be completed prior to Project construction. During operation, the Project will track fossil fuel consumption used in onsite activities for GHG quantification and report GHG emissions provincially and federally, as required by legislation (Section 6.1.1.2).

6.1.5.3 Sound Quality

With the implementation of mitigation measures, the Project will result in construction, operation and decommissioning noise effects that are not expected to exceed guidance levels. Should the results of noise modelling lead to recommendations of additional mitigation measures, a follow-up noise monitoring program is recommended for nearby receptor locations to confirm the effectiveness of those mitigation measures.

6.1.5.4 Lighting

A follow-up light monitoring program is recommended to confirm that the lighting plan design follows industry best practices for lighting and complies with applicable CIE guidelines for light trespass, glare, and sky glow.

6.2 Groundwater Resources

Groundwater Resources was selected as a valued component (VC) because of its importance to ecosystem function, potential Project-related interactions and provisions of the Newfoundland and Labrador (NL) *Water Resources Act*. Groundwater resources are critical in maintaining baseflow to streams for ecological habitat, and in supplying fresh water for human and industrial / commercial uses. Groundwater quality and quantity could be affected by the construction, operation, decommissioning, rehabilitation, and closure of the Project, which may in turn affect surface water and fish habitat. For this assessment, the Groundwater Resources VC is defined as the value and function of groundwater resources in maintaining baseflow to streams for ecological habitat, and in supplying fresh water for human and industrial / commercial uses.

The federal guidelines for potable water, Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada 2024), are applicable as aesthetic and health-based guidelines for a variety of chemical parameters for potable water sources at the site (e.g., accommodations camp). As well, *Metal and Diamond Mining Effluent Regulations* (MDMER), pursuant to the federal *Fisheries Act,* set out the maximum allowable limits for concentrations of specific metals and compounds in discharge resulting from the Project and extensive environmental effects monitoring criteria to be implemented during the operational phase of a Project. Provincially, The *Water Resources Act* gives Water Resource Management Division of the NL Department of Environment and Climate Change (NLDECC) the responsibility and legislative power for the management of water resources in NL. The *Environmental Control Water and Sewer Regulations*, under the provincial *Water Resources Act*, which incorporate the limits imposed by the MDMER, will also apply to discharge of water and effluent from the Project.

As described in Section 5.2.3 and shown on Figures 6.2.1 and 6.2.2, Project spatial boundaries for Groundwater Resources include the Project Area and the Local Assessment Area (LAA) which is based on the surface watersheds that represent the possible extent of drawdown dewatering of the underground workings, and changes to flow or groundwater quality due to recharge from the tailings management facility (TMF) and waste rock piles. The LAA boundaries will be confirmed through groundwater flow modelling, which will be completed prior to the start of construction. The Regional Assessment Area (RAA) is the same as the LAA because the aquifers that interact with the Project are limited in extent due to groundwater flow divides coinciding with surface water sub-watershed boundaries. The LAA and RAA are therefore considered together as the LAA / RAA in the remainder of the assessment.

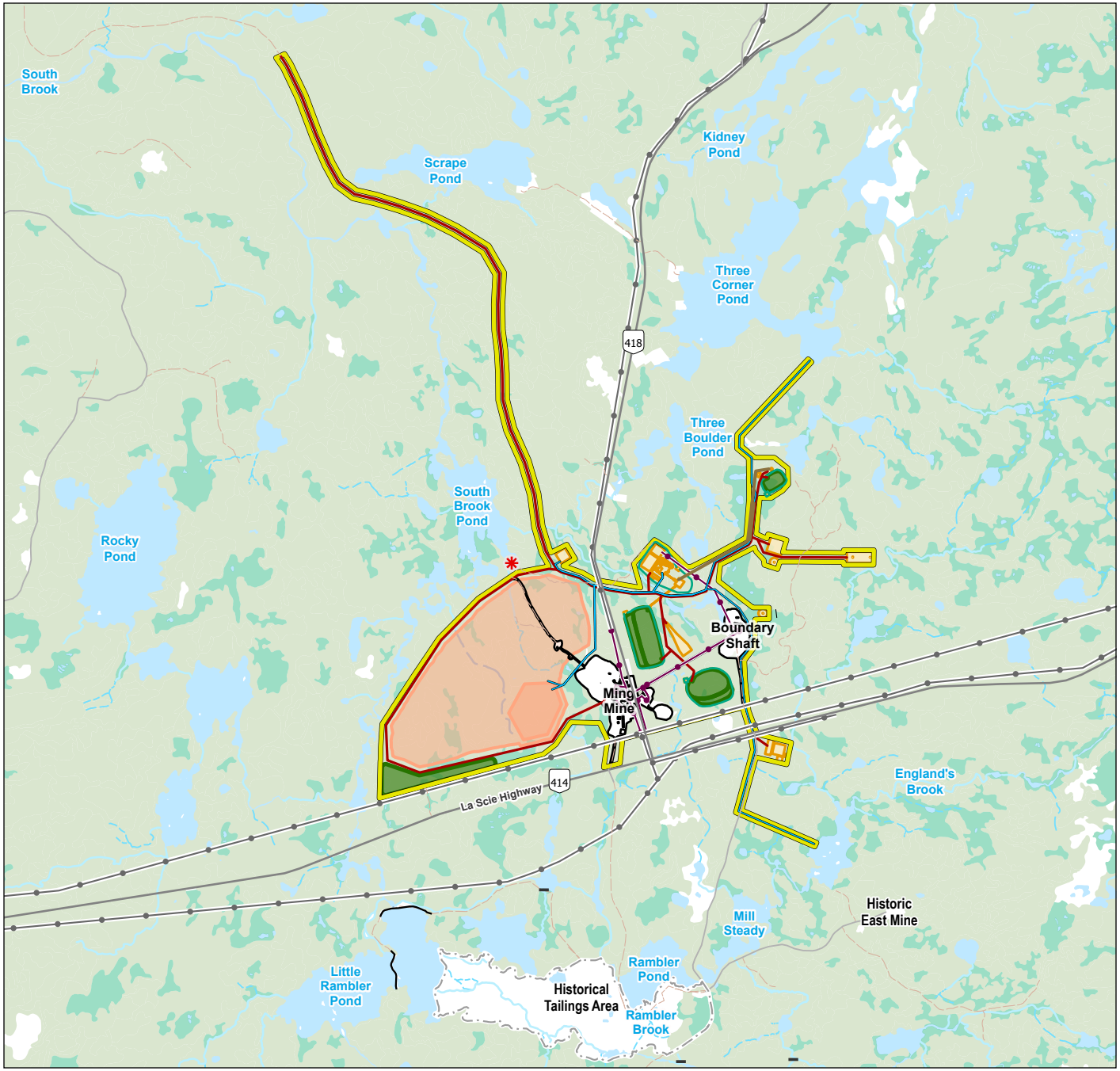

Figure No.
6.2.1
Title
Project Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_2_001

Project Location
Baie Verte, NL

Prepared by AC/MB on 2024-12-03
Revised by SC 2025-03-19

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:40,000

- Final Discharge Point
- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Project Area
- Ming Mine Operation
- Stockpile and Organic Laydown
- Other Site Infrastructure
- TMF and Polishing Pond
- Dam
- Resource Road / Trail
- Highway
- Arterial / Collector
- Resource Road / Trail
- Power Line
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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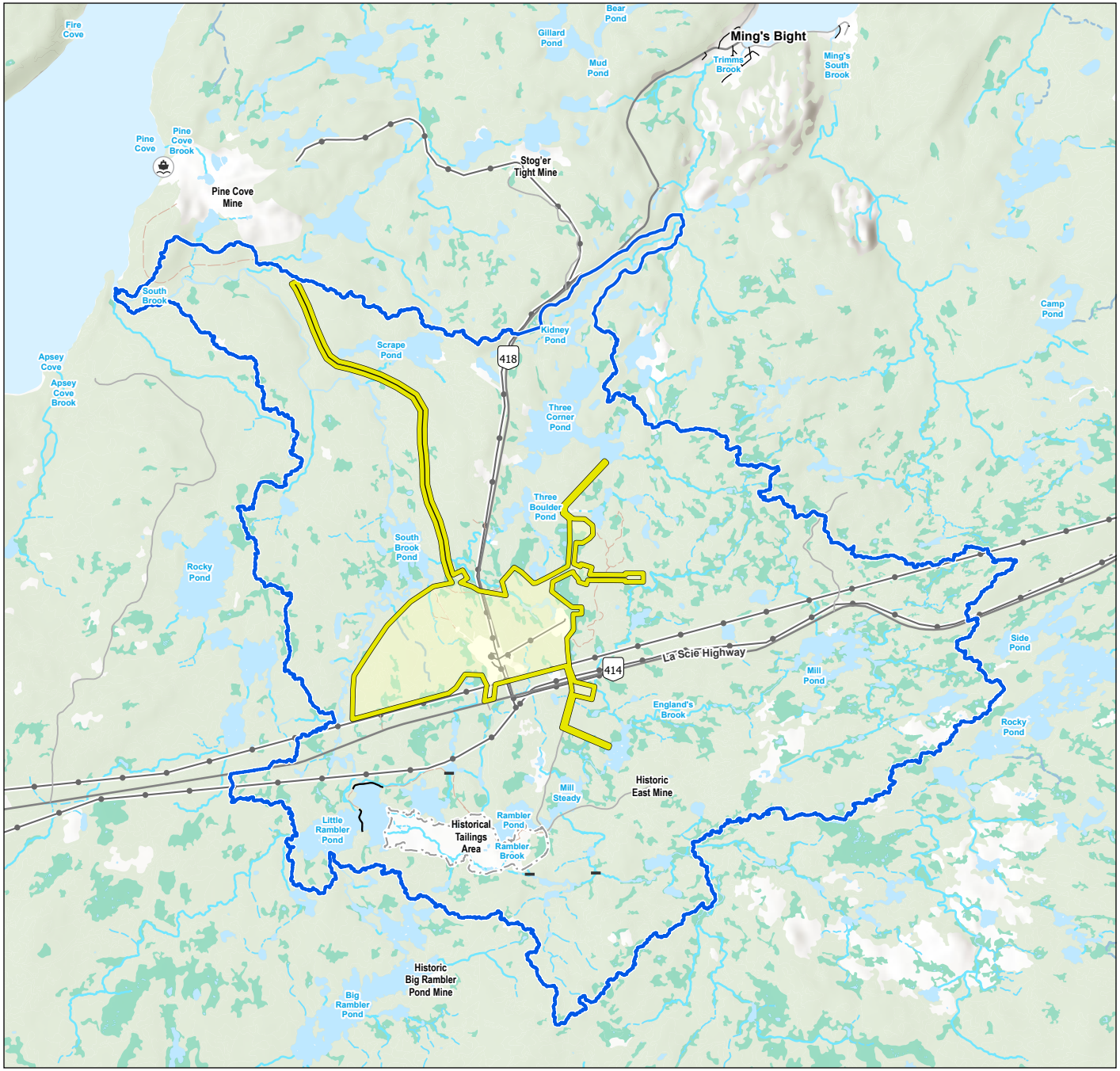

Figure No.
6.2.2

Title
Groundwater Local Assessment Area and Regional Assessment Area Boundaries

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_001a

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-06
Revised by SC 2025-03-20

N

0 500 1,000
Metres
(At original document size of 8.5x11)
1:68,000

- Local and Regional Assessment Area
- Project Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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A significant residual adverse effect on Groundwater Resources for the Project is defined as any of the following:

- Decrease in the yield from an existing and otherwise adequate groundwater supply well to the point where it is inadequate for its intended use
- Change in groundwater quality, such that the quality of groundwater from an otherwise adequate water supply well that meets applicable guidelines deteriorates to the point where it becomes non-potable or cannot meet the GCDWQ (Health Canada 2024) for a consecutive period exceeding 30 days
- Physical or chemical alteration to an aquifer to the extent that interaction with local surface water results in streamflow or surface water chemistry changes that adversely affect aquatic life or a down-stream surface water supply

6.2.1 Existing Conditions

A characterization of the existing conditions within the spatial boundaries defined in Figures 6.2.1 and 6.2.2 is provided in the following sections. This includes discussion of the influences of past and present physical activities on the VC, leading to current conditions. An understanding of the existing conditions for the VC within the spatial area being assessed is a key requirement in the prediction of potential residual Project effects provided in Section 6.2.4.

6.2.1.1 Approach and Methods

Information regarding existing conditions of groundwater resources in the Project Area are derived from data collected in support of the existing mine, data collected in 2024 for the baseline characterization studies in support of Project development, and existing, publicly available regional hydrogeological information. The data spans the period 2005 through to 2024. The following data and reports were reviewed to characterize existing conditions for groundwater resources for the Project:

- Phase I Environmental Site Assessment, Former Rambler Mine Property, Baie Verte, Newfoundland (Davis Engineering & Associates Ltd. 2005)
- Baseline Water and Sediment Assessment Program, Ming Mine, Newfoundland (Golder 2006)
- Phase II Environmental Site Assessment (ESA), Former Consolidated Rambler Mine Property, Baie Verte, Newfoundland and Labrador (AMEC 2007)
- Phase III ESA & Hazardous Materials Assessment, Former Consolidated Rambler Copper Mine, Baie Verte, NL (Jacques Whitford 2008)
- Preliminary Effluent Quality Evaluation in Support of the Green Bay Ming Mine Project (Ecometrix 2024)

Additional information used in support of baseline water resource characterization was derived from:

- Geological / hydrogeological mapping information from GeoScience OnLine Atlas (Newfoundland and Labrador Department of Industry, Energy and Technology [NLDIET] 2013)
- Drilled Water Well Database (NLDECC 2008) and recent updates (unpublished)

Historical information and groundwater data were used to characterize baseline groundwater conditions to assess potential changes in groundwater quantity and quality through pathways described in Section 6.2.2. Physiographic setting, water levels, groundwater chemistry, hydraulic properties, groundwater flow direction, and groundwater users were considered to develop an understanding of how groundwater might interact with the Project, and how the Project may in turn interact with the natural hydrogeological-hydrologic cycle.

Current groundwater data is being collected in accordance with an ongoing monitoring program that began in August 2024. Fifteen new monitoring wells, including two sets of paired wells (i.e., a shallow and a deep well), were installed throughout the Project Area between August and September 2024. The new wells were strategically placed to near existing underground mine workings and down-gradient of the TMF footprint to be used for long-term monitoring. Measurements of groundwater levels and collection of groundwater samples for chemical analysis began in September 2024 and will proceed on a quarterly basis. Preliminary results are presented in Section 6.2.1.2.3 and a final baseline report will be completed prior to the start of construction.

6.2.1.2 Description of Existing Conditions

This section provides an overview of existing groundwater conditions for the Project.

6.2.1.2.1 Physiographic Setting

An overview of the data and analysis used to characterize the existing conditions for the groundwater environment include climate, detailed in Section 6.1.1, and surficial geology, bedrock geology, and regional hydrogeology, which are provided below.

Topography

Based on a review of a topographic map for the area (Natural Resources Canada 2021), the Project Area is located in a topographic low area with an average elevation of approximately 140 metres above sea level (masl). Surrounding the Project Area, the topography rises to greater than 200 masl, including the area directly adjacent to Three Corner Pond, which has a topographic high of 237 masl. In general, the Project Area slopes west toward the waters of Baie Verte, which is approximately 5 kilometres (km) from the Project Area.

Surficial Geology

Based on a surficial geology map prepared by Kirby et al. (2011), the overburden material in the Project Area generally consists of glacial till veneer that is mapped to be less than 1.5 metres (m) thick, bedrock concealed by vegetation, and areas of poorly drained accumulations of organic matter, peat and peat moss. The surficial geology of the LAA / RAA is shown on Figure 6.2.3.

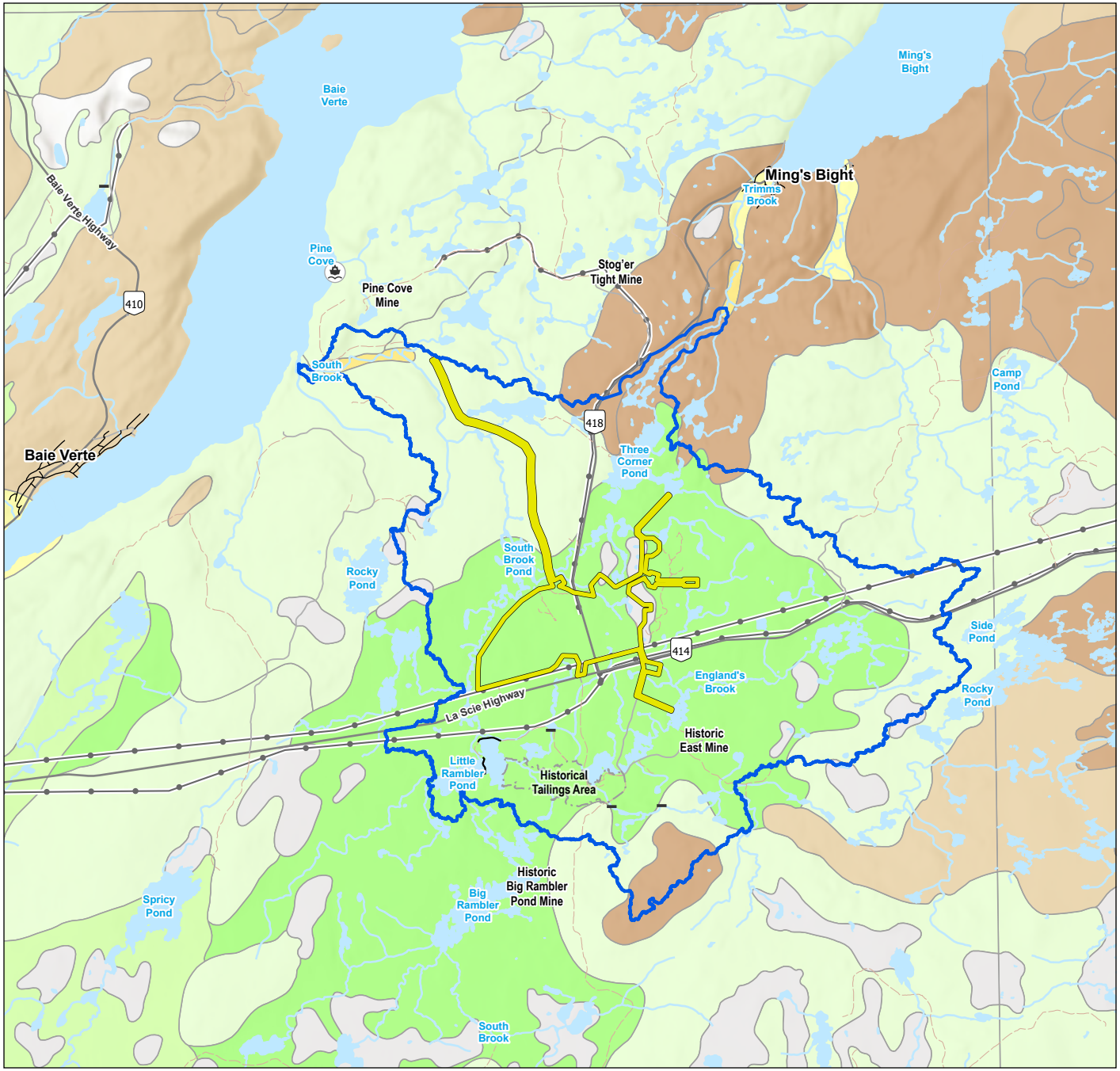


Figure No.
6.2.3
Title
Surficial Geology

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_002

Project Location
Baie Verte, NL

Prepared by AC on 2024-12-03
Revised by MB/SC 2025-03-19

N

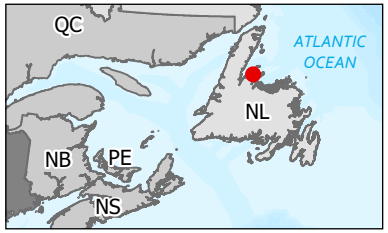
0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Project Area
- Local and Regional Assessment Area

Surficial Geology

- Fluvial
- Glaciofluvial
- Till Veneer
- Hummocky Till
- Thick Till
- Organics
- Rock Exposed
- Rock Concealed

- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, GovNL - Geological Survey Division
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199903_data\gis_cad\gis_data\mapping\aprx\2_121418199_FireFlyMetals_GreenBayCuAu_Aquatics\121418199_FFM_MingMine_GW.aprx Revised: 2025-03-25 By: mblackwood

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Bedrock Geology

Based on a review of bedrock geology mapping (Hibbard and Gagnon 1980; Skulski et al. 2017), the area surrounding the Project is a complex geological system that is underlain by Late Cambrian to Early Ordovician bedrock of the Rambler Rhyolite, Scrape Point, and Bobby Cove Formations.

The southern portion of the TMF and Polishing Pond (west of Highway 418; Figure 6.2.1) is underlain by the Rambler Rhyolite Formation, which is described as felsic volcaniclastic rocks (Skulski et al. 2017). The remainder of the Project Area is underlain by the Scrape Point and Bobby Cove Formations with sporadic intrusions of synvolcanic rocks. The Scrape Point Formation is described as mafic volcaniclastic rocks and basalt flows (Skulski et al. 2017). The bedrock of the Scrape Point Formation primarily underlies the portion of the Project Area south of Highway 414 (i.e., the pipeline to Water Intake Location A), the northern portion of the TMF and Polishing Pond, and the access road along South Brook Pond and Scrape Pond (Figure 6.2.1). The Bobby Cove Formation is described as volcanogenic sandstones and siltstones, mafic tuffs, and pillow basalts (Skulski et al. 2017). The bedrock of the Bobby Cove Formation primarily underlies the Boundary Shaft and infrastructure toward Three Corner Pond (Figure 6.2.1).

A large-scale, dominantly northeast plunging synform structure is shown on geological maps (Hibbard and Gagnon 1980; Skulski et al. 2017) in the area of the historical tailings (Figure 6.2.1). A large-scale assumed thrust fault is in the area of Scrape Pond (Figure 6.2.1) (Hibbard and Gagnon 1980; Skulski et al. 2017). Small-scale fractures and joints can be associated with these features and may be important water-bearing structures (secondary porosity) that are expected to be common in the rocks underlying the area. The bedrock geology of the Project Area and LAA / RAA is shown on Figure 6.2.4.

The underground geology has been characterized by FireFly into high- and low-grade ore zones within the lower footwall, the upper footwall, and massive sulfide zones within the regional geology described above. A block model of the deep geology in the Project Area is shown in Figure 6.2.5.

Regional Hydrogeology

Regional hydrogeological data was obtained from The Hydrogeology of Central Newfoundland (AMEC 2013). The Project Area is located in what is referred to as Hydrostratigraphic Unit 3 (Figure 6.2.6), which consists of basic pillow lava, flows, breccia, and tuff. Yields of wells drilled in Unit 3 are typically low to moderate, ranging from 0.1 litres per minute (L/min) to 455 L/min, with a median sustainable pumping rate of 9 L/min.

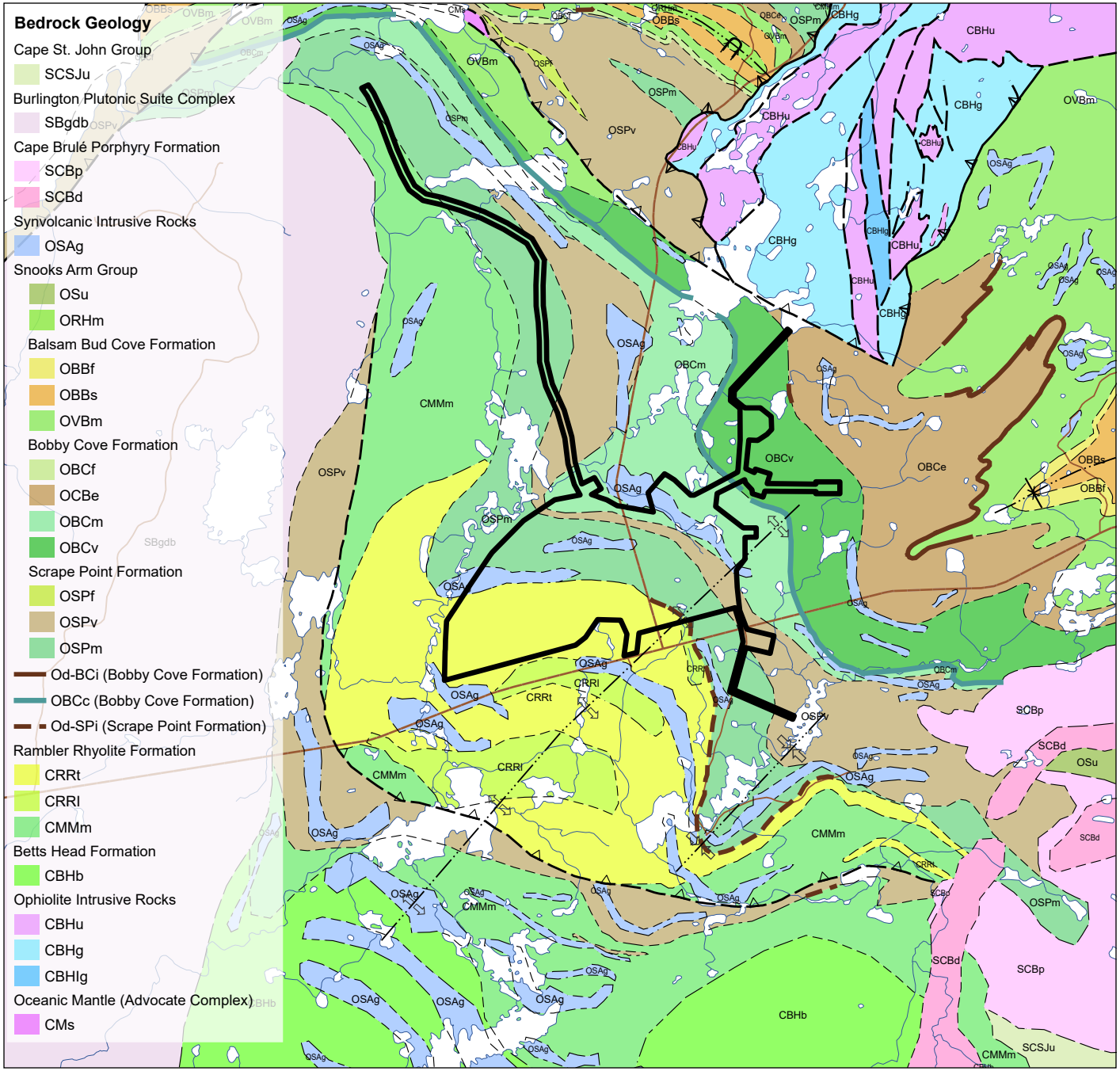


Figure No.
6.2.4
Title
Bedrock Geology

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_003a

Project Location
Baie Verte, NL

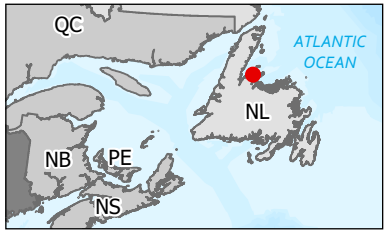
Prepared by AC on 2024-12-03
Revised by MB/SC 2025-03-19

N

0 500 1,000
Metres
(At original document size of 8.5x11)
1:50,000

- Project Area
- Fault or Shear Zone
- D_2 Thrust Fault
- D_3 Thrust Fault
- D_3 antiform, upright
- D_2 syncline, upright
- D_3 synform, upright
- D_2 syncline, overturned

Lithologic or Stratigraphic Contact
- contact, approximate
- contact, inferred



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, NRCan Geological Survey of Canada, Digital geoscience atlas of Baie Verte Peninsula
3. Background: Geological Survey of Canada, Digital geoscience atlas of Baie Verte Peninsula

Stantec

\\ca0151-ppfss01\work_group\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\2_121418199_FireFlyMetals_GreenBayCuAu_Aquatics\121418199_FFM_MingMine_GW.aprx Revised: 2025-03-20 By: mblackwood

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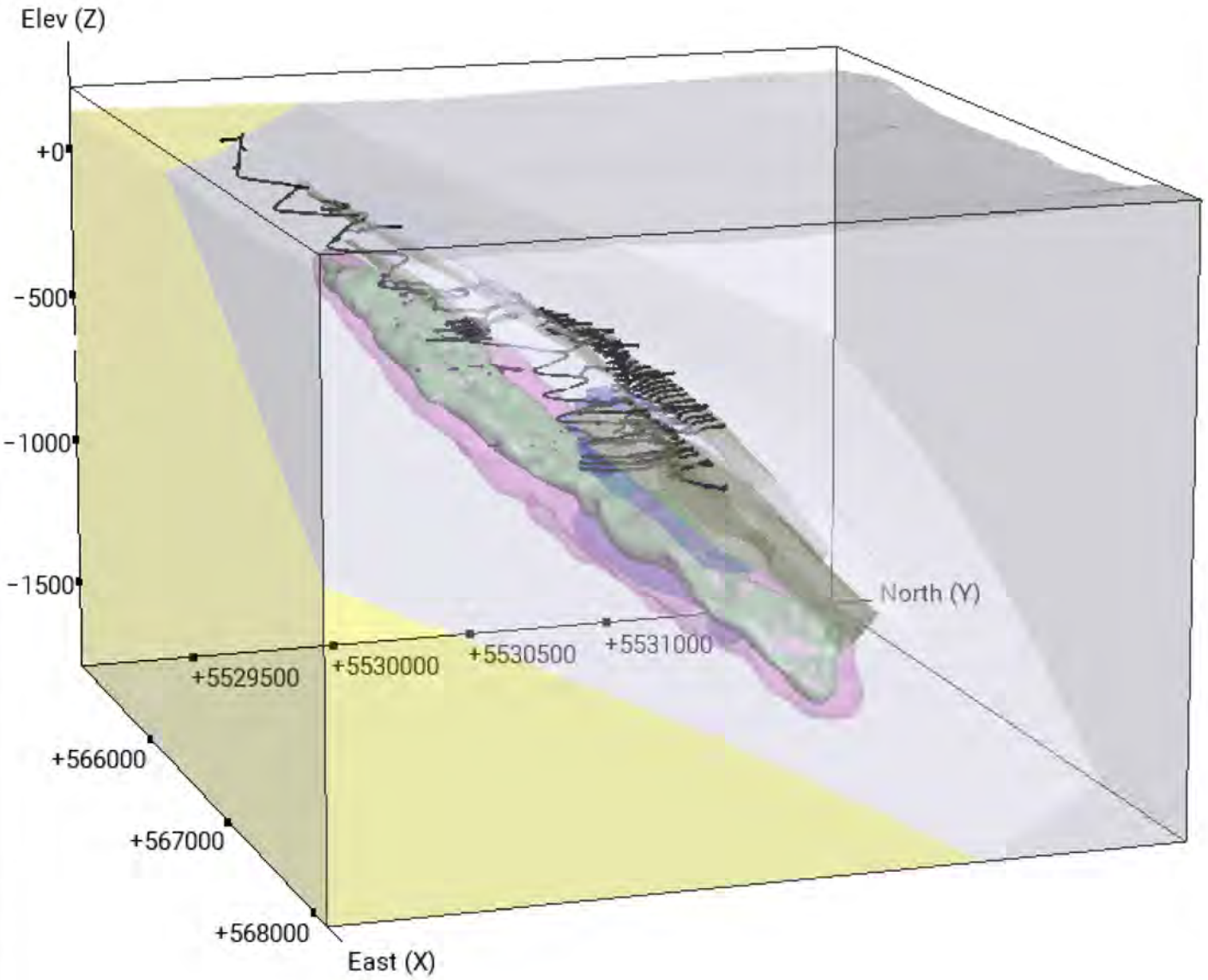

Figure No.
6.2.5
Title
Geological Block Model

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project
121418199_2_005

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-22
Revised by SC 2025-03-19

- Portal
- Lower Footwall Zone High Grade
- Lower Footwall Zone Low Grade
- Upper Footwall Zone
- Massive Sulphide Zone
- Bobby Cove Formation
- Scrape Point Formation
- Rambler Rhyolite formation

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd,
3. Background: NRCan CanVec

Stantec

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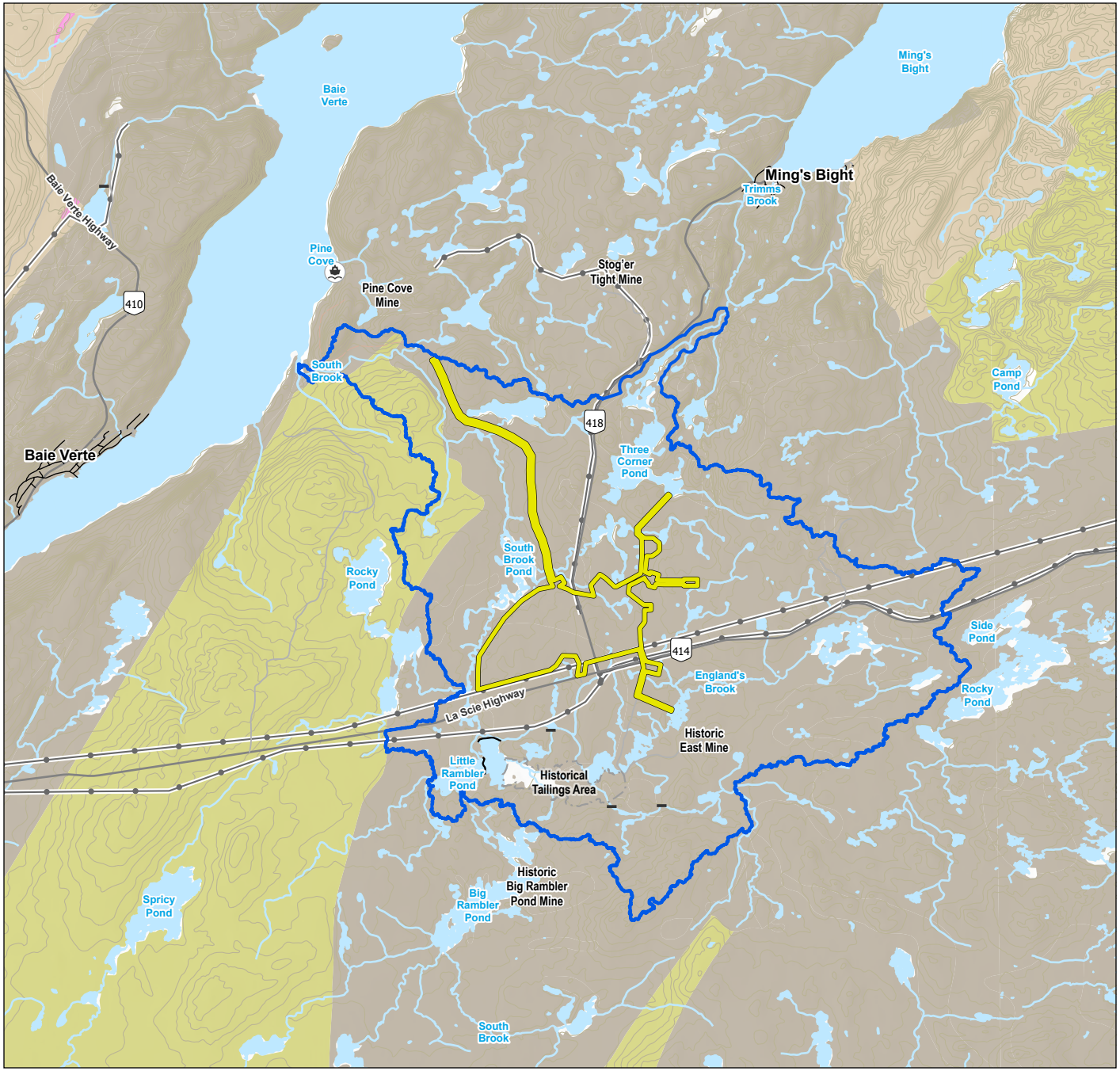


Figure No.
6.2.6
Title
Regional Hydrogeology

Client/Project 121418199_006
FireFly Metals Ltd
Green Bay Ming Mine Project

Project Location
Baie Verte, NL

Prepared by AC on 2024-12-03
Revised by MB/SC 2025-03-19

N

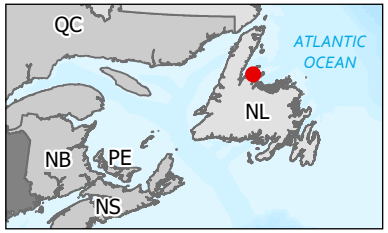
0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Project Area
- Local and Regional Assessment Area

Hydrostratigraphic Unit

- Unit 1 – Low to Moderate Yield Metamorphic Rocks
- Unit 3 – Low to Moderate Yield Igneous Rock
- Unit 4 - Low Yield Ophiolite Complexes
- Unit 5 - Low to Moderate Yield Plutonic Strata

- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Contour (20 m)
- Watercourse
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, GovNL - Geological Survey Division
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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On the regional scale, groundwater recharge areas are expected at higher elevations within the LAA / RAA, while discharge is anticipated in the lower elevations, corresponding to surface water features. Given the limited overburden thickness described in the surficial geology section, the predominant regional groundwater flow mechanism is expected to occur through the bedrock aquifer, which is expected to occur mainly through secondary openings, such as fractures and joints, and will be variable depending on the frequency and interconnection of these structures. Despite the limited thickness, the glacial till, organic material, and wetland areas are considered important mechanisms for groundwater recharge to the local hydrogeological systems, which will feed into the regional bedrock systems. Groundwater flow and recharge through the till and organic material will predominantly occur through pore spaces between gravel, sand, silt, clay, and organic grains of material.

6.2.1.2.2 Groundwater Quantity

Groundwater Levels

Water levels collected manually from 15 monitoring wells during September 2024 ranged from approximately 0.08 metres below ground surface (mbgs) to 3.2 mbgs. Water levels were collected within the Project Area in the vicinity of the Ming Mine and Boundary Shaft. Groundwater elevations vary across the Project Area and generally reflect the topographic relief of the area, with higher groundwater elevations occurring in wells located at higher topographic elevations.

Hydraulic Properties

Hydraulic response testing was conducted on the fifteen newly installed monitoring wells within the Project Area between September 6 and 17, 2024 (Figure 6.2.7). The Bouwer-Rice method (Bouwer and Rice 1976) was used to calculated hydraulic conductivities for each well. Table 6.2.1 presents the results of the hydraulic response testing completed in September 2024. An average hydraulic conductivity of 1.6×10^{-6} metres per second (m/s) was calculated for the newly installed monitoring well network.

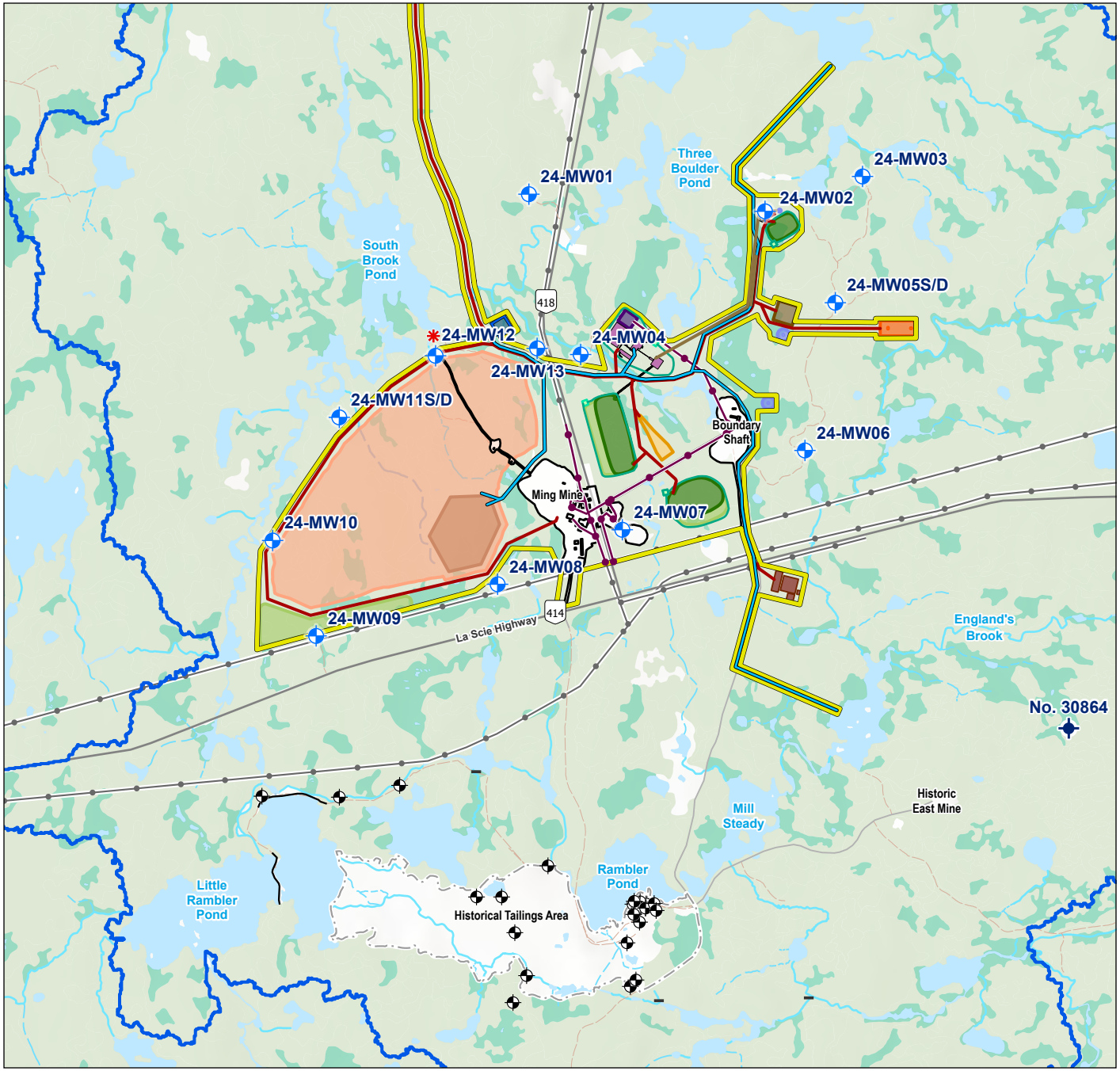


Figure No.
6.2.7

Title
Groundwater Monitoring Well Locations (Existing and Historic)

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_008

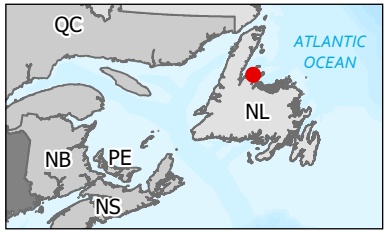
Project Location
Baie Verte, NL

Prepared by AC on 2024-12-03
Revised by MB/SC 2025-03-19

N

0 200 400 600 Meters
(At original document size of 8.5x11)
1:30,000

- Drilled Water Well
- Monitoring Well
- Historic Monitoring Well
- Project Area
- Local and Regional Assessment Area
- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Final Discharge Point (FDP)
- Camp
- Catch Basin
- Explosives Storage
- Ming Mine Operation
- Processing Plant Infrastructure
- Substation
- Stockpile
- Organic Laydown
- Paste Plant
- Portal Location
- Shaft Location
- Polishing Pond
- Tailings Management Facility (TMF)
- Wastewater Management Plant (WWMP)
- Other Features



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 6.2.1 Hydraulic Response Testing (2024)

Well ID	Test Date	Coordinates		Rising Head (m/s)	Falling Head (m/s)	Geometric Mean (m/s)
		Northing (m)	Easting (m)			
24-MW01 D	Sept 14, 2024	5531042.162	565455.820	1.2×10^{-7}	9.9×10^{-8}	1.1×10^{-7}
24-MW01 S	Sept 14, 2024	5531042.162	565455.820	1.4×10^{-5}	5.6×10^{-6}	8.9×10^{-6}
24-MW02	Sept 8, 2024	5530956.290	566638.913	1.1×10^{-6}	1.2×10^{-6}	1.1×10^{-6}
24-MW03	Sept 16, 2024	5531131.113	567127.493	9.9×10^{-7}	9.2×10^{-7}	9.5×10^{-7}
24-MW04	Sept 10, 2024	5530238.928	565715.107	4.7×10^{-7}	-	-
24-MW05 D	Sept 8, 2024	5530498.421	566991.108	4.7×10^{-7}	-	-
24-MW05 S	Sept 16, 2024	5530498.421	566991.108	8.5×10^{-8}	-	-
24-MW06	Sept 8, 2024	5529758.346	566839.035	1.2×10^{-6}	-	-
24-MW07	Sept 10, 2024	5529360.846	565923.969	1.1×10^{-5}	1.2×10^{-5}	1.1×10^{-5}
24-MW08	Sept 15, 2024	5529087.878	565299.103	7.4×10^{-6}	6.9×10^{-6}	7.1×10^{-6}
24-MW10	Sept 15, 2024	5529307.056	564171.735	8.8×10^{-7}	-	-
24-MW11	Sept 17, 2024	5529924.097	564505.830	1.8×10^{-6}	-	-
24-MW12	Sept 17, 2024	5530232.673	564988.219	2.0×10^{-6}	-	-
24-MW13	Sept 6, 2024	5530269.879	565497.017	9.3×10^{-6}	3.0×10^{-6}	5.3×10^{-6}

Further details of the hydraulic response testing will be available prior to the start of construction.

Groundwater Flow Directions

Based on topography in the Project Area and water levels collected during September 2024, groundwater contours were generated as shown in Figure 6.2.8. Groundwater in the Project Area generally flows toward South Brook and South Brook Pond to the west and northwest.

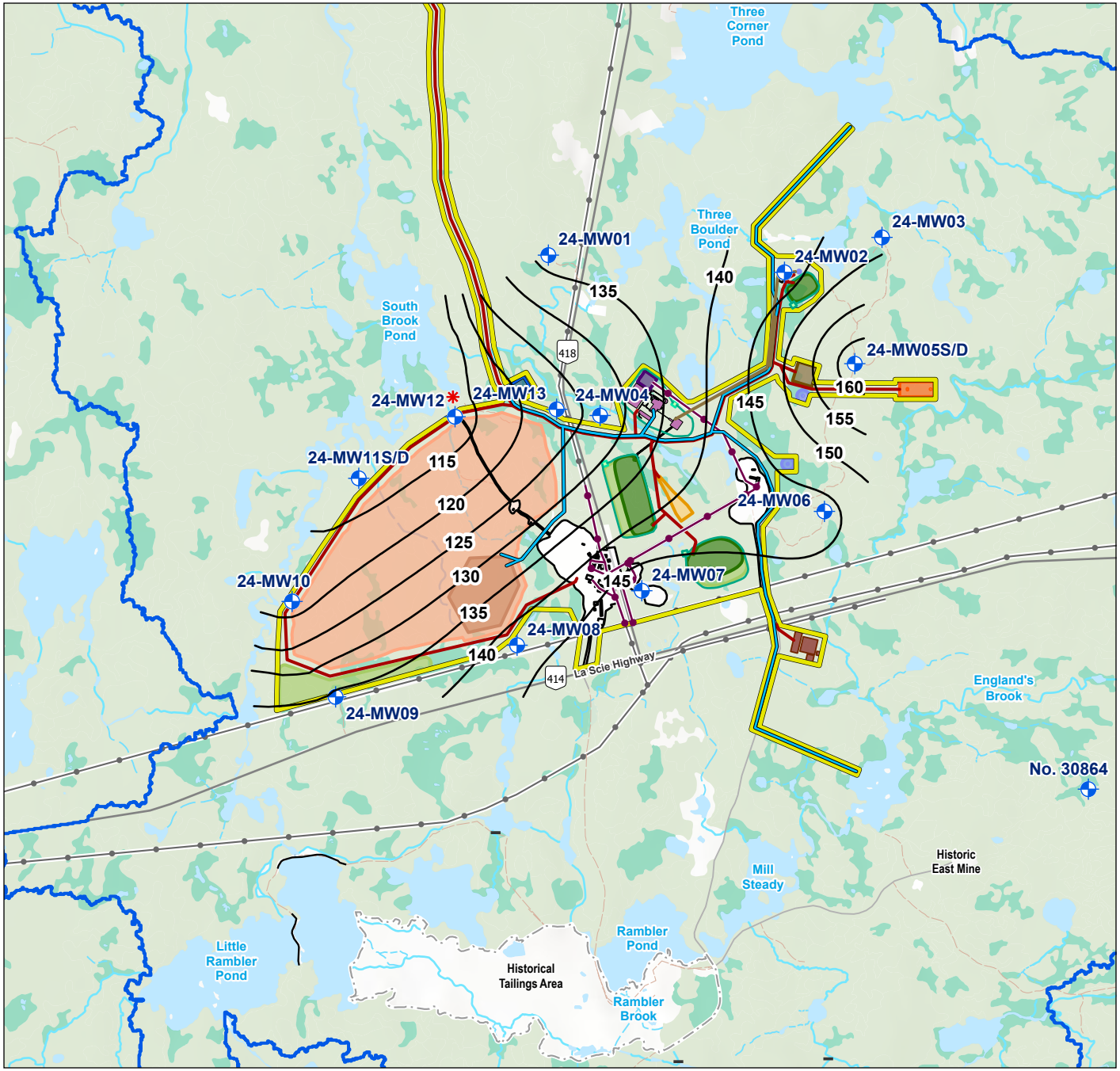


Figure No.
6.2.8
Title
Groundwater Contours

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_007

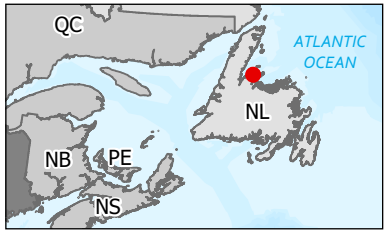
Project Location
Baie Verte, NL

Prepared by AC on 2024-12-03
Revised by MB/SC 2025-03-19

N

0 200 400 600 Meters
(At original document size of 8.5x11)
1:30,000

- Existing Monitoring Wells
- Groundwatr Contour, 5 m
- Project Area
- Local and Regional Assessment Area
- Conveyor
- Drainage Channel
- Pipeline
- Powerline
- Road
- Final Discharge Point (FDP)
- Camp
- Catch Basin
- Explosives Storage
- Ming Mine Operation
- Processing Plant Infrastructure
- Substation
- Stockpile
- Organic Laydown
- Paste Plant
- Portal Location
- Shaft Location
- Polishing Pond
- Tailings Management Facility (TMF)
- Wastewater Management Plant (WWMP)
- Other Features



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\2_121418199_FireFlyMetals_GreenBayCuAu_Aquatics\121418199_FFM_MingMine_GW.aprx Revised: 2025-03-25 By: mblackwood

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Underground Mine

The existing underground mine may affect groundwater elevations due to required dewatering. Current dewatering rates of the underground mine range from 57 to 68 cubic metres per hour (m^3/hr) (Ecometrix 2024). Preliminary groundwater elevations observed in monitoring well 24-MW06 that are lower than anticipated for the area may be a result of current and historical dewatering in the underground mine.

Groundwater Users

Based on the NLDECC Drilled Water Well Database, there is one drilled water well within the LAA / RAA (NLDECC 2008 and updates) that may be used as potable water sources for residences and/or cabins. The well was drilled in 2021 to a depth of 68.58 mbgs. Bedrock was encountered at 1.0 mbgs and the reported yield from an airlift test was 0.39 L/min. Table 6.2.2 summarizes the construction details of the drilled well within the LAA / RAA and Figure 6.2.7 shows the location of the drilled water well in relation to the Project Area.

Table 6.2.2 Well Construction Details for an Existing Water Well with in the Local Assessment Area / Regional Assessment Area

Well No.	Lat (DD)	Long (DD)	Depth to Bedrock (m)	Well Depth (m)	Casing Length (m)	Date Drilled	Well Yield (L/min)
30864	49.9038	-56.0508	1.0	68.58	5.48	10/03/2021	0.39

6.2.1.2.3 Groundwater Quality

Current Groundwater Monitoring Program (2024)

Groundwater chemistry in the Project Area was characterized with samples collected from the 15 new groundwater wells in September 2024. Samples were analyzed for general chemistry, dissolved metals, cyanide (total and weak acid dissociable), and radium-226. Results were compared to the criteria provided by the Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada 2024) and MDMER, as applicable.

Exceedances of GCDWQ and/or MDMER criteria were reported for the following parameters for at least one monitoring well: aluminum, cadmium, colour, copper, iron, lead, manganese, pH, total dissolved solids, total suspended solids, and zinc. Table 6.2.3 summarizes the exceedances for each monitoring well in the 2024 groundwater monitoring program.

Table 6.2.3 Summary of Exceedances in the 2024 Groundwater Monitoring Wells

	Aluminum	Cadmium	Colour	Copper	Iron	Lead	Manganese	pH (Lab)	TDS	TSS	Zinc
Units	**µg/L**	**µg/L**	**CU**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**-**	**mg/L**	**mg/L**	**µg/L**
GCDWQ	**100[A]; 2,900[B]**	**7[B]**	**≤15[A]**	**≤1,000[A]; 2,000[B]**	**≤300[A]**	**5[B]**	**≤20[A]; 120[B]**	**7.0-10.5[A]**	**≤500[A]**	**-**	**≤5,000[A]**
MDMER	**-**	**-**	**-**	**100[C]**	**-**	**80[C]**	**-**	**6.5-9.5[C]**	**-**	**15[C]**	**400[C]**
24-MW01D	-	-	-	-	-	-	520	-	-	710	-
24-MW01S	430	-	47	-	300	-	460	6.78	-	2,800	-
24-MW02	-	-	29	-	420	-	840	-	-	78	-
24-MW03	-	-	-	-	-	-	-	-	-	29	-
24-MW04	-	-	-	-	-	-	560	-	-	250	-
24-MW05D	-	-	-	-	-	-	26	-	-	1,300	-
24-MW05S	-	-	-	-	-	-	35	-	-	53	-
24-MW06	-	-	-	-	-	-	67	-	-	710	-
24-MW07	26,000	19	-	7,100	1,600	28	3,600	4.14	700	30	3,000
24-MW08	-	-	-	-	-	-	240	-	-	150	-
24-MW09	-	-	-	-	-	-	580	-	-	360	-
24-MW10	-	-	21	-	1,200	-	1,000	-	-	45	-
24-MW11	-	-	-	-	-	-	55	-	-	35	-
24-MW12	-	-	-	-	-	-	32	-	-	110	-
24-MW13	-	-	-	-	-	-	320	-	-	-	-

Notes:

µg/L microgram per litre; mg/L milligram per litre; TDS total dissolved solids; TSS total suspended solids; CU colour units

[A] GCDWQ Aesthetic Objectives / Operational Guidance Value

[B] GCDWQ Maximum Acceptable Concentration

[C] MDMER Schedule 4, Table 1 Maximum Authorized Monthly Mean Concentration

Results presented in Table 6.2.3 indicate that monitoring well 24-MW07, located on the Ming Mine operation east of Highway 418 (Figure 6.2.7), reported the most exceedances of the monitoring wells during the September 2024 monitoring event. Monitoring well 24-MW01S reported exceedances of six parameters, and monitoring wells 24-MW02 and 24-MW10 each reported exceedances of four parameters. The other monitoring wells reported exceedances of manganese and/or total suspended solids. Exceedances of manganese were reported in all monitoring well samples, except for 24-MW03, with the highest concentration reported in 24-MW07 (3,600 micrograms per litre [µg/L]). Exceedances of total suspended solids were reported in all monitoring wells, except for 24-MW13, with the highest concentration reported in 24-MW05D (1,300 milligram per litre [mg/L]). Exceedances of MDMER guidelines were reported for copper (24-MW07; 7,100 µg/L), pH (24-MW07; 4.14), total suspended solids (all monitoring wells except 24-MW13), and zinc (24-MW07; 3,000 µg/L).

Historical Groundwater Monitoring Programs (2007 and 2008)

Groundwater chemistry in the LAA/RAA was characterized with 25 samples collected during Phase II (AMEC 2007) and Phase III (Jacques Whitford 2008) ESAs within and in the vicinity of the Historical Tailings Area in 2006 and 2007, respectively. Where applicable, results were compared to the Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Freshwater Aquatic Life and Atlantic Risk Based Corrective Action (RBCA) Reference Documentation for Petroleum Impacts Sites, current at the time of investigation.

Results of the Phase II ESA (AMEC 2007) indicated the following exceedances:

- Toluene, aluminum, cadmium, chromium, copper, iron, nickel, silver, zinc, fluoride, pH in the area directly southeast and adjacent to the historical tailings area.
- Aluminum, arsenic, cadmium, chromium, copper, iron, lead, nickel, selenium, silver, zinc, cyanide, fluoride, pH, nitrite (as N) at the historical tailings area.
- Aluminum, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, zinc, cyanide, fluoride, pH, phenols directly south and adjacent to England’s Brook.

Results of the Phase III ESA (Jacques Whitford 2008) indicated the following exceedances:

- Toluene, aluminum, cadmium, chromium, copper, iron, nickel, silver, zinc, fluoride, and pH in the area directly southeast and adjacent to the historical tailings area.
- Aluminum, arsenic, cadmium, chromium, copper, iron, lead, nickel, selenium, silver, zinc, cyanide, fluoride, pH, and nitrite (as N) at the historical tailings area.
- Aluminum, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, zinc, cyanide, fluoride, pH, and phenols 200 m south of England’s Brook.

The remaining parameters were either non-detect or detected at a concentration below the applicable criteria.

Underground Mine Groundwater (2006)

Groundwater chemistry of the flooded underground workings of the Ming Mine was characterized with 18 samples collected during a baseline assessment of the existing mine shaft in 2006 (Golder 2006). Field measurements were completed for conductivity, dissolved oxygen, pH, redox potential, and temperature. Laboratory analysis was completed for total acidity, total alkalinity, strong acid dissociable cyanide, dissolved chloride, dissolved sulphate, and metals. Results were compared to the provincial *Environmental Control Water and Sewage Regulations* (NLR 65/03), under the *Water Resources Act*, and federal MDMER, under the federal *Fisheries Act*, where applicable.

Results of the baseline assessment of the existing mine shaft (Boundary Shaft) reported exceedances of copper, iron, phosphorus, and zinc (Golder 2006). Figure 6.2.9 presents the depth profile of copper, iron, pH, and zinc concentrations for depths ranging from 0 to 500 m.

Source: Golder 2006

Figure 6.2.9 Existing Mine Shaft Depth Profile of Select Groundwater Chemistry Parameters for Groundwater Samples Collected in May 2006

Copper concentrations in water collected from the existing mine shaft generally increased from the surface to 100 m (ranging from 0.53 to 0.75 mg/L) (Golder 2006). After 100 m, a substantial decrease was noted, with copper concentrations reported below the NLR 65/03 guideline of 0.3 mg/L (ranging from 0.02 to 0.13 mg/L).

Iron concentrations in the existing mine shaft were consistent and below the NLR 65/03 guideline (10 mg/L) from the surface to 100 m (ranging from 3.2 to 4.4 mg/L) (Golder 2006). A considerable increase in iron concentration was observed after 100 m, with concentrations ranging from 57 to 110 mg/L.

pH conditions within the existing mine shaft remained consistent throughout the vertical column. Groundwater samples reported near-neutral conditions, with pH values ranging from 5.85 to 6.36 (Golder 2006).

Zinc concentrations in the existing mine shaft were above both the NLR 65/03 guideline (0.5 mg/L) and the MDMER guideline (1.0 mg/L) for all samples collected along the vertical column (Golder 2006). Zinc concentrations increased from the surface to 100 m (ranging from 5.9 to 8.3 mg/L). A decrease in concentration was observed after 100 m, with concentrations ranging from 3.6 to 4.2 mg/L.

6.2.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Groundwater Resources is provided in Table 6.2.4. Potential environmental effects and effects pathways were selected based on the review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.2.4 Potential Effects and Effect Pathways for Groundwater Resources

Potential Effect	Effect Pathway(s)
Change in groundwater quantity	• Construction of site infrastructure will result in the reduction of infiltration where impervious surfaces remain, thereby altering groundwater flow patterns and recharge rates resulting in affects groundwater discharge to surface water features and wetlands • Reduced groundwater availability for existing well users in the Project Area due to long-term dewatering in the underground mine
Change in groundwater quality	• Changes in groundwater chemistry from infiltrating water in exposed areas of overburden removal associated with earthworks activities • Release of contaminated seepage from the waste rock piles and TMF • Degradation of groundwater quality in potable water supplies compared to applicable guidelines

6.2.3 Mitigation and Management Measures

As discussed in Section 2.11, FireFly has revised the Ming Mine EPP, including identification and addition of mitigation measures required to address new and/or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on Groundwater Resources, including the measures identified for the following Project activities:

- Surveying (Section 4.1 of the EPP)
- Laydown and Storage Areas (Section 4.3 of the EPP)
- Clearing Vegetation (Section 4.4 of the EPP)
- Grubbing and Disposal of Related Debris (Section 4.5 of the EPP)
- Overburden (Section 4.6 of the EPP)
- Excavation, Embankment and Grading Environmental Concerns (Section 4.7 of the EPP)
- Erosion Prevention and Sediment Control (Section 4.8 of the EPP)
- Water Supply (Section 4.9 of the EPP)
- Watercourse Crossings (Section 4.10 of the EPP)
- Exploration Drilling (Section 4.11 of the EPP)
- Pumps and Generators (Section 4.12 of the EPP)
- Dewatering Work Areas and Site Drainage (Section 4.13 of the EPP)
- Equipment Installation, Use and Maintenance (Section 4.14 of the EPP)
- Storage, Handling and Transfer of Fuel and Other Hazardous Material (Section 4.15 of the EPP)
- Waste Disposal (Section 4.17 of the EPP)
- Sewage Disposal (Section 4.18 of the EPP)
- Hazardous Waste Disposal (Section 4.19 of the EPP)
- Road Maintenance (Section 4.23 of the EPP)
- Building Construction (Section 4.24 of the EPP)
- Drilling and Blasting (Section 4.25 of the EPP)
- Waste Rock and Ore/Concentrate (Section 4.26 of the EPP)
- Processing Activities (Section 4.27 of the EPP)

The following mitigation measures specific to Groundwater Resources have also been identified for the Project:

- Groundwater quality and quantity will be monitored and adaptively managed, as required, using a network of groundwater monitoring wells to document Project effects on groundwater flow and quality. Monitoring locations will be maintained until the water levels and water quality have stabilized post-closure. Fifteen groundwater monitoring wells were installed and sampled in September 2024, with a subsequent sampling event in November 2024. The results of the September 2024 sampling event are discussed in Section 6.2.1.2.3. The results of the November 2024 sampling event are not yet available. A final baseline report will be completed prior to the beginning of construction. The 2024 wells have been strategically placed outside of the direct footprint and downstream of key infrastructure so they can be incorporated into the long-term groundwater monitoring program during mine operation, at closure and post-closure monitoring.

6.2.4 Residual Environmental Effects

Potential environmental effects on Groundwater Resources were identified in Section 6.2.2. For Groundwater Resources, two effects were identified: change in groundwater quantity and change in groundwater quality. Residual effects (i.e., those remaining following implementation of mitigation [Section 6.2.3]) for each Project phase are evaluated below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and is not in a pristine environment; the natural and human environments in the area have been affected by past mining, logging and quarry activities.
- One groundwater user is located within the LAA / RAA. Surface water is expected to the main receptor of any measurable groundwater effects.
- Groundwater and surface water modelling will be conducted prior to construction to confirm adequate mitigation measures have been employed to reduce adverse effects to groundwater resources.
- Existing mitigation measures and contingency plans identified in the EPP will continue to be in place for the Project and will serve to avoid or reduce potential residual effects on Groundwater Resources.
- Follow up groundwater monitoring will be conducted on a quarterly basis, along with annual reporting, to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation and the nature of the residual effects, and to manage adaptively, if required.

6.2.4.1 Change in Groundwater Quantity

Groundwater quantity effects can include potential lowering of local water levels, with consequent reduction in water levels in water supply wells drilled for the Project, reduction in domestic well yield in proximity to Project activities, and reduction in local streamflow.

6.2.4.1.1 Construction

During construction, the Project activities and components that may interact with groundwater quantity and result in an environmental effect include mine site preparation and earthworks, construction / installation of infrastructure and equipment, and construction of the TMF. Local changes in infiltration rates through compaction of ground surfaces or construction of infrastructure may result in reduced infiltration within the Project Area. Stripping of topsoil and removal of vegetation in the Project Area will result in changes in evapotranspiration rates and runoff and may result in decreased infiltration rates where impervious surfaces remain, or increased infiltration rates where vegetation is removed. These changes are considered to have a limited effect on groundwater resources due to their limited extent of development (footprint) during construction.

Construction earthworks may encounter groundwater and require water management (i.e., localized dewatering to maintain dry working conditions and/or contact water collection). This could result in limited local changes to groundwater flow direction and/or lowering of groundwater levels and a potential decrease in discharge to surface water features. The construction of the TMF may cause the raising (or mounding) of the water table through operation of the overburden stockpiles and waste rock piles. This could result in changes to groundwater flow and recharge rates. With implementation of construction mitigation measures, these effects are expected to be low in magnitude (i.e., detectable but within the normal variability that would be expected relative to baseline). The temporary pumping for dewatering will be short-term (i.e., restricted to the construction phase) and on an as-needed basis and may be required for minor supporting infrastructure for equipment storage and maintenance, and preparation of foundations for the overburden stockpiles, ore/concentrate stockpiles, waste rock piles, and TMF.

The resulting change in groundwater flow patterns and recharge rates may affect groundwater discharge to surface water features and wetlands. Potential effects to surface water features and wetlands from the lowering of groundwater levels and changes to baseflow are further discussed in Section 6.3 (Surface Water Resources).

6.2.4.1.2 Operation

During operation, the Project activities and components that may interact with groundwater quantity and result in an environmental effect include underground mining, management of overburden and waste rock, operation of the TMF, water management, and operation of infrastructure and other facilities. The primary Project effect on groundwater quantity and/or flow during operation is the lowering of groundwater levels through continued dewatering of the underground mine and the raising (or mounding) of the water table through operation of the overburden stockpiles, waste rock piles, and TMF.

The lowering of the water table because of dewatering the underground mine during operation has the potential to affect the quantity of water available to groundwater users located in the vicinity of the Project Area. Current dewatering rates of the underground mine range from 57 to 68 m^3/hr. It is anticipated that these dewatering rates will be maintained during the operation phase of the Project (Ecometrix 2024), though the estimates may increase with groundwater flow modelling that will be completed prior to Project construction. The predicted extent of drawdown from dewatering the underground mine and the predicted zone of influence of the waste rock piles and TMF will also be estimated through groundwater flow modelling.

6.2.4.1.3 Decommissioning, Rehabilitation and Closure

During decommissioning, rehabilitation and closure, the Project activities and components that may interact with groundwater quantity and result in an environmental effect include rising groundwater levels immediately upon cessation of dewatering of the underground mine. Following completion of the operation phase, dewatering of the underground mine will cease and the underground workings will be backfilled. The underground workings will saturate to a stage that is in equilibrium with the groundwater table, and the degree of distant groundwater drawdown will gradually recover to near pre-mining levels. Simulated drawdown (relative to baseline conditions) after the underground mine has been backfilled will be estimated using groundwater flow modelling, which will be completed prior to the start of Project

construction. Decommissioning of seepage collection ditches will allow for mounding of the water table extending past the footprint of the waste rock piles and the TMF. This has the potential to affect nearby surface water features.

During progressive and closure rehabilitation, the removal and/or rehabilitation of the ore/concentrate stockpiles, rehabilitation of the waste rock piles and TMF, and lowering of the water level in the tailings pond can change groundwater recharge rates (e.g., through re-vegetation). These changes will affect groundwater flow patterns and discharge to surface water features and wetlands. Potential effects to surface water features and wetlands are further assessed in Section 6.3 (Surface Water Resources).

During post-closure monitoring, interaction with groundwater quantity will be limited to monitoring of groundwater levels.

6.2.4.2 Change in Groundwater Quality

Groundwater quality effects can include changes in groundwater chemistry near site infrastructure and may adversely affect groundwater quality in wells should they be located in proximity to Project activities, and contaminated discharge to local surface water.

6.2.4.2.1 Construction

Project activities during construction that could affect groundwater quality are mine site preparation and earthworks. During construction, groundwater quality effects can include changes in groundwater chemistry from infiltrating water in exposed areas of overburden removal, and ammonia and/or silt contamination from underground blasting. However, the short duration of the construction period is not anticipated to result in metal leaching / acid rock drainage issues; therefore, groundwater quality effects are not anticipated during construction. Where necessary, effluent from blasted areas will be monitored and sampled, and if required, effluent will be treated prior to discharge. As there are no residual effects of construction on groundwater quality, no additional characterization or assessment is required.

6.2.4.2.2 Operation

During operation, the Project activities and components that may interact with groundwater quality and result in adverse environmental effects include underground mining, management of overburden and waste rock, TMF operation, and water management. The waste rock piles, ore / concentrate stockpiles, and the TMF have the potential to affect groundwater quality. Infiltration into the waste rock piles, ore/concentrate stockpiles, and the TMF from precipitation may result in seepage or recharge out the base of the stockpiles to groundwater and/or surface water receivers. This seepage from the waste rock piles and TMF will migrate through overburden and shallow bedrock toward discharge points at the closest streams, lakes, or wetlands. Based on the topography and drainage characteristics of the Project site, groundwater transport pathways from a source to a receptor stream or lake are likely to be short (i.e., less than a few hundred metres). In the absence of nearby domestic well users, surface water would be the primary receptor of contaminated seepages from the TMF or waste rock piles. Predicted water quality from source areas during operation and predicted mass loading from groundwater baseflow to surface water receivers during operation will be estimated using geochemical source terms applied to the groundwater flow model, that will be completed prior to Project construction.

The Project is not anticipated to interact with the nearest reported residential groundwater supplies in the vicinity of Baie Verte or Ming's Bight due to the distance between the Project and these well users. In addition, the intervening lakes and watershed divides would act as hydraulic barriers.

6.2.4.2.3 Decommissioning, Rehabilitation and Closure

During decommissioning, rehabilitation and closure, groundwater quality effects can include changes in groundwater chemistry from infiltrating water in the waste rock piles and the TMF and continuing to seep into the ground. However, post-closure, the waste rock piles and TMF will be progressively rehabilitated throughout the Project, reducing seepage from these areas. During this phase, the ore/concentrate stockpiles will be depleted and rehabilitated and should not act as a source of seepage post-closure. Predicted water quality from source areas post-closure and predicted mass loadings from groundwater baseflow to surface water receivers post-closure will be estimated using geochemical source terms applied to the groundwater flow model, that will be completed prior to Project construction.

A short distance of travel is expected, with seepage ultimately discharging to adjacent surface water features and wetlands, which are further discussed in the Surface Water Resources VC (Section 6.3).

During post-closure monitoring, interaction with groundwater quality will be limited to monitoring of groundwater chemistry.

6.2.4.3 Summary

Based on application of the mitigation measures identified in Section 6.2.3 and FireFly's commitment to comply with regulatory standards, residual environmental effects on groundwater resources are likely to be not significant. This prediction will be confirmed through the completion of groundwater modelling prior to the start of Project construction. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed to maintain not significant adverse effects on Groundwater Resources.

6.2.5 Follow-up and Monitoring Programs

Follow-up and monitoring programs are intended to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation and the nature of the residual effects, and to manage adaptively, if required. FireFly, in consultation and partnership with the Water Resources Management Division (WRMD) of the Department of Environment and Climate Change, will establish a water resource monitoring network that can include real-time monitoring and be comprised of water quantity, quality, climate and groundwater monitoring stations. FireFly will bear all reasonable costs associated with the monitoring network to collect baseline data before Project commencement and throughout the life of the Project.

During Project development, a groundwater monitoring program will be implemented for main Project components, building on the baseline groundwater study, to confirm potential changes in groundwater associated with Project activities. The groundwater monitoring program will be developed based on regulatory requirements for both quantity and quality and will be continued during closure and will document water quality and recovery in groundwater levels across the Project Area.

The current groundwater monitoring well locations were selected in consultation with FireFly, and between August and September 2024, 15 monitoring wells were installed throughout the Project Area (Figure 6.2.7). Groundwater monitoring will be completed on a quarterly basis and will include groundwater sample collection for chemical analysis, manual water level measurement, and data retrieval from automated water level dataloggers. Groundwater samples will be collected in clean laboratory-prepared bottles specific to each analysis and will be stored and shipped in coolers at a temperature of 4°C. Groundwater samples will be submitted under a chain of custody to an accredited laboratory for analysis of general chemistry, total suspended solids, dissolved metals, dissolved mercury, radium-226, and cyanide (total and weak acid dissociated). Quality assurance and quality control measures will be applied during the monitoring program, including collection of field duplicates (10% of samples per monitoring event) for laboratory analysis.

Results from the 2024 groundwater monitoring program will be summarized prior to Project construction. Results will be compared to the MDMER and Atlantic RBCA to identify parameters that may be elevated in the baseline conditions. Although MDMER criteria are specifically discharge guidelines, they can be used as a screening tool in groundwater, where an exceedance of MDMER limits of parameters of potential concern in groundwater are indicative of potential impacts to receiving surface waters.

Groundwater monitoring locations will be reviewed at regular intervals. Monitoring locations may be added or removed from the monitoring program in accordance with their utility in monitoring the effects of the Project on the environment.

Monitoring locations will be maintained until the location is no longer required. If a monitoring location is no longer required but is identified as part of a regulatory approval, it will only be removed from the monitoring program once the required amendments are approved.

6.3 Surface Water Resources

Surface Water Resources were selected as a valued component (VC) because they have the potential to both influence, and be influenced by, Project activities. Surface water is an integral part of the hydrological cycle and effects of the Project will be considered for both surface water quantity and quality, and how changes in either may influence human and ecological use. Surface water is an integral part of the regional environment, providing habitat for fish, vegetation and aquatic populations, and contributing to local socio-economic drivers.

A Certificate of Approval (CoA), issued by Newfoundland and Labrador (NL) Department of Environment and Climate Change, is required for both construction and operation phases of a mine and sets concentration limits for specific parameters in the discharge effluent (typically those provided in the *Metal and Diamond Mining Effluent Regulations* [MDMER] under the federal *Fisheries Act*). The *Environmental Control Water and Sewage Regulations*, under the NL *Water Resources Act*, regulate the discharge of sewage and other effluent and specifies that the metal mining industry must comply with MDMER. Several sections (32, 35, and 36) and subsections of the *Fisheries Act* pertain to surface water and potential interactions with a Project, as does MDMER, and the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG-FAL).

As described in Section 5.2.3 and shown on Figure 6.3.1, Project spatial boundaries for Surface Water Resources include the Project Area (the immediate area in which Project activities and components occur), the Local Assessment Area (LAA, includes the Project Area and the watersheds that interact with the Project Area) and the Regional Assessment Area (RAA, incorporates the Project Area and LAA, and extends to include the watersheds within which potential Project interactions may be observed).

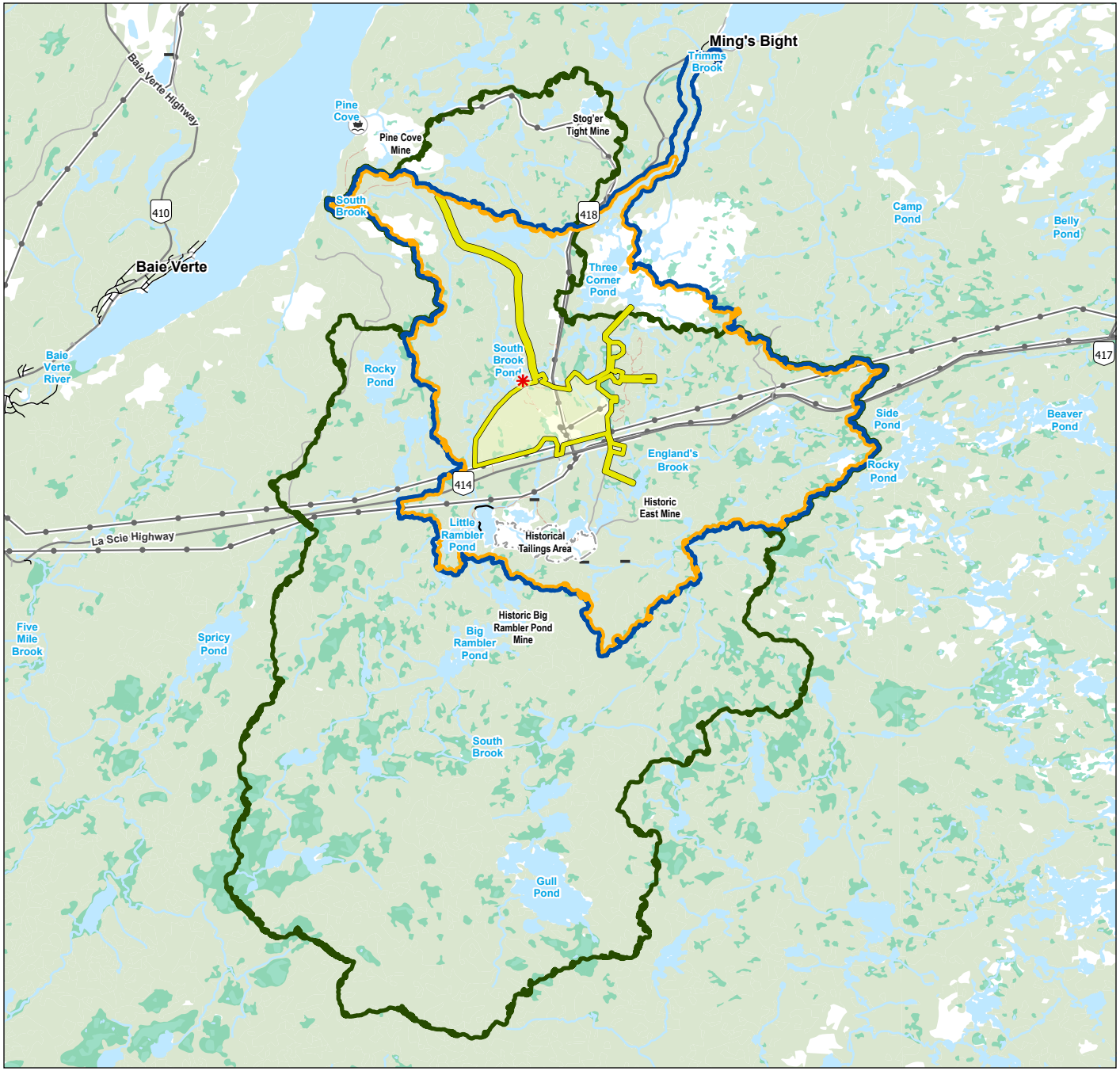


Figure No.
6.3.1

Title
Surface Water Local Assessment Area and Regional Assessment Area Boundaries

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_2_006

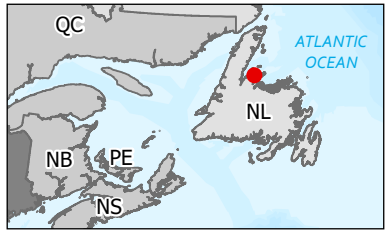
Project Location
Baie Verte, NL

Prepared by MB on 2025-02-03
Revised 2025-03-22

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:110,000

- Final Discharge Point (FDP)
- Project Area
- Local Assessment Area
- Regional Assessment Area
- South Brook Watershed
- Port
- Dam
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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A significant adverse residual effect on surface water quantity is defined as a measurable change in hydrological regime that:

- Does not meet established instream flow needs (environmental flow thresholds), and
- Contravenes a watershed management target including:
  - an uncompensated loss of fish habitat
  - changes to flow that increase sedimentation and erosion above regulatory guidance in waterbodies receiving surface water runoff
  - changes to flows that cause flooding downstream of the Project beyond existing conditions
  - changes to pond and lake levels outside the Project Area to a point that it affects their ability to support existing ecological functions

The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining activities. Therefore, the definition of a significant adverse residual effect on surface water quality is dependent on the baseline water quality of the watercourse (i.e., historical mine activity impacted, background unimpacted by historical mine activities).

For watercourses that have been historically impacted by mine activities, a significant adverse residual effect on surface water quality is defined as:

- If current water quality exceeds MDMER limits or a site-specific water quality guideline for the protection of aquatic life, a measurable negative change from current water quality (e.g., increased iron concentration, lower pH value)
- If current water quality is less than MDMER limits or a site-specific water quality guideline for the protection of aquatic life, a measurable change from current water quality that exceeds the implemented water quality requirement, such as MDMER or site-specific guideline.

For watercourses that have not been historically impacted by mining activities, a significant residual effect on surface water quality is defined as:

- A measurable change from current water quality that exceeds an implemented water quality requirement, such as MDMER limits or a site-specific water quality guideline for the protection of aquatic life

6.3.1 Existing Conditions

The Project Area is located on the Baie Verte Peninsula on the northern coast of the Island of Newfoundland, primarily encompassing parts of the South Brook watershed, with the freshwater intake located in Trimms Brook watershed. The Project Area is presented on Figure 6.3.1 and the watersheds are included on Figure 6.3.2.

The LAA for the Project includes the portion of the South Brook and Trimms Brook watersheds in which the Project has direct influence, or may have potential to influence, including Mill Pond (P29) to the east, the Historical Tailings Area to the south (P13), Three Corner Pond (P02) to the north and extending to the outlet of South Brook watershed to the west (S02). The South Brook and Trimms Brook watersheds were further delineated for the Project (within the LAA) and are referred to as the LAA watersheds (Figure 6.3.2). The LAA watersheds provide the spatial boundaries upon which changes to surface water quality and quantity will be assessed. Sub-watershed areas that are upstream of where the Project is not expected to interact with watercourses and waterbodies are not included in the LAA. The upstream sub-watershed drainage areas and attributes outside the LAA are used in the surface water quantity assessment. The RAA for this Project includes the boundaries of the LAA, but extends to where Trimms Brook discharges into Ming's Bight to the north, as presented on Figure 6.3.1.

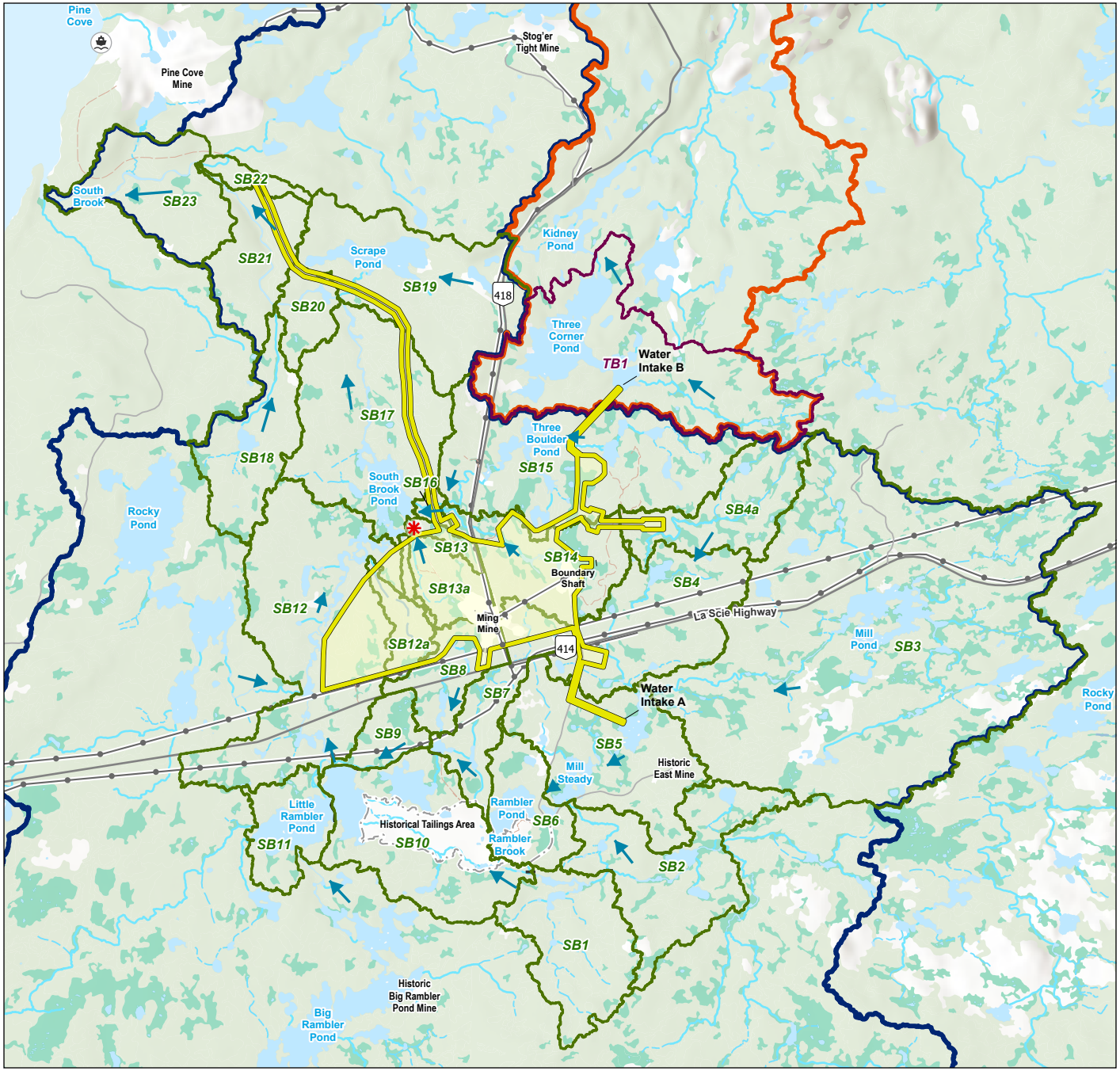

Figure No.
6.3.2
Title
Local Assessment Area Watersheds

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project
121418199_2_002

Project Location
Baie Verte, NL

Prepared by MB on 2024-12-12
Revised 2025-04-14
IR by AS on 2025-04-14

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:58,000

- Final Discharge Point (FDP)
- Flow Direction
- Project Area
- South Brook subcatchment
- Three Corner Pond subcatchment
- South Brook Watershed
- Trimms Brook Watershed
- Port
- Dam
- Highway
- Arterial / Collector
- Powerline
- Highway
- Arterial / Collector
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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The characterization of the existing surface water quantity and quality conditions for this Environmental Registration is based on desktop review and analysis, including use of historic monitoring program data within the Project Area, LAA and RAA. Specifically, the following analysis were conducted:

- Description of watershed characteristics within the LAA and RAA, including physiography, drainage areas, existing land uses and vegetation
- Description of the existing climate, which controls local hydrologic process within the LAA watersheds, and potential changes due to climate change
- Conduct of a regional desktop hydrologic assessment to characterize local hydrologic conditions in the LAA watersheds using long-term historical flow data from regional watercourse flow monitoring stations, including mean annual and monthly flow, flood flow and low / environmental flow conditions (Appendix 6.A).
- In support of the local hydrology assessment, development of a Project Area environmental water balance to understand the baseline hydrologic system (Appendix 6.A)
- Description of bathymetry of select waterbodies within the LAA that will potentially interact with the Project and have had bathymetric surveys conducted
- Assessment of the results of historical surface water quality studies conducted within the Project Area, LAA and RAA watersheds (Appendix 6.B). These studies were typically conducted in support of past mining activities. They are summarized in the sections below and are used to identify Parameters of Potential Concern (PoPCs) in comparison to applicable guidelines and to describe surface water quality associated with historic mining activities.

Methods for these analyses are provided in Section 6.3.1.1 and results are provided in Section 6.3.1.2.

A baseline surface water quantity and quality monitoring field program began in 2024 to support Project development. At the time of preparation of this Environmental Registration, there were limited results from the 2024 field monitoring, as the programs are ongoing. However, descriptions of the 2024 baseline local hydrology and surface water quality monitoring programs are outlined in the following sections. The results will be submitted in a separate baseline report in support of the CoA Application for Project construction and operation.

- The predicted effects of the Project on the baseline surface water quantity and quality conditions are presented in Section 6.3.4.

6.3.1.1 Approach and Methods

6.3.1.1.1 Surface Water Quantity

Desktop

As indicted above, to establish baseline conditions of surface water quantity, desktop analyses were conducted to assess the physiographic setting, local climate, watershed areas, and regional and local water quantity of the Project Area, LAA, and RAA. The methodologies for these analyses are presented in the following sections.

Physiographic Assessment

Understanding the surface features of the Project Area, LAA, and RAA watersheds is a vital piece of a baseline assessment as the local physiography has an influence on both the quantity and quality of runoff in each affected watershed. Knowledge of the physiographic characteristics of the LAA watersheds has been established through a review of surface features, soils and surficial geology information, topography, and vegetation typical of the area from publicly available resources.

Vegetation communities and land cover classes are an important consideration in determining expected runoff resulting from rainfall in each relevant watershed. These have been identified using available public information maintained by the Government of NL. Vegetation and land cover classes within the LAA watersheds have been determined based on available geographic information system (GIS) and publicly available topographic information (i.e., provincially available topographic contours, ecological land classification datasets).

The topography of the Project Area has been determined using client-provided light detection and ranging digital elevation information, supplemented with provincially available topographic contours (Stantec ArcGIS Online, 2021). Topography, geological, and soils mapping, were also reviewed to establish the expected surficial geology.

Climate and Climate Change

Climatic factors have a defining influence on the hydrologic conditions of the LAA watersheds. Temperature and precipitation directly influence the quantity and timing of expected runoff, evapotranspiration (ET) rates, and infiltration rates. It is important to characterize the climatic conditions of the site, especially as they are anticipated to change over time.

The climatic setting of the Project has been established through assessment of available climate data, including temperature and precipitation data, and applicable intensity-duration-frequency (IDF) curves. Stations located up to 100 kilometres (km) away from the site, with greater than 10 years of record, and with more recent climatic data (2000s onwards) were considered for use as climate data sources. Historical (40-year records) and climate normal data from the Middle Arm climate station (ID 8402644) located 20 km southeast of the Project Area were used to characterize climate conditions of the RAA (Environment and Climate Change Canada [ECCC] 2024).

A wet and dry year assessment was performed using publicly available data at the Project Area. Dry years are defined as years having annual precipitation less than climate normal precipitation amounts, and wet years are defined as years having annual precipitation greater than the annual climate normal precipitation.

Precipitation data for storm events with durations ranging from 5-min to 24-hours were calculated from available IDF curves at the climatological monitoring stations. IDF curves summarize the annual exceedance probability of a depth of rainfall in a single event of selected duration and intensity. ECCC periodically publishes IDF curves at selected meteorological locations in NL and elsewhere in Canada (2023a).

The 24-hour storm events rainfall data of various return periods (i.e., 2, 5, 10, 25, 50, and 100 year) are representative for conservative use in conjunction with other hydrology information to assist with the sizing of infrastructure, such as sediment ponds, culverts across access roads, and diversion channels. To calculate the precipitation for these return periods of both wet and dry year conditions, hydrological frequency analysis (HYFRAN) software has been used (El Adlouni and Bobée 2015).

Annual and monthly snow depth and snowfall data has been summarized based on available data from ECCC climate stations relevant to the Project Area.

Quantitative predicted impacts from climate change on temperature and precipitation are necessary to estimate potential peak flow and runoff volume changes into the future and assist with water management infrastructure design for the Project to consider climate change adaptation. Future predictions of impacts to site specific IDF curves, temperature and precipitation impacts have been collected from the climate change scenario model results provided by ClimateData.ca (2024). ClimateData.ca is a collaboration between ECCC, the Computer Research Institute of Montréal, Ouranos, the Pacific Climate Impacts Consortium, the Prairie Climate Centre, and Habitat. Seven to provide access to climate change data (ClimateData.ca 2024).

The Intergovernmental Panel on Climate Change (IPCC) advises the use of ensemble models to make future predictions on the impacts of climate change since these models tend to be more successful than individual models for both seasonal and long-term simulations (IPCC 2007; Boer and Lambert 2008). This is because ensemble models work by developing a mean prediction based on the outputs from several different models, which aids in reducing model uncertainty. The model used to provide data for the RAA comes from the global Coupled-Model Intercomparison Project 6 (CMIP6). The CMIP6 ensemble model has been used to provide climate change estimates for the Project Area, as it is the most recent model available at ClimateData.ca (2024). CMPI6 represents various emission scenarios as Shared-Socioeconomic Pathways (SSPs), otherwise referred to as Representative Concentration Pathways (RCPs). IPCC's most recent technical reporting refers to each scenario as SSPx-y, where "SSPx" refers to the SSP describing the socio-economic trends underlying the scenario, and "y" refers to the approximate target level of radiative forcing (in W/m^2) resulting from the scenario in the year 2100 (Arias et. al. 2021).

To provide a comprehensive picture of future conditions at the site, three SSP scenarios have been considered. These three scenarios include the low emission scenario (SSP1-2.6), moderate emission scenario (SSP2-4.5), and a high emission scenario (SSP5-8.5). The Canadian Standards Association (CSA) Plus 4013:19 technical guide recommends that moderate to high emission scenarios are used for Project projections (CSA 2019). Model results are available in 30-year time frames, and the IDF curves and total precipitation monthly and annual amounts predicted over a time frame of 2021-2050 have been assessed to capture the Project timescale covering approximately two years of construction, 15 years of active mine period, 2 years of active closure, and the post-closure period.

Watershed Delineation

The LAA watersheds were delineated to quantify the surface water quality and quantity within each sub-watershed area. The South Brook watershed flows into Baie Verte (Figure 6.3.2). Three Corner Pond is located in the headwaters of the Trimms Brook watershed and flows through Kidney Pond and Trimms Brook to Ming's Bight and is represented by red borders in Figure 6.3.2. Changes to LAA watershed areas following the introduction of each Project phase (construction, operation, closure, post-closure) will be identified prior to construction to quantify changes to surface water quantity and quality related to the Project. The LAA watersheds under baseline conditions and each stage of Project life will be mapped to visually represent changes to each area due to Project activities.

Regional Hydrologic Assessment

A regional assessment using publicly available hydrometric data for stations operated by the Water Survey of Canada (WSC) was developed to define relationships between watershed area and hydrological statistics (mean annual flow [MAF], mean monthly flow [MMF], peak flows, low flows, and environmental flows).

The WSC stations were first assessed using a series of selection criteria, before assuming homogeneity between sites. Transpositional scaling assumes homogeneity will be more likely due to their proximity, similar climate and physiographic conditions between the selected regional WSC stations. The following criteria were used for WSC station selection for the homogeneity test assessment:

1. WSC station watershed has an area no greater than one order of magnitude difference to the largest LAA watercourse watershed, South Brook Watershed (37 square kilometres [km^2])
2. The station is located less than 150 km from the Project Area to maintain climatic and physiographic comparability with local watersheds
3. The station has a period of record that falls within one climate normal period - preferably the most recent ECCC climate normal period currently being estimated for climate stations in Canada (1991 to 2020) (ECCC 2023b)
4. The station has a natural flow regime (non-regulated) as LAA watersheds are natural.
5. The station has a period of record greater than 20 years to support development of long-term hydrological statistics for average, low and high flows, and estimation of 100-year event flows. Stations with period of record of greater than 15 years are included in the assessment as they typically represent smaller watersheds in the region that are closer in size to the LAA watersheds.

The details of the homogeneity test assessment are presented in Appendix 6.A.

With the validated stations from the homogeneity tests, the MAF and MMFs for the selected WSC stations were plotted against watershed areas to establish regression relationships (Appendix 6.A). Similarly, relationships were developed between peak flows and watershed areas for various return periods (2, 5, 10, 20, 50, and 100-year). Low-flow relationships were derived using the minimum of the seven-day average for each year on a Log-Pearson Type III distribution with Method of Moments using HYFRAN. The desired low-flow return periods for the WSC stations were plotted on a graph to determine the low flow relationship for the various return periods (7Q10, 7Q20). Environmental flows for the province of NL are calculated as 50% MAF for summer months (i.e., summer environmental flows), and 30% MAF for winter months (i.e., winter environmental flows) (Zadeh 2012). Additional details about the regional assessment methods are presented in Appendix 6.A.

Local Hydrologic Assessment

An environmental water balance was developed based on available data for climate normal, wet year, and dry year conditions. Surplus runoff was calculated in the water balance model based on climate and physiographic characteristics of the site.

The Thornthwaite monthly water balance model, refined by the United States Geological Survey (USGS), was used (McCabe and Markstrom 2007; Thornthwaite 1948). Surface runoff was estimated based on net precipitation less the ET and infiltration losses. Input parameters were established based on latitude, local climate and soil conditions, and guidance provided by USGS.

To estimate the baseline hydrologic regime, the environmental water balance was run using a temporal scale compatible with the Life of Mine (LoM), which is expected to operate for 15 years. A warmup period of two years of climate normal data is applied, then followed by either the wet year, dry year, or climate normal for the third year. Results are taken from the third year for discussion. Detailed water balance setup methods are provided in Appendix 6.A.

Watercourses and waterbodies (lakes/ponds) were identified within and adjacent to the Project Area using provincial mapping and ground truthing as described in the Fish and Fish Habitat Section (6.4.2.1). The watercourse lengths and waterbody surface areas were determined from provincial mapping and ground truthing. The type of stream (perennial or intermittent) was also determined from provincial mapping and ground truthing.

Field Program

The baseline local hydrology assessment includes an ongoing field hydrometric monitoring program established in 2024 and conducted by Stantec and FireFly staff. Stantec staff installed 13 hydrometric stations (11 riverine; 2 pond water levels) and associated monitoring equipment in May 2024, as detailed in Figure 6.3.3 and Table 6.3.1. The stations are equipped with Solinst Leveloggers® to monitor continuous water level and water temperature. A Solinst barologger® is installed at the site (SW-4) to collect atmospheric pressure and air temperature data to barometrically correct Levelogger® water level data. The hydrometric stations have been equipped to continue logging water level data year-round. Figure 6.3.4 presents the typical stilling well setup for each of the 10 hydrometric stations.

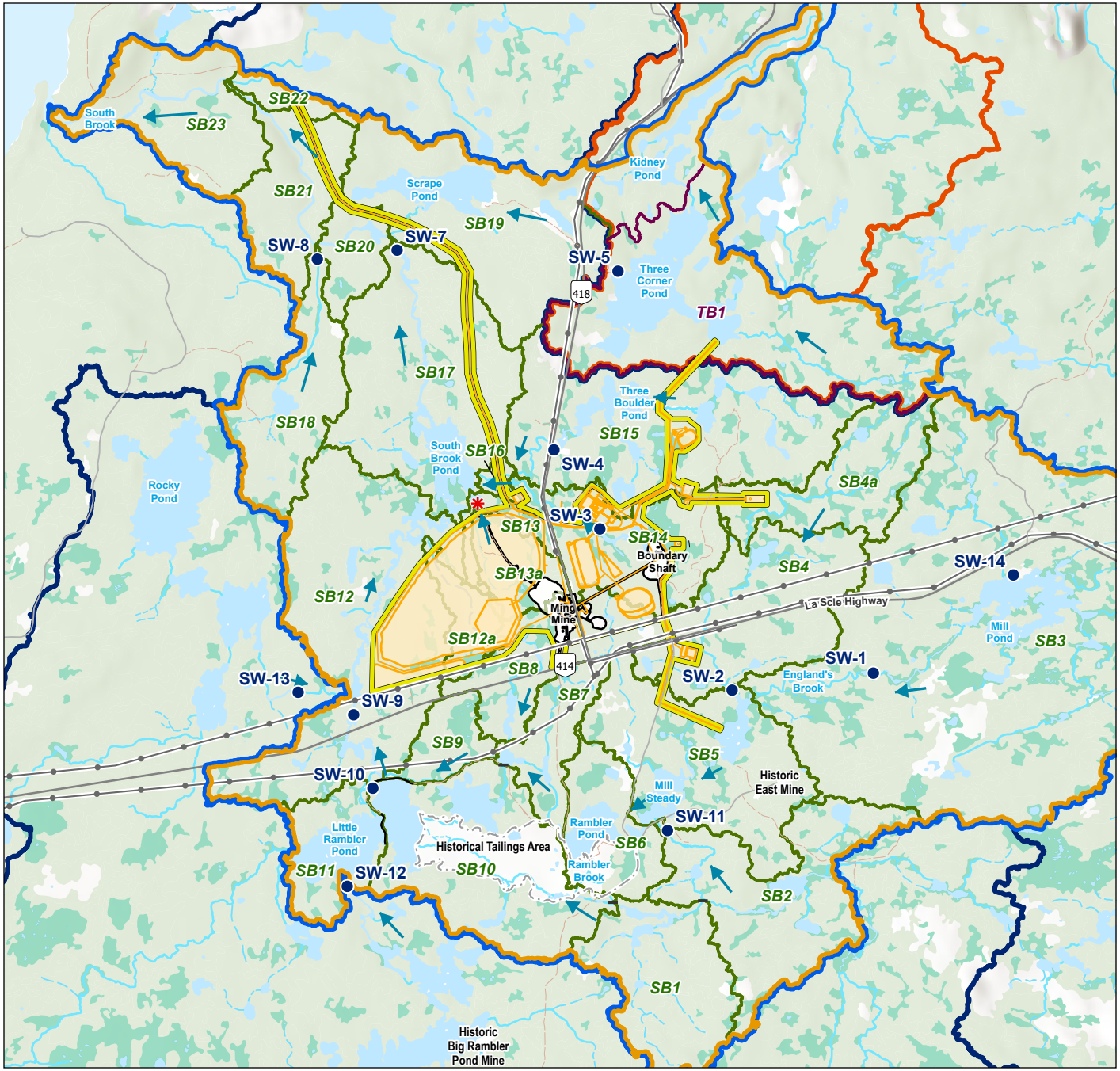

Figure No.
6.3.3

Title
Existing Surface Water Quantity Monitoring Stations

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_2_003

Project Location
Baie Verte, NL

Prepared by MB on 2024-12-12
Revised 2025-04-14
IR by AS on 2025-04-14

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- Surface Water Monitoring Station
- Local Assessment Area
- Regional Assessment Area
- Project Area
- Ming Mine Operation
- Other Site Infrastructure
- South Brook subcatchment
- Three Corner Pond subcatchment
- South Brook Watershed
- Trimms Brook Watershed
- Final Discharge Point (FDP)
- Flow Direction
- Dam
- Highway
- Arterial / Collector
- Powerline
- Highway
- Arterial / Collector
- Resource Road / Trail
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 6.3.1 Surface Water Monitoring Locations

Station ID	Location	Type of Gauge	Continuous Water Level	Manual Flow Measurements
SW-1	England's Brook (S19)	Riverine	Yes	Yes
SW-2	Unnamed Tributary of England's Brook (S20)	Riverine	Yes	Yes
SW-3	Unnamed Tributary #1 to South Brook Pond (S06)	Riverine	Yes	Yes
SW-4[1]	Unnamed Tributary #2 to South Brook Pond (S07)	Riverine	Yes	Yes
SW-5	Three Corner Pond (P02)	Pond level	Yes	No
SW-7	South Brook (S02)	Riverine	Yes	Yes
SW-8	Unnamed Tributary to South Brook (S30)	Riverine	Yes	Yes
SW-9	Little Rambler Pond outflow (S01)	Riverine	Yes	Yes
SW-10	Rambler Pond (P30)	Pond level	Yes	No
SW-11	Rambler Brook (Stream into P14)	Riverine	Yes	Yes
SW-12	South Brook upstream of Little Rambler Pond (Inlet to P30)	Riverine	Yes	Yes
SW-13	Rocky Pond outflow (Inlet to S27)	Riverine	Yes	Yes
SW-14	Mill Pond (P29)	Pond Level	Yes	No

Note:
[1] SW-4 site also recording barometric pressure (Barologger)

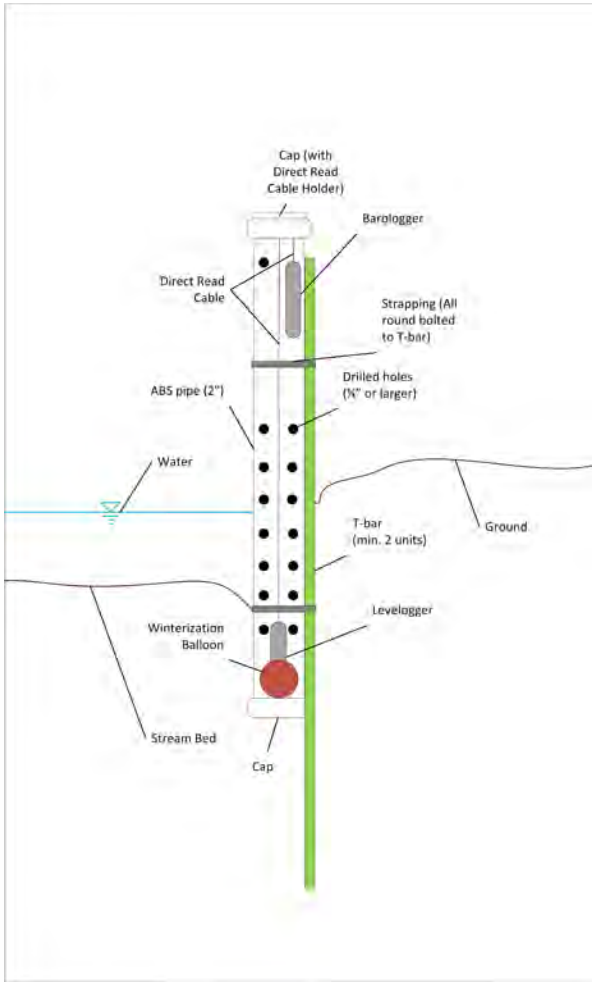

Figure 6.3.4 Typical Stilling Well for Continuous Level Logger Installation

Manual flow measurements and logger downloads were conducted at the hydrometric stations for six events in 2024 (June to December 2024), with additional monitoring events planned in 2025. Manual measurements of streamflow are conducted using the Mid-Section Area-Velocity Method, where the discharge is calculated from multiple velocity measurements and cross-section areas (Botma and Struyk 1971; World Metrological Organization [WMO] 2010a). Water velocity measurements are conducted using a SonTek FlowTracker2 acoustic doppler velocimeter. Manual measurements are processed in Aquarius™ hydrometric analysis software to develop station rating curves.

The *in situ* continuous water levels and manual flow measurements are used to develop rating curves in the Aquarius™ software. The rating curve estimates continuous flows based on the relationship between water level and manual flow measurements. The WSC's manual for developing rating curves titled Hydrometric Manual – Data Computations (Rainville et al. 2016), WMO Manual on Stream Gauging, Vol. I: Fieldwork (WMO 2010a), WMO Manual on Stream Gauging, Vol. II: Computation of discharge (WMO 2010b) are used in this study to support rating curve development. The rating curve equation applied is listed in Rainville et al. (2016).

$$\boldsymbol{Q = C\,(h + a)^n} \qquad \textbf{Equation 6-1}$$

Where:
- Q = discharge (m^3/s)
- C, n = constants
- h = gauge height/offset (m)
- a = stage at zero flow

Results from the 2024 and 2025 baseline surface water quantity program will be summarized prior to Project construction and used to support permit applications, such as the CoA.

Bathymetry

Bathymetric data was collected in South Brook Pond (P01) and Three Corner Pond (P02) using a combined Global Positioning System and sonic transducer. South Brook Pond bathymetry was collected by AMEC in 2008 and achieved vertical and horizontal resolutions of +/- 0.5 m and 3.5 m, respectively. Stantec collected mapping of Three Corner Pond in 2023 using a vessel-mounted, single-beam sonar chartplotter (Garmin Echomap 75CV UHD Chartplotter). Vertical and horizontal resolutions of +/- 0.13 m and 3.0 m, respectively were achieved for the Stantec surveys of Three Corner Pond. Lake perimeters from base mapping were digitized into a GIS database to calculate surface area and perimeter. Bathymetric data were used to determine maximum depth and digitized to estimate lake volume and calculate mean lake depth.

6.3.1.1.2 Surface Water Quality

Desktop Review and Data Sources

To establish baseline conditions of surface water quality a desktop review of historical water quality data in and around the LAA was conducted. There are no provincial (Water Resources Management Division) water quality monitoring stations on the Baie Verte Peninsula.

Studies conducted within the last 20 years were selected for desktop data review as they would have similar laboratory analysis reportable detection limits (to the 2024 baseline field program (which is ongoing) and would represent water quality data within the same climate normal period as applied to the regional surface water quantity assessment. These include the following:

- Seasonal and Mining Influences on Stream-Water Geochemistry in the Rambler Mines Area: Implications for Mineral Exploration and Environmental Monitoring (McConnell 1995; Appendix 2.A)

- Stream-Water Geochemistry as a Guide to Sources of Acid-Mine Drainage in the Former Rambler Mines Area (McConnell 2002; Appendix 2.A)
- Aquatic Survey of Tailings Options (AMEC 2008)
- Ming Mine Phase 3 Environmental Effects Monitoring (EEM) Interpretive Report (Stantec 2019)
- Ming Mine Phase 4 Environmental Effects Monitoring (EEM) Interpretive Report (Stantec 2023)
- Ming Mine Cycle 2 Environmental Effects Monitoring (EEM) Interpretive Report (Stantec 2016)
- Ming Mine MMER Cycle 1 EEM Interpretive Report for 2012 Biological Monitoring Studies (Stantec 2013)
- Ming Mine – Design of MMER Cycle 1 EEM (Stantec 2012)
- Ming Mine – Design of MMER Phase 3 EEM (Stantec 2018)
- Surface Water and Sediment Quality Sampling Program, Rambler Ming Mine, Baie Verte, NL (GEMTEC 2019)

Historical water quality stations assessed in this report are presented on Figure 6.3.5.

Field Program

The baseline local water quality assessment includes an ongoing field water quality monitoring program established in 2024 and conducted by Stantec and FireFly staff. Surface water quality monitoring sites have been selected in consultation with FireFly and based on the following criteria:

- Proximity of surface waters to receiving mine water discharge
- Proximity to the proposed tailings management facility (TMF) and other Project infrastructure
- Locations of potential water takings
- Applicable reference sites outside of potential Project Area and historical mining activity influences
- Alignment with other monitoring programs (i.e., surface water quantity and fisheries)

Surface water quality is monitored at 13 sites (SW-1 to SW-13), 10 of which are watercourses (SW-1 to SW-4; SW-7 to SW-9; SW-11 to SW-13) and 3 waterbodies (SW-5, SW-6 and SW-10) as presented in Figure 6.3.5.

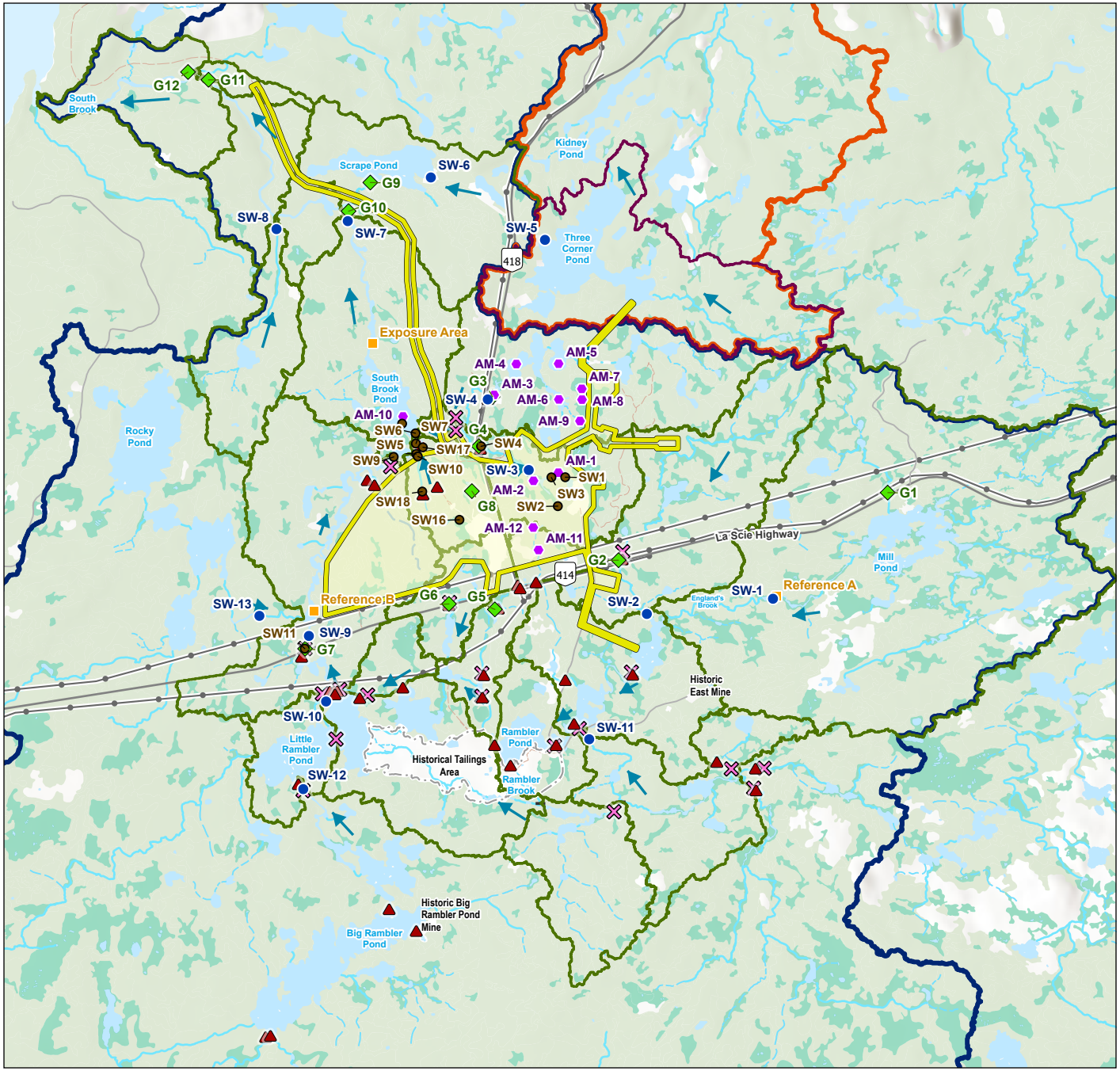

Figure No.
6.3.5

Title
Existing and Historical Surface Water Quality Monitoring Stations

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_2_005

Project Location
Baie Verte, NL

Prepared by MB on 2025-02-03
Revised 2025-04-14
IR by AS on 2025-04-14

N

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Surface Water Quality Monitoring Stations
- Stantec 2024
- Stantec 2019 Phase 3 EEM
- GEMTEC 2019
- AMEC 2008
- Golder 2006
- McConnel 2002
- McConnel 1995

Project Area
South Brook subcatchment
Three Corner Pond subcatchment
South Brook Watershed
Trimms Brook Watershed

Final Discharge Point (FDP)
Dam
Flow Direction
Resource Road / Trail
Highway
Arterial / Collector
Powerline
Highway
Arterial / Collector
Indeterminate Stream
Intermittent Watercourse
Definite Watercourse
Waterbody
Wetland
Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, GEMTEC, McConnel, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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In 2024, between May and December six monitoring events were conducted. For each monitoring event, water samples were collected for submission to a Canadian Association for Laboratory Accreditation accredited laboratory following chain of custody protocols for analysis. Primary and duplicate samples are sent to AGAT Laboratories in St John's, NL for analysis. In addition, *in situ* surface water quality is monitored using a calibrated multi-parameter water quality meter. The *in situ* parameters included water temperature, pH, conductivity, dissolved oxygen, oxidation reduction potential (ORP), and turbidity. Field meters used to collect *in situ* water quality data are calibrated with certified standard solutions and as per manufacturer maintenance manual guidance. Water samples are collected in clean laboratory-prepared containers specific to each analysis, and are stored and shipped in coolers at 4°C. Samples submitted to the laboratory that required filtration (e.g., dissolved metals) are field filtered prior to shipment. The laboratory analysis packages for the baseline surface water quality monitoring program include total and dissolved metals / metalloids, general chemistry, dissolved organic carbon, low-level total phosphorus, ultra low-level total mercury and low level total suspended solids (TSS). One monitoring event collected waters samples for Radium-226 and cyanide (total and weak acid dissociable).

Additional surface water quality monitoring is planned for 2025, including monitoring during the winter season. Results from the 2024 and 2025 baseline water quality study will be summarized prior to Project construction and submitted in support of the surface water quantity assessment for a *Fisheries Act* Authorization (FAA) application and an assimilative capacity study for the CoA Application. The results of the 2024/2025 baseline water quality program will be compared to CCME CWQG-FAL to confirm the parameters identified through previous studies as exceeding CCME CWQG-FAL and to identify new parameters that may be elevated in the baseline conditions in the receivers.

6.3.1.2 Description of Existing Conditions

To establish existing conditions for Surface Water Resources, this section provides an overview of the physiographic setting, local climate, regional hydrology, local hydrology, bathymetry, and historical water quality. As indicated previously, the results of the 2024 and 2025 baseline water quality and quantity monitoring program will be submitted in a separate baseline report in support of the CoA Application prior to Project construction and operation.

6.3.1.2.1 Physiography

The Project is located near the border of the Central Newfoundland Forest and the Northcentral Subregion and North Shore Forest ecoregion (NL Department of Fisheries and Land Resources [NLDFLR] 2019). The topography of the RAA is varied ranging from flat areas of bog containing woody ridges to hilly and mountainous areas falling steeply to rugged coastline with elevations reaching up to 315 m above sea level (NL Department of Fisheries, Forestry and Agriculture 2021). The major watersheds within the Project Area are the South Brook watershed and the Trimms Brook watershed. Based on a surficial geology map prepared by Kirby et al. (2011), the overburden material in the Project Area generally consists of glacial till veneer mapped to be less than 1.5 m thick, bedrock outcrops concealed by vegetation, and areas of poorly drained accumulations of organic matter (e.g., bog).

The Project Area, LAA and RAA and associated watersheds are located within the National Hydro Network watershed 02YM000 (Western Norte Dame Bay), which covers most of the Baie Verte peninsula (Natural Resources Canada 2016).

6.3.1.2.2 Climate

The Project is within the Central Newfoundland Forest and the Northcentral Subregion and North Shore Forest Ecoregions, which experience cool, late springs near the coast with sea ice persisting into May and warm and sunny summers (NLDFLR 2019). The Baie Verte Peninsula has heavy snowfalls, a late spring, and frequent rain during the summer and late fall (AMEC 2013).

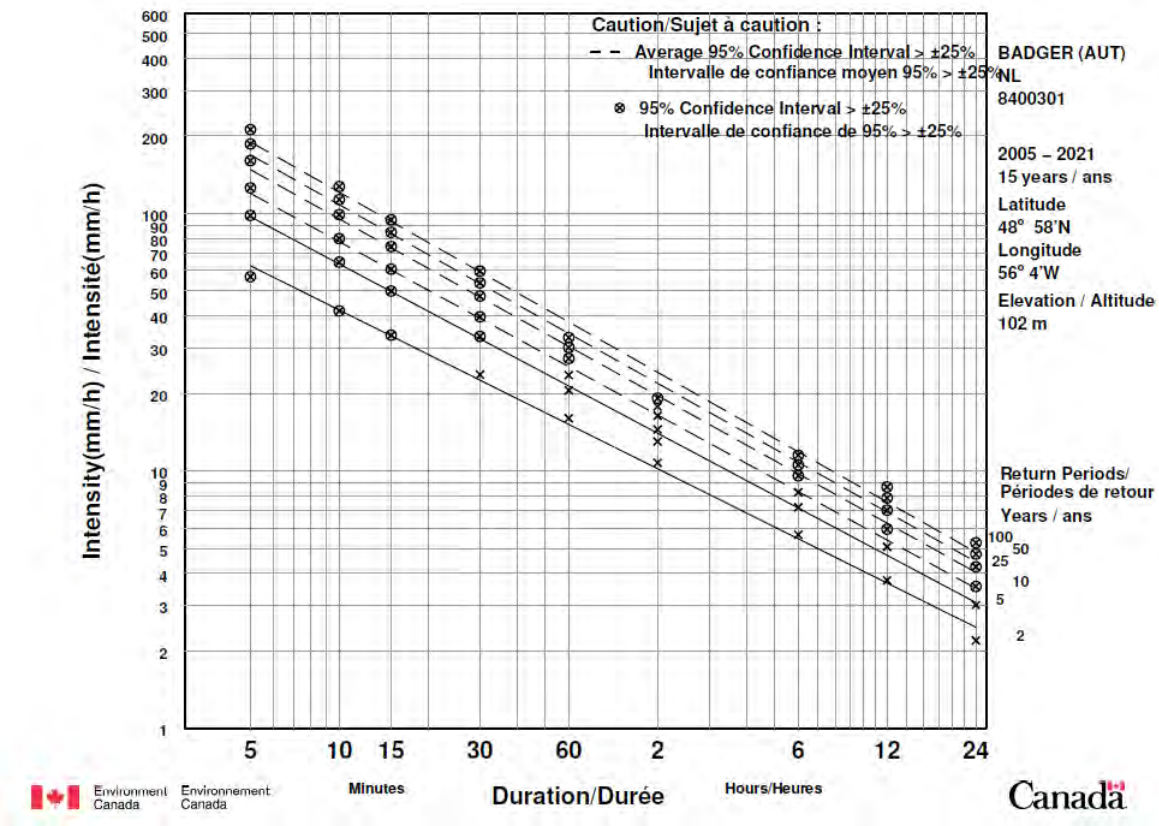
The nearest ECCC Climate station with recent data (within the last 10 years) is the Middle Arm climate station (ID 8402644). The Middle Arm climate station, active between 1988-2021, is located approximately 10 km southeast of the Project (49°41’ N, 56°05’ W) at an elevation of 47.8 m. Climate normals from 1991-2020 show a temperature range from a low of -7.7°C in February to a high of 16.1°C in August. The climate normal annual precipitation was found to be 1,214.5 mm, with a mean annual snowfall of 344.5 centimetres. Snow cover is expected between November through April. The mean annual potential ET for NL was found to range from 475 to 499 millimetres (mm) (NL Department of Environment and Conservation [NLDOEC] 1992).

The closest actively operating ECCC station with a recent IDF availability is the Badger (AUT) climate station (ID 8400301). Badger (AUT) is located 105 km southwest of the Project (48°58’ N, 56°04’ W) at an elevation of 102.7 m. The Badger IDF dataset was from 2005-2021 (15 years of data) and was assessed to understand the rainfall intensity that may be expected during various return period events (2-, 5-,10-, 25-, 50-, and 100-year (Table 6.3.2, Figure 6.3.6).

Table 6.3.2 Intensity-Duration-Frequency Data for Badger Climate Station

Duration	Total Rainfall (mm)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5 minute	4.7	8.2	10.5	13.4	15.5	17.6
10 minute	7.0	10.8	13.3	16.5	18.9	21.2
15 minute	8.4	12.5	15.2	18.6	21.1	23.6
30 minute	11.8	16.6	19.8	23.9	26.9	29.8
1 hour	16.0	20.5	23.5	27.3	30.2	32.9
2 hour	21.5	26.0	29.0	32.7	35.5	38.3
6 hour	33.9	43.3	49.5	57.4	63.2	69.0
12 hour	45.0	60.8	71.2	84.4	94.2	103.9
24 hour	52.6	72.3	85.3	101.7	113.9	126.0

Source: ECCC 2022



Source: ECCC 2022

Figure 6.3.6 Intensity-Duration-Frequency Data for Badger Climate Station

6.3.1.2.3 Climate Change

Climate projections for currently operating Badger (AUT) station were assessed for three shared socio-economic pathways (SSPs): low emissions scenario (SSP1-2.6), moderate emissions scenario (SSP2-4.5), and high emissions scenario (SSP5-8.5) from Climatedata.ca. The climate projection includes a 30-year projection period from 2021-2050 at a median percentile value of the Coupled-Model Intercomparison Project 6 (CMIP6) model ensemble. SSP1-2.6 represents a medium-low scenario with the assumption that aggressive mitigation occurs during the period of interest, while SSP2-4.5 is a medium stabilization scenario with average means of curbing emissions, and SSP5-8.5 is a very high emission scenario that assumes a failure to curb global warming. The climate change IDF curves for various return period events (2-, 5-,10-, 25-, 50-, and 100-year) are presented in Tables 6.3.3 to 6.3.5.

Table 6.3.3 Intensity-Duration-Frequency Data for Badger Climate Station – SSP1-2.6, Projection Period 2021-2050

Duration	Total Rainfall (mm)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5 minute	5.3	9.3	11.9	15.2	17.6	20.0
10 minute	7.8	12.2	15.2	18.7	21.3	24.0
15 minute	9.5	14.3	17.3	21.0	24.0	26.8
30 minute	13.5	19.0	22.5	27.0	30.5	34.0
1 hour	18.0	23.0	27.0	31.0	34.0	37.0
2 hour	24.0	30.0	32.0	38.0	40.0	44.0
6 hour	38.4	49.2	56.4	66.0	72.0	78.0
12 hour	51.6	69.6	80.4	94.8	106.8	118.8
24 hour	60.0	81.6	98.4	115.2	127.2	144.0

Source: ECCC 2022

Table 6.3.4 Intensity-Duration-Frequency Data for Badger Climate Station – SSP2-4.5, Projection Period 2021-2050-

Duration	Total Rainfall (mm)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5 minute	5.4	9.3	11.9	15.2	17.7	20.1
10 minute	8.0	12.3	15.2	18.8	21.5	24.2
15 minute	9.5	14.3	17.3	21.3	24.0	27.0
30 minute	13.5	19.0	22.5	27.0	30.5	34.0
1 hour	18.0	23.0	27.0	31.0	34.0	37.0
2 hour	24.0	30.0	32.0	38.0	40.0	44.0
6 hour	38.4	49.2	56.4	66.0	72.0	78.0
12 hour	51.6	69.6	80.4	96.0	106.8	118.8
24 hour	60.0	81.6	98.4	115.2	127.2	144.0

Source: ECCC 2022

Table 6.3.5 Intensity-Duration-Frequency Data for Badger Climate Station – SSP5-8.5, Projection Period 2021-2050

Duration	Total Rainfall (mm)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5 minute	5.5	9.5	12.16667	15.5	18	20.41667
10 minute	8	12.5	15.5	19.16667	21.83333	24.5
15 minute	9.75	14.5	17.5	21.5	24.5	27.25
30 minute	13.5	19.5	23	27.5	31	34.5
1 hour	19	24	27	32	35	38
2 hour	24	30	34	38	42	44
6 hour	39	49.8	57.6	66	72	78
12 hour	52.8	70.8	81.6	97.2	108	120
24 hour	60	84	100.8	117.6	129.6	146.4

Source: ECCC 2022

Even under the best-case scenario (SSP1-2.6), the climate is expected to have some substantial changes to precipitation, with higher total rainfall and rainfall intensities occurring more frequently. Changes in temperature and precipitation are described in the ensuing sections using the medium stabilization emissions scenario, defined as SSP2-4.5, as recommended by the CSA (2019).

6.3.1.2.4 Surface Water Quantity

Regional Hydrologic Assessment

A regional hydrologic assessment was completed to understand the relationships between watershed area and hydrologic stations to predict flows within the Project Area. The detailed regional analysis is provided in Figure 6.3.7 and is summarized below.

Seven WSC stations were selected for the regional hydrologic assessment following the homogeneity tests detailed in Appendix 6.A. The relationship between MAFs and selected WSC stations indicates that 91% of the variability in the MAF can be explained by watershed area. The MAF and watershed area relationship is presented in Figure 6.3.7. Mean monthly flow relationships versus watershed area were also developed and are presented in Appendix 6.A. Streamflow tends to peak twice per year, first in April / May due to the spring freshet, and again in November due to fall rainfall events. Minimum flows are observed during the winter months from January to February and during late summer between July and September.

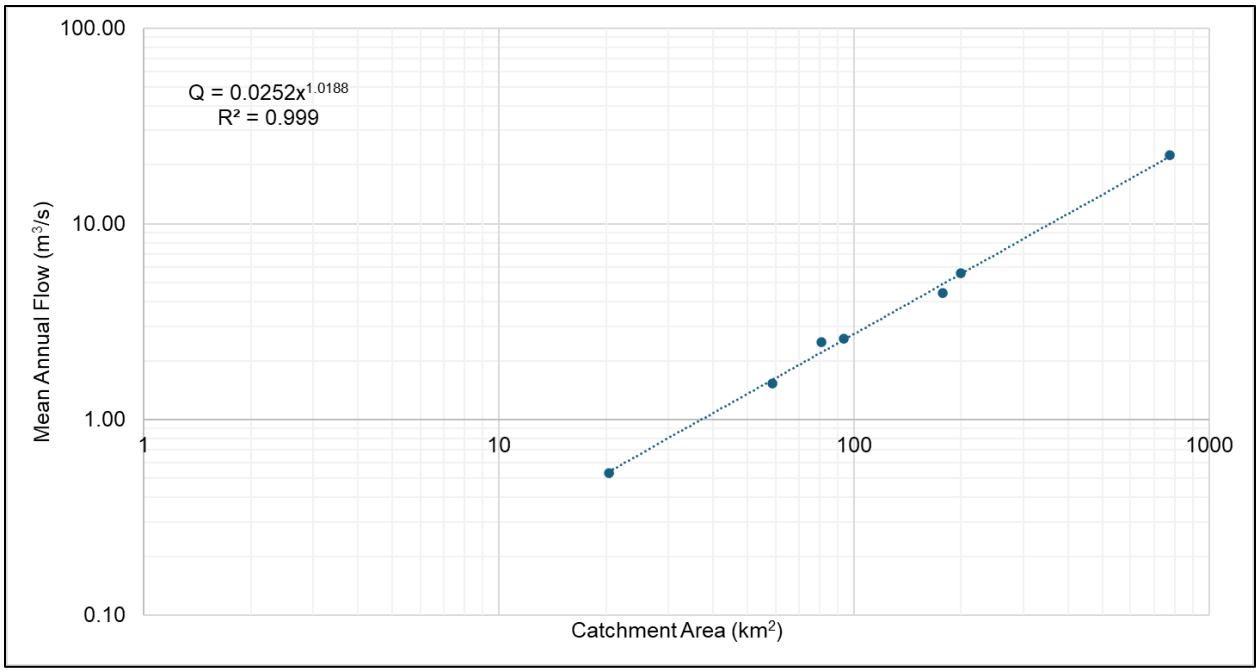


Figure 6.3.7 Watershed Area and Mean Annual Flow Relationship for WSC stations

Regional relationships for peak flows were developed using the seven WSC stations selected from the regional hydrologic assessment. Table 6.3.6 presents the relationships between peak flows and watershed areas for various return periods (2, 5, 10, 25, 50, and 100-year).

Table 6.3.6 Peak Flow Relationships

Return Period	Relationship	R^2-value
2-year	$Q_2 = 0.7447\ (DA)^{0.8205}$	0.96
5-year	$Q_5 = 1.2452(DA)^{0.7865}$	0.95
10-year	$Q_{10} = 1.5964(DA)^{0.7745}$	0.95
25-year	$Q_{25} = 2.0451(DA)^{0.7667}$	0.95
50-year	$Q_{50} = 2.3771(DA)^{0.7645}$	0.95
100-year	$Q_{100} = 2.7093(DA)^{0.7641}$	0.95

Note:
DA = Drainage Area (km²)

Low and environmental flows were calculated using the data from the selected seven WSC stations. Table 6.3.7 presents the low and environmental flow statistics for a range of arbitrary watershed areas based on the regional relationships.

Table 6.3.7 Low Flows (m³/s) and Environmental Flows (m³/s) for Various Watershed Areas

Flow Statistic	Watershed Area (km²)					
	1	5	10	25	50	100
7Q10	0.002	0.012	0.026	0.072	0.155	0.336
7Q20	0.002	0.014	0.030	0.084	0.180	0.387
Summer Environmental Flow (50% MAF)	0.013	0.065	0.132	0.335	0.678	1.374
Winter Environmental Flow (30% MAF)	0.008	0.039	0.079	0.201	0.407	0.824

Regional flow data from the WSC stations considered to be homogeneous were used to establish relationships between watershed area and flow statistics (MAF, MMF, peak flows, and low-flows) and will be used to quantify potential changes due to Project interactions. A detailed summary of regional flows is included in Appendix 6.A and the flows for sub-watersheds containing 2024/25 surface water hydrometric stations are presented in Table 6.3.8.

Table 6.3.8 Summary of Low Flows and Environmental Flows at Surface Water Quantity Monitoring Stations

SW Monitoring Station ID	Sub-watershed ID	Area (km²)	7Q10	7Q20	Summer Env. Flow (50% MAF)	Winter Env. Flow (30% MAF)
SW – 1	SB3	9.15	0.023	0.028	0.120	0.072
SW – 2	SB4	2.81	0.006	0.008	0.036	0.022
SW – 3	SB14	1.24	0.003	0.003	0.016	0.009
SW – 4	SB15	2.77	0.006	0.007	0.036	0.021
SW – 7	SB17	104.73	0.354	0.408	1.440	0.864
SW – 8	SB18	1.14	0.002	0.003	0.014	0.009
SW – 9	SB12	100.05	0.336	0.388	1.375	0.825
SW – 11	SB2	7.40	0.019	0.022	0.097	0.058
SW – 12	SB11	64.42	0.206	0.238	0.878	0.527

SB = South Brook
TB = Trimms Brook

Local Hydrologic Assessment

The Project is located within the South Brook watershed (watershed area of approximately 116 km²) and a portion of the Trimms Brook watershed (watershed area of approximately 40 km²). The watercourses (ID, length and type) and waterbodies (ID, surface area) within and adjacent to the Project Area are presented in Table 6.3.9. and Table 6.3.10, respectively. The identified streams and waterbodies are displayed in Figure 6.3.8.

Table 6.3.9 Summary of Watercourses Identified within and Adjacent to the Project Area

Stream ID	Length (m)	Type	Stream ID	Length (m)	Type
S01	2,140	Perennial	S20	273	Perennial
S02	5,932	Perennial	S21	262	Intermittent
S03a	340	Perennial	S22	270	Intermittent
S03b	1,009	Intermittent	S23	995	Perennial
S04	1,164	Perennial	S24	661	Perennial
S05	410	Perennial	S25	1,914	Perennial
S06	1,685	Intermittent	S26	428	Intermittent
S07	954	Perennial	S27A	626	Perennial
S09	4	Perennial	S27B	524	Intermittent
S10	159	Perennial	S28	714	Intermittent
S11	583	Perennial	S29	815	Perennial
S12	173	Perennial	S30	91	Perennial
S13	494	Intermittent	S31	547	Intermittent
S14	263	Intermittent	S32	431	Intermittent
S15	1,484	Perennial	S33	901	Intermittent
S16	150	Perennial	S34	287	Intermittent
S17a	124	Perennial	S35	70	Intermittent
S17b	446	Intermittent	S36	395	Perennial
S18	240	Intermittent	S45	798	Intermittent
S19	1,255	Perennial	-	-	-

Table 6.3.10 Summary of Waterbodies Identified Within and Adjacent to the Project Area

Waterbody type	ID	Area (ha)	Waterbody type	ID	Area (ha)
Bog Hole	B01	0.04	Pond	P07	2.80
Bog Hole	B02	0.05	Pond	P08	1.17
Bog Hole	B03	0.04	Pond	P09	1.68
Bog Hole	B04	0.14	Pond	P10	1.51
Bog Hole	B05	0.04	Pond	P11	0.29
Bog Hole	B06	0.24	Pond	P12	2.41
Bog Hole	B07	0.18	Pond	P13	13.30
Bog Hole	B08	0.32	Pond	P14	9.84
Bog Hole	B10	0.18	Pond	P15	8.76
Bog Hole	B11	0.05	Pond	P16	0.53
Bog Hole	B12	0.08	Pond	P17	0.52
Bog Hole	B13	0.11	Pond	P18	3.23
Bog Hole	B14	0.05	Pond	P19	1.18
Bog Hole	B15	0.04	Pond	P20	0.16
Bog Hole	B16	0.03	Pond	P21	0.31
Bog Hole	B17	0.04	Pond	P22	0.16
Bog Hole	B18	0.05	Pond	P23	0.24
Bog Hole	B19	0.05	Pond	P24	0.40
Pond	P01	22.10	Pond	P25	0.63
Pond	P02	55.53	Pond	P26	0.51
Pond	P03	7.17	Pond	P27	1.74
Pond	P04	3.79	Pond	P29	29.25
Pond	P05	1.50	Pond	P30	26.15
Pond	P06	2.29	-	-	-

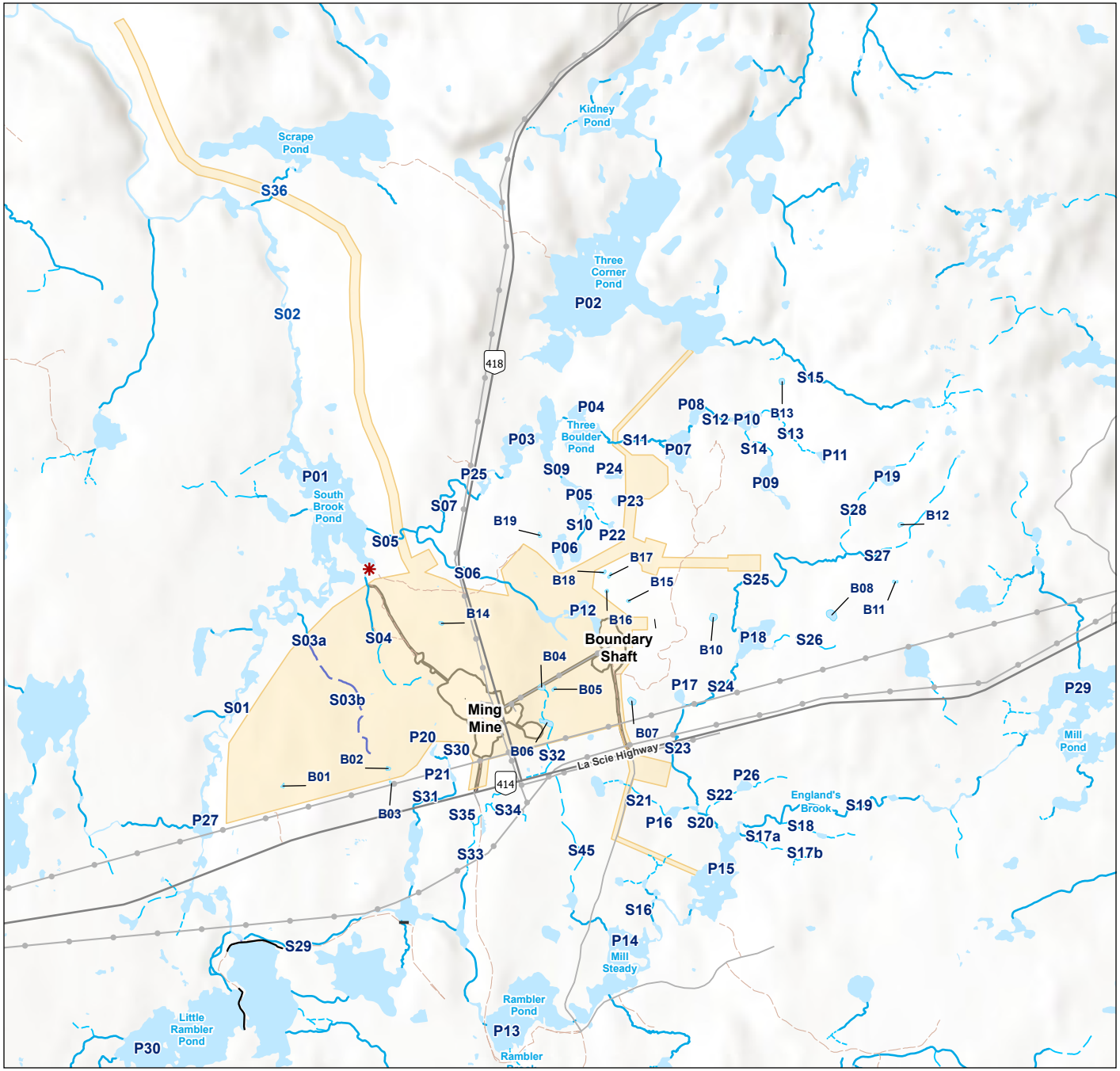


Figure No.
6.3.8

Title
Location of Streams and Waterbodies Identified Within and Adjacent to the Project Area

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project
121418199_007

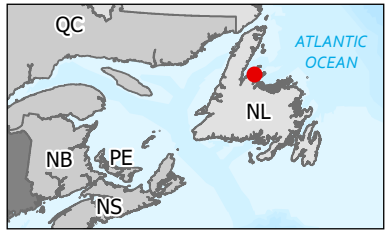
Project Location
Baie Verte, NL

Prepared by MB on 2025-03-19
Revised 2025-04-14
IR by AS on 2025-04-14

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:37,000

- Project Area
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Final Discharge Point (FDP)
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap Esri, NASA, NGA, USGS, Esri, TomTom, Garmin, FAO, NOAA, USGS, NRCan, Parks Canada, Esri, USGS

Stantec

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The results of the local baseline assessment will be compiled into a report and submitted prior to construction of the Project.

The environmental water balance model was run on a monthly basis for the climate normal year. The input parameters included monthly precipitation, temperature, runoff factor, soil moisture storage capacity, and rain and snowfall temperature thresholds. These were established based on assumptions of local climate and soil conditions and guidance provided by USGS (McCabe and Markstrom 2007). Input parameters and detailed results analysis are discussed further in Appendix 6.A. The results of the water balance are presented in Table 6.3.11 to Table 6.3.13 for the climate normal, wet-year, and dry-year assessments, respectively. The results show that expected annual ET is 438.9 mm and is within 7.6% of the Water Resources Atlas of Newfoundland (NLDOEC 1992) of 475 to 499 mm/year reported for the Project Area.

Table 6.3.11 Environmental Water Balance for the Climate Normal Period from 1991-2020

Parameters (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation	95.8	94.1	76.1	80.2	95.8	100.9	105	105.3	119.0	124.1	113.1	105.1	1,214.5
Actual ET	6.5	7.6	13.8	27.8	48.2	71.0	95.0	80.4	45.1	23.8	12.1	7.6	438.9
Potential ET	6.8	8.2	15.5	27.8	48.2	71.0	95.0	80.4	45.1	23.8	12.1	7.6	441.5
Excess Precipitation	89.3	86.5	62.3	52.4	47.6	29.9	10	24.9	73.9	100.3	101	97.5	775.6
Total Streamflow	21.9	11.0	5.5	105.9	123.5	100	66.7	51.6	66.0	86.2	93.3	43.8	775.4
Storage Change	67.4	75.5	56.8	-53.5	-75.9	-70.1	-56.7	-26.7	7.9	14.1	7.7	53.7	0.2
Groundwater Recharge	8.8	4.4	2.2	42.4	49.4	40.0	26.7	20.6	26.4	34.5	37.3	17.5	310.2
Overland flow	13.1	6.6	3.3	63.5	74.1	60.0	40.0	31.0	39.6	51.7	56.0	26.3	465.2

Table 6.3.12 Environmental Water Balance for the Wettest Year - 2011

Parameters (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation	171.2	169.2	84.0	52.6	103.8	201.8	161.3	65.8	118.9	293.0	37.2	79	1,537.8
Potential ET	8.4	8.1	16.3	27.5	47.3	60.5	86.3	76.5	46.3	24.1	12	7.8	421.1
Actual ET	8.1	7.5	14.4	27.5	47.3	60.5	86.3	76.5	46.3	24.1	12	7.8	418.3
Excess Precipitation	163.1	161.7	69.6	25.1	56.5	141.3	75.0	-10.7	72.6	268.9	25.2	71.2	1,119.5
Total Streamflow	23.8	11.9	5.9	123.8	154.4	181.7	143.1	71.7	77.4	181.4	96.9	47.5	1,119.5
Storage Change	139.3	149.8	63.7	-98.7	-97.9	-40.4	-68.1	-82.4	-4.8	87.5	-71.7	23.7	0.0
Groundwater Recharge	9.5	4.8	2.4	49.5	61.8	72.7	57.2	28.7	31.0	72.6	38.8	19.0	447.8
Overland flow	14.3	7.1	3.5	74.3	92.6	109.0	85.9	43.0	46.4	108.8	58.1	28.5	671.7

Table 6.3.13 Environmental Water Balance for the Driest Year - 1989

Parameters (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation	78	6	27	18	85.7	52.2	50.8	124.4	76.4	113	164.4	58	853.9
Potential ET	6.5	7.5	14.3	32	60.2	84.7	108.3	86.5	49.9	23.7	11.9	6.7	492.2
Actual ET	6.3	7	12.8	32	60.2	84.7	108.3	86.5	49.9	23.7	11.9	6.7	490
Excess Precipitation	71.7	-1	14.2	-14	25.5	-32.5	-57.5	37.9	26.5	89.3	152.5	51.3	363.9
Total Streamflow	23.6	11.8	5.9	22.2	46.7	23.8	13.1	11.5	8.9	50	102.6	47.2	367.3
Storage Change	48.1	-12.8	8.3	-36.2	-21.2	-56.3	-70.6	26.4	17.6	39.3	49.9	4.1	-3.4
Groundwater Recharge	9.4	4.7	2.4	8.9	18.7	9.5	5.2	4.6	3.6	20.0	41.0	18.9	146.9
Overland flow	14.2	7.1	3.5	13.3	28.0	14.3	7.9	6.9	5.3	30.0	61.6	28.3	220.4

Bathymetry

Bathymetric data were collected for South Brook Pond (P01) and Three Corner Pond (P02) within the LAA and are presented in Figures 6.3.9 and 6.3.10, respectively. Bathymetric data were collected for these two ponds as South Brook Pond is the current final discharge point (FDP) and is proposed to receive effluent from the Project, and Three Corner Pond is a proposed surface water supply for the Project. Bathymetric mapping for South Brook Pond presents the lake with a total area of 26.7 hectares (ha) and depths up to 7.0 m. South Brook Pond has an irregular shape and three basins with depths between 5.0 and 7.0 m. The irregular shape of the lake is a result of the four inlet channels contributing to the lake. Three Corner Pond is 55.2 ha in area and has a maximum depth up to 32 m within its central basin. Three Corner Pond is appropriately named as it is triangular in shape with the main basin located in the centre of the lake.

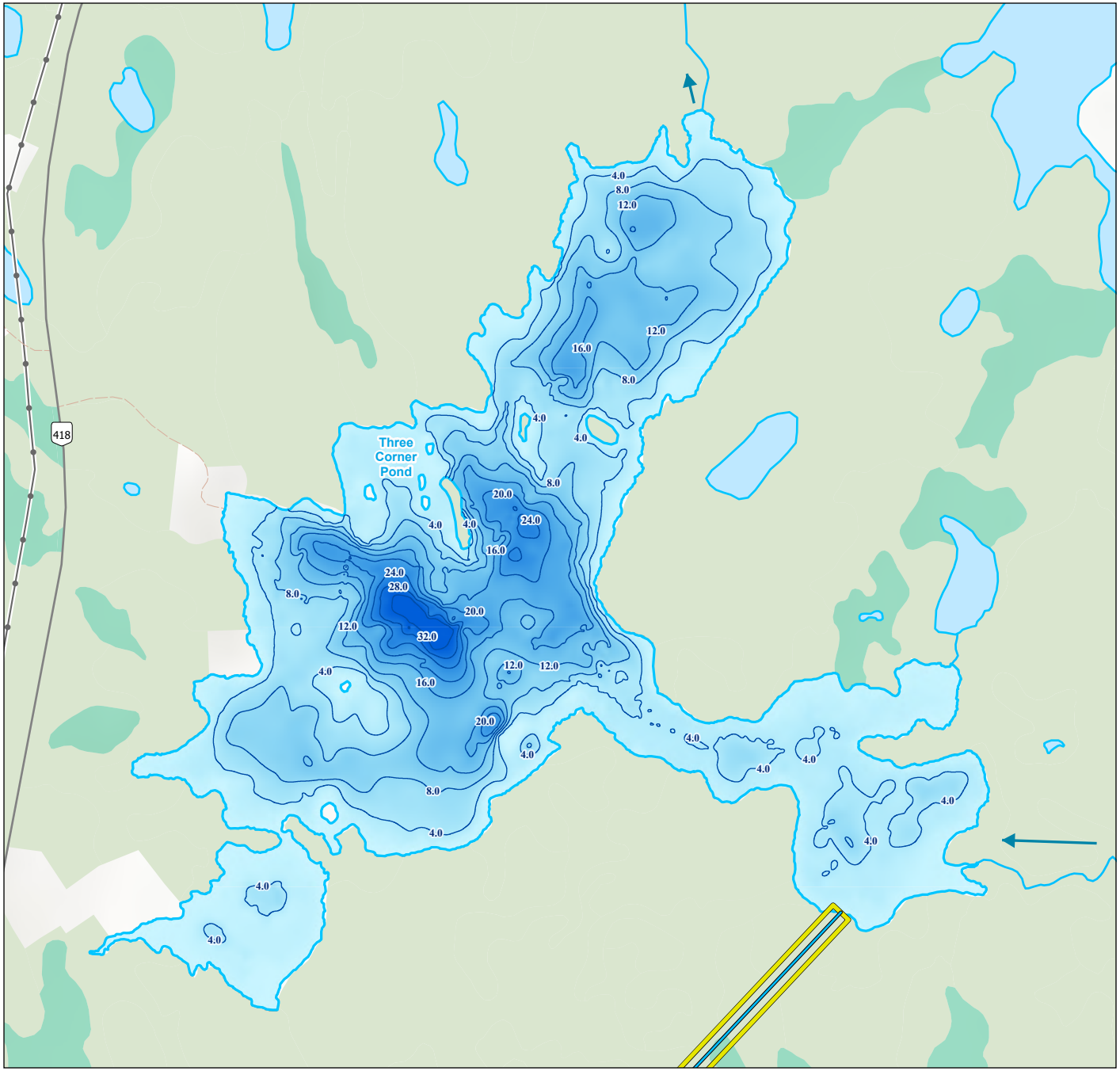


Figure No.
6.3.9
Title
Three Corner Pond Bathymetry

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_2_004a

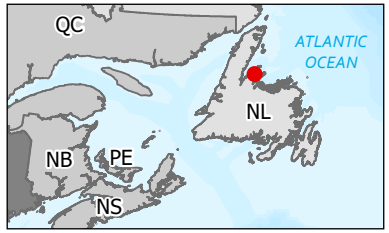
Project Location
Baie Verte, NL

Prepared by MB on 2024-12-12
Revised 2025-03-19

N

0 75 150
Metres
(At original document size of 8.5x11)
1:8,500

- Bathymetry Contour, 4 m
- Pipeline
- Project Area
- Highway
- Resource Road / Trail
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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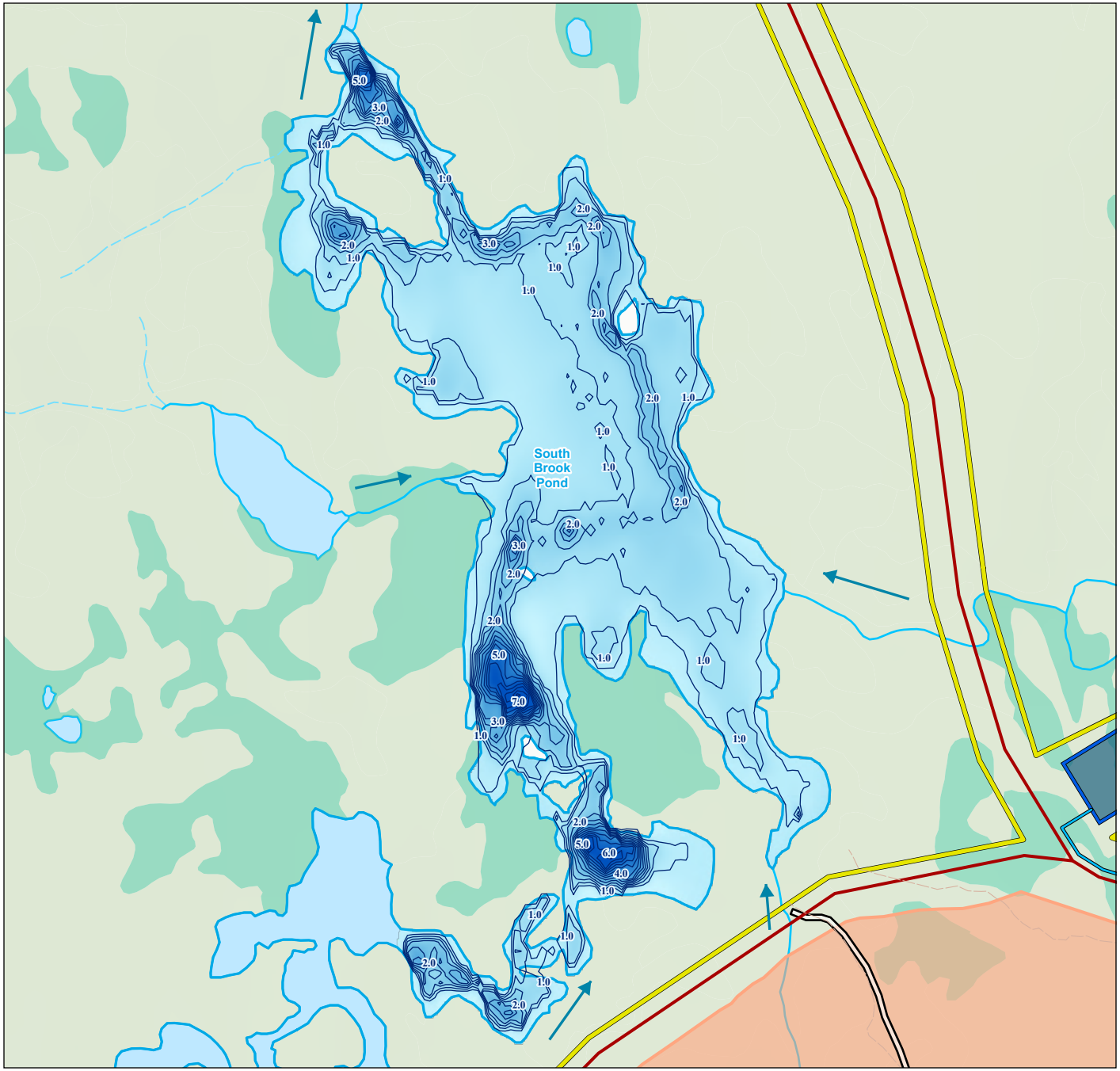

Figure No.
6.3.10

Title
South Brook Pond Bathymetry

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_2_004b

Project Location
Baie Verte, NL

Prepared by MB on 2024-12-12
Revised 2025-03-19

N

0 75 150 Metres
(At original document size of 8.5x11)
1:6,500

- Bathymetry Contour, 0.5 m
- Pipeline
- Road
- Project Area
- Ming Mine Operation
- Tailings Management Facility (TMF)
- Wastewater Management Plant (WWMP)
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.3.1.2.5 Surface Water Quality

Desktop Review

A review of historical surface water quality studies was conducted to understand existing condition water quality in the Project Area, LAA and RAA, including water quality associated with historical mining activities. Historical surface water quality studies have been predominantly conducted in support of assessing discharge and potential effects from historical mining activities at or near the Project Area, including prior to the Rambler Metals and Mining reactivating the Ming Mine in 2010. Results from the following five studies were identified as having relevant historical surface water quality data within the Project Area and LAA:

Pre-Rambler Metals and Mining's Ming Mine reactivation:

- Seasonal and Mining Influences on Steam-Water Geochemistry (McConnell 1995; Appendix 2.A)
- Sources of Acid-Mine Drainage (McConnell 2002; Appendix 2.A)
- Aquatic Survey (AMEC 2008)

Post-Rambler Metals and Mining's Ming Mine reactivation:

- Surface Water and Sediment Quality Sampling Program (GEMTEC 2019)
- Environmental Effects Monitoring (Stantec 2013, 2019, 2023)

Local water quality data provides a robust baseline dataset, with over 120 samples collected for laboratory analysis for total metals, general chemistry, cyanide and radium-226 parameters at various locations across the Project Area and LAA intermittently in a total of 11 years over a 30-year period, including samples collected prior to the reactivated Mine Ming operation in 2010. The monitored parameters represent the typical PoPCs associated with hard rock mining activities. Surface water quality data from the larger scale LAA provides a greater areal coverage with less monitoring frequency over the same period than in comparison to the Project Area. By considering the historical local surface water quality data, existing water quality conditions for the Project Area and LAA can be established, including reference water quality for surface water features not impacted by historical mining activities.

Surface water quality data from the monitoring sites was classified into the following categories to represent geographic conditions, relationship to the proposed FDP for the Project and in relation to historical mining activities:

- Reference - represent surface water features upstream of the proposed Project Area and are outside of the influence of historical mining activities (i.e., natural background sites)
- Project Area - represent surface water features located within the Project Area that may or may not be impacted by historical mining activities (e.g., Boundary Shaft)

- Upstream South Brook - represent surface water features on the South Brook channel located upstream of the proposed FDP and influenced by historical mining activities (e.g., Historical Tailings Area)
- Downstream South Brook - represent surface water features located downstream of the proposed FDP and potentially influenced by historical mining activities (e.g., Boundary Shaft)

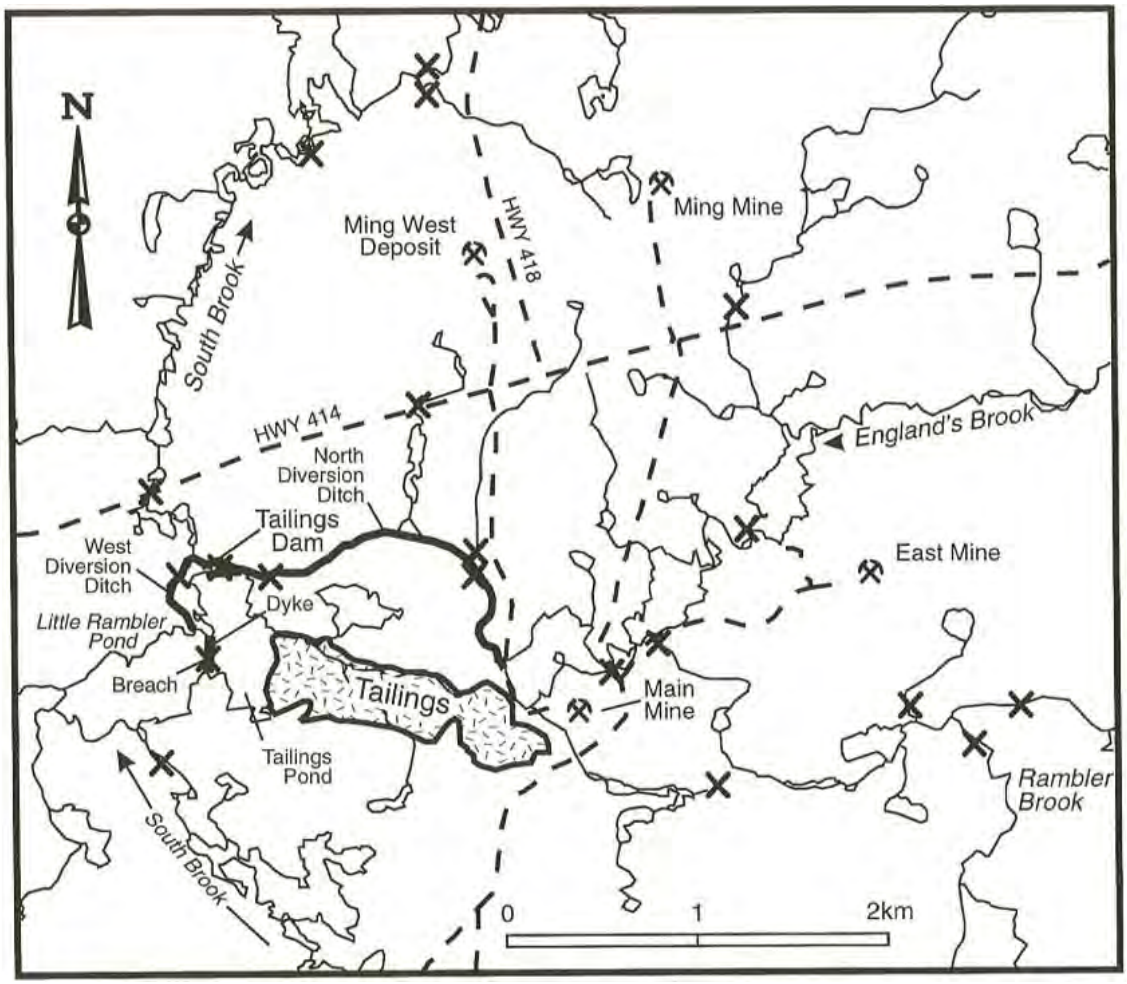
The site types can also be grouped as reference sites that are not influenced by historical mining activities (reference) and sites influenced by historical mining activities (Project Area, upstream and downstream of South Brook).

Historical mining activities refers to activities that occurred before 2010 and prior to the past operator and FireFly conducting activities at the site. Figures 6.3.11 and 6.3.12 present locations of historical mining infrastructure from the 1995 and 2002 McConnell studies, respectively (Appendix 2.A). Rambler Metals and Mining operated the Ming Mine in accordance with federal Metal Mining Effluent Regulations and the updated MDMER. Refer to Section 2.2 for the history of the Ming Mine and surrounding legacy mining areas.

Figure 6.3.5 presents the locations of the historical surface water quality monitoring station locations. For the five studies assessed, the monitoring stations were classified as follows:

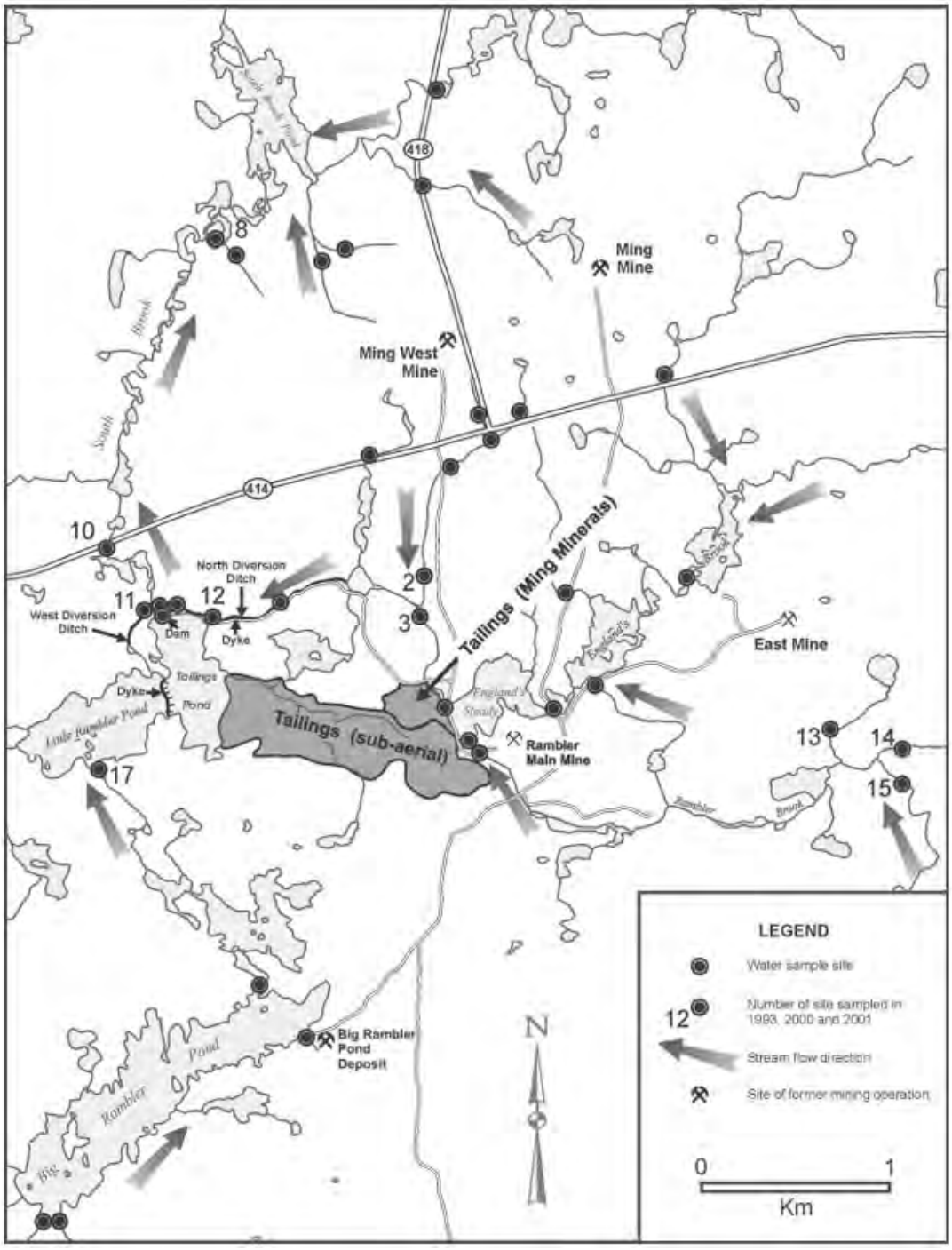
- Reference - Keneachel Pond (AM-4), Scrape Pond (EEM Study), Three Boulder Pond (AM-5), four sites from McConnell (1995), and five sites from McConnell (2002) (Appendix 2.A)
- Project Area - Jesse's Pond (AM-7), Vincers Pond (AM-1), SW1 to SW4, SW16/16A, SW18, and three sites from McConnell (2002; Appendix 2.A)
  - Jesse's Pond (AM-7) in the AMEC (2008) study was identified as a reference site based on observed water quality and its upstream catchment activities
- Upstream South Brook - SW11, 12 sites from McConnell (1995), and 18 sites from McConnell (2002) (Appendix 2.A)
- Downstream South Brook sites - South Brook Pond (AM-10; EEM Study), SW5 to SW10, SW17, three sites from McConnell (1995), and two sites from McConnell (2002) (Appendix 2.A)

A detailed description of historical surface water monitoring program results and existing water quality conditions within the Project Area, LAA, and RAA is presented in Appendix 6.B and summarized below.



Source: McConnell 1995 (Appendix 2.A)

Figure 6.3.11 Historical Mining Activity and Surface Water Monitoring Locations



Source: McConnell 2022 (Appendix 2.A)

Figure 6.3.12 Historical Mining Activity and Surface Water Monitoring Locations

Results Summary

The following discussion presents a summary of the desktop water quality assessment with a focus on parameters that exceeded CWQG-FAL values representing reference and historical mine activity areas water quality for two monitoring periods: pre-Ming Mine reactivation in 2010 by Rambler Metals and Mining; and post-Ming Mine reactivation in 2010. The presentation of two monitoring periods is to provide additional context on surface water features impacted by historical mining activities in and around the Project Area and within the LAA.

Pre-2010 Ming Mine Reactivation

Three monitoring studies were conducted prior to 2010 (McConnell 1995, 2002 (Appendix 2.A); AMEC 2008). Table 6.3.14 presents a summary of the PoPCs identified for the surface water monitoring sites, grouped into two categories: reference sites and historical mine activity areas. PoPCs were identified based on exceedances of CWQG-FAL criteria.

Table 6.3.14 Parameters of Potential Concern Identified for Grouped Historical Surface Water Quality Monitoring Sites for the Pre-2010 Ming Mine Reactivation Monitoring Period

Reference	Historical Mine Activity Areas
Monitoring Sites	
Keneachel Pond (AM-4) Three Boulder Pond (AM-5) Four sites from McConnell (1995; Appendix 2.A) Five sites from McConnell (2002; Appendix 2.A)	Jesse's Pond (AM-7)[1] Vincers Pond (AM-1) South Brook Pond (AM-10) 16 sites from McConnell (1995; Appendix 2.A) 25 sites from McConnell (2002; Appendix 2.A)
PoPCs	
Total Aluminum Total Copper Total Iron Total Lead pH (*in situ*/Field)	Total Aluminum Total Cadmium Total Copper Total Iron Total Lead Total Manganese Total Nickel Total Zinc pH (*in situ*/Field)

Note:
[1] AMEC (2008) classified as "reference" water quality
Source: McConnell 1995, 2002 (Appendix 2.A); AMEC 2008

The reference sites are located upstream of historical mining areas and based on water quality data they have not been adversely impacted by the historical mining activities. As presented in Table 6.3.14, the reference sites have notably fewer PoPCs than the historical mine activity areas. In addition, the concentrations of the reference sites PoPCs are, in some cases, up to two to three orders of magnitude less than that of the historical mine activity areas. No PoPCs reported exceedances of MDMER guidelines for the reference sites. For the historical mine activity areas, exceedances of MDMER criteria were reported for total copper, total lead, and total zinc.

Based on the historical surface water quality results for the reference monitoring sites and monitoring sites associated with historical mining areas, the PoPCs are total aluminum, total cadmium, total copper, total iron, total lead, total manganese, total nickel, total zinc, and pH.

Post-2010 Ming Mine Reactivation

Table 6.3.15 presents a summary of the PoPCs for the GEMTEC (2019) and Stantec (2013, 2019, 2023) studies grouped into the four types of surface water monitoring sites, based on exceedances of CWQG-FAL parameter values. The historical water quality results for the reference site identified two PoPCs, copper, and lead. The pH at the reference site was typically in the circum-neutral range (6.5 to 8.5). The additional surface water quality monitoring data collected in 2024 will assist on further characterizing existing condition water quality within the LAA that is not influenced by historical mining activities.

The Project Area, and upstream and downstream South Brook groups of stations are influenced by historical mining activities and as presented in Table 6.3.14, identified the same PoPCs across the different groups. The metals/metalloids concentrations at the Project Area and downstream South Brook sites were typically higher than the upstream South Brook site results. pH values for the sites influenced by historical mining activities were acidic, with values below the CWQG-FAL guideline lower range value of 6.5. Several parameters within the Project Area and downstream South Brook sites reported total copper and total zinc concentrations for a number of monitoring events that exceeded the MDMER Schedule 4 Table 2 average monthly discharge concentration criteria, and had pH values below the acceptable range. The Project Area and downstream South Brook sites also reported concentrations for a number of parameters (total aluminum, copper, manganese and zinc) that were up to 100 times greater than their corresponding CWQG-FAL value (Appendix 6.B).

Table 6.3.15 Parameters of Potential Concern (PoPCs) Identified for Grouped Historical Surface Water Quality Monitoring Sites for the Post-2010 Ming Mine Reactivation Monitoring Period

Reference	Project Area	Upstream South Brook	Downstream South Brook
Monitoring Sites			
Scrape Pond (EEM Study)	SW1 to SW4 SW16/16A SW18	SW11	South Brook Pond (EEM Study) SW5 to SW10 SW17
PoPCs			
Total Copper Total Lead	Total Aluminum Total Cadmium Total Copper Total Iron Total Lead Total Manganese Total Zinc pH (*in situ*/Field)	Total Aluminum Total Cadmium Total Copper Total Iron Total Lead Total Manganese Total Zinc pH (*in situ*/Field)	Total Aluminum Total Cadmium Total Copper Total Iron Total Lead Total Manganese Total Zinc pH (*in situ*/Field)

Source: (GEMTEC 2019; Stantec 2013, 2019, 2023)

Based on the historical surface water quality results for the reference monitoring sites and monitoring sites associated with historical mining activities, the PoPCs are total aluminum, cadmium, copper, iron, lead, manganese, zinc and pH. Water quality in South Brook, including South Brook Pond (P01), which are the proposed receivers for the Project have elevated concentrations of the PoPCs, including exceeded MDMER discharge criteria for copper and zinc.

Additional details about the surface water quality results and their assessment within the individual studies is presented in Appendix 6.B.

6.3.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Surface Water Resources is provided in Table 6.3.16. These potential environmental effects and measurable parameters are selected based on professional judgement, understanding of the Project, and recent environmental assessments for mining projects in NL and Canada.

Table 6.3.16 Potential Effects and Effect Pathways for Surface Water Resources

Potential Effect	Effect Pathway(s)
Change in surface water quantity	• Site preparation and ground disturbance could change catchment areas, increase runoff and flooding potential, and reduce infiltration and ET due to increases in imperviousness and reduction of vegetative cover • Temporary dewatering for the installation of foundations for buildings, ore stockpile, waste rock pile, and TMF starter dams, which could potentially alter groundwater discharge to surface water features • Construction of watercourse crossings, which have the potential to increase flooding and alter overland flow drainage patterns • Construction of trenches and excavations could potentially affect surface water quantity by changing groundwater discharge to surface water features by altering preferential groundwater flows and lowering of groundwater levels • Development of water management infrastructure, which could result in surface drainage changes related to contact water collection in perimeter collection ditches • Development of the waste rock pile, ore stockpile and TMF, which will alter runoff, flooding potential, and infiltration and ET • Mine portal and underground working dewatering to surface • Water withdrawals to meet processing needs not met by internal recycling of TMF treated water • Linear facilities (roads) with accompanied drainage infrastructure (ditches, culverts), which may increase runoff potential due to changes in impervious cover, slope and vegetation management • Final rehabilitation of TMF and other disturbed areas with appropriate cover materials and vegetation to stabilize soils, reduce overland flow and surface erosion, increase ET, and reduce infiltration • Re-establishment of drainage patterns, to the extent reasonably feasible, which could change the contributing areas of the local watersheds and subsequently affect surface water quantity

Table 6.3.16 Potential Effects and Effect Pathways for Surface Water Resources

Potential Effect	Effect Pathway(s)
Change in surface water quality	• Site preparation and ground disturbance can convey sediment (as TSS) to receiving waters • Ground disturbance can expose loose soil and rock to precipitation and runoff that will be discharged to temporary ditching and ponds and ultimately to the receiving environment • Waste rock and ore handling, which increase TSS loading from disturbed and un-stabilized ground surfaces and active work zones • Contact water and seepage originating from the ore stockpile and waste rock pile that is not captured by the contact water management infrastructure could discharge to surface water receptors • Portal and underground working dewatering water quality which may require sedimentation and further treatment prior to discharge to the environment • Project effluent discharge at the FDP to surface water receptors • Spills of hazardous materials • Sodium cyanide used in the mill to leach gold from the ore has the potential to persist at lower concentrations after cyanide destruct to the tailings stream and ultimately to the TMF. • Destruction of cyanide results in increase in ammonia products which may require treatment to meet regulatory effluent limits • The TMF will contain both tailings and process water used to create a pumpable tailings slurry. The area submerged within the tailings impoundment has the potential to result in the conversion of mercury in organic soils to methyl mercury

6.3.2.1 Analytical Assessment Techniques

6.3.2.1.1 Change in Surface Water Quantity

Flows under pre-development conditions were used as a baseline against which construction and operations related changes were assessed. Pre-development watershed areas are presented in Figure 6.3.2 and overlain with the Project Area. The full site buildout changes in watershed areas are due to construction of mine infrastructure, such as the TMF, and during operations site drainage is managed and discharged at one location (Figure 6.3.13). During construction within the Project Area, the existing wastewater management plant (WWMP) will discharge to the existing FDP to South Brook Pond, and up to two sediment management areas (sediment pond and/or geotube) will be monitored and if containing any deleterious substances will be managed and discharged at the existing FDP.

For Three Corner Pond (P02; sub-watershed TB1), there is a proposed surface water withdrawal to provide freshwater to the process plant. In England's Brook (P15; sub-watershed 5), there is a proposed surface water withdrawal to provide water to the accommodations camp. The maximum monthly water taking for each will not exceed more than 10% of the MMF value.

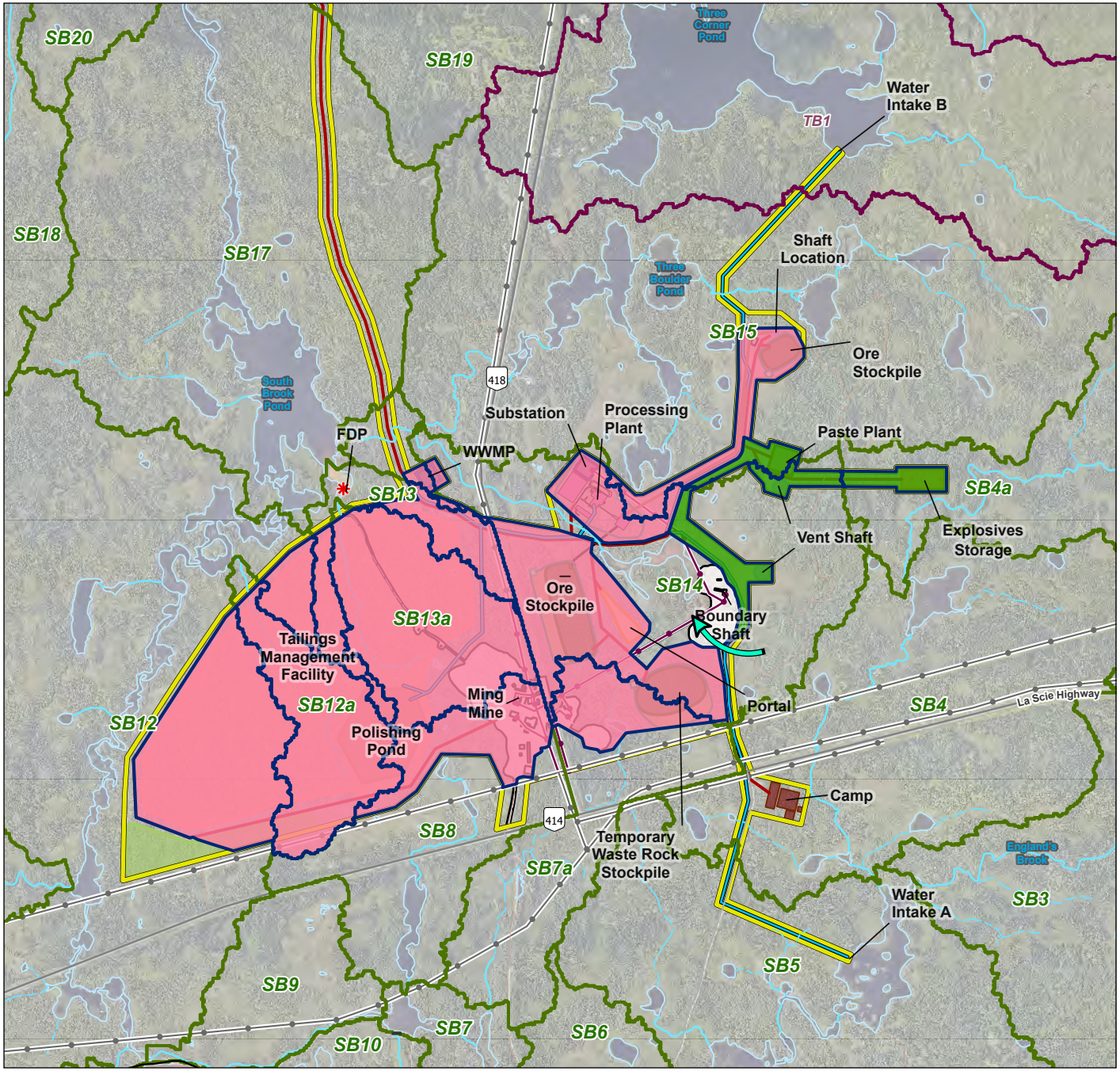


Figure No.
6.3.13
Title
Catchment Areas

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project
121418199_001

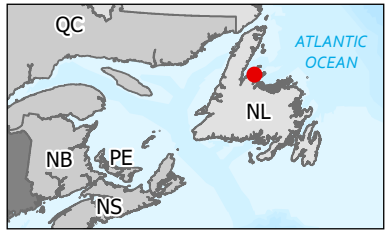
Project Location
Baie Verte, NL

Prepared by MB on 2025-03-24
IR by AS on 2025-04-07

N

0 300 600 Metres
(At original document size of 8.5x11)
1:24,000

- Final Discharge Point (FDP)
- Site Drainage to Wastewater Management Plant (WWMP)
- Site Drainage to WWMP or FDP
- South Brook subcatchment
- Three Corner Pond subcatchment
- Project Area
- Flow Direction
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL

Stantec

V:\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\3_121418199_FFM_2024Field_OtherReporting\121418199_FFM_MingMine_SW_TechMemo.aprx Revised: 2025-04-08 By: mblackwood

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Project changes in surface water quantity are assessed at the watershed scale using the following tiered approach. Changes in MAF and MMF from pre-development conditions are used as a screening threshold to determine whether further assessment of changes in flow were required. Changes in MAF and MMF are calculated for watersheds during both baseline and the operations phase of mine development, when the full site buildout and associated water management system occurs. An average treated discharge rate from the FDP of 128 m^3/hr is applied during the operations phase at the outlet of sub-watershed SB13 (Knight Piesold 2025). MAF and MMF are developed using regional relationships presented in Appendix 6.A of this Environmental Registration. Watersheds with an expected change in MAF of greater than 10% are carried forward to subsequent assessment steps.

For watersheds with an expected decrease of over 10%, the MAFs are compared with baseline environmental flows. Environmental flows for the province of NL are calculated as 50% MAF for summer months (i.e., summer environmental flows), and 30% MAF for winter months (i.e., winter environmental flows) (Zadeh 2012). A negligible residual effect is considered to occur if the predicted MMF was greater than the baseline environmental flows. If the expected MMF was lower than the baseline environmental flows, a residual surface water quantity effect is expected within the LAA.

For watersheds with an expected increase of over 10%, mitigation efforts are planned to reduce adverse effects of higher flows on downstream catchments. Affected watersheds are planned to discharge to the same downstream catchment as in baseline conditions.

6.3.2.1.2 Change in Surface Water Quality

Baseline and historical water quality was used as the baseline against which changes in surface water quality during the Project phases was assessed. As outlined in Chapter 2.5.13, water management infrastructure has been designed to keep contact and non-contact water separated. Contact water is directed to catch basins and then the polishing pond. An assimilative capacity (AC) study of the receiving waters with the discharge of treated effluent from the Project is presented in the AC memorandum (Appendix 6.C) to support the surface water resources assessment. The Project plans to manage contact water through the WWMP and discharge via the existing FDP. In the AC study, mass balance analyses were used to simulate water quality changes for PoPCs within the receiving waters and determine the extents of the mixing zone in South Brook Pond and in the South Brook channel downstream. The PoPCs were identified based on comparison of 90th percentile influent quality (i.e., prior to treatment) concentration predictions of the inflow to the WWMP and comparison to applicable CWQG-FAL values, and inclusion of parameters expected to require treatment based on mine activities (i.e., TSS, pH, total ammonia, unionized ammonia).

Site discharges from the WWMP are expected to be controlled predominantly by meteoric inputs (e.g., TMF, polishing pond, catch basin storage) and behave similarly to watercourse and pond levels in the South Brook watershed. The site-wide water management system would have higher storage volumes and flows during high-flow events, and limited flow during dry periods. Two flow scenarios were considered in the AC study, normal (average) and high-flow (80th percentile regional flow) scenarios.

The two scenarios were represented in the assessment using the following inputs:

- Effluent quality: PoPCs in discharge, in both high-flow and average scenarios, at maximum effluent criteria values, including maximum average monthly regulatory criteria concentrations (e.g., MDMER)
- Effluent quantity: maximum and average discharge flow rate at the FDP in high-flow and normal scenarios, respectively
- Receivers quality: 75th percentile concentrations for PoPCs, in both high-flow and normal scenarios, in the immediate receiver (South Brook Pond) and inflows from sub-watersheds downstream of South Brook Pond
- Receivers quantity: 80th percentile flow and MAF, in high-flow and normal scenarios, respectively, in sub-watersheds delineated within the South Brook watershed

The main objective in the AC study was to determine the extent of the mixing zone in the two scenarios (high-flow and average), based on the resulting concentrations in South Brook Pond and the downstream watercourse. Concentrations were evaluated at the edge of full mixing in South Brook Pond (1.02 km downstream of the FDP) and at four points downstream of South Brook Pond, referred to as P1 – P4 located 2.65 to 6.96 km downstream of the FDP (Attachment A in Appendix 6.C).

CWQG-FAL guideline values or baseline surface water quality concentrations, whichever were higher in value, were used to identify the downstream edge of mixing zone for the two scenarios. Total copper, total lead, dissolved zinc, pH, total aluminum, total cadmium, total chromium and total iron baseline 75th percentile concentrations were higher than CWQG-FAL values. As there is no CWQG-FAL value for total chromium, the 75th percentile concentration was compared against the CWQG-FAL value of 1 µg/L for the hexavalent state, which is the lower value between the guideline values for the trivalaent state (8.9 µg/L) and the hexavalent state (1 µg/L).

Assimilative capacity results are presented in the AC memorandum (Appendix C.6) and summarized in the Change in Surface Water Quality section (Section 6.3.4.2).

6.3.3 Mitigation and Management Measures

The approach to the water management for the site and associated Project components and activities has been provided in Section 2.5.13.

As discussed in Section 2.11, FireFly has revised the Ming Mine EPP, including identification and addition of mitigation measures required to address new and / or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on surface water quantity and quality. The mitigation measures identified serve to avoid or reduce potential effects on Surface Water Resources for the following Project activities are:

- Buffer Zones (Section 4.2 of the EPP)
- Laydown and Storage Areas (Section 4.3 of the EPP)

- Clearing Vegetation (Section 4.4 of the EPP)
- Grubbing and Disposal of Related Debris (Section 4.5 of the EPP)
- Overburden (Section 4.6 of the EPP)
- Excavation, Embankment and Grading (Section 4.7 of the EPP)
- Implement Erosion and Sediment Controls (Section 4.8 of the EPP)
- Water Supply (Section 4.9 of the EPP)
- Watercourse Crossings (Section 4.10 of the EPP)
- Exploration Drilling (Section 4.11 of the EPP)
- Pumps and Generators (Section 4.12 of the EPP)
- Dewatering Work Areas and Site Drainage (Section 4.13 of the EPP)
- Equipment Installation, Use and Maintenance (Section 4.14 of the EPP)
- Storage, Handling and Transfer of Fuel and Other Hazardous Material (Section 4.15 of the EPP)
- Waste Disposal (Section 4.17 of the EPP)
- Sewage Disposal (Section 4.18 of the EPP)
- Hazardous Waste Disposal (Section 4.19 of the EPP)
- Vehicle Traffic (Section 4.20 of the EPP)
- Dust and Air Contaminant Control (Section 4.21 of the EPP)
- Road Maintenance (Section 4.23 of the EPP)
- Building Construction (Section 4.24 of the EPP)
- Drilling and Blasting (Section 4.25 of the EPP)
- Waste Rock and Ore/Concentration (Section 4.26 of the EPP)
- Processing Activities (Section 4.27 of the EPP)

Additionally, as discussed in Section 2.5.13, FireFly is currently developing a conceptual site water management plan, which is still in progress.

The following mitigation measures specific to the Surface Water Resources VC have also been identified for the Project:

- Water management infrastructure, such as ponds and catch basins, will be constructed to manage via water transfer i.e., pumping the design storm volumes (1:100 year and 1:25 year design storms, respectively)
- Water inventory will be reduced through perimeter berms and promotion of overland flow of non-contact runoff.
- Surface water runoff and dewatering will be managed to meet mill reclaim process demand.

- Flow to fish bearing streams and wetlands will be maintained by maintaining pre-development catchments and/or flows to the extent practicable.
- Water management pumping and energy requirements during operation will be reduced through grading and gravitational drainage.
- Mine water management infrastructure will be developed to control mine contact water.
- Placement of mine waste has been purposely designed to use previously disturbed areas and to avoid overprinting waterbodies to avoid impacts to fish and fish habitat and triggering Schedule 2 of the *Fisheries Act.*
- Runoff will be directed away from active work areas before construction commences, reducing the volume of sediment-laden water to be managed.
- Use of the existing FDP and directing site contact water through grading of ditches and construction of diversion channels so it can be managed and discharged through the existing FDP.
- Accepted industry best practice geochemistry methods will be used to predict mine contact runoff and seepage quality.
- The amount and timing of exposed soil left open at any one time will be limited to reduce the potential for erosion.
- Mine contact water will be treated via a polishing pond and WWMP (if required) to ensure effluent meets regulatory effluent limits.
- Mine effluent will discharge via an existing FDP to create a mine effluent point source.
- Seasonal / residential receptors will be protected from sediment-laden runoff by directing untreated runoff away from these areas.
- Currently, it is planned to cap the historic waste rock in the area of Boundary Shaft, which will reduce potential for disturbance or dust lift-off from this potentially acid generating (PAG) waste rock. Based on current configuration of infrastructure, there are no plans to disturb soils that are impacted by historic mining activities, however if inadvertently disturbed, the impacted material would be removed from site and disposed of in accordance with applicable regulations or managed on site in accordance with best practices for metal leaching / acid rock draining materials.
- Mean monthly and daily effluent water quality at FDP will be managed to be below MDMER schedule 4 Table 2 limits.
- The ultimate mixing zone boundary has been assessed using conservative flow and effluent discharge quality scenarios to end (return to CWQG-FAL values or baseline concentrations) prior to where South Brook empties into the marine environment. The Project will not have a mixing zone downstream of the FDP that extends into the marine environment.

6.3.4 Residual Environmental Effects

Potential environmental effects on Surface Water Resources were identified in Section 6.3.2. For Surface Water Resources, two effects were identified: change to surface water quantity and change to surface water quality. Residual effects (i.e., those remaining following implementation of mitigation [Section 6.3.3]) for each Project phase are evaluated below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining activities. FireFly will use previously disturbed / cleared areas for Project development to the extent possible; however, the new 6 km port access road represents a new linear feature on the landscape.
- The Project Area and LAA includes areas where surface water was considered to be affected by historical mining activities (prior to 2010), with elevated levels of metals/metalloids (e.g., copper, zinc) and acidic (low pH) conditions (Section 6.3.1.2.5). Existing mitigation measures and contingency plans identified in the EPP will continue to be in place for the Project and will serve to avoid or reduce potential residual effects on Surface Water Resources.
- Placement of mine waste has been purposely designed to use previously disturbed areas and to avoid overprinting waterbodies to avoid impacts to fish and fish habitat and triggering Schedule 2 of the MDMER.
- Use of PAG along the base of the interior embankments of the TMF and polishing pond to be maintained as sub-aqueous, and use of non-PAG material for construction of the outer berms and general pad and road construction in the Project Area.
- FireFly will work towards returning the Project Area to as close to pre-Project conditions as practical, with due consideration to the natural aesthetics that existed pre-mining by FireFly.

6.3.4.1 Change in Surface Water Quantity

The following Project processes are expected to use water within the Project Area:

- Project Area surface water runoff and underground works dewatering will be used to meet reclaim water needs for processing purposes
- Reclaim water in the tailings pore spaces will be sequestered and represent a net water loss
- Underground water demands include spraying/misting for dust control

The net water consumption losses due to reclaim water sequestration of tailings pore water and use for underground dust control are assumed to exceed available water excesses. This is due to increased runoff within the Project Area due to larger hardened surface areas compared to the existing condition and underground works dewatering.

Freshwater demand for the processing plant is planned to be taken from Three Corner Pond (P02) in the headwaters of the Trimms Brook system. The accommodations camp is planned to take water from England's Brook (P15).

The post-closure phase will be marked by the completion of rehabilitation activities, and it will be characterized by the Project Area being returned to as close to pre-Project conditions as is feasible, including for local drainage areas.

6.3.4.1.1 Watershed Area

Changes in watershed area for the construction and operations phases, and estimated changes in MAFs between baseline and full mine buildout conditions are shown in Table 6.3.17. Estimated changes in MMFs are shown in Table 6.3.18 for the same Project phases. Where changes in MAF were less than 10%, there is no residual effect expected. Where an increase in MAF exceeds 10%, increased flows during high flow events are anticipated as a potential residual effect. Where a decrease greater than 10% is predicted, decreased flows during low flow periods not meeting environmental flows are considered a residual effect.

Table 6.3.17 Summary of Watershed Area, Mean Annual Flow Change through Project Phases

Sub-Watershed ID	Sub-Watershed Area (km²)		MAF (m³/s)		Change in MAF (%) (+ = decrease; - = increase)
	Baseline	Post-Development	Baseline	Post-Development	
SB1	1.418	1.420	0.036	0.036	0%
SB2	7.202	7.202	0.188	0.188	0%
SB3	9.150	9.150	0.240	0.240	0%
SB4	2.810	2.810	0.072	0.072	0%
SB4A	1.110	1.080	0.028	0.027	3%
SB5	18.312	18.312	0.487	0.487	0%
SB6	19.122	19.122	0.509	0.509	0%
SB7	23.472	22.550	0.628	0.603	4%
SB7A	0.640	0.530	0.016	0.013	**17%**
SB8	0.700	0.528	0.018	0.013	**25%**
SB9	24.552	23.910	0.657	0.640	3%
SB10	3.494	3.490	0.090	0.090	0%
SB11	54.890	54.890	1.491	1.491	0%
SB12	102.012	98.127	2.804	2.695	4%
SB12A	0.340	0.010	0.008	0.000	**97%**
SB13	1.130	0.058	0.029	0.001 (0.003)	**95%** (-5%)
SB13A	0.460	0.000	0.011	0.000 (0.013)	**100%** (**-13%**)
SB14	1.240	0.820	0.031	0.021	**34%**
SB15	2.770	2.667	0.071	0.068	4%
SB16	4.090	3.556	0.106	0.092	**13%**
SB17	109.682	104.191	3.019	2.865 (3.021)	5% (0%)
SB18	1.140	1.140	0.029	0.029	0%
SB19	2.230	2.230	0.057	0.057	0%
SB20	112.322	106.831	3.093	2.939 (3.095)	5% (0%)
SB21	114.442	108.951	3.153	2.999 (3.154)	5% (0%)
SB22	7.460	7.460	0.195	0.195	0%
SB23	123.192	117.701	3.398	3.244 (3.400)	5% (0%)
TB1	2.960	2.960	0.076	0.069	10%

Notes:
SB = South Brook; TB = Trimms Brook
BOLD - flow increase or decrease exceeds 10% difference from pre-development MAF value
1) SB4A, SB7A, SB12A, SB13A are representative of sub watersheds SB4, SB7, SB12 and SB13, respectively.
2) Values in brackets () indicate MAF and percent change with added flows from wastewater management plant final discharge point input in SB13

Table 6.3.18 Projected Change in MMF between Baseline and Construction / Operations Phases

Sub-Watershed ID	Phase	MMF (m^3/s)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SB1	Baseline	0.028	0.015	0.019	0.099	0.085	0.024	0.018	0.015	0.039	0.040	0.041	0.028
	CO	0.028	0.015	0.019	0.100	0.085	0.024	0.018	0.015	0.039	0.040	0.041	0.028
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB2	Baseline	0.135	0.086	0.110	0.493	0.423	0.134	0.088	0.078	0.185	0.196	0.216	0.154
	CO	0.135	0.086	0.110	0.493	0.423	0.134	0.088	0.078	0.185	0.196	0.216	0.154
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB3	Baseline	0.171	0.111	0.142	0.624	0.537	0.174	0.111	0.100	0.233	0.248	0.276	0.198
	CO	0.171	0.111	0.142	0.624	0.537	0.174	0.111	0.100	0.233	0.248	0.276	0.198
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB4	Baseline	0.055	0.031	0.039	0.195	0.167	0.049	0.035	0.031	0.075	0.078	0.083	0.057
	CO	0.055	0.031	0.039	0.195	0.167	0.049	0.035	0.031	0.075	0.078	0.083	0.057
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB4A	Baseline	0.022	0.012	0.014	0.078	0.066	0.018	0.014	0.012	0.031	0.031	0.032	0.022
	CO	0.022	0.011	0.014	0.076	0.065	0.018	0.014	0.012	0.030	0.031	0.031	0.021
	%Change	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
SB5	Baseline	0.333	0.231	0.303	1.237	1.067	0.365	0.221	0.199	0.454	0.488	0.559	0.412
	CO	0.333	0.231	0.303	1.237	1.067	0.365	0.221	0.199	0.454	0.488	0.559	0.412
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB6	Baseline	0.347	0.242	0.318	1.291	1.114	0.383	0.230	0.208	0.474	0.510	0.584	0.431
	CO	0.347	0.242	0.318	1.291	1.114	0.383	0.230	0.208	0.474	0.510	0.584	0.431
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB7	Baseline	0.424	0.301	0.398	1.580	1.365	0.477	0.282	0.255	0.577	0.623	0.720	0.534
	CO	0.407	0.288	0.381	1.519	1.312	0.457	0.271	0.245	0.555	0.599	0.691	0.512
	%Change	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
SB7A	Baseline	0.013	0.007	0.008	0.045	0.038	0.010	0.008	**0.007**	0.018	0.018	0.018	0.012
	CO	0.011	0.005	0.006	0.038	0.032	0.008	**0.007**	**0.006**	0.015	0.015	0.015	0.010
	%Change	17%	18%	19%	17%	17%	18%	17%	17%	17%	17%	17%	18%
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SB8	Baseline	0.014	0.007	0.009	0.050	0.042	0.011	0.009	**0.008**	0.020	0.020	0.020	0.013
	CO	0.011	0.005	0.006	0.038	0.032	**0.008**	**0.007**	**0.006**	0.015	0.015	0.015	0.010
	%Change	24%	26%	27%	24%	24%	26%	24%	25%	24%	24%	25%	26%
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 6.3.18 Projected Change in MMF between Baseline and Construction / Operations Phases

Sub-Watershed ID	Phase	MMF (m^3/s)											
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
SB9	Baseline	0.442	0.316	0.418	1.651	1.427	0.500	0.294	0.267	0.603	0.651	0.754	0.560
	CO	0.431	0.307	0.406	1.609	1.390	0.486	0.287	0.260	0.587	0.634	0.734	0.545
	%Change	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
SB10	Baseline	0.067	0.040	0.050	0.242	0.207	0.062	0.043	0.038	0.092	0.097	0.103	0.072
	CO	0.067	0.040	0.050	0.242	0.207	0.062	0.043	0.038	0.092	0.096	0.103	0.072
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB11	Baseline	0.962	0.742	1.005	3.648	3.166	1.185	0.650	0.597	1.307	1.430	1.712	1.307
	CO	0.962	0.742	1.005	3.648	3.166	1.185	0.650	0.597	1.307	1.430	1.712	1.307
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB12	Baseline	1.750	1.435	1.976	6.719	5.851	2.302	1.196	1.109	2.372	2.622	3.219	2.509
	CO	1.686	1.377	1.894	6.467	5.630	2.209	1.152	1.067	2.285	2.524	3.094	2.408
	%Change	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
SB12A	Baseline	0.007	0.003	0.004	0.024	0.021	0.005	0.004	0.004	0.010	0.010	0.010	0.006
	CO	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	%Change	97%	98%	98%	97%	97%	98%	97%	97%	97%	97%	97%	98%
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SB13	Baseline	0.023 (0.024)	0.012 (0.013)	0.015 (0.016)	0.080 (0.081)	0.068 (0.069)	0.018 (0.020)	0.014 (0.016)	**0.012 (0.012)**	0.031 (0.033)	0.032 (0.033)	0.033 (0.034)	0.022 (0.023)
	CO	**0.001**	**0.001**	**0.001**	**0.004**	**0.004**	**0.001**	**0.001**	**0.001**	**0.002**	**0.002**	**0.002**	**0.001**
	%Change	94% (-7%)	96% (-12%)	96% (-10%)	95% (2%)	95% (-2%)	96% (-8%)	95% (-10%)	95% (-12%)	94% (-5%)	95% (-5%)	95% (-5%)	96% (-7%)
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SB13A	Baseline	0.009	0.005	0.005	0.033	0.028	0.007	0.006	**0.005**	0.013	0.013	0.013	0.009
	CO	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	%Change	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SB14	Baseline	0.025	0.013	0.016	0.087	0.074	0.020	0.016	**0.014**	0.034	0.035	0.036	0.024
	CO	0.017	0.009	0.010	0.058	0.049	**0.013**	**0.010**	**0.009**	0.023	0.023	0.024	0.016
	%Change	33%	36%	36%	33%	34%	36%	33%	34%	33%	33%	34%	35%
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SB15	Baseline	0.054	0.031	0.039	0.192	0.164	0.048	0.034	0.030	0.074	0.077	0.082	0.056
	CO	0.052	0.030	0.037	0.185	0.158	0.046	0.033	0.029	0.071	0.074	0.079	0.054
	%Change	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%

Table 6.3.18 Projected Change in MMF between Baseline and Construction / Operations Phases

Sub-Watershed ID	Phase	MMF (m^3/s)											
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
SB16	Baseline	0.078	0.047	0.059	0.282	0.242	0.073	**0.050**	**0.045**	0.107	0.113	0.121	0.085
	CO	0.068	0.040	0.051	0.246	0.210	0.063	**0.044**	**0.039**	0.094	0.098	0.105	0.073
	%Change	13%	14%	14%	13%	13%	14%	13%	13%	13%	13%	13%	14%
	Env Flow	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SB17	Baseline	1.877 (1.879)	1.550 (1.551)	2.139 (2.140)	7.217 (7.218)	6.286 (6.288)	2.488 (2.490)	1.285 (1.286)	1.192 (1.194)	2.544 (2.545)	2.814 (2.816)	3.466 (3.467)	2.708 (2.709)
	CO	1.787	1.467	2.022	6.861	5.974	2.355	1.222	1.133	2.421	2.676	3.289	2.565
	%Change	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)
SB18	Baseline	0.023	0.012	0.015	0.080	0.068	0.019	0.014	0.012	0.031	0.032	0.033	0.022
	CO	0.023	0.012	0.015	0.080	0.068	0.019	0.014	0.012	0.031	0.032	0.033	0.022
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB19	Baseline	0.044	0.025	0.030	0.155	0.133	0.038	0.028	0.024	0.060	0.062	0.065	0.045
	CO	0.044	0.025	0.030	0.155	0.133	0.038	0.028	0.024	0.060	0.062	0.065	0.045
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB20	Baseline	1.921 (1.923)	1.589 (1.591)	2.195 (2.197)	7.388 (7.389)	6.436 (6.437)	2.553 (2.554)	1.315 (1.317)	1.221 (1.222)	2.603 (2.604)	2.881 (2.882)	3.551 (3.552)	2.776 (2.778)
	CO	1.830	1.507	2.078	7.032	6.124	2.419	1.252	1.161	2.480	2.743	3.374	2.634
	%Change	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)
SB21	Baseline	1.956 (1.958)	1.621 (1.623)	2.240 (2.242)	7.525 (7.527)	6.556 (6.558)	2.604 (2.606)	1.340 (1.341)	1.244 (1.245)	2.650 (2.652)	2.934 (2.935)	3.619 (3.621)	2.831 (2.833)
	CO	1.865	1.539	2.123	7.169	6.245	2.471	1.277	1.184	2.528	2.796	3.442	2.689
	%Change	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)	5% (0%)
SB22	Baseline	0.140	0.089	0.114	0.511	0.438	0.140	0.091	0.081	0.192	0.203	0.224	0.160
	CO	0.140	0.089	0.114	0.511	0.438	0.140	0.091	0.081	0.192	0.203	0.224	0.160
	%Change	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SB23	Baseline	2.100 (2.102)	1.753 (1.755)	2.428 (2.430)	8.092 (8.093)	7.053 (7.054)	2.818 (2.820)	1.441 (1.442)	1.339 (1.340)	2.845 (2.846)	3.153 (3.155)	3.901 (3.903)	3.060 (3.061)
	CO	2.010	1.670	2.310	7.736	6.741	2.684	1.377	1.279	2.723	3.016	3.724	2.916
	%Change	4%	5%	5%	4%	4%	5%	4%	4%	4%	4%	5%	5%
TB1	Baseline	0.057	0.033	0.042	0.205	0.176	0.052	0.037	0.032	0.079	0.082	0.087	0.060
	CO	0.050	0.026	0.034	0.198	0.168	0.044	0.029	0.025	0.071	0.075	0.080	0.053
	%Change	13%	23%	18%	4%	4%	15%	21%	24%	10%	9%	9%	13%

Notes
SB = South Brook; TB = Trimms Brook
BOLD - below environmental flow threshold
1) CO = construction and operation
2) SB4A, SB7A, SB12A, SB13A are representative of sub watersheds within the greater watershed of the same ID and thus are portions of a complete watershed.
3) Values in brackets indicate MAF and percent change with added flows from wastewater management plant final discharge point input in SB13.
4) Environmental flow values are a threshold determined from MAF values for each catchment, divided into winter and summer months (30% MAF - October to March; 50% MAF - April to September)"

Predicted changes in MAF and MMF values due to construction phases altering catchment areas are presented in Tables 6.3.17 and 6.3.18. Sub-watersheds SB7A, SB8, SB12A, SB13A, SB13, SB14 and SB16 are predicted to observe decreases in MAF of greater than 10%. The sub-watersheds SB12A, SB13a and SB13 have over 95% reductions in MAF flows, indicating they will have local residual water quantity effects.

Within sub-watersheds SB7A and SB8, which are unnamed tributaries draining to the England's Brook watercourse (tributary of South Brook), the pre-development MMF values for August are below the environmental flow threshold (50% MAF). With the watershed reduction for SB7A and SB8 flows will be further reduced in August and go below the environmental flow threshold value in July. SB8 also does not meet the summer environmental flow threshold in June, which are considered potential localized residual effects.

Sub-watersheds SB14 and the downstream SB16 contain an unnamed tributary draining to South Brook Pond that includes the historical mine works, Boundary Shaft, within its drainage area. Similar to the above watersheds, pre-development MMF values are below the environmental threshold in August, and in SB16 are below the threshold in July as well. Post-development SB14 has MMF values that do not meet the environmental flow threshold in June to August, and for SB16 in July and August. These are considered potential localized residual effects.

Project Area sub-watersheds are primarily diverted to discharge following treatment via the FDP at the outlet of sub-watershed SB13. The South Brook watercourse from South Brook Pond (SB17) to the downstream sub-watershed SB23 where it empties into Baie Verte have predicted MAF flow reductions of 5% or less with no discharge via the FDP. When average WWMP discharge from the conceptual water balance model (Knight Piesold 2025) is included, there is predicted to be no change in MAF within South Brook downstream of the FDP discharge.

At the SB13 outlet, there is a predicted increase in flow in comparison to the SB13 outflow pre-development MAF value of approximately 5%, which would not be expected to increase local flood levels within the receiver. No increases in local flood levels are expected from the Project in the South Brook watershed.

6.3.4.1.2 Water Withdrawals

The proposed water withdrawals for Three Corner Pond (P02; sub-watershed TB1) and England's Brook (P15; sub-watershed 5) will have a maximum monthly water taking rate that is no more than 10% of the MAF rate of each waterbody. Where changes in MAF in either system are less than 10%, there is no residual effect expected.

6.3.4.1.3 Summary

Based on the above Project water use processes and implementation of mitigation measures, the residual effect on surface water quantity for the construction and operation phases is anticipated to cause a reduction in surface water quantity to select watercourses downstream of mine infrastructure and within the LAA during the LoM, with localized impacts (greater than 10% reduction in MAF) to watercourses in SB7A, SB8, SB12A, SB13A, SB13, SB14 and SB16. South Brook is expected to potentially receive less water (less than or equal to 5%) from the Project Area due to reclaim water sequestration in the tailings pore water and use for underground dust control during periods when the WWMP is not discharging. During the mill start-up and operation phase of the Project, freshwater demand from Three Corner Pond (P02) and England's Brook (P15) will not cause a net reduction in these freshwater systems and their downstream catchments that exceeds 10% MAF rate.

The magnitude of residual effects is predicted to be a measurable change that is detectable, but within the baseline conditions at the LAA boundary. Therefore, predicted changes in water quantity at the LAA boundary during construction, operation and post-closure phases are expected to be within the range of natural variability. The change in surface water quantity is predicted to extend to the boundaries of the LAA and be continuous and long term in duration (i.e., beyond the life of the mine) as permanent changes to the baseline flow regime. The natural seasonal variations including precipitation, surface runoff and groundwater flows could affect the surface water quantity within the LAA. However, these variations would not be considered a Project-related effect. Changes to some watersheds within the LAA will be realized post-closure (e.g., TMF landform), therefore these are considered long-term effects. Effects on water quantity for most of the watercourses / waterbodies assessed are considered reversible as conditions will return to pre-development flow patterns for the majority of the Project Area in post-closure.

6.3.4.2 Change in Surface Water Quality

Baseline surface water quality from historical studies as early as 1995 and the 2024 baseline study have been used to support a quantitative verification of changes to surface water quality during the Project phases through an AC study (Appendix 6.C). Baseline water quality thresholds were developed using baseline water quality data collected in 2024, and historical water quality data within the Project Area and applicable reference sites. Baseline surface water quality values have been compared to applicable regulatory guidelines, including CWQG-FAL. Summary statistics have been calculated for each parameter and include mean, minimum, maximum, standard deviation and 75th percentile where applicable. The 2024 baseline surface water report will be prepared and submitted prior to construction as part of the CoA Application.

During construction, potential Project-related changes to water quality from contact water due to disturbances associated with the mine development (runoff from cleared and stripped areas, overburden, roads and pads constructed of clean aggregate and revegetated areas), will be reduced with the implementation of erosion and sediment control measures installed around the perimeter of disturbance areas, such as silt fence and staked hay bales. The predicted changes to local water quality from contact water during the construction phase flowing from local erosion and sediment control measures is expected to be within the range of natural variability.

During operations, contact water from site be collected and reclaimed in the process plant. Surplus water will be managed through the WWMP and discharged to the environment via the existing FDP to South Brook Pond (Figure 6.3.13). Discharge of effluent will comply with MDMER, Schedule 4 Table 2 requirements.

6.3.4.2.1 Assimilative Capacity Study

To estimate water quality in the receiver downstream of the existing FDP, the AC study (Appendix 6.C) was updated considering two scenarios for the Project, high-flow (80th percentile regional flow) and average flow. Generally, for both high-flow and average flow scenarios, the extent of the mixing zone in the receiver occurs at or before the outlet of South Brook Pond, where concentrations of most of the PoPCs meet CWQG-FAL or baseline values. Subsequently, mixing improves once other tributaries enter the main stem of South Brook further downstream. The mixing zones identified in the high-flow and average scenarios are discussed below.

In the high-flow scenario with maximum discharge at the FDP and 80th percentile pro-rated regional flow values in the receiver, most effluent parameters were at CWQG-FAL or baseline receiver concentration values by the extent of full mixing (outlet of South Brook Pond; 1.02 km downstream of FDP). The MDMER parameters with mixing zones extending beyond South Brook Pond were total copper and total zinc, which returned to baseline conditions at P1 (2.65 km downstream of the FDP), total lead returning to the baseline concentration at P3 (5.21 km downstream of the FDP), total arsenic at P4 (6.96 km downstream of the FDP), and free cyanide as a fraction of total cyanide meeting the CWQG-FAL value for free cyanide (0.005 mg/L) at P4. The non-MDMER parameters total iron, total aluminum, total phosphorus, and total cadmium and total chromium, returned to baseline condition ranges/values at P1, P2, P3, P4 and P4, respectively. Total cadmium, total chromium, total arsenic and total cyanide determine the extent of the ultimate mixing zone, which is at P4 (6.96 km downstream of the FDP) prior to the South Brook discharge to Baie Verte marine environment.

In the average scenario, results were similar to the high-flow scenario and the outlet of South Brook Pond was identified as the downstream edge of the mixing zone for most parameters. The differences from the high-flow condition scenario were for total arsenic (with the downstream edge of the outlet of South Brook Pond), total phosphorus (P1) and total lead (P2). Mixing zones for these parameters were shorter than those identified in the high-flow scenario. Total cadmium and total chromium determined the extent of the ultimate mixing zone, which was at P4.

The results obtained in two flow scenarios indicate that the assimilative capacity of South Brook Pond and downstream receivers is sufficient to accommodate the projected effluent discharge while maintaining water quality within regulatory limits prior to discharge to the marine environment. Based on the AC study, the recommended effluent criteria (monthly objectives) are presented in Table 6.3.19. The recommended effluent criteria were developed for the anticipated average and maximum effluent discharge rates of 128 and 200 m^3/hr, respectively.

Table 6.3.19 Recommended Effluent Criteria

Parameter	Units	MDMER Maximum Authorized Monthly Mean Concentration	MDMER Maximum Authorized Concentration in a Grab Sample	Monthly Mean Treatment Objective
Arsenic	mg/L	0.30	0.60	0.30
Copper	mg/L	0.30	0.60	0.30
Cyanide	mg/L	0.50	1.00	0.50
Lead	mg/L	0.10	0.20	0.013
Nickel	mg/L	0.50	1.00	0.50
Zinc	mg/L	0.50	1.00	0.50
TSS	mg/L	15.00	30.00	15.00
Unionized Ammonia (as N)	mg/L	0.50	1.00	0.50
pH	S.U.	6.0 – 9.5	6.0 – 9.5	6.0 – 9.5

The changes in water quality with the planned discharge criteria during construction, operation and closure conditions are predicted to be within the range of natural variability. The changes in surface water quality are predicted to extend to the boundaries of the LAA, with localized effects experienced within the LAA. Effects will be continuous and both short term (large storms, one-off events) and long term (seepage from TMF) in duration. Effects on water quality for most of the watercourses / waterbodies assessed are considered reversible as conditions will return to baseline conditions once Project discharges cease. Irreversible effects may occur as a result of seepage from mine infrastructure (TMF).

A significant adverse effect would be defined as a measurable change in water quality that exceeds an implemented water quality requirement, such as MDMER limits or a site-specific water quality guideline for the protection of aquatic life. While localized effects are expected in the receiving watercourses and waterbodies immediately downstream of the FDP, no significant adverse residual effects are predicted for surface water quality throughout the Project phases.

6.3.4.3 Summary

Based on application of the mitigation measures identified in Section 6.3.3 and the commitment by FireFly to comply with regulatory standards, residual environmental effects on surface water quantity and surface water quality are likely to be not significant.

6.3.5 Follow-up and Monitoring Programs

Follow-up and monitoring are intended to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation and the nature of the residual effects, and to manage adaptively, if required. Compliance surface water quantity and quality monitoring will be conducted to confirm that mitigation measures are implemented.

FireFly, in consultation and partnership with the Water Resources Management Division (WRMD) of the Department of Environment and Climate Change, will establish a water resource monitoring network that can include real-time monitoring and be comprised of water quantity, quality, climate and groundwater monitoring stations. FireFly will bear all reasonable costs associated with the monitoring network to collect baseline data before Project commencement and throughout the life of the Project.

The follow-up surface water monitoring plan will be developed and submitted as part of the CoA Application for the Project. Should an unexpected deterioration of the environment be observed during follow-up monitoring, intervention mechanisms will include initiating the adaptive management process. This may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures to be implemented to address it. Surface water quantity and quality monitoring results will be reported as required by regulations and permits.

6.4 Fish and Fish Habitat

Fish and fish habitat have been assessed as a valued component (VC) because they provide ecological, cultural, recreational and economic value to the public, Indigenous groups, local businesses, and government agencies. As fish are valued by resource users for recreational fishing activities and as a source of country foods, it is important to maintain stable populations within the region. Fish and fish habitat occur within the Project Area and will be affected by planned Project activities. The Fish and Fish Habitat VC includes freshwater and diadromous fish and fish habitat and freshwater fisheries, as defined under the federal *Fisheries Act* as follows:

- Fish, which include: (i) parts of fish; (ii) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals; and (iii) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans, and marine animals
- Fish habitat, which includes waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply, and migration areas
- A fishery, which includes any place where or period during that fishing may be carried out; regardless of method of fishing, type of fishing gear, equipment, or fishing vessel used; and regardless of species, populations, assemblages, or stocks, whether the fish is harvested or not

Fish and fish habitat is protected by federal and provincial legislation. The *Fisheries Act* protects fish and fish habitat and addresses national interests in marine and fresh waters with the goal of protecting the long-term sustainability of aquatic resources and prohibiting the death of fish (other than fishing). The *Fisheries Act* includes prohibitions against works, undertakings or activities that result in the harmful alteration, disruption or destruction (HADD) of fish habitat and such work requires an authorization with an appropriate offsetting of residual adverse effects after avoidance and mitigation steps have been taken. The *Fisheries Act* also prohibits the deposition of deleterious substances into waters frequented by fish in Canada unless authorized by regulation. While the primary legislation protecting fish and fish habitat is the federal *Fisheries Act*, provincial legislation such as the Newfoundland and Labrador (NL) *Environmental Protection Act* (NL EPA), the NL *Water Resources A*ct, and the NL *Endangered Species Act* (NL ESA) is also considered in the assessment of effects on fish and fish habitat.

As described in Section 5.2.3 and shown on Figure 6.4.1, Project spatial boundaries for Fish and Fish Habitat include the Project Area (area of physical activities), the Local Assessment Area (LAA), and the Regional Assessment Area (RAA), which are based on sub-watershed boundaries. These boundaries are consistent with the those used in the assessment of Surface Water Resources (Section 6.3). A substantial portion of the LAA for this Project has been impacted by historical mining activities, resulting in poor water quality and fish absence in impacted ponds and streams.

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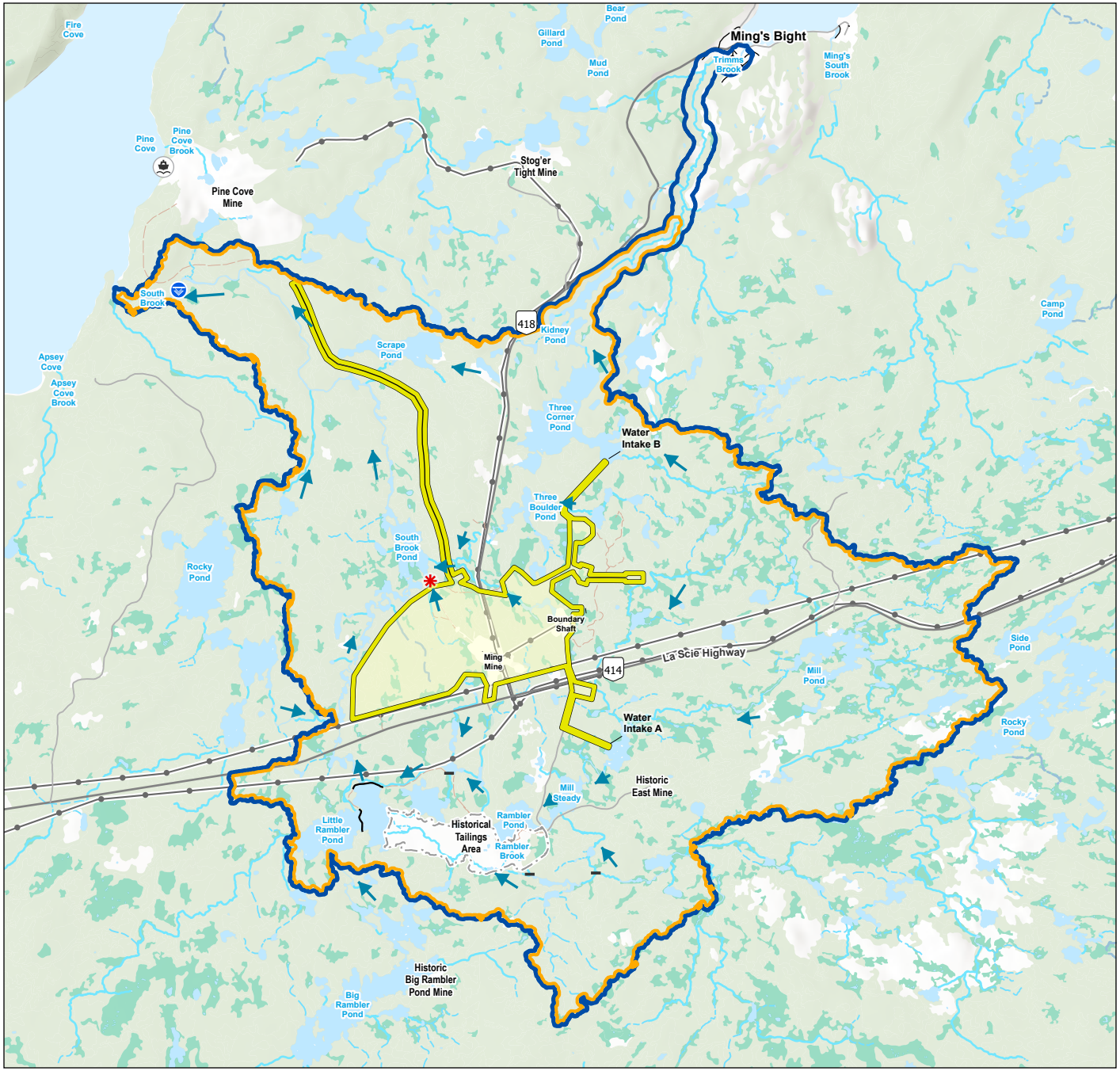

Figure No.
6.4.1
Title
Fish and Fish Habitat Spatial Boundaries

Client/Project
FireFly Metals Ltd
Green Bay Copper-Gold Project

121418199_2_001

Project Location
Baie Verte, NL

Prepared by MB on 2024-12-12
Revised 2025-03-20

N

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(At original document size of 8.5x11)
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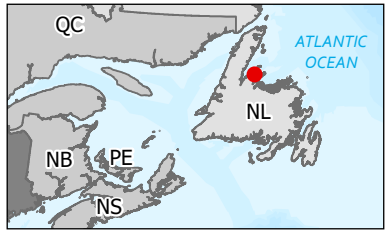
- Falls
- Final Discharge Point (FDP)
- Flow Direction
- Project Area
- Local Assessment Area
- Regional Assessment Area
- Port
- Dam
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

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It should be noted that while the RAA extends to the head of tide to allow the assessment to consider the regional context, the AC study detailed in Section 6.3.4 (Appendix 6.C) indicates that contaminants of potential concern in effluent will meet background levels or CCME CWQG-FAL, whichever is higher within 6.96 km of the final discharge point (FDP), and prior to the South Brook discharge to the marine environment. Based on the water quantity assessment described in Section 6.3.4.1, the quantity of water to be withdrawn from Three Corner Pond is not of sufficient magnitude to result in adverse effects to fish and fish habitat within the Trimms Brook Watershed. As a result, no adverse effects on the marine environment or marine receptors are anticipated, and the marine environment is not considered further in the Fish and Fish Habitat VC

A significant residual adverse effect on Fish and Fish Habitat for the Project is defined as any of the following:

- A Project-related HADD of fish habitat or the death of fish, as defined by the *Fisheries Act*, that cannot be mitigated, authorized or offset
- A change to the productivity or sustainability of fish populations or fisheries within the LAA where recovery to baseline conditions is unlikely

6.4.1 Existing Conditions

A characterization of the existing conditions within the spatial boundaries of the Project Area and LAA / RAA is provided in the following sections. This includes a discussion of the influences of past and present physical activities on the VC. An understanding of the existing conditions for the VC within the spatial area being assessed is a key requirement in the prediction of potential Project effects provided in Section 6.4.3.

The existing mine has been in operation on and off over the past 20 years. During that time, it has undergone two provincial environmental assessment and is continuing to undergo Environmental Effects Monitoring (EEM) as per the *Metal and Diamond Mining Effluent Regulations* (MDMER). The description of the existing environment considered past (Golder 2006; AMEC 2008; GEMTEC 2019) and continuing studies (i.e., EEM; Stantec 2013, 2016, 2019, 2023, in preparation), which were conducted using various sampling methods over different seasons. The results of the past and ongoing studies that were used to inform this assessment are considered representative of current conditions, since no substantive changes to landscape, forestry activities, exploration activities, stream flow direction or water quality have occurred since the studies were completed that would alter the conclusions of those studies. These results were used, along with the proposed Project footprint, to identify information gaps and to inform the scope of the 2024 baseline studies. The 2024 studies focused on aquatic habitat that may be directly affected (overprinted) or indirectly affected (loss of flow) by Project activities.

A substantial portion of the LAA for this Project has been impacted by historical mining activities, resulting in poor water quality and fish absence in impacted ponds and streams. The spatial extent of historical impact is illustrated on Figure 6.4.2 and subsequent figures (as relevant) and documented in McConnell (1995, 2002; Appendix 2.A), discussed in Section 2.2.2. Section 6.3 (Surface Water Resources) provides further information on surface water quality and hydrology within the LAA.

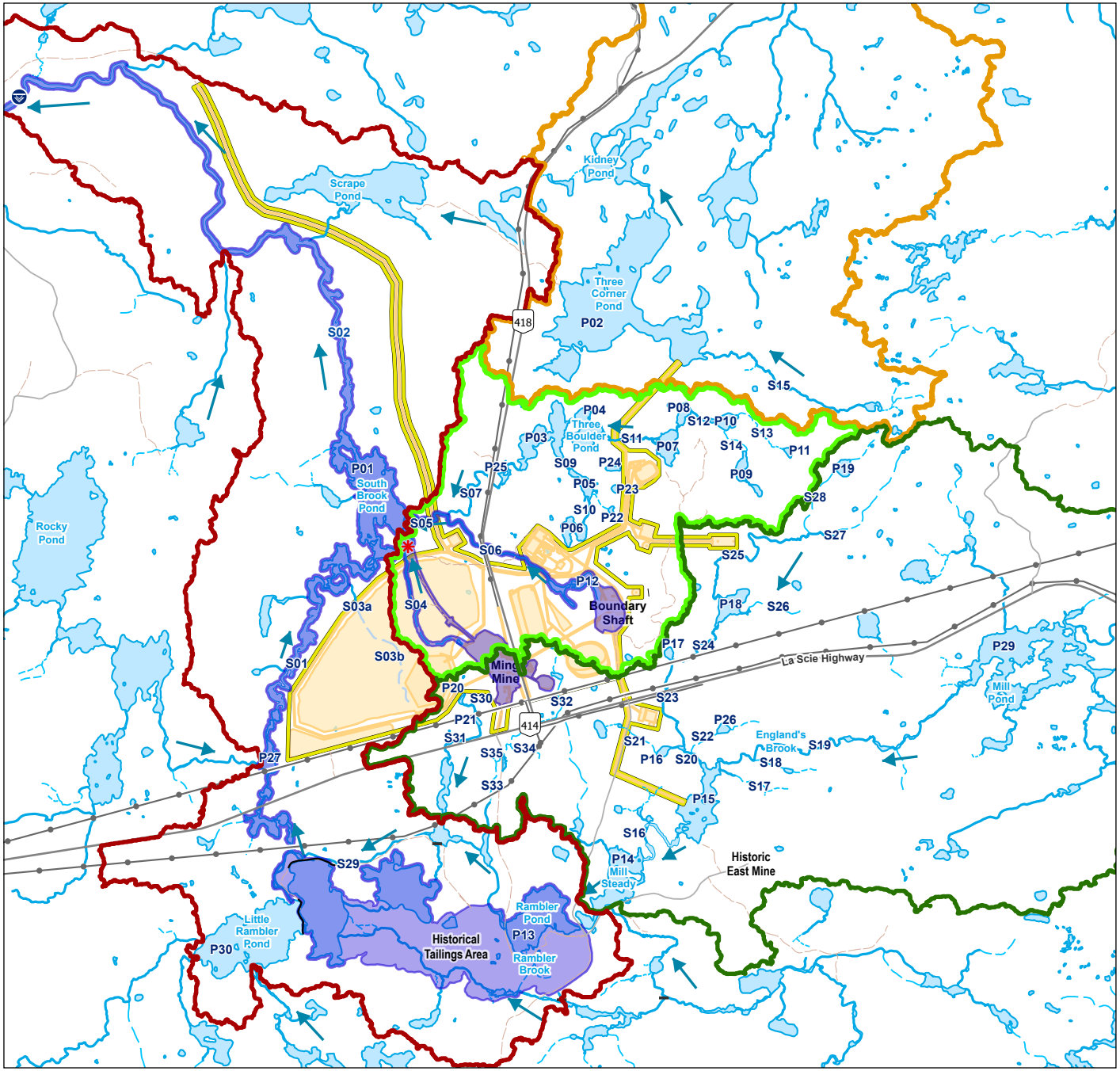

Figure No.
6.4.2
Title
Ponds and Brooks Within the Sub-Watersheds Associated With the Project

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project
121418199_2_002

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-30
Revised 2025-03-20
IR by JR on 2025-04-14

N

0 500 1,000 Metres
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- Falls
- Final Discharge Point (FDP)
- Trimms Brook Watershed
- Sub-watershed A
- Sub-watershed B
- Lower South Brook Sub-watershed
- Approximate Region Impacted by Historical Mining Activities
- Project Area
- Site Infrastructure
- Dam
- Flow Direction
- Resource Road / Trail
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

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6.4.1.1 Approach and Methods

To characterize the existing conditions for the Fish and Fish Habitat VC, existing literature and existing publicly available information was reviewed, Land and Resource Use survey (detailed in Chapter 6.7), and field data were collected over multiple years in potentially affected aquatic environments.

The review of existing literature and information included:

- EEM programs carried out for Ming Mine which included the following programs:
  - Ming Mine - Nugget Pond EEM Cycle 4 Interpretive Report (Stantec 2023)
  - Ming Mine - EEM Cycle 3 Interpretive Report (Stantec 2019)
  - Ming Mine - EEM Cycle 2 Interpretive Report (Stantec 2016)
  - Ming Mine - EEM Cycle 1 Interpretive Report (Stantec 2013)
- Other field programs carried out for the Project (Golder 2006, AMEC 2008, GEMTEC 2019)
- Publicly available scientific information
- Recreational fisheries and species at risk data obtained from publicly available information
- Digital satellite imagery to supplement existing fish habitat information
- Federally available hydrometric data
- Site-specific light detection and ranging data

Much of the existing data collected for fish and fish habitat have focused on historically impacted areas. Stantec collected additional information to support the Project in 2024, which included fish habitat characterization, fish presence / absence, fish tissue, primary (chlorophyll α and periphyton) and secondary (benthic invertebrates) productivity, water and sediment quality. Much of these data were collected in areas not historically impacted by mining. Results from the 2024 field studies will be provided directly to the appropriate regulatory authorities in a separate baseline survey report.

6.4.1.2 Description of Existing Conditions

The following sections provides a summary of fish and fish habitat characterization and field data collected in the previous EEM and baseline programs, focusing on the Project Area and associated watersheds. The Project Area is located within two major watersheds, the South Brook Watershed and the Trimms Brook Watershed (Figure 6.4.2). The South Brook Watershed is sub-divided into three sub-watersheds as shown on Figure 6.4.2:

- Lower South Brook sub-watershed - includes Pond P13, the historical tailings area, South Brook (Streams S01 and S02) and South Brook Pond (P01) which flows into Baie Verte
- Sub-watershed A - encompasses the majority of the mine site and flows into South Brook Pond (P1)
- Sub-watershed B, also called England's Brook sub-watershed - flows into Pond P15, upstream of Rambler Pond and then flows into South Brook (via the north ditch diversion)

As described in Section 2.2.2, many areas are historically impacted (pre-2010) from the Rambler Historical Tailings, and Boundary Shaft and the historic Ming Mine; shown as purple-blue (streams and ponds) and lilac-purple (land or infrastructure) on Figure 6.4.2 and subsequent figures (as relevant).

Three Corner Pond is in the headwaters of the Trimms Brook Watershed and flows through Kidney Pond and Trimms Brook into Mings Bight (Figure 6.4.2).

For the purposes of the VC, watercourses are broken into individual streams where they are separated by a pond or confluence.

6.4.1.2.1 Fish Habitat Characterization

Fish habitat is described for each of the watersheds / sub-watersheds noted above, including lacustrine (ponds) and riverine (stream) habitats. Results of studies for each habitat type are described below. Figure 6.4.2 encompasses the survey areas of the field programs.

Lower South Brook Sub-watershed

The Lower South Brook sub-watershed includes South Brook (S01 and S02) and receives flow from the historical tailings area (including the north and south ditch diversion) through South Brook Pond (P01) and discharges into Baie Verte (Figure 6.4.2). The lower South Brook sub-watershed receives from the Rambler historical tailings area, Boundary Shaft and historical impacts and effluent from the existing Ming Mine. These areas are shown on Figure 6.4.2 to 6.4.4. Water quality in the lower South Brook sub-watershed makes the habitat uninhabitable for fish because of the very low pH (approximately 4.2 to 4.6) and elevated metal concentrations (e.g., aluminium, copper, iron, zinc; AMEC 2008; Stantec 2013, 2016, 2019, 2024).

Pond Habitat

South Brook Pond (P01) has a surface area of 191 ha, with an average and maximum water depth of 1.4 and 7.8 m, respectively (AMEC 2008). P01 contains mostly littoral (shallow) and some profundal habitat (Section 6.3.1.2.5, Figure 6.3.8). The littoral zones contained a high proportion of fines with some cobble substrates and no aquatic vegetation (Stantec unpublished). Riparian vegetation consists of trees and shrubs.

As previously noted and detailed in Section 6.3 (Surface Water Resources), water quality is impacted in Pond P01. The pH is below the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-FAL) (range of 3.5 to 4.2), and many water quality parameter concentrations (including nitrate, aluminum, arsenic, cadmium, copper, iron, lead, selenium, and zinc) exceed CWQG-FAL (Stantec 2023). Although dissolved oxygen concentrations and water temperatures in Pond P01 are generally suitable to support fish populations, no fish are present due to low pH and high metal concentrations (Stantec 2023). Additional water quality details are provided in Section 6.3.2 of the Surface Water Resources VC.

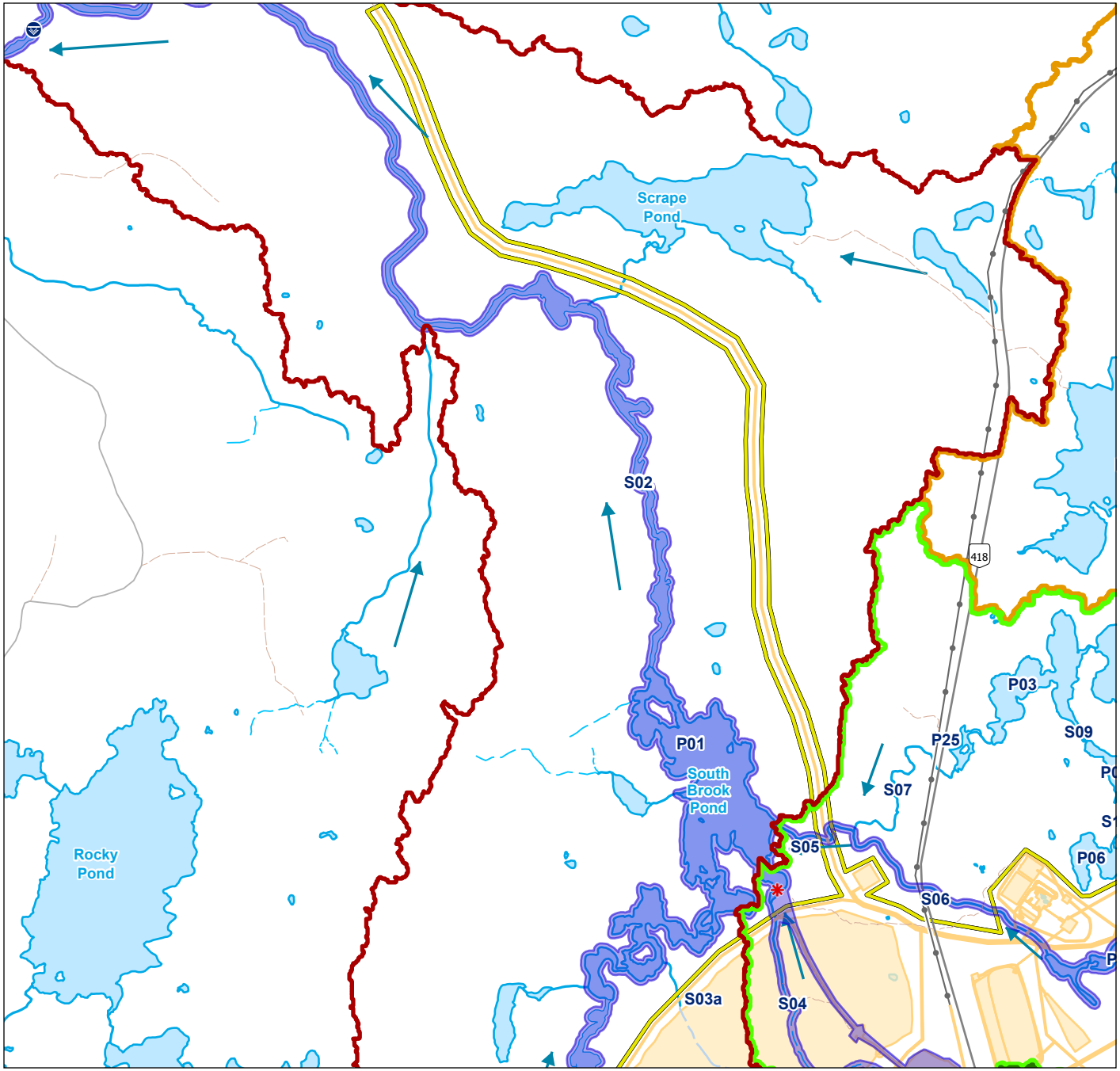

Figure No.
6.4.3
Title
Ponds and Brooks Within the Lower South Brook Sub-Watershed Associated With the Project Downstream of the Mine Site

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_2_003

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-30
Revised 2025-03-20

N

0 300 600 Metres
(At original document size of 8.5x11)
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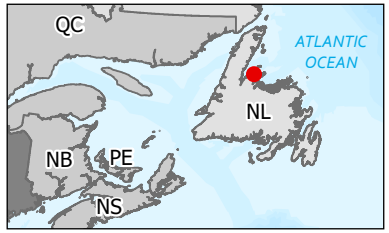
- Falls
- Final Discharge Point (FDP)
- Trimms Brook Watershed
- Sub-watershed A
- Sub-watershed B
- Lower South Brook Sub-watershed
- Approximate Region Impacted by Historical Mining Activities
- Project Area
- Site Infrastructure
- Flow Direction
- Highway
- Arterial / Collector
- Resource Road / Trail
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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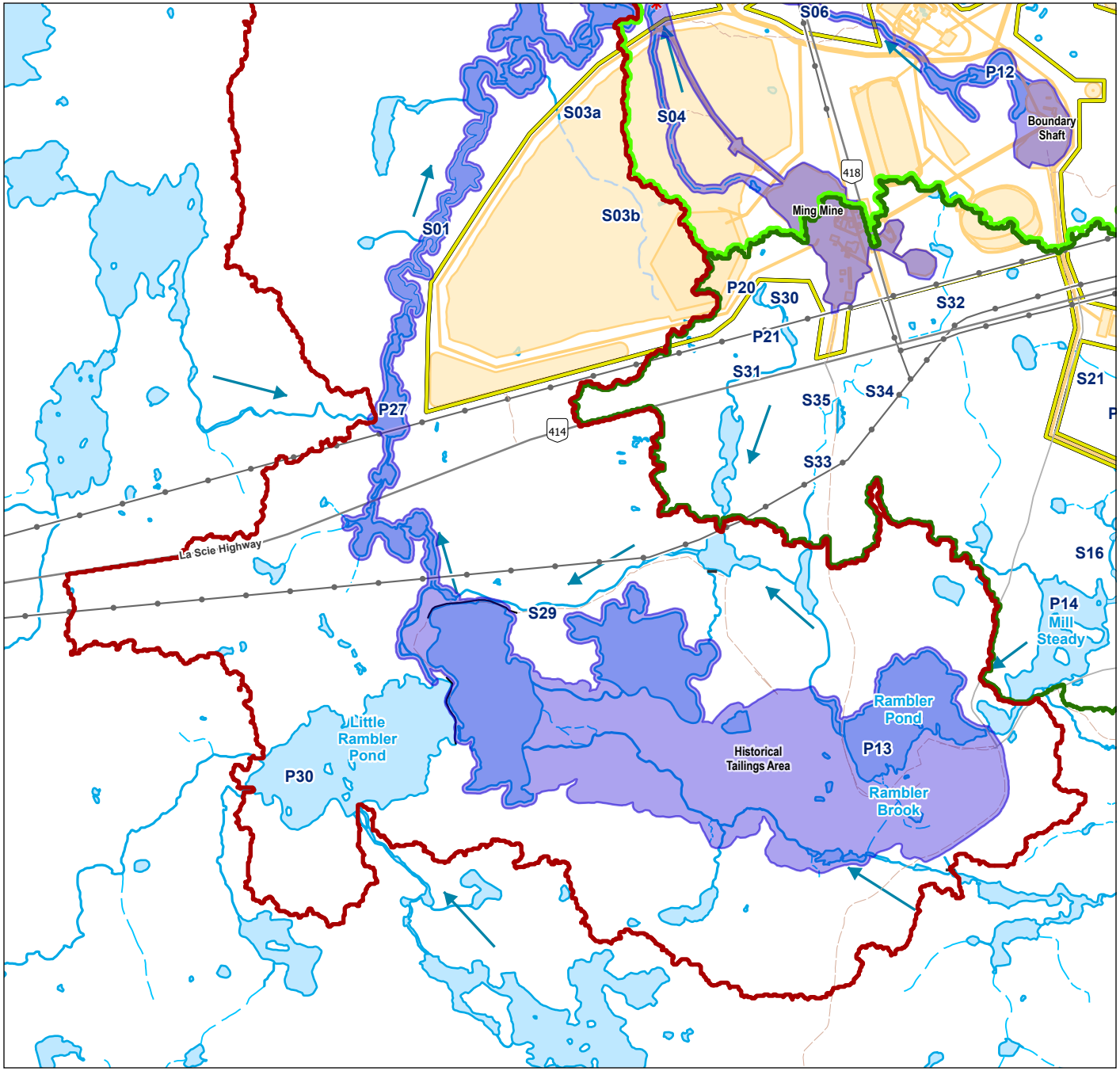

Figure No.
6.4.4
Title
Ponds and Brooks Within the Lower South Brook Sub-Watershed Associated With the Project Upstream of the Mine Site

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project
121418199_2_003

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-30
Revised 2025-03-20
IR by JR on 2025-04-14

N

0 300 600 Metres
(At original document size of 8.5x11)
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- Final Discharge Point (FDP)
- Trimms Brook Watershed
- Sub-watershed A
- Sub-watershed B
- Lower South Brook Sub-watershed
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- Site Infrastructure
- Dam
- Flow Direction
- Highway
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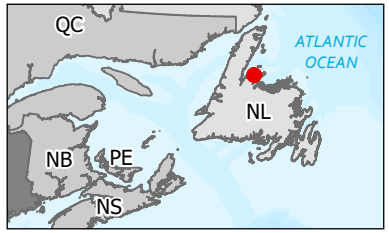
- Definite Watercourse
- Waterbody



Notes
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Ten sediment samples were collected from South Brook Pond (P01) between 2012 and 2018 (GEMTEC 2019; Stantec 2013, 2016). As reported in McConnell (1995, 2002; Appendix 2.A), South Brook Pond (P01) is impacted by pre-2010 historical mining activities and samples showed exceedances of numerous metals.

Exceedances of the Canadian Sediment Quality Guideline Probable Effects Limit (CSQG PEL) guidelines were shown for arsenic (nine samples; ranged from 27 to 1,240 milligrams per kilogram [mg/kg]) cadmium (seven samples; ranged from 6.6 to 113 mg/kg), chromium (four samples; ranged from 94 to 172 mg/kg), copper (nine samples; ranged from 828 to 36,700 mg/kg), lead (six samples; ranged from 96.9 to 279 mg/kg), mercury (two samples; 0.59 and 0.71 mg/kg), and zinc (eight samples; ranged from 409 to 25,800 mg/kg) in sediments (GEMTEC 2019; Stantec 2013, 2016).

Stream Habitat

South Brook flows from Gull Pond into Big Rambler Pond and then into Little Rambler Pond and is diverted north around the southern extent of the historical tailings area (approximately 9 kilometres [km]). England's Brook (S16) flows through Pond P13, and east through the north ditch diversion and into Stream S01. Stream S01 then flows to Pond P01 (approximately 3 km) and then veers northwest to Baie Verte (approximately 6 km (S02)). Stream S01 is shallow (less than 0.6 m), has velocities less than 0.6 metres er second (m/s), is low gradient, and substrates that are typically cobble, rubble and gravel (AMEC 2008; Stantec 2013, 2016). Riparian vegetation is primarily trees.

Like Pond P01, water quality in South Brook is also severely impacted. The pH is below the CWQG-FAL (typically between pH 4 and 5) and many of the same parameters exceed the CWQG-FAL (aluminum, cadmium, cobalt, copper, iron, lead, and zinc; GEMTEC 2019). Dissolved oxygen concentrations and water temperatures in South Brook are generally suitable to support fish populations, however no fish are present due to low pH and high metal concentrations (Stantec 2023; in prep.). The impacted water quality extends over 9 km and likely results in a chemical barrier to fish passage, which limits fish immigration into these areas (Figure 6.4.2).

Eleven sediment samples were collected from the lower South Brook sub-watershed between 2012 and 2018, including South Brook (S01, n=5; S02, n=4) and S04 (n=2) (GEMTEC 2019; Golder 2006, Stantec 2013, 2016). As reported in McConnell (1995, 2002; Appendix 2.A), the lower South Brook sub-watershed is impacted by historical mining activities and contains elevated concentrations of several metals. Exceedances of the CSQG PEL guidelines were shown for arsenic (ten samples; ranged from 33 to 977 mg/kg), cadmium (two samples; 37.7 and 96.4 mg/kg), chromium (six samples; ranged from 100 to 360 mg/kg), copper (ten samples; ranged from 270 to 27,500 mg/kg), lead (nine samples; ranged from 120 to 305 mg/kg), mercury (five samples; ranged from 0.49 to 0.83 mg/kg) and zinc (four samples; ranged from 420 to 22,700 mg/kg) in sediments (GEMTEC 2019; Golder 2006; Stantec 2013, 2016, 2019).

Overall, the lower South Brook sub-watershed does not contain sufficient quality habitats to support fish populations (AMEC 2008; Stantec 2013, 2016, unpublished). The sub-watershed has poor water quality (i.e., low pH and elevated metals concentrations), sediments with elevated concentrations of metals and impoverished benthic invertebrate communities (Stantec 2013, 2016, 2019, 2023). Benthic invertebrate communities have low densities of individuals per m², low taxon richness, little diversity and communities that are not similar to unimpacted reference areas (Stantec 2013, 2016, 2019, 2023).

Sub-Watershed A and B

Pond Habitat

There are ten ponds within sub-watershed A. Nine were previously surveyed for habitat classification and fished by AMEC (2008) and the remaining one was surveyed in 2024 to further inform the existing conditions and subsequent fisheries related permitting (Figure 6.4.5). The habitat characteristics of each pond surveyed previously are included in Table 6.4.1. Ponds in sub-watershed A had surface areas ranging from 1.7 to 67 ha. The assessed ponds were generally shallow and had a maximum depth of 4.8 m. The ponds surveyed contained littoral (shallow) habitat only and no profundal (deep) habitat. The dominant substrate in the littoral zones of ponds was fines, with some coarse and medium substrate present. Aquatic vegetation was typically sparse with less than 5% of each pond containing aquatic vegetation, with the exception of Ponds P25 and P03 which had less than 25% aquatic vegetation. The ponds surveyed in sub-watershed A contained habitat which supported fish, except for ponds P12 and P31 which were impacted by historical tailings and Pond P22 which had no visible inflow or outflow (Figure 6.4.5).

There are eleven ponds within sub-watershed B. Three ponds were surveyed for habitat characterization and/or fish in sub-watershed B during previous studies in the area (AMEC 2008, Stantec 2019) and eight ponds were surveyed in 2024 to further inform the existing conditions and subsequent fisheries related permitting (Figure 6.4.6). For the ponds previously surveyed, pond size ranged from 1.2 to 28 ha (Table 6.4.1). Maximum depth ranged from 1.7 to 2.4 m. Pond P29 was the only pond surveyed that was confirmed to be fish habitat (Stantec 2019). Two of the ponds surveyed for fish by AMEC (2008) (BH06 and BH04) were not considered to contain fish habitat. Photos of representative ponds habitats in sub-watershed A and B are provided in Figures 6.4.7 and 6.4.8 below.

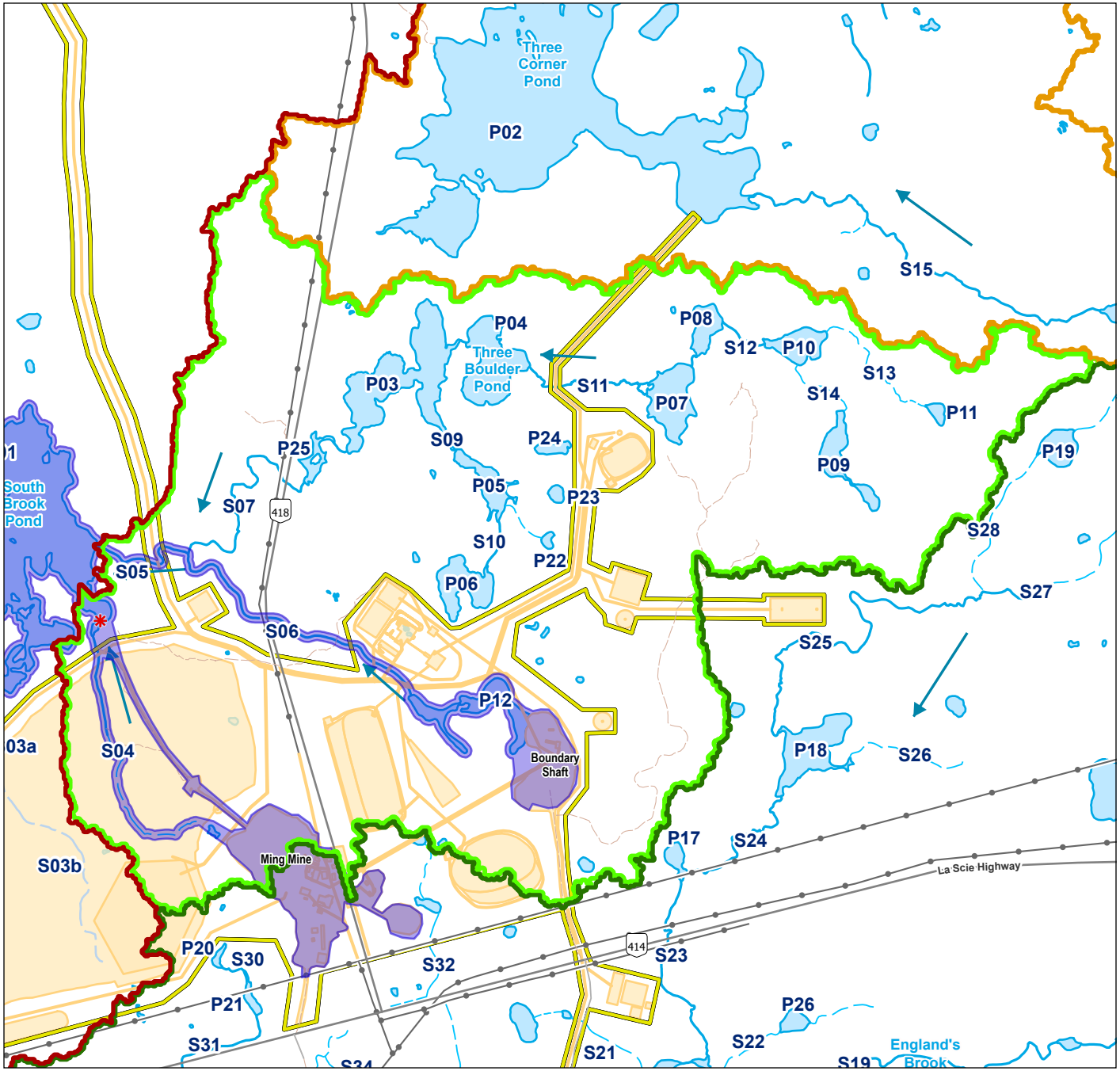

Figure No.
6.4.5

Title
Ponds and Brooks Within the Sub-Watershed A Associated With the Project

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_2_003a

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-30
Revised 2025-03-20
IR by JR on 2025-04-14

N

0 200 400 Metres
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- Final Discharge Point (FDP)
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- Sub-watershed A
- Sub-watershed B
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Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 6.4.1 Summary of Pond Habitat Characteristics

Major Sub-Watershed	Pond ID[1]	Surface Area (ha)	Maximum Depth (m)	Dominant Littoral Substrate[2]	Subdominant Littoral Substrate[2]	Aquatic Vegetation[4]	Fish Habitat
A	P12	18.25	<1	Tailings	Fines	None	Not fish habitat. Impacted from Boundary Shaft and historic mining activities
A	P31	3.17	<1	Tailings	Fines	None	Not fish habitat. Impacted from Boundary Shaft and historic mining activities
A	P25	3.18	2	Fines	Coarse	Sparse	Fish habitat
A	P03	67.00	2.2	Fines	Coarse	Sparse	Fish habitat
A	P04	33.76	2.1	Fines	Medium	None	Fish habitat
A	P05	13.18	1.5	Fines	Coarse	None	Fish habitat
A	P24	36.14	4.3	Fines	None	None	Fish habitat
A	P23	1.99	4.8	Fines	None	None	Fish habitat
A	P22	1.69	1.5	Fines	None	None	Not fish habitat, no visible inflows or outflows
Lower South Brook	P01	191.75	7.8	Fines	Cobble	None	Not fish habitat. Impacted by historical tailings
B	BH06	2.48	2.4	ND	ND	ND	Not fish habitat, no visible inflows or outflows
B	BH04	1.24	1.7	ND	ND	ND	Not fish habitat, no visible inflows or outflows
B	P29	28.00	ND	ND	ND	None	Fish habitat

Note:
[1] Stantec pond ID as currently used by the Project. [2] Coarse = bedrock and boulder; Medium = rubble, cobble, gravel; Fine = sand, silt, clay, muck, organics. [3] Abundant (>50%), common (25 to 50%), sparse (5 to 25%) or none (<5%). [4] Assessed during the EEM programs (Stantec 2013, 2016, 2019). ND = No Data

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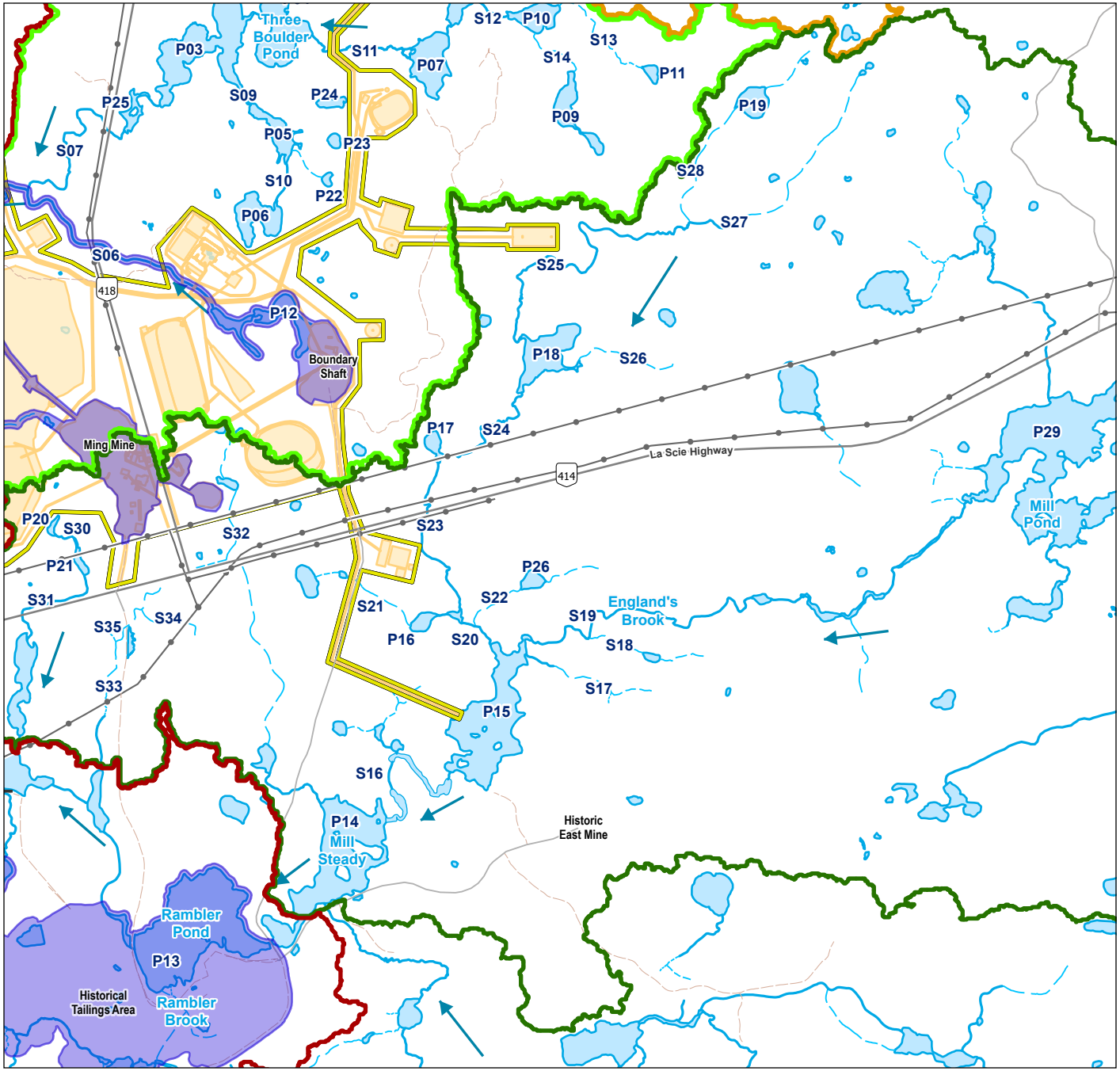

Figure No.
6.4.6
Title
Ponds and Brooks Within the Sub-Watershed B Associated With the Project

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_2_003b

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-30
Revised 2025-03-20
IR by JR on 2025-04-14

N

0 200 400 Metres
(At original document size of 8.5x11)
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- Trimms Brook Watershed
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- Lower South Brook Sub-watershed
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Figure 6.4.7 Aerial Image of P07, Representative Pond Habitat Sub-watershed A

Figure 6.4.8 Aerial Image of P18, Representative Fish Habitat in Sub-watershed B

Water quality in ponds in sub-watershed A and B that are upstream or upgradient of historically impacted areas (e.g., Ponds P03, P04) have neutral pH and relatively low or non-detectable concentrations of arsenic, copper, lead, nickel, and zinc (GEMTEC 2019). Water quality in ponds affected by historical mining activities including those near Boundary Shaft and Ming Mine (e.g., Ponds P12, P31) are acidic (pH 3 to 5) with elevated concentrations of several metals (GEMTEC 2019). Dissolved oxygen concentrations and water temperatures in ponds in Sub-watershed A and B are generally suitable for fish (AMEC 2008).

A total of five sediment samples were collected from ponds in Sub-watersheds A and B. These samples were collected from Pond P12 (n=2), Pond P25 (n=1), and Pond P29 (n=2) (GEMTEC 2019; Golder 2006; Stantec 2013, 2016). No exceedances of the CSQG PEL for cadmium, chromium, lead and mercury were identified for ponds unaffected by historical mining activities (i.e., Ponds P25 and P29; Canadian Council of Ministers of the Environment [CCME] 2024). However, in Pond P25 arsenic (530 mg/kg), copper (1,100 mg/kg) and zinc (370 mg/kg) concentrations were above CSQG PEL in the only sediment sample collected (Golder 2006). In Pond P12, which was impacted by historical mining activities, sediment exceedances were recorded for arsenic (two samples; 333 to 1,720 mg/kg), cadmium (one sample; 6.0 mg/kg), copper (two samples; 377 and 7,790 mg/kg), and zinc (one sample; 988 mg/kg) (Golder 2006; GEMTEC 2019).

Stream Habitat

There are seven streams within sub-watershed A. Six streams were previously surveyed (AMEC 2008) and one stream was surveyed in 2024. The streams surveyed were first or second order and varied in size (4.3 to 26.9 metres [m]; Table 6.4.2). The surveyed streams were shallow (<0.3 m) and had moderate flows (less than 0.8 m/s), with generally low to moderate gradients (less than 5.5%). The most dominant habitat type was steadies with fine grain substrates. Predominant riparian vegetation was identified as graminoids and shrubs, while instream cover was generally low (15% to 30%). The streams within Sub-watershed A contained fish, with the exception of Streams S05 and S06, which were fishless due to effects of historical mining activities (Table 6.4.2).

Streams within sub-watershed B are typically small and flow through a series of small ponds (Figure 6.4.6). Stream S19 (England's Brook) was used as a reference area for the Ming Mine EEM program (Stantec 2013, 2016, 2019) and is an area within sub-watershed B that has been previously surveyed (Table 6.4.2). Stream S19 is larger than many of the other streams in sub-watershed B and is approximately 2.3 km long, generally shallow (0.17 m), and slow flowing (0.1 m/s; Stantec 2013, 2016). It generally consists of riffle habitat, connecting a series of small steadies or ponds. Substate in Stream S19 is composed mainly of fine grain substrates and the dominant riparian vegetation is shrubs and grasses (Stantec 2013, 2016). The streams within sub-watershed B provide habitats which support fish (Stantec 2013, 2016).

Table 6.4.2 Summary of Stream Habitat Characteristics

Major Watershed	Stream ID[1]	Stream Order	Stream Length Surveyed (m)	Wetted Stream Width (m)	Channel Stream Width (m)	Average Depth (m)	Velocity Range (m/s)	Average Gradient (%)	Dominant Habitat Type	Dominant Substrate Type[2]	Dominant Riparian Vegetation	Instream Cover (%)	Fish habitat
A	S06, S05	1 or 2	1,395	2.9	18.0	0.10	0 to 0.68	3	Steady	Fines	Spruce, balsam fir, gramminoids, shrubs	27.5	Not fish bearing. Impacted by Boundary Shaft and historic mining activities
A	S06	1	83	1.1	16.0	0.13	0 to 0.01	1	Steady	Fines	Gramminoids, shrubs	22.5	Not fish bearing. Impacted by Boundary Shaft and historic mining activities
A	S07	2	819	ND	ND	0.27	0 to 0.3	1	Steady	Fines	Gramminoids, shrubs	ND	Fish habitat
A	S07	2	32	5.3	18.6	0.06	0 to 0.84	5	Run	Fines	Gramminoids, shrubs	30.0	Fish habitat
A	S09	1	94	12.3	26.9	0.09	0 to 0.38	0	Steady	Fines	Moss and gramminoids	25.0	Fish habitat
A	S10	1	315	8.6	8.8	0.25	0 to 0.05	6	Steady	Fines	Gramminoids	18.8	Fish habitat
A	S11	1	281	5.9	15.5	0.16	0 to 0.42	1	Steady	Fines	Gramminoids, shrubs	15.0	Fish habitat
A	S11	1	19	3.2	4.3	0.16	0 to 0.58	0	Riffle	Medium	Gramminoids, shrubs	30.0	Fish habitat
B	S19	3	1,650	5.3	18.1	0.17	0.02 to 0.18	1	Riffle	Medium	Shrubs, grasses	10.6	Fish habitat
South Brook	S01	1	ND	13.7	ND	0.64	0.93 to 1.55	ND	Run	Medium	Gramminoids, shrubs	ND	Not fish bearing. Impacted by historical tailings.
South Brook	S01	4	ND	9.7	12	0.21	0.1 to 0.6	3	Riffle	Medium	Shrubs, grasses	0	Not fish bearing. Impacted by historical tailings.
South Brook	S02	4	ND	16.7	17.6	0.22	0.2 to 0.6	3	Riffle	Medium	Trees, shrubs	0	Not fish bearing. Impacted by historical tailings.

Note:
[1] Stantec stream ID as currently used by the Project.
[2] Coarse = bedrock and boulder; Medium = rubble, cobble, gravel; Fine = sand, silt, clay, muck, organics.
ND = no data.

Water quality in streams in sub-watershed A and B that are upstream or upgradient of historically impacted areas have neutral pH and relatively low or non-detectable concentrations of arsenic, copper, lead, nickel, and zinc (GEMTEC 2019). Water quality in streams affected by historical mining activities is acidic (pH 3 to 5), with elevated concentrations of several metals (arsenic, copper, lead, nickel, zinc) (GEMTEC 2019). Dissolved oxygen concentrations and water temperatures in streams in sub-watershed A and B are generally suitable for fish (AMEC 2008). Additional details are provided in Section 6.3.2 the Surface Water Resources VC.

A total of six sediment samples were collected from streams S06 (n=3) and S19 (n=3) in sub-watersheds A and B. No exceedances of the CSQG PEL were identified for streams that were unaffected by historical mining activities (i.e., S19) for cadmium, copper, lead, and mercury (CCME 2024). Arsenic (21 mg/kg), chromium (99 mg/kg) and zinc (410 mg/kg) were above the CSQG PEL in one of three samples collected from S19. Streams in sub-watershed A and B that were impacted by historical mining activities (i.e., S06) had exceedances of the CSQG PEL for arsenic (two samples; 23 and 660 mg/kg), cadmium (one sample; 97 mg/kg), chromium (two samples; 126 and 458 mg/kg), and copper (one sample of 440 mg/kg) (Golder 2006; GEMTEC 2019).

Overall, most streams and ponds in sub-watershed A and B contain sufficient quality habitats to support fish populations, with the exception of a few which drain areas of historical mining activity and have generally unsuitable water quality to support fish.

Trimms Brook Watershed

One of the options for freshwater for the Project will be Three Corner Pond (Pond P02). Three Corner Pond is 7.2 ha in surface area and has a maximum depth of 28 m (Figure 6.3.8, Section 6.3). There are two mapped inflowing streams to Three Corner Pond (Water Resources Management Division n.d.) (Figure 6.4.9). A review of aerial imagery indicated that riparian vegetation surrounding the pond is primarily forest. Substrates in the littoral area are likely coarse (e.g., cobble, rubble), with substrates in the profundal zone likely being fines.

No previous water quality or sediment quality information was available for the Trimms Brook Watershed. Additional information collected in 2024 will be provided following the submission of the Environmental Registration to the appropriate regulatory authorities in a separate submission.

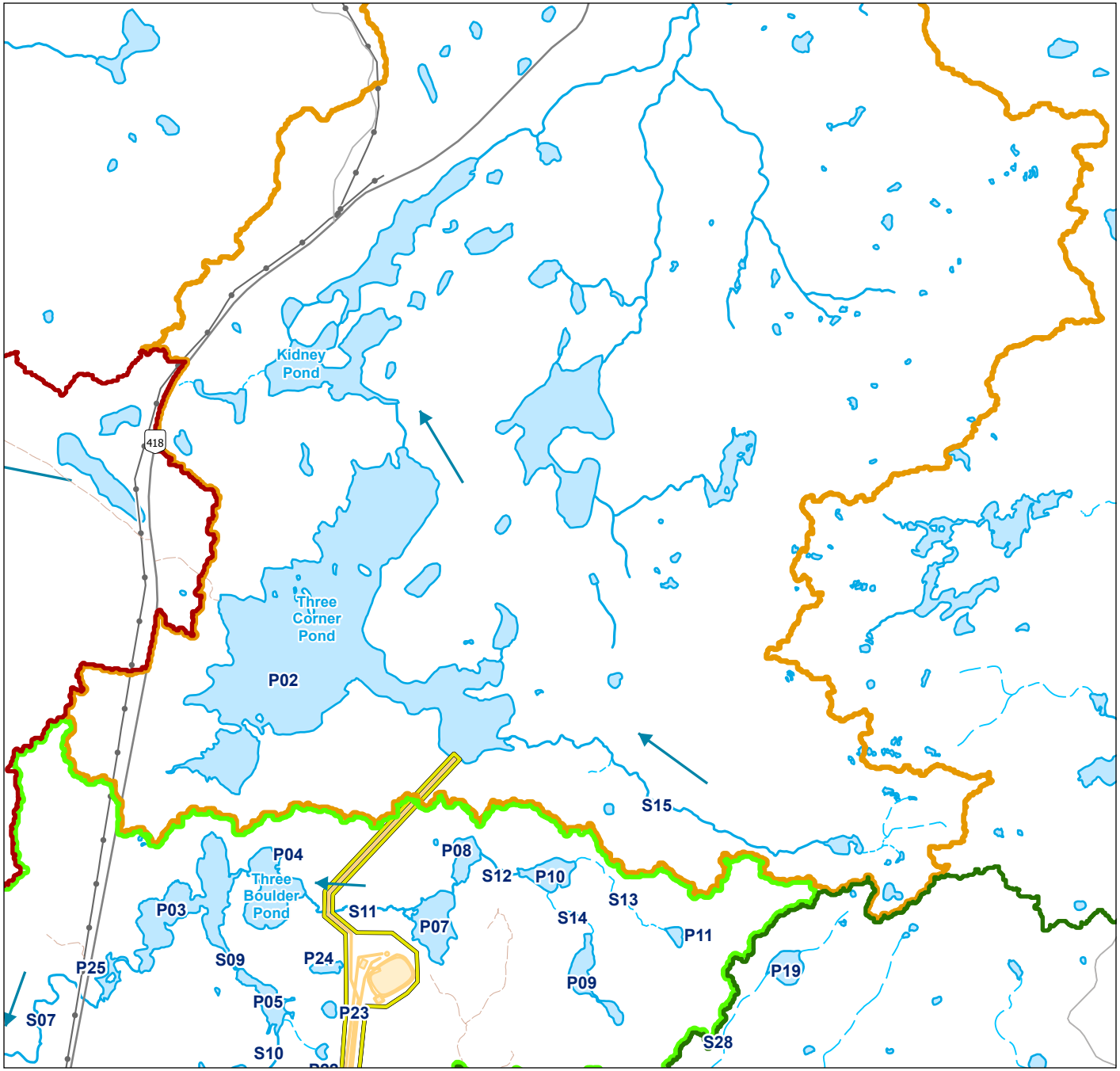


Figure No.
6.4.9

Title
Ponds and Brooks Within the Trimm's Brook Watershed Associated With the Project

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_2_003c

Project Location
Baie Verte, NL

Prepared by MB on 2025-01-30
Revised 2025-03-20

N

0 200 400 Metres
(At original document size of 8.5x11)
1:22,000

- Project Area
- Site Infrastructure
- Trimms Brook Watershed
- Sub-watershed A
- Sub-watershed B
- Lower South Brook Sub-watershed
- Flow Direction
- Resource Road / Trail
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Intermittent Watercourse
- Definite Watercourse
- Waterbody

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\2_121418199_FireFlyMetals_GreenBayCuAu_Aquatics\121418199_FFM_MingMine_FFH.aprx Revised: 2025-03-26 By: mblackwood

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

6.4.1.2.2 Fish Communities

Within the RAA, brook trout (*Salvelinus fontinalis*), Atlantic salmon (*Salmo salar*), threespine stickleback (*Gasterosteus aculeatus*) and American eel (*Anguilla rostrata*) are known to occur within the freshwater environment (Stantec 2013; Porter et al. 1974; Newfoundland and Labrador Department of Fishries, Forestry and Agriculture [NLDFFA] n.d.). The streams, brooks, and ponds within the RAA provide adequate spawning, rearing, migratory and overwintering habitat for these species to carry out their life processes in freshwater, as they occur, and as habitat quality permits. There is a 12.2 m high waterfall on South Brook approximately 0.8 km from Baie Verte, which represents a complete obstruction to fish (Porter et al. 1974; Figure 6.4.1). Additionally, impacted water quality (pH 3 to 5) likely results in a chemical barrier to fish passage. Both barriers influence the distribution and abundance of fish species in South Brook. Atlantic salmon are only potentially present in the Trimms Brook Watershed.

Sea-run Atlantic salmon and American eel are diadromous species (a portion of their life cycle is carried out in the marine environment) in the RAA. They are only known to occur in the Trimms Brook watershed. Sea-run Atlantic salmon migrate upstream to spawn and their offspring spend their early life stages in freshwater. Juvenile Atlantic salmon leave the freshwater environment as smolts to grow and mature in the marine environment before returning to their natal rivers to spawn. The sea-run Atlantic salmon are part of the Northeast Newfoundland Atlantic Salmon population and are designated as Not-at-Risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (2010).

For American eel, which spawn within the marine environment in the Sargasso Sea, the freshwater environment provides adequate rearing, overwintering and migratory habitat to carry out their life processes. American eel is listed as ‘Threatened’ under COSEWIC and ‘Vulnerable’ under NL ESA (described further in Section 6.4.2.2.3).

Lower South Brook Sub-watershed

South Brook Pond (P01) and South Brook (S01 and S02) are fishless based on extensive fishing effort with fyke nets, gill nets, baited minnow traps, angling, and electrofishing, which has taken place over multiple years and seasons between 2008 to 2024 (AMEC 2008; Stantec 2013, 2016, unpublished). These areas have impoverished benthic invertebrate communities and poor water quality (i.e., low pH and elevated metals concentrations) that is unsuitable for supporting fish as a result of historic mining activities (Stantec 2013, 2016, 2019, 2023). Section 6.3 (Surface Water Resources) further details the impacted water quality that extends from the area of historical tailings, Boundary Shaft (S05, S06), and Ming Mine to the outlet of South Brook at Baie Verte. Additionally, low pH (e.g., 3 to 5; McConnell 2002; Appendix 2.A) likely results in a chemical barrier to upstream fish passage for over 9 km within the mainstem of South Brook and South Brook Pond. Fish that may attempt to colonize these habitats from nearby fish bearing streams would be exposed to pHs less than 4. A pH less than 4 is below the tolerances of fish in the area (Raleigh 1982) and is known to cause reduced survival or growth (Smith 1977) or mortality (Wood et al. 1990). Note that Streams S05 and S06, which convey flow from the Boundary Shaft, are also historically impacted and fishless (described below in sub-watershed A).

Sub-Watersheds A and B

Fish sampling conducted within sub-watershed A included surveys of eight streams and nine ponds (AMEC 2008). Six out of nine ponds and six of eight streams surveyed contained brook trout. Total catch ranged from 1 to 36 fish per pond and population estimates ranged from 142 to 177 fish per 100 m² in the streams (AMEC 2008). Habitat suitability analyses indicated that aquatic habitats were suitable for all life stages of brook trout (i.e., spawning, young-of-year, juvenile, and adult).

Streams S05 and S06 flow from the former Ming Mine workings and had no fish captures (AMEC 2008). The absence of fish in these streams and ponds is likely due to historic mining activities associated with Boundary Shaft and the negative effects on water quality, which make the habitats unsuitable for fish life processes.

Fish sampling in Watershed B included Pond P29 and Stream S19. Fish surveys confirmed the presence of brook trout in Pond P29 and Stream S19 (Stantec 2013, 2016). Multiple brook trout year classes (from young-of-year to 3+) were observed in Stream S19, suggesting that this stream section provides habitats suitable for fish to carry out their life processes (Stantec 2013, 2016). Given the connectivity with other ponds and streams in Watershed B, it is anticipated that these ponds and streams may also contain brook trout.

Trimms Brook Watershed

No information was available on the fish community in the Trimms Brook Watershed. It is anticipated that the fish communities are similar to those in proximity to the South Brook Watershed and contain Atlantic salmon, brook trout, and potentially American eel and sticklebacks.

6.4.1.2.3 Species at Risk

American eel is the only aquatic species at risk / species of conservation concern that is known to inhabit watersheds within the LAA / RAA or have the potential to be present within the Project Area. Based on the fish sampling conducted to date, American eel is likely to occur only in the Trimms Brook watershed. They are unlikely to occur in the South Brook Watershed as poor water quality (i.e., low pH) likely results in a chemical barrier to upstream passage for over 9 km (AMEC 2008; McConnell 2002 (Appendix 2.A); Stantec unpublished) American eel has no status under the federal *Species at Risk Act* (under consideration) and is listed as ‘Threatened’ under COSEWIC and ‘Vulnerable’ under NL ESA.

In Newfoundland, eels are found in almost all lakes and rivers and are common in coastal areas closer to the sea (NLDFFA n.d.; Veinott and Clark 2011). American eel is catadromous; adults move downstream in late summer or autumn to marine waters and migrate to the Sargasso Sea to spawn (COSEWIC 2012). American eel is considered a single breeding population (COSEWIC 2012). As young eels grow, they drift toward the continental shelf and eventually move to inshore waters, migrating to brackish waters or back to freshwater habitats. Threats to the population include habitat alteration, dams and turbines, fishery harvest, changes to ocean conditions related to climate change, contaminants, and parasites (COSEWIC 2012). There has been a general decline in eel abundance over time (Veinott and Clark 2010).

6.4.1.2.4 Commercial and Recreational Fisheries

The South Brook Watershed and Trimms Brook Watershed are part of Salmon Fishing Area 3 and are considered unscheduled ponds and rivers. The Project Area also comprises part of the Trout Angling Zone 1, which is open between February 1 to April 15 and May 15 to September 7 of each year. There are no known commercial fisheries or Indigenous fisheries in the RAA.

As discussed in Section 6.7.1.2, based on a land and resource use survey, less than 2.5% of the survey participants indicated that they fish in the Project Area. The most commonly reported species fished was trout and Atlantic salmon (Stantec 2024).

6.4.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Fish and Fish Habitat is provided in Table 6.4.3. Potential environmental effects and effects pathways were selected based on a review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.4.3 Potential Effects and Effect Pathways for Fish and Fish Habitat

Potential Effect	Effect Pathway(s)
Change in fish habitat quantity	• Placement of infrastructure in streams or ponds may result in a reduction of available habitat for fish to carry out their life processes (i.e., direct loss) • Stream crossings have the potential to result in an obstruction to fish passage if not properly designed, which could limit access to upstream habitats that are required to carry out life processes (Khan and Colbo 2008; Dunham et al. 1997) • Construction of mine features may also result in an indirect loss of fish habitat due to a reduction in stream flows associated with changes in drainage area, water management infrastructure or excavation, and dewatering of underground mine features • Water extraction from ponds may result in an indirect loss of fish habitat due to changes in flow or water levels
Change in fish habitat quality	• Mine site preparation and earth works could increase the potential for changes in runoff, sedimentation, and the introduction of deleterious substances into fish habitat, thus reducing habitat quality (e.g., siltation of spawning beds) (Greig et al. 2007; Wood et al. 1997; Curry and MacNeill 2004) • Removal of riparian vegetation may reduce shade and/or increase nutrient and energy inputs, which could affect water quality, in turn affecting the quality of fish habitat through changes in temperature and food availability (i.e., primary and secondary productivity) (Zalewski et al. 2001) • The use of industrial equipment in or near water could introduce deleterious substances, result in sedimentation and alteration of fish habitat such that habitat quality is reduced (Sweka and Hartman 2001; Herbert and Merkens 1961; Robertson et al. 2006) • Construction within watercourses which receive runoff from historically impacted areas (i.e., roads, water pipeline, tailings management facility [TMF]) could result in the short-term resuspension of stream-bed contaminants within the water column • Flooded vegetation within the TMF area has the potential to result in the generation of methyl mercury in water • Runoff from overburden and waste rock piles could affect water quality and thereby affect fish habitat quality (Jennings et al. 2008) • Discharges into the aquatic environment could affect fish habitat quality if suspended sediments and/or contaminants are released, which could affect the suitability of habitat for fish (Sweka and Hartman 2001; Herbert and Merkens 1961; Robertson et al. 2006) • Changes in stream flow due to loss of watershed area or water withdrawal can affect habitat suitability or quality

Table 6.4.3 Potential Effects and Effect Pathways for Fish and Fish Habitat

Potential Effect	Effect Pathway(s)
Change in fish health and survival	• Fish health and survival could be affected directly or indirectly through injury due to industrial equipment working in or near streams and ponds • Introduction of sediments and contaminants into fish habitat could affect fish health and survival. Siltation events could inhibit the ability of fish to forage and cause behavioural or physiological changes in fish and smothering of eggs (Sweka and Hartman 2001; Herbert and Merkens 1961; Kjelland et al. 2015) • Introduction of deleterious substances (e.g., grease, fuel) from machinery operating in or near waterbodies could also affect fish health and survival • Removal of riparian vegetation near watercourses and waterbodies could affect fish health due to changes in shade, protective cover, and/or external nutrient/energy inputs (Zalewski et al. 2001) • The use of explosives in or near water could result in instantaneous changes in pressure, and changes to fish health and survival through injury or instantaneous death • The improper design or construction of stream crossings could block fish passage to important habitats • Water extraction activities could result in impingement or entrainment and thereby affect fish health and survival. • Fish survival could be affected by stranding in areas of water withdrawal (DeBoer et al. 2016; Irvine et al. 2009) • Discharges into the aquatic environment could affect fish habitat quality when contaminants are released, which could affect the habitat suitability

6.4.3 Mitigation and Management Measures

As discussed in Section 2.11, FireFly has revised the Ming Mine EPP, including identification and addition of mitigation measures required to address new and/or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on Fish and Fish Habitat, including the measures identified for the following Project activities:

- Buffer Zones (Section 4.1 of the EPP)
- Laydown and Storage Areas (Section 4.2 of the EPP)
- Clearing Vegetation (Section 4.4 of the EPP)
- Grubbing Disposal of Related Debris (Section 4.5 of the EPP)
- Overburden (Section 4.6 of the EPP)
- Excavation, Embankment and Grading Environmental Concerns (Section 4.7 of the EPP)
- Erosion Prevention and Sediment Control (Section 4.8 of the EPP)
- Water Supply (Section 4.9 of the EPP)
- Watercourse (Stream) Crossings (Section 4.10 of the EPP)
- Pumps and Generators (Section 4.12 of the EPP)
- Dewatering Work Areas and Site Drainage (Section 4.13 of the EPP)
- Equipment Installation, Use and Maintenance (Section 4.14 of the EPP)
- Storage, Handling and Transfer of Fuel and Other Hazardous Material (Section 4.15 of the EPP)
- Sewage Disposal (Section 4.18 of the EPP)
- Hazardous Waste Disposal (Section 4.19 of the EPP)
- Road Maintenance (Section 4.23 of the EPP)
- Drilling and Blasting (Section 4.25 of the EPP)
- Waste Rock and Ore / Concentrate, and Milling Activities (Section 4.26 of the EPP)

The following measures specific to Fish and Fish Habitat have also been identified for the Project:

- During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including loss of fish habitat. Standard construction best practices will be used during the site preparation and construction phase to reduce the potential negative interactions.
- Reduce water inventory through perimeter berms and promote overland flow of non-contact runoff
- Maintain flows to fish bearing streams and ponds by encouraging flow within the pre-development catchments to the extent practicable

- Direct runoff away from active work areas before construction commences, reducing the volume of sediment-laden water to be managed
- If historically impacted sediments need to be excavated from streams to facilitate the placement of stream crossings structures, the impacted material would be removed from site and disposed of in accordance with applicable regulations or managed on site in accordance with best practices for metal leaching / acid rock draining materials.
- Vegetation will be cleared within the TMF prior to filling / flooding to reduce potential generation of methyl mercury from accumulating in surface waters
- Culvert design, installation / upgrades and maintenance will follow and conform to appropriate DFO and NL operational statements, guidance, and protocols. Although most of the waterbodies and streams are impacted by legacy mining and don't support fish, the culverts will be designed to maintain passage for fish, allow streamflow and drainage through channels to direct non-contact water (does not come in contact with mine waste) to flow along existing natural pathways and not be obstructed and designed to account for extreme high and low hydrological events (Section 2.5.8).
- Emergency spill kits will be readily available when working within 15 m of watercourses and waterbodies.

6.4.4 Residual Environmental Effects

Potential environmental effects on Fish and Fish Habitat were identified in Section 6.4.3. For Fish and Fish Habitat, three effects were identified: change in fish habitat quantity, change in fish quality and change in fish health and survival. Residual effects (i.e., those remaining following implementation of mitigation (Section 6.4.3) for all Project phases are evaluated in the sections below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural environment in the area has been affected by past mining activities. Impacted streams and ponds have low pH, elevated concentrations of metals and no longer support fish, unimpacted streams and ponds have neutral pH, baseline concentrations of metals and support fish populations.
- Sea-run Atlantic salmon are not known to occur within the South Brook Watershed as a result of a natural falls located 0.8 km from Baie Verte, however they have the potential to occur in the Trimms Brook Watershed.
- Based on the land and resource use survey (Stantec 2024), limited recreational fishery occurs in the Project Area (less than 5% of participants indicated that the Project Area is used for harvesting purposes).
- The Project pathways that have been identified are consistent with those for the existing Approved Mine.

- A comprehensive aquatic field program was undertaken in 2024 to further characterize the existing environment and support subsequent fisheries related permitting. Results from the 2024 field studies will be provided directly to the appropriate regulatory authorities in a separate submission.
- The Project has been designed to avoid loss of fish habitat, to the extent practicable, through careful planning of the placement of infrastructure away from waterbodies.

Where watercourses and waterbodies cannot be avoided the application of mitigation measures will be used to reduce adverse effects to fish and fish habitat. The mitigation measures have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures for sediment and erosion control, incorporate DFO standards and best management practices, and consider regulations and guidelines that govern fish and fish habitat protection.

Following avoidance and mitigation, the primary residual Project-related effects on fish and fish habitat include changes to local watershed runoff due to water management infrastructure, changes in flow because of water withdrawal and the direct and indirect loss of fish habitat. These are further discussed below.

Key data limitations for the assessment of Project effects on fish and fish habitat include quantitative predictions associated with groundwater modelling and surface water quality and quantity modelling to assess the extent of effects on fish and potential indirect loss of fish habitat associated with potential flow reductions in streams. These models are being developed using the data collected in 2024 and will be provided directly to the appropriate regulatory authorities in a separate submission.

6.4.4.1 Change in Fish Habitat Quantity

The Project has been designed to avoid loss of fish habitat through careful planning of the placement of infrastructure and shifting locations of activities away from waterbodies. Where avoidance was not feasible, mitigation will be employed to reduce the potential for effects as described below. Residual Project-related effects to fish habitat quantity are reduced through the application of best practices in accordance with DFO's "Measures to Protect Fish and Fish Habitat" (DFO 2023). The installation of water crossing structures at road crossings will be conducted and designed to allow fish passage. When working near water, DFO standards and codes of practice will be used to reduce the potential for change in fish habitat quantity.

Where residual adverse effects remain, these must be counterbalanced by offsetting through an authorization pursuant to the *Fisheries Act*. A cautionary approach to offsetting will be taken in developing an Offsetting Plan to account for uncertainty in predicting the loss of fish habitat; it will aim for a net gain of fish habitat. The Offsetting Plan will take into account input from engagement and will be developed and implemented in consultation with DFO and in consideration of the "Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the Fisheries Act" (DFO 2019a).

The Offsetting Plan will address the direct loss of fish habitat associated with water intake pipes and/or effluent diffusers, stream crossings, other Project components and infrastructure, and indirect loss associated with changes in flow due to water management infrastructure. Streams experiencing indirect loss are anticipated to continue to support fisheries at a reduced level of productivity for the duration of the Project. The magnitude of changes in stream flow through the various Project phases in comparison to existing conditions will be determined through surface water quantity predictions. The quantity of fish habitat to be offset will be based on the quantity of fish habitat lost within the Project Area. Should the location of Project components shift, the loss of the habitat associated with the Project may be revised, as required, and the offset adjusted accordingly.

Stream crossings have the potential to result in an obstruction to fish passage if not properly designed, which could limit access to upstream habitats that are required to carry out life processes (Khan and Colbo 2008; Dunham et al. 1997). However, stream crossing structures will be designed consistent with best practices and DFO guidance, as described in the EPP, allowing fish to access the necessary habitat required for life processes.

Placement of infrastructure and use of equipment in streams or ponds may result in a direct loss of fish habitat and reduce the available habitat for fish to carry out their life processes. While the intent is to avoid most watercourses and waterbodies, the construction of mine infrastructure (e.g., roads, water pipeline and intake) may result in the direct loss of pond and stream habitat within the immediate footprint. The area of direct loss due to the Project will be determined following conceptual Project design and the completion of fish habitat characterization surveys. Mine waste will not overlay Stream S03a. Direct loss of fish habitat will be offset as required under a *Fisheries Act* Authorization issued by DFO.

The construction of mine features may result in an indirect loss of fish habitat due to a reduction in stream flows associated with changes in sub-watershed catchment area or water management. Excavation and dewatering activities associated with operation of the underground mine can lower groundwater elevations and change groundwater discharge to local waterbodies, resulting in the alteration or loss of fish habitat by reducing flow in streams and water levels in ponds.

Watercourses are broken into individual streams where they are separated by a pond or confluence. The assessment in change in water quantity is described below for individual streams. Streams with a reduction in mean annual flow (MAF) of less than 10% are considered to not result in adverse effects to fish habitat. Streams with a reduction in MAF greater than 10% are considered to potentially result in adverse effects to fish habitat. There are five watercourses that are anticipated to have a reduction in stream flow of more than 10%. These five watercourses include the following streams:

- Stream S03a
- Stream S04
- Stream S05 and S06
- Streams S30 and 31
- Stream S32, S33, S34 and S35

Streams S04, S05 and S06 are impacted by historical mining activity and no longer support fish, so any changes in flow will not result in adverse effects to fish habitat. The lower portion of Stream S03 (S03a) is expected to experience a flow reduction of approximately 97% (as a result of loss upstream) and the remaining flow will not be sufficient to support fish, resulting in a 100% loss of fish habitat in Stream S03a.

Streams S30 and S31 (17% loss in flow) and S32, S33, S34, and S35 (25% loss in flow) are expected to experience flow reductions greater than 10%. Streams experiencing indirect loss are anticipated to continue to support fisheries at a reduced level of productivity for the duration of the Project construction and operation periods. These streams will likely be less productive and contain primary (e.g., periphyton) and secondary (e.g., benthic invertebrates) producers' representative of low flow headwater communities. Indirect loss of habitat in Streams S03a, S30, S31, S32, S33, S34, and S35 will be offset as described above through the *Fisheries Act*. The quantity of fish habitat lost because of changes in surface water flows will be confirmed in consultation with applicable regulators during permitting.

Water withdrawn from ponds will be required for mine operation, which could affect fish habitat quantity by lowering water levels, thereby reducing fish habitat. Based on the water quantity assessment described in Section 6.3.4.1, the quantity of water to be withdrawn from Three Corner Pond (P02) (for the process plant) is not large enough to result in adverse effects to fish and fish habitat within the Trimms Brook watershed. Similarly, the quantity of water to be withdrawn from England's Brook (P15) is not large enough to result in adverse effects to fish and fish habitat. The quantity of water withdrawal will be confirmed during detailed design.

6.4.4.2 Change in Fish Habitat Quality

The residual effects on fish habitat quality are dependent on the results of the assessment of Project effects on Surface Water Resources (Section 6.3). For surface water resources and fish habitat, residual effects for all Project phases were considered together.

Pathways that affect fish habitat quality as outlined in Table 6.4.3 are related to surface runoff from areas of disturbance, resuspension of contaminants from impacted areas, direct discharges of wastewater to waterbodies, changes to watershed areas, and work within or near water.

The Project has been designed to avoid these pathways to the extent practicable through shifting the placement of infrastructure away from waterbodies, reducing clearing of riparian vegetation and industrial equipment in or near water. Where avoidance is not feasible, mitigation (Section 6.4.4) will be used to reduce the potential for effects. When working near water, potential effects on fish and fish habitat are well known and documented, and DFO measures and codes of practice will be followed. Consequently, with the application of DFO's *Measures to Protect Fish and Fish Habitat* (DFO 2023) and codes of practice, significant adverse effects on fish habitat quality are not anticipated.

Construction activities associated with the access roads, water pipeline and TMF have the potential to result in short-term resuspension of sediments containing elevated concentrations of contaminants within the water column (i.e., metals) if construction occurs in watercourses or ponds that drain historically impacted areas. It is anticipated excavations will take place in the dry season; however, it is possible that small amounts of sediment may be released into Streams S04, S05 and S06 and/or South Brook Pond

(P01). Streams S04, S05 and S06 and Pond P01 are currently impacted and the potential interactions resulting from the redistribution of contaminants is expected to be reduced through standard mitigation measures (e.g., erosion control). Surplus excavated material will be disposed of appropriately. However, as these streams and ponds are historically impacted and no longer support fish, the resuspension of contaminants during construction are not expected to result in effects to fish.

During the construction and operation phase, residual Project-related effects to the quality of fish habitat (where fish habitat is present), could occur due to changes in water quality from discharge of effluent or seepage containing contaminants above the CWQG-FAL. With the installation of a WWMP, stormwater collections basins, and the implementation of a site wide water management plan (see Chapter 2.0), mine effluent will meet federal and provincial authorized discharge limits which are protective of aquatic life. Discharge from the Project site will be from the existing FDP and a new WWMP to South Brook Pond. The AC analyses have been completed, as detailed in Section 6.3.4.2, and indicate that PoPCs in effluent will meet CCME CWQG-FAL guidelines or background levels, whichever is higher, within 6.96 km of the discharge point. Changes in water quality are anticipated to be localized and assimilate within the freshwater receiving environment. Water-based discharges will be managed and treated to meet authorized limits prior to discharge. Water quality monitoring will be conducted during operation to verify these assumptions. It should be noted that the existing FDP is on South Brook. South Brook and South Brook Pond are historically impacted and no longer contain fish. No effects due to changes in water quality are expected at these locations.

Residual effects on the quality of fish habitat (where it exists) from Project effluents and discharges are anticipated to be low, as they will be authorized and in compliance with applicable regulatory requirements. An EEM program is currently being conducted at the site with new requirements being implemented in accordance with the MDMER.

Residual Project-related effects to fish habitat quality from methylmercury production in organic soils or terrestrial vegetation (resulting from flooding the TMF) are anticipated to be low. As part of construction, vegetation in the TMF will be cleared to reduce the potential for methylmercury production. The tailings will cover the base of the TMF early in the operation phase. Water collected in the TMF will be treated prior to release to meet authorized limits. If methylmercury production occurs, it is anticipated to peak in the first two years following anaerobic inundation and is predicted to return to pre-existing levels approximately 10 years later (St. Louis et al. 2004). The TMF will also have a seepage collection system that cycles seepage back to the TMF, thus mitigating potential concerns and reducing overall effects on fish habitat quality.

Seepage from the TMF and stockpiles has the potential to have exceedances of the CWQG-FAL for contaminants (i.e., metals). Contact water will be managed through a site water management plan, and will be collected, monitored and treated as required during operation. During closure and post-closure there is the potential that seepage may result from the TMF and stockpiles. Water quality monitoring will be conducted to verify these assumptions, and adaptative management strategies may be implemented as required.

One to two years of water quality monitoring post-closure is currently planned, as described in the Updated Rehabilitation and Closure Plan (Rambler Metals and Mining 2018). Following the results of the water quality monitoring, adaptive management, including additional monitoring or mitigation, may be implemented as required.

Changes to stream flow may occur in the construction phase, as described in Section 6.4.5.1 in relation to change in catchment area because of water management. Streams S04, S05 and S06 are impacted by historical mining activity and no longer support fish, so changes in flow are not anticipated to affect the productivity or sustainability of fish populations in the area. The loss in flow in the lower portion of Stream S03 is such that S03a will no longer support fish habitats. Streams S30 and S31 and Streams S32, S33, S34, and S35 are expected to experience flow reductions greater than 10% MAF resulting in decreases in stream flows during construction and operation. Streams experiencing indirect loss are anticipated to continue to support fisheries at a reduced level of productivity for the duration of the Project construction and operation periods. These streams will likely be less productive and contain primary (e.g., periphyton) and secondary (e.g., benthic invertebrates) producers' representative of low flow headwater communities.

These residual changes in habitat quantity can result in indirect effects to habitat quality, including changes in water velocity, substrates and primary (e.g., periphyton) and secondary (e.g., benthic invertebrates) producers. Changes in habitat quality are not anticipated to result in changes in the sustainability of fish populations since these species occupy varying types of aquatic habitats which include ponds and brooks with varying velocities, substrates sizes and primary and secondary producers.

6.4.4.3 Change in Fish Health and Survival

Several Project-related activities could affect fish health and survival. In general, effects to fish habitat quality and quantity can also affect fish health and survival. As stated earlier, many systems are fishless and impacted due to historical mining activities; however, standard mitigation and adaptive management will be applied to manage potential effects on fish health and survival (Section 6.4.4).

The timing of construction could influence the environmental effects of the Project on fish health and survival, hence work should be conducted outside of the DFO timing windows for the Island of Newfoundland, to the extent practicable, to protect fish and avoid direct mortality of fish larvae or eggs (DFO 2019b).

Fish health and survival could be affected directly or indirectly through injury due to industrial equipment working in or near streams and ponds. Fish will be relocated from areas of in-water work to avoid the death of fish, as required by applicable permits.

Introduction of sediments and contaminants into fish habitat could affect fish health and survival. Conducting work during periods of high rainfall could lead to siltation events, which could inhibit the ability of fish to forage and cause behavioural or physiological changes in fish and smothering of eggs (Sweka and Hartman 2001; Herbert and Merkens 1961; Robertson et al. 2006). Fish eggs and larvae have been shown to be the life stage most sensitive to increased sedimentation through the reduction of water flow and oxygen delivery to eggs (Greig et al. 2007; Argent and Flebbe 1999; Curry and MacNeill 2004). Introduction of deleterious substances (e.g., grease, fuel) from machinery operating in or near waterbodies could also affect fish health and survival. When working near water, the mitigation measures described in the EPP will be used in accordance with applicable approvals.

Removal of riparian vegetation during road work and mine site preparation could affect fish health due to changes in shade, protective cover, and/or external nutrient/energy inputs (Zalewski et al. 2001). Changes in fish habitat may affect predation rates, alter water temperature to exceed species specific thermal tolerances, or affect primary and secondary productivity upon which fish rely as food sources (Zalewski et al. 2001). A minimum buffer of undisturbed natural vegetation will be left between the access road and bank of watercourses as described in the EPP, to provide shade, cover and external nutrient/energy inputs.

The use of explosives in or near water could result in instantaneous changes in pressure, and changes to fish health and survival through injury or instantaneous death. However, use of explosives in or near water will follow the mitigation measures described in the EPP and will be used in accordance with applicable approvals.

The improper design or construction of stream crossings could block fish passage to essential habitat (e.g., for rearing, spawning) (Khan and Colbo 2008; Dunham et al. 1997). Stream crossings will be designed to allow fish passage to access the necessary habitat required for life processes. Culverts will be sized appropriately and designed to facilitate sufficient depth and velocities for fish passage and new culverts will be embedded with appropriately sized substrates. Culvert Installations will follow the EPP and permit conditions from NL Water Resources Management Division and/or DFO.

During operation, mining could directly or indirectly affect fish health and survival by altering groundwater flows to surface waters. Changes could result from the stranding of fish due to groundwater drawdown or result from changes to fish habitat quality (e.g., water temperature) (DeBoer et al. 2016; Irvine et al. 2009). Given that potential effects on groundwater quantity have not been observed to date at the existing underground mine, additional effects are not anticipated. As described previously, Streams S04 and S06 are historically impacted and no longer support fish, whereas Stream S03 supports a very small population of fish in its lower reach (less than 15 individuals total, caught in two sampling events conducted in summer and fall 2024). As a result of limited fish populations in the area measurable effects of stranding are not anticipated.

Water extraction activities could cause impingement and thereby affect fish health and survival. Young, small-bodied fish with poor swimming (avoidance) ability are more susceptible to impingement and entrainment than are larger adult fish (DFO 1995). Intake design will be based on site-specific parameters and will be designed considering the End-of-Pipe Screen Size Tool (DFO no date) and the EPP.

Residual Project-related effects to fish health and survival, are not anticipated to occur due to changes in water quality from discharge of effluent or seepage into streams or ponds, as effluent will meet MDMER requirements. As noted earlier, these receivers are fishless and impacted due to historical mining practices (Stantec 2013, 2016, 2019, unpublished). Water-based discharges will be managed and treated to meet MDMER authorized limits prior to discharge. In addition, an EEM program is currently being implemented in accordance with the MDMER.

6.4.4.4 Summary

With mitigation, offsetting, and environmental protection measures in place, the residual adverse environmental effects on fish and fish habitat are predicted to be not significant. Best management practices and the use of standard mitigation will be followed for work in or near water. Fish habitat that is lost because of the Project will be counterbalanced through implementation of a Fish Habitat Offsetting Plan, to be developed in consultation with DFO. The Plan will include follow-up monitoring to confirm that the required offset is achieved, and contingency measures if the offsetting is not successful. During all phases of the Project, it is anticipated that discharges will be managed to meet regulatory requirements and/or site-specific guidelines. Given the planned mitigation measures, the Project is not anticipated to affect the likelihood of their long-term survival or sustainability of fish populations which currently occur within the RAA.

The overall determination of significance is made with a moderate to high level of confidence for fish habitat quantity and a moderate level of confidence for fish habitat quality and fish health and survival. The prediction confidence associated with the residual direct loss of fish habitat is high, as the Project features which overprint fish habitat have a defined footprint. For indirect loss of fish habitat, the prediction confidence for the quantity of fish habitat lost is high as changes in flow are anticipated within the Project Area but occur primarily in historically impacted watercourses. Regardless, there is a high level of confidence in the predictions that there will be an overall gain in fish habitat as a result of the Project. The FAA will require an Offsetting Plan which achieves a conservation outcome greater than if the offset had not taken place (i.e., net gain in habitat) and the offset measures will be monitored to confirm an overall gain in fish habitat has been achieved.

For fish habitat quality and fish health and survival the overall determination of significance is made with a moderate level of confidence at this time, given that many of the streams and ponds are impacted and fishless within the immediate Project Area, and standard mitigation will be in place when working in and around water and effluent will meet MDMER discharge limits.

Based on application of the mitigation measures identified in Section 6.4.4 and FireFly's commitment to comply with regulatory standards, residual environmental effects on Fish and Fish Habitat are likely to be not significant. This prediction will be confirmed through the completion of surface water quantity and quality modelling prior to the start of Project construction, which will support the Water Use Licence and *Fisheries Act* Authorization application. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed to prevent significant adverse effects on Fish and Fish Habitat.

As indicated in the introduction to the Fish and Fish Habitat VC, while the RAA extends to the head of tide to allow the assessment to consider the regional context, the AC study detailed in Section 6.3.4 (Appendix 6.C) indicates that contaminants of potential concern in effluent will meet background levels or CCME CWQG-FAL, whichever is higher within 6.96 km of the final discharge point, and prior to the South Brook discharge to the marine environment. Based on the water quantity assessment described in Section 6.3.4.1, the quantity of water to be withdrawn from Three Corner Pond is not of sufficient magnitude to result in adverse effects to fish and fish habitat within the Trimms Brook Watershed. As a result, no adverse effects on the marine environment or marine receptors are anticipated, and the marine environment was not considered further.

6.4.5 Follow-up and Monitoring Programs

Follow-up and monitoring are intended to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation and the nature of the residual effects, and to manage adaptively, if required. Compliance monitoring will be conducted to confirm that mitigation measures are properly implemented. Should an unexpected deterioration of the environment be observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process. This may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures to be implemented to address it. Additional information collected following submission of the EA will be provided to applicable regulators as required. Follow-up and monitoring plans which are currently being implemented or will be implemented include:

- Environmental monitoring to follow up on effectiveness of mitigation in the Erosion and Sediment Control Plan (Section 4.8 of the EPP)
- Surface water compliance monitoring, as required under the provincial CoA
- Compliance and effectiveness monitoring of the Offsetting Plan upon implementation, as authorized under the *Fisheries Act*
- An EEM program as required under the MDMER

6 Environmental Effects Assessment

6.5 Terrestrial Environment (including Species at Risk)

The Terrestrial Environment was selected as a valued component (VC) because it provides ecological, cultural, recreational, aesthetic, and economic value to the public, Indigenous groups, local businesses, and government agencies. Activities associated with the construction and operation of the Project have the potential to interact with the environment in such a way that could adversely affect vegetation, wetlands, avifauna, and other wildlife (including species at risk [SAR] and species of conservation concern [SOCC]). For the purposes of this assessment, the Terrestrial Environment includes:

- Vegetation (including SAR and SOCC) focussing on plant species and community diversity
- Wetlands including bogs, fens, marshes, swamps, and shallow waters that are permanently or temporarily submerged
- Wildlife (including SAR and SOCC) comprising of avifauna, large mammals, furbearers, and small mammals, focusing on SAR and SOCC in the Project Area

SAR include those species designated as Endangered, Threatened, or Special Concern under Schedule 1 of the federal *Species at Risk Act* (SARA) and/or the Newfoundland and Labrador (NL) *Endangered Species Act* (NL ESA). The protection of SAR and their residences is a legal requirement for those species listed under Schedule 1 of SARA and the NL ESA. While SOCC are not specified under federal or provincial legislation, in NL these are species that are considered rare in the province, or ones for which the long-term sustainability of their populations has been evaluated as tenuous. SOCC are defined herein as those species that do not meet the definition of SAR, but are ranked S1 (Critically Imperiled), S2 (Imperiled), or combinations thereof (e.g., S1S2) on the Island of Newfoundland by the Atlantic Canada Conservation Data Centre (AC CDC) (AC CDC 2023); species recommended for listing by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered, Threatened, Vulnerable, or Special Concern but not yet listed under SARA; or recommended for listing by the Species Status Advisory Committee as Endangered, Threatened, Vulnerable, or Special Concern but not yet listed under the NL ESA. SOCC also include a few species that do not meet the above-listed definition but are of particular interest to various government agencies. For terrestrial wildlife, this includes muskrat (*Ondatra zibethicus*) and, for vegetation, SOCC also include species ranked S2S3 by the AC CDC.

The protection of SAR is a legal requirement for those species listed under Schedule 1 of SARA and the NL ESA. Avifauna are also regulated through the *Migratory Birds Convention Act, 1994* (MBCA), which provides protection for most avifauna species (including their nests and eggs) found in the Project Area, except some non-migratory groups and species, such as raptors, crows, ravens, jays, kingfishers, starlings, and upland game birds. Avifauna species not protected under the MBCA, as well as other wildlife species, are afforded protection under the NL *Wild Life Act* which prohibits the hunting, taking, or killing of wildlife or classes of wildlife (including avifauna), except under license or permit.

The spatial boundaries for the Terrestrial Environment include the Project Area, the Local Assessment Area (LAA), which is defined as a 500 metre (m) buffer surrounding the Project Area, and the Regional Assessment Area (RAA), which includes those watershed areas and associated inflows that encompass the LAA (including South Brook and Trimms Brook Watershed Areas, Figure 6.5.1).

A significant residual adverse effect on the Terrestrial Environment (including SAR) for the Project is defined as any of the following:

- Threatens the long-term persistence or viability of a species in the RAA for the terrestrial environment, including effects that are contrary to or inconsistent with the goals, objectives, or activities of provincial or federal recovery strategies, action plans, and management plans (i.e., change from a non-listed species to a SAR or SOCC)
- Results in a non-conformance with section 5.1 of the NL Policy for Development in Wetlands or a loss of more than 10% of wetland area within the RAA

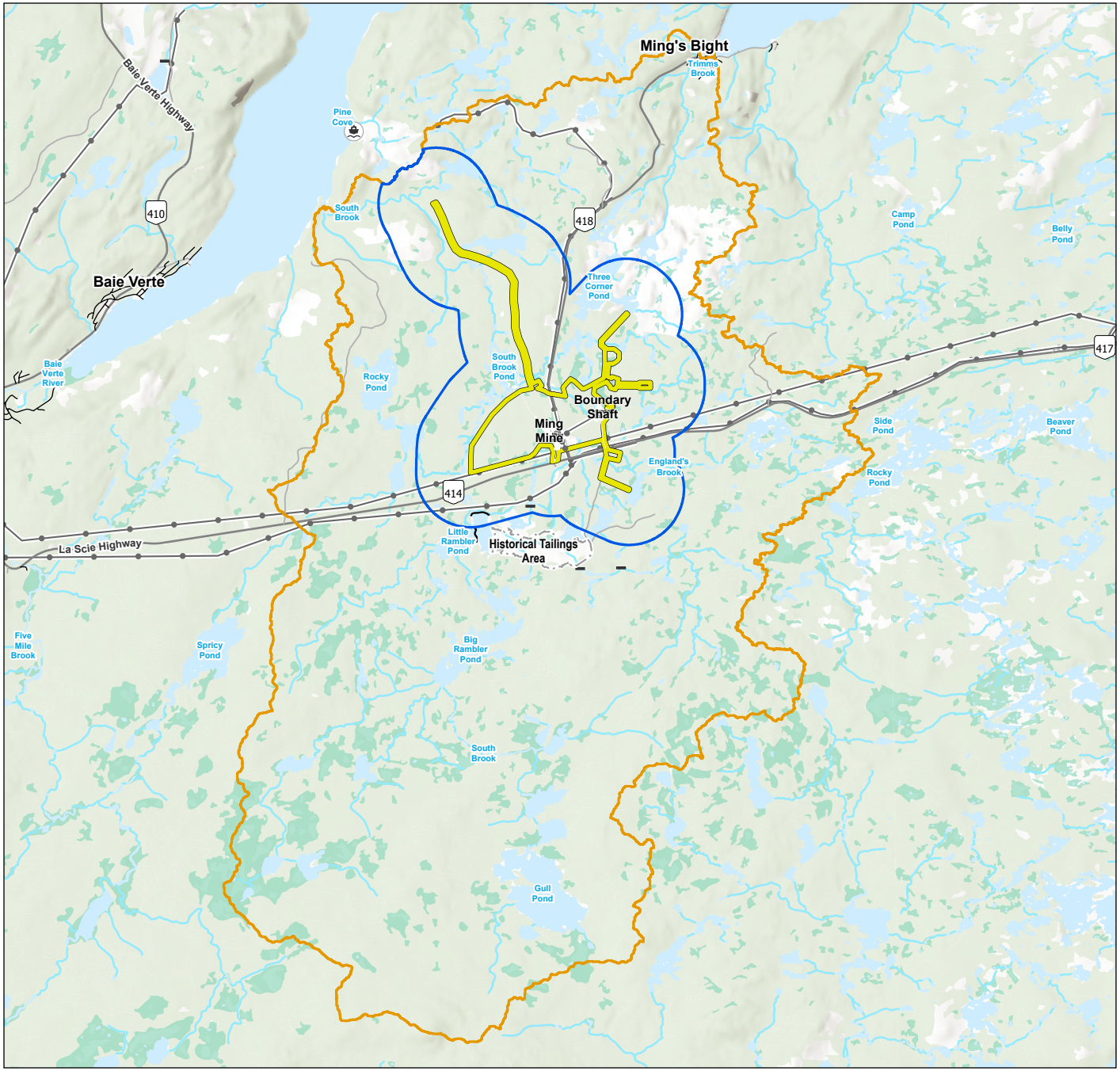


Figure No.
6.5.1

Title
Terrestrial Environment Spatial Boundaries: Project Area, Local Assessment Area, and Regional Assessment Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_6_004

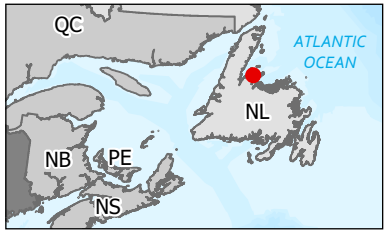
Project Location
Baie Verte, NL

Prepared by SC on 2024-12-03
Revised by SC on 2025-03-18
TR by MB on 2024-12-20

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:110,000

- Project Area
- Local Assessment Area
- Regional Assessment Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.5.1 Existing Conditions

6.5.1.1 Approach and Methods

Existing data for vegetation, wildlife, ecologically important areas, and habitats were obtained from a combination of Project-specific baseline field surveys (vegetation, wetlands, avifauna, and bats) and publicly available primary and secondary literature and databases, including environmental assessments for other mine developments and expansions that have been completed in the region.

6.5.1.1.1 Literature Review

Existing data sources from federal and provincial government agencies, peer-reviewed published literature, other publications and data sources, and communications with the NL Department of Fisheries, Forestry, and Agriculture (NLDFFA) - Wildlife Division were reviewed to compile information on the terrestrial environment, including SAR and SOCC. The following key public resources were consulted:

- NLDFFA forest and non-forest spatial data
- AC CDC observation data on SAR / SOCC within 5 kilometres (km) of the Project
- COSEWIC Assessment and Status Update Reports
- Provincial Status and Recovery Plans for SAR / SOCC
- SARA Recovery and Management Plans
- Citizen science records – North American Breeding Bird Survey (BBS) observation data (BBS route 57020); Newfoundland Breeding Bird Atlas (NBBA) data (Atlas Square 21UWR63, Region 3: Baie Verte–Buchans); and eBird observation records (Baie Verte area)
- Stog'er Tight Expansion Project Environmental Registration (Stantec 2022)
- Hammerdown Gold Project – Environmental Assessment Registration (Maritime Resources Corporation 2020)
- Argyle Gold Project – Appendix A (Environmental Baseline Studies) of the Environmental Assessment (GEMTEC 2018)
- Ming Copper-Gold Mine Tailings Management Facility Expansion – Environmental Preview Report (Rambler Metals and Mining 2018)

6.5.1.1.2 Baseline Surveys

Four terrestrial baseline field studies were conducted in 2024. These included vegetation surveys, wetland functional assessments, avifauna surveys, and bat surveys. In addition, wetland interpretation was completed for the Project Area. A summary of the surveys is provided below. Baseline survey reports for these field programs are provided in Appendices 6.D to 6.F.

Vegetation surveys were completed using an intelligent meandering approach within the range of habitats that exists in the Project Area from July 27 to August 1, 2024. During these surveys, vascular plant species were recorded on first observation. SAR or SOCC were recorded within the ESRI Field Maps app each time they were observed, and pertinent details such as population size were also recorded. Provincial forest, wetland, and non-forest inventory data was summarized for the Project Area. Vegetation community descriptions were also recorded within each newly encountered habitat, including dominant species in each stratum. Vegetation surveys were conducted within the Project Area as it was defined at the time of surveys. The Project design has since been refined and some surveyed areas are no longer within the Project Area.

A land cover dataset was compiled for the Project Area, LAA, and RAA from NLDFFA forest and non-forest spatial data, which was updated to reflect recent changes to cleared areas from mining activities in the area. Wetland boundaries were interpreted using Project-flown high-resolution imagery, a hillshade model created from Project-flown light detection and ranging (LiDAR) data, satellite imagery, and other digital data, and were merged with the land cover information compiled from NLDFFA forest and non-forest spatial data to create an updated land cover dataset for the Project Area. The results of this wetland interpretation exercise are appended in the vegetation and wetland baseline survey report (Appendix 6.D).

Wetland functional assessments were completed for 8 wetlands or portions of wetlands within the Project Area using the Wetland Ecosystems Services Protocol for Atlantic Canada: Non-tidal Wetlands (New Brunswick Department of Environment and Local Government [NBDELG] 2018) assessment form version 3.3. This method includes both a field form completed during a site visit and an office form completed using a Geographic Information System (GIS). Together the results of these assessments calculate scores for twenty different wetland functions and benefits that largely fall into the categories of hydrologic, water and climate protection, aquatic support, aquatic habitat, and transition habitat. The scores for assessed functions are ranked as lower, moderate, or higher, based on their relationship to a set of regional calibration wetlands (NBDELG 2018). Wetlands in areas that contain historically affected soils were not assessed. The results of these functional assessments are appended in the vegetation and wetland baseline survey report (Appendix 6.D).

The approach to the avifauna field program was guided by “Canadian Wildlife Service Guidance Regarding Information Needed to Support Assessment of Project Effects on Birds” (Canadian Wildlife Service 2022). Avifauna surveys consisted of breeding bird point-count surveys, area searches, and deployment of autonomous recording units (ARUs) in habitats representative of the Project Area[1]. For point-count surveys, observers completed a 10-minute point-count at 28 sampling stations from June 12 to June 14, 2024, following a protocol based on a fixed-radius (100 m) point-count sampling procedure (Bibby et al. 2000). Bird species detected by sight or ear during the point-count surveys were recorded along with their locations relative to the observer. Concurrent area searches were used to gather additional baseline information on avifauna in the Project Area, including for shorebirds, waterfowl, and other waterbirds. Bird species detections from five ARUs deployed in the Project Area were also analyzed for the period from June 12 to June 25, 2024, in which a five-minute period for every half-hour of

[1] Sample stations were selected to represent the diversity of habitats in the Project Area and included representative habitats outside of the Project Area boundary.

sampling, beginning one hour before sunrise to five hours after (13 samples/day), was analyzed for species identification. Further detail is provided in the avifauna baseline survey report (Appendix 6.E).

An acoustic bat monitoring field program was completed to investigate the occurrence and activity of bats in the Project Area, following the approach used for similar recent programs in the province and associated engagement with NLDFFA - Wildlife Division. Four ARUs were deployed in suitable bat habitat in or adjacent to the Project Area during the maternity roosting and migration periods (May 3 to September 24, 2024) to passively record echolocation calls of passing bats. Recorded audio files were initially processed using Kaleidoscope Pro (Wildlife Acoustics [version 5.6.4]) and then manually inspected to review the accuracy of identifications or reclassify them, as necessary, based on the criteria outlined in McBurney and Segers (2021). Further detail is provided in the bat baseline survey report (Appendix 6.F).

6.5.1.1.3 Data Limitations

Lichen SAR are considered unlikely to occur in the Project Area or LAA (AC CDC 2024), and no lichen field surveys were conducted in support of the Project. The assessment of lichens is based on the known distributions of lichen SAR as described in COSEWIC status reports, which are described in more detail in the vegetation and wetland baseline survey report (Appendix 6.D).

Complete coverage for vegetation surveys is not possible. Vascular plant surveys sampled representative vegetation communities and did not cover 100% of the Project Area. It is possible there are additional instances of vascular plant SOCC within the Project Area that were not recorded during vegetation surveys.

Species-specific baseline surveys for terrestrial wildlife completed in 2024 included bat and avifauna SAR (ARU surveys in targeted habitats). In addition, surveys for American marten (*Martes americana atrata*) were initiated in March 2025, with results pending (note that marten was identified within 5 km of the Project Area through AC CDC records, and there was one incidental observation in the LAA in 2024). The presence of other SAR, SOCC, and other species of interest in the Project Area (e.g., muskrat), is inferred based on known distributions (e.g., from status reports, AC CDC records) and their occurrence in similar habitats in the region.

Finally, there were no field surveys to assess the use of existing underground mine works in the Project Area as winter hibernacula. Bats are not expected to hibernate in existing infrastructure as the mine had been operational up until 2023, following which 24/7 activity continued at the mine site through on-going care and maintenance and recent exploration (beginning in October 2023). Bats would also not be expected in historic underground workings in the area, as they have all been flooded and are inaccessible (C. Greenham, pers. comm., November 29, 2024).

6.5.1.2 Description of Existing Conditions

An overview of the environmental setting for the terrestrial environment is provided in Section 4.1.2 (Biophysical Environment). A more detailed description of the existing conditions for vegetation, wetlands, avifauna, and other wildlife, based on literature reviews and summaries of baseline studies completed in support of the Project in 2024, is provided below.

6.5.1.2.1 Vegetation and Wetlands

The Project is located within the Northcentral Subregion of the Central Newfoundland Forest Ecoregion, near the boundary of the North Shore Forest Ecoregion (Newfoundland and Labrador Department of Environment and Climate Change n.d.). The landscape in the general area of the Project is a mix of dense vegetation, wetlands, and ponds. Black spruce (*Picea mariana*), balsam fir (*Abies balsamea*) and, to a lesser extent, white birch (*Betula papyrifera*), are common (Meades 1990). White spruce (*Picea glauca*), trembling aspen (*Populus tremuloides*) and alders (*Alnus* spp.) also occur in some areas. Barrens dominate along coastal headlands to the north and east of the Project Area (Meades 1990). Several historical mining sites exist within or upstream of the Project Area, LAA, and RAA. The Project Area includes areas associated with the historic Ming Mine operations and areas downstream of these developed areas, where surface water is considered to be affected by historic mining activities, with elevated levels of metals / metalloids (e.g., zinc, copper), and acidic conditions (Section 6.3).

SAR and SOCC species previously reported on the Baie Verte Peninsula were collected from several sources including data received from AC CDC, the Stog'er Tight Registration document, and the Anaconda Argle baseline report (Table 6.5.1; GEMTEC 2018; Stantec 2022; AC CDC 2024). These sources did not identify vegetation SAR, but did identify four vascular plant SOCC.

Table 6.5.1 Vascular Plant Species of Conservation Concern Previously Reported on the Baie Verte Peninsula

Scientific Name	Common Name	AC CDC S Rank[1]	Data Source
Chimaphila umbellata	common wintergreen	S2	GEMTEC 2018; Stantec 2022; AC CDC 2024
Potamogeton amplifolius	large-leaf pondweed	S2S3	Stantec 2022
Potamogeton praelongus	white-stem pondweed	S2S4	Stantec 2022
Sparganium fluctuans	floating bur-reed	S2S3	AC CDC 2024

Notes:
[1] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S#S# = range of uncertainty about the status (AC CDC 2023, 2025).

The AC CDC Expert Opinion Maps indicate that mountain holly fern (*Polystichum scopulinum*), a fern with no provincial S Rank, but listed as threatened by COSEWIC and on Schedule 1 of SARA, is possible within the Project Area (AC CDC 2024). There are no records of it within 5 km of the Project Area, and the only record of it within the province is from 1950, when it was found on serpentine soils in Humber West, in western Newfoundland. This population could not be relocated during surveys of the reported area conducted in 2000 (COSEWIC 2005).

A total of 230 vascular plant species or genera were observed during field surveys conducted in support of the Project (Appendix 6.D). No vegetation SAR and three vascular plant SOCC were observed during these field surveys (Table 6.5.2). Because of the changes in Project Area, the observations of slender cotton-grass (*Eriophorum gracile*, S1S2) are not within the current Project Area or LAA, though three observations were recorded within the RAA (Figure 6.5.2). Similarly, wild calla (*Calla palustris*, S2S3) was not observed within the Project Area, but was observed at two locations within the same wetland within the LAA. Bog willow (*Salix pedicellaris*, S2S3) was observed within two separate wetlands within the Project Area. One observation is in a wetland adjacent to the current boundary shaft area (Figure 6.5.2). The other is in a lacustrine wetland adjacent to the water intake area (Point A), located on England's Brook.

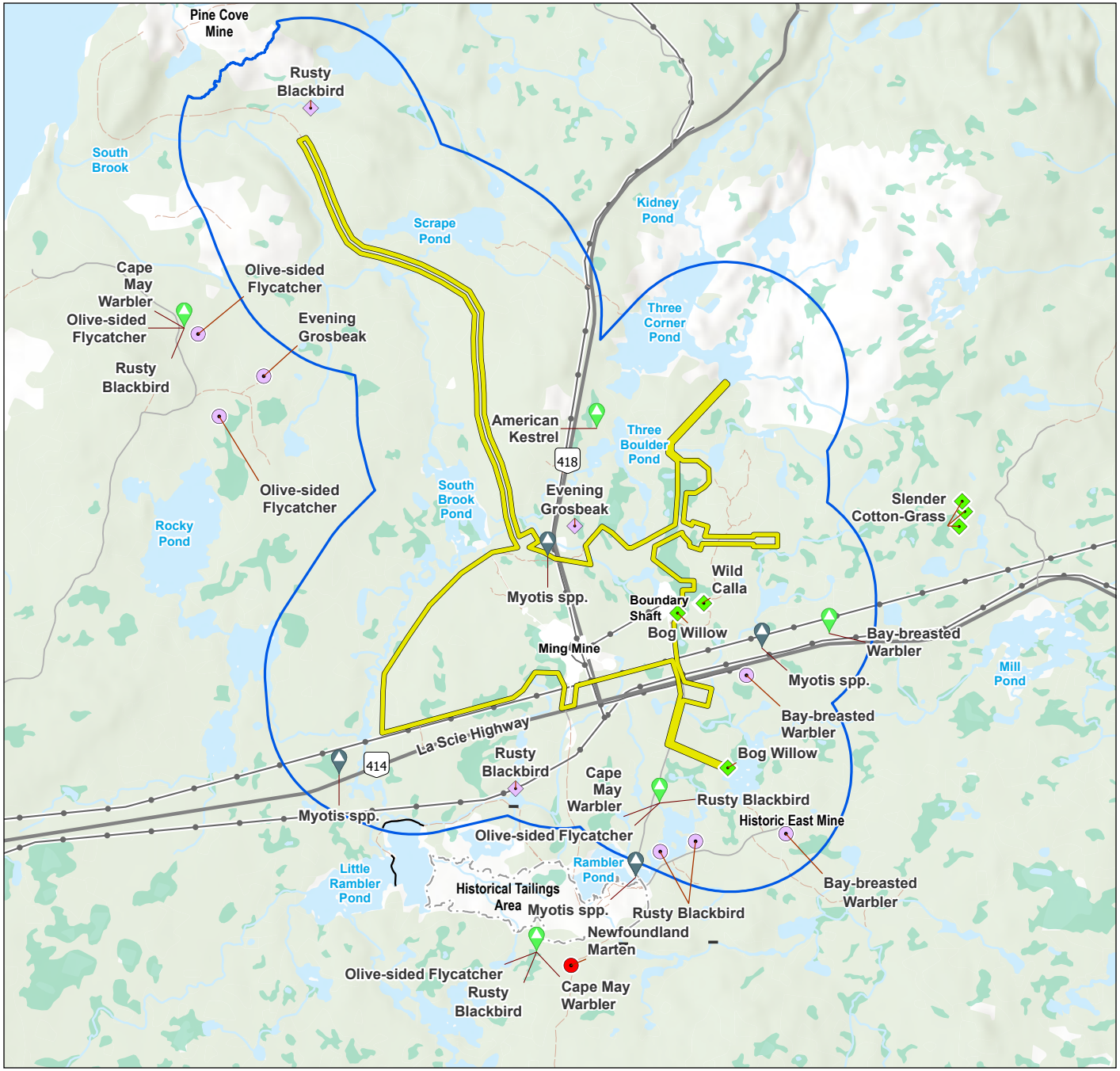

Figure No.
6.5.2

Title
Species at Risk and Species of Conservation Concern Within and Near the Project Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project
121418199_6_003

Project Location
Baie Verte, NL

Prepared by SC on 2024-12-03
Revised by SC on 2025-03-18
TR by MB on 2024-12-20

N

0 500 1,000 Metres
(At original document size of 8.5x11)
1:50,000

- ARU Bat Monitoring (Stantec)
- ARU Bird Monitoring (Stantec)
- Incidental Bird Observation (Stantec)
- Rare Mammal Observation (AC CDC)
- Survey Bird Observation (Stantec)
- Survey Vegetation Observation (Stantec)
- Project Area
- Local Assessment Area
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 6.5.2 Vascular Plant Species of Conservation Concern Observed During 2024 Field Surveys

Scientific Name	Common Name	AC CDC S Rank[1]	Observations in Project Area (n)	Observations in LAA, outside Project Area (n)	Observations in RAA, outside LAA (n)
Eriophorum gracile	slender cotton-grass	S1S2	0	0	3
Calla palustris	wild calla	S2S3	0	2	0
Salix pedicellaris	bog willow	S2S3	2	0	0

Notes:
[1] S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S#S# = range of uncertainty about the status (AC CDC 2025).

Eleven other uncommon vegetation species ranked S3 (vulnerable) were observed within or near the Project Area (Appendix 6.D).

Although NL has no official list of invasive species present within the province, the list of plants observed during field surveys was reviewed for species that are considered potentially invasive in other jurisdictions. Three species, creeping buttercup (*Ranunculus repens*), colt's-foot (*Tussilago farfara*), and reed canary grass (*Phalaris arundinacea*) were noted during vascular plant surveys. Creeping buttercup was noted in two locations, both of which are outside of the current Project Area, and one of which is outside of the LAA. Colt's-foot was noted in four locations: two adjacent to existing roads within the Project Area, one adjacent to Highway 414 in the RAA, and one within a transmission line right-of-way within the RAA. Reed canary grass was noted adjacent to an existing road within the Project Area.

Boreal felt lichen (*Erioderma pedicellatum*) is considered possible but unlikely to occur within the Project Area (AC CDC 2024). On the Island of Newfoundland, this species is primarily known from the east coast and south-central areas, with the only two records in the northern half of the Island on the Northern Peninsula (COSEWIC 2014). Other lichen SAR known to occur on the Island of Newfoundland are not known from this region and thus are unlikely to occur within the Project Area. Vole ears (*Erioderma mollissimum*, ranked endangered by COSEWIC) is currently only known from the Avalon Peninsula on very old balsam fir of a stage that was not noted within the Project Area (COSEWIC 2021). Wrinkled shingle lichen or wrinkled shield lichen (*Pannaria lurida*, ranked threatened by COSEWIC) is historically known from only two locations on the Island of Newfoundland, the closest of which was on the Northern Peninsula (COSEWIC 2016). This species is known to occur within 10 m of cliff edges on white spruce and thus is unlikely to occur within the Project Area. Blue felt lichen (*Degelia plumbea*, ranked special concern by COSEWIC) is known from the Avalon Peninsula and southern coast of the Island of Newfoundland (COSEWIC 2010). On the Island of Newfoundland, this species has only been recorded on yellow birch (*Betula alleghaniensis*), white spruce, Norway maple (*Acer platanoides*), and other non-native species, which were not recorded within the Project Area.

Land cover information (i.e., forest and non-forest spatial data) indicates both upland and wetland vegetation communities / wildlife habitat types within the Project Area and LAA (Table 6.5.3). Although wetland interpretation was completed for the Project Area, the original land cover information is presented in Table 6.5.3 to allow for comparisons between the Project Area, LAA, and RAA. Wetland interpretation is described in more detail in the vegetation and wetland baseline survey report (Appendix 6.D).

Table 6.5.3 Land Cover Types within the Project Area, Local Assessment Area, and Regional Assessment Area

Land Cover Types[1]	Area within Project Area		Area within LAA[2]		Area within the RAA[2]	
	ha	% of total	ha	% of total	ha	% of total
Barrens						
Barren - Rock	-[3]	-	2.7	0.1	108.2	0.8
Barren - Soil	-	-	10.6	0.4	108.4	0.8
Total Barrens	-	-	13.3	0.5	216.6	1.6
Wooded						
Coniferous Scrub	127.7	41.1	713.1	26.5	3,307.3	25.0
Deciduous Scrub	2.0	0.6	27.3	1.0	59.8	0.5
Hardwood - Over-mature	-	-	-	-	2.0	0.02
Mixedwood - Regenerating	-	-	27.2	1.0	45.8	0.3
Mixedwood - Immature	12.0	3.9	200.2	7.4	366.2	2.8
Mixedwood - Semi-mature	0.2	0.1	0.3	0.0	56.2	0.4
Mixedwood - Mature	-	-	1.7	0.1	16.3	0.1
Mixedwood - Over-mature	1.1	0.4	24.1	0.9	50.3	0.4
Softwood - Regenerating	16.0	5.2	159.8	5.9	826.2	6.3
Softwood - Immature	37.9	12.2	322.3	12.0	2,640.2	20.0
Softwood - Semi-mature	12.9	4.1	70.6	2.6	207.2	1.6
Softwood - Mature	4.2	1.3	39.1	1.5	77.3	0.6
Softwood - Over-mature	18.3	5.9	291.0	10.8	1,656.5	12.5
Softwood - Uneven aged	0.4	0.1	3.3	0.1	18.8	0.1
Unknown Forest	6.9	2.2	44.2	1.6	390.5	3.0
Small Island[4]	-	-	1.0	0.04	3.0	0.02
Total Wooded	239.6	77.1	1,925.2	71.5	9,723.5	73.6
Wetlands / Waterbodies						
Wetland - Bog	33.9	10.9	247.8	9.2	1,556.9	11.8
Wetland - Treed Bog	-	-	3.6	0.1	33.9	0.3
Wetland - Wet Bog	2.7	0.9	8.1	0.3	84.3	0.6
Water	3.2	1.0	232.8	8.6	938.2	7.1
Total Wetlands / Waterbodies	39.7	12.8	492.3	18.3	2,613.3	19.8

Table 6.5.3 Land Cover Types within the Project Area, Local Assessment Area, and Regional Assessment Area

Land Cover Types[1]	Area within Project Area		Area within LAA[2]		Area within the RAA[2]	
	ha	% of total	ha	% of total	ha	% of total
Disturbed						
Past Disturbance - Harvest	7.4	2.4	48.1	1.8	109.4	0.8
Past Disturbance – Fire/Wind	-	-	113.9	4.2	340.7	2.6
Corridor – Road / TL	6.4	2.1	34.7	1.3	65.6	0.5
Cleared Land	17.9	5.8	57.4	2.1	113.8	0.9
Residential	-	-	8.3	0.3	31.1	0.2
Total Disturbed	31.7	10.2	262.5	9.7	660.6	5.0
Total	310.9	100	2,693.3	100	13,214.0	100

Notes:
1. Wooded and wetland areas contain historically impacted soils resulting from past activities that have occurred within the Project Area
2. LAA = Local Assessment Area; RAA = Regional Assessment Area. The LAA and RAA (and associated numbers presented in this table) are unique to the Terrestrial Environment.
3. "-" indicates land use category was not present at that scale
4. Small islands are wooded areas within open water, but may occasionally be wetland

Six vegetation communities were encountered within the Project Area, as described below. Many land use types listed in Table 6.5.3 were reclassified in the field (e.g., as wetlands), while others that exist in relatively small amounts (e.g., mixedwood stands) may not have been encountered, or were reclassified.

Wooded Vegetation Communities

Wooded land cover types of various ages, including coniferous and deciduous scrub, comprise 233.9 ha of the Project Area as mapped, and 9,723.5 ha of the RAA. The wooded land cover in the Project Area represents approximately 2.4% of the total wooded land cover in the RAA. Open coniferous areas and coniferous forest were encountered within the Project Area.

Open coniferous woodlands are upland areas that are dominated by an open canopy of young to mid-aged black spruce and balsam fir that are regenerating from past cutting or disturbance. Shrubs such as rhodora (*Rhododendron canadensis*), late lowbush blueberry (*Vaccinium angustifolium*), and sheep-laurel (*Kalmia angustifolia*), grow abundantly in the openings. Other shrubs, such as wild red raspberry (*Rubus idaeus* subsp. *strigosus*), and common Labrador-tea (*Rhododendron groenlandicum*), occur occasionally. Common species of herbaceous flora include Clinton lily (*Clintonia borealis*), dwarf dogwood (*Cornus canadensis*), twinflower (*Linnaea borealis*), northern starflower (*Lysimachia borealis*), pearly everlasting (*Anaphalis margaritacea*), fireweed (*Chamerion angustifolium*), woodland horsetail (*Equisetum sylvaticum*), and bracken (*Pteridium aquilinum*). Bare areas within these cut over / disturbed areas are often covered in *Cladonia* lichen.

Upland forests in the Project Area have a closed canopy and are generally dominated by mid-aged balsam fir. Associated tree and large shrub species, such as paper birch, heartleaf birch (*Betula cordifolia*), mountain maple (*Acer spicatum*), and black spruce, occur sporadically. The ground layer in these forests is relatively sparse due to shading. Common ground layer species include twinflower, northern starflower, creeping snowberry (*Gaultheria hispidula*), dwarf dogwood, wild sarsaparilla (*Aralia nudicaulis*), wild lily-of-the-valley (*Maianthemum canadense*), and bracken.

Wetland Vegetation Communities

Wetlands within the Project Area and LAA provide important biogeochemical, hydrologic, and ecological functions (Price and Maloney 1994; Hanson et al. 2008; Kimmel and Mander 2010; Beaulne et al. 2021). Peatlands store carbon in both peat and woody biomass, at a rate relative to the height of peat above the water table (Belyea and Malmer 2004). Fens, swamps, and marshes can moderate water flows, mitigating downstream flooding (Hanson et al. 2008). Shrub swamps and marshes can stabilize and retain sediments, improving water quality, and can provide stream flow support and moderation (Johnston 1991). Wetlands can provide habitat for wildlife species; peatlands marshes can provide nesting and feeding habitat for waterfowl, and swamps provide habitat for forest songbirds and mammals (Hanson et al. 2008)

Some portions of the Project Area and LAA, particularly wetland areas downstream of the Ming Mine site, the Rambler Historic Tailings Area, and the boundary shaft area, have been impacted by past mining activities (Section 6.3). In those areas, there are few plants currently growing, but the historical impact appears localized, as nearby vegetation communities appear visually unaffected. However, it is assumed that the wetlands in these areas may provide different levels of function than assessed wetlands which are in relatively unaffected areas. The function of assessed wetland areas is described in the vegetation and wetland baseline survey report (Appendix 6.D).

Wetlands and waterbody land cover types comprise 39.6 ha of the Project Area as mapped, and 2,613.3 ha of the RAA. As mapped, wetlands and waterbody land cover types of the Project Area represent 1.5% of those land cover types within the RAA. Fens, bogs (shrub dominated and treed), marshes, and shrub swamps were encountered in the Project Area.

Fens are common and widespread in the Project Area. They are mainly open graminoid peatlands dominated by sedges with sporadic shrubs or stunted trees. Characteristic and dominant herbaceous plant species include deergrass (*Trichophorum cespitosum*), slender sedge (*Carex lasiocarpa*), yellow sedge (*Carex flava*), few-seeded sedge (*Carex oligosperma*), Buxbaum's sedge (*Carex buxbaumii*), white beakrush (*Rhynchospora alba*), water horsetail (*Equisetum fluviatile*), and coast sedge (*Carex exilis*). Other herbaceous species that occur frequently, but not in great abundance include bog goldenrod (*Solidago uliginosa*), northern pitcher-plant (*Sarracenia purpurea*), and bog aster (*Oclemena nemoralis*). Common shrub species in these communities include golden-hardhack (*Dasiphora fruticosa*), bog rosemary (*Andromeda polifolia*), swamp birch (*Betula pumila*), sweet bayberry (*Myrica gale*), creeping juniper (*Juniperus horizontalis*), Newfoundland Dwarf Birch (*Betula michauxii*), and alderleaf buckthorn (*Endotropis alnifolia*). Stunted and sporadic American larch (*Larix laricina*) are common. Stunted black spruce is present but is less common than American larch. Sphagnum mosses occur occasionally to abundantly throughout fen areas.

Fens can receive water from multiple input types, and water movement within fens is both horizontal and vertical (Vitt 2013). Peat depths in various types of fens can range from 1- 3 m (National Wetlands Working Group [NWWG] 1997). The fens in the Project Area and LAA can largely be classified as poor fens, based on their dominant vegetation (Environment and Climate Change Canada [ECCC] 2023a).

Bogs are much less common than fens in the Project Area. They typically have an open canopy of black spruce as well as small, shrub-level black spruce. The shrub layer is comprised of Ericaceous shrubs such as common Labrador-tea, rhodora, leatherleaf (*Chamaedaphne calyculata*), sheep-laurel, and pale laurel (*Kalmia polifolia*). Creeping shrubs, such as small cranberry (*Vaccinium oxycoccos*), cloudberry (*Rubus chamaemorus*), and creeping snowberry, are also common. Characteristic herbaceous species include boreal bog sedge (*Carex magellanica*), three-leaf Solomon's-plume (*Maianthemum trifolium*), goldthread (*Coptis trifolia*), few-flowered sedge (*Carex pauciflora*), tawny cotton-grass (*Eriophorum virginicum*), and roundleaf sundew (*Drosera rotundifolia*). Sphagnum mosses occur abundantly throughout bog areas, and underlying peat can be many meters thick (NWWG 1997). Bogs receive water from precipitation, snowmelt, and sometimes fog, and water movement is vertical (NWWG 1997; Vitt 2013). They often contain open water depressions in their centres known locally as bogholes (also called flarks). The pH of bogs is lower than that of fens; many bogs formed from fens over time, and transitional areas exist within the Project Area.

Marshes in the Project Area are generally small and associated with watercourses. They are dominated by sedges and to a lesser extent grasses, rushes and other wetland forbs. Bear sedge (*Carex utriculata*) is a dominant species of sedge in marshes in the Project Area. Other characteristic species include Canada manna-grass (*Glyceria canadensis*), black-girdle bulrush (*Scirpus atrocinctus*), swamp aster (*Symphyotrichum puniceum*), sensitive fern (*Onoclea sensibilis*), little prickly sedge (*Carex echinata*), stalk-grain sedge (*Carex stipata*), blueflag (*Iris versicolor*), water horsetail, soft rush (*Juncus effusus*), narrow-panicled rush (*Juncus tweedyi*), yellow sedge and small fruit bulrush (*Scirpus microcarpus*). Water levels in marshes vary in response to climatic conditions and are highly dynamic (NWWG 1997).

Shrub swamps in the Project Area grow are typically small and grow in depressions between upland areas. They are dominated by dense green alder (*Alnus alnobetula*), and to a lesser extent speckled alder (*Alnus incana*). The ground layer in these swamps contains many of the same herbaceous species found in marsh communities, but in different relative amounts. Common ground species include three-seed sedge (*Carex trisperma*), tall meadow-rue (*Thalictrum pubescens*), northern oak fern (*Gymnocarpium dryopteris*), purple avens (*Geum rivale*), fowl manna-grass (*Glyceria striata*), rough-leaved aster (*Eurybia radula*), northern beech fern (*Phegopteris connectilis*) and cinnamon fern (*Osmundastrum cinnamomeum*). Smaller shrubs such as squashberry (*Viburnum edule*), Bartram shadbush (*Amelanchier bartramiana*) and mountain holly (*Ilex mucronata*) occur occasionally.

Within the Project Area, a total of 137.4 ha of wetland was interpreted within 83 individual wetland polygons, representing 44% of the Project Area (Table 6.5.4, Figure 6.5.3).

Table 6.5.4 Wetlands within the Project Area

Wetland ID	Area (ha)	Wetland ID	Area (ha)	Wetland ID	Area (ha)
1	0.13	29	0.04	57	5.20
2	0.01	30	0.07	58	0.39
3	0.11	31	0.15	59	1.52
4	0.15	32	0.03	60	0.01
5	0.21	33	0.07	61	1.75
6	0.12	34	0.51	62	5.28
7	0.02	35	0.04	63	0.13
8	0.04	36	0.07	64	2.60
9	0.31	37	0.11	65	0.13
10	0.08	38	59.11	66	0.19
11	0.01	39	0.06	67	0.11
12	0.02	40	0.65	68	0.09
13	0.15	41	0.04	69	0.41
14	0.05	42	0.03	70	0.04
15	0.22	43	0.27	71	0.18
16	0.67	44	0.15	72	1.16
17	0.35	45	0.10	73	0.34
18	0.24	46	0.14	74	0.25
19	0.09	47	0.10	75	0.01
20	0.09	48	0.23	76	0.23
21	0.03	49	0.39	77	0.35
22	0.01	50	0.07	78	0.88
23	0.14	51	0.04	79	0.13
24	0.19	52	0.09	80	0.14
25	0.03	53	45.60	81	0.08
26	0.21	54	1.69	82	0.41
27	0.03	55	0.03	83	0.41
28	0.90	56	0.49		

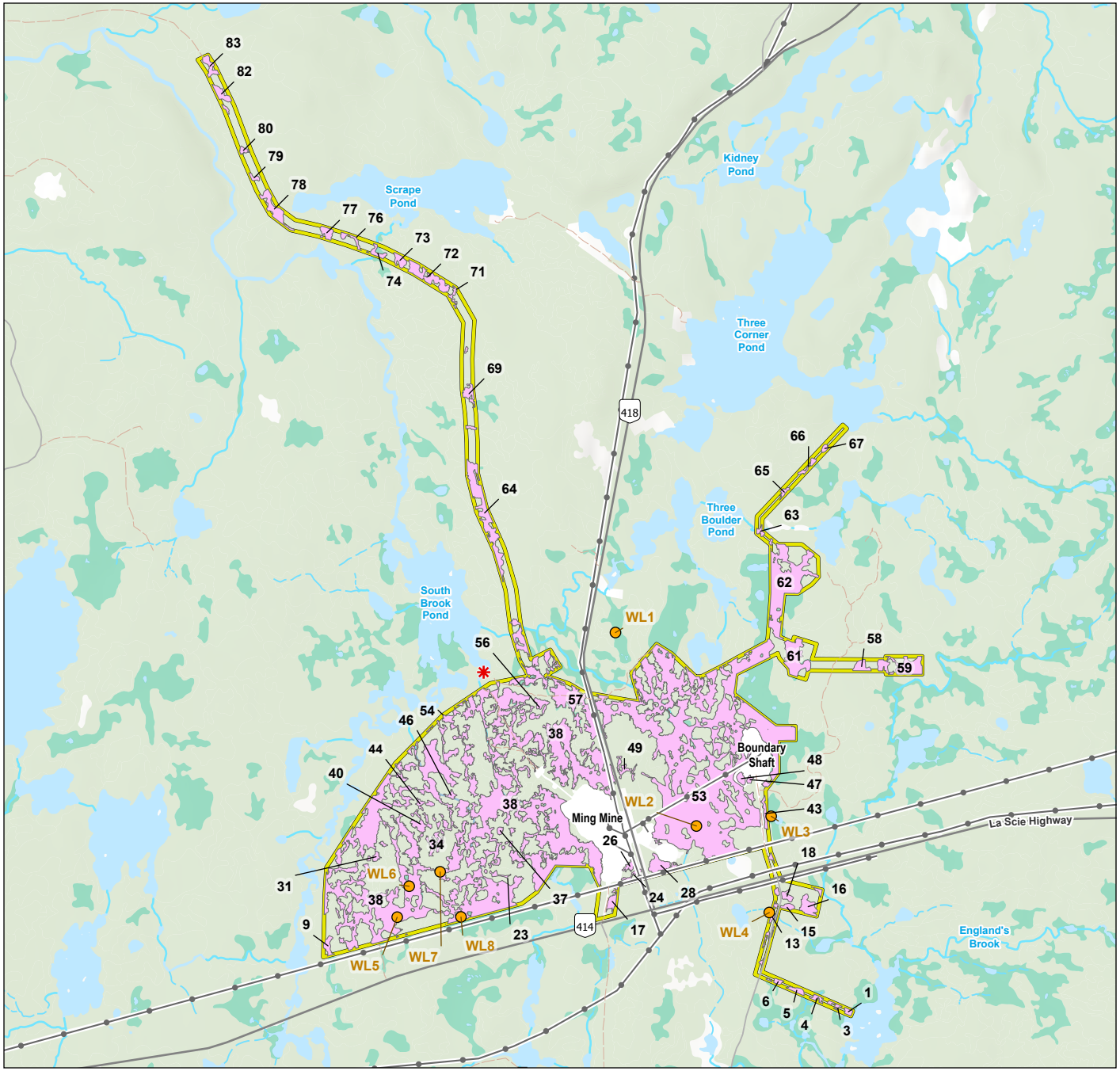


Figure No.
6.5.3

Title
Interpreted Wetland Boundaries within the Project Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_6_005

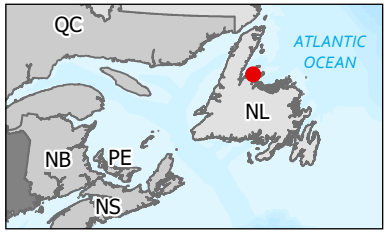
Project Location
Baie Verte, NL

Prepared by MB on 2025-03-18

N

0 400 800 Metres
(At original document size of 8.5x11)
1:33,000

- Project Area
- Final Discharge Point (FDP)
- Wetland Functional Assessment Location
- Interpreted Wetland
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.5.1.2.2 Avifauna and Other Wildlife

A total of 37 avifauna species were documented during migratory breeding bird point-count surveys in 2024 (Appendix 6.E). The five most abundant breeding bird species recorded during point-count surveys were:

- White-throated Sparrow (*Zonotrichia albicollis*; 40 individuals)
- Ruby-crowned Kinglet (*Corthylio calendula*; 33 individuals)
- American Robin (*Turdus migratorius*; 29 individuals)
- Magnolia Warbler (*Setophaga magnolia*; 26 individuals)
- Evening Grosbeak (*Coccothrastes vespertinus*; 25 individuals[2])

Fifty avifauna species were identified by ARU surveys, including 20 species that were not identified during point count surveys. Fifteen species (all previously detected) were identified during area searches (Appendix 6.E). Observations included species of woodpeckers, raptors, and waterfowl and other waterbirds. There was also one swallow (Tree Swallow [*Tachycineta bicolor*]), and one upland game bird (Spruce Grouse [*Canachites canadensis*]), identified during baseline surveys.

Woodpecker species encountered were Black-backed Woodpecker (*Picoides arcticus*), Downy Woodpecker (*Dryobates pubescens*), and Hairy Woodpecker (*Dryobates villosus*). Waterfowl and other waterbirds documented during baseline surveys were: American Black Duck (*Anas rubripes*), Spotted Sandpiper (*Actitis macularius*), Greater Yellowlegs (*Tringa melanoleuca*), Common Loon (*Gavia immer*), and Wilson's Snipe (*Gallinago delicata*).

Only one species of raptor, American goshawk (*Astur atricapillus*), was documented during baseline investigations. Osprey (*Pandion haliaetus*) and Bald Eagle (*Haliaeetus leucocephalus*) have also been documented in the region.

There were no records of avifauna SAR or SOCC in the AC CDC database as occurring within 5 km of the Project. However, three avifauna SAR were recorded during baseline surveys (Table 6.5.5): Olive-sided Flycatcher (*Contopus cooperi*); Rusty Blackbird (*Euphagus carolinus*); and Evening Grosbeak (*Coccothraustes vespertinus*). There were also two avifauna SOCC documented (Table 6.5.5): Bay-breasted Warbler (*Setophaga castanea*) and Cape May Warbler (*Setophaga tigrina*). These SAR and SOCC are not unique to habitats in or near the Project Area; historical records exist for these species on BBS route 57020 and/or within NBBA Region #3 (Baie Verte–Buchans). Other avifauna SAR that may occur in the Project Area, based on a review of previous assessments, citizen records (i.e., BBS, eBird. NBBA), and general habitat availability in the region, include Lesser Yellowlegs (*Tringa flavipes*), Red Crossbill (*Loxia curvirostra percna*), and Gray-cheeked Thrush (*Catharus minimus minimus*). The AC CDC Expert Opinion Maps also indicate that Ivory Gull (*Pagophila eburnea*) is "possible" and Short-eared Owl (*Asio flammeus*) is "possible but unlikely" within 5 km of the Project (AC CDC 2024).

[2] One observation of 25 Evening Grosbeaks

Table 6.5.5 Avifauna Species at Risk / Species of Conservation Concern Detected During 2024 Baseline Surveys

Species[1]	Status[2,3]	Detection Details[4]	Habitat Preferences[5]
Olive-Sided flycatcher (*Contopus cooperi*)	**SAR:** Vulnerable under NL ESA; Special Concern under SARA	Detected during baseline surveys in 2024 (2 records from 2 point-count locations and detected at 3 ARUs)	Breeding: Edge of coniferous / mixedwood forests with tall trees or snags for perching, alongside open habitats, wetlands, or disturbed forest
Evening grosbeak (Coccothraustes vespertinus)	**SAR:** Vulnerable under NL ESA; Special Concern under SARA	Resident species: detected during baseline surveys in 2024 (flyover – flock of 25 during one point-count, and one incidental observation in the Project Area during area wetland surveys)	Breeding: Forested habitats with large composition of fir (Abies spp.), spruce (Picea spp.), larch (Larix spp.), pine (Pinus spp.), aspen (Populus spp.) Non-breeding: nomadic; lives in large flocks
Rusty blackbird (*Euphagus carolinus*)	**SAR:** Vulnerable under NL ESA; Special Concern under SARA	Detected during baseline surveys in 2024 (2 records from a single point-count, detected at 3 ARUs, 1 observation during area searches, and 2 incidental observations during wetland surveys)	Breeding: Open canopy forested wetlands and waterbodies (riparian habitats)
Cape may warbler (*Setophaga tigrina*)	**SOCC:** ranked by AC CDC as S2B,SUM	Detected during baseline surveys in 2024 (detected at 3 ARUs)	Breeding: Medium to old aged coniferous forests with spruce and balsam fir (A. balsamea)
Bay-breasted warbler (*Setophaga castanea*)	**SOCC:** ranked by AC CDC as S2B,SUM	Detected during baseline surveys in 2024 (2 records from 2 point-count locations and detected at 1 ARU)	Breeding: Dense coniferous (spruce-fir) and mixedwood forests

Notes:

1. English and scientific names for avifauna, and taxonomic order, are based on Clements et al. (2024)
2. SAR – Species at Risk; SOCC – Species of Conservation Concern; SARA – *Species at Risk Act*; NL ESA – Newfoundland and Labrador *Endangered Species Act*; AC CDC – Atlantic Canada Conservation Data Centre
3. AC CDC Status Ranks: S2 = imperiled, SU = status uncertain, B = breeding, M = migration (AC CDC 2025)
4. Based on baseline field surveys in 2024 (ARU [Autonomous Recording Unit] surveys, breeding bird point-counts, and area searches). Locations of SAR / SOCC observations are shown on Figure 6.5.2.
5. Sources: Baltz and Latta (2020); COSEWIC (2017, 2018a); ECCC (2022); Smallwood and Bird (2020); Venier et al. (2020)

Several other wildlife species are expected to occur in or near the Project site. Mammals documented in the region include moose (*Alces alces*), American black bear (*Ursus americanus*), Canada lynx (*Lynx canadensis*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), beaver (*Castor canadensis*), muskrat, ermine (*Mustela erminea*), mink (*Neovison vison*), river otter (*Lontra canadensis*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), and southern red-backed vole (*Myodes gapperi*) (Meades 1990, Stantec 2022). Most of these species are managed by the NLDFFA-Wildlife Division (large game, small game, and furbearers) through annual hunting and trapping guidelines and regulations, and harvest quotas (Section 6.5.1.2.3 and Section 6.7.1.2.2). The AC CDC Expert Opinion Maps also indicate that polar bear (*Ursus maritimus*) is “possible but unlikely” within 5 km of the Project Area during spring and summer (AC CDC 2024).

In addition to these wildlife species, there are three mammal SAR that occur in or near the Project Area, including two bat species – little brown myotis (Myotis lucifigus), northern myotis (Myotis septentrionalis) – and the Newfoundland population of American marten, which was observed in the RAA, approximately 5 km north of the Project Area. These wildlife SAR are summarized in Table 6.5.6. There are also three species of migratory bats (hoary bat [*Lasiurus cinereus*], eastern red bat [*Lasiurus borealis*], and silver-haired bat [*Lasionycteris noctivagans*]), recently listed as Endangered under the NL ESA, that also have the potential to occur in the region (during spring and fall migration and/or summer roosting). However, none of the migratory bat species were detected during the baseline survey (Appendix 6.F).

Caribou (*Rangifer tarandus*), listed as Special Concern on Schedule 1 of SARA, is unlikely to occur in or near the Project Area, LAA, or RAA, based on historical year-round caribou distributions (i.e., collar data and seasonal ranges) and limited availability of preferred habitats in the area (Weir et al. 2014; Government of NL 2015).

Muskrat, a species of interest to the NLDFFA-Wildlife Division due to suspected declines on the Island of Newfoundland, has not been observed in the Project Area. Within the Project Area, a total of 137.4 ha of wetland habitat (i.e., potential muskrat habitat; NLDFFA 2019) was interpreted, which represents approximately 44% of the Project Area (Section 6.5.1.2.1). While specific muskrat surveys were not conducted in 2024, surveys for wetlands, rare plants, and fish and fish habitat covered large portions of the Project Area, including wetlands and waterbodies. There was no evidence of muskrat (e.g., scat, clippings, burrows, trails, tracks, feed beds, houses) recorded during the 2024 surveys and suitable habitat for this species, based on the professional opinion of field technicians with experience in muskrat surveys, was not present.

Table 6.5.6 Wildlife Species at Risk / Species of Conservation Concern Confirmed During 2024 Baseline Surveys and Atlantic Canada Conservation Data Centre Records

Species	Status[1]	Detection Details[2]	Habitat Preferences[5]
American Marten (*Martes americana atrata*) – Island of Newfoundland Population	**SAR:** Vulnerable under NL ESA; Threatened under SARA[4].	AC CDC records within 5 km of the Project and incidentally observed in the LAA during field studies in 2024 Extent of occurrence (COSEWIC 2022) overlaps the Project Area and habitat with a >60% probability of supporting marten occurs in the Project Area	Array of habitat types, including coniferous and mixed-wood forests and early seral stands. Use hollow trees, stumps, logs, and rock crevices for denning and nesting sites.
Little Brown Myotis (*Myotis lucifigus*)	**SAR:** Endangered under NL ESA and SARA	Resident bat species Acoustic records of *M. lucifigus* in the Project Area Additional acoustic records of Myotis spp. that could not be definitively identified to species-level due to overlap in call characteristics of *M. lucifigus* and *M. septentrionalis*	Roosts in colonies in anthropogenic structures, within cavities and/or peeling bark of trees, natural crevices, and other structures. Forages in open habitats, such as ponds, wetlands, and urban and suburban areas, roads, and deciduous and mixed forests and edges. Overwinters (hibernates) in underground sites, such as caves and abandoned mines.
Northern Myotis (Myotis septentrionalis)	**SAR:** Endangered under NL ESA and SARA	Resident bat species Acoustic records of *M. septentrionalis* in the Project Area Additional acoustic records of Myotis spp. that could not be definitively identified to species-level due to overlap in call characteristics of *M. lucifigus* and *M. septentrionalis*	Roosts singly or in small groups within cavities and/or loose bark of large diameter trees, in open canopy forests with high density of snags. Forages along and within primarily deciduous forests, wetlands, and riparian zones. Overwinters (hibernates) in underground sites, such as caves and abandoned mines.

Notes:
1. SAR – Species at Risk; SOCC – Species of Conservation Concern; SARA – *Species at Risk Act*; NL ESA – Newfoundland and Labrador *Endangered Species Act*; AC CDC – Atlantic Canada Conservation Data Centre
2. Based on baseline ARU (Autonomous Recording Unit) surveys in 2024 and AC CDC records. Locations of SAR observations are shown on Figure 6.5.2.
3. Sources: Canadian Bat Maternity Roost Protection Working Group (2024); COSEWIC (2022, 2023); ECCC (2018)
4. Newfoundland marten was recently (in 2024) downlisted from Threatened to Vulnerable under the NL ESA, based on improvements in numbers due to recovery efforts (NLDFFA 2024a), and was also recently (in 2022) re-assessed as Special Concern by COSEWIC (COSEWIC 2022)

6.5.1.2.3 Regulatory Boundaries

Management Areas

Provincial wildlife management areas that overlap the Project Area, LAA, and RAA include Moose Management Area (MMA) 14, Bear Management Area (BMA) 14, furbearer trap zone 8, and small game zones / areas for either the “Island of Newfoundland” or “Remainder of Island” (generally the areas outside the Avalon Peninsula). The Project Area represents 0.1% or less of each of these wildlife management areas (Table 6.7.1 in the Land and Resource Use VC).

Moose are an important large game species on the Island of Newfoundland, with more than 20,000 individuals harvested each year through a quota allocation distributed across provincial MMAs. In the absence of an apex predator capable of naturally controlling moose populations, such harvest quota allocations are necessary to keep the population in check and to protect natural habitats and other species within the ecosystems (NLDFFA 2024b). MMA 14 is a Category II MMA, which has a density target of 1.5 moose per square kilometre (km²) of productive forest (NLDFFA 2022). The harvest quota set for MMA 14 for the 2024-2025 hunting season to help achieve this goal is 1,050 animals, comprised of 500 males and 550 moose of either sex, while the total quota for the province is 27,590 (NLDFFA 2024b). NLDFFA-Wildlife Division has recently initiated a moose density mapping project (using aerial moose census data) to provide more detailed information on moose densities within the various MMAs; however, area maps and population estimates for MMA 14 are currently not available (NLDFFA 2024b).

BMAs on the Island of Newfoundland correspond to MMAs, with annual licences issued that permit the harvest of two black bears per hunting season (NLDFFA 2024b). Hunters in BMA 14 (and other BMAs) can choose to either harvest two bears in the spring, two in the fall, or one in each season (NLDFFA 2024b).

Small game licences on the Island of Newfoundland are issued for ptarmigan, grouse, snowshoe hare, and red squirrel, and 11 species of furbearers are managed and trapped in the province, including beaver, fox, lynx, coyote, mink, muskrat, otter, ermine (*Mustela erminea*), and marten (NLDFFA n.d.). Up to 35,000 people in NL are estimated to participate in small game hunting for recreational and subsistence purposes and approximately 16,000 people harvest furbearers to sell the furs and supplement their income (NLDFFA n.d.).

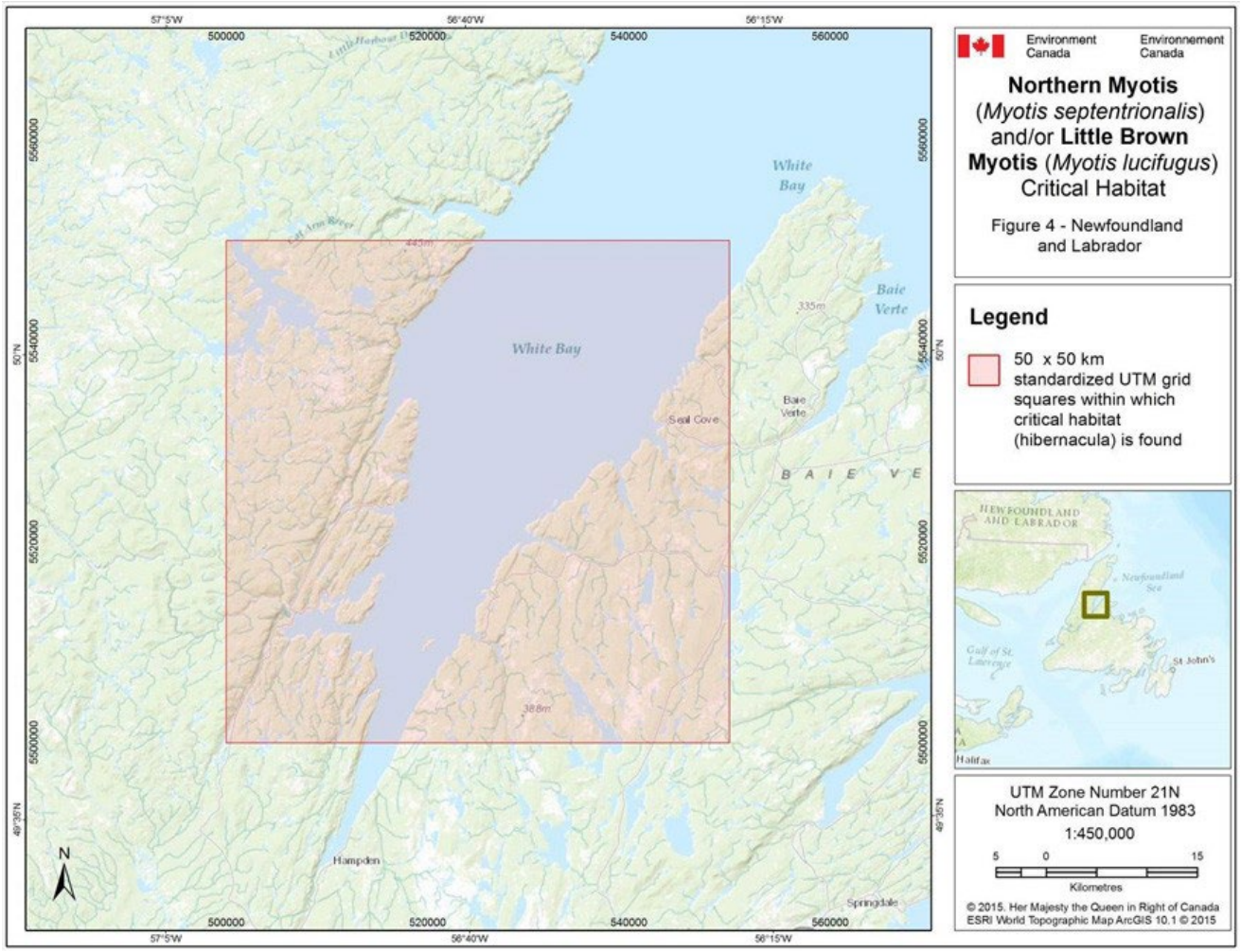
Additional details on wildlife management areas are provided in Section 6.7.1.2.1 of the Land and Resource Use VC.

Critical Habitat

Critical habitat is defined as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy or in an action plan for the species” (subsection 2(1) of SARA).

In the recovery strategy for little brown myotis, northern myotis, and tri-colored bat (*Perimyotis subflavus*), any site where hibernation has been observed at least once between 1995 and 2018 is identified as critical habitat (ECCC 2018). ECCC (2018) identifies caves, abandoned mines, hand-dug wells, cellars, tunnels, rock crevices, and tree root hollows, that meet specific temperature (between 2˚C and 10˚C) and relative humidity (>80%) requirements and where light and noise levels are low, as potential hibernacula sites. A 50 km x 50 km grid square containing critical habitat for little brown myotis and/or northern myotis has been identified in the White Bay area (ECCC 2018), approximately 14 km west of the Project Area (Figure 6.5.4) and there is potential for other hibernacula to occur in the region. Although there are underground workings at the Project site, mining activities have been continuous at the site (through operation until 2023, on-going care and maintenance, and exploration) and historic (inactive) underground sites are flooded (C. Greenham, pers. comm., November 29, 2024). As such, hibernacula are not expected in existing infrastructure.

Critical habitat has also been identified for American marten on the Island of Newfoundland, but is also outside of the Project Area. However, their extent of occurrence (COSEWIC 2022) overlaps the Project Area and habitat with a >60% probability of supporting marten occurs in the Project Area. There is an AC CDC record of marten within 5 km of the Project and this species was also incidentally observed in the LAA during field studies in 2024. Baseline studies were initiated in winter 2025 to confirm presence of American marten in the Project Area.



Source: ECCC (2018)

Figure 6.5.4 Standardized Universal Transverse Mercator (UTM) Grid Square Containing Critical Habitat for Little Brown Myotis (*Myotis lucifugus*) and/or Northern Myotis (*Myotis septentrionalis*) in Newfoundland and Labrador

6.5.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Terrestrial Environment is provided in Table 6.5.7. Potential environmental effects and effects pathways were selected based on the review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.5.7 Potential Effects and Effect Pathways for the Terrestrial Environment (including Species at Risk)

Potential Effect	Effect Pathway(s)
Change in wetland function	• Loss or disturbance to wetlands and change in wetland functions could occur by a direct disturbance (loss) from Project construction activities, primarily through mine site preparation and earthworks • Changes to wetland function can occur through conversion of wetland class and type through vegetation removal and disturbance, edge effects, and changes in wetland hydrology
Change in species diversity, community diversity, and/or habitat	**Vegetation** • Site preparation could result in the direct loss of vascular plant species, including SAR or SOCC, and plant communities, within the Project Area • Site clearing can result in indirect interactions on adjacent areas through edge effects, including changes in microclimate, vegetation structure, plant dispersal, and access for herbivores (Harper et al. 2005; Murcia 1995) • Removal of soils and excavation activities will remove any vegetation remaining after clearing, and will likely remove the associated seedbank and compact remaining soil layers, changing habitat quality for plants that may later regenerate within the area • Transportation can result in dust deposition onto vegetation, which can cover leaves and block stomata, reducing photosynthesis and causing other physiological effects (Farmer 1993), as well as altering soil chemistry (Brown 2009) • Fluctuations in water levels at the water intake locations can result in changes to hydrology in the adjacent wetlands, potentially resulting in changes in species composition • Transportation along access roads throughout the life of the Project has potential to affect species diversity by introducing or aiding in the spread of invasive or non-native species • Indirect interactions on adjacent areas through edge effects, including changes in microclimate, vegetation structure, changes to wildlife presence and/or abundance, and behavioral responses of wildlife (Harper et al. 2005; Murcia 1995) **Avifauna and Other Wildlife Habitat** • Site preparation could result in the direct loss of suitable habitat and important habitat features such as nests, denning sites, maternity roosts, or hibernacula • Vegetation clearing can result in habitat fragmentation, which can have particularly detrimental effects on species with large ranges, and those that require large patches of interior forest or other types of homogenous habitat • Indirect interactions on adjacent areas through edge effects, including changes in microclimate, vegetation structure, changes to wildlife presence and/or abundance, and behavioral responses of wildlife (Harper et al. 2005; Murcia 1995) • Construction and operational activities can result in indirect effects on habitat through sensory disturbance (e.g., noise, light pollution, dust, vibrations, odors, and human presence). Sensory disturbance can result in avoidance behaviours and/or alter movement patterns of animals. Sensory disturbance from odors can also attract wildlife.

Table 6.5.7 Potential Effects and Effect Pathways for the Terrestrial Environment (including Species at Risk)

Potential Effect	Effect Pathway(s)
Change in mortality risk of avifauna and other wildlife	• Direct change in mortality risk due to vegetation clearing and site preparation activities, vehicular collisions, and human-wildlife conflicts • Indirect change in mortality risk due to changes in wildlife health and survival, including increased stress and/or reduced body condition (e.g., increased physiological stress in wildlife may increase their susceptibility to disease [e.g., Hing et al. 2016]) • Increase in predation, hunting and/or poaching because of improved access or other habitat changes • Wildlife mortality risk could increase from the accidental release of toxic substances or wastes

6.5.3 Mitigation and Management Measures

As discussed in Section 2.11, FireFly has revised the Ming Mine EPP, including identification and addition of mitigation measures and contingency plans required to address new and / or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on the Terrestrial Environment (including SAR), including environmental protection procedures (section 4 of the EPP) and contingency plans (section 5 of the EPP) identified for the following Project activities and to address potential incidents and unplanned situations:

- Surveying (Section 4.1 of the EPP)
- Buffer Zones (Section 4.2 of the EPP)
- Laydown and Storage Areas (Section 4.3 of the EPP)
- Clearing Vegetation (Section 4.4 of the EPP)
- Grubbing and Disposal of Related Debris (Section 4.5 of the EPP)
- Exploration Drilling (Section 4.11 of the EPP)
- Storage, Handling and Transfer of Fuel and Other Hazardous Material (Section 4.15 of the EPP)
- Waste Disposal (Section 4.17 of the EPP)
- Sewage Disposal (Section 4.18 of the EPP)
- Hazardous Waste Disposal (Section 4.19 of the EPP)
- Vehicle Traffic (Section 4.20 of the EPP)
- Dust and Air Contaminant Control (Section 4.21 of the EPP)
- Noise and Light Control (Section 4.22 of the EPP)
- Road Maintenance (Section 4.23 of the EPP)
- Drilling and Blasting (Section 4.25 of the EPP)

- Wildlife Management (Section 5.2 of the EPP)
- Avifauna Management Plan (Section 5.3 of the EPP)

The following mitigation measures specific to the Terrestrial Environment (including SAR) have also been identified for the Project:

- During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including area of vegetation clearing. Existing disturbed areas were incorporated into the Project Area to accommodate Project components and, where possible, to reduce direct effects on forest cover and other vegetation communities. Standard construction best practices will be used during the site preparation and construction phase to reduce the potential negative interactions on vegetation, wildlife, and their habitats, including wetlands.
- Vehicles and equipment will be operated on previously disturbed areas, wherever feasible.
- The limits for approved disturbance activities including clearing, grubbing and topsoil overburden removal will be clearly identified (flagging / survey stakes) in the field prior to the commencement of work.
- Currently, it is planned to cap the historic waste rock in the area of Boundary Shaft, which will reduce potential for disturbance or dust lift-off from this potentially acid generating (PAG) waste rock. Based on current configuration of infrastructure, there are no plans to disturb soils that are impacted by historic mining activities; however, if inadvertently disturbed, the impacted material would be removed from site and disposed of in accordance with applicable regulations or managed on site in accordance with best practices for metal leaching / acid rock draining (ML/ARD) materials.
- Waste rock used to upgrade or construct site roads, pads or any other infrastructure area will be non-PAG material. This may come from an existing, permitted off-site quarry or could be quarried onsite within the footprint of the tailings management facility (TMF), depending on the results of geochemical testing. Non-PAG waste rock may also come from the Project mine development and from other nearby operations depending on the results of geochemical testing.
- Buffers will be established and maintained around identified sensitive areas (e.g., wetlands, rare plant occurrences, hibernacula, roosts), where feasible.
- Grading, if required, will be directed away from wetlands, where possible, and grading will be reduced within wetland boundaries unless required for site-specific purposes.
- The drainage system for the site will be designed with basins to collect contact water from mine wastes and appropriately sized to manage stormflows, considering impacts to on-site downstream watercourses, wetlands, and infrastructure.
- Equipment will arrive at the construction site clean and free of soil and vegetative debris, to reduce the risk of introducing or spreading non-native and/or invasive vascular plant species. Equipment will be inspected and either approved for use or cleaned, re-inspected and approved for use.

- Specific stockpiles of topsoil, overburden, and other potentially dust-generating materials will be kept covered, where practical, and used as soon as practical, or will be appropriately temporarily vegetated.
- If invasive vascular plant species are noted within or near the Project Area during construction or operation, the extent of the species will be assessed and a plan for removal and/or control will be developed.
- If vegetation clearing occurs during the active bat season (approximately May 1 to October 31), targeted pre-clearing surveys for bat maternal colonies/roost sites will be conducted in trees with a diameter at breast height of greater than 25 cm in those areas proposed to be cleared and where suitable habitat exists.
- If possible, large diameter trees will be maintained, especially those that are dead or dying. These types of trees typically have peeling bark, crevices and cavities that provide important roosting habitats for bats.
- Caves, sinkholes, fissures, or other underground cavities that are identified as a result of Project activities will be inspected for signs of previously overwintering bats and reported to the Wildlife Division.
- Observations of bat colonies, potential hibernacula sites, or sick or dead bats will be reported to the provincial Wildlife Division at 709-637-2025 or through the toll-free bat hotline: 1-877-434-2287 (BATS).
- Prior to demolishing / deconstructing existing buildings and infrastructure, surveys for breeding birds and roosting bats will be conducted.
- The discovery of bat roosts or hibernacula, or active dens (e.g., marten dens), will be reported immediately to the Health, Safety and Environmental Superintendent or designate and work will cease. A plan for protection, avoidance, and/or mitigation will be established by FireFly, guided by engagement with a qualified biologist and/or federal or provincial regulators.
- Additional mitigation may involve offering alternate habitat (e.g., artificial structures such as bat boxes) to off-set the loss of roosting habitat as a result of development.
- Project lighting will be limited to that which is necessary for safe and efficient Project activities. Mobile and permanent lighting will be located such that unavoidable light spill of the working area is not directed towards receptors outside the Project Area, to the extent practicable.
- Water management infrastructure will be designed to allow wildlife crossing opportunities.

6.5.4 Residual Environmental Effects

Potential environmental effects on the Terrestrial Environment were identified in Section 6.5.2. For the Terrestrial Environment, three effects were identified: change in wetland function, change in species diversity, community diversity, and/or habitat, and change in mortality risk. Residual effects (i.e., those remaining following implementation of mitigation [Section 6.5.3]) for each Project phase are evaluated below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining activities. FireFly will use previously disturbed / cleared areas for Project development to the extent possible; however, the new 6 km port access road represents a new linear feature on the landscape.
- The Project Area covers approximately 310.9 ha (3 km²) of disturbed (e.g., cleared land, roads; 10% of the Project Area) and undisturbed (e.g., wooded, wetland; 90% of the Project Area) areas that will be lost or altered during Project construction (Table 6.5.8). It is assumed that 100% of the Project Area will be directly lost or disturbed. The Project Area includes areas where surface water is considered to be affected by historic mining activities, with elevated levels of metals/metalloids (e.g., zinc, copper) and acidic conditions (Section 6.3).
- A total of 230 vascular plant species or genera were observed during field surveys conducted in support of the Project. No vegetation SAR and three vascular plant SOCC were observed during these field surveys. Two of the three vascular plant SOCC are outside of the Project Area.
- Three avifauna SAR were recorded during baseline surveys: olive-sided flycatcher, rusty blackbird, and evening grosbeak. There were also three avifauna SOCC documented: bay-breasted warbler, cape may warbler, and American kestrel. Other avifauna SAR that may occur in the Project Area, based on historical records on the Baie Verte Peninsula, include red crossbill and gray-cheeked thrush.
- There are three mammal SAR that occur in or near the Project Area: little brown myotis, northern myotis, and the Newfoundland population of American marten. There are also three species of migratory bats (hoary bat, eastern red bat, and silver-haired bat), recently listed as Endangered under the NL ESA, that may occur in the area.
- There was no evidence of muskrat, a species of interest to the NLDFFA-Wildlife Division, noted during baseline surveys. Based on professional opinion, suitable habitat for this species does not occur in the Project Area.
- Due to the ongoing activities at the mine site, the residual effects resulting from sensory disturbances (e.g., noise, light, dust, vibrations, human presence) associated with the Project are not new. Instead, they represent potential incremental increases in the intensity or extent of existing disturbances. Ongoing activity at the Project site has likely resulted in avoidance of the area by some wildlife and habituation / accommodation of the activities by other wildlife.
- Existing mitigation measures and contingency plans identified in the EPP will continue to be in place for the Project and will serve to avoid or reduce potential residual effects on the Terrestrial Environment.

Table 6.5.8 Land Cover Types within the Project Area: Area, Relative Percent, and Percent of Area in the Regional Assessment Area

Land Cover Types in the Project Area[1,2]	Area within Project Area		
	ha	% of total Project Area	% of Area in RAA[5]
Wooded			
Coniferous Scrub	125.0	40.8	3.8
Deciduous Scrub	2.0	0.6	3.3
Mixedwood - Immature	10.0	3.3	2.7
Mixedwood - Semi-mature	0.2	0.1	1.4
Mixedwood - Over-mature	1.1	0.4	2.2
Softwood - Regenerating	13.8	4.5	1.7
Softwood - Immature	37.1	12.1	1.4
Softwood - Semi-mature	13.8	4.5	6.7
Softwood - Mature	4.2	1.4	5.4
Softwood - Over-mature	19.5	6.4	1.2
Softwood - Uneven aged	0.4	0.1	2.0
Unknown Forest	6.9	2.2	1.8
Wetlands / Waterbodies			
Wetland - Bog	33.8	11.0	2.2
Wetland - Wet Bog	2.7	0.9	3.2
Water	3.2	1.0	0.3
Disturbed			
Past Disturbance - Harvest	7.9	2.6	7.2
Corridor – Road / TL	6.8	2.2	21.4
Cleared Land	17.9	5.9	15.7

Notes:
1. Additional land cover types occur in the Local Assessment Area and/or RAA (Table 6.5.3).
2. Wooded and wetland areas contain historically impacted soils resulting from past activities that have occurred within the Project Area.
3. RAA = Regional Assessment Area. The RAA (and associated numbers presented in this table) are unique to the Terrestrial Environment.

6.5.4.1 Change in Wetland Function

Construction of the Project could result in a change in wetland function through direct disturbance or through changes in hydrology. These interactions are expected to occur primarily through site preparation and civil works activities. These activities involve vegetation clearing, which will remove woody vegetation such as trees and shrubs, and potentially damage herbaceous understory vegetation, resulting in a change in wetland composition and structure. Soil disturbance associated with these activities will remove organics and other soil layers, and may include infilling, which will result in the loss of wetland area or change in wetland function.

Losing wetland area will result in changes to and loss of wetland functions from the Project Area and LAA. The Project will result in a decrease in wetland habitat available for hydrophytic plants, including SOCC, and wildlife that use wetlands, such as waterfowl, though this habitat will remain abundant within the LAA and RAA. Wetlands in the Project Area are primarily peatlands, and thus loss of these wetlands will result in a loss of organic carbon sequestration function (Glenn et al. 2006). The hydraulic function of wetlands such as fens will be reduced in portions of wetland areas remaining after implementation of the Project. Similarly, water quality functions will be reduced. There are no identified public water supply areas within the Project Area, and no known issues with flooding, so the potential losses of these wetland benefits are not expected to be an issue for the LAA.

Areas that are cleared but not infilled will experience a conversion of wetland habitat (i.e., a change from one wetland type to another). As different wetland classes, forms, and types perform different wetland functions to varying degrees, a change in wetland function, such as a change in wildlife habitat function, can be expected from wetland conversion.

Some non-native species were noted within and near the Project Area during vascular plant surveys conducted in support of the Project, including creeping buttercup, which is considered invasive in other jurisdictions. Though this was observed outside of the Project Area, Project activities such as transportation could introduce this and other invasive vascular plant species to wetlands and other habitats adjacent to access roads and other areas where vehicles are operated. However, with planned mitigation and the presumed low incidence of invasive plant species in the LAA, the potential reduction in function resulting from the introduction of invasive plant species is expected to be limited.

Currently the mine discharges into South Brook Pond, and the discharge location for the Project will remain the same. Changes to discharge volumes could result in changes to the water table in wetlands adjacent to South Brook Pond, which could potentially change wetland area or alter wetland classes or types, resulting in a change in wetland function in this area. Other water control mechanisms such as ditching could result in similar hydrological changes on a lower scale in other areas within the LAA. Water levels and expected changes as a result of the Project are further discussed in Section 6.3. In general, water balances will be managed onsite with the intent of water discharges and freshwater withdraws being within the natural ranges of existing systems.

The NL land cover data indicate there is 36.5 ha of wetland habitat within the Project Area, which represents approximately 14.8% of the wetland within the LAA, and 2.2% of wetland within the RAA. Many of the wetlands within the Project Area, specifically those surrounding Boundary Shaft and into portions of the LAA, contain historically impacted soils from legacy mining activities. Project-related ground disturbance in these areas could change the area affected by historically impacted soils, if they are not properly managed. Loss of wetland area from areas with historically impacted soils could represent less of a loss of wetland function relative to unaffected areas, as these areas are inherently lower functioning for many types of ecological functions; however, it is possible that they may be performing important water quality functions, and the benefit or value of these functions may be relatively high.

Indirect effects within wetlands and other habitats are expected to extend beyond the Project Area into the LAA but are not expected to extend to the boundary of the LAA in most cases. In many instances, these effects are expected to occur in downstream environments, many of which contain historically impacted soils associated with past legacy mining activities that have occurred within the Project Area, LAA, and RAA.

Overall, Project-related residual effects on wetland function will be both direct and indirect. Direct effects to a change in wetland function will occur primary through loss during Project construction and indirect effects are expected throughout all Project phases. Mitigation measures (Section 6.5.3) and best practices will reduce the total change in wetland function, directly and indirectly, throughout the life of the Project. This includes a Project design that maximizes the use of the current (i.e., previously disturbed) footprint and the implementation of standard mitigation to reduce potential adverse effects such as edge effects, changes in hydrology, and the spread of invasive, non-native species. FireFly has engaged EcoMetrix to conduct rock characterization studies to delineate existing ML/ARD conditions on site as a result of historical mining and development. These studies will present detailed management and closure plans for the ML/ARD materials on site for future development and closure planning.

6.5.4.2 Change in Species Diversity, Community Diversity, and/or Habitat

The Project is in an area with a long history of mining operations and, as such, much of the terrestrial habitat in the Project Area is already heavily disturbed, either directly or indirectly. FireFly will use previously disturbed / cleared areas for Project development and many existing facilities will be expanded and/or redesigned for the Project; however, site preparation in other locations will involve clearing, grubbing, stripping, grading, drilling and blasting, excavating, and pre-stripping. Key additions to the Project include the construction of the process plant and TMF onsite, a port access road to the north, and the expansion of underground mining areas during operations. Site preparation activities during Project construction could result in the loss or alteration of an estimated 281.4 ha of vegetation communities (including wetlands) and habitat (Table 6.5.8). This assumes that those smaller portions of the Project Area that will not be directly disturbed, will likely be indirectly disturbed.

6.5.4.2.1 Vegetation

Construction of the Project will result in changes to vegetation species and communities through the direct removal of vegetation, and indirectly through edge effects, including changes to abiotic conditions in areas adjacent to where vegetation was removed. Changes to plant species diversity, the area of vegetation communities, and to the structure of directly and indirectly affected vegetation communities are expected to occur within the Project Area and portions of the LAA.

Project interactions with vegetation are expected to primarily occur during construction, when vegetation clearing and site preparation for Project infrastructure will remove plant species, including some vascular plant SOCC, and vegetation communities. Clearing is expected to remove trees and shrubs, and damage understory vegetation. Site preparation activities such as excavation and infilling will remove remaining vegetation, and may compact soils and remove the existing seedbank, affecting the vegetation communities that could later regenerate within the area. One vascular plant SOCC, bog willow, was

observed at two locations within the Project Area (Figure 6.5.2). It is expected that both instances of this species will be directly lost as a result of site preparation activities; however, the wetland vegetation communities where this species was found are common within the LAA and RAA, and it is considered likely that this species occurs in these habitats in other locations within the LAA and RAA.

Some reduction of the area of previously undisturbed vegetation communities (represented by various wooded and wetland land cover types) will occur as a result of the Project. The amount of individual relatively undisturbed, vegetated land cover types within the Project Area represents from 1.2 to 6.7% of the area of those land cover types within the RAA (Table 6.5.8). Generally, though some vegetation community loss is expected, there are no land cover types that will not remain abundant within the RAA, if the entire Project Area is affected.

Edge effects in temperate forests at anthropogenic edges have generally been documented to extend a maximum of 180 m but average less than 50 m (Franklin et al. 2021) and start to decline after 20 m (Harper et al. 2005, 2015). Within this distance, edge effects can alter abiotic conditions including light, air and soil temperatures, and humidity, which in turn can lead to secondary changes in community composition, including changes in plant competitive ability and a potential increase in non-native and invasive species. Although extremely invasive plant species can potentially affect vegetation communities up to 1 km from an edge in undisturbed habitat (Henderson 2011; Vakhlamova et al. 2016); this is considered unlikely in the LAA as the potentially invasive species that were noted are not considered extremely invasive. Transportation in and around the Project Area can provide or move source material (i.e., propagules) of invasive and non-native species, therefore aiding in the spread of these species. Several species were observed within or adjacent to disturbed habitats within the Project Area and surrounding surveyed areas that are considered invasive in other jurisdictions. Planned mitigation measures will reduce the spread of invasive plant species within the Project Area but may not be able to eliminate this from occurring. However, no measurable changes to species and community diversity are expected to occur. Non-native and invasive plant species (if they occur) are expected to primarily establish in disturbed areas.

The operation of vehicles on roadways and within the site can generate dust which may then be deposited onto vegetation. Dust can cause physiological changes (Farmer 1993) and change soil chemistry (Brown 2009), both of which can result in changes to plant communities (Hosker and Lindberg 1982). The distance of dust penetration into surrounding vegetation communities and habitats is affected by site-specific characteristics (Walker and Everett 1987) but is expected to be restricted to the LAA. This issue of dust is of particular concern in areas that are currently affected by historically impacted soils. Exceedances in metals and metalloids in historically impacted soils within and around the site is typically spread through water flow, and spreading these metals through dust could introduce them to new areas that have previously been unaffected. Planned remediation measures should reduce the instance of excess metals and metalloids spread by dust. FireFly has engaged EcoMetrix to conduct rock characterization studies to delineate existing ML/ARD conditions on site as a result of historical mining and development. These studies will present detailed management and closure plans for the ML/ARD materials on site for future development and closure planning.

Two options are proposed for water intake for the Project (Figure 2.5.1), as well as the currently approved water taken at Jenkins Pond. Water levels in these areas may fluctuate during operations, which could affect some species in adjacent wetlands that are less tolerant of varying water levels. One instance of bog willow was noted near Water Intake A (Figure 6.5.2). Though this observation was within the planned footprint and the instance will likely be directly lost due to site preparation activities. If other instances of bog willow exist in the same wetland outside of the Project Area, they may be affected by fluctuating water levels as a result of the Project. However, there is similar habitat appropriate to support bog willow in other areas of the LAA and RAA that are not expected to be affected by the Project.

The Project is expected to result in some changes to species and community diversity for vegetation. However, only one vegetation SOCC is expected to be affected by the Project (bog willow), and though some individuals will be lost, it is likely this species exists elsewhere in the RAA, and the persistence of this species in the region is not expected to be affected as a result of the Project. Similarly, some vegetation communities within the Project Area will be lost as a result of the Project; however, much of the Project Area has been directly or indirectly affected by past mining activities and the change in vegetation communities within the RAA will not threaten the long-term persistence or viability of the species found within them.

6.5.4.2.2 Avifauna and Other Wildlife

Direct effects on avifauna and other wildlife habitat will occur primarily through vegetation removal. If present in the Project Area, there is the potential for important habitats and habitat features, such as nests, dens, burrows, maternity roosts, or hibernacula, to be altered or lost during this phase. This includes habitat for several SAR, including avifauna, bats, and American marten, that use trees for roosting, denning, and nesting during breeding.

The Project Area covers approximately 310.9 ha (3 km²) of disturbed (e.g., cleared land, roads) and undisturbed (e.g., wooded, wetland) areas that will be lost or altered during Project construction (Table 6.5.3). Undisturbed land cover types in the Project Area comprise a relatively small portion (i.e., 0.3% to 6.7%) of their availability in the RAA (Table 6.5.8). Most of the habitat in the Project Area is classified as coniferous scrub (125 ha, or 40.8% of the Project Area) and immature softwood (37.1 ha, or 12.1% of the Project Area) that is typically to be used by some avifauna (e.g., upland game birds, American kestrel [SOCC]) and other wildlife (e.g., moose). These land cover types represent 3.8% and 1.4%, respectively, of the total availability in the RAA (Table 6.5.8). Wetlands and waterbodies also comprise approximately 12.9% of the Project Area (39.6 ha), which are an important habitat component of SAR known to occur in the area, including rusty blackbird, olive-sided flycatcher, and little brown myotis; wetlands and waterbodies in the Project Area represent 2.2% to 3.2% and 0.3%, respectively, of the total availability in the RAA (Table 6.5.8). However, important habitat features for SAR, such as large diameter trees for roosting or denning and tall trees or snags for perching, are expected to be relatively uncommon in the Project Area, based on the distribution of land cover classes identified in Table 6.5.3.

Vegetation removal can also result in habitat fragmentation and the creation of edge habitats. Linear features in particular, such as the port access road, create an abrupt linear edge and increase the proportion of edge habitat in an area. Edge effects may include changes in the microclimate, light, and vegetation structure of avifauna and other wildlife habitats. This can have varying effects depending on the species, but may have the greatest effects on those species with large ranges (e.g., moose) or those that prefer larger patches of homogenous habitat (e.g., forest interior dwelling birds). For example, bats require connectivity between roosting and foraging areas, and the fragmentation or loss of these areas could increase travel distances, resulting in increased energetic costs (ECCC 2018). Alternatively, foraging little brown myotis are often associated with open habitats, including roads (ECCC 2018). Other species, such as olive-sided flycatcher, preferentially use edge habitats, while species such as Newfoundland marten appear to have evolved in a naturally fragmented landscape to use a wide variety of habitat types (COSWEIC 2018, 2022).

On-going activity at the Project site, has likely resulted in avoidance of the area by wildlife, however indirect effects on a change in habitat through sensory disturbance (e.g., noise, light, dust, vibrations, human presence) are expected to continue and/or increase relative to current activities at the mine site, and will extend into the LAA. Activities such as blasting, the use of heavy equipment, and increased traffic volumes result in increased noise, light, dust deposition, and other emissions (e.g., exhaust) can have adverse effects on avifauna and other wildlife habitat. Existing mitigation measures identified in the EPP will serve to reduce potential residual effects from sensory disturbance (described below) associated with new and / or expanded Project components and activities.

Noise, light, and vibrations generated where maternity colonies are found have the potential to disturb bats and may result in roost abandonment, with potential effects on reproductive success (ECCC 2018). In general, however, as the preferred natural summer roosting habitat for bats is in older forest stands, the magnitude of potential adverse residual effects on maternity roost sites is anticipated to be low as there is little habitat of this type in the Project Area and LAA. Noise can also affect a species ability to communicate; chronic noise exposure can reduce the distance and area over which acoustic signals are heard, which can have adverse effects on foraging, anti-predator behaviour, and reproductive success (Barber et al. 2010). Noise levels that are more than 10 decibels above ambient levels, or that are greater than 50 decibels, have the potential to disrupt avifauna (ECCC 2023b). These effects are generally considered greatest if disturbance occurs during critical life stages, such as courtship or breeding. Alternatively, there is evidence that some species (e.g., mink) readily habituate to noise disturbances (AMEC Americas Limited 2005).

Light associated with vehicle traffic, heavy equipment, or other on-site equipment and lighting, has the potential to attract or disorient nocturnally migrating birds (Poot et al. 2008) or may influence the behaviour and activity of some animals. Artificial light near bat roosts has the potential to delay the onset of emergence, which can have implications on foraging success (Boldogh et al. 2007). Alternatively, the presence of site lighting has the potential to benefit little brown myotis, which are efficient aerial hawkers that may opportunistically feed on insects that become concentrated around light sources (ECCC 2018). Other prey species may avoid lit areas because of increased risks of predation (e.g., Clarke 1983). Section 6.1 includes mitigation measures for site lighting, including a requirement to follow lighting design guidelines and to limit Project lighting to that which is necessary for safe and efficient Project activities.

Traffic and maintenance activities on the port access road and other areas on-site may also indirectly affect habitat through dust deposition in adjacent areas (Section 6.5.4.2.1). Depending on the level of activity, this has the potential to reduce habitat suitability for some (edge) species (e.g., reduced forage for moose). Standard mitigation measures to reduce the residual effects from dust, such as the covering of transported materials (ore and concentrate) and procedures for dust control (e.g., application of water), are included in Section 6.1.

Overall, Project-related residual effects on habitat will have direct and indirect effects on avifauna and other wildlife. Direct changes to habitat will occur primarily during Project construction while indirect effects on a change in habitat are expected to occur and/or increase relative to current activities throughout all Project phases. Mitigation measures (Section 6.5.3) and best practices will reduce the total amount of habitat lost or altered, directly and indirectly, throughout the life of the Project. This includes a Project design that maximizes the use of the current (i.e., previously disturbed) footprint and the implementation of standard mitigation to reduce potential adverse effects from noise, light, dust, and vibrations associated with blasting and other activities. Additional species-specific mitigation includes (to the extent practicable) the retention of important habitat features, if present, such as large diameter trees that are potential summer roost sites for bats (e.g., dead or dying trees with peeling bark, crevices, and cavities), surveys for bats in buildings and other site infrastructure prior to their removal, and avoidance of vegetation clearing during the migratory bird breeding season. Should any key habitat features (e.g., hibernacula, maternity roots, raptor nests, marten dens, muskrat burrows) be encountered during any phase of the Project, work will immediately cease, and the Health, Safety and Environmental Superintendent or designate and Wildlife Division will be contacted. Appropriate follow-up actions will be guided by consultation with a qualified biologist and/or federal or provincial regulators.

6.5.4.2.3 Summary

With mitigation, the residual effect of a change in species diversity, community diversity, and/or habitat is not expected to be significant because the change is not expected to threaten the long-term viability of species diversity, community diversity and/or habitat in the RAA. Previously undisturbed habitats in the Project Area that will be lost or altered due to the Project comprise a relatively small portion (i.e., 0.3% to 6.7%) of their availability in the RAA, and potential indirect effects from elevated sensory disturbance, as well as possible changes to wildlife habitat and plant diversity from invasive species, groundwater or surface hydrology, or edge effects, will only affect a relatively small proportion of the RAA and will not result in the permanent impairment of habitat or its use by wildlife, including SAR.

6.5.4.3 Change in Mortality Risk

The primary pathway for a change in the mortality risk to avifauna and other wildlife is a direct risk to individuals if clearing and site preparation activities occur during sensitive periods (e.g., nesting, denning, roosting, hibernating). For example, if clearing activities occur during the regional nesting season for migratory birds (mid-April to mid-August; ECCC 2024), there is an increased risk of mortality to eggs and flightless young, which are protected under the MBCA. There is also an increased mortality risk to other species with overlapping sensitive periods, including SAR such as little brown and northern myotis (maternity roosting) and American marten (denning). The risk of direct mortality to avifauna and wildlife

SAR will be reduced through the implementation of timing restrictions on activities that involve the removal of vegetation, such as limiting clearing during the migratory bird breeding season. Should vegetation clearing be completed during this period, activities will be conducted in accordance with the EPP (including the Avifauna Management Plan, Section 5.3 in Appendix 2.C) and additional mitigation will be implemented (e.g., nest sweeps, setbacks) to manage the potential for adverse effects on avifauna and other wildlife, including SAR.

Drilling and blasting and associated vibrations also have the potential for increased mortality risk to bats, as these activities have the potential to result in the collapse of entrances to hibernacula or to arouse bats from torpor, the latter which can have substantial effects on their limited energy reserves during hibernation (ECCC 2018). While there are no known hibernacula in the RAA, it is possible additional overwintering sites may be discovered. If active hibernacula are encountered during blasting, work will immediately cease, and the NLDFFA-Wildlife Division contacted. Similarly, if active roost sites, bird nests, or dens are discovered, work will immediately cease until appropriate follow-up is determined.

Collisions with Project vehicles or other Project equipment (e.g., site lighting) may also directly affect mortality risk of avifauna and other wildlife. The risk of mortality is influenced by factors such as traffic volumes, vehicle speeds, wildlife speeds, the presence of preferred habitat, season, and time of day (e.g., fall rut, bat swarming, dusk and dawn), and will likely be highest along the new port access road, an area of primarily natural habitat that is further from sensory disturbance and where wildlife are likely to be more common. Species that can be difficult for drivers to see (e.g., nocturnal species including bats and American marten) may be more susceptible to direct mortality. Overall, the mortality risk from wildlife-vehicle collisions is expected to be low, as mitigation measures will continue to be implemented to reduce traffic speeds (i.e., signed speed limits, wildlife crossing signs, driver training) and wildlife presence (e.g., removal of roadkill, gaps in snow banks to allow animals to easily exit), and to increase lines of sights (e.g., adequate vegetation clearing on corners). In addition, Project-related vehicles and equipment are required to yield to wildlife. However, should locations of high frequency interactions be identified, adaptive management measures will be developed and implemented to reduce the mortality risk to avifauna and other wildlife.

Increased mortality risk of avifauna and other wildlife may also result indirectly, through increased hunting / harvest pressure (hunting and/or poaching) due to improved access. The port access road, linking the process plant to the port approximately 6 km north of the Project, is an area of new access associated with the Project. The development of the port access road could also influence the mortality risk of prey species by facilitating predator movements and hunting efficiency (Dickie et al. 2020). To reduce pressures from hunting / harvesting, a no hunting and no trapping policy has been implemented for workers at the site. In addition to standard traffic control measures, FireFly will be controlling access using gates and signage to prevent public use.

Human-wildlife conflicts can also result if wastes are improperly disposed of or if pets (i.e., dogs) are brought on site, which can attract potential predators (e.g., American black bear) and result in unintended injury or mortality. Mitigation measures included in the EPP to reduce human-wildlife conflicts include a requirement to keep working areas clean of food scraps and garbage, to collect wastes in appropriate containers only, and to routinely transfer wastes to the local landfill. Project personnel are also prohibited from feeding wildlife (including birdfeeders) and from bringing personal pets to the site.

The ingestion and/or absorption of water in the TMF or other areas also has the potential to result in a change in mortality risk. Although cyanide is currently not proposed as part of ore processing, future use could be considered to improve gold and silver recoveries. Wildlife deaths associated with cyanide-bearing mine wastes have been reported, with avifauna having the greatest risk of mortality (Donato et al. 2007). Use of the TMF and other Project features, by avifauna or other wildlife, will be monitored and adaptive management measures implemented if deemed necessary (e.g., use of deterrents and/or exclusionary measures) as detailed in the Avifauna Management Plan included in the EPP (Section 5.3 of Appendix 2.C).

Overall, the Project has the potential to result in some residual effects on the mortality risk of avifauna and other wildlife throughout the life of the Project. However, with mitigation, including timing Project construction activities to avoid the breeding season, the implementation of speed limits, limiting the amount of on-site lighting, and prohibiting the hunting or harassment of avifauna and other wildlife by on-site Project personnel, the likelihood of increased mortality risk will be low and the Project is not expected to result in a measurable change in the baseline conditions for avifauna and other wildlife. Residual effects on a change in mortality risk will affect few individuals and will not substantively affect the sustainability of avifauna and wildlife populations in the LAA or RAA. This risk is also considered low for SAR, given their limited occurrence in the Project Area and therefore limited potential for direct interactions.

6.5.4.4 Summary

Based on application of the mitigation measures and best management practices identified in Section 6.5.3 and FireFly's commitment to comply with regulatory standards, residual environmental effects on the Terrestrial Environment (including SAR) are predicted to be not significant. Project-related residual effects are not expected to threaten the long-term persistence or viability of a species in the RAA, including effects that are contrary to or inconsistent with the goals, objectives, or activities of provincial or federal recovery strategies, action plans and management plans, and are not expected to result in a non-conformance with section 5.1 of the NL *Policy for Development in Wetlands* or a loss of more than 10% of wetland area within the RAA. Mitigation measures and best practices will reduce the total amount of vegetation communities and habitat lost or altered, directly and indirectly, throughout the life of the Project. This includes a Project design that maximizes the use of the current (i.e., previously disturbed) footprint and the implementation of standard mitigation to reduce potential adverse effects from dust, noise, light, and vibrations. To the extent practicable, sensitive areas identified in the Project Area, including wetlands, rare plant occurrences, hibernacula, roosts, and nests, will be buffered in accordance with regulatory standards.

This prediction is based on the information collected as part of the desktop literature review, GIS data analyses, understanding of Project activities, baseline surveys in the area, an understanding of existing conditions (including SAR / SOCC occurrences), the known effectiveness of mitigation measures, and experience of the assessment team. The overall predictions for the direct loss of habitat are made with a high level of confidence, since the direct loss of habitat is equal to the surface area of the Project features associated with the habitat loss. For indirect changes to habitat (e.g., habitat alteration from dust or noise), there is a moderate level of confidence as these predicted effects cannot be similarly quantified.

6.5.5 Follow-up and Monitoring Programs

Follow-up and monitoring programs will be conducted for SAR and will include:

- American marten hair snag surveys (initiated in March 2025)
- Monitoring of bat SAR using ARUs deployed during the active bat season (approximately May – October 2025)

Desktop habitat assessment to evaluate sites as potential habitat for insect SAR (Gypsy Cuckoo Bumble Bee [*Bombus bohemicus*], Suckley's Cuckoo Bumble Bee [*Bombus suckleyi*], Yellow-banded Bumble Bee [*Bombus terricola*], and Transverse Lady Beetle [*Coccinella transversoguttata*]) and bat SAR (i.e., maternal colonies/roost sites). Future targeted surveys, if warranted, will be developed based on the results of the desktop habitat assessment. Although the AC CDC Project data and Expert Opinion Maps do not mention the possibility of black ash (*Fraxinus nigra*), and the Project is outside of the suggested range described in the COSEWIC status report (COSEWIC 2018b), a desktop habitat assessment will be completed to identify potential areas that could support black ash. Future targeted surveys, if warranted, will be developed based on the results of the desktop habitat assessment. Similarly, there is no evidence that boreal felt lichen or other lichen SAR are likely to be found within the Project Area; however, a similar desktop habitat assessment will be completed for lichen SAR and targeted surveys will be conducted within appropriate habitat, if warranted.

6.6 Communities

Communities has been selected as a valued component (VC) because Project activities can create positive and adverse effects to nearby communities, including to community services and infrastructure, community well-being, employment and the economy. For the purposes of this assessment, this VC is comprised of the following:

- Infrastructure and services: housing and temporary accommodations, transportation, and local services and infrastructure (water, sewer, power, solid waste, education, recreation, safety, and health care)
- Community well-being: residents' access to health services and infrastructure, ability to conduct daily activities, and participation in employment and business opportunities
- Employment and economy: labour, labour income, and contributions to Gross Domestic Product [GDP] and government revenues

The surrounding communities are made up of Indigenous and non-Indigenous peoples. As mentioned in Chapter 3.0, indigenous members of Qalipu First Nation (Qalipu) and Miawpukek First Nation (Miawpukek) live in the non-Indigenous communities and one individual from each group self-identified during engagement. The Newfoundland and Labrador (NL) Office of Indigenous Affairs and Reconciliation indicated the Indigenous Organizations on the Island of NL who may wish to be engaged with the Project. The NL Office of Indigenous Affairs and Reconciliation shared that the Qalipu First Nation was the Indigenous Organization closest to the Project Area and will likely be interested in the Project. FireFly will continue to reassess communities, organizations and stakeholders who are interested in the Project, the engagement plan is a living document that evolves as new information and feedback are received. This chapter assesses Project-related effects on the local communities, which can include both Indigenous and non-Indigenous.

As described in Section 5.2.3 and shown on Figure 6.6.1, spatial boundaries for Communities includes the Project Area (area of physical activities), the Local Assessment Area (LAA; the Towns of Baie Verte and Ming's Bight), and the Regional Assessment Area (RAA; Economic Zone 11, which encompasses the Baie Verte Peninsula, as well as the Town of Springdale).

The residual effects assessment for Communities considers both positive and adverse effects after mitigation and other management measures are implemented. However, significance determination is made for adverse effects only. The definition of a significant effect on Communities includes the following:

- A significant adverse residual effect on community services and infrastructure is one that results in demands on services or infrastructure above and beyond current capacity, such that standards of service are routinely and persistently reduced below current levels for an extended period such that they are unlikely to recover to existing conditions.
- A significant adverse residual effect on community health is one that results in deterioration of health and well-being over an extended period that cannot be managed or mitigated through adjustments to programs, policies, plans, or other mitigation.
- A significant adverse residual effect on economy and employment is defined as an effect that is highly distinguishable from current conditions and trends, which cannot be mitigated or managed with current or anticipated programs, policies, plans, or other mitigation measures.

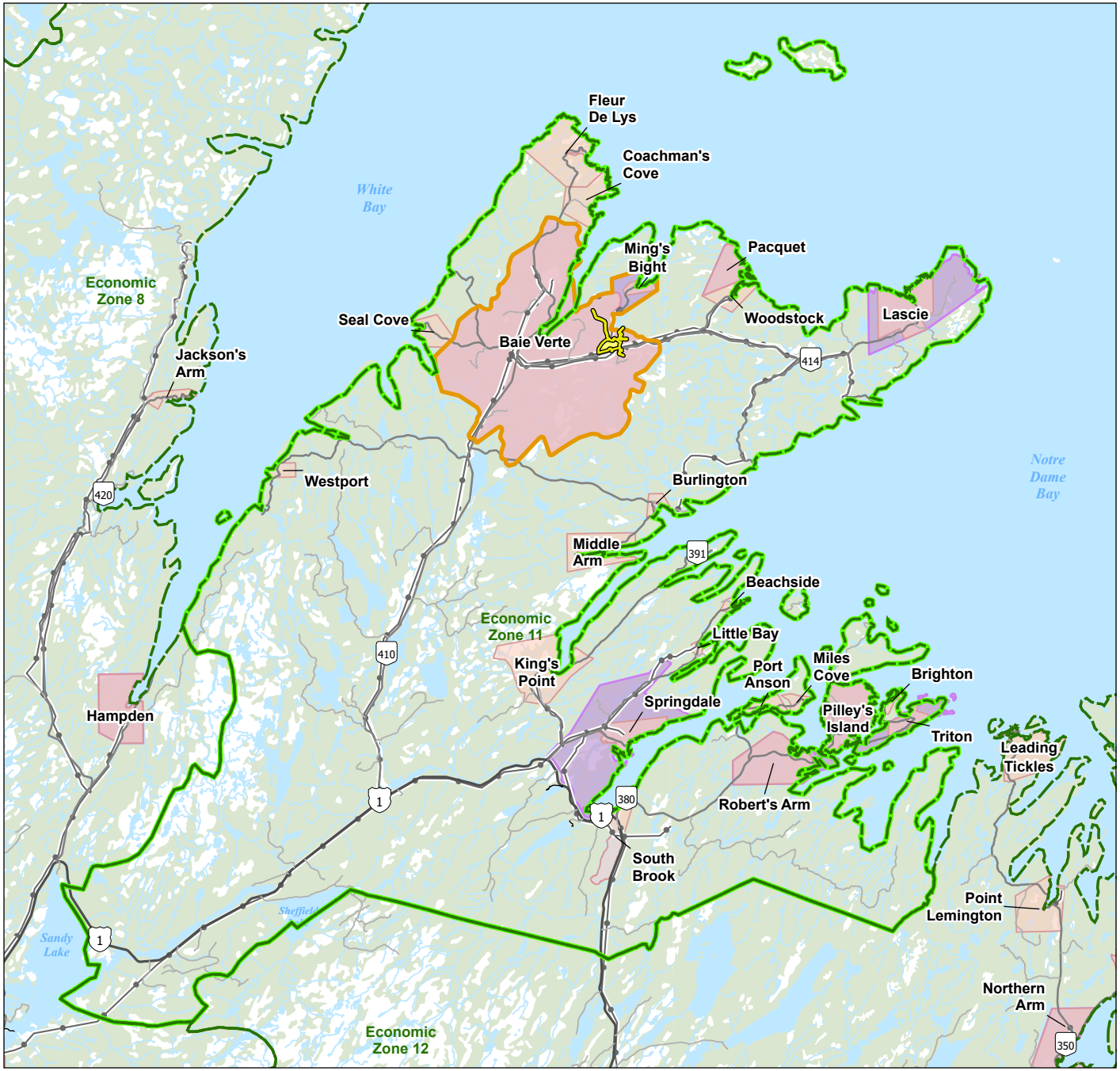


Figure No.
6.6.1

Title
Spatial Boundaries for the Communities Valued Component

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_5_001

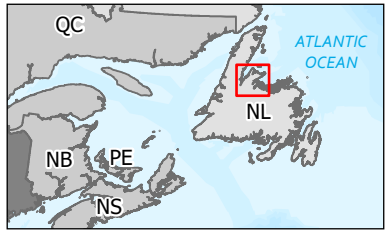
Project Location
Baie Verte, NL

Prepared by MB on 2024-12-12
Revised 2025-03-20

N

0 8 16 Kilometres
(At original document size of 8.5x11)
1:695,000

- Project Area
- Local Assessment Area
- Regional Assessment Area
- Economic Zone
- Municipal Boundary
- Municipal Planning Area
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local
- Power Line
- Watercourse
- Waterbody
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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6.6.1 Existing Conditions

A characterization of the existing conditions within the spatial boundaries defined in Section 6.6 is provided in the following sections. This includes a discussion of the influences of past and present physical activities on communities, leading to the current conditions.

6.6.1.1 Approach and Methods

Secondary sources of information were used to describe existing conditions in the LAA and RAA. Secondary information included government sources (e.g., Statistics Canada, Government of NL), publicly available data, and literature.

Much of this chapter relies on government databases, including census data from Statistics Canada. Available data that were used include population, education, occupational and industry information, wages, and labour. Statistics Canada regularly suppresses (i.e., selectively does not disclose) survey information to protect the identity of individuals and to address data quality issues. The 2021 Census of the Population (Census), which is used in this chapter is subject, in part, to data suppression by Statistics Canada. Results of engagement with stakeholders and Indigenous groups have also been integrated into the description of existing conditions, where applicable.

The existing data collection focused on information that facilitated the assessment of the beneficial and adverse effects of the Project, and which made a meaningful contribution to the assessment. For example, information on existing conditions was collected not just on relevant services and infrastructure, but also on their capacity and ability to absorb additional Project-related demand.

Services and infrastructure, their capacities, and the ease with which additional capacity can be provided were identified through secondary research. Aside from the 2021 Census of the Population, the main sources of information on existing conditions are:

- NL Statistics Agency / Community Accounts
- Provincial agencies, boards and commissions
- School and health boards
- Police and other emergency response organizations
- Housing agencies

6.6.1.2 Description of Existing Conditions

6.6.1.3 Mining History

The Baie Verte Peninsula is located on the northeast coast of the Island of Newfoundland; the town Baie Verte, was part of the French Shore until 1904 but was used by English settlers from the 1870s. The name "Baie Verte" means "green bay," reflecting the area's lush greenery and the origins of the name of the Project.

In the 1850s, a copper mine opened near Baie Verte, making mining and lumbering the main occupations until the mine closed in 1915. Mining regained importance in 1963 with the start of asbestos operations by Advocate Mines Ltd., followed by copper mining by Consolidated Rambler. By the late 1970s, half the labor force in Baie Verte Peninsula was employed in mining. However, declining prices in the early 1980s led to work stoppages, with Consolidated Rambler closing in 1982 (though it operated sporadically between 1995-1998) and the Advocate mine changing hands twice before shutting down in 1994. The Nugget Pond gold mine operated from 1997 to 2001.

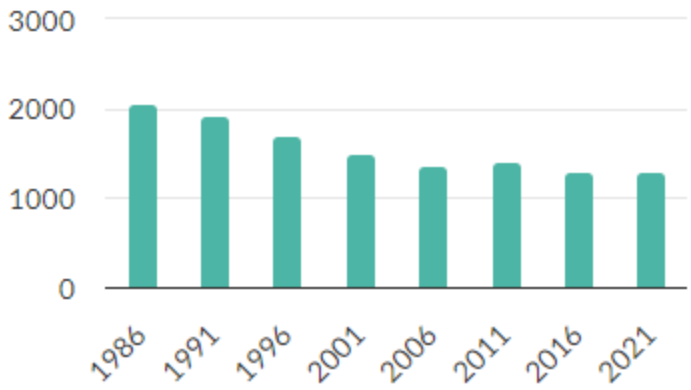
Mining activity picked up again in the late 2000s with the opening of the Pine Cove gold mine in 2008, the reopening of the Nugget Pond mine in 2007 to process gold-bearing ore from Greenland, and again with the reopening of the Ming Mine by Rambler Metals and Mining, who processed copper and gold at the Nugget Pond Mill Facility. The lumber and logging industries also provide some employment.

Baie Verte remains the main service centre on the peninsula and hosts a campus of the College of the North Atlantic. Tourism has grown in importance, especially with the opening of a downhill ski resort in 1994 but is now closed. The Miners' Museum features a mining tunnel. Nearby, the Dorset Soapstone Quarry at Fleur de Lys, 29 kilometres (km) north of Baie Verte, is a designated national historic site (1982) that shows how the Dorset people mined soapstone for bowls and lamps over 1,600 years ago (Pitt 2015).

The Baie Verte Peninsula has a rich mining legacy, with mineral extraction starting 1,600 years ago spanning into recent history. As the region has been dominated by the modern mining industry for over 100 years, a substantial portion of the local labour market has historically worked in mining; many of the operations are now in care and maintenance and therefore require a smaller workforce.

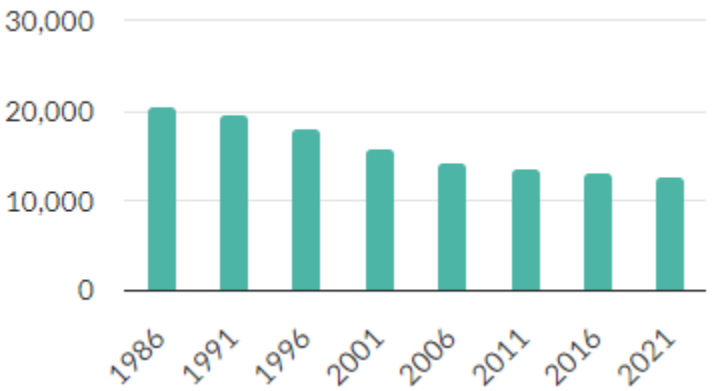
6.6.1.4 Population

The 2021 Census population for the LAA was 1,595. This represents a decrease of 1.2% since 2016 (down from 1,615). Over the same period, the province experienced an overall population decrease of 1.8% (510,550 in 2021, down from 519,715 in 2016). The 2021 Census population for the RAA was 12,650. This represents a decline of 4.5% since 2016 (down from 13,250). The median age in the LAA was 48 in 2021, with the median age in the RAA being 55 in the same year. The 2021 median age in NL was 48. As identified in Figures 6.6.2 and 6.6.3, the population has been declining since 1986 (Community Accounts 2022).



Source: Community Accounts 2022

Figure 6.6.2 Population of the Local Assessment Area, 1986 – 2021



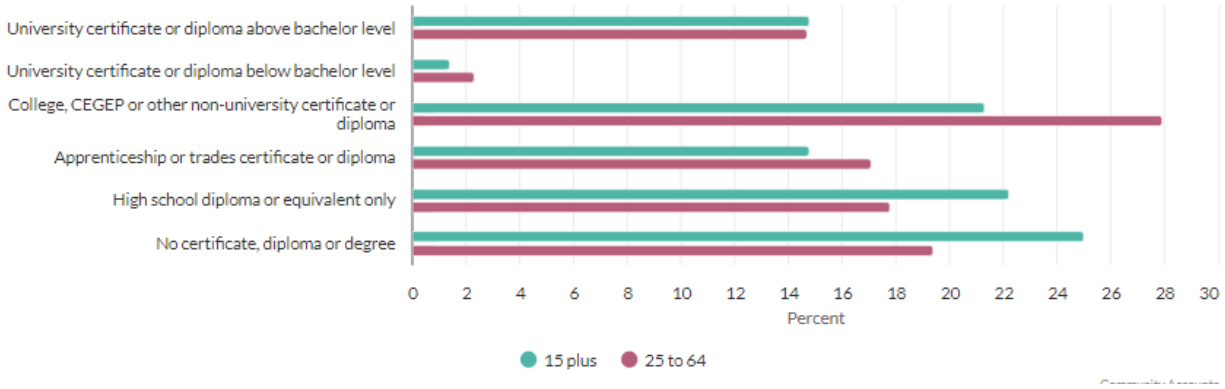
Source: Community Accounts 2022

Figure 6.6.3 Population of the Reginal Assessment Area, 1986 – 2021

6.6.1.5 Educational Attainment

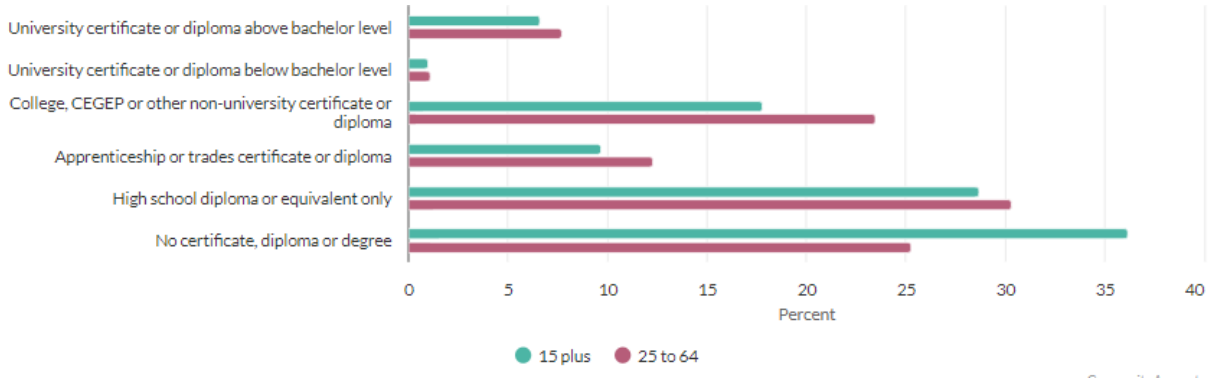
As of 2021, 25.0% of people 15 years and over in the LAA and 36.2% of people 15 years of age and older in the RAA do not have a high school diploma, compared to 20.4% of people in the province. Approximately 14.8% of people in the LAA and 6.6% of people in the RAA aged 15 and over had a bachelor's degree or higher in 2021, compared to 16.6% in the province (Community Accounts 2022).

In 2021, 19.4% of people 25 to 64 years of age in the LAA and 25.3% of people 25 to 64 years of age in the RAA do not have a high school diploma, compared to 12.6% in the province. Approximately 14.7% of people in the LAA and 7.7% of people in the RAA aged 25 to 64 had a bachelor's degree or higher in 2021, compared to 20.8% in the province (Community Accounts 2022). Further details regarding educational attainment are provided in Figures 6.6.4 and 6.6.5.



Source: Community Accounts 2022

Figure 6.6.4 Educational Attainment of the Local Assessment Area, 2021



Source: Community Accounts 2022

Figure 6.6.5 Educational Attainment of the Regional Assessment Area, 2021

6.6.1.6 Labour Force

In the LAA, the employment rate for those aged 15 years and older is 37.5%, slightly higher than the RAA rate of 36.2% but lower than the provincial rate of 47.5%. The unemployment rate for the LAA is 22% compared to 23.0% of the RAA and 15.2%. There are 645 individuals in the LAA, 5,245 individuals in the RAA and 243,330 for NL participating in the labour force (Community Accounts 2022).

Tables 6.6.1 and 6.6.2 provide a summary of LAA and RAA employment (by gender) by occupations. Generally, men make up a slightly larger proportion of workers within both the LAA (275 men compared to 230 women) and the RAA (2,165 men compared to 1,875 women). Trades, transport and equipment operators (and related) are among the top occupations in both the LAA (110) and RAA (915), while sales and service occupations also predominate (110 in the LAA vs. 745 in the RAA).

Table 6.6.1 Local Assessment Area Employment by Occupation, 2021

Employment by Occupation	Male	Female	Total
Management occupations	x	x	x
Business, finance and administration occupations	20	45	65
Natural and applied sciences and related occupations	x	x	10
Health occupations	x	55	55
Occupations in education, law and social, community and government services	25	35	60
Occupations in art, culture, recreation and sport	x	x	x
Sales and service occupations	35	75	110
Trades, transport and equipment operators and related occupations	110	x	110
Natural resources, agriculture and related production occupations	75	x	75
Occupations in manufacturing and utilities	x	x	10

Note:
x – data are suppressed to protect anonymity given small sample sizes
Source: Community Accounts 2022

Table 6.6.2 Regional Assessment Area Employment by Occupation, 2021

Employment by Occupation	Male	Female	Total
Management occupations	10	20	30
Business, finance and administration occupations	90	260	350
Natural and applied sciences and related occupations	90	20	110
Health occupations	65	300	365
Occupations in education, law and social, community and government services	145	415	560
Occupations in art, culture, recreation and sport	10	25	30
Sales and service occupations	185	560	745
Trades, transport and equipment operators and related occupations	845	70	915
Natural resources, agriculture and related production occupations	530	100	630
Occupations in manufacturing and utilities	195	105	300

Source: Community Accounts 2022

6.6.1.7 Individual and Family Income

Half of the males in the LAA received more than $48,000 in income during 2021, while half of females received more than $31,000. Half of the males in the RAA received more than $42,500 in income during 2021, while half of females received more than $27,200. Half of the males in NL received more than $43,200 in income during 2021, while half of females received more than $33,300. The national values were $47,700 for males and $36,900 for females (Community Accounts 2022).

Half of the couple families in the LAA had incomes of more than $103,600 in 2021, while the average couple family income in the LAA was $113,800. Half of the couple families in the RAA had incomes of more than $84,000 in 2021, and the average couple family income in the RAA was $90,800. Half of the couple families in the province had incomes of more than $99,900 and the national value was $107,000. The average couple family income in the province was $122,400; the national value was $133,900 (Community Accounts 2022).

Half of the lone parent families in the LAA had incomes of more than $54,400 in 2021. Half of the lone parent families in the RAA had incomes of more than $47,600 in 2021. Half of the lone parent families in the province had incomes of more than $51,100; the national value was $56,800 (Community Accounts 2022).

When comparing income levels, predominantly individual and family income is higher in the LAA and RAA compared to NL, but generally less than the national values. As such, the economic context of the Baie Verte Peninsula is generally better than average compared to the province, which is partially attributed to the presence of the mining industry. It is worth noting that the data for individual and family income were obtained in 2021, and between 2022-2023 several mines in the LAA and RAA entered care and maintenance, reducing the number of jobs in the mining industry. Income levels in the LAA and RAA may be currently less than what was reported in 2021.

6.6.1.8 Permanent and Temporary Accommodations

In 2021, there were 2,173 occupied private dwellings in various RAA communities, of which nearly 60% were in Springdale (Table 6.6.3). In the RAA, the majority (73.4%) of homes were owned while just over one-quarter of the homes were rented. Most (78.7%) homes were single-detached dwellings (Statistics Canada 2023a).

Table 6.6.3 Housing Characteristics, 2021

Community	Total Dwellings	Owned	Rented	Average Price of Owned Home ($)	Average Monthly Rent ($)
Town of Baie Verte	556	430	120	157,000	720
Ming's Bight	130	130	0	126,000	NA
Springdale	1,285	880	405	197,600	780
South Brook	202	155	50	144,000	600
Total	2,173	1,595	575	156,150	700

Source: Statistics Canada 2023a

On the Baie Verte Peninsula, there are seven hotels / motels and bed-and-breakfasts with a total of 77 rooms. There are four hotels / motels and inns in Springdale with 38 rooms (NL Tourism 2024). These temporary accommodations are listed in Table 6.6.4.

Table 6.6.4 Temporary Accommodations in the Baie Verte Region

Accommodation	Community	Number of Rooms
Arctic House	Baie Verte	4
Baie Vista Inn	Baie Verte	56
Parson's Garden B&B	Baie Verte	2
Harbour View Haven	Fleur de Lys	3
Harbour View House	La Scie	3
The Fisher's Inn and Hospitality Home	La Scie	5
The Yellow Biscuit Box	Wild Cove	4
Indian Falls Chalets	Springdale	3
Lake and Sand by Riverwood	Springdale	2
Riverwood Inn	Springdale	11
Springdale Inn and Suites	Springdale	22

Source: NL Tourism 2024

The Baie Verte Peninsula is in NL's Central Tourism Region. Between 2019 and 2023, the occupancy rate in the Central Region increased from 43% to 48% (Tourism Research Division 2024).

6.6.1.9 Waste

The Baie Verte-Green Bay Waste Management Region includes the communities on the Baie Verte Peninsula and Green Bay South, spanning from Westport in the west to Brighton in the east. Newfoundland has two regional waste management facilities, in the Eastern Region at Robin Hood Bay and Central Region at Norris Arm. These are the only facilities on the Island permitted to accept waste for final disposal. Waste management regions across the province transport their waste from local transfer stations to one of these regional waste management facilities. Waste produced in the Baie Verte-Green Bay Waste Management Region is transported to the facility at Norris Arm from the Region's 12 transfer stations (NL Department of Municipal Affairs and Environment [NLDMAE] 2019).

The Norris Arm Waste Management Facility is a lined landfill with leachate collection for final disposal. When it opened in 2012, the landfill had a 50-year life expectancy, however, in 2016, a second lined cell was constructed, doubling the lifespan. As a result of the additional capacity, the facility has been collecting waste from the Western Regional Service Board, in addition to Central Region communities (Central Regional Service Board 2019; Hickey 2010; NL Department of Municipal Affairs 2012).

6.6.1.10 Water and Sewer

The source of drinking water for the Town of Baie Verte is Southern Arm Pond. A water treatment facility made up of a chlorination and filtration system is used for the treatment of drinking water prior to distribution to the town. The system has a 400 gallon/minute capacity which is able to meet local demand (Town of Baie Verte 2013). Even though some sections of the town have had drinking water advisories in the last five years, no clear rating data on drinking water quality is currently available on the provincial water resources portal for the Town of Baie Verte (Uthman 2019). The town of Baie Verte lacks a sewage treatment facility. The town has a total of four sewage outfalls (Uthman 2019).

The municipal water system of Springdale is supplied from two sources: surface water from Sullivan's Pond backed up by Huxter's Pond, Lower, Huxter's Pond, and Little Huxter's Pond; and ground water from an artesian well in the Springdale Industrial Park, which serves only the Industrial Park (Town of Springdale 2016). In 2017, federal and provincial funding of $356,000 was announced to upgrade the infrastructure on Orange Lane and Churchill Place in Springdale (Housing, Infrastructure and Communities Canada 2017).

6.6.1.11 Health

The Baie Verte Peninsula and Springdale fall within NL's Central Health region. Central Health is the second largest Health Authority in the province. It provides health and community services to 176 communities and approximately 20% of the provincial population (Central Health 2023). Health and community services are provided through 45 facilities, with approximately 915 total beds throughout the region. In 2023, Central Health had two regional referral centres, nine health centres, 23 community health facilities, and 11 long-term care facilities (Central Health 2023).

The two primary regional health centres are the Central Newfoundland Regional Health Centre in Grand Falls-Windsor and the James Paton Memorial Regional Health Centre in Gander. The Baie Verte Peninsula Health Centre in Baie Verte has18 long term care, one respite, six acute care, and one palliative care bed. Community health services are provided by two full-time and one part-time continuing care nurse coordinators. There are also three public health nurses and two community support workers. The Green Bay Health Centre in Springdale nine inpatient beds; two convalescent beds, 1 palliative care bed, five holding beds, and one assessment bed (Central Health n.d.).

There are approximately 136 physicians practicing within the Health Region. Central Health is challenged with recruitment and retention of family physicians and specialists and the region's physician vacancy rate steadily increased from 2020 to 2023. Central Health is currently the largest teaching site outside of St. John's. Six family medicine residents per year are matched to Memorial University's Central Stream, where residents come to work at local sites for two years. This has proved to be an effective recruitment strategy for Central Health Family Medicine physicians. Central Health continues to work with the Department of Health and Community Services and the other Regional Health Authorities to explore successful recruitment and retention strategies (Central Health 2023).

Central Health advanced virtual care to help address the impact of human resource shortages on emergency services. Developed in 2021-22, and implemented in 2022-23, the strategy led to substantial strides being made in building and expanding virtual health care during a time when COVID-19 exacerbated human resource and physician shortages. Two Health Hubs were opened to provide a virtual care option for patients who require non-emergency services and do not have a primary health care provider. These, along with several other initiatives such as the e-mental health service bridgetheapp.ca, continued to support patient flow and access to care (Central Health 2023).

Between 2019 and 2023, the number of family medicine physicians in the Central Health Region decreased 12.0% from 108 to 95. The number of specialists increased 12.7% from 71 to 80 during the same period (Canadian Institute for Health Information 2024).

6.6.1.12 Health Characteristics

In 2019/20, the Central Health Region showed higher rates of arthritis, diabetes and high blood pressure than the province; however, lower rates of asthma and chronic obstructive pulmonary disease were noted (Statistics Canada 2023b). Females in the Central Health Region had higher rates of chronic disease than males in most instances (other than high blood pressure and diabetes). In 2019/2020, Central Health Region residents perceived their mental health to be very good or excellent (Statistics Canada 2023b) (Table 6.6.5). This is lower than what was reported for the region in 2018 (72.2%) and slightly higher than that of the province (68.9%). Perceived life stress was lower in the Central Health Region (11.7%) than the province (13.4%) in 2019/20 while the Region's sense of community belonging was higher (84.9%) than that of the province (80.1%) (Statistics Canada 2023b).

Table 6.6.5 Health Characteristics, Newfoundland and Labrador and Central Health Region, 2019/2020

Health Characteristic	NL			Central Health Region		
	Total	Male	Female	Total	Male	Female
General Health Indicator (%)						
Perceived health (very good or excellent)	63.9	61.0	66.6	63.1	60.4	65.6
Has a regular healthcare provider	87.1	83.2	90.8	84.8	80.1	89.4
Mental Health Status (%)						
Perceived mental health (very good or excellent)	68.9	70.7	67.3	69.5	71.5	67.6
Sense of community belonging (very strong or somewhat strong)	80.1	78.8	81.3	84.9	85.9	83.9
Perceived life stress (population aged 12 and over who reported perceiving that most days in their life were quite a bit or extremely stressful)	13.4	13.7	13.0	11.7	11.5	11.8
Life satisfaction (satisfied or very satisfied)	93.3	93.7	92.9	93.3	92.7	93.9
Rates of Chronic Disease (%)						
Arthritis (15 years and over)	29.0	25.8	32.0	30.4	29.8	31.0
Diabetes	11.0	11.3	10.8	15.7	16.2	15.2
Asthma	8.7	7.3	10.1	6.4	5.6	7.1
Chronic obstructive pulmonary disease (35 years and over)	5.3	5.4	5.1	4.9	4.3	5.4
High blood pressure	23.6	23.6	23.7	30.3	31.1	29.4
Rates of Substance Abuse and Healthy Living Indicators (%)						
Current smoker, daily or occasional	19.3	20.8	17.8	23.1	27.4	19.0
Heavy drinking	22.3	28.4	16.5	22.8	26.9	13.3

Source: Statistics Canada 2023b

Rates of smoking and alcohol consumption were higher in the Central Health Region than the province in 2019/2020. This is a change from 2018 when rates of these behaviours were higher in the province than in the Central Health Region with more than 20% of the Region's population smoking daily or occasionally versus 16.6% of the Central Health Region (Statistics Canada 2023b).

6.6.1.13 Education Infrastructure

Schools in Baie Verte and Springdale are within the Western Newfoundland and Labrador English School District which accounted for 62 of the 256 provincial schools and 16.5% (10,527) of the 63,718 total provincial enrolments. In 2023-2024, enrolment among full-time equivalent pupils fell 1.7%. That year, there were 92.4 full-time equivalent teachers for every 1,000 students in the Western District and 82.1 full-time equivalent teachers for every 1,000 students in the province (NL Department of Education 2024). Table 6.6.6 presents the schools in the LAA and their enrolments in 2023-24.

Table 6.6.6 Schools in the Baie Verte Region

School	Community	Grades	Enrolment
Copper Ridge Academy	Baie Verte	K-12	296
Indian River Academy	Springdale	K-6	208
Indian River High School	Springdale	7-12	269
MSB Regional Academy	Middle Arm	K-12	117
St. Peter's Academy	Westport	K-12	22
Valmont Academy	King's Point	K-12	91
Cape John Collegiate	La Scie	7-12	78
Hillside Elementary	La Scie	K-6	51

Source: NL Department of Education 2024

At the time of writing, information on the capacity of schools in Table 6.6.6 was unavailable. However, as per NLSchools policy, requests for a student to attend a new school zone due to parent or guardian change of residence are automatically granted for the English stream programs, upon verification of residence (NLSchools 2016). FireFly will engage with NLSchools as Project details are confirmed.

The Baie Verte campus of College of the North Atlantic has a full-time credit course registration of approximately 70 students per semester and about 300 students participate in Continuing Education evening courses. This campus also houses the Sedler Community Employment Corporation for Baie Verte, and the Advanced Education and Skills office (College of the North Atlantic 2024).

6.6.1.14 Roads and Highways

Provincial Highway 410 is the main road through the town of Baie Verte. The local road network, which consists of about 18 km of paved streets, is maintained by the Town Council. Most local roads have pavement but hardly any sidewalks, some curbs and occasional ditches for drainage. The condition of the roads overall is poor (CBC News 2022).

Residents along on the Baie Verte Peninsula have complained about the condition of the highway and the local roads. The industrial activity along the highway, including mining and logging, has contributed to the condition as has additional residential traffic along Route 410 and offshoot provincial roads along the peninsula (CBC News 2022).

In 2023, a $4.2 million contract was awarded to rehabilitate and pave sections of the Trans-Canada Highway between Springdale and Baie Verte to be completed during the 2023-2024 road construction season (NL Department of Transportation and Infrastructure 2023).

6.6.1.15 Policing, Fire and Emergency Response Services

The RCMP operates a detachment in Baie Verte with five regular members on staff. The staffing levels are governed by the 2012 Provincial Policing agreement and the number of agreed upon positions by the province (Adams 2017).

Crime statistics are not available for the Baie Verte RCMP detachment. However, the Deer Lake RCMP District, which includes the Baie Verte detachment, saw the crime severity index (CSI) increase from 37.1 in 2018 to 44.3 in 2021 (NL Statistics Agency 2022). The CSI measures changes in the level of crime severity in Canada from year to year and includes Criminal Code violations including traffic and drug violations and Federal Statutes (Statistics Canada 2020).

Baie Verte and Springdale each have volunteer fire departments, with 28 and 30 members, respectively (Town of Baie Verte 2025; Town of Springdale 2019). La Scie also has a volunteer fire department and a newly constructed fire hall (La Scie Regional Fire Department 2024). Ambulance services in Baie Verte Peninsula are provided by Central Health. Central Health oversees implementation and monitoring of standards for five private ambulance operators and eight community ambulance operators. There are two ambulances each in Springdale and Baie Verte but there are not enough resources to operate all of them (Hurley 2017). There have been reports of long response times from ambulances in the region (CBC News 2018).

6.6.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Communities is provided in Table 6.6.7. Potential environmental effects and effects pathways were selected based on the review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.6.7 Potential Effects and Effect Pathways for Communities

Potential Effect	Effect Pathway(s)
Change in employment and economy	• The Project's demand for qualified labour will affect the regional labour supply and existing wage levels, as will the loss of Project employment following completion of decommissioning, rehabilitation and closure of the Project • The Project will affect regional businesses as it may provide future business development opportunities • The Project will affect regional businesses as it may contribute to increased competition for the local / regional labour supply and wage inflation • Completion of decommissioning, rehabilitation and closure of the Project will also affect regional businesses, due to the loss of Project spending • Project employment and spending will affect the local and provincial economy in a positive manner during the construction and operation phases and loss of Project employment and spending will cease once decommissioning is complete
Change in infrastructure and services	• Availability and cost of accommodations (vacancy rates, inventory levels) could affect demand on local housing and temporary accommodations due to potential Project-related population growth • Demand on local services and infrastructure (hospital beds, physicians, police force, teachers, road volume, air transportation infrastructure) may be affected by Project activities and Project-related population growth (i.e., construction and operation labour force)
Change in community well-being	• Community well-being, crime severity, and capacity of health services (i.e., number of hospital beds, doctor / patient ratio) may be affected by the number of local and non-local (influx) workers and their associated incomes • Emissions and discharges from the Project resulting in air, sound, and water quality changes, which could affect human health through direct exposure (e.g., inhalation of air) and indirect exposure (e.g., ingestion of contaminated food) to contaminants • The value and perceived quality of country food could be reduced and hunting, trapping or plant harvesting activities could change due to a change in access if Project activities cause a change in access to and availability of country foods to harvest

6.6.3 Mitigation and Management Measures

As discussed in Section 2.11, FireFly has revised the existing EPP, including identification and addition of mitigation and management measures required to address new and/or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on communities, including the measures identified for the following Project activities:

- Vehicle Traffic (Section 4.20 of the EPP)
- Dust and Air Contaminant Control (Section 4.21 of the EPP)
- Noise and Light Control (Section 4.22 of the EPP)

Additionally, mitigation to reduce effects on Atmospheric Environment (Section 6.1), Groundwater Resources (Section 6.2), and Surface Water Resources (Section 6.3), described in the appropriate sections, will reduce adverse effects to community well-being.

As discussed in Sections 2.9 to 2.12, FireFly has several management plans and policies currently in place which will reduce adverse effects to Communities. This includes:

- Diversity Plan (Appendix 2.B): FireFly has a Diversity Plan in place which encompasses a proactive approach to best industry practices geared towards a workplace culture supportive of a diverse workplace. FireFly is committed to a workplace design with policies in place to strengthen professional and career development opportunities. These policies promote moral fairness, enhance work/life balance, and provide a working environment that is free from harassment and discrimination. These policies are:
  - Progressive Discipline Policy
  - Respectful Workplace Policy
  - Human Rights and Freedoms Policy
  - Workplace Etiquette Policy
  - Drug and Alcohol Policy
- Waste Management Plan (Appendix 2.D): This plan provides direction on waste handling, storage, transport, treatment and disposal of the various wastes produced from the Project.
- EPP (Appendix 2.C): Details the procedures required for Project personnel (i.e., FireFly employees, contractors and suppliers) to reduce or eliminate potential adverse environmental effects associated with the construction and operation work across the Project sites. Addresses potential incidents and unplanned situations (i.e., fuel and hazardous material spills, wildlife encounters, avifauna management, forest fires, and discovery of historic resources).
- Emergency Response Plan: Defines the responsibilities and duties of employees, contractors, visitors and third-party / external responders in the event of an emergency at the Project site.

Several Project design mitigations will reduce adverse effects to Communities. An approximate 250-person accommodations complex will be constructed approximately 1.5 km from the main construction site. The camp will allow non-local, and specialist skilled employees to be accommodated during the peak construction phase. The accommodation complex will then be used for the fly in / out employees for the life of the Project. It will include dining rooms, entertainment areas and a vehicle parking area. Additionally, a port access road will be developed to reduce Project-related traffic along public roads and highways.

The following mitigation measures specific to the Communities VC have also been identified for the Project:

- FireFly will continue to work with municipalities and economic development organizations to identify opportunities to reduce negative impacts of the population growth and enhance positive socio-economic benefits through the Baie Verte Peninsula.

- FireFly will address concerns through a grievance redress mechanism.
- FireFly will continue to engage with local resource users (hunters, trappers, anglers), including the communication of Project information, updates on ongoing and planned activities and a discussion of issues and concerns and potential means of addressing them.
- FireFly will provide opportunities for apprenticeships and on-the-job training. The Common Core Program will provide employees with the tools required to be successful in a position. FireFly is in communication with Trades NL and the Office to Advance Woman Apprentices so that FireFly will be aware of available local labour.
- FireFly is committed to hiring locally and will communicate employment information to local communities in a timely manner so that local residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.
- Procurement packages will be developed and posted in a timely manner with consideration for capacity and capabilities of local and regional businesses.
- FireFly commits to consider bids from qualified locally owned businesses first, including those submitted from companies owned by diverse groups (e.g., Indigenous, women, two-spirit, lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual, and all other sexual orientations and genders [2SLGBTQQIA+], persons with disabilities, visible minority).
- Prior to decommissioning, FireFly will implement strategies to help transition the workforce.
- FireFly will implement rotational work arrangements to maximize the rooms available in the accommodation complex during construction and later in operation, which will reduce the demand on housing in local communities. The accommodation complex will be built in a manner that permits flexibility to adjust to numbers of contractors and employees during different phases of the Project.
- FireFly will continue to provide diversity and cultural sensitivity training for Project employees.
- FireFly will continue to provide Project employees with health services (physical, mental and social health), including Employee Assistance Programs (EAP) and on-site emergency service infrastructure, including fire-fighting equipment.
- FireFly will continue to coordinate its Emergency Response Plan with the local emergency services departments.
- FireFly will implement a Traffic Management Plan, which will include encouraging car-pooling and providing bus transport and requiring Project drivers and employees to observe speed limits and take safety precautions.
- When practicable, shift changes and truck movements will be scheduled to avoid peak traffic hours and school bus pick-up and drop-off times.
- Signage will be installed around the Project Area to alert the public and land users of the presence of the Project and its facilities.

- Hunting / fishing / harvesting of wildlife will be strictly prohibited on the site. Workers will not be permitted to hunt / fish / harvest and will not be permitted to bring firearms or angling gear to site.
- Desired land and resource end-uses will be considered in the preparation of the Rehabilitation and Closure Plan.

6.6.4 Residual Environmental Effects

Potential environmental effects on Communities were identified in Section 6.6.2. For Communities, three effects were identified: change in employment and economy, change in infrastructure and services and change in community well-being. Residual effects (i.e., those remaining following implementation of mitigation [Section 6.6.3]) for each Project phase are evaluated below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and is not in a pristine environment; the natural and human environments in the area have been affected by past mining, logging and quarry activities.
- There is a long mining history in the Baie Verte Peninsula, with an experienced workforce locally available. At peak operation activity, the previous mine employed over 250 full-time employees, with the majority from local communities. Based on past projects in the region, including Rambler mine, it is estimated that up to 60% of FireFly's employees and 20% to 30% of the contracted employees will be sourced from local communities.
- A modular accommodation complex will provide housing for non-local workers.
- The nearest potential seasonal / residential receptor (i.e., cabin user) is located approximately 168 m from the Project Area and existing mine operation, with additional cabin users located along the Highway 418. FireFly has incorporated the port access road into their Project design to limit Project-related traffic along the highway, but noise and air quality modelling have not yet been completed. They will be completed pre-construction. FireFly understands that additional mitigation may be required if noise or air quality concerns are identified at these closest receptors.
- Noise, air quality, groundwater and surface water modelling will be conducted prior to construction to confirm adequate mitigation measures have been employed to reduce adverse effects to community well-being.

6.6.4.1 Change in Employment and Economy

6.6.4.1.1 Employment

Project demand for labour can have both beneficial and adverse effects on employment. Beneficial effects stem from increased local employment during construction and operation phases, while adverse effects stem from losses in local employment due to decreased labour demand as the Project transitions from the operation phase through the decommissioning, rehabilitation and closure phase.

There is a long mining history in the Baie Verte Peninsula, with an experienced workforce locally available. At peak operation activity, the previous operator of Ming Mine had employed over 250 full-time employees at the Project site, with the majority from local communities (over 80% at that time). In March 2023, the past operator became insolvent and resulted in the layoff of the workforce except 35 employees that remained on care and maintenance. The expected labour force for each phase of the Project is presented in Table 6.6.8. Employing most of the workforce from NL is a priority for FireFly and the company implemented strategies to achieve more than 60% NL employment. Based on past projects in the region and in consideration of recent commencement of mining operations in the RAA and Island of Newfoundland, including the former operations of Ming Mine it is estimated that up to 60% of FireFly's employees and 20% to 30% of the contracted employees will be sourced from local communities. Local is typically within 150 km of the Project, for the Ming Mine Project, local is defined as the Baie Verte Peninsula, Springdale and the surrounding local region (Green Bay-White Bay). The Provincial Workforce is defined as Newfoundland and Labrador but outside of the Local Area. Local communities are considered here to be those within a 150 km radius or driving distance from the mine.

Table 6.6.8 Labour Force by Phase

Employer	Estimated Labour (FTE)[1]	Local Workforce[2]	Provincial Workforce[3]	Workforce Outside NL[4]
Early Works – Site Preparation				
FireFly	120	60%	20%	20%
Subcontractors	100 to 175	30%	30%	40%
Construction				
FireFly	180	60%	20%	20%
Subcontractors	400 to 700	20%	40%	40%
Operation				
FireFly	350 to 400	60%	20%	20%
Subcontractors	60 to 100	60%	20%	20%

Notes:
[1] FTE – full-time equivalent
[2] Communities within a 150 km radius (Baie Verte Peninsula)
[3] Communities outside the 150 km radius within NL
[4] Rest of Canada and Immigration

During the site preparation phase, the workforce will consist of approximately 120 full time equivalents (FTE) employed by FireFly and an average subcontractor workforce of approximately 100 to 175 FTE, bringing the total site preparation workforce to 220 to 295 FTE. Based on past operations, it is estimated that 60% of FireFly's employees and 20% of the construction workforce will be from local communities and will not require accommodation. FireFly employees during the construction phase is expected to reach 180 FTE, while subcontractors are anticipated to employ between 400 to 700 FTE, bringing the total maximum workforce to 880 FTE. In reviewing current operations and future projects, the overall demand for skilled labour in the region will be high. The competition from other mining operations and advancing projects, exploration activities, and competing industries will make it challenging to achieve over 60% NL employment during construction.

Current operations and future mining projects require anywhere from 1,500 to 2,500 skilled workers as shown below:

- Voisey's Bay Mine: Approximately 500 workers, with an expected increase due to underground mining
- Calibre Valentine Gold Mine: Around 400-500 workers
- Iron Ore Company of Canada: Estimated 1,000-1,200 workers
- Maritime Hammerdown Project: Several hundred workers

These mining operations and projects are competing for the same workforce as FireFly's Project. Exploration projects also compete for the same skilled workforce. Currently, there are approximately eight key companies advancing exploration projects, with a workforce of 30 to 50 employees, totalling 240 to 400 workers. Additionally, the provincial government has launched the Mining the Future 2030 initiative, which aims to establish five new mines and create 1,400 jobs by 2030. This initiative will substantially increase the demand for skilled workers in the mining sector.

Apart from mining, NL have other thriving industries that compete for the same skilled labour pool:

- Offshore Petroleum Projects: Major projects like Hibernia, Hebron, Terra Nova, and White Rose are significant employers, estimated to have 800 to 1,000 employees each
- New Hydroelectric Projects: Bay d'Espoir Expansion, Gull Island Project, and Holyrood Combustion Turbine. In total, approximately 5,000-8,000 skilled workers during the peak construction phases of these projects
- Project Nujio'qonik, led by World Energy GH2 is expected to create approximately 2,200 direct construction jobs, 400 operations jobs
- Fishing and Aquaculture: These traditional industries continue to be major employers in the region. 10,000 registered fish harvesters; 6,350 fish processing employees and 500 aquaculture workers
- Forestry:1,200 people work in forestry and logging, support activities for forestry, and wood product manufacturing

With the timing of construction and operations of many of these major projects overlapping with the Project, there will be a high demand for skilled labour across these industries. As a result, FireFly may find it challenging to hire more than 60% of its workforce locally. The competition for skilled workers is intense and specialized skills required for mining may not be readily available in the local workforce, necessitating the hiring of workers from outside the region. FireFly must make reasonable assumptions to plan for an accommodations complex with the capacity to house the Fly In / Fly Out (FIFO) workforce. Given the anticipated demand on skilled labour as outlined above, sourcing 60% of the construction workforce locally is a reasonable assumption.

Operation staff will be predominantly employed by FireFly, with 350 to 400 FTE annually, and 60 to 100 FTE annually employed by subcontractors. With a projected 15-year operational life of mine, the total person-years for operation for FireFly and subcontractors will range from 6,150 to 7,500 person-years.

Although past operators of this mine were able to achieve over 80% hire from local workforces, FireFly's projected workforce is anticipated to be larger than the 250 FTE previously required at the former Rambler mine.

Therefore, FireFly anticipates being able to hire 60% from the local workforce and 20% outside the local workforce but within the province for both construction and operation, with the remaining 20% expected to come from out of province. During engagement for the Project, FireFly heard that many skilled mine workers who were displaced from recent mine closures in the province have found employment outside the province and work away from home and the Baie Verte Peninsula via FIFO work arrangements. Several of these workers attended the public sessions and the desire to avail of employment opportunities near their home and their families was a recurring theme identified from the public (Section 3.1). Work is ongoing to determine the labour requirements for decommissioning, rehabilitation, and closure; however, it will be less than required for the construction phase. It is anticipated that as the Project transitions into the final phase there will be a decrease in workforce that ultimately results in the loss of employment. This loss will be known and anticipated by Project workers as the operational life of the Project will be communicated at early stages and updated throughout the life of the Project. Mitigating the magnitude of this loss of employment is the gained labour income, skills and experience workers realize while employed with the Project. In the case of gained skills and experience, these improved qualifications will aid with securing employment on other and future projects within the LAA, RAA, or elsewhere. Required Project construction and operation occupations by National Occupation Classification code are provided in Section 2.9.1.

FireFly is committed to hiring locals and will communicate employment information to local communities in a timely manner so that local residents have an opportunity to acquire the necessary skills to qualify for Project-related employment. The current composition of FireFly employees represents 85% from NL, and the preference remains to recruit locally. FireFly is prepared to explore available opportunities to promote gender and cultural diversity in the workplace with the goal of increasing awareness and integration of this diversity into normally non-traditional roles. Seventeen percent of the FireFly workforce is female, which aligns with the continued efforts of FireFly to implement their industry best practice workforce diversity plan. FireFly is committed to a workplace that provides equal opportunities with competitive benefits and compensation. FireFly will continue to work with contractors hired on the Project to promote the Diversity Plan and its initiatives.

FireFly has also developed a common core program to provide people with the tools, training (including on-the-job training), and information required for successful employee performance. FireFly is focused on strengthening, mentoring and coaching structures that provide employees with the knowledge, skills and motivation to accomplish short and long terms goals within the industry. There are annual opportunities for apprenticeships, co-op positions and internships including opportunities to continue working for FireFly once a role is complete. FireFly has ongoing communication with relevant institutions, such as Trades NL and the Office to Advance Women Apprentices, to have information readily available regarding potential employees that have completed their apprenticeships and are available for work.

6.6.4.1.2 Economy

Project expenditures on services, materials and equipment can result in both positive and adverse effects on regional business. Positive effects include increased business revenue, which can support capital investment and hiring (indirect employment), thereby increasing capabilities and capacity among local businesses. Spending of income by direct and indirect workers further contributes to beneficial effects on local businesses, primarily within the service sector, resulting in induced employment effects. Adverse effects relate to Project contributions to labour drawdown (i.e., workers leave current employers to secure employment with the Project due to wage differentials or a desire to work on the Project) and wage inflation (i.e., to attract and retain workers, local employers may have to increase compensation paid to workers). Project spending will result in overall increased economic activity in the LAA and RAA, as well as contribute to provincial and federal government revenues through royalty payments and taxation on production, labour, goods, and services. Completion of decommissioning, rehabilitation and closure of the Project will have a negative impact on local and regional businesses and the economy as the positive impacts of the Project cease.

The capital expenditures estimate includes costs such as mine development, processing, tailings management facility, infrastructure, information systems, and other miscellaneous expenditures. The largest capital expenses for the Project includes mining and processing activities, followed by infrastructure investments, with a combined estimated capital expenditure of between CAD 320 million and CAD 350 million. The cost of the Project will be funded privately by FireFly. The operational expenditures estimate include costs related to mining development and production, process plant and freight costs, refining, and general administration. A breakdown of operational Project costs based on the estimate of 28.3 metric tonnes of resource reserve with potential to be milled throughout the life of the mine are provided in Table 6.6.9.

Table 6.6.9 Estimated Operational Expenditures (C$M) for the Project

Activity	Operational Cost (C$M)
Mining Development	248.2
Mining Production	1,323.6
Process Plant Cost	507.7
General Administration Cost	315.8
Conc Treatment and Freight Costs	294.9
Refining Costs	65
Total Operation	2,755.0

Costs associated with decommissioning, rehabilitation and closure continue to be finalized. Once decommissioning of the Project is complete, the economic benefits for the LAA and the RAA will cease, with the exception of a small number of staff required to complete post-closure monitoring. Upon closure, the Project will no longer contribute towards GDP growth; however, it is possible that the Project will contribute to the specialization of mining activity in the LAA and RAA given the training program and experience provided by FireFly to its workers, which may provide labour market benefits. such as qualified workers once the decommissioning of the Project is complete.

The degree to which LAA and RAA businesses benefit from Project contracting and supply opportunities, and therefore result in indirect employment, depends on several factors, including their size, capability and capacity to accommodate Project requirements. Specifically, indirect employment resulting from Project spending on goods and services would only be expected to result in 'net new' (i.e., creation of) indirect employment if businesses become established or expand (by increasing workforces) to meet Project demands. In consideration of the LAA's and RAA's industrial composition and the history of mining in the Baie Verte Peninsula, existing labour force (Section 6.6.1.6) conditions, and using employment as a measure of capacity, businesses within the LAA are positioned to compete for small- to medium-sized service and supply contracts, particularly those related to construction, transportation, and warehousing (Section 6.6.4.1.2).

It is anticipated that both local Baie Verte Peninsula businesses and those across NL will participate and provide services and product requirements for the Project, including bidders submitted from companies owned by diverse groups (e.g. Indigenous, women, 2SLGBTQQIA+, persons with disabilities visible minority etc.). Areas identified will range from earthwork contracting companies, transportation and freight, goods and services, and hospitality services. Procurement packages will be developed with consideration for capacity and capabilities of local and regional Indigenous and non-Indigenous businesses, and requirements will be posted in a timely manner, so such businesses are provided the necessary time to prepare and compete to supply goods and services required across Project phases.

Given the length of construction, operation, and decommissioning, rehabilitation and closure, it is possible that local businesses could expand (workforce size) or new businesses could be established (especially those seeking to fulfill operational service and supply contracts) to meet Project demands. It is possible that new and expanded businesses may be established in the LAA and RAA, particularly as the Project has the potential to stimulate a specialized mining industry for the province and the country, which would stimulate further indirect impacts and induced spending.

As the Project transitions from operation through to completion of decommissioning, rehabilitation and closure, a loss of Project expenditures within the LAA could result (depending on economic conditions at the time) in adverse effects (i.e., a reduction) on indirect employment. Many of the business owned in LAA and RAA have operated in the Baie Verte Peninsula through peak mining and downturns in the mining industry and as a result, have modified their business practices. Many businesses provide services for transportation, forestry, fishing and aggregate and others, becoming more resilient to changes in economy.

Wages paid to the Project's direct workforce are predicted to be substantially higher than the average wage rates currently paid within the LAA and RAA. While Project wages are likely to fall within the existing range of compensation paid to NL workers of industries and sectors most applicable to Project-related work, due to differentials between existing LAA and RAA conditions, the Project has the potential to contribute to upward pressure on wages through increased competition for labour among local employers. Combined with the potential for Project-related employment to be perceived as being more desirable than other forms of employment within the LAA and RAA, the Project could result in increased difficulty for local businesses to recruit or retain qualified workers. To manage the Project's contribution to upward pressure on wages, FireFly will pay its direct workforce wages that are consistent with NL's mining industry.

6.6.4.2 Change in Infrastructure and Services

As described in Section 6.6.2, Project activities and Project-related population growth may affect the capacity of local infrastructure and services. During the site preparation phase, the workforce will consist of approximately 220 to 295 employees. Project construction will require a workforce of between approximately 580 and 880, while the operation labour force will peak at approximately 500 workers. Work is ongoing to determine the labour requirements for decommissioning, rehabilitation, and closure, but it is anticipated that as the Project transitions into the final phase there will be a decrease in the size of the workforce. Based on past mining projects in the region, it is estimated that 60% of FireFly's employees and 20% of the contracted workforce will be from local communities.

With respect to the potential effects of the Project labour force on accommodations, during Project phases, an accommodation complex located 1.5 km from the Project site will be available to house non-local workers. It is assumed that workers from local communities will commute to the Project from their homes and will not require a room at the accommodation complex. The modular accommodation complex will have 500 beds in double rooms during construction and 250 beds in single rooms during operation. Due to the rotation schedule, it is anticipated that the complex will fully accommodate FireFly's non-local rotational employees during the peak of the construction and operation phases. The complex will also have associated amenities like washrooms, dining rooms, entertainment areas, and a vehicle parking area. The modular design of the complex will enable the rooms to be converted into a modern operation accommodation complex for future FireFly employees that are Regional or FIFO, and local employees during poor weather conditions and for future shutdowns or maintenance requiring contractors onsite. FireFly also has an existing camp with 60 rooms to house employees and contractors, which will remain onsite during Project construction and operation. Additional local accommodation, such as hotels, apartments or temporary construction trailers, will be used to house workers, if required.

Project activities and the Project labour force may also place additional demands on local services and infrastructure (utilities, emergency, health, education, and transportation infrastructure and services). FireFly's commitment to hire locally will reduce demands of the Project labour force on infrastructure and services. FireFly will have mitigation in place (listed in Section 6.6.3) to manage the effects of Project activities on infrastructure and services. With respect to utilities, power supply to the mine site will be through the existing power lines in the Project Area. A 30 megawatt substation is planned to be constructed, and the site will have emergency generators on-site. Supplemental power maybe required with diesel generator(s) to support the accommodation complex, laydown areas, and other auxiliary work area / activities. Having discussed the Project requirements with NL Hydro, it is anticipated that the existing electrical grid has capacity to support the Project during all phases.

FireFly has an approved Waste Management Plan for managing waste produced during construction and operation, which conforms with provincial requirements and includes protocols for handling solid and hazardous waste. The Waste Management Plan has been revised to address the Project and is included in Appendix 2.D. Hazardous waste will be collected, stored on site temporarily as appropriate and trucked offsite to appropriate licensed facilities. Waste produced in the Baie Verte-Green Bay Waste Management Region is transported to the facility at Norris Arm Waste Management Facility, which had a 50-year life expectancy when it opened in 2012, and its lifespan was doubled in 2016 through facility upgrades. Three Corner Pond and England's Brook have been identified to supply Project water requirements. Water from

the existing Jenkins Pond will be used to feed the water plant and subsequent distribution to the existing office and camp facilities. The Project is not expected to place additional demand on the community potable water supply.

FireFly will have mitigation in place to manage Project-related demand on emergency services. For instance, security is provided on-site and access to the Project site controlled. Security rooms and check points are established to control and manage access to the Project sites. Control points are managed by 24 hr coverage consisting of both security personnel, video camera and biometric access systems. This will reduce potential demands of the Project labour force on local police services. As detailed in Section 2.12, an Emergency Response Plan and Environmental Contingency Plan has been developed to address the potential for on-site accidents, and this will limit demands on fire protection and ambulance providers. These plans, as well as the presence of a trained Mine Rescue Team, a physician hired to support FireFly Project employees, and EAP, will also reduce demands on local health care facilities due to fewer accidents and the availability of health care on-site for non-emergency situations.

It is anticipated that construction and operation will generate 100 passenger vehicles each day, with peak traffic during day and night shift changes and rotation changes. Most of the traffic will be workers traveling to and from the site at the start and end of their shifts, with some general freight and equipment transport vehicles accessing the site throughout the day. The truck traffic will be primarily restricted to Highway 414 and Highway 418. The shift changes will likely occur during periods of the day that are outside of the regular work or school day, early in the morning or later in the evening, so an increase in traffic in local communities may not be apparent to the residents.

FireFly has incorporated a port access road into their Project design to limit Project-related traffic, along public roads and highways. Vehicle traffic volumes will also be managed through traffic management measures, which will include the provision of shuttles or bus services at commuter pick up locations. FireFly will have a bus to take workers from the accommodation complex to the mine site. Carpooling will also be encouraged among local employees. A scheduled shuttle bus will be available from Deer Lake airport to transport FIFO to and from the Project site. Transport requirements will be reviewed throughout the site preparation and construction phase to manage traffic volumes during all Project phases. The highway on the Baie Verte Peninsula has historically been in poor condition. Recent upgrades to the highway have improved this situation. The traffic management measures will reduce the Project's contribution to future road deterioration in the region.

Due to the provision of housing for non-local employees and FireFly's efforts to hire locally, the Project and its workforce are not likely to place additional demands on local housing and accommodations or other local infrastructure and services. As a result of the mitigation and management measures described throughout this section, it is anticipated that there will be a small measurable change to infrastructure and services in the LAA which will be managed within the capacity of existing infrastructure and services.

It should be noted that the Project may support improved access to local infrastructure and services through the production of revenue, which can increase the capacity for investment in local infrastructure and services, such as recreation, which will benefit LAA residents.

6.6.4.3 Change in Community Well-being

Community well-being may be affected by changes in the level of crime in LAA and RAA communities and changes in access to health services related to the presence of non-local Project employees.

The Baie Verte Peninsula Health Centre in Baie Verte and the Green Bay Health Centre in Springdale are the main health facilities in the LAA and RAA. There are also three public health nurses and two community support workers (Central Health n.d.). Central Health has been challenged with recruitment and retention of family physicians and specialists and the region's vacancy rate has been increasing (Central Health 2023). Virtual care services have been helping to accommodate patients who require non-emergency services and do not have a primary health care provider. FireFly will continue to retain a doctor to oversee health care to Project employees. FireFly will also employ an on-site paramedic, provide EAP services, and provide medical services on-site to reduce demands on local health care services and facilities.

The majority of Central Health Region residents perceived their mental health to be very good or excellent and perceived life stress was lower in the Central Health Region than the province in 2019/2020. Residents of the Central Health Region also feel a greater sense of community belonging than residents of the of the province as a whole (Statistics Canada 2023b). As described in Section 6.6.3, FireFly will continue to implement several policies with the aim of reducing Project effects on community well-being, including a Respectful Workplace Policy, a Workplace Etiquette Policy, and a Drug and Alcohol Policy. FireFly will also continue to work with municipalities to identify opportunities to reduce negative impacts of the rapid population growth and positive socio-economic benefits are enhanced throughout the Baie Verte Peninsula.

Policing services are provided throughout the LAA and RAA by the RCMP detachment in Baie Verte. While crime statistics are not available for this detachment, the CSI has been increasing for the Deer Lake RCMP District, which includes the Baie Verte detachment (NL Statistics Agency 2022). FireFly will manage potential demands on the local police service by continuing to provide on-site security, and the current plan to control access to the site will be reviewed and revised as needed to accommodate the needs of the Project. Effects will also be managed through the policies described in Section 6.6.3. These policies will help create a working environment that is free from harassment and discrimination and reduce opportunities for altercations among Project employees.

Increased disposable income from Project employment can have positive and adverse effects. Project employment and increased income can improve well-being by allowing some individuals more opportunities for exercise and family activities, as well as more access to healthy market foods. Adverse effects on well-being may result if increased disposable income decreases financial barriers to negative coping mechanisms, such as overeating, smoking, heavy drinking, and illicit drug use. FireFly has an EAP in place and has retained a doctor to support Project employees and will maintain these services for the Project. Project employment may also lead to a decrease in the amount of time that workers have available to engage in traditional and recreational activities and increase time away from family, which could result in increased stress and strained family dynamics. The policies described above which will be implemented by FireFly will reduce negative effects and enhance benefits of increased income as a result of Project employment.

With respect to physical health, emissions and discharges from the Project may cause changes in air, sound, and water quality, potentially affecting human health through direct exposure (e.g., inhalation of air) and indirect exposure (e.g., ingestion of contaminated food) to contaminants. Detail on emissions and discharges from the Project and potential effects on air, sound, and water quality are available in Sections 6.1, 6.2, and 6.3. Noise and emissions to the air and water in the Project area will be mitigated to be below the regulatory threshold. This prediction will be confirmed through the completion of modelling prior to the start of Project construction. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed.

Potential sensory disturbance effects (e.g., noise, dust, visual) could affect the quality of the outdoor experience for local land and resource users. According to the Project Land and Resource Use (LRU) Survey, 5% or less of those surveyed engage in recreational activities (e.g., hiking, fishing, snowmobiling) in the LRU LAA and in the Project Area. Noise and emissions associated with Project activities will be mitigated to be below the regulatory threshold (Sections 6.1 and 6.2). This prediction will be confirmed through the completion of modelling prior to the start of Project construction. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed.

The well-being of land and resource users in the Project Area could be affected if Project activities cause a change in access to land use, their ability to harvest country foods, and recreational opportunities. However, there has been a long history of mining in the area and land use associated with the Project is consistent with the resource use that has been occurring in the RAA. As described in Section 6.7 (Land and Resource Use), a relatively small percentage of the local population have engaged in harvesting activities in the Project Area and there are alternate areas within the LRU LAA and RAA where resource users could pursue these harvesting activities.

FireFly will engage with local resource users (hunters, trappers, anglers), including the communication of Project information, updates on ongoing and planned activities, and a discussion of issues and concerns and potential means of addressing them. For safety and security reasons, informal recreational activities will be restricted near construction and operation activities. Signage will be installed around the mine site to alert land users of the presence of the Project and its facilities, and gates will be established to restrict access to active areas of the Project. If complaints are received from land and resource users regarding perceived Project-related impacts, FireFly will work with the affected land and resource users to address their concerns through a grievance redress mechanism.

Mitigation measures will reduce Project effects on access to health care, policing services, and LRU, as well as changes in LRU caused by sensory disturbances. Residents of the LAA and RAA who gain employment with the Project may experience a small measurable change (positive and adverse) in community well-being as a result of increased income.

6.6.4.4 Summary

Potential adverse effects will be largely mitigated by the provision of accommodations for the non-local labour force. FireFly's commitment to hire most of the Project labour force from local communities will reduce demands on housing and temporary accommodations, as well as other community services and infrastructure, such as health and education. Project vehicles will increase use of local roadways, which

have historically been in poor condition; however, funding has been allocated by the provincial government for improvements to the highway in the region and FireFly will implement measures to reduce Project traffic through its Traffic Management Plan. In addition, the addition of a port access road will reduce Project-related traffic on local roads and highways. As a result, there may be a change in use of local infrastructure and services, but that level of use will be within their existing capacity.

Effects on community well-being may be positive or adverse as a result Project-related income. FireFly will aim to enhance positive effects by hiring a local labour force and reduce adverse effects by continuing to develop and implement policies with an aim to promoting moral fairness, enhancing work / life balance, providing a working environment that is free from harassment and discrimination, and discouraging negative coping mechanisms. Potential adverse effects that may result from a change in access to health care and in demands on policing services will be managed through a number of measures, including the Emergency Response and Contingency Plan, Mine Rescue Team and through the provision of an EAP, Project physician, a paramedic, and security at the Project site. Changes to LRU due to decreased access and sensory disturbances that may adversely affect community well-being are likely to have a measurable change, however; does not exceed applicable objectives, guidelines, or standards; and allows LRU activities to take place at or near current levels within the RAA. There are alternate areas within the LRU LAA and RAA where resource users could pursue these harvesting and recreational activities.

With the implementation of mitigation and enhancement measures, Project residual effects on the LAA and RAA labour force are expected to be positive in direction during construction and operation, with adverse effects anticipated as the Project transitions from operation through completion of decommissioning, rehabilitation and closure (i.e., loss of direct employment). Project residual effects on local and regional businesses are expected to be mixed in direction (positive and adverse). Positive effects relate to Project spending on goods and service contracts, and direct, indirect and induced employment effects alongside the prospect of improved financial positions of LAA and RAA constituents. While positive and adverse effects on regional businesses are expected to extend province wide, although it is recognized that benefits also extend beyond NL. Adverse effects may result from anticipated upward pressure on wages, increased difficulty of local employers to recruit or retain workers who may be qualified for employment with the Project throughout the life of the Project. Project residual effects on the economy are predicted to be positive during construction and operation. Adverse effects are anticipated during decommissioning, rehabilitation and closure. Effects are expected to primarily extend to the LAA, RAA, and NL although it is recognized that Project expenditures and, therefore, contributions to GDP will extend beyond NL.

Based on application of the mitigation and management measures identified in Section 6.6.3, residual environmental effects on Communities are likely to be not significant.

6.6.5 Follow-up and Monitoring Programs

A dedicated follow-up and monitoring program is not proposed for Communities.

6.7 Land and Resource Use

Land and Resource Use (LRU) was selected as a valued component (VC) because of the potential interactions between the Project and the use of the land and resources in and nearby the Project Area and their socio-economic value to the region. This VC includes activities and infrastructure related to the use of land and resources, including designated land use (e.g., protected areas, communities), resource use (e.g., hunting, trapping, fishing, forestry) and recreational use (e.g., hiking, fishing, snowmobiling). This section assesses Project-related effects on land and resource use, which can include activities by both Indigenous and non-Indigenous residents.

Applicable federal legislation related to LRU includes the *Canadian Navigable Waters Act* and the *Fisheries Act*. Provincial legislation, regulations policy, and guidance that are applicable to land and resource use include the Newfoundland and Labrador (NL) *Forestry Act*, NL *Fisheries Act* and *Fishery Regulations*, NL *Urban and Rural Planning A*ct, and NL *Wild Life Act*.

As described in Section 5.2.3 and shown on Figure 6.7.1, Project spatial boundaries for LRU include the Project Area (area of physical activities), the Local Assessment Area (LAA, 1-kilometre [km] buffer around the Project Area), and the Regional Assessment Area (RAA, 5-km buffer around the Project Area). A significant residual adverse effect on LRU for the Project is defined as any of the following:

- The Project does not comply with established federal, provincial, or municipal land use designations, policies, or by-laws
- The Project will create a change or disruption that restricts or degrades present land and resource use capacity within the RAA to a point where activities cannot continue at or near current levels over the long term and where compensation is not possible

6.7.1 Existing Conditions

6.7.1.1 Approach and Methods

Information on existing conditions for land and resource use by both Indigenous and non-Indigenous peoples was obtained through primary and secondary research. Primary data were collected through a land and resource use survey (LRU survey; Appendix 6.D), as well as government, stakeholder, and community engagement activities undertaken for the Project. The online LRU survey was open to the public from September 26 to October 11, 2024, and was composed of 42 questions, which included multiple choice, single choice, yes/no, and open-ended question formats. A printed version of the LRU survey was also made available to the public at FireFly's regional and community group events in Baie Verte on October 9 and 10, 2024, with the option to return completed surveys to FireFly's information booth during the days of the events, or on or before October 11, 2024.

Figure No.
6.7.1

Title
Land and Resource Use Spatial Boundaries

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_4_001

Project Location
Baie Verte, NL

Prepared by MB on 2024-12-09
Revised on 2025-03-19
TR by NW on 2025-01-07

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Project Area
- Local Assessment Area
- Regional Assessment Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199903_data\gis_cad\gis_data\mapping\aprx\4_121418199_FFM_MingMine_LRU\121418199_FireFlyMetals_GreenBay_LRU.aprx Revised: 2025-03-21 By: mblackwood

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

The LRU survey was completed by 418 people, comprising 417 online surveys and one printed survey (Stantec 2024, Appendix 6.D). The study areas for the LRU survey are shown in Figure 2 Appendix 6.D and included three areas: the Area of Interest, a 1 km buffer, and 5 km buffer around the Area of Interest (Appendix 6.D; Stantec 2024). Note, due to refinements in the Project Area between the filing of this document and the LRU survey, these areas are slightly different than the spatial boundaries for the LRU VC. However, the difference is very slight and does not affect the applicability of the information collected.

Secondary research included a desktop review of existing and publicly available research and studies, research findings, other environmental assessments, and a review of traditional knowledge, where available.

LRU metrics generated through spatial analysis have also been used to describe the existing environment. Geospatial data were plotted using Geographic Information Systems (GIS) software to determine the spatial distribution and nature of overlapping land uses within the Project spatial boundaries, as described in Section 5.2.3. By using GIS overlay mapping, the following information on land uses occurring in the vicinity of the Project was quantified:

- The number of land use permit and lease sites (e.g., cabins, recreation lots) and municipal planning areas in the LAA and RAA
- The number and/or area of provincial forests, wildlife management units (bear / moose), provincial Crown lands, conservation lands, ecological reserves, and protected area lands in the LAA and RAA
- The number and/or area of recreational use areas (e.g., campgrounds, lodges, recreational sites, canoe routes, hiking trails, all-terrain vehicle (ATV) trails, snowmobile trails) in the LAA and RAA
- The number and/or area of Forest Management Districts (FMDs), research and monitoring sites and private land forest values in the LAA and RAA
- The number and/or area of mineral dispositions (e.g., mining claims, mineral leases, quarry leases, quarry permits, mining areas, aggregate resources) in the LAA and RAA
- The extent of potential Project interaction with registered traplines, game hunting areas and outfitter allocation areas and game bird hunting zones in the LAA and RAA
- The extent of potential Project interaction with commercially fished and sport fished lakes (trout / salmon) in the LAA and RAA
- Hydro and power infrastructure within the LAA and RAA

6.7.1.2 Description of Existing Conditions

This section provides an overview of land and resource uses, including designated land use, resource use, and recreational use. Designated land use includes lands that have defined uses as per provincial and municipal regulations and may be subject to property rights or interests. These areas include municipal planning areas and town boundaries, protected water supplies, protected roads, provincial crown land, protected conservation areas, and wildlife management areas. Resource use describes lands used for resource extraction, including hunting and outfitting, trapping, angling / fishing, mining and quarrying, forestry, and hydroelectric development. Recreational use of the land includes leisure activities in which people take part on the land and water (e.g., hiking, fishing, snowmobiling).

6.7.1.2.1 Designated Land Use

Municipal Land Use and Communities

In NL, municipal land use is governed by the *Urban and Rural Planning Act, 2000*, administered by the NL Department of Municipal and Provincial Affairs. The Act establishes the province's land use planning system and details the requirements for preparing, approving and implementing planning documents. As required under the Act, the preparation of Development Regulations is required to control land development, used in compliance with the Municipal Plan.

The Project is an expansion to an existing mine located within the Town of Baie Verte Planning Area Boundary as described in the 2022-2032 Municipal Plan and associated Development Regulations (Figure 6.7.2). These documents are used to guide future growth and physical improvements in the Town by identifying locations and setting policies for land use and development (Town of Baie Verte 2022a). The Development Regulations include land use zones, permitted and discretionary uses in each zone, development standards and conditions as well as criteria for the evaluation of subdivision and development applications. The Project is mainly located within the Industrial Mining Zone, the current location of Ming Mine, with the road extending into the Rural Zone. In the Industrial Mining Zone, permitted uses include industrial general, industrial heavy and hazardous, mineral exploration – development, mineral working, mining, natural resource-related use, and onsite temporary worker's residence(s) (Town of Baie Verte 2022b). Mining, defined as "an operation involving the extraction of a mineral for sale and for which a mining lease is required under the provincial *Mineral Act 1999* administered by the NL Department of Industry, Energy and Technology (NLDIET)", is permitted with an application for a development permit by the Town. The permit is required to include a Mineral Working Development Plan and Mining Reclamation Plan, as detailed in the Development Regulations. At the discretion of Council, temporary worker residence(s) may be permitted on the mine site and are required to be restored to its original condition at the end of the temporary period. Developers may also be required to enter into a legal agreement with Council to provide financial guarantees with respect to the terms relating to temporary occupancy and reinstatement of the site upon expiration of the approved temporary occupancy (Town of Baie Verte 2022b). Currently the operation of the Ming Mine and existing operations camp is permitted by the Town. The existing operation has two leases (Figure 6.7.3) and the proposed expansion would largely remain in the existing leases, which the exception of the access road to the port and the camp located 1.5 km south of the mine site.

The Project is also located 1.2 km from the Ming's Bight municipal planning area, which intersects the LAA and RAA. Given Project components are located outside the planning area, land use regulations for Ming's Bight do not apply.

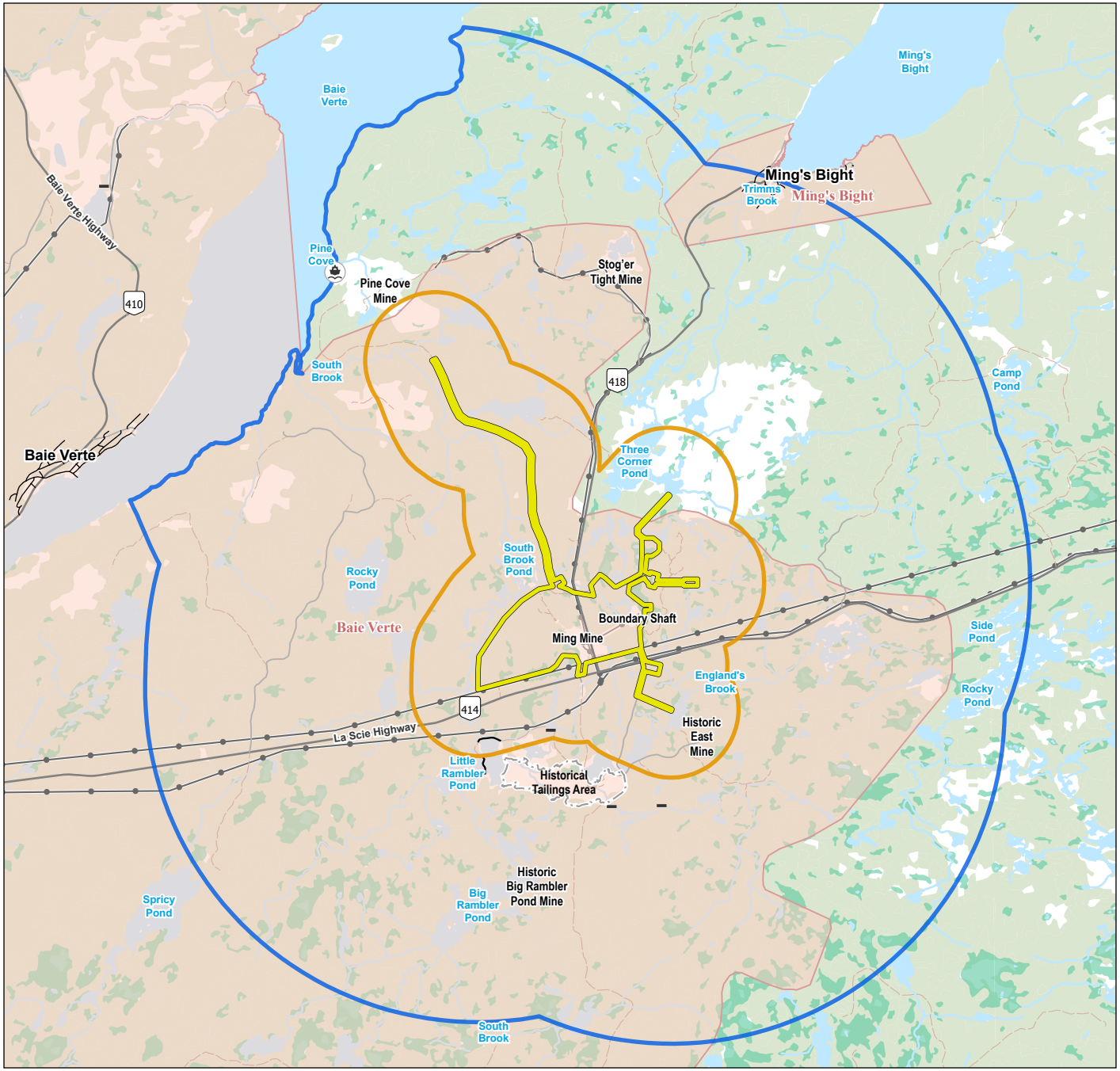


Figure No.
6.7.2
Title
Municipal Boundaries within the Regional Assessment Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_4_002

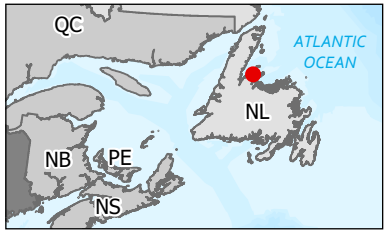
Project Location
Baie Verte, NL

Prepared by MB on 2025-01-07
Revised 2025-03-19
TR by NW on 2025-01-07

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Project Area
- Local Assessment Area
- Regional Assessment Area
- Municipal Boundary
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, GovNL Department of Fisheries, Forestry and Agriculture
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Protected Water Supplies

The Water Resources Management Division of the Newfoundland and Labrador Department of Environment and Climate Change (NLDECC) is responsible for water resources management as per provisions of the *Environmental Protection Act* and the *Water Resources Act*. The Division has programs to protect, enhance, conserve, develop, control and effectively use the water resources of NL (NLDECC 2023). There are no protected water supply areas within the Project Area or LAA. Middle Brook Pond, catchment area for a water supply for Ming's Bight, is located within the RAA (i.e., within 5 km of Project Activities).

Provincial Crown Land

The Lands Branch of the Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture (NLDFFA) is responsible for managing and allocating provincial Crown land. The RAA is mainly comprised of unoccupied Crown land. Less than 0.1% of the remaining land in the RAA is comprised of expropriated land, private Crown titles, applications for Crown titles, and lands owned by Service NL. There are 31 unverified (i.e., have not been ground-truth) cabin plots within the LAA and 62 within the RAA (Figure 6.7.3). The closest cabin to the Project Area is 168 m.

Protected Areas

The province of NL has 60 protected areas including 54 provincially protected areas and six federally protected areas. Provincial protected areas include two wilderness reserves, 18 ecological reserves, 31 provincial parks, a wildlife park, a wildlife reserves and a special management area (NLDECC n.d.). There are four federal national parks and two national historic sites as well as four World Heritage Sites and one GeoPark. However, there are no protected areas within the Project Area, LAA, or RAA. The nearest protected area is the Waterway Provincial Park (approximately 170 km away).

Wildlife Management Areas

Hunting and trapping are regulated by NLDFFA's Wildlife Division (NLDFFA-Wildlife Division) through the *Wild Life Act* and Regulations, which is responsible for managing and conserving NL's biodiversity and wildlife resources. As part of wildlife management, research is conducted and used to make recommendations to the NLDFFA-Wildlife Division, as well as to other provincial and federal government agencies, such as the EA Division of the NLDECC and DFO (NLDFFA n.d.[a]). The NLDFFA-Wildlife Division's Research Section conducts research involving moose, bear and collaring and monitoring of caribou, as well as other big game, small game, furbearers, and fish species. The Game and Fur Management Section monitors the status of wildlife populations by monitoring population, biological components and hunter trends of each species, providing population estimates or relative abundance estimates, where possible (NLDFFA n.d.[a]). This information is used to set licence quotas which are established within management areas. Wildlife management areas within NL include Moose Management Areas (MMAs), Bear Management Units (BMUs), small game management areas, and furbearing trap zones. Table 6.7.1 provides a description of the overlap between the wildlife management areas and the RAA, LAA and Project Area (Figure 6.7.4).

Figure No.
6.7.3

Title
Seasonal/Residential Receptors within the Regional Assessment Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_4_005

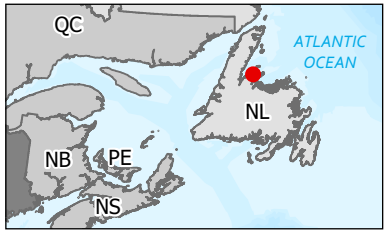
Project Location
Baie Verte, NL

Prepared by MB/AC on 2024-12-09
Revised 2025-03-19
TR by NW on 2025-01-07

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Potential Receptor
- Application for Crown Title
- Crown Title
- Project Area
- Local Assessment Area
- Regional Assessment Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
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2. Data Sources: FireFly Metals Ltd, Stantec, GovNL Department of Fisheries, Forestry and Agriculture
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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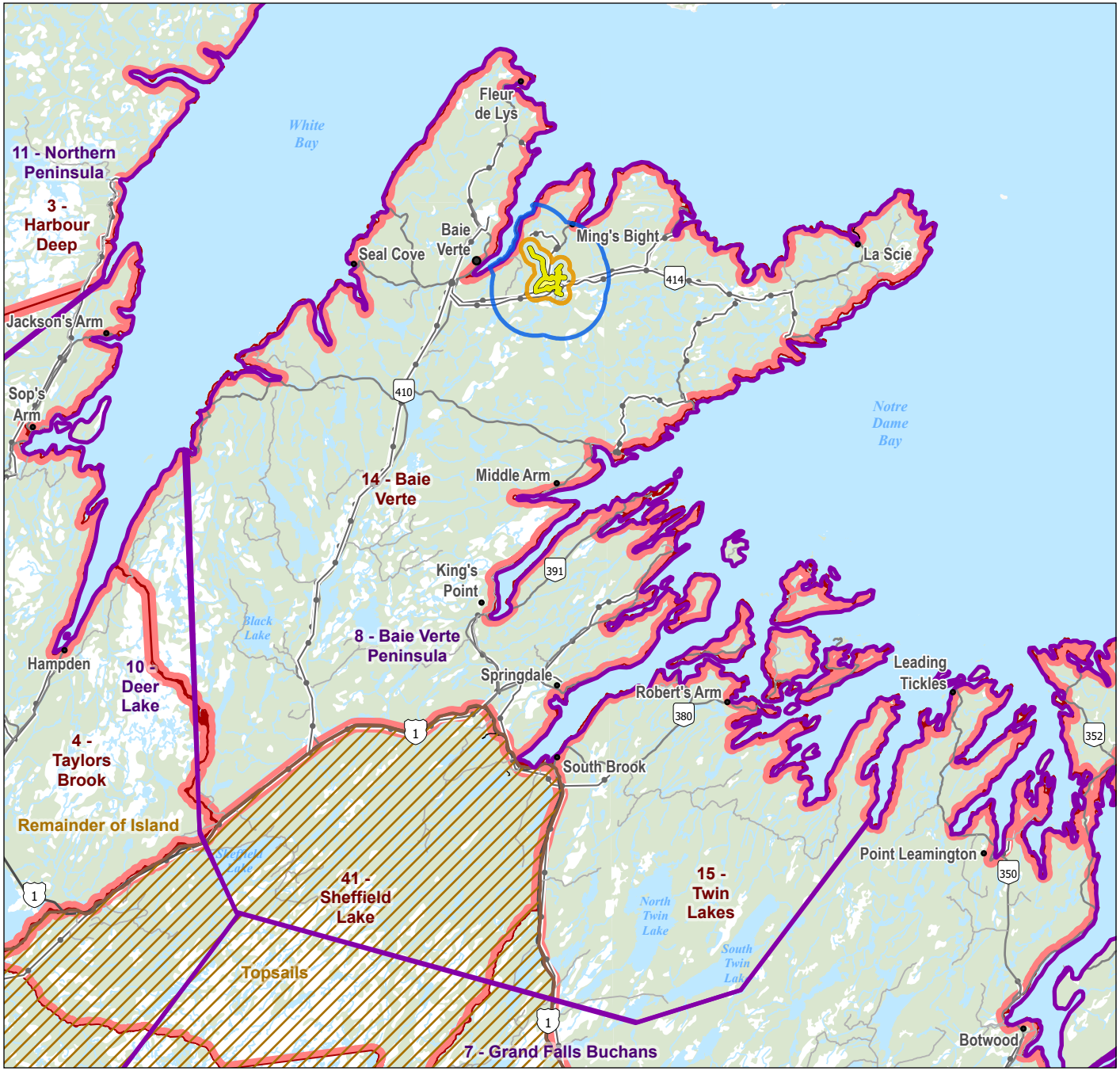


Figure No.
6.7.4

Title
Wildlife Management Areas within the Regional Assessment Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_4_006

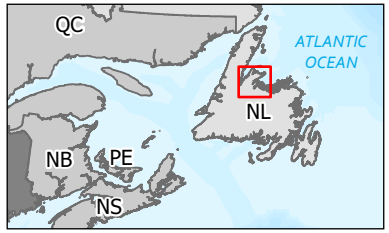
Project Location
Baie Verte, NL

Prepared by MB on 2025-01-07
Revised on 2025-03-19
TR by NW on 2025-01-07

N

0 10 20 Kilometres
(At original document size of 8.5x11)
1:680,000

- Project Area
- Local Assessment Area
- Regional Assessment Area
- Fur Zone
- Moose/Bear Management Area
- Small Game Zone
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local Road
- Powerline



Notes
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2. Data Sources: FireFly Metals Ltd, Stantec, GovNL Department of Fisheries, Forestry and Agriculture
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 6.7.1 Wildlife Management Areas with Overlap in the Regional Assessment Area, Local Assessment Area, and Project Area

Management Area	Total Area (km²)	% Overlap		
		RAA	LAA	Project Area
MMA14 / BMU 14	3,619	4.1%	0.7%	0.1%
Small Game – Rest of the Island	91,624	0.2%	0.03%	0.003%
Furbearing Trap Zone 8	5,563	2.7%	0.5%	0.1%

6.7.1.2.2 Resource Use

Hunting and Trapping

Hunting in NL provides recreational opportunities for residents and non-residents and contributes to the province's wildlife management programs and economy through local spending and the outfitting industry (NLDFFA n.d.[b]). Hunting is regulated by NLDFFA and a licence is required to hunt, take, or kill wildlife in the province. Non-residents wishing to hunt big game are required to apply through one of the outfitting companies and possess a valid non-resident hunting licence. Hunting is regulated through Wildlife Management Units. Hunting must take place during open seasons with bag limits in place, depending on the species. Target species for hunting and trapping are divided into three categories: big game (moose, black bear), small game (e.g., grouse, snowshoe hare), and furbearers (e.g., lynx, beaver). Additional details on avifauna and other wildlife species presence are provided in Section 6.5.1.2.2 of the Terrestrial Environment VC.

Big Game

Big game hunting includes moose and black bear. NLDFFA-Wildlife Division is responsible for managing big game populations and determines the maximum number of moose and black bear that can be safely harvested to prevent population declines, while making sure populations are being maintained at levels that will not degrade the habitat and possibly lead to a population collapse (NLDFFA n.d.[b]). Hunting seasons and licence quotas are described below for each of these hunted species.

Moose are an important large game species on the Island of Newfoundland, with more than 20,000 individuals harvested each year through a quota allocation distributed across provincial MMAs. The 2022-2026 Moose Management Plan was developed to manage the big game resources in a sustainable approach based on scientific data that was collected through moose management surveys and other research activities (NLDFFA 2022). Hunters can apply to hunt in one of 46 MMAs, two national parks, and four sub-MMAs on the island. The Project is located within MMA 14, a Category II Regional Moose Management Area which allows 1.5 moose per square kilometre (km²). The 2024-25 hunting season dates are from September 14 to December 31. The harvest quota for the 2024-2025 hunting season in this area is 1,050 (550 either sex and 500 male) compared to a total quota of 27,590 for the province (NLDFFA 2024). The success rate for 2022 in MMA 14 was 59.9% (compared to 55.7% for the province) (NLDFFA 2024). The black bear open seasons for MMA 14 were from May 1 to July 15 and September

14 to November 10, 2024. Hunters are limited to two black bears per license and can apply to harvest two bears in the spring, two in the fall, or one in each season (NLDFFA 2024).

Just under one third of the LRU survey participants indicated that they, or a member of their family, hunt for big game (e.g., moose, bear) within the Project Area, LAA or RAA. Most of the big game hunting occurs within the RAA (31.8%). Only 1.9% of participants indicated they, or a family member, hunt for big game within the Project Area, and 3.3% of participants hunt big game within the LAA. The most common purpose for big game hunting identified by survey participants was food (95.4%), followed by recreation/sport (37.4%), and traditional and/or cultural purposes (6.8%). Survey respondents who indicated they hunt for big game in the Project Area, LAA or RAA reported that they hunt moose (100%), while just under a quarter hunt bear (24.4%). The frequency of big game hunting varied among study participants, with approximately one-third reporting they or a family member hunt big game once or twice a week during the open season (29.8%), while another one-third reported hunting big game only once a year (33.6%). Just under half of survey participants indicated that they or a member of their family consumed big game once or twice a week (45%) (Stantec 2024; Appendix 6.D).

Small Game and Furbearers

In NL, there are six small game species are currently managed and hunted including snowshoe hare, Arctic hare (hunted in Labrador only), willow ptarmigan, rock ptarmigan, ruffed grouse, and spruce grouse (NLDFFA n.d.[c]). There are up to 35,000 people in the province who participate in small game hunting by snaring and shooting for recreational and subsistence activity (NLDFFA n.d.[c]).

The LRU survey included duck, muskrat and fox among the species listed for small game hunting (Stantec 2024). Duck hunting is subject to the *Migratory Birds Hunting Regulations*, and hunters must possess a valid Migratory Game Bird Hunting Permit and a Canadian Wildlife Habitat Conservation Stamp to qualify (Environment and Climate Change Canada [ECCC] 2024). In NL, fox and muskrat are managed under provincial trapping regulations, along with beaver, otter, mink, coyote, lynx, wolf, ermine (weasel), and squirrel. Trapping seasons vary, although generally extend from late-October to mid-March (NLDFFA 2024). Of the species not listed in the LRU survey, one participant indicated they trap coyote and otter within the Project Area, LAA or RAA (Stantec 2024, Appendix 6.D).

Just under one half of study participants indicated that they or a family member hunt and/or trap small game (such as rabbit, duck, partridge, muskrat, or fox), and just over one-fifth do so within the Project Area, LAA or RAA. Of these areas, the most commonly reported by survey participants was within the RAA (18.7%), while less than 4% engaged in small game hunting within the Project Area (3.5%) and LAA (3.9%), respectively. The most common purpose for small game hunting and/or trapping identified by survey participants was food (93.1%), followed by recreation/sport (42.5%) and traditional and/or cultural purposes (12.6%). The most commonly reported hunted and/or trapped species was rabbit (92%), followed by ptarmigan/grouse (64.4%), ducks (48.3%), and partridge (31%). The frequency of small game hunting and/or trapping ranges among study participants, with just over one-third reporting they or a family member hunts and/or traps small game once or twice a week (32.3%). The majority of survey participants indicated that they or a member of their family consumed small game either once or twice a week (23%), once a month (31%) or once every few months (24.1%) (Stantec 2024, Appendix 6.D).

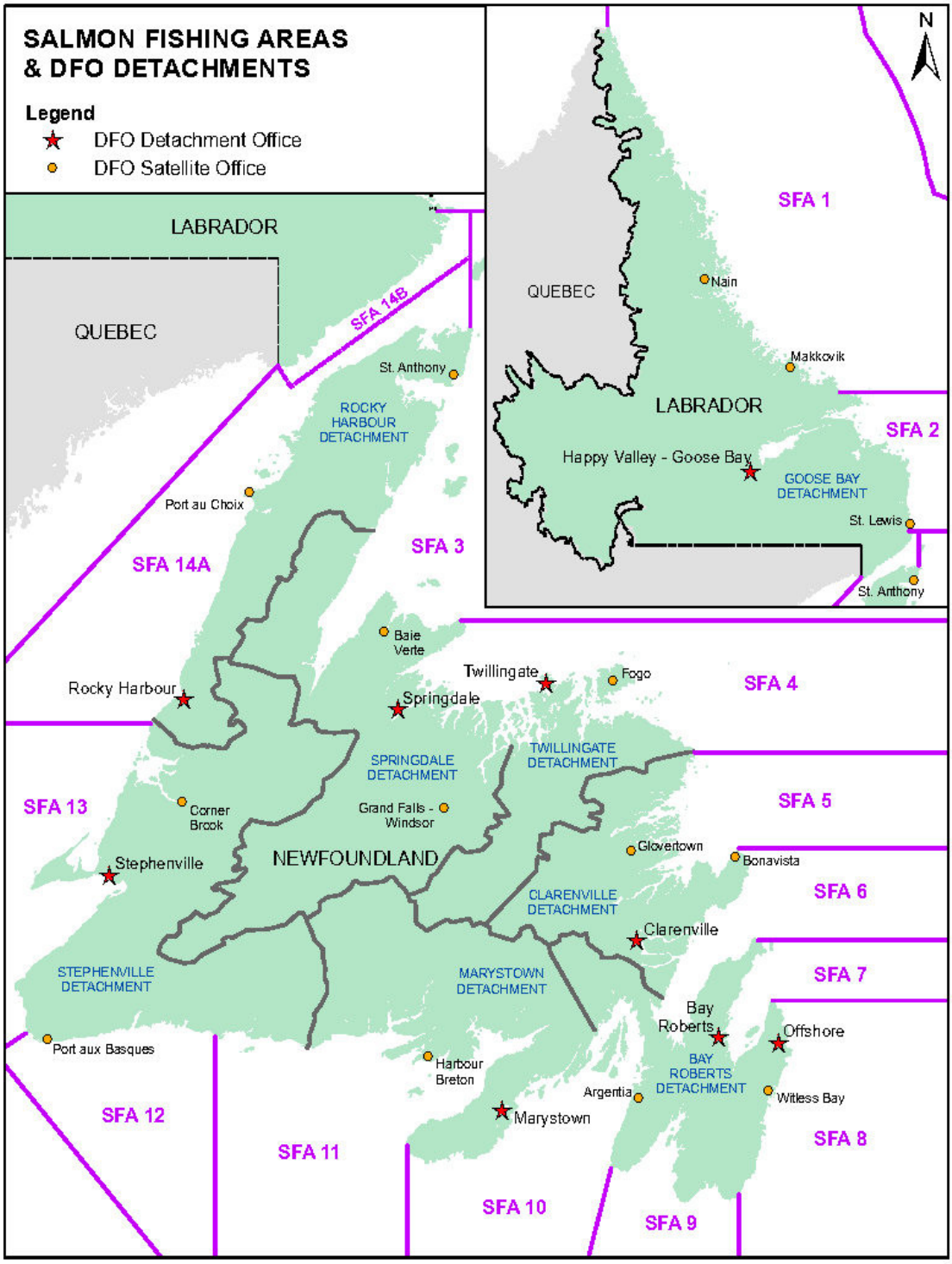
Fishing/Angling

Angling / fishing is regulated by DFO through the *Newfoundland and Labrador Fishery Regulations* pursuant to section 34 of the *Fisheries Act*. Licences issued by the Government of NL are required for both residents and non-residents for salmon, and non-residents only for trout and other sport fish, such as arctic char and northern pike (DFO 2024). The RAA intersects the Salmon Fishing Area 3 – Baie Verte River and tributaries (Figure 6.7.5).

Less than half of LRU survey participants indicated that they or a family member catch freshwater fish, and approximately one-quarter do so within the Project Area, LAA or RAA. Of these areas, the most commonly reported by survey participants was within the RAA (18.7%), while 5% or less engaged in freshwater fishing within the Project Area (2.5%) and LAA (5%), respectively. The most common purpose for freshwater fishing identified by survey participants was food (91.3%), followed by recreation/sport (59.8%) and traditional and/or cultural purposes (8.7%). The most commonly reported species fished was brook trout (84.8%), followed by brown trout (47.8%), rainbow trout (26.1%) and Atlantic salmon (21.7%). The frequency of freshwater fishing ranges among study participants, however, the majority of survey participants indicated that they or a member of their family fished for freshwater fish either once a week (21.7%), once a month (16.3%), or once every few months (34.8%). Consumption of freshwater fish follows a similar trend, with survey participants indicating that they or a member of their family consumed freshwater fish either once or twice a week (17.4%), once a month (28.3%) or once every few months (32.6%).

Wild Berry and Plant Harvesting

According to the LRU Survey, just under one-half of participants indicated that they or a member of their family pick wild berries and/or harvest other wild plants, and approximately one-fifth do so within the Project Area, LAA or RAA. Of these three areas, the most commonly reported by survey participants was within the RAA (16.4%), while 5% or less engage in berry picking and/or plant harvesting within the Project Area (2.6%) and the LAA (4.1%). Almost all of survey participants reported that they or a member of their family pick wild berries and/or harvest wild plants for food (98.7%). In comparison, only one-fifth do so for recreational purposes (22.1%), and one-tenth for traditional or cultural purposes (10.4%). Only a small fraction (2.6%) of survey participants harvest wild berries and/or plants for medicinal purposes. The three most commonly reported berries harvested by survey participants included blueberries (92.2%), partridge berries (75.3%), and raspberries (68.8%). Less than 3% of survey respondents indicated that they harvest wild plants, including species such as fireweed, labrador tea, low brush juniper, and mushrooms. The frequency of berry and/or plant harvesting ranges among study participants; however, the most common response was one a year (36.5%), followed by once or twice a week (20.8%). Despite this, over 50% of survey participants indicated that they consumed wild berries or plants once or twice a week (Stantec 2024; Appendix 6.D).



Source: DFO 2024

Figure 6.7.5 Salmon Fishing Areas

Water Use

The LRU survey polled participants on their water use for both drinking water and water used for bathing, cooking, cleaning, and other household tasks. Of the responses, less than one-tenth of survey participants indicated they sourced their water from the Project Area, LAA or RAA. Of those areas, the majority (62.5%) indicated they sourced their drinking water and household water from within the RAA, while less than 15% of responses were equally split between the Project Area and the LAA. While the majority of study participants identified they sourced both drinking water and household water from a municipal supply (approximately 60%), of the remaining responses, participants identified the use of both filtered and unfiltered surface water intakes, natural springs, and private wells (Stantec 2024; Appendix 6.D). The South Brook watercourse, which contains historic mining activities and is the planned receiver for the Project. South Brook historical surface water quality exceeded Canadian Drinking Water Quality Guideline maximum acceptable concentration values for a number of parameters, including pH, arsenic, cadmium, manganese and lead. Section 6.3 (Surface Water Resources) provides additional detail on water quality within the Project Area.

Mining and Quarrying

In NL, mining is one of the largest and oldest industries and major contributor to the economy with metal mines producing iron ore, nickel, copper, cobalt, and gold, and other operations mine pyrophyllite, fluorspar, limestone, and dolomite (NLDIET n.d.). The Baie Verte Peninsula has had a long history of mining and quarries, with modern mining dating from the late nineteenth century. Mines and quarries within the RAA include Big Rambler Pond Mine (closed), Shoreline Aggregates (operational), Guy J Bailey's (operational) East Mine (closed), Pine Cove Mine (restarted December 2024), and Stog'er Tight Mine (in care and maintenance).

The Green Bay Copper-Gold Project, is comprised of the Ming Mine site, Nugget Pond milling facility, Little Deer/Whalesback property and the adjacent landholdings acquired from Gold Hunter Resource Inc. The current Green Bay Ming Mine Project is an existing mine and has been subject to previous mining activity producing copper and gold. Historically, the Ming Mine has been mined since the early 1950s before shutting down in 1982. In 2010, the Project's previous owner began the process of reactivating the historical Ming Mine. Mining continued until recently (2023) when the mine was placed on care and maintenance due to financial challenges with the previous owners. The Nugget Pond mill and tailing management facility and the Goodyear's Cove port were also placed on care and maintenance. According to the LRU Survey, approximately one-quarter of participants indicated they were a former employee of Rambler Metals and Mining, while 16% indicated they were a current employee of FireFly (Stantec 2024, Appendix 6.D). As shown in Figure 6.7.6, there are nine mineral leases within the RAA, two of which are owned by FireFly, with the remainder owned by Maritime Resources Corp. Aside from the mineral leases held by FireFly, there is one mineral lease held by Maritime Resources Corp. within the LAA (approximately 1.7 km² of the lease).

Within the RAA, there are also three quarry permits and three quarry leases (Table 6.7.2; Figure 6.7.6). There are no quarries located in the Project Area. Three quarries are located within the LAA, owned by Guy J Bailey Ltd., Penney Paving, and Shoreline Aggregates.

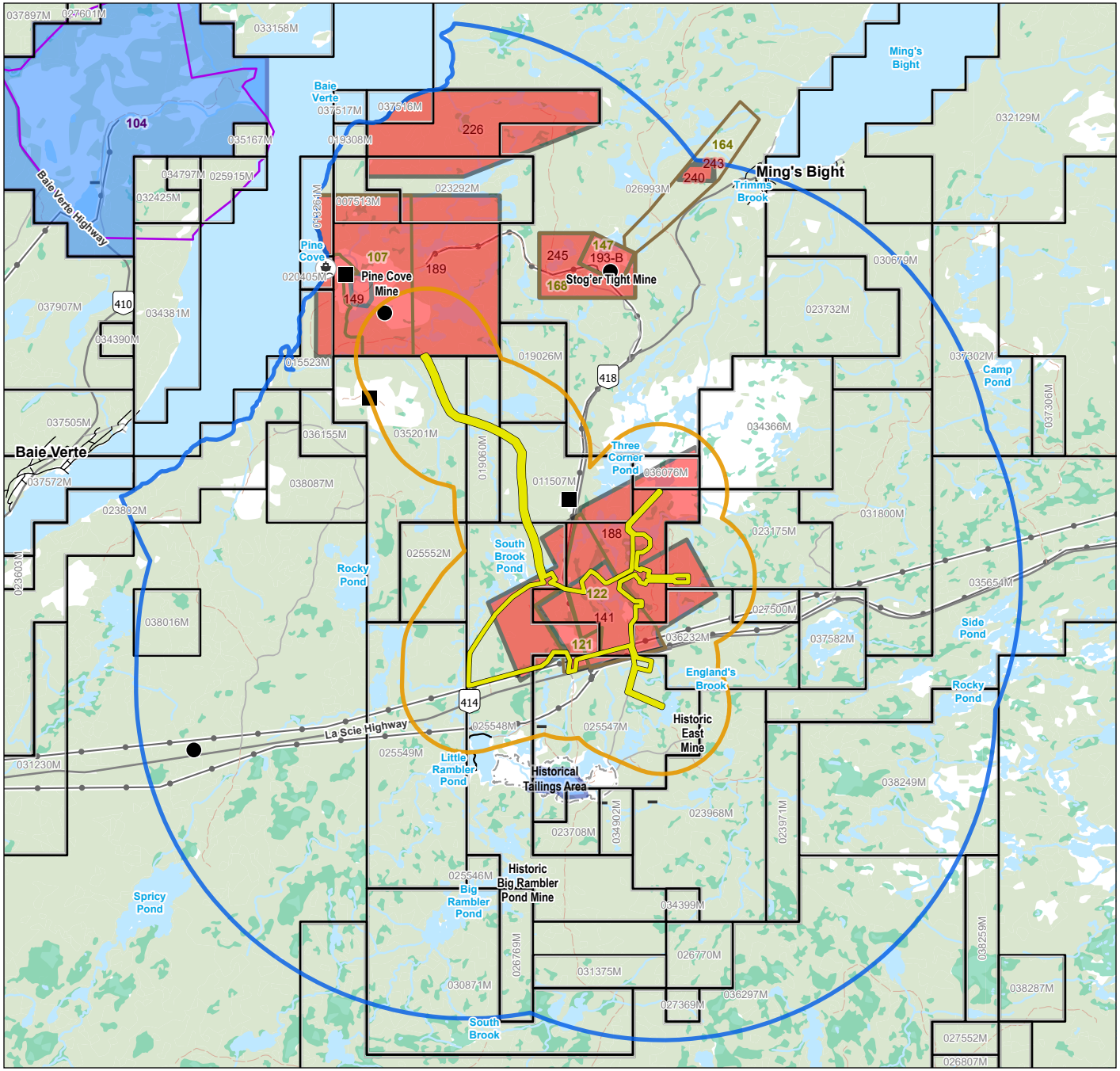


Figure No.
6.7.6

Title
Mining and Quarry Activity within the Regional Assessment Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_4_004

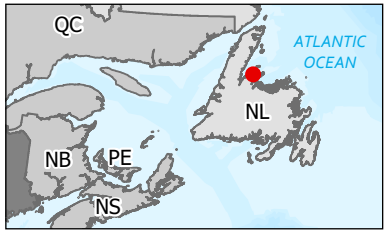
Project Location
Baie Verte, NL

Prepared by MB/AC on 2024-12-09
Revised on 2025-03-19
TR by NW on 2025-01-07

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Quarry Permit
- Quarry Lease
- Development - Former Baie Verte Mine Site
- Surface Lease
- Exempt Mineral Land
- Mining Lease
- Map Staked Claims
- Project Area
- Local Assessment Area
- Regional Assessment Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, Government of Newfoundland and Labrador - Geological Survey Division
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

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Table 6.7.2 Quarry Permits / Leases in the Regional Assessment Area

Company	Size (km²)	Issue Date	Expiry Date	Within the LAA?
Guy J Bailey Ltd.	0.05	6/4/2024	5/3/2025	Yes
Shoreline Aggregates Inc.	0.03	8/9/2024	10/24/2025	No
Guy J Bailey Ltd.	0.04	9/19/2024	9/18/2025	No
Penney Paving	0.05	1/11/2010	1/11/2033	Yes
Shoreline Aggregates Inc.	0.91	10/12/2021	10/4/2041	Yes
Shoreline Aggregates Inc.	0.78	7/26/2024	7/24/2044	No

Forestry

The provincial *Forestry Act* (1990) mandates the Forestry Services Branch of Newfoundland and Labrador to manage the forest resources of the province. The province is divided into 24 Forestry Management Districts, with 18 in Newfoundland and six in Labrador. Management of forestry activities include timber harvesting, construction of forest access roads, and silviculture activities, such as planting, thinning and site preparation. The allocated annual cut (AAC) is also set for each FMD. The Project is located within FMD 9. The Project Area accounts for 0.1% of the total FMD 9 area. The AAC for FMD 9 is shown in Table 6.7.3.

Table 6.7.3 Allocated Annual Cut for Forest Management District 9

Type	Core Softwood	Operational Softwood	Domestic Softwood
AAC Volume (m³)	38,376	1,968	53,874

Note: m³ = cubic metre;
Source: NLDFFA 2021

As shown in Table 6.7.4 and Figure 6.7.7, there are several domestic (i.e., for personal use) harvesting areas within the Project Area, LAA and RAA. There are four domestic harvesting areas within the Project Area and LAA.

Table 6.7.4 Domestic Harvesting Areas within the Regional Assessment Area

Domestic Harvest Area	Harvest Area (km²)	Percent Project Area Intersect	Percent LAA Intersect	Percent RAA Intersect
D09-12-Ming's Bight North	24.22	-	-	18%
D09-13-Three Corner Pond	22.67	4.35%	28%	83%
D09-11-Scrape Pond	7.53	1.9%	34%	100%
D09-29-Beaver Pond	29.38	-	-	6%
D09-10R-Rocky Pond Road	15.20	-	-	86%
D09-10-South Brook Pond	12.14	13.84%	66%	100%
D09-CBPP-02-Rambler	232.90	0.02%	2%	23%
D09-14-Belly Pond	21.21	-	-	14%

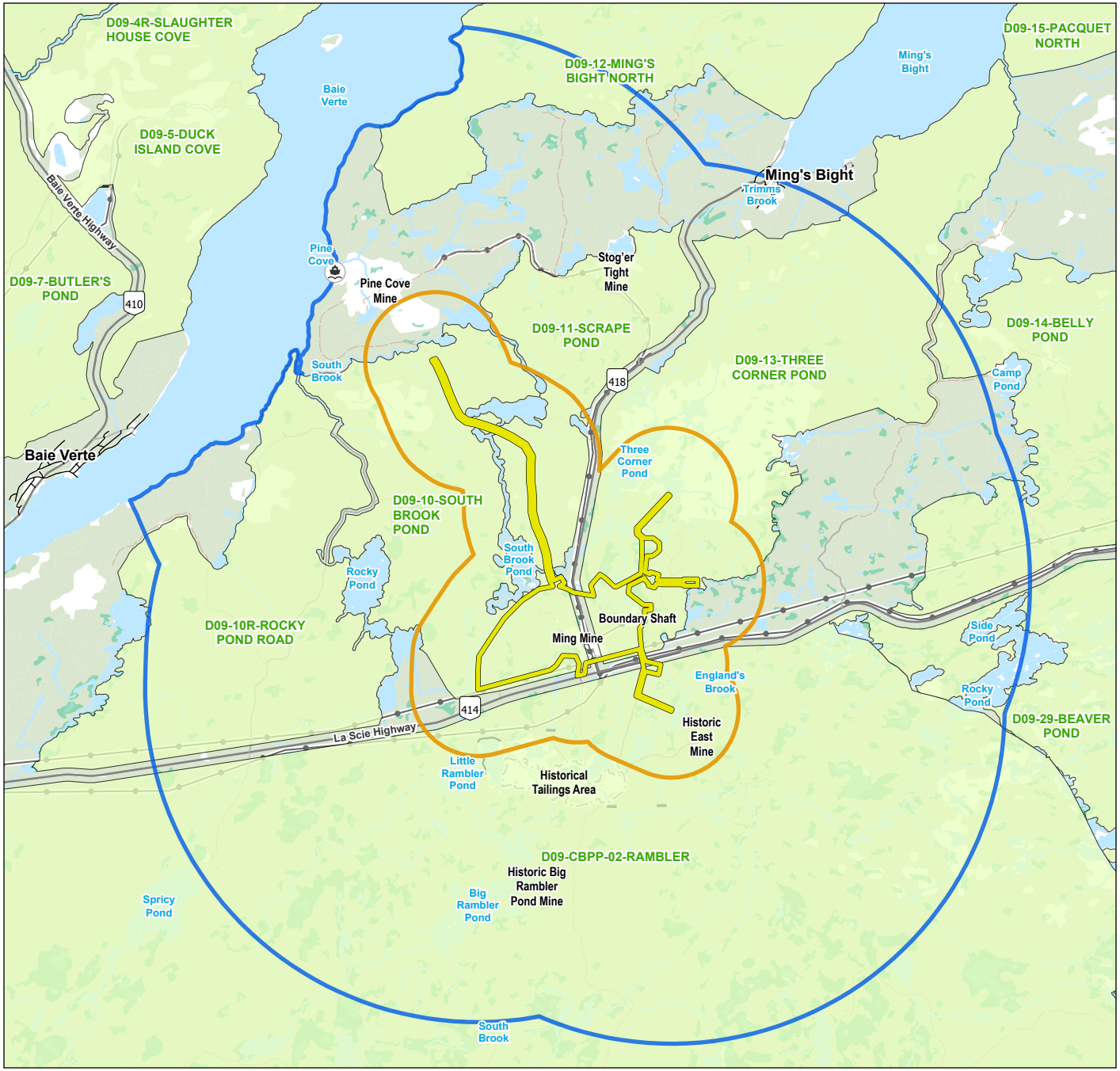


Figure No.
6.7.7
Title
Domestic Wood Harvesting Areas within the Regional Assessment Area

Client/Project 121418199_4_003
FireFly Metals Ltd
Green Bay Ming Mine Project

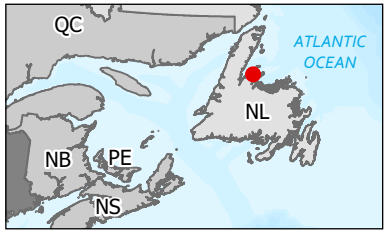
Project Location
Baie Verte, NL

Prepared by MB/AC on 2024-12-09
Revised 2025-03-19
TR by NW on 2025-01-07

N

0 1 2 Kilometres
(At original document size of 8.5x11)
1:90,000

- Project Area
- Local Assessment Area
- Regional Assessment Area
- Domestic Wood Harvest Area
- Port
- Dam
- Highway
- Arterial / Collector
- Local Road
- Resource Road / Trail
- Powerline
- Watercourse
- Waterbody
- Wetland
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, GovNL Department of Fisheries, Forestry and Agriculture
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\4_121418199_FFM_MingMine_LRU\121418199_FireFlyMetals_GreenBay_LRU.aprx Revised: 2025-03-21 By: mblackwood

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According to the LRU Survey, just less than half of survey participants indicated that they or a family member cut wood under a provincial Wood Cutting Permit, and less than one-fifth (17.7%) do so within the Project Area, LAA or RAA. Of these three areas, the most reported by survey participants was within the RAA (18.4%), while 2% or less engage in domestic wood cutting within the Project Area (0.5%) and the LAA (1.6%). The frequency of domestic wood cutting ranges among study participants from daily (18.3%), once or twice a week (23.9%), once a month (7%), once every few months (15.5%) to once a year (22.5%). Most survey participants indicated they cut wood domestically for heating their home, cabin, shed, garage or other buildings (93%), while firewood collection was reported as the second-most popular purpose (31%).

6.7.1.2.3 Recreational Use

The natural areas throughout the RAA host a variety of recreational land use activities, which are closely linked to the some of the designated land uses and resource uses described above. Recreational activities within the RAA primarily include hunting, trapping and fishing activities. These activities are discussed in Section 6.7.1.2.2.

Other recreational activities that are likely to take place within the RAA include hiking, snowshoeing, snowmobiling, swimming, canoeing, bird watching, camping, cycling, ATV / Utility Task Vehicle (UTV) use or dirt biking. According to the LRU Survey, over half of survey participants engage in these kinds of recreational activities, and approximately 40% do so within the Project Area, LAA, or RAA. Of these three areas, the majority (33.8%) engage in recreational activities within the RAA, while 5% or less do so in the Project Area (3.7%) and the LAA (5%). The most popular recreational activities include snowmobiling (88.6%) and ATV, UTV, side-by-side, or other similar activities (75.9%). These activities were also mentioned during engagement with communities discussed in Chapter 3 and taken into consideration during planning for the Project.

6.7.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for LRU is provided in Table 6.7.5. Potential environmental effects and effects pathways were selected based on the review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.7.5 Potential Effects and Effect Pathways for Land and Resource Use

Potential Effect	Effect Pathway(s)
Change in designated land use	• Mine site preparation and earthworks within the Project Area can change the use of lands through the loss of area and the restriction of access to designated lands • Project activities may affect seasonal / residential receptors (i.e., cabin users) due to sensory disturbances associated with noise emissions from the use of heavy equipment, transport of materials and increased traffic • The development and presence of stockpiles may affect nearby land use through visual disturbance

Table 6.7.5 Potential Effects and Effect Pathways for Land and Resource Use

Potential Effect	Effect Pathway(s)
Change in resource use	• The AAC in an area of commercial forest may be reduced • Direct loss of local resource use areas through mine site preparation and earthworks and construction / installation of infrastructure and equipment (i.e., the physical presence of the Project) • Sensory disturbance (e.g., noise, visual) to resource users and harvesting activities (hunting, trapping, outfitting, and fishing), affecting the quality of outdoor experience • Behavioral changes and/or mortality of harvested wildlife species due to the presence of sensory disturbances and Project activities which may cause a reduction in wildlife hunting success, as well as greater pressure on game resources • Presence of Project workers could increase the competition for species harvested by local hunters, trappers, outfitters, and fishers • Changes in water quality associated with emissions, discharges, and wastes to the aquatic environment have the potential to affect fish health, growth, or survival which could, therefore, result in greater pressure on fishery resources
Change in recreational use	• Access to recreational areas may result in the loss of area available for recreational use from Project presence • Project activities may reduce access to or quality of recreational use (i.e., noise, dust, visual) • Population increase associated with the Project may increase competition for resources, which may likewise affect the quality of the outdoor recreation experience being pursued by recreational users

6.7.3 Mitigation and Management Measures

As discussed in Section 2.11, FireFly has revised the Ming Mine EPP, including identification and addition of mitigation measures required to address new and / or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on LRU, including the measures identified for the following Project activities:

- Surveying (Section 4.1 of the EPP)
- Buffer Zones (Section 4.2 of the EPP)
- Clearing Vegetation (Section 4.4 of the EPP)
- Vehicle Traffic (Section 4.20 of the EPP)
- Dust and Air Contaminant Control (Section 4.21 of the EPP)
- Noise and Light Control (Section 4.22 of the EPP)

The following mitigation measures specific to LRU have also been identified for the Project:

- During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including area(s) of vegetation clearing. Existing disturbed areas were incorporated into the Project Area to accommodate Project components and, where possible, to avoid recreational (e.g., snowmobile and ATV) trails and reduce direct effects on these areas. Standard construction best practices will be used during the site preparation and construction phase to reduce the potential negative interactions.
- Additional signage will be installed around the mine site to alert the public and land users of the presence of the Project and its facilities.
- FireFly will consult with NLDFFA in advance of construction to incorporate the harvesting of forestry resources in the Project Area as part of site preparation.
- Hunting / fishing / harvesting of wildlife will be strictly prohibited on the mine site. Workers will not be permitted to hunt / fish / harvest while staying at the accommodations camp and will not be permitted to bring firearms or angling gear to site.
- FireFly will continue to engage with local resource users regarding the overlap of the Project with land use areas in the Project Area. This will include the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them.
- If complaints are received from land users regarding perceived Project-related impacts, FireFly will work with the affected land users to address their concerns through a grievance redress mechanism and the potential implementation of additional mitigation measures as needed.
- Project activities, locations, and timing will continue to be communicated to communities, affected land and resource users, environmental non-government organizations, the provincial government, and local authorities throughout the life of the Project. FireFly will communicate in advance with respect to Project activities that may limit / affect use of the access road (i.e., upgrading activities or transport of large loads or equipment). This information will be communicated through local town councils, local radio stations and social media.
- Measures will be taken to address public health and safety requirements throughout rehabilitation and closure.
- Desired land and resource end-uses will be considered in the preparation of the Rehabilitation and Closure Plan.

6.7.4 Residual Environmental Effects

Potential environmental effects on LRU were identified in Section 6.7.2. For LRU, three effects were identified: change in designated use, change in resource use and change in recreational use. Residual effects (i.e., those remaining following implementation of mitigation [Section 6.7.3]) for each Project phase are evaluated below. The assessment of residual effects considers the following key factors:

- The Project is an expansion of an existing mine and does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining, logging and quarry activities.
- The Project is located within the Industrial Mining Zone in the Town of Baie Verte and will be carried out in accordance with applicable permitting requirements.
- Based on the LRU survey, limited resource and recreational use occurs within the Project Area (less than 5% of participants indicated that the Project Area is used for harvesting purposes). It is therefore presumed that historical and ongoing mining activity in the Project Area have altered the land use, leading hunting, trapping and fishing and other recreational activities to shift to other areas in the RAA.
- The nearest potential seasonal/residential receptor (i.e., cabin user) is located approximately 168 m from the Project Area, with additional cabin users located along the Highway 418. These residents (both permanent and seasonal) have lived or recently built adjacent to the existing mine operations and an area known for historical mining. There have been no complaints by the nearby residents for the past operations or current activities of FireFly.
- FireFly has incorporated the port access road into their Project design to limit Project-related traffic along the highway, but noise and air quality modelling have not yet been completed. They will be completed pre-construction. FireFly understands that additional mitigation may be required if noise or air quality concerns are identified at these closest seasonal / residential receptors.
- FireFly will work towards returning the Project Area to as close to pre-mining conditions by FireFly as practical with due consideration to the natural aesthetics that existed pre-mining by FireFly.

6.7.4.1 Change in Designated Land Use

The assessment of change in designated land use considers Project activities that may be incompatible with designated land use (e.g., applicable land use and development plans, policies, regulations, zoning requirements) in the Project Area and LAA. The mine site is located on an existing mineral claim area owned by FireFly and is located within the Industrial Mining Zone in the Town of Baie Verte Planning Area. Project activities will be carried out in accordance with applicable permitting requirements, including mineral leasing requirements and associated restrictions, and municipal planning restrictions. Mining is a permitted use within the Industrial Mining Zone. There has been a long history of mining in the area and land use of the Project is consistent with the resource use that has been occurring in the RAA.

Designated land uses within the LAA includes occupied Crown land. As discussed in Section 6.7.1.2.1, there are 31 cabin plots within the LAA. Project activities may affect cabin users due to sensory disturbances associated with noise emissions from the use of heavy equipment, transport of materials and increased traffic. Sound emissions will also result from blasting during construction. Blast energy that liberates into the atmosphere can generate air overpressure and noise. Blasting is expected to be limited to daytime hours, and during operation will occur primarily underground and will follow best management practices outlined in guidance documents such as the Blasters Handbook (International Society of Explosives Engineers 2016) and the Environmental Code of Practice for Metal Mines (ECCC 2009). The estimation of noise emissions associated with construction, operation and decommissioning depends on the final design, processing approach, intensity of mining activity and required supporting infrastructure.

Additionally, a port access road will be developed to reduce Project-related traffic along the highway, to therefore reduce the noise emissions to cabin users along the highway. Following the results of quantitative modelling to be completed prior to construction in 2025 (described in Section 6.1.5.3), FireFly will apply additional mitigation where needed to maintain not significant adverse effects on sound quality.

Visual effects from physical features or works associated with the Project (i.e., the development of the topsoil, overburden, waste rock, ore piles) may alter the viewscape within the LAA and result in visual disturbance to cabin users, as well as continue to be visible from the highway. The Project does not occur in a pristine environment; the natural and human environments in the area have been affected by past mining activities; however, visual impact of a mine site is an important consideration. The current Rehabilitation and Closure Plan is to return the site to near pre-mining conditions and the updated Rehabilitation and Closure Plan will uphold that objective. During reclamation, FireFly will restore the health and fertility of the land to a self-sustaining natural state through the creation of a landscape, which is visually acceptable and compatible with surrounding terrain. FireFly will engage with local residents and land users within the LAA to discuss their occupancy, potential future use of these cabins/homes, and potential applicable mitigation measures. If complaints are received from land users regarding perceived Project-related impacts, FireFly will work with the affected cabin users to address their concerns through a grievance redress mechanism and the potential implementation of additional mitigation measures as needed.

Through the application of mitigation measures, residual effects from the Project during all Project phases will result in a measurable change in designated land use capacity that:

- is within the range of historical variability
- does not exceed applicable objectives, guidelines, or standards
- allows land and resource use activities to take place at or near current levels within the RAA.

Following the results of quantitative modelling to be completed prior to construction in 2025 (described in Section 6.1.5.3), FireFly will apply additional mitigation where needed to maintain not significant adverse effects on sound quality. Project effects on land use are expected to occur within the LAA (from indirect sensory disturbances). Residual effects are anticipated to occur throughout the life of the Project and be reversible upon Project rehabilitation, apart from the visual disturbance associated with the TMF, which will be irreversible but can be rehabilitated in a manner that blends with the rolling landscape of the RAA.

6.7.4.2 Change in Resource Use

Land clearing at the mine site will remove commercially harvestable timber in FMD 9. As the mine site accounts for less than 0.1% of the total area of FMD 9, the AAC may still be achieved by relocating harvesting activities. The affected productive forest land will remain deforested for the duration of the Project. Clearing activities will comply with the requirements of applicable permits. Merchantable timber from the mine site will be salvaged and sold, provided market conditions allow. Unsellable cuttings may be disposed of through chipping and piling, and alternative beneficial uses for slash and non-marketable timber will also be explored.

Restricted access zones surrounding Project activities will be implemented during construction and remain in place throughout the life of the Project And therefore resource areas overlapped by the Project Area will be unavailable for harvesting during the life of the Project. This includes the following resource use in the Project Area:

- Big Game Hunting: The Project Area overlaps MMA 14 / BMU 14, less than 0.1% of each management area available. As discussed in Section 6.7.1.2.2, just under one third of LRU survey participants indicated that they, or a member of their family, hunt for big game within the Project Area, LAA or RAA. Most of the big game hunting occurs within the RAA (31.8%), compared to the Project Area (1.9%) and the LAA (3.3%).
- Small Game Hunting and Trapping: The Project Area overlaps the small game management area, and furbearing trap zone 8, with less than 0.1% of each management area available. According to the LRU survey results, just under one half of study participants indicated that they or a family member engage in small game hunting or trapping in the Project Area, LAA or RAA. Most of the small game hunting and trapping occurs in the RAA (18.7%), compared to the Project Area (3.5%) and in the LAA (3.9%).
- Fishing / Angling: Less than half of LRU survey participants indicated that they or a family member catch freshwater fish, and approximately one-quarter do so within the Project Area, LAA or RAA. Most of the freshwater fishing takes place in the RAA (27.1%), compared to the Project Area (2.5%) and the LAA (5%).
- Wild Berry and Plant Harvesting: Just under one-half of LRU survey participants indicated that they or a family member pick wild berries and/or harvest other wild plants, and approximately one-fifth do so within the Project Area, LAA, or RAA. Most of this harvesting takes place in the RAA (16.4%), compared to the Project Area (2.6%) and LAA (4.1%).
- Domestic Wood Cutting: Less than half of survey participants indicated that they or a family member cut wood under a Domestic Wood Cutting Permit, and less than one-fifth do so within the Project Area, LAA and RAA. Most of this wood cutting takes place in the RAA (18.4%), compared to the Project Area (0.5%) and the LAA (1.6%).
- Drinking and Household Water Use: Less than 8% of LRU survey participants indicated that they source drinking water from the Project Area, LAA and RAA. Of those areas, the majority (62.5%) indicated they sourced drinking water from the RAA, compared to the Project Area (5%) and the LAA (5%). Most of these participants also identified sourcing household water from the RAA (62.5%), compared to the Project Area (7.5%) and the LAA (7.5%).

The overlap with the Project Area and wildlife management zones are relatively small (i.e., less than 0.1% of each management area available), and there are alternate areas within the LAA and RAA where resource users could pursue these harvesting activities. Furthermore, as indicated through the LRU survey results, the level of activity within the Project Area and the LAA is limited. Adverse effects on resource use associated with the loss / restriction of access to designated lands are, therefore, anticipated to result in a small measurable change within the range of historical variability and allows land and resource use activities to take place at or near current levels within the RAA. There has been a long history of mining in the area and with the existing operation of Ming Mine, the land use associated with the expansion Project is consistent with the resource use that has been occurring in the RAA. FireFly will engage with local resource users (hunters, trappers, anglers), including the communication of Project information, updates on ongoing and planned activities and a discussion of issues and concerns and potential means of addressing them.

In addition to the loss of area available, Project activities may result in sensory disturbance effects (e.g., noise, dust, visual). Sensory disturbance (e.g., noise, visual) to resource users and harvesting activities (hunting, trapping, and fishing) could affect the quality of outdoor experience. Sensory disturbances related to the Project have the potential to influence where users choose to pursue resource use activities. For example, Project activities could result in a decrease in interest in resource activities near the Project Area, particularly if undisturbed or undeveloped areas are available elsewhere. However, the Project is in an area of an active mine and an area with a long historical mining activity that has already been developed with buildings and infrastructure in-place. FireFly will continue to engage with local resource users regarding the overlap of the Project with land use areas in the Project Area and LAA. This will include the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them.

Sensory disturbances may displace targeted species and reduce harvesting success rates within the LAA for local harvesters, as well as greater pressure on game resources. An assessment of wildlife disturbance and mortality risk is provided in Section 6.5.4. Since mining activities are ongoing at the site and assuming the successful implementation of mitigation measures (including timing of Project construction activities to avoid the breeding season, the implementation of speed limits, limiting the amount of on-site lighting, and prohibiting the hunting or harassment of avifauna and other wildlife by on-site Project personnel) and the low levels of resource use within the LAA, it is therefore anticipated that associated effects to harvesting success rate is anticipated to result in a small measurable change, and allows land and resource use activities to take place at or near current levels within the RAA.

An increase in workers associated with the Project could increase the competition for species harvested by local hunters, trappers, outfitters, and fishers. While the presence of Project workers could lead to increased competition for wildlife and fish resources, hunting / harvesting of wildlife will be strictly prohibited on the mine site. Workers will not be permitted to hunt / harvest while staying at the accommodations camp and will not be permitted to bring firearms or angling gear to site.

Through the application of mitigation measures, residual effects from the Project on change in resource use are anticipated to result in a small measurable change. The related change in the affected land base represents a small area and given there are numerous opportunities to hunt, trap and fish outside of the Project Area, it is predicted that hunting, trapping, and fishing activities will be able to continue at or near current levels. Based on the LRU survey results, it is presumed that historical and ongoing mining activity in the Project Area have altered the land use, leading hunting, trapping and fishing activities to shift to other areas in the RAA. Project effects on resource use are expected to occur within the Project Area (from the direct loss of area) and LAA (from indirect sensory disturbances). Residual effects are anticipated to occur throughout the life of the Project and be reversible upon Project rehabilitation, apart from the visual disturbance associated with the TMF, which will be irreversible but can be rehabilitated in a manner that blends with the rolling landscape of the RAA.

6.7.4.3 Change in Recreational Use

The Project may lead to direct loss of, or loss of access to, recreation areas and may disrupt recreational enjoyment due to sensory disturbance (e.g., noise, visual aesthetics). While decommissioning/closure activities may also disrupt or intrude on recreation activities, following closure activities, access will be ultimately restored. Residual effects related to hunting, trapping and fishing activities are assessed in Section 6.7.4.2.

There are a variety of recreational land use and water-based (i.e., hiking, snowshoeing, snowmobiling, swimming, canoeing, bird watching, camping, cycling, ATV / UTV use or dirt biking) activities that take place in the RAA, and to a lesser extent, the LAA. According to the LRU Survey, over half of survey participants engage in these kinds of recreational activities, with the majority (33.8%) engaging in recreational activities within the RAA, while 5% or less do so in the Project Area (3.7%) and the LAA (5%), this is likely due to the fact there has been activity mining and exploration in the LAA and Project area since 1950s. Restricted access at the mine site could displace recreationalists to other areas of the LAA and elsewhere. For safety and security reasons, informal recreational activities will be restricted near construction activities. Signage will be installed around the mine site to alert land users of the presence of the Project and its facilities, and gates will be established to restrict access to active areas of the Project. Given the limited existing recreational use occurring within the mine site, residual effects on the loss of area available for recreational use is anticipated to result only in a small measurable change, within the range of historical variability and allows recreational activities to take place at or near current levels within the RAA.

Project activities could result in sensory disturbance (i.e., noise, visual changes) to outdoor recreational users in the LAA potentially affecting the quality of the outdoor recreation experience. Noise associated with Project activities will be mitigated to be below the regulatory threshold. Sensory and visual disturbances will be reduced through the implementation of mitigation to reduce noise and light emissions, where feasible. Because alternative areas within the LAA and the RAA are available for recreational use and given the low levels of existing recreational use in the LAA, the residual effects to the quality of recreational use is anticipated to result in a small measurable change within the range of historical variability and allows recreational activities to take place at or near current levels within the RAA.

The temporary influx of construction workers to the LAA can increase competition for resources, which may also affect the quality of the outdoor recreation experience being sought by recreational users. Hunting / harvesting of wildlife will be strictly prohibited on the mine site. Workers will not be permitted to hunt / harvest while staying at the accommodations camp and will not be permitted to bring firearms or angling gear to site. Therefore, increased pressure on resource use from the presence of Project workers is anticipated to result in a small measurable change, and to allow recreational use activities to take place at or near current levels within the RAA.

Through the application of mitigation measures, activities are expected to take place at or near current levels. The Project is located in a remote area at an existing mine site, which is reflective of the low levels of recreational use in the Project Area. Based on the LRU survey results, it is presumed that historical and ongoing mining activity in the Project Area have altered the land use, leading recreational activities to shift to other areas in the RAA. Project effects on recreational use are expected to occur within the Project Area (from the direct loss of area) and LAA (from indirect sensory disturbances). Residual effects are anticipated to occur throughout the life of the Project and be reversible upon Project rehabilitation, apart from the visual disturbance associated with the TMF, which will be irreversible but can be rehabilitated in a manner that blends with the rolling landscape of the RAA.

6.7.4.4 Summary

Overall, with the application of mitigation and management measures, residual effects on land and resource use are not anticipated to exceed or contravene established federal, provincial, or municipal land use designations, policies, or by-laws and/or create a change or disruption that restricts or degrades present land and resource use capacity within the RAA to a point where activities cannot continue at or near current levels over the long term. Given the long history of mining on the Baie Verte Peninsula and the current mining and exploration activities at the Ming Mine site, the expansion Project and associated activities align with ongoing activities in the RAA. Resource (other than mining) and recreational use in the Project Area is reflective of mining history at the site versus higher reported land use activities elsewhere within the RAA. The residual effects are limited to the Project Area (direct loss of area) and LAA (sensory disturbances). Effects range in duration from short term (e.g., sensory disturbance due to during construction activities) to long term (e.g., visual impacts associated with Project operation). Effects are predicted to be mostly reversible upon Project rehabilitation. Existing land and resource use levels within the LAA are low, and there is capacity within the RAA to accommodate land and resource users displaced from the LAA.

Based on application of the mitigation measures identified in Section 6.7.3 and FireFly's commitment to comply with regulatory standards, significant residual environmental effects on Land and Resources Use are not likely. This prediction will be confirmed through the completion of noise modelling prior to the start of Project construction. Based on the results of quantitative modelling, FireFly will apply additional mitigation where needed to maintain not significant adverse effects on LRU.

6.7.5 Follow-up and Monitoring Programs

A dedicated follow-up and monitoring program is not proposed for LRU.

6.8 Historic Resources

Historic resources include sites, materials and, in certain instances, landscapes and/or places of historical, archaeological, cultural / spiritual, paleontological and architectural importance. They can date to the distant past or to the precontact, historic or contemporary periods. Historic Resources has been selected as a Valued Component (VC) because they can be the only physical information on Indigenous lifestyles prior to the arrival of Europeans in North America and help us understand the history, land-use, fossil record, and architectural history of a region. Moreover, they can provide insight into the interactions that took place between different cultural groups and the connections each had with the environment in which they lived. The assessment of the potential for historic resources to be affected by the Project includes the identification of known sites of historical, archaeological, cultural and spiritual, paleontological, and architectural importance, along with identification of locations with potential to contain such sites.

In Newfoundland and Labrador (NL), historic resources are protected under the provincial *Historic Resources Act* (1985) (HRA), administered by the Provincial Archaeology Office (PAO) of the NL Department of Tourism, Culture, Industry and Innovation, and, in the case of architectural resources, by the Heritage Foundation of NL. Sites of archaeological or historic significance are defined for this assessment as sites that have elevated interest due to their cultural or spiritual importance to Indigenous groups or their importance to the historical record as defined by the HRA.

As described in Section 5.2.3 and shown on Figure 6.8.1, Project spatial boundaries for Historic Resources include the Project Area (area of physical activities), Local Assessment Area (LAA; note for Historic Resources the Project Area and LAA are the same), and the Regional Assessment Area (RAA), which is the same area used as the “Study Area” for the desktop baseline work (includes most of the Baie Verte Peninsula of northeast Newfoundland. It is bounded to the north by the Horse Islands, to the east by Notre Dame Bay, to the south by the community of King’s Point, and to the west by White Bay). For the Historic Resources VC, and in consideration of the HRA, the threshold beyond which a residual environmental effect is considered significant is the unauthorized disturbance or destruction of a historic resource that is determined by the provincial regulator (PAO) to be an archaeologically significant historic resource and that cannot be mitigated.

6.8.1 Existing Conditions

6.8.1.1 Approach and Methods

A Historic Resources Overview Assessment (HROA) of the Project was conducted to serve as a preliminary assessment of the archaeological potential of the Project Area to assist in Project planning and to determine the requirements for a field-based Historic Resources Impact Assessment (HRIA) of the Project Area (Figure 6.8.1).

Figure No.
6.8.1

Title
Project Area and Regional Assessment Area / Heritage Resources Overview Assessment Study Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_8_001

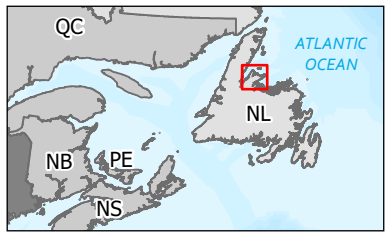
Project Location
Baie Verte, NL

Prepared by MB on 2024-12-11
Revised 2025-03-20

N

0 6 12 Kilometres
(At original document size of 8.5x11)
1:535,000

- Project Area
- Regional Assessment Area
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local
- Powerline
- Watercourse
- Waterbody
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, Green Bay Ming Mine Project - Historic Resources Overview Assessment
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\8_121418199_FFM_MingMing_HeritageResources\121418199_FFM_MingMine_HeritageResources.aprx Revised: 2025-03-26 By: mblackwood

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The HROA was a desktop exercise. The desktop assessment of archaeological potential depended on a review of archaeological work previously conducted in Newfoundland, and specifically within the Study Area which encompasses a large portion of northeast Newfoundland, as well as spatial data such as aerial photographs and remote-sensing data such as Light Detection and Ranging (LiDAR) images provided to Stantec by FireFly. The HROA was completed using digital and archival information available from various government and non-government resources to gather an understanding of the general and specific history of the Project Area. These resources included:

- General archaeological, historic, and ethnohistoric literature pertaining to the broad culture-historical framework of Pre-Contact and Historic Period settlement on the island of Newfoundland, with particular reference to settlement in the Baie Verte region
- Specific archaeological, historic and ethnohistoric literature bearing on the archaeology of the north-east Newfoundland
- Literature and other information on environmental factors pertinent to archaeological potential within the Project Area, such as fauna abundance, coastal, lakeshore, and riverine characteristics, and the impacts of previous development
- Aerial (Google Earth) imagery and topographic maps reviewed for preliminary identification of specific locations of elevated archaeological potential
- Topographic hillshade raster datasets generated from high resolution LiDAR in a Geographic Information System (GIS) to identify potential landforms and topographic features conducive to past human settlement or activity

The HROA identified the need for an HRIA. Due to seasonal restrictions (i.e., the need for snow-free ground conditions), the field verification will occur once ground conditions allow, likely in the spring of 2025 and prior to Project construction activities.

6.8.1.2 Description of Existing Conditions

6.8.1.2.1 Newfoundland Culture-Historical Overview

The following subsections provide an overview of cultural history in NL during the Pre-contact and Historic Periods, with particular focus on the Island of Newfoundland. A focused discussion of historic resources on the Baie Verte Peninsula is provided in Section 6.8.1.2.2.

Pre-Contact Period

Archaeological investigations in NL, particularly over the last forty years, have provided a relatively clear understanding of the Island's long-term culture-history. The initial human occupation of the Island appears to have occurred late in the Maritime Archaic Period, circa (ca.) 5,400 to 3,200 years Before Present (BP), although one site in the Deer Lake area may potentially be older (Reader 1999). Nearby southern Labrador shows clear evidence for occupation much earlier in the Maritime Archaic Period, by 8,800 to 7,500 years BP (McGhee and Tuck 1975, Schwarz 2010), and insular Newfoundland was theoretically habitable by this time as well (Macpherson 1981). The scarcity of evidence for an early Archaic

occupation of the Island, and the apparent delay in the expansion of Archaic Period groups from Labrador to the Island of Newfoundland, has never been satisfactorily explained. The Maritime Archaic occupation (5,400 BP to 3,200 years BP) is followed, after a hiatus of several centuries, by an Early Pre-Inuit (Groswater) occupation, dating to 2,800 to 1,800 years BP. This in turn is followed by a distinct Late Pre-Inuit (Middle Dorset) occupation beginning ca. 1,900 years BP.

Dorset sites in Newfoundland are both larger and more numerous than those of other periods, and although absolute population estimates are not possible, the Dorset occupation appears to have been the most extensive. Its population levels may be the highest in the Island's Pre-Contact Period. Perhaps because of the large size and number of sites, it has proved possible to recognize regional variation in Newfoundland Dorset artifact styles. It has been suggested that the Dorset population of Newfoundland may be divided into at least three distinct regional groups: 1) West Coast, 2) Northeast Coast, and 3) South Coast (Robbins 1985, 1986). While it may have seen the most extensive occupation, the Dorset period was also the briefest, apparently ending by ca. 1,100 BP.

The Recent Period (1,500 years BP to European contact) includes the most recent pre-contact Indigenous groups on the Island. Traditionally, the Recent Period on the Island was believed to be made up of three cultural complexes referred to as Cow Head (1,900 to 1,000 years BP), Beaches (1,500 to 800 years BP), and Little Passage (800 years BP – European). The Cow Head occupation, contemporary with the Dorset, indicates shared occupation of the Island by both Amerindian and Pre-Inuit peoples (Hartery 2007; Holly 2002). However, research (Hartery 2001) suggests the Cow Head complex does not form part of a Newfoundland cultural continuum that includes the Beaches and Little Passage complexes, with the latter group becoming referred to as the Beothuk culture during the Historic Period. Beothuk sites of the early Contact Period (1500 to 1700) have been identified in Notre Dame Bay, Bonavista Bay, the Avalon Peninsula, and along the south coast. Later historic Beothuk sites (1700 to 1829) are predominantly limited to the Exploits Valley, including Beothuk Lake (formerly Red Indian Lake). This area, along with Badger Bay and Gander Bay, were among the final locations of the Beothuk prior to their cultural extinction in 1829 (Devereux 1965a, 1970; LeBlanc 1973).

It is important to note that most archaeological work on the Island has been concentrated on the coast (Bell and Renouf 2003). Archaeologists have tended to regard Newfoundland's marine resources as rich and stable, in contrast to an interior resource base, which is limited, impoverished, and prone to periodic fluctuations in abundance (cf. Tuck and Pastore 1985). As a result, archaeologists have tended to concentrate their efforts on investigating coastal sites, assuming that the archaeological potential of the interior is generally low. It has long been recognized that the archaeological potential of one interior region - the Exploits River - has been high, although this has been viewed as unique. The historic resources of the Exploits Valley are dominated by the remains of the Beothuk, a people forced into a deep interior caribou hunting adaptation by the spread of European and Mi’kmaq settlement along the coast. Pre-Beothuk remains are relatively scarce along the Exploits River. This Beothuk interior adaptation ended ultimately in cultural extinction, and the Beothuk have thus been regarded as the exception that proves the rule: successful hunter-gatherer adaptation to the deep interior was not possible over the long term and would not have been attempted without competition from expanding European and Mi’kmaq settlement (Robbins 1989).

However, archaeological work since the 1980s has somewhat modified this pessimistic view of the Newfoundland interior resource base. Examinations of the interior by several archaeologists (for an overview, see Schwarz 1994) have confirmed the archaeological potential of the Newfoundland interior for pre-contact sites, particularly on near coastal interior lakes, and along the major southwest-northeast-oriented river systems (most notably the Exploits River), which offer travel routes into the deep interior and strategic locations from which to intercept migrating caribou. Most of the interior sites identified to date pertain to the Recent Period, though Maritime Archaic sites have also been identified. Increasingly, evidence for Early Pre-Inuit occupations has been discovered, even at deep-interior locations, such as Birchy Lake and the Exploits River (Erwin and Holly 2006). Late Pre-Inuit (Dorset) sites in the interior remain relatively rare. In terms of micro-locational attributes, pre-contact interior sites appear to be particularly associated with points of land and constrictions in waterways, as well as at stream mouths and above or below falls and rapids (Schwarz 1992a, 1994).

Historic Period

Newfoundland has a long history of European settlement. Historic Period archaeology in Newfoundland has tended to focus on the Island's unusually early European contact and on the archaeology of the historic Beothuk.

The earliest known historic European site on the Island is the Norse site at L'Anse aux Meadows, dated ca. 1,021 BP (Ingstad 1969; Kuitems et al. 2022), a period that archaeologists still generally regard as pre-contact in Newfoundland and elsewhere in Atlantic Canada. Intensive European fisheries in the province are well documented by sites like the Basque remains at Red Bay (Tuck and Grenier 1989). These fisheries included migratory and whale fisheries which developed and expanded through the sixteenth century. The seventeenth century has recently become a focus of investigation; outside of the Avalon, this century is still sparsely documented archaeologically, though there are likely many sites of this period along the coast, pertaining to the English, French, and Basque migratory fisheries. The eighteenth century, a period which saw substantial growth in the resident population of Newfoundland, is well represented at archaeological sites across the Island. The French Treaty Shore (1713 to 1783) came into existence with the ratification of the Treaty of Utrecht (1713) and provided France with fishing privileges along the Newfoundland coast between Point Riche and Cape Bonavista; these areas had been previously frequented by fishermen from Brittany since the early sixteenth century (Brière 1990). Precarious relations between the French and English, underscored by the Seven Years' War (1756 to 1763), and the ensuing encroachment of English fishermen in French waters eventually led to a second "French Shore" (1783 to 1904), via the Treaty of Versailles, which was re-mapped along the island's western coast to Cape St. John in the northeast and gave France exclusive fishing rights (Brière 1990).

As with pre-contact archaeology, and for many of the same reasons, research in historic archaeology has been strongly focused on the coast. Historic European activities in the interior such as trapping (Pastore 1987) have not been investigated archaeologically although archaeological research into European near-coastal interior "winterhousing" (Smith 1987) has recently begun (Venovcevs 2016).

For the Beothuk, the centuries from the late 15th century to the death of Shawnadithit, the last known Beothuk, in 1829, were years when English, Portuguese, Basque, and French fishermen encroached on not only the coast and its rich resources, but also on salmon-fishing rivers. For reviews of this period, see Howley (1915) and Marshall (1996). Mi'kmaq settlements, moving to Newfoundland from the mainland, also deprived the Beothuk of hunting and fishing locations, although documentary evidence suggests the Beothuk use of the St. George's River estuary and even a period of "shared occupation" of inner St. George's Bay between Beothuk and Mi'kmaq in the early 1700s (Marshall 1996: 47-49). The Beothuk rarely traded with Europeans and their desire for metal might have led to occasional raiding of seasonal fishing stations during the winters, followed by retaliation from Europeans and Mi'kmaq. This hostility, coupled with Europeans and Mi'kmaq excluding the Beothuk from the coastline and from favoured salmon fishing spots, contributed to the decline of the Beothuk. By the 19th century the remaining Beothuk were largely confined to the Exploits River, Beothuk Lake, and along the inner bays of Notre Dame Bay.

The earliest known historical references to the Mi'kmaq in Newfoundland come from correspondences between various governors, ministers, and military officials associated with the French colony at Plaisance (modern-day Placentia) during the last two decades of the 17th century (Mills 2022). Through the eighteenth century, the Mi'kmaq's favoured destinations on the Island included St. George's Bay, Cape Ray, Bay d'Espoir, and Placentia (Speck 1922). Initially, Mi'kmaq in Newfoundland regularly returned to Cape Breton, although by the end of the 18th century or early 19th century, Mi'kmaq families were settling permanently in southern and southwestern Newfoundland, hunting caribou, trapping, and later, serving as guides for European explorers and sportsmen (see Pastore 1978a).

In the 18th and early 19th centuries, there was little territorial overlap between the Mi'kmaq and the Beothuk as the latter withdrew from areas encroached upon by the former. Mi'kmaq settlement and harvesting tended to focus on the southern and southwestern interior from St. George's Bay to Placentia Bay, while the Beothuk ranged to the north, principally along the Exploits, Beothuk Lake (Pastore 1978b), and also Gander Bay (Howley 1915: 55, 59, 63, 159). In 1822, William Epps Cormack and his Mi'kmaq guide, Joseph Sylvester, walked across the Newfoundland interior from Trinity Bay to St. George's Bay via Flat Bay Brook near the Project, including the country between Meelpaeg, Granite Lake, and George IV Lake (Cormac 1856). The Mi'kmaq families they encountered along their route informed them that the southern border of Beothuk territory (i.e., where they withdrew to) lay 15 to 25 kilometres (km) north of the Mi'kmaq camp on King George IV Lake (Marshall 1996: 156). King George IV Lake marked the approximate eastern limit of Mi'kmaq canoe travel inland from St. George's Bay (Penney 1987).

Through the 19th century, the Mi'kmaq extended their range to encompass most of the central and western Newfoundland interior, as far north as the Bay of Exploits and Gander Bay. Although there was some competition with European trappers in the hinterlands of the northeast coast, through the second half of the 19th century and the beginning of the 20th century, the Mi'kmaq had the interior of the Island largely to themselves (Pastore 1978a: 170). In 1914, the anthropologist Frank Speck mapped the hunting and trapping territories of individual Mi'kmaq families across the Newfoundland interior. For example, the large territory extending from Sandy Lake down through Beothuk Lake, Victoria River and Lake, and Lloyd's River, as far east and Meelpaeg, and as far south as the northern end of King George IV Lake was at that time the territory of Frank Joe, a hunter and trapper of mixed Mi'kmaq and Innu descent (Speck 1922). A memoir from Saunders (1986) provides confirmation of the use of the Gander River by

Mi'kmaq since at least the first half of the twentieth century for hunting and trapping and states that it was common knowledge that they used the river as a travel route between Glenwood and locations on the northeast coast.

Archaeologically, the historic Mi'kmaq occupation of the Newfoundland interior is demonstrated by a number of recorded 20th century "home tilts". Two historic Mi'kmaq sites, both situated on Middle Ridge east of the Bay d'Espoir Highway, have been excavated (Penney and Nicol 1984). Burnt Knaps 1 (DbAv-01) yielded the remains of a rectangular wigwam dating to the first quarter of the 20th century, and Burnt Knaps 2 (DbAv-02), appeared to be slightly older, dating to the last half of the 19th century.

Newfoundland's non-Indigenous population grew substantially throughout the nineteenth century. When the earlier "French Shore" (1713 to 1783) became known as the North Shore fishery in the early part of the nineteenth century, it was regularly fished by residents from Conception Bay and elsewhere which resulted in an increase in settlers to the area (Cardigan and Hutchings 2001). Most of the early immigrants were from southwest England and southeast Ireland as regular fishery-related trade routes were maintained with these regions. Throughout this century, however, Newfoundland experienced high rates of immigration (in the first half of the century) and high rates of emigration (in the latter of the century), and this was largely in response to shifting economic conditions and employment opportunities (Alexander 1980). The saltfish trade, for example, drew large numbers of immigrants until the fishery fell into decline during the 1880s (Cardigan and Hutchings 2001). Internal migration was a common form of mobility across the island in the nineteenth century both on a seasonal or permanent basis. These mobility patterns helped shape the province's resident population. When the cod fishery declined in the 1880s, seasonal migration was an adaptive strategy for people moving inland from the coast to cut wood, hunt caribou, or work mines (Herrick 1971).

Land-based industries developed with the construction of the Newfoundland Railway and branch lines during the late 19th century which allowed better access to the Island's interior (Alexander 1980). The provincial government promoted these industries in an effort to diversify the economy away from fisheries only and, by the start of the Second World War, new mines and lumber mills dotted the province and gave rise to a variety of new settlements. The forestry industry attracted migrants to several areas of the province to work at mills and wood-cutting operations and agriculture also expanded in the first half of the twentieth century although it did not reach the same level of economic success as forestry or mining (Alexander 1980). For the community of Baie Verte, approximately 10 km west of the Project, mining was the main economic driver from the 1850s to 1916 while the Terra Nova Mine (copper and sulfur) was in operation (Town of Baie Verte 2024). However, in the late 1930s forestry became an important industry for the community with the establishment of the Bowater Pulp and Paper Company. Then in 1955, asbestos was discovered in Baie Verte and was high in demand (Heritage Newfoundland and Labrador 2024a). An asbestos mine (Advocate Mines Ltd.) operated from 1963 until 1981. Another major group of mines in the area were the Consolidated Rambler Group which included Rambler, Ming, East, and Big Rambler Pond mines. Ore bodies associated with these mines were discovered in the early 20th century, though the mines only opened in the 1960s and 1970s and were short-lived, closing in 1982 (Heritage Newfoundland and Labrador 2024b).

6.8.1.2.2 Historic Resources of the Project Area and Baie Verte Peninsula

Historic Resources of the Study Area

To assess the potential for historic resources to be present within the Project Area, a broader regional review of known historic resource sites that have been identified from previous archaeological work was completed. The review provided a general understanding of the surrounding site types, locations, cultural affiliations and cultural patterning (e.g., subsistence-settlement models), and provides the necessary context for evaluating the potential for historic resources to be located within the Project Area. This section of the HROA focuses on a broader Study Area, which includes most of the Baie Verte Peninsula of northeast Newfoundland. The Study Area is bounded to the north by the Horse Islands, to the east by Notre Dame Bay, to the south by the community of King's Point, and to the west by White Bay (Figure 6.8.1).

Numerous professional archaeological investigations have been undertaken within the Study Area over the last century including the work of natural historians, academic researchers, provincial archaeologists, and development-led cultural resource management archaeologists (Barber 1981; Barber and Barber 1984; Brake 2005; Brown and Easo n.d.; Burgraff 1974; Caribou Heritage Associates 2002; Crompton and Erwin 2006; Devereux 1965a, 1965b, 1966a, 1966b, 1966c, 1966d, 1966e, 1969; Eaton 2005; Erwin and Crompton 2002; Erwin 1998, 1999, 2000a, 2000b, 2001, 2003a, 2003b, 2003c, 2004a, 2004b, 2005, 2006, 2007, 2008, 2009, 2011a, 2011b; Evans 1993, 2002; Hill 2005; Howley 1915; Keeping 2021; Labreche 1997; Lavers 2004; Lewis 2002; McLean 2009, 2010; Moore 2006; Nagle 1982; Newfoundland Marine Archaeological Society 1981; Noseworthy 2003; Penney 1988, 1989, 2006; Peschell 1997; Renouf 2003; Reynolds 2005; Sea-Force Diving Ltd. 2006; Staniforth 2004; Stantec 2010, 2011; Tapper 2014; Tapper and Pope 2014; Thomson 1983). Where relevant, information provided by these assessments and studies is presented in the sections below.

One of the first professional archaeological surveys conducted within the Study Area and various other places along the Island's northeast coast was led by Helen Devereux. She referred to her work as "the Beothuk Project" since the goal of her investigations was to establish an archaeological identity for the Beothuk of Newfoundland (Devereux 1965a, 1965b, 1966a, 1966b, 1966c). Devereux's work between 1964 and 1969 led to the identification of twenty-three archaeological sites, one of which is within the Study Area (i.e., The Eastern Point Site). Some of the sites she examined became very well-known and important like Cape Ray, North Angle, and Indian Point. She was also one of the first women in the province, after A.S. Ingstad, to lead professional excavations and the first archaeologist to excavate the multi-component Beaches Site from which the "Beaches Cultural Complex" – an early precursor to the Beothuk - was initially derived. The Eastern Point Site (DkAx-01) is located approximately 25 km south of the Project on the southeastern shore of Green Bay. It comprises a 19th - 20th century European occupation as well as an Early Pre-Inuit (Groswater) occupation (2,800 to 1,800 years BP). Devereux (1966d, 1966e, 1969) believed that the purple slate-like material that the Groswater artifacts were composed of was locally sourced and quarried nearby.

While mining has historically played an important role in the economic, social, and cultural history of Newfoundland, it may be less commonly known that the first inhabitants of the Island were adeptly quarrying local stone from the outset of their arrival just over 5,000 years ago. One of the most important and unique archaeological sites in the Study Area (and in the continental Northeast generally) is the Fleur de Lys soapstone quarry (EaBa-01), located approximately 22 km north of the Project in the community of Fleur de Lys. Archaeological interest in the numerous carvings along the faces of soapstone outcrops in this area has existed for more than a century (Erwin 2001). The carvings were initially attributed to the Beothuk by Howley (1915) since they were the only known Indigenous group at the time. In 1925, Jenness suggested the carvings may instead be attributed to the newly described Cape Dorset cultural group (Jenness 1925). This suggestion was later confirmed by W.J. Wintemberg (1939, 1940) with the discovery of soapstone vessels on Dorset sites. It was not until the 1980s, however, that a basic understanding of the site began to emerge with systematic descriptions from Nagle (1982) and Thomson (1983). Circumstantial evidence comprising a soapstone plummet from the Maritime Archaic component at the nearby Shelley Garden Site (EaBa-10) suggests that Maritime Archaic groups could have also used the Fleur de Lys quarry some 1,500 to 2,000 years before the Dorset activity. Full scale excavations began from 1997 to 2000 with the “Fleur de Lys Archeological Project” led by Erwin (1998, 1999, 2000a, 2000b, 2001). This comprehensive work revealed the extent and complexity of the site, defined a Dorset quarrying tool kit by way of a four-stage vessel manufacturing process, showed that vessels were being finished at the quarry site, and disclosed at least 400 years of quarry use by the northeastern variant (*sensu* Robbins 1985,1986) of Newfoundland Dorset culture (Erwin 2001).

In 1988, Penney conducted a large-scale archaeological survey of western Notre Dame Bay and Green Bay which recorded 38 new archaeological sites including 27 pre-contact sites comprising artifactual evidence belonging to Maritime Archaic and Pre-Inuit cultural groups. Another cluster of well-known sites comes from Cow Cove, 15 km north of the Project, where the Memorial University Field School ran excavations between 2002 and 2007 (Erwin 2011a). The focal point of the Field School was the excavation of a Dorset Pre-Inuit dwelling site known as Cow Cove 3 (EaBa-16). Other sites were identified in the vicinity relating predominantly to Early and Late Pre-Inuit activity although Cow Head 1 (Eaba-14) also contains evidence for Maritime Archaic and Recent Period (i.e., Cow Head complex) occupations.

Several Historic Period sites affiliated with European or Newfoundlander settlement and land use have also been documented within the Study Area including an historic fishing settlement, root cellars and middens, logging camps, late 19th century mining activity, at least two, but likely three, shipwrecks (the third comprising four canons found by divers), bread ovens, and seventeenth century French fishing rooms near Fleur de Lys 4 (EaBa-08) and possibly Coachman’s Cove (EaBa-19). The latter site type refers to a parcel of land from which a fishery is conducted and can include structures and facilities where the catch is landed and processed and where the crew is housed.

As a result of previous archaeological work, assessment of the Project's archaeological potential was initially based on a review of the historic resource site inventory for the Study Area provided by the PAO that includes records for 67 archaeological sites. Of these, 23 are from the Pre-Contact Period only, 27 are from the Historic Period only, 15 include components from both Periods, and 2 are undetermined. Figure 6.8.2 illustrates the distribution of registered archaeological sites within the Study Area. Aside from one Historic Period logging camp inland at Southern Arm Pond, the remaining sites are concentrated along the coastline and shorelines of inner bays with clusters of sites around Fleur de Lys, Coachman's Cove, Horse Islands, Western Notre Dame Bay, Jackson's Cove, King's Point, Little Bay, and the Little Bay Islands.

Included among the pre-contact sites within the Study Area (including multi-component sites) are 12 archaeological sites affiliated with a Maritime Archaic occupation, 21 sites affiliated with a Pre-Inuit occupation, 3 sites affiliated with Recent Period occupations, and 7 sites are pre-contact sites with unspecified or undetermined cultural affiliations. Most of the pre-contact sites represent site types that reflect habitation or undetermined activity areas while several are classified as spot finds, four are quarry sites, and two are Maritime Archaic burial sites.

With respect to the Study Area's Historic Period sites, 33 are considered European and 12 are considered Euro-American (Newfoundlander). Conspicuously absent from this group are sites relating to historic Beothuk and Mi'kmaq occupations. European sites with specified cultural affiliations tend to be French and relate to the Petit Nord fishery with at least one potential whaling facility near Snooks Arm whereas the Newfoundlander site types are dominated by habitation structures.

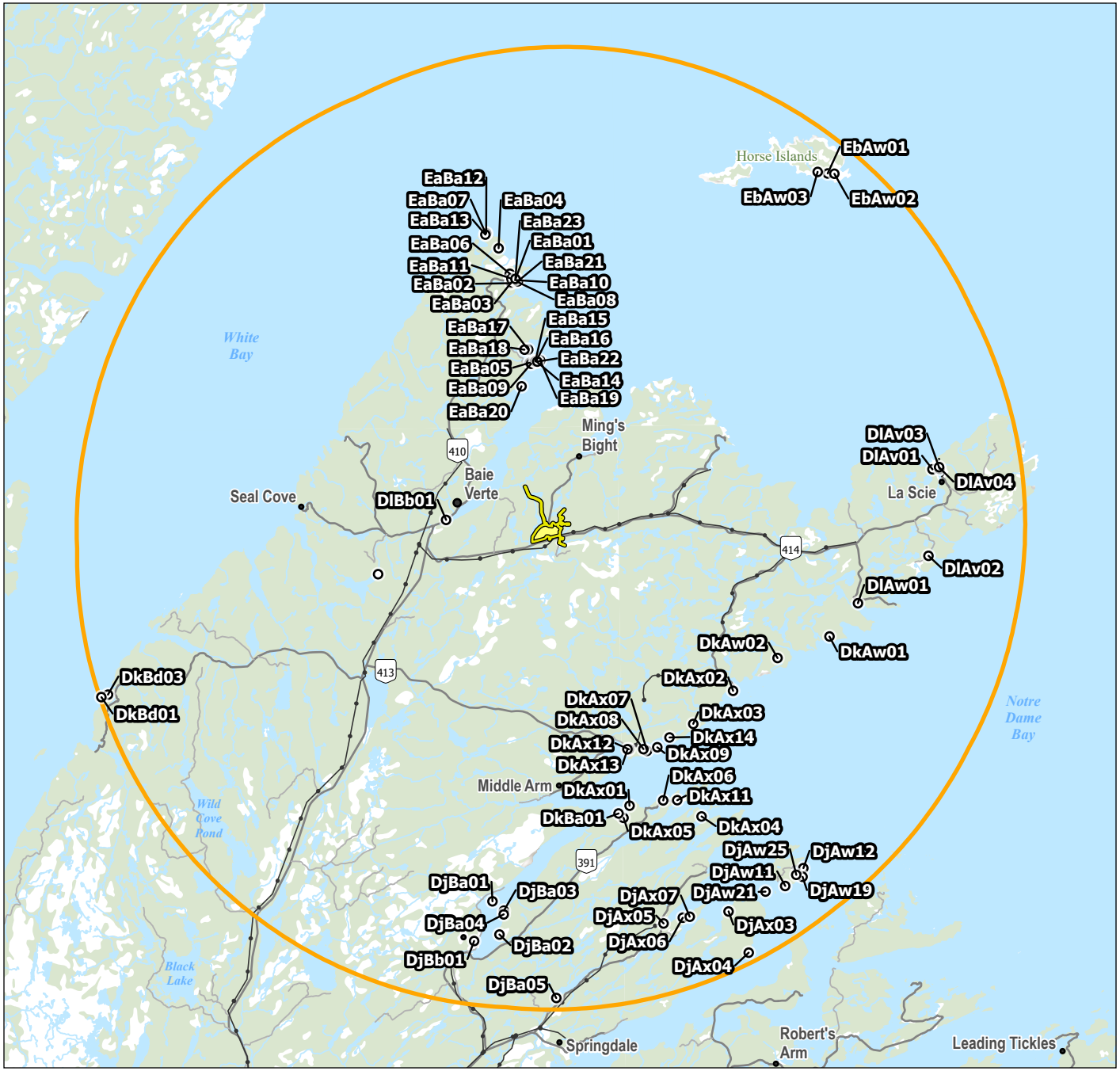


Figure No.
6.8.2

Title
Registered Historic Resource Sites in the Regional Assessment Area

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_8_002

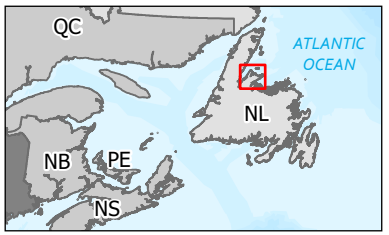
Project Location
Baie Verte, NL

Prepared by MB on 2024-12-11
Revised 2025-03-20

N

0 6 12 Kilometres
(At original document size of 8.5x11)
1:535,000

- Known Historic Resource Sites
- Project Area
- Regional Assessment Area
- Trans Canada Highway
- Highway
- Arterial / Collector
- Local
- Powerline
- Watercourse
- Waterbody
- Forested Area



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, Provincial Archaeology Office (PAO), Green Bay Ming Mine Project - Historic Resources Overview Assessment
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199\03_data\gis_cad\gis_data\mapping\aprx\8_121418199_FFM_MingMine_HeritageResources\121418199_FFM_MingMine_HeritageResources.aprx Revised: 2025-03-26 By: mblackwood

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Historic Resources and Potential of the Project Area

There are no registered historic resource sites within the Project Area. The absence of known sites can be attributed to a combination of factors including biases in archaeological research which has disproportionally favoured the coast and has traditionally ignored the archaeological potential of areas further inland due to a perception of an "impoverished" resource base – a perception that more recent archaeological research suggests could be premature (see Section 6.8.1.2.1 above). It is possible that this bias is reflected in the distribution of recorded archaeological sites across the Study Area in which nearly all are located along the shorelines of the coast and inner bays (Figure 6.8.2). However, the subsistence-settlement patterns of the Island's cultural groups, including historic European and Euro-American groups, have generally favoured coastal locations due in large part to challenges related to overland mobility and resource access. In particular, Pre-Inuit groups, who are the most represented pre-contact group in the Study Area, have tended to adopt an inner-outer coastal settlement model in the White Bay region which was strategically situated toward more than one important seasonally available resource (Erwin 2003b). The lack of inland Pre-Inuit sites, however, and the lack of known inland historic resources on the Baie Verte Peninsula generally, could also be seen as a consequence of the paucity of inland archaeological surveys by and large on the Island (Schwarz 1992b). Some Pre-Inuit sites have been identified as far as 30 km inland in parts of western Newfoundland, so inland loci are not unheard of for this group.

In relation to the scarcity of inland archaeological surveys, reports and information provided by the PAO indicate that no previous professional archaeological assessments have taken place inside the Project Area. With exception to the construction of provincial Routes 414 and 418 that traverse portions of the Project Area and past mining-related footprints associated with the Consolidated Rambler Group of mines – developments that occurred prior to the ratification of the HRA (1990) - no other development projects have occurred that might have triggered historic resource assessments. There have been smaller mining developments and expansions to existing mines that have proceeded without historic resources assessments as their footprints were limited to smaller areas that were considered to be of low archaeological potential (e.g., previously disturbed areas or not overlapping substantial waterbody or stream shorelines). Moreover, the Project Area itself is topographically rugged, elevated, steep in places, and exposed. Elevations range between 100 and 175 m above sea level in a west-east direction across the Project Area and between 150 and 60 m above sea level in a south-north direction. With challenging access to the waterways and ponds within and near the Project Area, this difficult landscape might have deterred other attempts at field-based reconnaissance (not tethered to development) by researchers looking for historic resources.

The rugged landscape of the Project Area can also have a direct bearing on the archaeological potential within it. Landscape characteristics such as being elevated and exposed would not necessarily have prevented inland occupation by past groups like the Pre-Inuit, who were unlikely to be bothered by direct exposure to harsh conditions and inclement weather. However, these characteristics would not necessarily have been favoured by other Pre-Contact and Historic Period Indigenous groups unless they had very good reasons, such as the interception of caribou migrations, for entering such challenging landscapes. According to historical data on woodland caribou range, dispersal, and migration, the Baie Verte Peninsula was not an area where caribou would normally aggregate (NL Department of

Environment and Conservation 2015; Weir et al. 2014). The potential for prolonged settlement across cultural groups and periods is likely to be low for such a rugged landscape; however, there remains elevated potential for temporary encampments and / or past human activities that could leave an archaeological trace. For example, logistical forays (Binford 1982) into the Project Area might have been conducted from semi-permanent base camps located elsewhere associated with trapping, tool-stone acquisition, and the harvesting of aquatic resources, edible / medicinal plants, and balsam fir for fuel and construction. Historic resource potential could be elevated within the Project Area for activities relating to Historic Period trapping, logging, and nascent mining activities associated with the search for ore bodies in the early twentieth century (material remains associated with later mining activities from the Consolidated Rambler Group during the latter half of the 20th century are unlikely to hold substantial heritage value).

6.8.1.2.3 Assessment of Archaeological Potential within the Project Area

Although no known historic resource sites have been inventoried within the Project Area, a review of archaeological data indicates that the Project Area has elevated potential for undiscovered historic resources, particularly those pertaining to specific aspects of the Pre-Contact Period such as Maritime Archaic or Pre-Inuit activity as well for Historic Period hunting, trapping, logging, and early mining activities. Low to moderate potential exists for Recent and Historic Period Indigenous activity as well as for European and Newfoundlander settlement.

Desktop assessment of archaeological potential has focussed on the streams and ponds within the Project Area, particularly those with suitable aquatic resources and are navigable by watercraft. There are two relatively prominent watercourses that traverse the Project Area where there is the potential for historic resources. The first and largest watercourse is South Brook just west of the Project Area which flows from south to north from Little Rambler Pond, empties into South Brook Pond and then continues for more than 5 km before it empties into Baie Verte. The second is an unnamed tributary to South Brook which flows from southeast to northwest within the Project Area near a location where the construction of a mill site is proposed. Both of these waterways are contaminated from historical tailings associated with the Consolidated Rambler Group of mining activities. This historical contamination has resulted in a reduction in the quality of aquatic habitat and the loss of self-sustaining fish populations in these watercourses relative to pre-1960s mining development. Past aquatic sampling of these two streams have not observed fish (AMEC 2008; Stantec 2023). Aside from these prominent streams, there are a few smaller streams and pond shorelines that exhibit potential for historic resources. The majority of small waterways within the Project Area, are considered insubstantial, indeterminate streams or overland drainages.

Review of map overlays that combined aerial imagery, topographic hillshades generated from high resolution LiDAR data, provincial environmental base data, and known historic resource baseline data has established a preliminary assessment resulting in a total of 16 elevated Archaeological Potential Areas (APAs). Aside from these 16 APAs, all other areas of the Project are considered to exhibit low archaeological potential. The APAs within the Project Area are shown in Figure 6.8.3, not all of which interact with the finalized Project Layout. The largest of these (i.e., APA-001) is a generalized high potential zone within 50 m of the eastern shoreline of South Brook. Only some portions of APA-001 interact with the Project Area and no portion of APA-001 interacts with the Project Layout, although some areas of APA-001 are very close to the proposed TMF location. The remaining 15 APAs were derived from a desktop-level examination of landforms and features conducive to past human activity (e.g., terraces, former shorelines, benches, knolls, strategic ridges, eskers, and drumlins). While no obvious features, such as terraces, were identified during the desktop examination of the Project Area, several areas of potentially habitable terrain comprising level and dry ground conditions, typically interspersed with occasional rock outcrops, were noted in proximity to streams and ponds. Ground conditions and archaeological potential will need to be verified and re-evaluated in the field. The 16 APAs present the most optimal areas within the Project Area for past human activity amidst an otherwise rugged landscape. Archaeological potential is anticipated to be highest for those APAs that include characteristics such as sheltered sandy coves or points of land, prominent constrictions in waterways, oxbows, proximity to stream mouths and confluences, and proximity to falls and rapids, based on known provincial archaeological data.

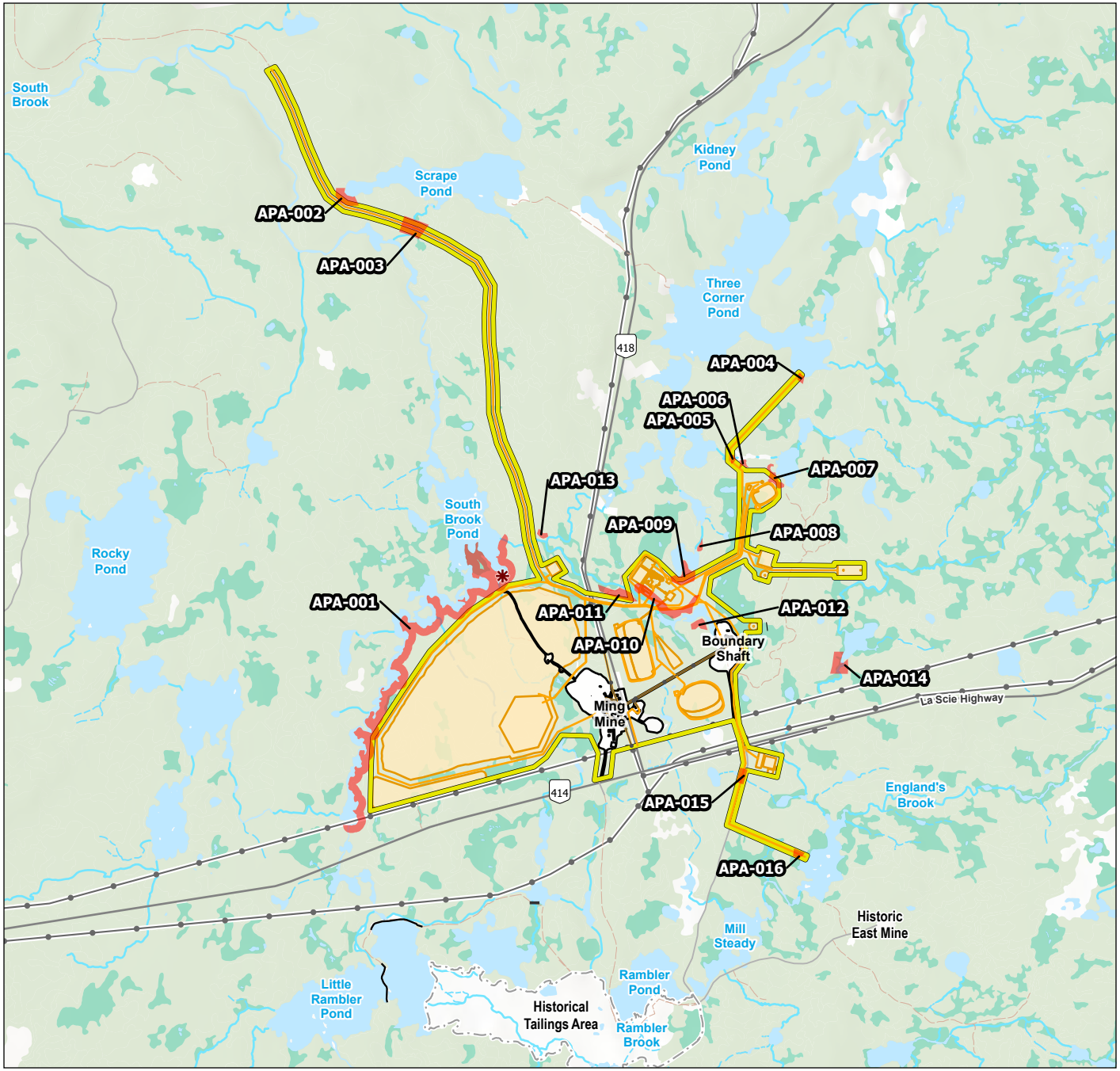


Figure No.
6.8.3
Title
Archaeological Potential Areas

Client/Project
FireFly Metals Ltd
Green Bay Ming Mine Project

121418199_8_003

Project Location
Baie Verte, NL

Prepared by MB on 2024-12-11
Revised 2025-03-20

N

0 400 800 Metres
(At original document size of 8.5x11)
1:40,000

- Elevated Archaeological Potential
- Final Discharge Point (FDP)
- Project Area
- Ming Mine Operation
- Other Site Infrastructure
- Dam
- Highway
- Arterial / Collector
- Resource Road / Trail
- Powerline
- Indeterminate Stream
- Intermittent Watercourse
- Definite Watercourse
- Waterbody
- Wetland
- Forested Area

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: FireFly Metals Ltd, Stantec, Green Bay Ming Mine Project - Historic Resources Overview Assessment
3. Background: NRCan CanVec, GovNL, OpenStreetMap

Stantec

V:\1214\active\121418199903_data\gis_cad\gis_data\mapping\aprx\8_121418199_FFM_MingMine_HeritageResources\121418199_FFM_MingMine_HeritageResources.aprx Revised: 2025-03-26 By: mblackwood

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

6.8.2 Potential Effects and Effect Pathways

A summary of the potential effects and Project effect pathways to be assessed for Historic Resources is provided in Table 6.8.1. Potential environmental effects and effects pathways were selected based on the review of similar projects in NL and other parts of Canada, and professional judgement.

Table 6.8.1 Potential Effects and Effect Pathways for Historic Resources

Potential Effect	Effect Pathway(s)
Loss of information about or alteration to historic resource(s) and their context	• Ground disturbance may disturb or destroy objects of historical value and, equally importantly, may disturb or destroy the context (the horizontal and vertical depositional relationships between historical objects), from which they derive much of their value • Alterations to the landscape and increased human activity resulting from improved access to the area also increase the likelihood of adverse effects to historic resources that may be present as they become available to human disturbance

Potential environmental effects are anticipated during construction only. No interaction is anticipated for Historic Resources during Project operation (aside from construction-related activities that occur during the operation phase) or decommissioning, rehabilitation and closure, as activities associated with these would occur in areas already disturbed by construction.

6.8.3 Mitigation and Management Measures

As discussed in Section 2.11, FireFly has revised the existing and approved Ming Mine EPP, including identification and addition of mitigation measures required to address new and/or expanded Project components (Appendix 2.C).

Many of the standard mitigation measures identified in the EPP will serve to avoid or reduce potential effects on Historic Resources. Measures to be included in the Discovery of Historic Resources Contingency Plan to mitigate the potential of adverse effects on historic resources resulting from an accidental discovery:

- If suspected archaeological material is encountered, all work in the immediate area of the discovery will be stopped until authorized personnel from FireFly, following consultation with the PAO, allow resumption of the work.
- Report the find immediately to FireFly's representative, the Health, Safety and Environmental Superintendent or designate.
- Mark the site's visible boundaries. Personnel will not move or remove any artefacts or associated material unless the integrity of the material is threatened.

- The FireFly representative will report the find with the following information to the PAO, NL Department of Tourism, Culture, Industry and Innovation, and will comply with the instruction provided:
  - Nature of the find
  - Precise descriptive and map location and the time of the find
  - Nature of the activity resulting in the find
  - Identity of the worker(s) making the find
  - Present location of the material, if moved, and any protective measures initiated for the material and the site
  - Extenuating circumstances

Mitigation measures to be applied with approval and appropriate permits issued by the PAO:

- Field assessment surveys will be undertaken prior to construction wherever the Project Area has potential to interact with identified areas of high potential for archaeological resources
- Archaeological field assessment and testing of road routes and other required infrastructure (new and upgraded) at selected river crossings and lakeshores will be undertaken prior to construction once development plans are finalized

6.8.4 Residual Environmental Effects

6.8.4.1 Loss or Disturbance of Historic Resources

Construction of the Project is unlikely to result in residual effects on Historic Resources primarily because there are no known registered archaeological sites within the Project Area. In addition, mitigation measures will reduce the potential for finds of presently unknown sites to be discovered during the archeological survey or during the construction phase, and mitigation measures will be implemented in the event of an unexpected discovery of historic resources. Interaction will be limited to the Project Area where Project-related ground disturbance could occur.

Because historic resources are static and situated on or beneath the ground surface, initial ground disturbance during construction activities has the greatest potential to adversely affect historic resources if present. There are no known registered sites within the Project Area. The HROA, however, identified 16 elevated APAs (Figure 6.8.3). Of these, 10 APAs interact with the finalized Project Layout (i.e., APA-002, APA-003, APA-004, APA-007, APA-009, APA-010, APA-011, APA-014, APA-015, and APA-016). The remaining 6 APAs do not interact with the finalized Project Layout (i.e., APA-001, APA-005, APA-006, APA-008, APA-012, and APA-013). While the largest of these (APA-001) interacts with the Project Area and no portion of it interacts with the Project Layout, some areas of APA-001 are very close to the proposed TMF location. The 16 APAs should be avoided by Project construction activities to the extent practical. If avoidance of these areas is not possible, then a field-based HRIA will be required prior to construction to assess these areas for historic resource potential and additional investigations (e.g., shove testing) could also be required.

Mitigation measures, including field assessment prior to construction should Project activities or infrastructure shift to overlap with high-potential locations or known sites, will further reduce the potential for presently unknown sites to be inadvertently disturbed or lost. Measures will also be implemented to identify and mitigate the unexpected discovery of historic resources.

The threshold criterion beyond which a residual environmental effect is considered significant is the unauthorized disturbance or loss of a historic resource that is determined by the provincial regulator (PAO) to be a significant historic resource, and that cannot be mitigated. Although considered unlikely, disturbance or loss of historic resources may potentially occur as a single event(s) during construction activities, and only within the Project Area during initial ground disturbance. Because historic resources are static and finite, environmental effects which did occur would be adverse, permanent and irreversible. However, with mitigation, the Project will result in a low (i.e., there is prior recovery of the resource and associated information with necessary regulatory approvals) or negligible (i.e., no loss or disturbance anticipated) loss or disturbance of known historic resources within the Project Area, while implementation of the Discovery of Historic Resources Contingency Plan will result in low disturbance or loss of unknown historic resources within the Project Area. Therefore, with mitigation and environmental protection measures, residual environmental effects on historic resources are predicted to be not significant.

6.8.4.2 Summary

Project residual effects (the loss or disturbance of historic resources) would be limited spatially and temporally; however, the effects would be adverse and irreversible. While these adverse effects would be associated only with ground disturbance during construction activities, some construction activities will occur during the operation phase, with the same residual effects predicted.

Based on application of the mitigation measures identified in Section 6.8.3 and FireFly's commitment to comply with regulatory standards, residual environmental effects on Historic Resources are likely to be not significant.

6.8.5 Follow-up and Monitoring Programs

The EPP includes a Discovery of Historic Resources Contingency Plan (Section 5.5 of Appendix 2.C). The Contingency Plan includes environmental protection procedures to mitigate the potential for adverse effects on historic resources resulting from accidental discovery. If suspected archaeological material is encountered, stop all work in the immediate area of the discovery until authorized personnel from FireFly, having consulted with the Provincial Archaeologist, permit resumption of the work. The Site Manager will report the find to the PAO and comply with the instruction provided.

6.9 Summary of Environmental Effects

The residual environmental effects for construction, operation and decommissioning, rehabilitation and closure for each valued component (VC) are presented in Sections 6.1 to 6.8. Table 6.9.1 provides a summary of the potential environmental effects and associated mitigation and management measures to reduce residual adverse effects. Mitigation measures provided below are VC-specific mitigation in addition to the mitigation and management measures described in the EPP. A summary of significance of residual effects is also provided. As shown in Table 6.9.1, the residual environmental effects of Project activities are assessed to be not significant.

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
Atmospheric Resources	• Change in air quality • Change in greenhouse gas (GHG) emissions • Change in sound quality • Change in light levels	• Project lighting will be limited to that which is necessary for safe and efficient Project activities. Lighting design guidelines will be followed, such as the Commission Internationale de L'Éclairage, International Dark Sky Association, Illuminating Engineering Society. • Light fixtures will be located so that they are not directed toward oncoming traffic on nearby roads on or off site. • Lighting will be designed to avoid excessive use of mobile flood lighting units and will be turned off when they are not needed. • To the extent practicable, mobile and permanent lighting will be located such that unavoidable light spill off the working area is not directed toward receptors outside of the Project Area. • Full cut-off luminaires will be used where practicable to reduce glare, light trespass and sky glow from the Project. • Where practicable in accessible areas (e.g., along cleared rights-of-way), trees and other vegetation will be left in place or encouraged to grow to obstruct the view of Project facilities and act as a wind break to reduce the transportation of fugitive dust, reducing the change in viewshed and muffling nuisance noise as well as reducing GHGs released from land-use changes and maintaining carbon sequestration. • Idling of equipment will be reduced, where practicable to reduce noise, air contaminant and GHG emissions. • Haul distances to processing and shipment sites will be reduced where practical to reduce noise, air contaminant and GHG emissions; the previous processing plant (Nugget Pond) was approximately 50 km by road from the mine. The new processing plant will be located within the Project Area, much closer to the underground mine. The Project will use Pine Cove Port rather than Goodyears Cove (approximately 140 km away), which will substantially reduce shipping distances of concentrate. The new port access road further reduces distance by providing a direct route. • Disturbed areas will be revegetated as soon as possible to limit dust emissions and already disturbed areas will be used for Project infrastructure where feasible to limit the extent of construction activities. • Grid electricity, which is primarily generated from hydroelectric power in Newfoundland and Labrador (NL), will be used as the primary source of energy for the facility, reducing GHGs and air contaminant emissions. • A best available control technology (BACT) study will be conducted for direct GHG sources of the Project to identify and select the lowest GHG-emitting technologies currently deemed technically and economically feasible for the Project. • Tier 4 engines are considered BACT for air contaminant emissions from diesel engines and will be used for mobile equipment and where available, used for standby emergency generators. • Enclosures, berms, or other barriers may be considered for activities involving excessive noise emissions.	Not Significant

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
Groundwater Resources	• Change in groundwater quantity • Change in groundwater quality	• Groundwater quality and quantity will be monitored and adaptively managed, as required, using a network of groundwater monitoring wells to document Project effects on groundwater flow and quality. Monitoring locations will be maintained until the water levels and water quality have stabilized post-closure. Fifteen groundwater monitoring wells were installed and sampled in September 2024, with a subsequent sampling event in November 2024. The results of the September 2024 sampling event are discussed in Section 6.2.1.2.3. The results of the November 2024 sampling event are not yet available. A final baseline report will be completed prior to the beginning of construction. The 2024 wells have been strategically placed outside of the direct footprint and downstream of key infrastructure so they can be incorporated into the long-term groundwater monitoring program during mine operation, at closure and post-closure monitoring.	Not Significant
Surface Water Resources	• Change in surface water quantity • Change in surface water quality	• Water management infrastructure, such as ponds and catch basins, will be constructed to manage via water transfer i.e., pumping the design storm volumes (1:100 year and 1:25 year design storms, respectively). • Water inventory will be reduced through perimeter berms and promotion of overland flow of non-contact runoff. • Surface water runoff and dewatering will be managed to meet mill reclaim process demand. • Flow to fish bearing streams and wetlands will be maintained by maintaining pre-development catchments and/or flows to the extent practicable. • Water management pumping and energy requirements during operation will be reduced through grading and gravitational drainage. • Mine water management infrastructure will be developed to control mine contact water. • Placement of mine waste has been purposely designed to use previously disturbed areas and to avoid overprinting waterbodies to avoid impacts to fish and fish habitat and triggering Schedule 2 of the *Fisheries Act.* • Runoff will be directed away from active work areas before construction commences, reducing the volume of sediment-laden water to be managed. • Use of the existing Final Discharge Point (FDP) and directing site contact water through grading of ditches and construction of diversion channels so it can be managed and discharged through the existing FDP • Accepted industry best practice geochemistry methods have been used to predict mine contact runoff and seepage quality. • The amount and timing of exposed soil left open at any one time will be limited to reduce the potential for erosion. • Mine contact water will be treated via a polishing pond and wastewater management plant (if required) to ensure effluent meets regulatory effluent limits. • Mine effluent will discharge via an existing FDP to create a mine effluent point source. • Sensitive receptors will be protected from sediment-laden runoff by directing untreated runoff away from these areas.	Not Significant

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
		• Currently, it is planned to cap the historic waste rock in the area of Boundary Shaft, which will reduce potential for disturbance or dust lift-off from this potentially acid generating (PAG) waste rock. Based on current configuration of infrastructure, there are no plans to disturb soils that are impacted by historic mining activities, however if inadvertently disturbed, the impacted material would be removed from site and disposed of in accordance with applicable regulations or managed on site in accordance with best practices for metal leaching / acid rock drainage (ML/ARD) materials. • Mean monthly and daily effluent water quality at FDP will be managed to be below *Metal and Diamond Mining Effluent Regulations* (MDMER) schedule 4 Table 2 limits. • The ultimate mixing zone boundary has been assessed using conservative flow and effluent discharge quality scenarios to end (return to CWQG-FAL values or baseline concentrations) prior to where South Brook empties into the marine environment. The Project will not have a mixing zone downstream of the FDP that extends into the marine environment.	
Fish and Fish Habitat	• Change in fish habitat quantity • Change in fish habitat quality • Change in fish health and survival	• During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including loss of fish habitat. Standard construction best practices will be used during the site preparation and construction phase to reduce the potential negative interactions. • Water inventory will be reduced through perimeter berms and promote overland flow of non-contact runoff. • Maintain flows to fish bearing streams and ponds by encouraging flow within the pre-development catchments to the extent practicable. • Runoff will be directed away from active work areas before construction commences, reducing the volume of sediment-laden water to be managed. • If historically impacted sediments need to be excavated from streams to facilitate the placement of stream crossings structures, the impacted material would be removed from site and disposed of in accordance with applicable regulations or managed on site in accordance with best practices for ML/ARD materials. • Vegetation will be cleared within the Tailings Management Facility (TMF) prior to filling / flooding to reduce potential generation of methyl mercury from accumulating in surface waters. • Culvert design, installation/upgrades and maintenance will follow and conform to appropriate DFO and NL operational statements, guidance, and protocols. Although most of the waterbodies and streams are impacted by legacy mining and don't support fish, the culverts will be designed to maintain passage for fish, allow streamflow and drainage through channels to direct non-contact water (does not come in contact with mine waste) to flow along existing natural pathways and not be obstructed and designed to account for extreme high and low hydrological events (Section 2.5.8). • Emergency spill kits will be readily available when working within 15 m of watercourses and waterbodies.	Not Significant

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
Terrestrial Environment	• Change in wetland function • Change in species diversity, community diversity, and/or habitat • Change in mortality risk	• During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including area of vegetation clearing. Existing disturbed areas were incorporated into the Project Area to accommodate Project components and, where possible, to reduce direct effects on forest cover and other vegetation communities. Standard construction best practices will be used during the site preparation and construction phase to reduce the potential negative interactions on vegetation, wildlife, and their habitats, including wetlands. • Vehicles and equipment will be operated on previously disturbed areas, wherever feasible. • The limits for approved disturbance activities including clearing, grubbing and topsoil overburden removal will be clearly identified (flagging / survey stakes) in the field prior to the commencement of work. • Currently, it is planned to cap the historic waste rock in the area of Boundary Shaft, which will reduce potential for disturbance or dust lift-off from this potentially acid generating (PAG) waste rock. Based on current configuration of infrastructure, there are no plans to disturb soils that are impacted by historic mining activities; however, if inadvertently disturbed, the impacted material would be removed from site and disposed of in accordance with applicable regulations or managed on site in accordance with best practices for metal leaching / acid rock draining (ML/ARD) materials. • Waste rock used to upgrade or construct site roads, pads or any other infrastructure area will be non-PAG material. This may come from an existing, permitted off-site quarry or could be quarried onsite within the footprint of the tailings management facility (TMF), depending on the results of geochemical testing. Non-PAG waste rock may also come from the Project mine development and from other nearby operations depending on the results of geochemical testing. • Buffers will be established and maintained around identified sensitive areas (e.g., wetlands, rare plant occurrences, hibernacula, roosts), where feasible. • Grading, if required, will be directed away from wetlands, where possible, and grading will be reduced within wetland boundaries unless required for site-specific purposes. • The drainage system for the site will be designed with basins to collect contact water from mine wastes and appropriately sized to manage stormflows, considering impacts to on-site downstream watercourses, wetlands, and infrastructure. • Equipment will arrive at the construction site clean and free of soil and vegetative debris, to reduce the risk of introducing or spreading non-native and/or invasive vascular plant species. Equipment will be inspected and either approved for use or cleaned, re-inspected and approved for use. • Specific stockpiles of topsoil, overburden, and other potentially dust-generating materials will be kept covered, where practical, and used as soon as practical, or will be appropriately temporarily vegetated. • If invasive vascular plant species are noted within or near the Project Area during construction or operation, the extent of the species will be assessed and a plan for removal and/or control will be developed.	Not Significant

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
		• If vegetation clearing occurs during the active bat season (approximately May 1 to October 31), targeted pre-clearing surveys for bat maternal colonies/roost sites will be conducted in trees with a diameter at breast height of greater than 25 cm in those areas proposed to be cleared and where suitable habitat exists. • If possible, large diameter trees will be maintained, especially those that are dead or dying. These types of trees typically have peeling bark, crevices and cavities that provide important roosting habitats for bats. • Caves, sinkholes, fissures, or other underground cavities that are identified as a result of Project activities will be inspected for signs of previously overwintering bats and reported to the Wildlife Division. • Observations of bat colonies, potential hibernacula sites, or sick or dead bats will be reported to the provincial Wildlife Division at 709-637-2025 or through the toll-free bat hotline: 1-877-434-2287 (BATS). • Prior to demolishing / deconstructing existing buildings and infrastructure, surveys for breeding birds and roosting bats will be conducted. • The discovery of bat roosts or hibernacula, or active dens (e.g., marten dens), will be reported immediately to the Health, Safety and Environmental Superintendent or designate and work will cease. A plan for protection, avoidance, and/or mitigation will be established by FireFly, guided by engagement with a qualified biologist and/or federal or provincial regulators. • Additional mitigation may involve offering alternate habitat (e.g., artificial structures such as bat boxes) to off-set the loss of roosting habitat as a result of development. • Project lighting will be limited to that which is necessary for safe and efficient Project activities. Mobile and permanent lighting will be located such that unavoidable light spill of the working area is not directed towards receptors outside the Project Area, to the extent practicable. • Water management infrastructure will be designed to allow wildlife crossing opportunities.	
Communities	• Change in infrastructure and services • Change in community well-being • Change in employment and economy	• FireFly will continue to work with municipalities and economic development organizations to identify opportunities to reduce negative impacts of the population growth and enhance positive socio-economic benefits through the Baie Verte Peninsula. • FireFly will address concerns through a grievance redress mechanism. • FireFly will continue to engage with local resource users (hunters, trappers, anglers), including the communication of Project information, updates on ongoing and planned activities and a discussion of issues and concerns and potential means of addressing them. • FireFly will provide opportunities for apprenticeships and on-the-job training. The Common Core Program will provide employees with the tools required to be successful in a position. FireFly is in communication with Trades NL and the Office to Advance Woman Apprentices so that FireFly will be aware of available local labour.	Not Significant

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
		• FireFly is committed to hiring locally and will communicate employment information to local communities in a timely manner so that local residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment. • Procurement packages will be developed and posted in a timely manner with consideration for capacity and capabilities of local and regional businesses. • FireFly commits to consider bids from qualified locally owned businesses first, including those submitted from companies owned by diverse groups (e.g., Indigenous, women, two-spirit, lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual, and all other sexual orientations and genders [2SLGBTQQIA+], persons with disabilities, visible minority). • Prior to decommissioning, FireFly will implement strategies to help transition the workforce. • FireFly will implement rotational work arrangements to maximize the rooms available in the accommodation complex during construction and later in operation, which will reduce the demand on housing in local communities. The accommodation complex will be built in a manner that permits flexibility to adjust to numbers of contractors and employees during different phases of the Project. • FireFly will continue to provide diversity and cultural sensitivity training for Project employees. • FireFly will continue to provide Project employees with health services (physical, mental and social health), including Employee Assistance Programs (EAP) and on-site emergency service infrastructure, including fire-fighting equipment. • FireFly will continue to coordinate its Emergency Response Plan with the local emergency services departments. • FireFly will implement a Traffic Management Plan, which will include encouraging car-pooling and providing bus transport and requiring Project drivers and employees to observe speed limits and take safety precautions. • When practicable, shift changes and truck movements will be scheduled to avoid peak traffic hours and school bus pick-up and drop-off times. • Signage will be installed around the Project Area to alert the public and land users of the presence of the Project and its facilities. • Hunting / fishing / harvesting of wildlife will be strictly prohibited on the site. Workers will not be permitted to hunt / fish / harvest and will not be permitted to bring firearms or angling gear to site. • Desired land and resource end-uses will be considered in the preparation of the Rehabilitation and Closure Plan.	

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
Land and Resource Use	• Change in designated land use • Change in resource use • Change in recreational use	• During Project planning and optimization of the conceptual mine design, efforts have been made to optimize the location of Project components to reduce the environmental impact including area(s) of vegetation clearing. Existing disturbed areas were incorporated into the Project Area to accommodate Project components and, where possible, to avoid recreational (e.g., snowmobile and ATV) trails and reduce direct effects on these areas. Standard construction best practices will be used during the site preparation and construction phase to reduce the potential negative interactions. • Additional signage will be installed around the mine site to alert the public and land users of the presence of the Project and its facilities. • FireFly will consult with NLDFFA in advance of construction to incorporate the harvesting of forestry resources in the Project Area as part of site preparation. • Hunting / fishing / harvesting of wildlife will be strictly prohibited on the mine site. Workers will not be permitted to hunt / fish / harvest while staying at the accommodations camp and will not be permitted to bring firearms or angling gear to site. • FireFly will continue to engage with local resource users regarding the overlap of the Project with land use areas in the Project Area. This will include the communication of Project information, updates on ongoing and planned activities, a discussion of issues and concerns, and a potential means of addressing them. • If complaints are received from land users regarding perceived Project-related impacts, FireFly will work with the affected land users to address their concerns through a grievance redress mechanism and the potential implementation of additional mitigation measures as needed. • Project activities, locations, and timing will continue to be communicated to communities, affected land and resource users, environmental non-government organizations, the provincial government, and local authorities throughout the life of the Project. FireFly will communicate in advance with respect to Project activities that may limit / affect use of the access road (i.e., upgrading activities or transport of large loads or equipment). This information will be communicated through local town councils, local radio stations and social media. • Measures will be taken to address public health and safety requirements throughout rehabilitation and closure. • Desired land and resource end-uses will be considered in the preparation of the Rehabilitation and Closure Plan.	Not Significant

Table 6.9.1 Summary of Environmental Effects

VC	Potential Effects	Mitigation	Significance of Residual Effects[1]
Historic Resources	• Loss of information about or alteration to historic resource(s) and their context	Measures to be included in the Discovery of Historic Resources Contingency Plan to mitigate the potential of adverse effects on historic resources resulting from an accidental discovery: • If suspected archaeological material is encountered, all work in the immediate area of the discovery will be stopped until authorized personnel from FireFly, following consultation with the Provincial Archaeology Office (PAO), allow resumption of the work. • Report the find immediately to FireFly's representative, the Health, Safety and Environmental Department. • Mark the site's visible boundaries. Personnel will not move or remove any artefacts or associated material unless the integrity of the material is threatened. • The FireFly representative will report the find with the following information to the PAO, Department of Tourism, Culture, Industry and Innovation, and will comply with the instruction provided: - Nature of the find - Precise descriptive and map location and the time of the find - Nature of the activity resulting in the find - Identity of the worker(s) making the find - Present location of the material, if moved, and any protective measures initiated for the material and the site - Extenuating circumstances Mitigation measures to be applied with approval and appropriate permits issued by the PAO: • Field assessment surveys will be undertaken prior to construction wherever the Project Area has potential to interact with identified areas of high potential for archaeological resources. • Archaeological field assessment and testing of road routes and other required infrastructure (new and upgraded) at selected river crossings and lakeshores will be undertaken prior to construction once development plans are finalized.	Not Significant

Note:
[1] Definitions of significance is VC-specific and described in the respective VC sections.

7 Capital Cost and Funding

The capital expenditure for the Project is estimated to be between CAD $320 million and CAD $350 million. This provisional estimate will be refined and optimized through ongoing detailed studies. The Project costs will be privately funded by FireFly Metals Limited, the parent company of FireFly Metals Canada. Refer to Section 2.9.2 for additional details on Project costs.

8 Project Related Documents

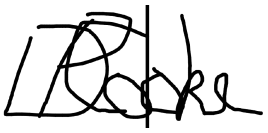
Baseline studies were conducted in 2024, however, in some cases, analysis and reporting of this data is not yet available and will be provided to regulators at a later date. The following appended documents provide baseline information to support the effects assessment in this Registration.

- Desktop Hydrological Assessment (Appendix 6.A)
- Desktop Historical Surface Water Quality Data Review (Appendix 6.B)
- South Brook Pond Assimilative Capacity Assessment (Appendix 6.C)
- Vegetation and Wetlands Baseline Survey Report (Appendix 6.D)
- Avifauna Baseline Survey Report (Appendix 6.E)
- Bats Baseline Survey Report (Appendix 6.F)
- Land and Resource Use Survey Report (Appendix 6.G)

A comprehensive list of Project-related documents that were prepared for Rambler Metals and Mining and FireFly, dating back to the mid-1990s, can be found in Appendix 8.A.

9 Signature

Date: 4/14/25 ----------



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