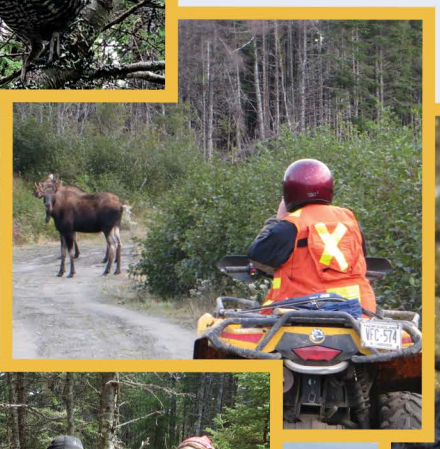
MARATHON GOLD

Valentine Gold Project Summary of the Environmental Impact Statement

September 2020



Valentine Gold Project: Summary of the Environmental Impact Statement

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Table of Contents

ABBREVIATIONS AND ACRONYMS VI

1.0 INTRODUCTION AND EA CONTEXT 1.1

2.0 PROJECT OVERVIEW 2.1
2.1 PROJECT LOCATION 2.1
2.2 PROJECT BACKGROUND AND PURPOSE 2.1
2.3 SUMMARY OF UPDATES TO THE PROJECT DESCRIPTION SINCE ORIGINALLY PROPOSED 2.4
2.4 PROJECT DESCRIPTION 2.5
2.4.1 Open Pits 2.7
2.4.2 Waste Rock Piles and Ore and Overburden Stockpiles 2.8
2.4.3 Process Plant 2.9
2.4.4 Tailings Management Facility 2.11
2.4.5 Water Management and Development 2.13
2.4.6 Process and Potable Water 2.15
2.4.7 Sanitary Effluent 2.15
2.4.8 Utilities and Infrastructure 2.15
2.4.9 Other Plant Site Buildings 2.15
2.4.10 Roads 2.15
2.4.11 Accommodations Camp 2.17
2.4.12 Explosives Storage and Production 2.17
2.5 PROJECT DEVELOPMENT 2.17
2.5.1 Overview of Construction 2.17
2.5.2 Overview of Operation 2.18
2.5.3 Decommissioning, Rehabilitation and Closure Phase Overview 2.19
2.5.4 Overview of Project Schedule and Activities 2.20
2.6 OCCUPATIONAL HEALTH AND SAFETY 2.22
2.7 MARATHON'S APPROACH TO ENVIRONMENTAL MANAGEMENT 2.23
2.8 EMISSIONS, DISCHARGES AND WASTES 2.23

3.0 ENVIRONMENTAL ASSESSMENT PROCESS 3.1
3.1 SCOPE OF THE ASSESSMENT 3.1
3.2 ASSESSMENT BOUNDARIES 3.3
3.2.1 Spatial Boundaries 3.3
3.2.2 Temporal Boundaries 3.3

4.0 PROJECT ALTERNATIVES 4.1
4.1 ALTERNATIVES TO THE PROJECT 4.1
4.2 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT 4.1

5.0 STAKEHOLDER PARTICIPATION 5.1
5.1 REGULATORY ENGAGEMENT 5.2
5.2 STAKEHOLDER ENGAGEMENT 5.2

6.0 ENGAGEMENT WITH INDIGENOUS GROUPS 6.1

7.0 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT 7.1
7.1 ENVIRONMENTAL SETTING 7.1
7.2 ATMOSPHERIC ENVIRONMENT 7.5
7.2.1 Existing Conditions 7.5
7.2.2 Environmental Effects 7.6
7.3 GROUNDWATER 7.11
7.3.1 Existing Conditions 7.11
7.3.2 Environmental Effects 7.12
7.4 SURFACE WATER 7.16
7.4.1 Existing Conditions 7.16
7.4.2 Environmental Effects 7.18
7.5 FISH AND FISH HABITAT 7.23
7.5.1 Existing Conditions 7.23
7.5.2 Environmental Effects 7.24
7.6 VEGETATION, WETLANDS, TERRAIN AND SOIL 7.32
7.6.1 Existing Conditions 7.32
7.6.2 Environment Effects 7.34
7.7 AVIFAUNA 7.42
7.7.1 Existing Conditions 7.42
7.7.2 Environmental Effects 7.43
7.8 CARIBOU 7.47
7.8.1 Existing Conditions 7.47
7.8.2 Environmental Effects 7.48
7.9 OTHER WILDLIFE 7.55
7.9.1 Existing Conditions 7.55
7.9.2 Environmental Effects 7.56
7.10 COMMUNITY SERVICES AND INFRASTRUCTURE 7.61
7.10.1 Existing Environment 7.61
7.10.2 Environmental Effects 7.63
7.11 COMMUNITY HEALTH 7.67
7.11.1 Existing Conditions 7.67
7.11.2 Environmental Effects 7.68
7.12 EMPLOYMENT AND ECONOMY 7.71
7.12.1 Existing Conditions 7.71
7.12.2 Environmental Effects 7.73
7.13 LAND AND RESOURCE USE 7.77
7.13.1 Existing Conditions 7.77
7.13.2 Environmental Effects 7.78
7.14 INDIGENOUS GROUPS 7.82
7.14.1 Existing Conditions 7.82
7.14.2 Environmental Effects 7.84
7.15 HISTORIC RESOURCES 7.91
7.15.1 Existing Conditions 7.91
7.15.2 Environmental Effects 7.92

7.16 DAM INFRASTRUCTURE 7.94
7.16.1 Existing Conditions 7.94
7.16.2 Environmental Effects 7.94

8.0 FOLLOW-UP AND MONITORING PROGRAMS 8.1

9.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT 9.1
9.1 METHOD AND APPROACH 9.1
9.2 EFFECTS ASSESSMENT 9.2
9.2.1 Potential Effects 9.2
9.2.2 Mitigation 9.3
9.2.3 Effects Assessment 9.5

10.0 EFFECTS OF POSSIBLE ACCIDENTS AND MALFUNCTIONS 10.1
10.1 METHOD AND APPROACH 10.1
10.2 EFFECTS ASSESSMENT 10.1
10.2.1 Potential Effects 10.1
10.2.2 Mitigation Measures 10.2
10.2.3 Residual Effects 10.4

11.0 CUMULATIVE ENVIRONMENTAL EFFECTS 11.1
11.1 APPROACH 11.1
11.3 CUMULATIVE EFFECTS ASSESSMENT 11.2
11.3.1 Atmospheric Environment 11.2
11.3.2 Groundwater 11.2
11.3.3 Surface Water Resources 11.4
11.3.4 Fish and Fish Habitat 11.4
11.3.5 Vegetation, Wetlands, Terrain and Soils 11.4
11.3.6 Avifauna 11.5
11.3.7 Caribou 11.6
11.3.8 Other Wildlife 11.7
11.3.9 Community Services and Infrastructure 11.7
11.3.10 Community Health 11.8
11.3.11 Employment and Economy 11.8
11.3.12 Land and Resource Use 11.8
11.3.13 Indigenous Groups 11.9
11.3.14 Historic Resources 11.10

12.0 CONCLUSIONS 12.1
12.1.1 Benefits of the EA Process 12.1
12.1.2 Effects on Capacity of Renewable Resources 12.4
12.1.3 Overall Conclusions 12.5

13.0 REFERENCES 13.1
13.1.1 Personal Communications 13.1
13.1.2 Literature Cited 13.1

LIST OF TABLES

Table 2.1 Anticipated Timeframes, Frequencies and Durations of Main Project Activities 2.21
Table 4.1 Alternative Means Assessment Descriptors 4.2
Table 4.2 Summary of Alternatives Analysis 4.3
Table 5.1 Relevant Regulatory Authorities and Jurisdictions 5.2
Table 5.2 Summary of Stakeholder Comments and Concerns 5.4
Table 6.1 Summary of Comments and Concerns Raised by Indigenous Groups 6.2
Table 7.1 Mitigation Measures: Atmospheric Environment 7.7
Table 7.2 Mitigation Measures: Groundwater Resources 7.13
Table 7.3 Mitigation Measures for Surface Water Resources 7.19
Table 7.4 Mitigation Measures: Fish and Fish Habitat 7.25
Table 7.5 Mitigation Measures: Vegetation, Wetlands, Terrain and Soils 7.36
Table 7.6 Mitigation Measures: Avifauna 7.44
Table 7.7 Mitigation Measures: Caribou 7.50
Table 7.8 Magnitude of Project Residual Effects on Assessed Caribou Herds 7.54
Table 7.9 Mitigation Measures: Other Wildlife 7.57
Table 7.10 Mitigation Measures: Community Services and Infrastructure 7.64
Table 7.11 Mitigation and Management Measures: Community Health 7.69
Table 7.12 Population Change – 2011 to 2016 ....7.72
Table 7.13 Mitigation and Management Measures: Employment and Economy 7.74
Table 7.14 Mitigation Measures: Land and Resource Use 7.79
Table 7.15 Mitigation Measures: Indigenous Groups 7.86
Table 7.16 Mitigation Measures: Historic Resources 7.93
Table 7.17 Mitigation Measures: Dam Infrastructure 7.95
Table 9.1 Scope of Factors Considered for Effects of the Environment on the Project 9.1
Table 9.2 Summary of Mitigation: Effects of the Environment on the Project 9.3
Table 10.1 Description of Potential Effects and Mitigation Measures for Accidents and Malfunctions 10.2
Table 10.3 Summary of Significance Determinations 10.5

LIST OF FIGURES

Figure 2-1 Location of Valentine Gold Project 2.2
Figure 2-2 Project Area 2.3
Figure 2-3 Mine Site 2.6
Figure 2-4 Area of Leprechaun Pit and Waste Rock Pile 2.7
Figure 2-5 Area of Marathon Deposit (Left) and Waste Rock Pile (Right) 2.7
Figure 2-6 Typical Waste Rock Pile, Partially Rehabilitated 2.8
Figure 2-7 Process Plant Rendering 2.10
Figure 2-8 Typical Tailings Management Facility 2.11
Figure 2-9 Tailings Storage Facility Staged Development 2.12
Figure 2-10 Typical Sedimentation Pond 2.14
Figure 2-11 Access Road 2.16
Figure 7-1 Combined Local Assessment Areas for the VCs 7.2
Figure 7-2 Combined Regional Assessment Areas for the VCs 7.3
Figure 11-1 Other Projects and Activities Considered in the Cumulative Effects Assessment 11.3

LIST OF APPENDICES

Appendix A Residual Effects Characterization

Abbreviations and Acronyms

%HA	percent highly annoyed
µm	micrometers
AAC	annual allowable cut
ARD	acid rock drainage
ASF	Atlantic Salmon Federation
asl	above sea level
ATK Study	Aboriginal Traditional Knowledge Study
ATV	all-terrain vehicle
BACT	best available control technologies
CAAQS	Canadian Ambient Air Quality Standard
CDA	Canadian Dam Association
CEAA	*Canadian Environmental Assessment Act*
CH_4	methane
CIL	carbon-in-leach
CNF	Central Newfoundland Forest
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPAWS	Canadian Parks and Wilderness Society
CWQG-FAL	Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life
dBA	A-weighted decibels
DFO	Fisheries and Oceans Canada
EA	environmental assessment
EEM	Environmental Effects Monitoring
EIS	environmental impact statement
ELC	Ecological Land Classification
ELCA	ELC Area

EMP	environmental management plan
EMS	environmental management system
EPP	Environmental Protection Plan
FDP	final discharge point
FMD	Forest Management Division
FTE	full-time equivalents
GDP	gross domestic product
GHGs	greenhouse gases
HADD	habitat alteration, disruption or destruction
HGO	high-grade ore
IAAC	Impact Assessment Agency of Canada
IC	incident command system
IDF	Intensity-Duration-Frequency
km	kilometers
kV	kilovolt
L/min	litres per minute
L/s	litres per second
LAA	Local Assessment Area
LGO	low-grade ore
LSD	local service district
m	metres
MAC	Mining Association of Canada
MAF	mean annual flow
Marathon	Marathon Gold Corporation
mbgs	metres below ground surface
MCF	Mi'kmaq Commercial Fisheries Incorporated
MDMER	*Metal and Diamond Mining Effluent Regulations*
mm	millimeter
Mm^3/year	million cubic metres per year
Mt	million-tonnes

Mt/a	million-tonnes per year
N_2O	nitrous oxide
NL	Newfoundland and Labrador
NLDECCM	Newfoundland and Labrador Department of Environment, Climate Change and Municipalities
NLDFFA	Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture
NL EPA	NL *Environmental Protection Act*
NO_2	nitrogen dioxide
NRCAN	Natural Resources Canada
NPR	neutralization potential ratio
PAG	potentially acid generating
$PM_{2.5}$	particulate matter <2.5 µm
PM_{10}	particulate matter <10 µm
POPC	parameters of potential concern
the Project	Valentine Gold Project
RAA	Regional Assessment Area
RCMP	Royal Canadian Mounted Police
SAEN	Salmonid Association of Eastern Newfoundland
SAG	semi-autogenous grinding
SAR	species at risk
SCNL	Salmon Council of Newfoundland and Labrador
SO_2	sulfur dioxide
SOCC	species of conservation concern
TMF	tailings management facility
tpd	tonnes per day
TSP	total suspended particulates
VC	valued component
WSC	Water Survey of Canada
YOY	young of the year

1.0 INTRODUCTION AND EA CONTEXT

Marathon Gold Corporation (Marathon; the proponent) proposes to develop the Valentine Gold Project (the Project), an open pit gold mine to be located in the west-central region of the Island of Newfoundland, near Valentine Lake. Marathon is a Canadian gold exploration company that was incorporated in 2010. It is a publicly listed, advanced exploration stage company based in Toronto, with offices in Grand Falls-Windsor and St. John's, Newfoundland and Labrador (NL). Marathon has 100% ownership of the Project and is the entity that will develop, manage and operate the Project.

The Project will use standard surface mining techniques to mine gold ore from the Leprechaun and Marathon open pits. Ore material will initially be mined and processed at a nominal rate of 6,850 tonnes per day (tpd), increasing to 10,960 tpd in Year 4. Current estimates are for a total Project mine excavation of 453 million tonnes of combined ore and waste material. The total ore to be mined from the open pits is estimated to be approximately 41 million tonnes. Ore will be processed through the mill, where it will be crushed, milled and put through flotation and cyanidation processes to recover the gold. Separate stockpiles will be established for high-grade ore (HGO) for priority processing and low-grade ore (LGO) for processing later in the mine life. Tailings will be treated in the process plant area to remove the cyanide and subsequently deposited in an engineered tailings management facility (TMF) in Years 1 to 9, then pumped to the exhausted Leprechaun open pit in Years 10 through 12. Gold will be formed into doré bars, which will be shipped from site to refiners in secured trucks.

On April 5, 2019, Marathon submitted a Project Description to the Impact Assessment Agency of Canada (IAAC) (formerly the Canadian Environmental Assessment Agency) pursuant to the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012). IAAC reviewed the Project Description and determined that an environmental assessment (EA) would be required. Based on the timing of the Project Description submission and determination by IAAC, review of the Project can continue under CEAA 2012, rather than the *Impact Assessment Act* (IAA). On April 16, 2019, Marathon submitted the same document to the provincial government for review as a Registration document of an undertaking, pursuant to the NL *Environmental Protection Act* (NL EPA). On June 21, 2019, the provincial Minister of Environment, Climate Change and Municipalities (NLDECCM) announced the Project would require the preparation of an Environmental Impact Statement (EIS).

Although the federal and provincial EA processes are not legislatively coordinated, an EIS has been prepared to meet the requirements of both CEAA 2012 and the NL EPA. The EIS has also been prepared to meet the requirements of the Project-specific guidelines issued by the federal government (Federal EIS Guidelines) and the provincial government (Provincial EIS Guidelines). Tables of concordance are included in the EIS to demonstrate compliance with both the Federal and Provincial EIS Guidelines and to indicate where these requirements have been addressed in the EIS.

As required by the Federal and Provincial EIS Guidelines, this document is a summary of the EIS and is available in English and French. Information summarized in this document is provided in the EIS and supporting appendices submitted to IAAC and NLDECCM.

2.0 PROJECT OVERVIEW

2.1 PROJECT LOCATION

The Project is in the west-central region of the Island of Newfoundland, approximately 60 kilometres (km) directly southwest of Millertown, NL (Figure 2-1). The center of the mine site is located at Universal Transverse Mercator 490055 m Easting and 5358023 m Northing, Zone 21, North American Datum 1983 (NAD83 Zone 21). It is located within National Topographic System map sheets 12A/06. The Project is in a rural region, with a history of mining exploration and development activities and other land and resource uses, including commercial forestry, hydroelectric developments, outfitting, and recreational land use. Marathon currently maintains a fully permitted, 50-person, all-season exploration camp at the site. The mine site is accessed by an existing public access road that extends south from Millertown approximately 88 km to Marathon's exploration camp. Marathon will upgrade and maintain the access road from a turnoff approximately 8 km southwest of Millertown to the mine site, a distance of approximately 76 km.

The Project Area (Figure 2-2) consists of the mine site and the portion of the existing access road from Millertown to the mine site that will be upgraded and maintained by Marathon (approximately 76 km). The Project Area also includes a 20 m buffer on either side of the access road where activities associated with upgrading would occur, as needed. The Project Area is located within National Topographic System map sheets 12A/06, 12A/10, 12A/11, and 12A/15. The Project Area is 113 km (254 km by road) from the Miawpukek First Nation reserve at Conne River. There are no federal lands located within 45 km of the Project Area and 76 km of the mine site.

2.2 PROJECT BACKGROUND AND PURPOSE

The purpose of the Project is to mine and process the discovered gold resources at the mine site to provide a financial return for the company's shareholders, which can then be redeployed, whether in the province of NL, Canada or globally, thus creating new opportunities. The Project will also create employment opportunities and economic benefits for the local communities, Indigenous groups, the Central Region of the province, and Canada as a whole. The Project will bring employment to the region, increase business activity in the region and the province, and provide revenue to the province and Canada.

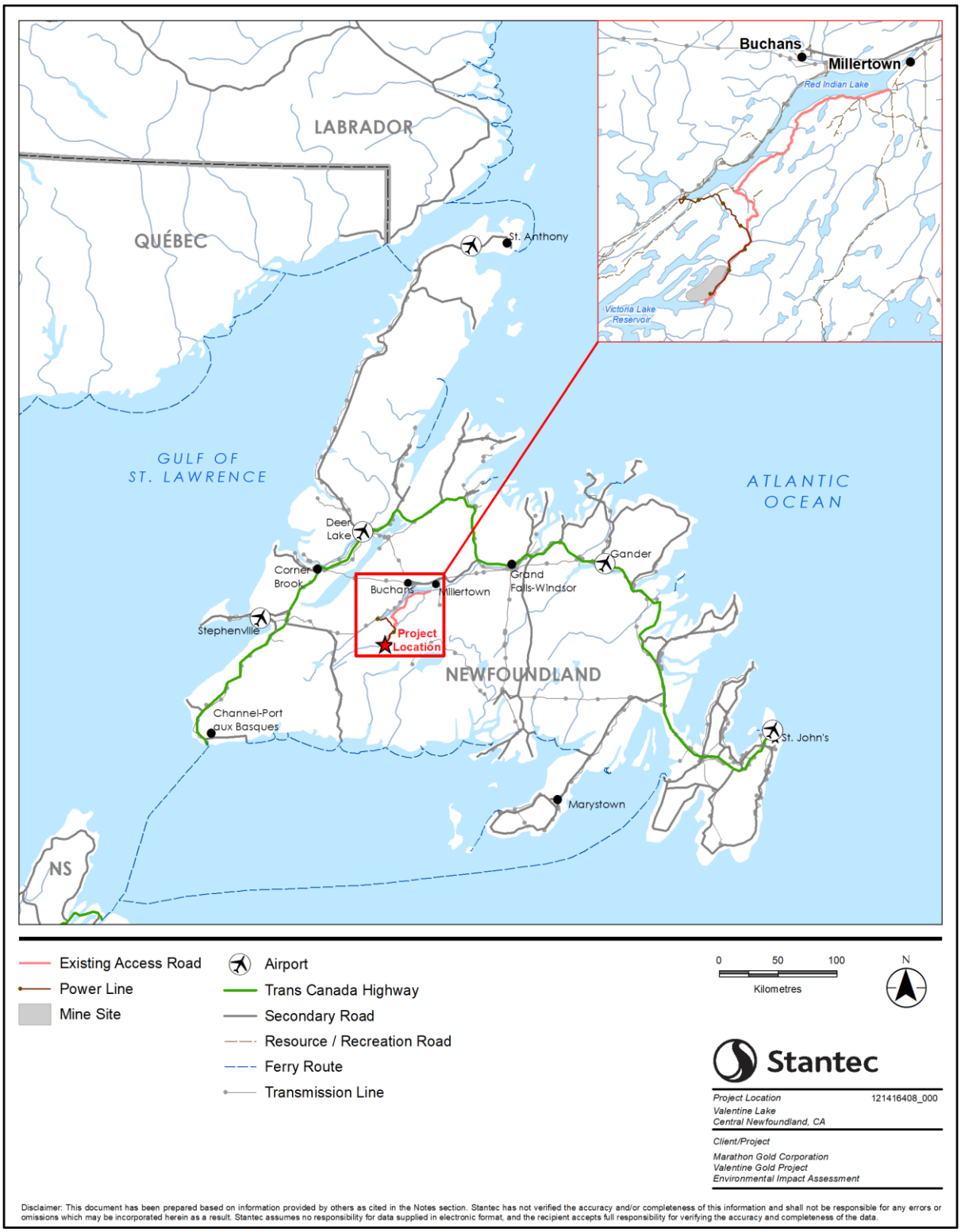

Figure 2-1 Location of Valentine Gold Project

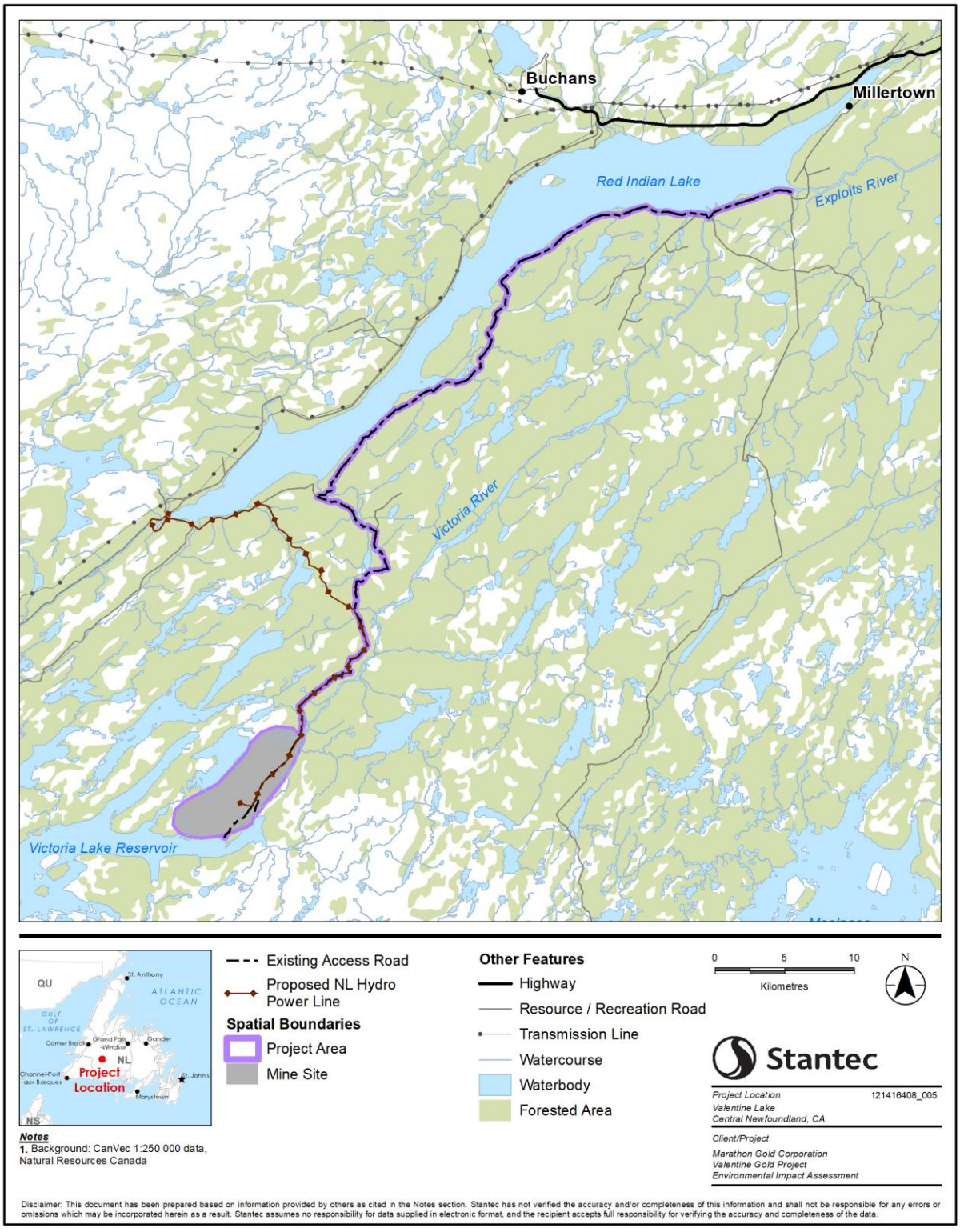

Figure 2-2 Project Area

Based on an independent economic assessment completed by Strategic Concepts Inc., the Project will have substantial economic impacts for both NL and Canada. Marathon will spend approximately $2.0 billion Canadian dollars (CAD) to develop and operate the Project over its planned 15-year life (includes construction and closure). This includes $272 million in pre-production capital expenditures, $288 million in post-production capital expenditures, and $1.4 billion in operating expenditures. The key economic impacts on the economy and the federal and provincial treasuries are[1]:

- Creation of over 19,000 full-time equivalents (FTE) of total employment (direct, indirect and induced) in Canada, including approximately 11,000 FTEs in NL
- Average annual employment (direct, indirect and induced) of nearly 1,300 FTEs of employment in Canada, including an average of 725 FTEs annually within NL
- Generation of approximately $1.3 billion in income to workers and business within Canada, including $750 million to workers and businesses located within NL
- Contribution of $3.6 billion to Canada's gross domestic product (GDP), which includes $2.9 billion to NL's GDP
- Generation of $292 million in federal government revenues
- Contribution of approximately $400 million ($27 million on an average annual basis) in incremental revenues to the treasury of NL

2.3 SUMMARY OF UPDATES TO THE PROJECT DESCRIPTION SINCE ORIGINALLY PROPOSED

As part of the Project planning phase, aspects of the Project concept and engineering design have been modified, refined and adapted to reduce potential adverse effects. These changes have been made during the Project Pre-Feasibility Study and in consideration of discussions with regulators, stakeholders and Indigenous groups, and in response to input received during public, Indigenous and regulatory review of the Registration / Project Description submitted to the federal and provincial governments in April 2019. The following substantive Project design changes have been made since submission of the Registration / Project Description:

- The heap leach process and associated infrastructure are no longer part of the proposed scope
- The TMF has been relocated to avoid known fish habitat and to be downstream of the Victoria Dam and Victoria Lake Reservoir
- The tailings deposition method has changed from a conventional slurry to thickened tailings
- Following operation Year 9, all remaining tailings produced from the milling process will be deposited into the mined-out Leprechaun Pit instead of to the TMF
- Mining of the Victory Deposit is no longer part of the proposed Project scope
- The process plant area has been relocated
- The waste rock piles have been reconfigured, primarily to avoid fish habitat and to avoid sterilization of potentially economic resources

[1]Treasury impacts based on US$1,350 per ounce of gold and an exchange rate of $0.75 US/CAD. A full-time equivalent of employment is typically equivalent to approximately 2,000 hours of work. For this model, 2,000 hours was used to measure full-time equivalents of employment from capital expenditures and 2,190 hours per year for operation jobs. The latter is based on the planned work schedule of a 24-hour operation with two 12-hour shifts.

- Ore stockpiles have been added due to the removal of the heap leach process
- Locations of topsoil and overburden stockpiles have been identified on the site plan

2.4 PROJECT DESCRIPTION

The EIS assesses the construction, operation, decommissioning, rehabilitation, and closure phases of the Project. The construction of the Project is expected to take place over a period of approximately 16 to 20 months, followed by an estimated mine operation life of 12 years. The Project will operate 24 hours a day, seven days a week on a 12-hour shift basis. Upon completion of mining, the operation will be closed, and the site components will be rehabilitated in accordance with applicable regulations at the time of closure.

The Project includes two open pits, waste rock piles, crushing and stockpiling areas, conventional milling and processing facilities (the mill), and a TMF. Other Project components and activities that are associated with the primary mining, milling, and processing activities include site and haul road construction and maintenance, waste rock management, electrical power supply and distribution, process and potable water supply and distribution, water management, treatment and discharge, fuel storage and fueling stations, mine and plant workshops and services, administrative office, personnel accommodations and lunchrooms, and security. A power line from NL Hydro's nearby Star Lake Generating Station will also be required to supply power to the mine site (Figure 2-2). As the power line will be constructed and operated by NL Hydro, it has not been included within the scope of this assessment. The power line will be subject to separate environmental approvals with NL Hydro as the proponent. However, the power line has been considered within this assessment as a contributor to potential cumulative effects.

The preliminary site layout for the development of the mine site is presented in Figure 2-3. Standard surface mining techniques will be used to mine material from the Marathon and Leprechaun open pits, including blasting, loading, hauling ore from the pit to stockpiles, processing ore, tailings deposition, hauling and placement of waste rock on the waste rock piles, and phased development of the TMF. The key activities and components associated with the Project are described below.

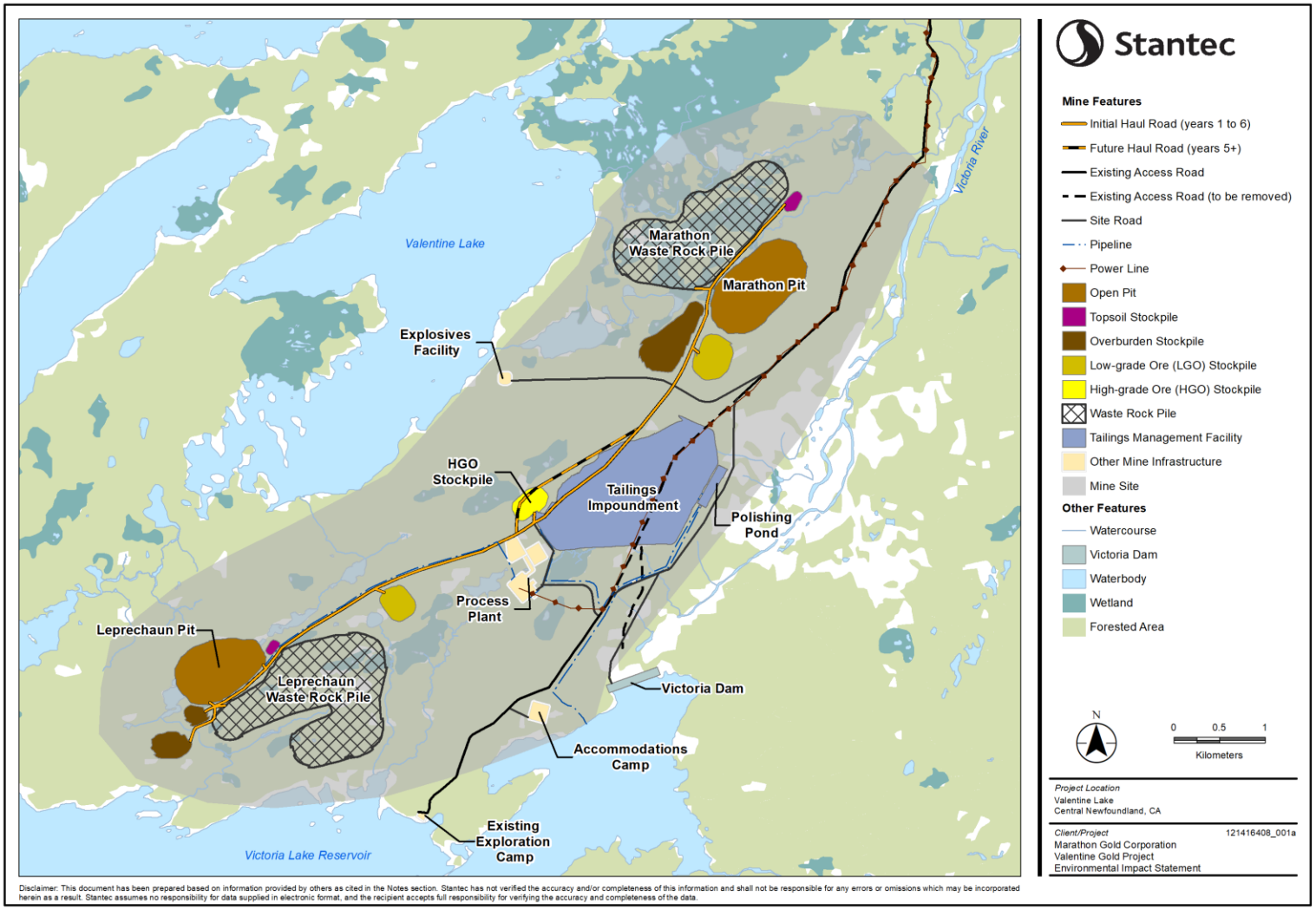

Figure 2-3 Mine Site

2.4.1 Open Pits

The Project comprises two mining areas: the Leprechaun deposit in the southwest of the mine site (Figure 2-4) and the Marathon deposit in the northeast (Figure 2-5). Ultimate pit limits are generally split up into phases over the mine life. The Marathon pit will be developed in three phases and will have approximate dimensions of 1,250 m southwest to northeast by 670 m southeast to northwest and a maximum depth of 270 m below current ground level. The Leprechaun pit will also be developed in three phases and will have maximum approximate dimensions of 1,010 m southwest to northeast by 660 m southeast to northwest, and a maximum depth of 285 m below current ground level.

Figure 2-4 Area of Leprechaun Pit and Waste Rock Pile

Figure 2-5 Area of Marathon Deposit (Left) and Waste Rock Pile (Right)

Standard surface mining techniques (drill, blast, load, haul) will be used to create an open pit within each of the two mining areas. Blasting activities will be carried out by a licensed blasting contractor. Haulage of ore and waste rock will be carried out by 91-tonne haul trucks.

Two-way haul roads of 25 m width will be constructed within the pit. Haul road grades are limited to a maximum of 10%. However, the bottom two ramped benches of the pit use one-way haul roads of 19 m width and 12% grade since bench volumes and traffic flow are reduced. Mine haul roads external to the open pits are designed to haul ore and waste materials from the open pits to the scheduled destinations. Ex-pit haul roads are 30 m wide and grades are limited to a maximum 8%.

2.4.2 Waste Rock Piles and Ore and Overburden Stockpiles

A waste rock pile is located at each of the two open pits. The Leprechaun waste rock pile is located southeast of the Leprechaun pit and the Marathon waste rock pile is located northwest of the Marathon pit (Figure 2-3). Waste rock piles will be constructed according to design recommendations, assuming a final closure slope angle of 30°. To accomplish this, the waste rock piles will be constructed in single lifts with a 35° face angle and a 6.1 m safety bench using bottom up construction. Less than 0.5% of the waste rock from the Leprechaun pit, and approximately 14% of the waste rock from the Marathon pit are considered potentially acid generating (PAG). PAG waste rock from the Marathon pit will be mixed with non-PAG waste rock within the waste rock pile, and the neutralizing potential of the non-PAG rock will avoid the potential for acidic drainage or related metals leaching from the pile. A typical waste rock pile is shown in Figure 2-6.

Figure 2-6 Typical Waste Rock Pile, Partially Rehabilitated

Topsoil and overburden stockpiles are located adjacent to the each of the open pits (Figure 2-3). For general site construction and development where excess topsoil and overburden materials must be stockpiled for future site rehabilitation, these materials may be placed as small rows / piles running along linear corridors (e.g., road, pipelines) or stored in relatively small stockpiles around the site and in close proximity to where these materials will be re-used. These materials may also be stored within the future footprints of major mine components (e.g., open pits, TMF, waste rock piles) where they can be reclaimed for progressive rehabilitation prior to development expanding into that area. Overburden and topsoil stockpiles will be developed using 3 (horizontal) to 1 (vertical) slope construction (3:1), with a 4 to 5 m

horizontal berm at 5 m elevation increments. Organics stockpiles are generally limited to approximately 4 to 5 m in total height with relatively flat side slopes – often 4 or 5 (horizontal) to 1 (vertical) (4:1 or 5:1), due to the nature of these materials. Overburden materials have been assessed and determined to be not acid generating.

Ore not immediately destined for the process plant will be stockpiled for future processing. Each of the open pits will have an adjacent LGO stockpile. An HGO stockpile will be located immediately to the north of the process plant (Figure 2-3). The ore stockpiles will be placed on prepared pads using 15 m lift heights with benches of 19 m, to form overall slope angles of 2.6 horizontal: 1 vertical. A 25 m wide haul road will be incorporated into each stockpile. About 10% of low-grade ore from the Leprechaun open pit is estimated to be PAG. However, overall, it is not expected to generate acidic drainage. Approximately one-half of the LGO from the Marathon pit is conservatively estimated to be PAG. A sample is conservatively classified PAG if the neutralization potential ratio (NPR) is below 2; otherwise, the sample is classified as non-PAG. The acid rock drainage (ARD) onset time is approximately six years based on highest laboratory leaching rates. The Marathon LGO stockpile effluent has been segregated from other mine component flow streams in the overall mine design to facilitate collection and ARD treatment, if required.

HGO from the Leprechaun and Marathon deposits will be stockpiled together at the process plant site, with 30% of the material originating from Leprechaun and the remainder from Marathon. On average. Approximately 13% and 67% of ore samples from Leprechaun and Marathon pits, respectively, are conservatively estimated to be PAG. The overall mixture of Leprechaun and Marathon high-grade ores is considered to be non-PAG and the HGO stockpile is not expected to generate ARD due to short dwell time, as these materials will be constantly replaced on the stockpile. Drainage from the HGO stockpile flows to the TMF by gravity and any potential acidity will be neutralized in the decant pond or in the mill process.

2.4.3 Process Plant

The process plant (Figure 2-7) will be designed to process 6,850 tpd from Year 1 to Year 4, treating approximately 2.5 million-tonnes per year (Mt/a) of ore using a fine grind for the ore at 80% passing 75 µm. After approximately four years of operation at 2.5 Mt/a, the process plant will be expanded to process 10,960 tpd of ore (4 Mt/a) with a grind size increased to 80% passing 150 micrometers (µm). The process design, both initial and following the expansion in Year 4, includes the following circuits:

- Primary crushing of ore
- A covered crushed material (mill feed) stockpile to provide buffer capacity ahead of the grinding circuit
- Grinding (milling) circuit: semi-autogenous grinding (SAG) mill with trommel screen, ball mill and cyclones
- Pebble recycle via front end loader reclaim with a pebble crusher (added in Year 4)
- Gravity recovery from ball mill discharge by two semi-batch centrifugal gravity concentrators, followed by intensive cyanidation of the gravity concentrate and electrowinning of the pregnant leach solution in a dedicated cell located in the gold room

- Trash screen prior to carbon-in-leach initially and then prior to rougher flotation of gravity tailings (added in Year 4)
- Gravity tailings carbon-in-leach (CIL) initially, then flotation concentrate CIL and flotation tails CIL (added in Year 4)
- Thickening of flotation concentrate and flotation tails prior to leaching (added in Year 4)
- Regrind mill for the flotation concentrate (added in Year 4)
- Acid washing and neutralization of loaded carbon and elution followed by electrowinning and smelting to produce doré; a doré bar is a semi-pure alloy of gold, which can be transported to a refinery for further purification
- Carbon regeneration by rotary kiln
- Cyanide destruction using Air/SO_2 process prior to release of tailings effluent to tailing management facility

Figure 2-7 Process Plant Rendering

2.4.4 Tailings Management Facility

The TMF consists of the tailings impoundment and the polishing pond. A typical tailing management facility is shown in Figure 2-8. The TMF is designed to store the 30 million-tonnes (Mt) of tailings to be produced over the initial 9 years of the mine life (Figure 2-3). After Year 9 of operation, tailings will be pumped via pipeline to the exhausted Leprechaun open pit until the end of milling operation. Approximately 11 million tonnes (Mt) of tailings are expected to be piped to the Leprechaun open pit during Years 9 through 12, which represents only 15% of the total volumetric capacity of the open pit below the approximate discharge crest elevation. Once tailings deposition is switched to the Leprechaun open pit, the TMF will be rehabilitated.

Figure 2-8 Typical Tailings Management Facility

A conventional embankment construction concept is planned for the TMF based on the mine plan and assessment of site topography, with embankments raised in a downstream direction. The TMF will be constructed in five stages over the mine life (Figure 2-9) and is designed to be raised based on the storage requirements and operating criteria. Mine waste rock from the pit developments will be the primary embankment construction material. The upstream embankment will be lined with a geomembrane to reduce potential seepage and underlain by a geotextile, a fine filter layer and a coarse filter layer. The filter zones will be engineered from material sourced from the waste rock piles.

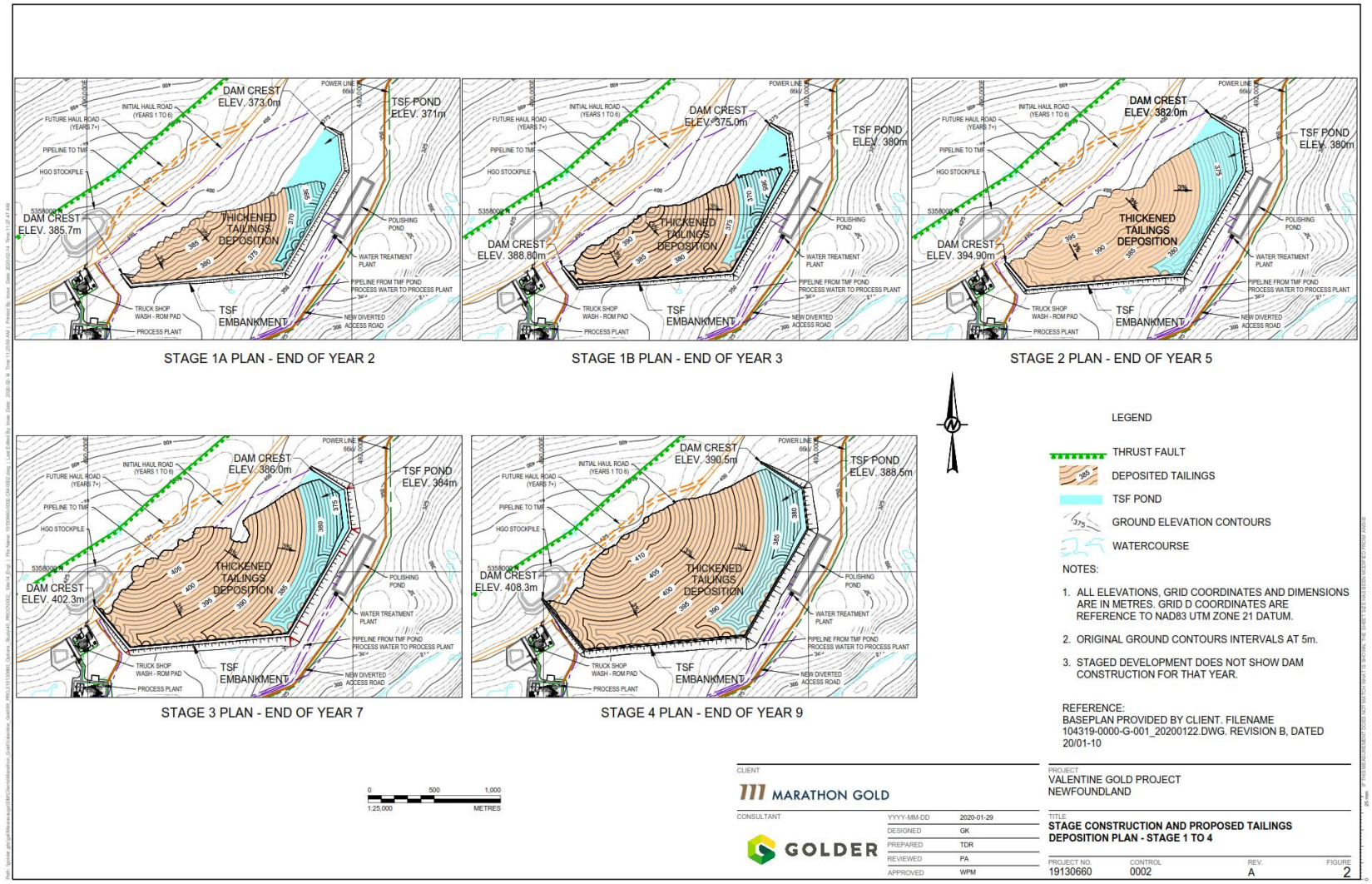

Figure 2-9 Tailings Storage Facility Staged Development

The accumulation of water in the TMF has been modelled for the mean and 25-year wet annual precipitation conditions. A water treatment plant and polishing pond will allow for the treatment and discharge of the excess water to Victoria Lake Reservoir. Treatment and discharge will occur for eight months a year during operation (avoiding winter months). The TMF has been sized to store the excess water during the non-discharge period.

Excess water produced by the TMF will be reclaimed to the process plant to offset process water demand and limit volumes of discharge from the TMF pond. TMF excess water that is not reused in ore processing will be treated via the water treatment plant and discharged to a polishing pond prior to discharge to the environment, in order to comply with *Metal and Diamond Mining Effluent Regulations* (MDMER) discharge limits.

The polishing pond will be located downstream of the TMF, with a footprint area of approximately 4.1 hectares. The pond will be constructed as part of the initial TMF with an operational capacity of 44,000 m^3. The pond will be lined with a geomembrane, similar to the upstream slope of the TMF embankment. The pond is designed to provide sufficient residence time for the settlement of solids. A retention time of 5 days was assumed based on a flow through rate of 115 to 280 m^3/h, which is sufficient to treat runoff, precipitation, and process flows for up to a 25-year wet precipitation year.

The dams required for the tailings impoundment will be designed, constructed, operated and closed in accordance with the Canadian Dam Association (CDA) and Mining Association of Canada (MAC) guidelines, Global Industry Standards on Tailings Management, as well as applicable provincial requirements. These requirements pertain to dam inspection, maintenance, and repair requirements of the NL *Water Resources Act.*

2.4.5 Water Management and Development

Water management components consist of sedimentation ponds, berms, drainage ditches, and pumps to collect and contain surface water runoff from waste rock, LGO stockpiles, overburden stockpiles, topsoil stockpiles, and pits. Water management across the site will be implemented and operated as follows:

- Diversion of non-contact water where possible. Channels and berms will be constructed around the crest of the open pits or up-hill of waste rock piles and other developed areas to divert natural precipitation and surface runoff away to natural water drainage areas and away from contact with the mining operation, where possible.
- Precipitation and groundwater entering the open pits will be managed in-pit via sloped pit floors and catchment sumps, as required. Water collecting in these in-pit sumps will be pumped to the crest of the pit and discharged into an engineered sedimentation pond, as required. Sedimentation ponds will be appropriately sized for retention and removal (by gravity) of suspended solids (sediment) and discharge from these ponds will be compliant with the applicable regulatory requirements including the MDMER pursuant to the *Fisheries Act*.
- Precipitation runoff from waste rock piles and other developed areas of the site will be collected via ditches and channels and directed to a downstream sedimentation ponds similar to those to be constructed for management of water from the open pits.

- Sedimentation ponds will be constructed in-ground, and/or using earthen berms and till, or synthetic liners, where required, for water retention.
- Sedimentation ponds have been sited based on topography and geotechnical conditions. Where possible, water collected in pit, or in the sedimentation ponds will be used for other purposes on site rather than discharged to the environment.

Design parameters included a 15-m setback from fish-bearing waterbodies, consistent with the Newfoundland and Labrador Policy on Flood Plain Management (DOEC 2004); consideration of climate change-associated precipitation events and associated flow; and maintaining flow to fish-bearing waterbodies where possible (draining mine site components to pre-development catchment areas, where practicable).

Sedimentation ponds and ditches will discharge to unnamed tributary streams of either the Victoria River or Valentine Lake Reservoir or directly to Valentine Lake Reservoir. A typical sedimentation pond in shown in Figure 2-10. Excess runoff from the TMF not reused in processing will be routed through a polishing pond and water treatment plant prior to discharge to Victoria Lake Reservoir. The process plant site stormwater system is designed to intercept and divert non-contact water outside of the process plant area to reduce the amount of contact water to be managed at the process plant site. The collection ditches at the process plant will convey the water to a sedimentation pond with 3,000 m^3 capacity. The water in the sedimentation pond will be pumped into the process water tank as make-up water.

Figure 2-10 Typical Sedimentation Pond

2.4.6 Process and Potable Water

Process water will be primarily recycled water from the thickener overflow and reclaimed from the TMF and plant stormwater pond. Raw (fresh) water is anticipated to be obtained from Victoria Lake Reservoir. It will be pumped from the intake to the raw water tank. From the tank it will be distributed to feed the potable water treatment system and required points in the plant where it will used for process-related requirements (e.g., gland water for pumps, reagent mixing, cooling). The bottom portion of the raw water tank (minimum reserve) will be dedicated for the fire water system.

2.4.7 Sanitary Effluent

Sewage generated within the Project site will be collected via an underground sanitary sewer network to a common location, where it will be treated by an above-grade mechanical sewage treatment plant. Sewage effluent will be treated and monitored in accordance with the NL *Environmental Control Water and Sewage Regulations* prior to discharge to the environment. Sludge generated as a by-product of the treatment of sewage will be collected by a licensed contractor for offsite disposal.

2.4.8 Utilities and Infrastructure

Power for the Project will be provided from a 66 kilovolt (kV) high voltage line extending from the Star Lake area to the main substation at the mine site (single wooden pole, 15 m wide right of way). The line will be constructed, connected and maintained by NL Hydro and is therefore outside the scope of this assessment (Figure 2-2). The high voltage line is expected to follow the existing rights of way (gravel roads between the grid connection and the mine site). Primary power will be delivered to the site substation, where it will be stepped down and distributed to the various equipment and locations required around the mine site, primarily via overhead power lines. Four standby diesel generators in weatherproof enclosures will be at the mine site throughout the operation phase to supply critical process loads and life safety systems.

2.4.9 Other Plant Site Buildings

Other plant buildings proposed for the Project include administration and change facility, warehouse, laboratory, security gatehouse, vehicle maintenance and storage buildings, and mine services areas (offices, truck wash, truck shop, fuel station).

2.4.10 Roads

Access to the Project is via existing gravel public access roads from Millertown as shown in Figure 2-2 and Figure 2-11. The initial 8 km of road leaving Millertown is a public roadway which is operated and maintained by the Province of NL. The roadway is otherwise primarily maintained (e.g., grading, snow clearing) by Marathon. The 88 km class D gravel road extending from the turnoff near the Millertown Dam to Marathon's exploration camp (76 km to the mine site) will be upgraded to Class A standard 7.3 m-wide driving surface and will include ditching on both sides and cross drainage by culverts. Rock and gravel for the road upgrade will be sourced from small, existing borrow pits along the 76 km route, and possibly

from site generated rock materials. The average Project-related traffic on the access road over the 16 to 20 -month construction period is anticipated to be 6 vehicles per day, with a peak of 18 vehicles per day on rotation change days. The average Project-related traffic on the access road during Project operation is anticipated to be 5 vehicles per day, with a peak of 10 vehicles per day on rotation change.

Figure 2-11 Access Road

Plant site roads will generally be 6 m wide and will be constructed flush with bulk earthworks pads to allow storm water sheet flow across the mine site, thereby avoiding the need for deep surface drains and culvert crossings within the plant area. Several site roads will be designed for smaller heavy equipment and light vehicles, and pipeline and electrical corridors. Connections between the open pits, waste rock piles, the run-of-mine stockpiles, and the mine services and fueling areas will be designed to haulage road construction specifications.

As Project planning and engineering proceed, existing infrastructure at stream crossings along the 76-km access road will be evaluated for possible upgrade or replacement. In addition to culvert upgrades or replacements (where required), eight existing steel bridges along the access road will be inspected to determine if upgrades or repairs are required. This work will be done in consultation with the Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture (NLDFFA), Forestry Division as the owner.

New stream crossings will also be needed on some site roads. New culverts will be sized appropriately and designed to maintain fish passage, where required. Applicable regulatory approvals will be obtained prior to starting stream crossing upgrades or installations. Marathon will employ design and construction best practices and adhere to all conditions of approval.

2.4.11 Accommodations Camp

A permanent 300-person accommodations camp with associated services will be located to the south of the process plant and will provide accommodation for construction and later for operating and maintenance staff. It is expected that the exploration camp will be refurbished and used for the first six months of construction until the accommodations camp is operational, then maintained for overflow accommodations.

2.4.12 Explosives Storage and Production

The explosives storage and production area, to be located to the northwest of the TMF (Figure 2-3), will consist of four main components: bulk ammonium nitrate storage, bulk emulsion storage, an emulsion production facility, and storage for explosive and blasting accessories (e.g., detonators, boosters, detonating cords). This location respects buffers mandated by Natural Resources Canada's Explosives Regulatory Division (NRCAN), to people, roadways and infrastructure of the mine. The gated 150 m X 150 m explosive pad will have a buffer of 1.1 km to all other site facilities and operations.

It is anticipated that ammonium nitrate shipments will arrive by cargo ship to Corner Brook or another suitable port facility, where containers will be off-loaded and moved to a local storage facility. The containers will be transported overland to the mine site. High explosives and detonators will be transported by the explosives' supplier from their central storage facility to the mine explosives magazines by truck on an as need basis. The oil phase component of the emulsion will be transported via highway tanker from its point of manufacture to the storage tank to be located at the on-site manufacturing facility.

The storage and production facilities are designed to meet all government regulations including required separation distances as regulated by the Explosives Regulatory Division of NRCAN. All explosives and accessories will be stored at the planned NRCAN approved magazine site and explosive storage area.

2.5 PROJECT DEVELOPMENT

2.5.1 Overview of Construction

Following release from environmental assessment and issuance of regulatory permits and authorizations, Project construction is anticipated to begin in late 2021. Construction activities generally include upgrading the access road, constructing site roads, removing vegetation for site infrastructure, and pre-stripping the open pits. Civil earthworks including for the TMF, foundations and subsurface utilities, and mill and infrastructure construction will occur over a 16 to 20-month period, with commissioning and start-up anticipated in mid-2023. Construction is estimated to require a peak labour force of approximately 625 FTEs (an average of 320 FTEs).

General construction activities for the Project include:

- Site Preparation: cutting and clearing of vegetation and removing organic materials and overburden on areas to be developed and developing construction stage water and erosion control (e.g., ditching, temporary/permanent sedimentation ponds) and access roads
- Earthworks: facilitating construction of infrastructure development areas by excavating, preparing excavation bases, placing structural fill, and grading; stripping and stockpiling organic and overburden materials from open pits; and use of open pit development rock for earthworks such as structural fill and road gravels
- Infrastructure Construction: placing concrete foundations and constructing buildings and Project infrastructure
- Equipment Installation: installing major Project equipment and supporting infrastructure
- Utilities Installation: constructing and connecting power, water and fuel supply infrastructure
- TMF Construction: constructing the first phase of the TMF including the Phase 1 dam, water treatment plant, and polishing pond

Construction activities will be conducted in accordance with a construction Environmental Protection Plan (EPP) under the Environmental Management System (EMS), and in respect of the conditions of EA release and all permits specific to construction activities. It is expected that its construction activities will be governed also by the terms of a Certificate of Approval issued under the NL *Environmental Protection Act*. Marathon will employ environmental monitors / technicians and environmental consulting firms and labs to strictly monitor all environmental conditions relative to the baseline studies conducted prior to construction.

2.5.2 Overview of Operation

During operation, standard surface mining techniques will be used to mine material from the Marathon and Leprechaun open pits, including blasting, loading, hauling ore from the pit to stockpiles, processing ore, tailings deposition, hauling and placement of waste rock on the waste rock piles, and phased development of the TMF dams. Both the Marathon pit and the Leprechaun pit will be mined simultaneously, with blasting occurring on alternating days. Operation is estimated to require a peak workforce of approximately 480 FTEs (an average of 300 FTEs).

It is anticipated that the Project will be operated pursuant to several key approvals. Principal among these will be a Certificate of Approval to operate the mine, mill and TMF (issued under the NL *Environmental Protection Act*), a mill licence issued under the NL *Mining Act*, and a development plan approved under the *Mining Act*.

The following summarizes the operation activities for the Project:

- Open Pit Mining: blasting, loading and haulage of rock from the open pits using conventional mining equipment, in sizes and numbers optimized for the operation
- Utilization of Excavated Rock: rock excavated from the open pits that will not be processed for gold will be used as engineered backfill for post-construction site development (e.g., TMF dams), maintenance and progressive rehabilitation, or will be deposited in waste rock piles

- Ore Hauling: ore extracted from the open pits will be hauled to stockpiles and the processing area where it will be crushed and ground, then processed to extract the gold via gravity, leaching and flotation processes
- Tailings Management: process waste (tailings) will be pumped to an engineered TMF in Years 1 through 9, and to the exhausted Leprechaun open pit thereafter; tailings dam raises will be constructed during the operational phase of the Project to achieve the ultimate storage capacity requirement
- Contact Water and Effluent Management and Treatment: contact water and process effluent will be managed on site and treated to remove sediments and deleterious substances prior to discharge to the environment; where possible, water will be diverted around site features, and recycling of site contact and process water for use on site will be used where possible; treatment of discharge from the tailings impoundment will be conducted via a water treatment plant and polishing pond prior to release to the environment
- Transportation, Storage and Use of Reagents, Hazardous Materials and Fuels: will be conducted in accordance with applicable regulations and guidelines
- New and Modern Technologies, Equipment and Industry Best Practices: current planning and design for the Project is based on 'conventional' and proven mining and milling techniques and processes; however, Marathon will incorporate and employ new and modern technologies and equipment and industry best practices where possible to reduce adverse effects on the environment and, where available, will investigate and consider new and emerging technologies to further improve the environmental footprint of the Project
- Update of Procedures and Plans: Marathon will update environmental procedures and plans (developed for construction) under the EMS to address potential environmental effects associated with mine and mill operation and sustaining development activities (e.g., phased TMF construction); further, there are numerous environmental plans and monitoring programs required under the operations Certificate of Approval and other permits that Marathon will incorporate into the EMS for the operational phase of the Project

Infrastructure, equipment and facilities will be subject to regular inspection and maintenance throughout the life of the Project. Equipment and infrastructure will be inspected, maintained and tested in accordance with current and future standards and regulatory requirements. Marathon will maintain the access road that begins at Millertown, except for the first 8 km which will be maintained by the Province of NL. Marathon will maintain all site roads, including activities such as culvert maintenance, pick up of refuse, grading and road repairs, snow removal and ice control, traffic sign installation and repairs, dust control, traffic signal maintenance, and vegetation control. Maintenance of power lines (e.g., vegetation control), including regularly scheduled inspections, will be conducted to allow for safe and reliable operation.

2.5.3 Decommissioning, Rehabilitation and Closure Phase Overview

For mining projects, a Rehabilitation and Closure Plan is a requirement under the Newfoundland and Labrador *Mining Act* (Chapter M-15.1 Sections 8, 9 and 10). There are three key stages of rehabilitation activities that occur over the life span of the Project, which include:

- Progressive rehabilitation
- Closure rehabilitation
- Post-closure monitoring and treatment

Progressive rehabilitation will overlap with the operation phase and will include rehabilitating infrastructure or areas not required for ongoing operation (e.g., buildings, roads, laydown areas); covering and revegetating completed tailings areas, where practicable, including commencing closure of TMF beginning in Year 9 (when tailings deposition moves to Leprechaun open pit); erosion stabilization and re-vegetation of completed overburden and/or waste rock piles; infilling or flooding of exhausted mining areas; and completing revegetation studies and trials.

Once mining has ceased, site buildings and infrastructure will be dismantled and removed, sedimentation, stormwater and effluent management ponds will be breached (following water quality testing to ensure regulatory compliance) and graded to re-establish drainage patterns, and disturbed areas will be graded, covered with overburden and organic materials, and seeded to promote natural revegetation. The open pits will be flooded with surface water runoff, precipitation and groundwater seepage, with excess site contact water directed to the pits where practicable to expedite this process. To accelerate pit filling, reclaim water from the tailings pond (as tailings slurry via the process plant) and freshwater from Victoria Lake Reservoir will be pumped to the Leprechaun pit during late operation, rehabilitation and closure, and into post-closure. Similarly, freshwater from Valentine Lake will to be pumped to the Marathon pit.

To fill the pits over a period of eight years post operation, a flow rate of 10.7 m^3/min from Valentine Lake for Marathon pit and a flow volume of 7.62 m^3/min from Victoria Lake Reservoir for Leprechaun pit is required. Accelerated pit filling will mitigate potential residual effects by improving the water quality of the pit lake, reducing long term liability related to an extended period of natural pit filling, and expedite the submergence of PAG materials possibly exposed on the pit walls.

The site will be rehabilitated in accordance with the Rehabilitation and Closure Plan and will be rehabilitated to as close to pre-development conditions as practicable, or to a suitable condition for an alternate use upon Project closure.

2.5.4 Overview of Project Schedule and Activities

A summary of Project activities and anticipated schedule is presented in Table 2.1 below. These timelines have been developed using assumptions and best estimates for various components of Project development (e.g., EA duration, permitting timelines), construction, operation and decommissioning, rehabilitation and closure. The schedule is subject to change / revision as the Project advances.

Initial construction activities (e.g., site preparation and earthworks, transportation along access road) are anticipated to begin in 2021, while others (e.g., construction of infrastructure, mining, water management) are scheduled to begin in 2022. Ore milling and processing are anticipated to occur from 2023 through 2034.

Table 2.1 Anticipated Timeframes, Frequencies and Durations of Main Project Activities

Project Activity	Anticipated Timeframe, Frequency, Duration
Mine Site Preparation and Earthworks Clearing and cutting of vegetation, removal of organic materials, development of roads and excavation, preparation of excavation bases within the mine site, grading for infrastructure construction, earthworks for open pits	Approximately 9-month period commencing late 2021 through 2022 (Y-1), and again in 2026 (Y4) (haul road relocation) Year-round; avoiding breeding bird season for clearing and cutting of vegetation, where feasible
Construction, Installation and Commissioning of Infrastructure and Equipment Placement of concrete foundations, construction of buildings and infrastructure, installation of water control structures, installation and commissioning of utilities on-site	Commencing 2022 (Y-1) through 2023 (Y1) Year-round, continual for approximately 18-month period Foundations and subsurface utilities: 6 months TMF earthworks: 12 months Mill and infrastructure construction: 15 months Commissioning and start-up: 6 months
Transportation along Access Road	Commencing with construction in late 2021, continuing through 2036 (Y14) (closure and rehabilitation) and beyond (post-closure monitoring) Year-round, continual throughout life of Project; sporadic during post-closure monitoring (2037 and beyond)
Open Pit Mining Blasting, excavation and haulage of rock from the open pits	Commencing in 2022 (Y-1) through 2031 (Y9) Year-round, continual
Ore Milling and Processing Ore excavated from the open pits is crushed and processed to extract gold via gravity/leach (Phase 1) or gravity/flotation/leach (Phase 2) processes	Commencing in 2023 (Y1) through mid-2026 (Y4) for Phase 1; 2026 (Y4) through 2034 (Y12) for Phase 2 Year-round, continual
Tailings Management Facility (TMF) Operation Process waste (tailings) are pumped to the engineered TMF, then to exhausted Leprechaun pit	Commencing in 2023 (Y1) through 2031 (Y9) (to engineered TMF) and 2032 (Y10) through 2034 (Y12) (to exhausted Leprechaun pit) Year-round, continual
Water Management Site contact water and process effluent managed on site and reused (where practicable) or treated prior to discharge to environment	Commencing in 2022 (Y-1) through 2036 (Y14) (closure and rehabilitation), longer if required post-closure to allow for improvement in water quality Year-round, continual
Operation of Utilities, Infrastructure and Other Facilities Camp and site buildings operation; vehicle maintenance facilities; explosives storage; access road and site roads maintenance and site snow clearing; power and telecom supply; fuel supply	Commencing as applicable in 2021 and 2022 (Y-1), extending through 2036 (Y14) (end of closure rehabilitation) and beyond (post-closure and long-term monitoring) Year-round, continual (as applicable)

Table 2.1 Anticipated Timeframes, Frequencies and Durations of Main Project Activities

Project Activity	Anticipated Timeframe, Frequency, Duration
Progressive Rehabilitation Demolishing and rehabilitating construction or exploration -related infrastructure; grading and revegetating completed tailings areas (where practicable); erosion stabilization and re-vegetation of completed overburden and/or waste rock piles; infilling or flooding of exhausted mining areas; completing re-vegetation studies and trials	Sporadically throughout the life of the Project, as use of individual components / infrastructure ceases (e.g., TMF decommissioning commencing in 2031 (Y9) when tailings disposal moves to mined-out Leprechaun Pit) May be any time of year, seasonally where appropriate (e.g., revegetation)
Closure Rehabilitation Similar activities as for progressive rehabilitation	Commencing in 2035 (Y13) through 2036 (Y14) Year-round, seasonally where appropriate (e.g., revegetation)
Post-Closure and Long-Term Monitoring	Commencing following closure rehabilitation in 2036 (Y14), with anticipated duration of 6-10 years for post-closure monitoring Monitoring plans to be developed once design and operation have been sufficiently advanced Anticipate closing and rehabilitating some key components prior to the end of the Project life

2.6 OCCUPATIONAL HEALTH AND SAFETY

Marathon is developing a Corporate Health and Safety Management System, including a comprehensive Occupational Health and Safety Program with safe work policies, procedures and practices, to be implemented prior to Project construction. In addition to adhering to legislated occupational health and safety requirements in compliance with the NL *Occupational Health and Safety Act* and regulations, Marathon is committed to preventing incidents and accidents and reducing health and safety risks by implementing best practices, including the following:

- Actively identifying and addressing hazardous conditions and health and safety risks
- Conducting mandatory site orientations for all employees, contractors/consultants and visitors and providing specialized safety training, as applicable
- Ensuring that supplies of personal protective equipment appropriate to the task are readily available
- Incentivizing near miss reporting
- Developing, measuring and reporting on key performance indicators that include both leading and lagging indicators
- Focusing on continuous improvement

The Program will also include industry standard elements such as maintaining and supporting the Occupational Health and Safety Committee; developing activity-specific job hazard assessments; ensuring appropriate use and availability of personal protective equipment; requiring daily toolbox talks and mandatory pre-job safety checklists; administering internal audits and regular workplace inspections; and conducting incident reporting and investigation including determining the root cause and identifying and implementing corrective actions.

2.7 MARATHON'S APPROACH TO ENVIRONMENTAL MANAGEMENT

Marathon is committed to the sustainable and responsible development of the Project as reflected in its corporate values and *Environmental Policy*. Environmental management and protection are recognized as a corporate priority, which is critical to the successful construction, operation, and decommissioning, rehabilitation and closure of the Project.

Consistent with its internal policies and corporate values, Marathon will implement processes and procedures to identify, assess, and avoid or reduce environmental risks during all phases of the Project life cycle. These processes and procedures will be developed and maintained under Marathon's EMS, comply with relevant legal requirements and be informed by industry best practices and standards, such as the MAC's Towards Sustainable Mining standards.

The EMS will be used by Marathon to manage environmental aspects throughout the life of the Project in a manner that is fully integrated with other management considerations and which will apply across all corporate levels and functions. The EMS will be regularly reviewed and revised as necessary to provide continuous improvement in environmental performance.

The EMS is designed as a conceptual and systematic framework to manage environmental risks, based on principles of adaptive management and continuous improvement. It will guide the development and implementation of Environmental Management Plans (EMPs) required to maintain environmental protection during all Project phases – construction, operation, and decommissioning, rehabilitation and closure. The EMS and associated EMPs will function as a set of standards to guide the environmentally and socially responsible development and operation of the Project through the definition and implementation of the following components:

- Defined objectives informed by Marathon's *Environment Policy*
- Defined roles, responsibilities and accountabilities
- Risk management processes and operating procedures focused on environmental responsibility
- Monitoring, auditing and reporting processes

2.8 EMISSIONS, DISCHARGES AND WASTES

Emissions, discharges and wastes will result from Project activities during all Project phases. During initial design, Marathon 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, Marathon will adhere to mitigation measures based on industry standard best practices to reduce emissions, discharges and wastes, as described in the applicable EIS VC sections. Marathon is also developing a comprehensive Environmental Management System as described above.

2.8.1.1 Effluent Management and Treatment

Sources of effluent include the TMF / polishing pond, surface runoff (i.e., contact water), and grey water and sanitary sewage. Once operational, water coming into contact with Project components will be collected and treated to meet discharge requirements prior to release to the environment. Sources of

sanitary sewage and grey water include the process plant/mine services area and the accommodations camp. Effluent from these sources will be treated as described in Section 2.4.7. During the construction phase, a contractor will handle sewage waste for offsite disposal until the sewage treatment plant is constructed.

2.8.1.2 Air Emissions

Air emissions associated with the Project include airborne particulate matter (dust) and greenhouse gases (e.g., carbon dioxide, methane and nitrous oxide) from the combustion of diesel and gasoline. Air quality modelling was completed for the operation phase and is discussed in Section 7.2.2.

Emissions during site preparation activities and the construction of Project infrastructure include combustion gases from vehicles, heavy-machinery and temporary diesel generators, and dust from sources such as the operation of heavy earth-moving equipment and wind erosion. Emissions are expected to occur intermittently during the construction phase. Water collected from a sediment pond or the polishing pond (once constructed) will be the primary dust suppressant used during construction. Other dust suppressants may be considered (in consultation with NLDECCM) where high traffic construction (i.e., temporary) roads are developed and permanent site / haul roads are established during construction. A comprehensive maintenance program for vehicles, equipment and roads will be implemented.

Project operation will generate many of the same emissions as those described for construction (e.g., operation of heavy equipment and dust generated from vehicle movement), and will also include dust generated from blasting, mining and the TMF; stockpiling, handling and transporting ore, waste rock and overburden; and milling. The potential for fugitive dust emissions at the processing area will be limited, as milling and processing will occur in enclosed buildings, and the conveyors and stockpile will be covered. Scrubbers, baghouses and water misting will be used as applicable to reduce fugitive dusts and other atmospheric emissions. Additional mitigation measures include limiting vehicle speeds; connecting to the electrical grid to reduce the need for diesel generators; and managing the TMF to reduce the area of exposed dry surfaces, where possible.

Emissions during decommissioning and rehabilitation are expected to be less than during operation (as no ore extraction or tailings deposition will be occurring) and post-closure monitoring is expected to generate negligible air emissions.

An estimated 10 million litres of diesel could be consumed during the construction phase, and 30 million litres annually during operation. Based on the anticipated amount of fuel to be consumed, it is estimated that an average of 630.42 kt of carbon dioxide equivalent (CO_2e) could be emitted throughout the life of the Project (construction and operation). Select exhaust sources will be equipped with emission control technologies to reduce emissions of contaminants.

2.8.1.3 Acoustic Emissions

Acoustic emissions associated with the Project include noise from operation of machinery and equipment during all Project phases and blasting during operation. Generally, sources of noise during construction will include trucks, portable air compressors and welders, bulldozers, front-end loaders, excavators,

graders, gravel and rock trucks, scrapers, compactors, mobile cranes, concrete pumps and temporary diesel generators. The main noise-generating sources associated with operation include blasting in the open pits, process plant equipment such as rock breakers, feeders and conveyors, and moving sources such as trucks, excavators and dozers. Noise modelling was completed, and predicted sound pressure levels related to construction are predicted to be below 35 A-weighted decibels (dBA) (background levels) approximately 5 km from the mine site, and at 25 dBA approximately 8 km from the mine site. During operation, sound pressure levels are predicted to be below 35 dBA approximately 5 km from the mine, and 25 dBA approximately 10 km from the mine. Noise generated during active closure is predicted to be similar to or less than construction.

Proposed mitigation includes equipping construction and other mobile equipment with appropriate muffler systems and selecting equipment and/or designing enclosures to limit overall noise emissions during operation. In addition to noise mitigation measures, Marathon is developing several plans associated with acoustic emissions, including an Environmental Protection Plan, Environmental Effects Monitoring Program, Explosives and Blasting Management Plan, and Traffic Management Plan. Marathon will implement a complaint response procedure to address noise complaints should they arise.

2.8.1.4 Solid and Hazardous Waste Management

Solid waste management for the Project will align and conform with NL's provincial waste management strategy. There will be no on-site disposal of waste. Waste management will include the following components:

- Receptacles placed at various locations around the mine site for the regular collection and segregation of waste and domestic recyclable materials (e.g., cans, paper)
- On-site waste sorting / storage areas for temporary storage of non-recyclable, non-hazardous domestic and putrescible waste, and of recyclable/reusable materials
- Transportation of non-reusable and non-recyclable wastes to the provincial waste management facility in Norris Arm, and of reuse/recyclables to the nearest management facility per material type
- Secure hazardous waste storage area for segregation and temporary storage of waste dangerous goods and hazardous wastes (e.g., waste oils, spent fuels, chemicals) prior to packaging and shipment by licensed contractors to certified waste management facilities, in accordance with federal and provincial regulations
- A Waste Management Plan, including the following strategies:
  - Consideration of truck traffic to/from site such that waste is removed via otherwise empty trucks heading off-site (which will also result in reduced emissions)
  - Integrating waste management into procurement contracts such that, where practicable, suppliers will be contractually obligated to remove recyclable and reusable materials related to their products and services (e.g., cable reels, liquid and storage containers)
  - Inclusion of waste management principles and practices in mandatory employee and contractor site orientations
  - Ongoing contracts with certified waste contractors such that waste materials are removed on a regular basis (i.e., varying with the type/quantity of waste generated) such that waste materials do not accumulate at site

3.0 ENVIRONMENTAL ASSESSMENT PROCESS

Environmental assessment is a planning and decision-making tool used to predict environmental effects of a project prior to a project being carried out. This chapter describes the scope of the assessment and the assessment boundaries.

The aspects determined to be within the scope of the Project were examined using a precautionary approach to avoid, reduce or mitigate adverse environmental effects. Conservative assumptions have been made, with the objective of overestimating rather than underestimating potential adverse effects. Throughout the EA process for the Project, opportunities have been and will continue to be provided for meaningful Indigenous and stakeholder participation, including opportunities to provide comment on the Project Description, draft guidelines, EIS and the draft EA Report to be prepared by IAAC. As discussed in Chapters 5 and 6, Marathon will continue to provide opportunities for such participation and will pursue positive and constructive relationships with Indigenous groups and stakeholders throughout the life of the Project. Information gathered during engagement activities has informed the EIS methodology, existing conditions and effects assessment.

3.1 SCOPE OF THE ASSESSMENT

The scope of the Project is defined by the components and activities required to construct and operate the Project 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 Sections 2.4 and 2.5 above.

The assessment of environment effects focuses on valued components (VCs), which are the elements of the environment that could be affected by the Project and are of importance or interest to regulators, Indigenous groups and stakeholders.

The following VCs have been assessed as part of the EIS:

- Atmospheric Environment
- Groundwater
- Surface Water
- Fish and Fish Habitat
- Vegetation, Wetlands, Terrain and Soils
- Avifauna
- Caribou
- Other Wildlife
- Community Services and Infrastructure
- Community Health
- Employment and Economy
- Land and Resource Use
- Indigenous Groups
- Historic Resources
- Dam Infrastructure

The environmental assessment approach incorporates the following key considerations:

- Identifying the activities and components of the Project
- Review of information on existing conditions
- Predicting and evaluating potential changes to the environment and the likely effects on identified VCs
- Proposing measures to mitigate adverse environmental effects
- Determining remaining residual effects and whether residual adverse effects are significant after the implementation of mitigation measures
- Development of follow-up and monitoring programs to verify both the accuracy of the effects assessment and the effectiveness of mitigation measures

Scoping establishes the parameters of the EA and focuses the assessment on relevant issues and concerns. The factors considered for the environmental assessment for the Project include the following:

- Purpose of and need for the Project
- Alternatives to the Project and alternative means of carrying out the Project
- Public and stakeholder comments and Indigenous group input
- Local knowledge
- Environmental effects of the Project, including effects due to accidents and malfunctions, as well as consideration of cumulative effects of the Project in combination with other projects and activities
- Significance of the identified environmental effects
- Technically and economically feasible mitigation measures to avoid or reduce adverse effects or enhance or prolong beneficial environmental effects

- Residual (post-mitigation) environmental effects that are beneficial or harmful that are likely to be caused by the undertaking regardless of the mitigation measures applied

- Requirements for follow-up programs
- Changes to the Project that may be caused by the environment
- The capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future
- The future predicted condition of the environment without the Project

There are no known relevant regional studies pursuant to CEAA 2012.

3.2 ASSESSMENT BOUNDARIES

3.2.1 Spatial Boundaries

The spatial boundaries for the assessment were selected based on the geographic extent of the measurable potential environmental, social, heritage and human effects of the Project. The spatial boundaries include the following:

- The Project Area encompasses the immediate area in which Project activities and components occur and is broken down into two distinct areas: the mine site and the access road. The mine site includes the area within which Project infrastructure will be located. The access road is the existing road to the site plus a 20-m buffer on either side. The Project Area is the anticipated area of direct physical disturbance associated with the construction and operation 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 potential 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.

3.2.2 Temporal Boundaries

Temporal boundaries for the assessment identify the Project phases (construction phase, operation phase, and decommissioning, rehabilitation and closure phase) and their anticipated timeframes and durations that the effects assessment will consider. The temporal boundaries for the assessment of potential effects on the VCs include:

- Construction Phase – 16 to 20 months, beginning in Q4 2021, with 90% of activities occurring in 2022
- Operation Phase – Estimated 12-year operation life, with commissioning / start-up and mine / mill operation slated to start Q2 2023
- Decommissioning, Rehabilitation and Closure Phase – Closure rehabilitation to occur once it is no longer economical to mine or resources are exhausted

4.0 PROJECT ALTERNATIVES

4.1 ALTERNATIVES TO THE PROJECT

The purpose of the proposed Project is to exploit the discovered gold resources at the mine site to the benefit of the province of NL, the central region of the province and local communities, the future employees of the operation, and the investors in the Company and Project. There is no alternative to mining the gold resource located at the mine site that would achieve the purpose for the Project. There are alternative means of carrying out the Project, which are described below.

4.2 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

This section identifies and describes alternative means of carrying out the Project, and components of the Project. As required under CEAA 2012, the Federal EIS Guidelines and the Provincial EIS Guidelines, the EIS must consider alternative means of carrying out the project that are considered technically and economically feasible and include the environmental effects of such alternative means. The approach to the alternative means assessment is consistent with the Agency's Operational Policy Statement for Addressing “Purpose of” and “Alternative Means” (CEA Agency 2015). An analysis of alternative means was considered for the following Project activities / components:

- Mining methods
- Pit dewatering
- Waste rock storage and management
- Overburden material storage and management
- Ore processing
- Tailing management and tailings disposal
- Water supply and wastewater
- Transportation
- Power supply and transmission
- Life of mine
- Labour supply
- Working conditions
- Rehabilitation (reclamation) methods

The assessment of alternatives considered regulatory acceptability, technical feasibility and economic feasibility, as well as the environmental and socio-economic effects (where applicable) of each alternative means as described in Table 4.1.

Table 4.1 Alternative Means Assessment Descriptors

Descriptor	Definition
Technically Feasible (including regulatory factors)	• Feasible considering criteria which could influence safe, reliable, and efficient operation • Technology must be available and proven for use by a similar activity, and cannot compromise personnel and process safety for it to be considered • Acceptable considering applicable regulatory guidelines and frameworks
Economically Feasibility (including market factors)	• Feasible considering capital and operational project expenditure, and opportunity cost • Project expenditure can be impacted directly (e.g., equipment and personnel requirements) and indirectly (e.g., schedule delays)
Environmental and Socio-economic Considerations	• Consideration of potential environmental and socio-economic effects on valued components (VCs) • Considers applicable regulatory guidelines and frameworks for reducing environmental and socio-economic effects and applicable mitigation measures
Implications of Failure / Malfunctions of Option	• Consideration of the implications of the option regarding the potential for failure or malfunction, including resulting potential environmental and socio-economic effects
Preferred / Selected Option	• The preferred alternative means in consideration of technical feasibility, economic feasibility, and potential environmental considerations • The preferred alternative means forms the basis of the Project to be assessed

A summary of the alternatives analysis that led to the selection of the preferred options is provided in Table 4.2. The preferred alternative means form the basis of the Project to be assessed (i.e., assumed to be the components of the Project that is assessed for environmental effects on the VCs).

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
Mining Methods		
• Placer Mining • In-Situ Mining • Open Pit • Underground	Placer, in-situ and underground mining are not technically feasible methods. Open pit mining is a common mining technique and the preferred method where sufficient mineral resource is available relatively close to the ground surface.	• Open Pit
Pit Dewatering		
• In-Pit Pumping • Ex-Pit Pumping • Exclusion Methods	While ex-pit pumping and exclusion methods are technically and economically feasible, they are not required as the rock is not highly fractured, groundwater inflows will be low, and pressures associated with pit slope stability are sufficiently low that in-pit dewatering is suitable.	• In-Pit Pumping
Waste Rock Storage and Management		
• In-Lake Disposal • On-Land Piles • In-Pit Disposal • Aggregate for Project • Aggregate for Other	In-pit disposal is not considered feasible based on the need to mine both pits simultaneously. Disposal in a natural waterbody is a technically and potentially economically feasible. However, from a regulatory and stakeholder perspective, it is not considered favourable relative to on-land piles. On-land waste piles and use of waste rock for aggregate for site development were selected as they are considered technically and economically feasible with management of environmental considerations (i.e., dust generation, aesthetics, contact water management) through proper design, planning for closure and progressive rehabilitation over the operational phase of the Project.	• On-Land Piles • Aggregate for Project • Aggregate for Other (if feasible)
Waste Rock Pile Locations		
• Area South of the Pit • Area Northwest of the Pit • Areas to the Southwest and Northeast of the Pit • Areas at Greater Distance in Any Direction	While each option is considered technically and generally economically feasible, the area south of the pit was selected for the Leprechaun pit as it does not hold economical mineralization potential. The area northwest of the pit was selected for the Marathon pit as it requires the lowest footprint, it avoids most water resources and no adverse effects to fish habitat are anticipated.	• Area South of the Pit for Leprechaun • Area Northwest of the Pit for Marathon

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
Overburden Material Storage and Management		
• Primary Stockpiles • Secondary Storage (windrows, future Project footprint areas) • Primary Stockpiles Located Adjacent to Pits / Waste Rock Piles • Primary Stockpiles Located Elsewhere	Developing stockpiles for overburden materials, including glacial till, topsoil and organic materials is a required component of the Project. Primary stockpiles piles located elsewhere may not be economically feasible depending on the location. Furthermore, alternative locations increase haulage distance (costs, fuel consumption, and emissions) and could affect other environmental features such as wetlands and fish habitat. Primary stockpiles, secondary storage and primary stockpiles located adjacent to pits were identified as technically and economically feasible. The locations of the primary stockpiles have been selected to be close to the location of excavation (the pits) and to where these materials will be primarily used for rehabilitation (the waste rock piles), as well as avoiding waterbodies, fish and fish habitat, and wetlands.	• Primary Stockpiles • Secondary Storage (windrows, future Project footprint areas) • Primary Stockpiles Located Adjacent to Pits / Waste Rock Piles
Ore Processing		
• Heap Leach Only • Heap Leach and Mill • Mill Only	Heap leach is somewhat technically and economically feasible. However, this option yields lower gold recovery, can be impacted negatively by climates with high rain, snow and freezing conditions, it requires a large footprint and was raised as a significant environmental concern with respect to potential cyanide releases (leaks) during stakeholder engagement. The heap leach and mill option is technically feasible although it has a higher capital cost and similar stakeholder concerns. The mill only option is technically and economically feasible and would have a smaller overall footprint.	• Mill Only
Mill Process Options		
• Grind-Gravity Recovery • Grind-Cyanide Leach • Grind-Gravity Recovery-Cyanide Leach Gravity Tailings • Coarse Grind-Gravity Recovery-Flotation-Cyanide Leach of Flotation Concentrate and Tailings	Grind-gravity recovery is considered technically feasible. However, is not considered economically feasible. While the grind-cyanide leach processing is technically and economically feasible, it has been proven that it is more effective, and economical, if gravity recovery is completed first. An option with a simple fine-grind, gravity recovery, cyanide leach option has a low capital cost, high recovery initial flowsheet that is readily and economically expanded by the addition of a flotation circuit and concentrate processing facilities.	• Grind-Gravity Recovery-Cyanide Leach Gravity Tailings (Phase 1) • Coarse Grind-Gravity Recovery-Flotation-Cyanide Leach of Flotation Concentrate and Tailings (Phase 2)

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
Leaching Reagents		
• Cyanide • Thiosulphate • Thiourea • Halides	Thiourea and halides may be technically feasible, however they are unproven commercially for a large-scale gold recovery operation. Thiosulphate is technically feasible. However, recoveries are less than required to be economically feasible. Cyanide has been safely and economically used by most gold producers.	• Cyanide
Mill Location		
• Central Site Area • Eastern Site Area • Western Site Area	Each option is considered technically and economically feasible. However, the eastern site area and western site area require a longer haulage from the pits, and therefore, increased operating costs and environmental emissions. The central site area is considered to be the best option in term of haulage (and associated air emissions) and is located west of the primary caribou migration path.	• Central Site Area
Tailing Management Locations		
• Option 1 • Option 13 • Option 14	A TMF siting study was conducted for the Project which assessed potential locations based on key technical, environmental, and economic criteria. Options 1, 13 and 14 were carried forward for further assessment. While each option is considered technically and economically feasible, options 1 and 13 do not avoid fish habitat and there is a potential that a TMF dam failure could result in a failure of the Victoria Dam.	• Option 14
Tailings Disposal Alternatives		
• Dry Stacking • Engineered Tailings Impoundment • Co-Disposal with Waste Rock • In-pit Disposal	Dry stacking and co-disposal with waste rock are not considered technically or economically feasible due to climate conditions (i.e., winter freezing, substantial precipitation). Engineered tailings impoundment and in-pit disposal are considered technically and economically feasible. Marathon's selected option for tailings disposal is to use an engineered tailings impoundment for the first nine years of operation, switching to in-pit disposal for the remaining three years of operation.	• Engineered Tailings Impoundment • In-pit Disposal
Tailings Deposition		
• Thickened Tailings • Slurry	While thickened tailings and slurry are both technically and economically feasible, slurry requires additional effluent treatment and discharge as well as an increased risk of TMF failure. The use of thickened tailings systems will suit both the impoundment deposition as well as deposition in the open pit.	• Thickened Tailings

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
Dam Design Alternatives		
• Zoned Dams • Lined, Homogeneous Rockfill Dams • Homogeneous Dams	Homogenous dams are not technically feasible due to climate conditions affecting construction and dam materials. Zoned dams are technically feasible. However, they are unnecessarily complicated and difficult to construct in wet / freezing climates. Lined, homogeneous rockfill dams are gaining popularity due to continuing improvements in synthetic liner materials and installation, the general ease of construction and addition of dam raises (even in less than ideal weather conditions). The use of waste rock from the open pit for mass fill and crushed filter materials required reduces the waste rock that will otherwise end up in the piles elsewhere at the mine site.	• Lined, Homogeneous Rockfill Dams
Dam Raise Options		
• Upstream • Downstream • Centreline	The downstream dam raise method is considered the safest method of dam raises and allows for easy tie-in of the upstream liner system to the raised dam, with a horizontal bench incorporated into each raise. The upstream option, while technically and economically feasible, is considered unfavourable due to concerns regarding stability (liquefaction). Centerline raises occur directly above the initial dam construction, and the construction of even part of the dam foundation on tailings increases the risks associated with stability of the dam.	• Downstream
Water Supply		
• Re-used / Recycled Water Sources • Victoria Lake Reservoir • On Site Ponds and Streams • Off Site Ponds and Streams • Groundwater	Smaller onsite and offsite ponds and streams and groundwater sources are not technically feasible as there is insufficient volume to support the Project. The primary water source will be re-use and recycling of site contact water and process / tailings effluent as it is the best source to limit adverse environmental effects, with the primary freshwater source from the Victoria Lake Reservoir.	• Re-used / Recycled Water Sources • Victoria Lake Reservoir
Process Effluent Treatment Options		
• In-Mill Cyanide Destruction • Downstream Natural Plus Treatment • Downstream Natural Only	Downstream natural treatment (attenuation) only is not technically feasible. While downstream natural plus treatment is technically and economically feasible, it increases the risks associated with TMF seepage, leaks or failures with higher levels of cyanide. For the in-mill cyanide destruction option, the cyanide is mostly removed at the mill (< 1 ppm) and results in a lower risk / consequence if a TMF failure or malfunction were to occur.	• In-Mill Cyanide Destruction

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
Process Effluent Management Options		
• Recycling	Recycling of effluent is a key consideration within the process effluent system, as it reduces the amount of process effluent released to the environment (after treatment) and reduces the amount of fresh water required to be drawn from the environment.	• Recycling
Additional Process Effluent Management Options		
• Tailings Pond • Polishing Pond • Water Treatment Plant	Based on the assessment of process water quality within the TMF, and the operational plan to hold process water in the TMF during the winter, requiring higher discharge volumes in the spring, Marathon has elected to use the three methods of treatment for process effluent listed.	• Tailings Pond • Polishing Pond • Water Treatment Plant
Effluent Discharge Points		
• Multiple Discharge Points • Reduced Number or Single Discharge Point	Although the reduced number or single discharge point is technically and economically feasible, this would require more assimilative capacity at the discharge point and disrupts small watershed balances and fish habitat. Multiple discharge points are anticipated to better maintain small watershed balances and areas of fish habitat.	• Multiple Discharge Points
Access Road Routing		
• Route Option 1 (Existing) • Route Option 2 (Granite Canal Rd) • Route Option 3 (Burgeo Highway) • Route Option 4 (Buchans)	Each option is considered technically and economically feasible. Overall, however Option 2 requires restoration of revegetated roads and many new crossings (culverts and bridges). Option 1 is in the best condition overall and requires the least amount of upgrades / improvements. Environmentally, the shortest route (Option 1) will result in the least adverse effects, as it is the shortest travel distance, resulting in less fuel consumption and emissions over the life of the Project. Options 3 and 4 are substantially longer.	• Route Option 1 (Existing)
Power Supply		
• Diesel Generators • Power Grid Connection (Hydroelectric) • Solar • Wind	Solar is not technically or economically feasible. Diesel generators are technically feasible, but with substantial capital and operating costs, as well as substantial air emissions. Wind is technically and economically feasible as a supplementary source of power but would result in a large footprint and ecological interactions. A power grid connection is the preferred base operating case, both technically and economically, for a mill operating 24 hours per day.	• Power Grid Connection (Hydroelectric)

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
Life of Mine		
• Contracted Life of Mine • Current Life of Mine • Lengthened Life of Mine	Each option is considered technically feasible, although contracted life of mine and lengthened life of mine are not considered economically feasible. The Valentine Project Feasibility Study contemplates a 12-year mine life. This is based on the quantity of mineral resources and mineral reserves currently delineated, an assessment of the optimum mining rate based on pit access and ore body geometries (technical feasibility), and the optimum processing rate based on capital expenditures and rate of return (economic feasibility). The identification of additional mineral resources and mineral reserves through exploration that are technical and economically exploitable would be expected to lengthen the mine life past the initial 12 years.	• Current Life of Mine
Labour Supply		
• Local, Regional, Provincial Hiring Preferences • No Hiring Preferences	Marathon considers the potential availability of this workforce in central NL to be a specific commercial strength and is not contemplating an alternate workforce strategy.	• Local, Regional, Provincial Hiring Preferences
Site Accommodations		
• No Accommodations On Site • Accommodations On Site	Both options are considered technically and economically feasible. However, accommodations on site is anticipated to result in reduced adverse environmental effects (travel), reduced adverse socio-economic effects, and substantially reduced health and safety issues associated with travel to and from the site.	• Accommodations On Site
Open Pit Rehabilitation		
• Flooding • Backfilling with Waste Rock • Backfilling with Tailings	Backfilling with waste rock is technically feasible. However, it is not economically feasible. Flooding and backfilling with tailings are technically and economically feasible. Marathon's current plan to rehabilitate the open pits is to flood the pits, create ingress / egress areas, design the pit slopes for appropriate factors of safety for long term stability, and place barricades and signage along remaining highwalls. Marathon plans to partially backfill the Leprechaun open pit with tailings once the pit is exhausted in Year 9. However, this will only fill a portion of the open pit and therefore the remaining volume of the pit will be flooded.	• Flooding • Backfilling with Tailings
Open Pit Flooding		
• Natural Flooding • Pumping from Lakes	While both options are technically and economically feasible, pumping from lakes is anticipated to reduce the flooding periods, improve risks associated with water quality and pit accessibility and reduce the closure period overall.	• Pumping from Lakes

Table 4.2 Summary of Alternatives Analysis

Options Considered	Summary of Alternative Analysis	Alternatives Assessed in the EIS
TMF Rehabilitation		
• Relocation of Tailings • Rehabilitate In-Place • Landform Classification	Relocation of tailings is technically feasible. However, it is not economically feasible. Landform classification for the TMF would be the preferred option. However, the technical feasibility of this alternative will require operational and even initial closure monitoring (while the Project is still operating and sending tailings to the Leprechaun open pit). Rehabilitation will include covering and revegetation of tailings, installation of a closure spillway, and if landform status is not achievable at long term plan for maintenance and inspections in accordance with NL Department of Industry, Energy and Technology's requirements.	• Rehabilitate In-Place • Landform Classification (preferred option if future monitoring indicates this is technically feasible)
Waste Rock Pile Rehabilitation		
• Relocation of Waste Rock to Pit • Rehabilitate In-Place	Relocation of waste rock to the pit is technically feasible. However, it is not economically feasible as it would require substantial costs to relocate rock and would make the Project economically unfeasible.	• Rehabilitate In-Place
Low-Grade Ore Stockpile Rehabilitation Methods		
• Material Relocated • Rehabilitated In-Place • Mill Ore and Rehabilitate	Each option is considered technically and economically feasible. However, milling and rehabilitating the ore is anticipated to reduce the rehabilitation footprint and increase the mill life, including employment.	• Mill Ore and Rehabilitate Pad

5.0 STAKEHOLDER PARTICIPATION

Marathon is committed to operating the Project within a sustainable development framework which reduces harm to the environment, contributes to local communities, respects human and Indigenous rights, and adheres to openness and transparency in operations. One of the key principles of sustainable development is meaningful engagement with the individuals, communities, groups and organizations interested in or potentially affected by the Project to build and maintain positive, long term and mutually beneficial relationships.

In keeping with Marathon's corporate values (Respect, Accountability, Transparency, Inclusion and Prosperity) and as required by the Federal and Provincial EIS Guidelines, Marathon has engaged with relevant government departments and agencies, Indigenous groups, and stakeholder organizations, including communities, business and industry organizations, fish and wildlife organizations, environmental non-governmental organizations and individuals. The results of this engagement are summarized below for stakeholder engagement, and in Chapter 6 for Indigenous engagement, and have been used to help inform the scope of the environmental assessment.

The objectives of Marathon's engagement and consultation efforts are to:

- Provide Project information and updates on a timely and continuing basis in a manner which is inclusive, culturally sensitive and appropriate to the particular circumstances of Indigenous groups and stakeholders
- Engage Indigenous groups and stakeholders in respectful and meaningful dialogue throughout the environmental assessment process and over the life of the Project
- Identify, document and respond to issues or concerns by Indigenous groups and stakeholders throughout the environmental assessment process and over the life of the Project
- Integrate feedback from Indigenous groups, communities and stakeholders into Project planning and execution, the assessment of effects and the implementation of mitigation
- Demonstrate how issues and concerns raised during engagement have been addressed

5.1 REGULATORY ENGAGEMENT

The regulatory authorities that are expected to have an interest in the Project are identified in Table 5.1.

Table 5.1 Relevant Regulatory Authorities and Jurisdictions

Federal Government	Provincial Government	Municipal Government
• IAAC (formerly Canadian Environmental Assessment Agency) • Environment and Climate Change Canada • Fisheries and Oceans Canada • Health Canada • Natural Resources Canada • Indigenous Services Canada	• Department of Industry, Energy and Technology • Department of Fisheries, Forestry and Agriculture • Department of Environment, Climate Change and Municipalities • Department of Tourism, Culture, Arts and Recreation • Department of Health and Community Services • Office for the Status of Women	• Town of Buchans • Town of Millertown • Local Service District (LSD) of Buchans Junction • Town of Badger • Town of Bishop's Falls • Town of Grand Falls-Windsor

Marathon has continued to meet with representatives from individual provincial and federal departments and agencies throughout the preparation of the EIS, particularly to seek clarification on interpretation and application of the EIS Guidelines requirements. Outcomes of regulatory consultation to date and regulatory review processes (of the Project Description and EIS guidelines) have been incorporated as applicable throughout the EIS, including in VC selection, approach to baseline studies, modelling methodology, proposed mitigation measures, and depth and focus of the various VC assessments.

5.2 STAKEHOLDER ENGAGEMENT

Public engagement and public participation activities undertaken by Marathon have involved a wide range of stakeholders, including:

- Communities
- Fish and wildlife organizations
- Environmental non-governmental organizations
- Trade and industry groups
- Cabin owners
- Individuals
- General public

Marathon's approach to engagement with stakeholders has been developed consistent with its core corporate values and has been based upon the timely and transparent sharing of all relevant Project-related information, ongoing opportunities for dialogue, identification and responsiveness to issues and concerns and consideration of stakeholder input into Project planning and design.

Key community and stakeholder engagement activities have included:

- Information sharing through Marathon's website, social media, quarterly newsletters and direct mailouts
- Meetings in person, by conference and video calls, and virtual meetings to provide corporate and project updates and information on the environmental assessment process; this has included in person and virtual public meetings (the latter format was adopted to adhere to provincial COVID-19 restrictions)
- Exit surveys and questionnaires to enable community residents and members of organizations to provide input and feedback

Questions related to the Project, and Marathon's responses, are outlined in Table 5.2. This table includes questions / comments raised throughout the Project planning process, including during the early planning phase. Many of these comments have been addressed and integrated in the EIS. In general, many questions and comments raised during the engagement activities for the Project focused on Marathon's corporate operations and the Project components and schedule, including:

- While employment, training, and procurement opportunities from the Project are seen as beneficial, concern that local residents and businesses will not be equitably represented in employment and contracting
- Tailings pond design and potential impacts on water quality
- Impacts to fish and fish habitat should a dam breach occur and fish habitat compensation
- Emergency response should a dam breach occur and design alternatives to the TMF
- Management of waste rock and acid rock drainage / heavy metals concerns
- Air quality concerns related to emissions, greenhouse gases (GHGs), tailings, and dust
- Use of cyanide
- Impacts to wildlife (caribou, moose) and associated outfitting operations
- Socio-economic effects (salaries, accommodations, health services and working conditions)
- Life of the mine and rehabilitation of the mine site

Table 5.2 Summary of Stakeholder Comments and Concerns

Stakeholder Group	Comment	Proponent Response
Town of Buchans, Town of Millertown, Town of Badger, LSD of Buchans Junction	Employment, training, and procurement opportunities	Marathon is committed to enhancing local benefits through hiring of local residents. Marathon will enter into a Benefits Agreement with the province which will outline commitments respecting hiring priorities which will be binding on Marathon and on its contractors. Marathon will make reasonable efforts to unbundle procurement packages to increase opportunities for local businesses. Future supplier / contractor engagement and workshops will be held as the Project advances towards construction. Marathon will provide information on estimated labour force requirements and will work with local communities, Indigenous groups, and stakeholders to identify potential training needs and opportunities.
Town of Buchans, Town of Millertown, LSD of Buchans Junction	Special status of close proximity towns	Marathon is committed to enhancing local benefits and this principle will be incorporated into the provincial Benefits Agreement.
Town of Badger, Town of Bishop's Falls, Town of Millertown, Town of Grand Falls-Windsor	Work conditions (salaries, shifts, and accommodations)	Marathon's operational workforce will be primarily direct employees with some exceptions. An accommodations camp will be established on site. Salaries will be in line with mining industry standards in the province: well-paying jobs with benefits. Wage categories have not been determined however will be market-based. Shifts will be 12 hours in length to operate 24 hours per day, with rotations ranging from 2 to 4 weeks.
Town of Buchans, Town of Grand Falls-Windsor	Supply of medical services	Appropriate emergency medical infrastructure, equipment and personnel will be established at the mine site. Marathon is currently engaged in discussions with Buchans, Millertown and Central Health with respect to the use of the A. M. Guy Memorial Hospital to supply certain services to mine personnel.
Town of Buchans, Town of Millertown, Town of Badger, LSD of Buchans Junction, Town of Bishop's Falls, Town of Grand Falls-Windsor	Need for ongoing community engagement	Marathon is committed to developing and maintaining relationships with communities closest to the mine site through ongoing engagement, including through the conclusion of Community Cooperation Agreements.

Table 5.2 Summary of Stakeholder Comments and Concerns

Stakeholder Group	Comment	Proponent Response
Town of Buchans, Salmonid Organizations – Atlantic Salmon Federation (ASF), Salmonid Council of Newfoundland and Labrador (SCNL), Salmonid Association of Eastern Newfoundland (SAEN)	Air quality	Air emissions are subject to rigorous regulatory standards and Marathon will be required to comply with specific thresholds. The potential effects of the Project are fully assessed in the EIS. Marathon will install and monitor air quality monitoring stations around the Project Area and will report results to the regulators.
Town of Buchans, Town of Badger, Town of Bishop's Falls, Salmonid Organizations – ASF, SCNL, SAEN, ERMA, Canadian Parks and Wilderness Society (CPAWS)	Tailings ponds and impacts on water quality	Site contact water will be managed and treated through ditching and sedimentation ponds. Process effluent will be pumped to the tailings impoundment post cyanide destruction, and will be subsequently treated in a water treatment plant and held in the polishing pond for five days. Water contacting Project features or used within the Project processes will be managed and treated prior to release to the environment, and the quality of water to be discharged will be monitored for compliance with regulatory requirements. With proper design, construction, operation and maintenance in accordance with the Canadian Dam Association (CDA) and MAC guidelines, Global Industry Standards on Tailings Management (ICMM et al. 2020), as well as applicable provincial requirements, the likelihood of a tailings impoundment breach is very low. TMF location and design alternatives and potential effects on surrounding waterbodies are addressed in detail in the EIS.
LSD of Buchans Junction, Salmonid Organizations – ASF, SCNL, SAEN, ERMA	Waste rock management and acid rock drainage (ARD)	ARD / metal leachate testing has been ongoing for approximately two years and results to date indicate that only small amounts of the waste rock and ore are PAG, and that overall, the piles will generally not be acid-generating. Continued ARD / ML test work will be used to confirm these conditions.
Town of Buchans, Salmonid Organizations – ASF, SCNL, SAEN, ERMA	Use of cyanide	Cyanide leaching is a common practice in gold mining and will be managed in accordance with the strict standards, regulations and guidelines in place within the industry with regards to transportation, handling, mixing and treatment. Cyanide destruction technology will be implemented to reduce cyanide concentrations in the process plant prior to discharge to the TMF.
Town of Buchans, CPAWS	Rehabilitation and closure plans	Marathon is committed to meeting or exceeding required measures for closure of the Project site and will develop a detailed Rehabilitation and Closure Plan that addresses the long-term physical and chemical stability of the site using current best practices, along with Financial Assurance to the province for the site.

Table 5.2 Summary of Stakeholder Comments and Concerns

Stakeholder Group	Comment	Proponent Response
Town of Millertown, Town of Badger, Salmonid Organizations – ASF, SCNL, SAEN, ERMA, Newfoundland and Labrador Outfitters Association, CPAWS	Impacts to wildlife (caribou, moose, and fish)	Marathon is working with NLDFFA - Wildlife Division to gain a better understanding of the migratory patterns of caribou herds in the vicinity of the Project. Potential effects are assessed in the EIS and mitigation measures tailored to identified adverse effects. Adverse effects on moose hunting in the area are expected to be low. The Project footprint overlaps only 1% of the moose management area and hunting will not be permitted on the site or in the immediate vicinity for safety of the workforce on site. Marathon has reconfigured the site layout and design to reduce fish habitat disruption or destruction to the extent possible. In consultation with DFO, Marathon is considering a number of different types of fish habitat offsetting projects that may be suitable.
Newfoundland and Labrador Outfitters Association	Compensation for impairment of outfitting operations	Marathon will continue to engage with the Newfoundland and Labrador Outfitters Association and individual outfitters. If any outfitting operations are adversely affected by the Project, Marathon will work with the outfitter(s) directly to determine appropriate steps to address the issues.

6.0 ENGAGEMENT WITH INDIGENOUS GROUPS

The Federal EIS Guidelines (Part 2, Section 5) identify Miawpukek First Nation (Miawpukek) and Qalipu Mi'kmaq First Nation (Qalipu) as Indigenous groups that may be affected by the Project. No other Indigenous groups have come forward or have been identified by either level of government or by Marathon as having an interest in, or being potentially affected by, the Project. Marathon has provided each Indigenous group with opportunities to learn about the Project, including its location, design, potential effects and proposed mitigation measures, to provide input respecting the potential effects of the Project upon Indigenous interests and activities and to discuss potential mitigation, avoidance and monitoring measures. More specifically, Marathon's engagement activities with each group have included the following:

- Information Sharing Initiatives: transmission of, and opportunities to review, Project-related documentation including EIS baseline information, newsletters, notices and other materials (e.g., press releases), related to the Project, Marathon's corporate operations, and employment and business opportunities
- Meetings: meetings and offers to meet with Indigenous leadership, community members and other groups in person (by video, conference calls, or webcast) to discuss the Project and associated regulatory processes, issues and concerns and potential mitigation, and holding a Project review workshop to provide information related to the Project's proposed layout and design
- Land and Resource Use Studies: offers of funding to conduct land and resource use studies and to collect Indigenous knowledge to enhance Marathon's understanding of the potential Project effects on Indigenous interests and activities, and to incorporate into the EIS
- Avoidance, Mitigation and Monitoring Initiatives: discussion with representatives of each Indigenous group of potential mitigation, monitoring and avoidance measures to address potential effects

Throughout engagement, Indigenous groups have been given opportunities to provide Marathon with their views on:

- Indigenous activities or interests in or near the Project Area or elsewhere that might be relevant to the assessment of the Project and its potential effects
- The effects of changes to the environment on their health and socio-economic conditions, physical and cultural heritage and current use of lands and resources for traditional purposes pursuant to paragraph 5(1)(c) of CEAA 2012

Marathon's engagement process has been based upon consistent and regular contact and information exchange designed to enable each group or representative organization to understand the Project and identify potential effects on their communities, activities, and asserted or established Indigenous rights. Comments and questions from Indigenous groups, and Marathon's responses, are summarized in Table 6.1.

Table 6.1 Summary of Comments and Concerns Raised by Indigenous Groups

Indigenous Group	Comment	Proponent Response
Qalipu	Need to balance economic benefits against potential adverse environmental effects	Marathon is committed to the sustainable development of the Project, reducing adverse environmental effects and enhancing benefits.
Qalipu, Miawpukek	Education, training, and employment opportunities specifically employment for women	Marathon will work with both Indigenous groups and various educational facilities to identify training needs and training facilities. Access to training and employment opportunities will be addressed in the Project's Gender Equity and Diversity Plan, which will be developed in consultation with both Qalipu and Miawpukek.
Qalipu, Miawpukek	Need for ongoing engagement and engagement with youth	Marathon is committed to ongoing engagement with Indigenous groups and stakeholders over the life of the Project. Youth engagement will be addressed in the Project's Gender Equity and Diversity Plan.
Qalipu, Miawpukek	Environmental Monitoring	Marathon is committed to working with Qalipu and Miawpukek with respect to their involvement in environmental monitoring.
Qalipu, Miawpukek	Tailings management	With proper design, construction and operation in accordance with the CDA guidelines, the likelihood of a tailings dam breach is very low. Through the EA and engineering processes, Marathon will continue to assess tailings management plans, particularly with respect to closure.
Qalipu, Miawpukek	Impacts to wildlife and fish	Marathon is working with NLDFFA - Wildlife Division to gain a better understanding of the migratory patterns of caribou herds in the vicinity of the Project. The Project design will avoid fish and fish habitat to the extent possible. The potential adverse effects of the Project on wildlife, fish, plants and waterfowl, as well as associated mitigation measures, are addressed in the EIS.
Qalipu, Miawpukek	Impacts to water	Potential effects on surrounding waterbodies are addressed in detail in the EIS. Water contacting Project features or used within the Project processes will be managed and treated prior to release to the environment, and the quality of water to be discharged will be monitored for compliance with regulatory requirements.
Qalipu	Impacts to Victoria Dam	The EIS assesses potential adverse effects from routine Project activities, like blasting, and a worst-case accidental event on the Victoria Dam.
Qalipu	Air Quality	Atmospheric Environment is a Valued Component within the EIS, and the potential effects of the Project are fully assessed in the EIS. Marathon will install and monitor air quality monitoring stations around the Project Area and will report results to the regulators and stakeholders.

Table 6.1 Summary of Comments and Concerns Raised by Indigenous Groups

Indigenous Group	Comment	Proponent Response
Qalipu, Miawpukek	Rehabilitation and Closure	Marathon is committed to meeting or exceeding required measures for closure of the Project site and will develop a detailed Rehabilitation and Closure Plan that addresses the long-term physical and chemical stability of the site using current best practices. Marathon will provide Financial Assurance to the province that will fund closure and rehabilitation in the event that Marathon can't complete the work (e.g., insolvency), and is committed to meeting required measures to avoid and/or reduce environmental effects through all stages of the mine life.
Qalipu, Miawpukek	Impacts to plants	Areas to be cleared of vegetation will be limited to those required for construction and operation. Disturbed and temporarily cleared areas not required for operation will be revegetated. The potential adverse effects of the Project on plants, as well as associated mitigation measures, are addressed in the EIS.
Qalipu, Miawpukek	Impacts to access and land and resource use	Marathon is committed to working with Qalipu and Miawpukek to enhance its understanding of potential Project-related effects on Indigenous land and resource use. Current use of land and resources by Indigenous groups is assessed in the EIS.
Miawpukek	Impacts to heritage resources	Historic resources are assessed in the EIS.

7.0 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

The following sections provide a summary of the environmental effects assessment for each VC including a description of the existing conditions, potential environmental effects from routine Project activities, mitigation measures and significance of residual effects. The environmental effects assessment has used a precautionary, conservative approach. Conservative assumptions have been made, so that potential adverse effects are overestimated rather than underestimated.

Figures 7-1 and 7-2 provide the LAA and RAA boundaries used in relation to each VC assessment. The assessment of cumulative effects is summarized in Chapter 10 and the assessment of accidental events and malfunctions is provided in Chapter 11.

7.1 ENVIRONMENTAL SETTING

The Project is located in a rural region in central Newfoundland where there is a history of mineral exploration and mining activities. Other land and resource use in the area include commercial forestry, multiple hydroelectric developments, outfitting, cabins, harvesting (e.g., trapping, hunting and fishing), and recreational land use such as hiking, boating, all-terrain vehicle (ATV), snowmobiling, angling, and camping. Although there are currently no active mines in the area, mineral exploration activity takes place throughout the region. The closest communities are the Town of Millertown, the Town of Buchans, and the local service district of Buchans Junction.

The Project is located within the Central Newfoundland Forest (CNF) Ecoregion (NLDFLR 2019a). This ecoregion typically consists of rolling hills, dense forest, and organic deposits occurring in valleys and basins (PAA 2008). Terrain (i.e., topography and landforms) varies and includes boggy areas, thin to thick glacial till layers, and bedrock outcrops. Scattered wetlands, specifically patterned fens and bogs are common in the Project Area and surrounding areas. Balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*) and black spruce (*Picea mariana*) are dominant tree species in the region. Three plant species of conservation concern (SOCC) were observed, including short-scale sedge (*Carex deweyana*), nodding water nymph (*Najas flexilis*), and perennial bentgrass (*Agrostis perennans*).

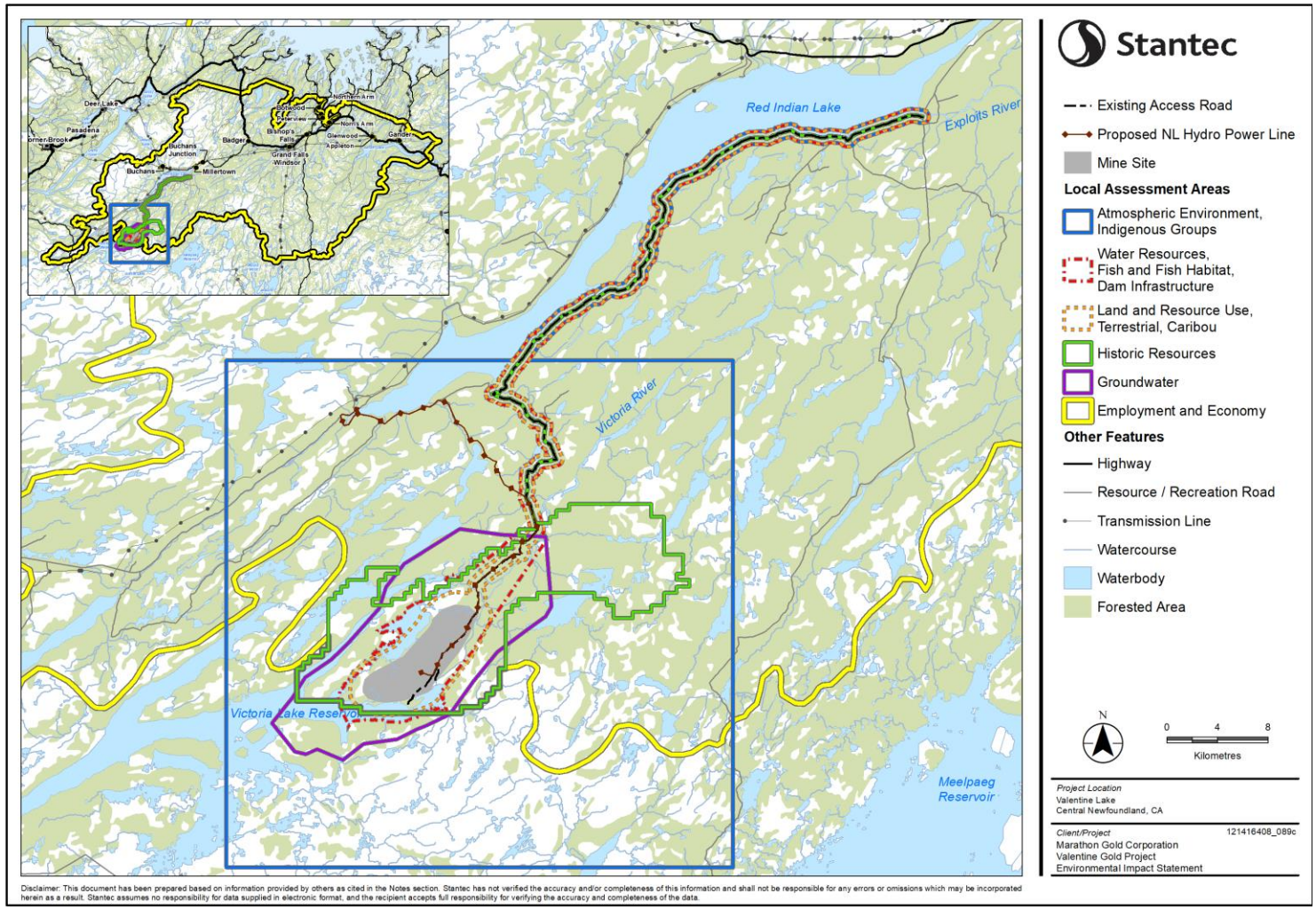

Figure 7-1 Combined Local Assessment Areas for the VCs

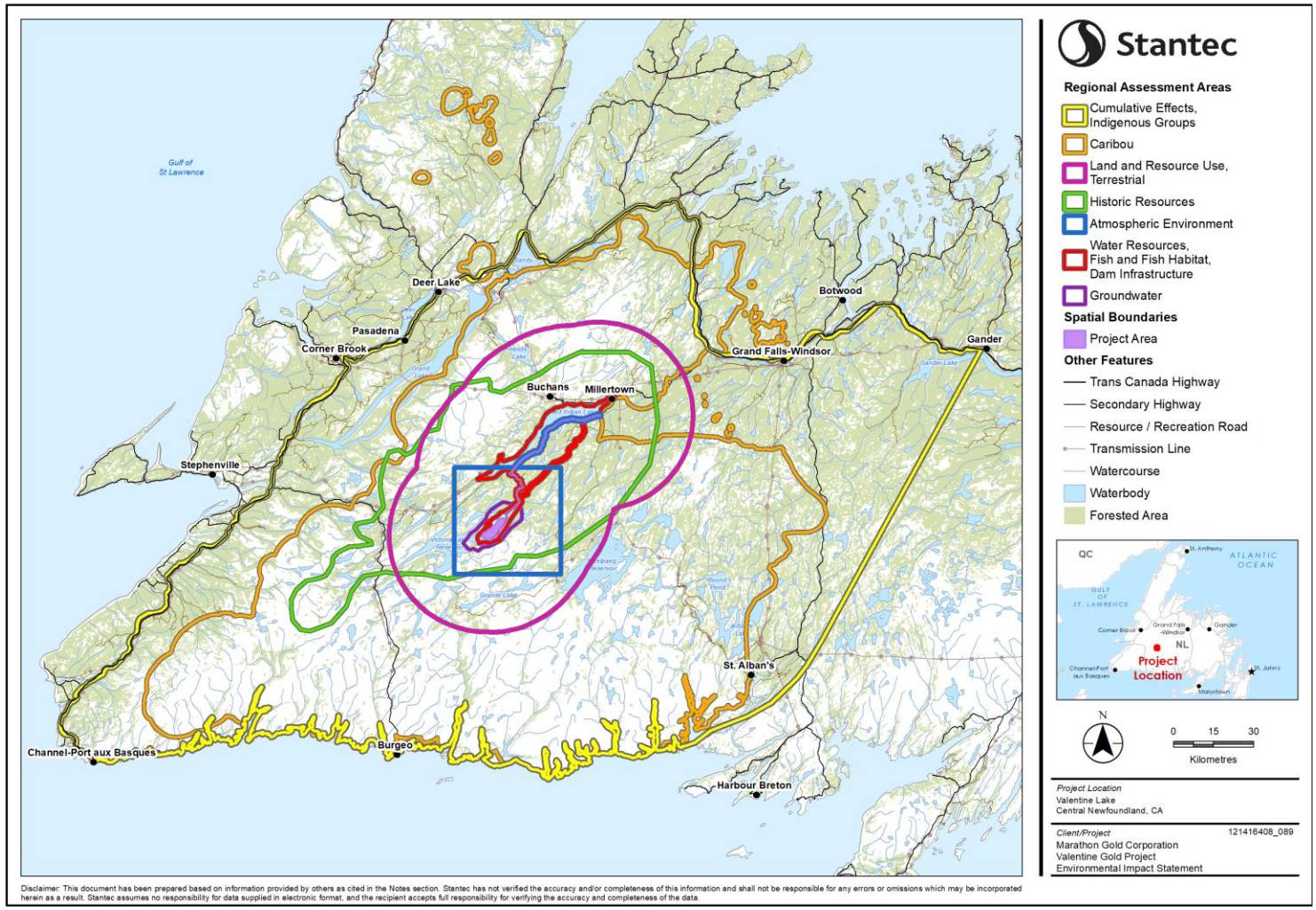

Figure 7-2 Combined Regional Assessment Areas for the VCs

Overall, ambient air quality is expected to be very good most of the time in the Project Area. Baseline studies found that concentrations of air contaminants are likely to be low and close to average background concentrations for similar rural locations in NL, with measured concentrations of air contaminants being below the regulatory standards. Sound levels are typical of a quiet rural/quiet suburban environment with noise generated primarily by natural phenomena or activities, such as wind, rain, and wildlife.

The head of the Victoria River (altered in the 1960s by hydroelectric development) to the east of the Project Area, and Valentine Lake to the northwest, combine to flow into Red Indian Lake which then flows into the Exploits River, an important Atlantic salmon river on the Island in terms of numbers of salmon returning. With the construction of the Victoria Dam in 1967 to create the Victoria Lake Reservoir, the flow from Victoria Lake was altered to flow in a southerly direction to Burnt Lake and Granite Lake, providing flow to downstream hydrogeneration stations. Sea-run and landlocked Atlantic salmon / (ouaninache) (*Salmo salar*), brook trout (*Salvelinus fontinalis*), Arctic char (*Salvelinus alpinus*), American eel (*Anguilla rostrata*) and threespine stickleback (*Gasterosteus aculeatus*) are also known to occur in the region (Cunjak and Newbury 2005; Porter et al. 1974).

Mammal species confirmed in the Project Area include woodland caribou (*Rangifer tarandus caribou*), moose (*Alces alces*), black bear (*Ursus americanus*), Canada lynx (*Lynx canadensis*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), marten (*Martes*), muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), southern red-backed vole (*Myodes gapperi*), meadow vole (*Microtus pennsylvanicus*), snowshoe hare (*Lepus americanus*), and American red squirrel (*Tamiasciurus hudsonicus*). Mink (*Neovison vison*), ermine (*Mustela erminea*), northern long-eared bat (*Myotis septentrionalis*), and little brown bat (*Myotis lucifugus*) are also expected to occur in the vicinity of the Project. The Project Area overlaps or is in proximity to the ranges of caribou herds including the Buchans, Grey River, Gaff Topsails, and La Poile herds, which have been assessed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2014). Other wildlife mammal species at risk (SAR) with potential to occur near the Project Area include the American marten (Newfoundland population) and the northern long-eared bat and little brown bat.

Broadly, the avifauna groups present in this area include passerines, waterfowl, upland gamebirds and raptors. Three avifauna SAR were identified during field surveys in the vicinity of the Project Area: olive-sided flycatcher (*Contopus cooperi*), common nighthawk (*Chordeiles minor*), and rusty blackbird (*Euphagus carolinus*). With respect to waterfowl, a Sensitive Wildlife Area along the Victoria River which overlaps with the Project Area has been identified as containing important waterfowl habitat (NL-EHJV 2008). NLDFFA has indicated that the waterfowl habitat that was likely the focus of this designation are “steadies” on the Victoria River system located well to the north of the mine site.

There are also three provincially protected areas in the area, including Little Grand Lake Ecological Reserve (approximately 27 km from the mine site and 23 km from the Project Area), Little Grand Lake Wildlife Reserve (approximately 28 km from the mine site and 23 km from the Project Area), and T’Railway Provincial Park (approximately 76 km from the mine site and 26 km from the Project Area). There are no known archaeological sites within the mine site; however, there is broad theoretical potential for archaeological resources in the area.

7.2 ATMOSPHERIC ENVIRONMENT

7.2.1 Existing Conditions

The data and analysis used to characterize existing conditions for the atmospheric environment included climate, air quality, GHG, sound quality, and lighting for the Project.

The Project is located within the Central Newfoundland Forest Ecoregion and has the warmest summers and coldest winters on the Island of Newfoundland, with the potential for night frost year-round (NLDFLR 2019a). Daily average temperatures at the nearby Town of Buchans range between -8.4°C to 16.3°C, with the lowest average temperatures occurring in February and the highest occurring in July. Total annual average precipitation at Buchans is 1,236 millimeter (mm), with 359 cm of snow and 877 mm of rain. Monthly average precipitation ranges between 86 to 123 mm, with the least occurring in April and the most occurring in December.

Given the largely undeveloped nature of the LAA/RAA, there are few anthropogenic sources and no large industrial emissions sources within the LAA/RAA for air quality. Ambient air quality monitoring was conducted at one location within the Project Area over the period from June 15 to 19, 2020. The baseline measured concentrations of nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total suspended particulate matter with an aerodynamic diameter less than 30 µm (TSP), respirable particulate matter with an aerodynamic diameter less than 10 µm (PM_{10}) and metals were well below applicable 24-hour ambient air quality criteria in NL. Measured concentrations of particulate matter (TSP and PM_{10}) ranged from 5.1 µg/m^3 to 13.8 µg/m^3 and the concentrations of TSP and PM_{10} were consistent, suggesting that the existing particulate matter within the LAA is made up mostly of PM_{10}. Metals detected in the samples included aluminum, calcium, magnesium, manganese, sodium and titanium; however, the measured concentrations were below the regulatory standards, where standards exist. The remaining metals that were sampled were not detected above analytical reportable detection limits.

There are no local sources of GHG emissions that require reporting to the provincial or federal government within or near the Project Area.

The mine site is in a remote area with no substantive anthropogenic noise sources within 50 km. Within the LAA/RAA, there are approximately 35 seasonal dwellings (three active outfitters, two inactive outfitters and 30 cabins), which represent the nearest sensitive receptors to the Project. The baseline day-night average sound level values ranged from 46.9 dBA to 47.4 dBA and are representative of a quiet rural (< 45 Decibels, A-Weighted [dBA]) to quiet suburban (48 – 52 dBA) area, with limited to no existing sources of noise.

Given the mine site is approximately 49 km southwest of the Town of Buchans and the fact that there are no nearby communities, year-round residential receptors, or major roadways, the LAA/RAA is considered a dark, and rural environmental zone. Measurements of incident light were less than 0.01 lux (measure of light equal to one lumen per meter squared) and sky glow ranged from 21.84 to 22.81 magnitudes per square arcsecond.

7.2.2 Environmental Effects

7.2.2.1 Changes to the Environment

The potential environmental effects of the Project on the atmospheric environment prior to mitigation include:

- Changes in air quality due to atmospheric dispersion of air emissions
- Changes in GHG emissions due the release of GHGs
- Changes in ambient sound quality due to noise emissions
- Changes in ambient light levels due to lighting

For a change in air quality, the most substantive air contaminant releases are expected during construction and operation of the Project. During construction, air contaminants may be released in the form of combustion gases (SO_2, nitrogen oxides [NO_x], carbon monoxide [CO]) and particulate matter (TSP, PM_{10}, particulate matter <2.5 µm ($PM_{2.5}$)) from the operation of equipment, as well as fugitive dust (particulate matter including TSP, PM_{10}, $PM_{2.5}$, trace metals) from earth and material loading and hauling activities, blasting and equipment movements. During mine operation, particulate matter and trace metals may be released during ore handling and crushing, wind erosion of ore stockpiles and waste rock pile surfaces and blasting at the Marathon and Leprechaun pits. Releases of NO_X, SO_2, carbon monoxide (CO), and particulate matter (TSP, PM_{10} and $PM_{2.5}$) will occur from internal combustion engines associated with mobile heavy equipment for material loading and hauling. Releases of particulate matter (TSP, PM_{10} and $PM_{2.5}$), trace metals (within the dust), NH_3, and HCN may also occur from the process plant sources. Although some releases will occur during decommissioning, the emissions are expected to be lower in magnitude than during construction or operation.

For changes in GHG emissions the substantive sources of direct GHG emissions during construction and operation are the mobile and stationary equipment exhausts, and blasting using an ammonium nitrate/fuel oil emulsion. Land clearing, specifically grubbing, also contributes to the direct GHG emissions during the construction phase only. These GHG emissions consist primarily of carbon dioxide (CO_2), with smaller amounts of methane (CH_4) and nitrous oxide (N_2O). Releases of GHG emissions will occur during decommissioning, rehabilitation and closure activities because of the combustion of diesel in heavy equipment.

For changes in sound quality, during construction sound emissions are expected from the operation of heavy mobile equipment and vehicles for land clearing, earth moving activities, material handling and other vehicle activities, such as those associated with the access road. Sound emissions will also result from blasting during construction. 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 is expected to be less than that required during Project construction and operation, the resulting sound emissions are also anticipated to be low.

For changes in light levels, it is likely that portable lighting units would be used to meet visibility and worker safety needs should construction activities be required to occur at night (i.e., during the fall and winter when days are shorter). In addition, during operation, mobile light sources will be used for safety at all loading and dumping points. There would also be light associated with the construction-related transportation along the access road. Permanent lighting structures will use directed lighting (when and where required), and will likely include a combination of street, flood and wall pack lighting. These will be installed along site roads within the Project Area and surrounding vehicle parking lots and site buildings (e.g., accommodations camp, processing facilities, mine services area).

7.2.2.2 Mitigation Measures

The mitigation measures presented in Table 7.1 are proposed to avoid or reduce Project-related effects on the atmospheric environment.

Table 7.1 Mitigation Measures: Atmospheric Environment

Category	Mitigation	C	O	D
Blasting	• Best practices from Blaster's Handbook (ISEE 2016) and Environmental Code of Practice for Metal Mines (ECCC 2009) will be followed to reduce and monitor noise emissions during blasting.	✓	✓	-
Air Emissions	• An Air Quality Management Plan will be developed and implemented as part of the EPP. The Air Quality Management Plan will specify the mitigation measures for the management and reduction of air emissions during Project construction and operation.	✓	✓	✓
	• During dry periods, water will be applied to the access road, site roads and haul roads as needed to mitigate dust emissions. The application of water will be limited to non-freezing temperatures to avoid icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day might be required, depending on surface and meteorological conditions. Water used for dust suppression will be sourced from site contact water, not natural waterbodies.	✓	✓	✓
	• The application of dust suppressants other than water to roads as an alternative option to watering will be considered in consultation NLDECCM. Dust suppression would be applied on an as-needed basis during high wind conditions or if measured ambient particulate matter (PM) concentrations are in exceedance of the Newfoundland and Labrador Ambient Air Quality Standards, and if an increase of watering is determined ineffective or unfeasible at the time. The chosen dust suppressant will be approved by the NLDECCM prior to application. These suppressants, if required, will be applied, as per the manufacturer's recommendations.	✓	✓	✓
	• Ambient air quality and noise monitoring programs will be implemented throughout the life of the Project, as required and in accordance with Project permitting and conditions of approval.	✓	✓	✓

Table 7.1 Mitigation Measures: Atmospheric Environment

Category	Mitigation	C	O	D
Air Emissions	• When loading stockpiles, drop heights will be reduced to be as close to the pile as possible.	✓	✓	-
	• Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage by means of vegetating or covering the exposed surfaces.	✓	✓	-
	• Conveyors will be covered to reduce fugitive dust emissions.	-	✓	-
	• Select exhaust sources will be equipped with emission control technologies to reduce contaminant emissions. Exhaust controls are listed as follows: – Lime silo: baghouse – Sodium cyanide mix tank: dust collector – Copper sulphate storage tank: dust collector – Sodium metabisulphate mix tank: dust collector – PAX storage tank: baghouse – Lime mix / storage: baghouse – Elution electrowinning: mist eliminator – ICU Electrowinning: mist eliminator – Barring furnace: baghouse – Carbon regeneration kiln: scrubber	-	✓	-
	• A Greenhouse Gas Management Plan will be created to manage Project GHG emissions, and outline and track the effectiveness of mitigation measures, including follow-up and monitoring activities. Additional details are provided in Chapter 8.	✓	✓	✓
Vehicles / Equipment / Roads	• Engines and exhaust systems of construction and mining equipment will be subject to a comprehensive equipment preventative maintenance program to maintain fuel efficiency and performance. To reduce emissions, equipment and vehicle idling times, and cold starts will be reduced to the extent possible. Marathon will develop an idling policy to this effect.	✓	✓	✓
	• Vehicles and heavy equipment will be maintained in good working order and will be equipped with appropriate mufflers to reduce noise.	✓	✓	✓
	• Haul roads and infrastructure will be designed to reduce transportation and haul distances where possible.	✓	✓	-
	• Project vehicles will be required to comply with posted speed limits on the access road, site roads and haul roads to limit fugitive dust from vehicle travel on unpaved roads. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads). Additional speed restrictions will be implemented during caribou migration periods.	✓	✓	✓
Light Emissions	• 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, and the lighting requirements for workspaces, as applicable.	✓	✓	✓
	• Lighting will be located so that the lights are not directed toward oncoming traffic on nearby roads on or off site because of the objectionable nuisance and safety hazard this may present.	✓	✓	✓

Table 7.1 Mitigation Measures: Atmospheric Environment

Category	Mitigation	C	O	D
Light Emissions	• Lights will be designed to avoid excessive use of mobile flood lighting units and will be turned off when they are not required.	✓	✓	✓
	• 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, to the extent practicable.	✓	✓	✓
	• Full cut-off luminaires will be used wherever practicable to reduce glare, light trespass and sky glow from Project lighting.	✓	✓	✓
Noise Emissions	• Project facilities and infrastructure will be designed to limit noise emissions.	-	✓	-
	• Where practicable in accessible areas (e.g., along cleared rights-of-ways), trees and other vegetation will be left in place or encouraged to grow to obstruct the view of Project facilities, reducing the change in viewshed and muffling nuisance noise.	✓	✓	-
Tailings Management	• The TMF will be designed and managed to reduce the area of exposed dry surfaces, where possible, to reduce the potential for windblown dust emissions.	-	✓	-
Site Facilities and Services	• The worker accommodations will be designed with sufficient ventilation systems to reduce the need to open the windows. This can also be supported through closed-window policies with requirements highlighted during mandatory site orientations for employees, contractors and visitors.	✓	✓	✓

7.2.2.3 Significance of Residual Effects

Residual Project-related effects to air quality during the construction and operation phases of the Project will result in air contaminant emissions, although the magnitudes of the releases will be limited and well managed. Construction-related emissions (primarily dust from site preparation and material handling, as well as combustion gases from equipment) can decrease air quality; however, with the implementation of mitigation (e.g., dust management), the change in air quality is not expected to be substantive. Air contaminant releases from construction activities are expected to be lower in magnitude than from operation activities. Air contaminant releases from construction are therefore not anticipated to result in frequent exceedances of the ambient air quality standards (<1% of the time).

The potential change to air quality in the LAA/RAA during operation was assessed by predicting ground-level concentrations from the modelling of Project-related releases combined with measured background concentrations and compared against ambient air quality criteria. The combined concentrations for most air contaminants modelled (due to Project related air contaminant releases combined with measured ambient background concentrations) were below the adopted ambient air quality standards outside the Project Area, with the exception of the 24-hour PM_{10} predictions. The exceedances of the 24-hour PM_{10} standard are likely a result of fugitive releases from the TMF, based on the location of occurrence of the maximum predicted concentrations (i.e., 500 m to 900 m to the east of the TMF). These exceedances are predicted to occur in a small area and are expected to be infrequent (<1% of the time) and of short duration.

Residual Project-related effects to GHG emissions during construction and operation represent a small contribution to provincial and national GHG emissions. The site construction direct GHG emissions include emissions from heavy off-road equipment, on-road trucks and vehicles, stationary generators, blasting and land clearing. Indirect GHG emissions from site construction include the shipping of supplies to site. On the maximum annual basis, the construction emissions contribute approximately 0.30% and 0.005% to provincial and national GHG emission totals, respectively. GHG emissions during operation include emissions from heavy off-road equipment, on-road trucks and vehicles, stationary combustion, and blasting.

Indirect GHG emissions during operation include electricity consumption and shipping related to supplies and product deliveries. The operation contributes approximately 0.84% and 0.013% to the provincial and national emission totals, respectively. Mitigation measures for GHG emissions are most-often related to lower fuel consumption which is directly proportional to lower GHG emissions. Some of these measures include equipment/vehicle maintenance to increase fuel efficiency, reducing idling times, and reducing cold starts.

Residual Project-related effects on sound quality from the construction, operation, and decommissioning, rehabilitation and closure of the Project will result in noise emissions; however, the magnitude of the releases will be limited and well managed. Construction and decommissioning-related emissions will occur through the use of heavy machinery and from earth moving and material handling. Emissions during Project operation are expected to be similar and would also include processing activities related to gold extraction and refinement. Acoustic modelling was completed to predict sounds levels at nearby receptors due to Project activities. The predicted sound pressure levels were added to measured baseline data collected within the Project Area to estimate the change in sound quality. The predicted sound pressure levels at the nearby receptors are expected to be well below Health Canada targets for annoyance (change in %HA < 6.5) and sleep disturbance (45 dBA partially open windows and 57 dBA for fully closed windows) during both construction and operation.

Residual Project-related effects to light levels may result from the use of nighttime safety lighting required for the site buildings (e.g., accommodations camp, mill buildings), surrounding vehicle parking lots, and along the site roads within the Project Area. However, it is anticipated that an increase in Project-related light emissions (light trespass and glare) is not likely to exceed the Commission Internationale de L'Éclairage criteria for a suburban environment. Based on this light assessment, the levels of light trespass and glare will be maintained at levels representative of a rural environment provided the final lighting be developed using the recommended minimum lighting levels provided by the North America's Illuminating Engineering Society Lighting Handbook for outdoor worksite lighting, and in consideration of the Commission Internationale de L'Éclairage criteria. With proper design, existing levels of sky glow will also be maintained at levels representative of rural areas beyond the Project Area.

A viewshed analysis was also conducted that considered nearby receptor locations with a direct line of sight to the Project. The results of the viewshed analysis indicated that there is one receptor location within the LAA/RAA that could have a direct line of sight to some Project components (note that trees and other vegetation were not considered); however, those components are not likely to contain permanent

lighting structures. Therefore, the nighttime views from that viewpoint will not likely be affected by the Project components within the Project Area.

With mitigation and management measures, residual environmental effects on the atmospheric environment are predicted to be not significant, given the Project is not predicted to result in:

- Releases of air contaminants to the atmosphere that degrade the quality of ambient air such that the model predicted concentrations (combined with background levels) are likely to exceed applicable regulatory criteria for ambient air quality beyond the Project Area, and are of concern relative to the geographical extent of predicted exceedances, their frequency of occurrence, and the presence of potentially susceptible receptors
- Noise levels at noise-sensitive receptors that are likely to frequently exceed the annoyance and sleep disturbance targets recommended by Health Canada
- Light emissions such that the Commission Internationale de L'Éclairage guidelines for light trespass and glare in a suburban environment are exceeded, and sky glow levels would be altered toward those of an urban environment

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.3 GROUNDWATER

7.3.1 Existing Conditions

The natural overburden material in the Project Area can generally be classified as discontinuous glacial till of varying thickness overlying bedrock (Smith 2011). This till is dominated by well to poorly drained sandy loam to loam textures and a thin layer of rootmat overlying till ranging in thickness from 0.3 metre (m) to 22.8 m is found across the Project Area. Bedrock underlying the Leprechaun and Marathon open pit areas and waste rock piles consists of the Valentine Lake Intrusive Complex. Bedrock underlying the TMF, plant and accommodations camp consists of mixed sedimentary units and lesser gabbroic and mafic volcanic rocks of the Victoria Lake Group, comprised of Cambrian to mid-Ordovician rocks.

Most of the Leprechaun and Marathon deposits are in what The Hydrogeology of Central Newfoundland (AMEC 2013) refers to as hydrogeological Unit 5. Unit 5 consists of plutonic strata and includes mostly major granites, granodiorite, diabase, and diorite intrusions. Wells drilled in Unit 5 are typically low to moderate with a median sustainable pumping rate of 9 litres per minute (L/min). The southeast portion of the Project Area is located in Unit 3, with yields of wells drilled similar to wells in Unit 5. Unit 2 lies along the southern boundary of the Leprechaun pit with low to moderate yields of wells (median sustainable pumping rate of 7 L/min).

Water levels ranged from overflowing wells (approximate water level of -0.8 metres below ground surface [mbgs]) to 28.2 mbgs. In general, it was found that groundwater comprised a slightly hard to very hard, calcium-sodium-bicarbonate-chloride-sulfate type water. The groundwater quality is characterized, based on 19 samples, as slightly alkaline with moderate acid buffering potential and low conductivity, indicating fresh conditions. Analyzed parameters generally meet the Guidelines for Canadian Drinking Water

Quality (Health Canada 2019), except for pH (2 samples), true colour (3 samples), total dissolved solids (1 sample), turbidity (17 samples), arsenic (2 samples), iron (4 samples), and manganese (16 samples), which exceed either the aesthetic objective or maximum allowable concentration.

The hydraulic conductivity values measured in shallow wells were generally higher than those in deep wells. This is due to less fracturing with depth. Hydraulic conductivity data collected to date do not indicate a correlation between hydraulic conductivity and lithological unit, supporting the assumption that permeability is likely controlled by fractures and joints.

In the Project Area, a groundwater divide is inferred to exist along the northeast-trending ridge (corresponding to the trend of the thrust fault) from the Leprechaun pit to the Marathon pit. Groundwater to the north and west of the divide is generally expected to flow into Valentine Lake to the northwest and groundwater to the east and south of the divide is generally expected to either flow into Victoria River to the east or into Victoria Lake Reservoir to the south. Horizontal groundwater gradients calculated in baseline assessment ranged from 1% along the low-lying area along the northwest side of the Marathon pit near the Marathon waste rock pile, to 8% along steeper topography in the vicinity of the exploration corridor between the two pits. Vertical hydraulic conductivity data calculated from two sets of paired wells ranged from 2.5% upward to 22% downward.

The only known active groundwater user in the Project Area is the exploration camp owned and operated by Marathon.

7.3.2 Environmental Effects

7.3.2.1 Changes to the Environment

The potential environmental effects of the Project on groundwater prior to mitigation include:

- Change in groundwater quantity arising from Project activities that reduce baseflow to surface water features and reduce groundwater availability for existing well users
- Change in groundwater quality resulting from Project activities that alter the physical or chemical properties of groundwater resources

Changes in groundwater quantity during construction include altering groundwater flow patterns by dewatering for the initial pit development, construction of the TMF and other site infrastructure during mine site preparation and earthworks, and construction / installation of infrastructure and equipment. These activities may affect groundwater discharge to surface water features and wetlands. The open pit mine areas will be isolated from overland drainage and shallow groundwater seepage through the overburden with trenches / ditches, sedimentation ponds and other water management measures. During the operation phase, the main potential effect to groundwater quantity is the potential dewatering of the overburden and bedrock aquifer surrounding the open pits.

The Project is not anticipated to interact with the nearest reported residential groundwater supplies in the vicinity of the Towns of Buchans and Millertown. The main potential effects to groundwater quantity during decommissioning, rehabilitation and closure include rising groundwater levels immediately upon

cessation of open pit mine dewatering as the open pits begin to flood with rainwater, runoff and groundwater seepage. As the water levels rise in the open pits, the degree of distant drawdown will gradually recover to near pre-mining levels. Changes to groundwater recharge rates will also occur during this Project phase (e.g., through re-vegetation). These changes will affect groundwater flow patterns and discharge to surface water features and wetlands

For changes to groundwater quality during construction, mine site preparation and earthworks could result in changes to groundwater chemistry from infiltrating water in exposed areas of overburden removal. The main potential effect to groundwater quality during mine operation is the potential infiltration of untreated seepage from the bottom of waste rock piles and the TMF. In the absence of identified well users in the vicinity of the Project, surface water would be the primary receptor of untreated seepages from the TMF or waste rock piles. During decommissioning, rehabilitation and closure, the main potential effect to groundwater quality is the continued seepage from the waste rock piles and TMF through overburden and bedrock. Revegetation of the waste rock piles and TMF during progressive and closure rehabilitation will reduce seepage from operational levels.

7.3.2.2 Mitigation Measures

The mitigation measures presented Table 7.2 are proposed to avoid or reduce Project-related effects on groundwater resources.

Table 7.2 Mitigation Measures: Groundwater Resources

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
Soil Management	• Sediment control fences will be installed in areas where topsoil is exposed to erosion and siltation, such as slopes and embankments and approaches to stream crossings or water bodies. Sediment control fences will be inspected and maintained over the course of the construction phase until the disturbed area has stabilized and natural revegetation has occurred. Non-biodegradable materials used for Sediment control fences will be removed following revegetation.	✓	✓	✓
Site Water Management	• Marathon will implement a Water Management Plan for the site which will incorporate standard management practices, including drainage control, excavation and open pit dewatering which collectively comprise the water management infrastructure currently designed as part of the Project scope. The Water Management Plan provides detail on runoff and seepage collection strategies and systems (e.g., local seepage collection ponds, berms, drainage ditches, pumps) to collect and contain surface water runoff and groundwater discharge from major Project components (open pit, waste rock piles, TMF, ore stockpile and overburden storage areas, process plant) during climate normal and extreme weather conditions.	✓	✓	✓
	• Standard construction methods, such as seepage cutoff collars, will be used where trenches extend below the water table to mitigate preferential flow paths.	✓	-	-

Table 7.2 Mitigation Measures: Groundwater Resources

Category	Mitigation	C	O	D
	• Contact water collection ditches will be installed around the overburden stockpiles, ore stockpiles and waste rock piles to collect toe seepage. Contact water collection ditches will be designed to convey the 1:100-year storm event, and with positive gradients to limit standing water and maintain positive flow.	✓	✓	✓
	• Groundwater quality and quantity will be monitored and adaptively managed, if 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.	✓	✓	✓
Tailings Management	• Shallow groundwater seepage from the TMF will be intercepted by seepage collection ditches and pumped back to the TMF via sump pumps.	✓	✓	✓
	• Cyanide detoxification within the mill using the sulphur dioxide / air oxidation process will result in the degradation of cyanide and precipitation of metals prior to discharge to the TMF.	-	✓	-
Rehabilitation and Closure	• Progressive rehabilitation (e.g., placement of soil cover and vegetation over waste rock piles, erosion stabilization and temporary vegetation of completed organics, topsoil, and overburden stockpiles) will be implemented.	-	✓	✓
	• Open pit filling will be accelerated at closure, which will return groundwater levels to baseline conditions in a shorter timeframe.	-	-	✓
Notes: C – Construction Activities; O – Operation Activities; D – Decommissioning, Rehabilitation and Closure Activities				

7.3.2.3 Significance of Residual Effects

Groundwater Quantity

During construction, local changes in infiltration rates and changes in evapotranspiration rates and runoff 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; however, with implementation of the construction mitigation, these effects are expected to be low in magnitude. The temporary pumping for dewatering will be short term and on an as-needed basis; therefore, changes to groundwater quantity and flow due to temporary construction dewatering are characterized as low in magnitude, given that excavations for typical foundations are expected to be less than 1 m below ground surface.

During operation, the primary Project effect on groundwater quantity and/or flow is the lowering of water levels through continued dewatering of the open pits and the raising (or mounding) of the water table through operation of the waste rock piles and TMF. Results of the groundwater flow modelling indicate that as dewatering progresses with development of the open pits, the average annual groundwater inflow rate to the open pits will increase, with a maximum rate of 1,350 m^3/d at the Leprechaun pit, and 1,846 m^3/d at the Marathon pit at the end of the operation. Dewatering of the open pits is predicted to lower the

water table by up to 1 m over an area extending up to 1.6 km from the Leprechaun pit and up to 1.3 km from the Marathon pit. Mounding of the water table within the area of the TMF is predicted to extend up to 475 m north of the limits of the TMF and is contained within the limits of the Leprechaun and Marathon waste rock piles. Drawdown due to the operation of the seepage collection ditches around the perimeter of the TMF and waste rock piles are predicted to lower the water table up to 1 m in the immediate vicinity of the collection ditches only.

There are no known groundwater well users located within the LAA/RAA. Therefore, no water supply wells or groundwater withdrawals that supply potable water are present within the extent of drawdown of the open pits and no adverse environmental effects to groundwater quantity and/or flow are predicted from the Project on existing water supply wells. A discussion of the effects of lowering the water table on wetlands is provided in the Vegetation, Wetlands, Terrain and Soils VC (Section 7.6). The direction of groundwater discharge to each surface water feature from baseline conditions to end of operation remains consistent with water features receiving groundwater and the effect of changes in groundwater discharge on surface water levels and flow are generally offset by flows from seepage collection ditches. The lowering of water levels through continued dewatering of the open pits, and the continued development of the waste rock piles and stockpiles and operation of the TMF is predicted to result in a change in groundwater level is less than 5 m in the Project Area and 1 m in the LAA/RAA; therefore, the magnitude of the effect is considered low to moderate.

During decommissioning, rehabilitation and closure, water levels will begin to rise within the open pits until an overflow elevation is reached. The water level will rise to a maximum water elevation of approximately 377 m above mean sea level (amsl) at Leprechaun pit, and approximately 330 m amsl at Marathon pit, and will represent the local water table elevation at closure. At the end of closure, the water table is predicted to return to near baseline conditions except in the northwest corner of the Leprechaun pit which will be permanently lowered at this location. Drawdown due to the presence of the seepage collection ditches around the perimeter of the TMF, waste rock piles and ore stockpiles is predicted in the direct vicinity of the collection ditches. However, the predicted effects of the removal of the ditches on baseflow rates result in flow rates in nearby water features that are similar to baseline conditions. Several smaller tributaries are expected to receive higher baseflow starting in operation due to the presence of the TMF, and these effects continue throughout closure. Overall, the magnitude of effects on groundwater quantity during this phase will be low in the LAA/RAA, as the change in groundwater level is predicted to be less than 1 m.

Groundwater Quality

During construction, changes to groundwater quality may result from infiltrating water in exposed areas of overburden removal. The short duration of the construction period is not anticipated to result in metal leaching / acid rock drainage issues (ARD); therefore, groundwater quality effects are not anticipated during construction.

During operation, the Project activities and components that might interact with groundwater quality and result in adverse environmental effects include open pit mining, management of topsoil, overburden and waste rock, TMF operation, and water management. Baseflow loadings will directly affect the surface

water quality, the effects are further characterized in Section 7.4. The magnitude of changes to groundwater quality during operation will be low in the LAA/RAA, as the change in groundwater quality will not adversely affect any existing or reasonably foreseeable groundwater users.

During decommissioning, rehabilitation and closure, the waste rock piles and TMF will be progressively rehabilitated throughout the Project, reducing the seepage from these areas. During this phase, the ore stockpiles are also depleted and rehabilitated, and should not act as source areas post-closure. As there are no groundwater receivers located along the predicted groundwater flow paths, the effects of the seepage from the Project infrastructure from groundwater are predicted to discharge to surface water receivers. These effects are characterized in Section 7.4. Overall, the magnitude of changes to groundwater quality effects during decommissioning, rehabilitation and closure will be low in the LAA/RAA, as the change in groundwater quality will not adversely affect any existing or reasonably foreseeable groundwater users.

With mitigation and management measures, residual environmental effects on groundwater resources are predicted to be not significant, given the Project is not predicted to result in:

- 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 Guidelines for Canadian Drinking Water Quality (Health Canada 2019) 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

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.4 SURFACE WATER

7.4.1 Existing Conditions

Climate affects the runoff characteristics and stream flows that define surface water conditions in the Project Area. The Project Area lies within the Western Mountains and Central Uplands climate zone of NL and is generally characterized by cloudy conditions, strong winds and heavy snowfall in winter (Heritage NL 2019). Climate normal, wet year and dry year precipitation, and temperature data for the Buchans Climate Station (ID 8400698), including a climate normal precipitation of 1,236 mm and mean annual snowfall of 359.3 cm, were used to understand the range of conditions that may be expected in the Project Area. Intensity-Duration-Frequency (IDF) curves for the Stephenville Climate Station (ID 8403800) were assessed to understand the rainfall intensity that may be expected during various return period events. Both IDF and climate data were also considered under RCP4.5 climate change scenarios.

The topography of the site is hilly with elevations ranging from 270 m to 437 m across the mine site and from 160 m above sea level to 437 m across the Project Area. A topographic ridge runs through the mine site in a northeast to southwest direction. Surface water runoff flows through streams and ponds south and east to the Victoria River and Victoria Lake Reservoir, or north and west to Valentine Lake. There is substantial hydroelectric development near the Project Area; however, the only hydroelectric facilities within the LAA are the Victoria Dam and Spillway, which are part of the Bay d'Espoir Hydroelectric Development.

Surface Water Quantity

Regional flow relationships between watershed area and a variety of hydrologic statistics (mean annual flow [MAF], mean monthly flow and environmental flows) were used to predict flows in watersheds within the Project Area. These relationships were based on twelve Water Survey of Canada (WSC) hydrometric stations located in the same hydrologic region (North East) as the Project Area (AMEC 2014). This regional data shows that stream flows tends to peak twice a year, first in April and May due to snow melt, and again in November due to autumn rainfall events. Minimum flows are observed during winter months from January to February, and late summer between July and September. Twelve hydrometric stations were installed across the Project Area between 2011 and 2019 and results from these stations showed flow patterns consistent with regional observations, with more variation noted for localized storm events.

Watersheds (23) within the Project Area were delineated to capture the pre-development areas that will overlap the Project infrastructure. These watersheds contain the entire area that will have runoff directed to a final discharge point (FDP) as part of the Project water management infrastructure. These pre-development watersheds capture the areas needed to quantify Project-related changes to surface water quantity. Lake bathymetric data for Valentine Lake and Victoria Lake Reservoir was also used to determine assimilative capacity and expected mixing zones where Project runoff and treated effluent will enter.

Surface Water Quality

Local water quality data provides a robust baseline dataset, with over 600 samples collected for many parameters at various locations throughout the Project Area between 2011 to 2019. Regional water quality data provides a greater areal coverage with less monitoring frequency over the same period. By considering both the regional and local surface water quality data, existing water quality conditions in the Project Area have been established.

A comparison between the regional and local water quality shows consistencies including low pH and alkalinity, with several metal concentrations above Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-FAL). The parameters identified as naturally occurring above CWQG-FAL during baseline were considered as parameters of potential concern (POPC) as these are already at levels that may be harmful to aquatic life. Additional POPC included parameters listed in MDMER, and parameters considered potentially present in mine effluent as a result of mining activities.

Water quality within the Project Area was also noted to vary relative to the following three site-specific elements. The first is geographic spread, with differences noted between northern and southwestern

clusters of monitoring locations. The second is waterbody type, with large lakes exhibiting distinct water quality compared to the other waterbody types monitored in the Project Area (streams, pond outlets and bogs). The third is seasonality, with decreased levels of some constituents noted during periods of increased flow (TDS levels decreasing during spring melt) and increased levels of others noted during periods of low flow (elevated iron in the northern cluster from increased groundwater input during summer low flows).

7.4.2 Environmental Effects

The environmental effects analyses for changes in surface water quantity and surface water quality were carried out using a number of analytical methods and tools, and included a site-wide water quantity and quality GoldSim™ model, an acid rock drainage and metal leaching (ARD/ML) assessment, and an assimilative capacity (3-dimensional steady state near-field) Cornell Mixing Zone Expert System (CORMIX) model.

7.4.2.1 Changes to the Environment

Potential environmental effects of the Project on surface water prior to mitigation include:

- Change in surface water quantity arising from Project activities that cause a measurable change in hydrologic flow regime
- Change in surface water quality resulting from Project activities that cause a measurable change in the physical or chemical properties of surface water resources

The potential Project-related changes to surface water (i.e., changes to quantity or quality) are primarily associated with changes to local watershed areas, open pit water management (dewatering during operation, flooding during closure), and the introduction of treated contact water and other effluents into the receiving environment through selected final discharge points and indirectly through seepage.

Construction of mine infrastructure and the required earthworks, including clearing vegetation, grubbing and stripping soils, has the potential to alter the quantity and quality of runoff from these areas. Upgrades and realignment of the access road and transportation along the access, site and haul roads during all Project phases may alter flow patterns and water quality. Several waterbodies and watercourses will be directly affected (overprinted) by the construction of mine infrastructure.

Surface water encountering mine infrastructure and discharging through a Project final discharge point or through seepage may affect water quality. Discharge of water from the TMF has the potential to affect the receiving water of Victoria Lake Reservoir.

The open pits will be dewatered through mining operation and left to fill during rehabilitation and closure, which will decrease the amount of water contributing to downstream watercourses. Water from Victoria Lake Reservoir and Valentine Lake will also be required to expedite the filling of the open pits, which could affect the water quantity in these two waterbodies.

7.4.2.2 Mitigation Measures

The mitigation measures presented Table 7.3 are proposed to avoid or reduce Project-related effects on surface water resources.

Table 7.3 Mitigation Measures for Surface Water Resources

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Progressive erosion and sediment control measures will be implemented, as required.	✓	-	-
Vehicles / Equipment / Roads	• Haul roads, site roads and the access road will be maintained in good condition. This will include periodically regrading and ditching to improve water flow, reduce erosion, and to manage vegetation growth.	✓	✓	✓
Site Water Management	• Marathon will implement a Water Management Plan for the site which will incorporate standard management practices, including drainage control, excavation and open pit dewatering which collectively comprise the water management infrastructure currently designed as part of the Project scope. The Water Management Plan provides detail on runoff and seepage collection strategies and systems (e.g., local seepage collection ponds, berms, drainage ditches, pumps) to collect and contain surface water runoff and groundwater discharge from major Project components (open pit, waste rock piles, TMF, ore stockpile and overburden storage areas, process plant) during climate normal and extreme weather conditions.	✓	✓	✓
	• Progressive water management will be implemented over the life of the mine. This includes construction of water management infrastructure as an area is developed and decommissioning / rehabilitation of water management infrastructure as an area is decommissioned.	✓	✓	✓
Site Water Management	• Existing drainage patterns will be maintained to the extent feasible with the use of culverts and bridges.	✓	✓	-
	• Existing culverts along the site access road will be maintained or upgraded as necessary. This will include placement of culverts of the same size or larger, at the same inlet and outlet elevations, and in a manner to not cause flooding or ice jams.	✓	-	-
	• Project water storage features (i.e., sedimentation ponds) will be used to attenuate peak discharges to the environment.	✓	✓	✓
	• Culverts will be inspected periodically to remove accumulated material and debris upstream and downstream of the culverts.	✓	✓	✓
	• Perimeter grading and access roads will be used to divert runoff away from the open pit and reduce the amount of dewatering required.	✓	✓	-
	• Contact water collection ditches will be installed around the overburden stockpiles, ore stockpiles and waste rock piles to collect toe seepage. Contact water collection ditches will be designed to convey the 1:100-year storm event, and with positive gradients to limit standing water and maintain positive flow.	✓	✓	✓
	• Where possible, contact water will be recycled for use on-site (e.g., dust suppression).	✓	✓	✓

Table 7.3 Mitigation Measures for Surface Water Resources

Category	Mitigation	C	O	D
	• Non-contact water will be diverted away from developed areas, where possible. Channels and berms will be constructed around the crest of the open pits or uphill of waste rock piles and other developed areas to divert natural precipitation and surface runoff away from contact with mining operations, where practicable.	✓	✓	✓
	• Water withdrawals from Victoria Lake Reservoir and Valentine Lake, for the purposes of expediting the filling of the open pits, will be done in accordance with a pumping operations plan. This plan will be developed to reduce effects on the lakes.	-	-	✓
	• Runoff and groundwater seepage will be collected from the open pits, with water pumped to sedimentation ponds before being discharged to each pits' pre-development watershed area.	-	✓	-
	• Pond inlet and outlet structures will be configured to reduce inlet velocity and scour, and to meet sedimentation requirements. Pond outlets will be designed with subsurface inlets to mitigate against chemical stratification in ponds, thermal heating of discharge and ice blockage of outlets.	✓	✓	✓
	• Contact water sedimentation ponds will be designed to provide onsite storage of local runoff with the size and residence times designed to provide sediment removal to meet the *Metal and Diamond Mining Effluent Regulation* (MDMER) effluent total suspended solids criterion of 15 mg/L (monthly mean concentration limit), with removal of particles down to 5 micron (µ) in size for up to the 1:10 Annual Exceedance Probability (AEP) flows.	✓	✓	✓
	• Sedimentation ponds will be designed to contain (without discharge) runoff resulting from storm events up to the 1:100 year AEP with spring snowmelt event, including emergency spillways and maintaining minimum freeboard of 0.5 m. The emergency spillways will accommodate flows up to the 1:200 AEP flow.	✓	✓	✓
Site Water Management	• Sedimentation ponds will be designed with active water storage that considers ice thickness during winter. Under an extreme storm event, only the stormwater in excess of the available storage at that time will be discharged to the environment via the emergency spillway to protect the collection ponds.	✓	✓	✓
	• Effluent will be treated prior to discharge to the receiving water environment, as required, to meet regulatory effluent criteria as well as criteria developed through the receiving water Assimilative Capacity Assessment.	✓	✓	✓
	• Effluent discharge rates will be maintained to below the highest rate used in the Assimilative Capacity Assessment.	✓	✓	✓
Tailings Management	• The TMF dam will be designed to maintain water storage to contain the Environmental Design Flood, a 100-year return hydrologic event (24-hour storm or freshet event (75 mm)) with no discharge through the spillway.	-	✓	✓
	• To address extreme weather events, an emergency spillway will be maintained to safely pass the Inflow Design Flood while maintaining minimum freeboards requirements to protect the structural integrity of the dam. The Inflow Design Flood is generated by the theoretical maximum precipitation that could fall in the area.	-	✓	✓
	• The TMF closure spillway will be upgraded to meet closure requirements developed during detailed design.	-	-	✓

Table 7.3 Mitigation Measures for Surface Water Resources

Category	Mitigation	C	O	D
	• Vegetation will be cleared within the TMF tailings containment zone prior to filling/flooding to reduce potential generation of methyl mercury (MeHg) water quality concerns.	✓	✓	✓
	• Shallow groundwater seepage from the TMF will be intercepted by seepage collection ditches and pumped back to the TMF via sump pumps.	✓	✓	✓
	• Contact and process water from the TMF will be recycled for ore processing to the extent possible.	-	✓	-
	• The tailings deposition strategy to deposit thickened tailings as beaches will reduce porewater lock-up in comparison to sub-aqueous deposition and will reduce the quantity of porewater seepage in closure.	-	✓	✓
	• A water treatment plant will receive discharge water from the tailings pond and use proven processes to treat the water to meet MDMER limits prior to discharge to the polishing pond and subsequent discharge to the environment.	-	✓	-
	• A polishing pond will receive discharge from the water treatment plant to further advance the treatment of water prior to discharge to the environment.	-	✓	✓
	• Reclaim water will be taken from the TMF during Years 10 to 12 and will subsequently be pumped to Leprechaun pit as part of the tailings slurry for deposition. Using reclaim water from the TMF in the process plant will reduce the amount of freshwater needed to be taken from Victoria Lake Reservoir.	-	✓	-
Materials Handling and Waste Management	• Sewage effluent will be treated and monitored in accordance with the NL *Environmental Control Water and Sewage Regulations* prior to discharge to the environment. Sludge generated as a by-product of the treatment of sewage will be disposed off-site by a licensed contractor.	✓	✓	-
	• Temporary use of existing sanitary sewage system at the exploration camp will be supplemented with mobile sanitary sewage storage facilities until the mine site system is operational.	✓	-	-
Rehabilitation and Closure	• Progressive rehabilitation (e.g., placement of soil cover and vegetation over waste rock piles, erosion stabilization and temporary vegetation of completed organics, topsoil, and overburden stockpiles) will be implemented.	-	✓	✓
	• Passive water quality treatment technologies will be employed, where and if required, for closure / post-closure including engineered wetlands to treat site seepage and runoff, as practicable.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.4.2.3 Significance of Residual Effects

Surface Water Quantity

Expected mean annual flows (MAFs) were calculated for the 23 local watersheds overlapped by Project infrastructure during the construction, operation and closure phases of the Project. Where changes in mean annual flows (MAF) are projected to be less than 10%, no residual effect is anticipated. This is based on the assumption that a high level of ecological protection is provided when flow alterations are within 10% of the natural flow (Richter et al. 2011; DFO 2013). Where an increase of over 10% in MAF is predicted, increased flows during high flow events are considered a potential residual effect. Where a decrease of over 10% in MAF is predicted, decreased flows during low flow events (environmental flows) are considered a potential residual effect. Surface water quantity residual effects are considered significant if a change in MAF of over 10% is predicted at the boundary of the LAA for the Victoria River, Valentine Lake and Victoria Lake Reservoir. Changes in MAF of over 10% within local watersheds are considered to cause a potential localized residual effect, although not considered significant.

During the construction and operation phases, it is expected that 15 watersheds will maintain a MAF within 10% of, or above, pre-development conditions. Of the seven watersheds that experience a decrease in MAF of over 10%, environmental flows are expected to be maintained in all except four watersheds.

During the closure phase, it is expected that 13 watersheds will maintain a MAF within 10% of, or above, pre-development conditions. Of the nine watersheds that experience a decrease in MAF of over 10%, environmental flows are expected to be maintained in all except five.

During the post-closure phase, it is expected that 17 watersheds will maintain a MAF within 10% of, or above, pre-development conditions. Of the five watersheds that experience a decrease in MAF of over 10%, environmental flows are expected to be maintained in all except one for which the reduction in flow will be permanent.

At the LAA boundaries for the Victoria River, Valentine Lake and Victoria Lake Reservoir, with mitigation measures and environmental measures applied, changes in MAF are less than 10%, and residual water quantity changes are predicted to be not significant.

Surface Water Quality

The residual environmental effects on surface water quality are predicted to be not significant, as effluent water quality will be below MDMER limits at the final discharge points and no watershed management targets will be contravened. Local water quality immediately downstream of some final discharge points and points where seepage enters surface water will experience increases of POPC above baseline levels and CWQG-FAL. However, these changes are expected to be contained within the boundaries of the LAA and to be dissipated within 300 m of entering one of the three ultimate receiving waterbodies.

With mitigation and management measures, residual environmental effects on surface water resources are predicted to be not significant, given the Project is not predicted to result in:

- A change in surface water quantity of over 10% MAF at the boundaries of the LAA
- A change in surface water quality above baseline and CWQG-FAL beyond an identified mixing zone within each of the ultimate surface water receiving environments of the Project (Valentine Lake, Victoria River and Victoria Lake Reservoir)

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.5 FISH AND FISH HABITAT

7.5.1 Existing Conditions

The LAA has been subject to substantial changes in water flow since the late 1960s. Prior to 1969, Victoria Lake was part of the Exploits River watershed and flowed to Red Indian Lake via the Victoria River. In 1968, the Victoria Dam was constructed at the extreme northeastern end of the lake at the former outlet (Victoria River). The Victoria Canal was constructed in 1969 on the southern side of Victoria Lake Reservoir to divert water through hydroelectric generating stations for the Bay d'Espoir Hydro Electric Development. Due to these changes, Victoria Lake Reservoir is now part of the White Bear Watershed to the south of the Project. Prior to the creation of the Victoria Lake Reservoir, the surface area of Victoria Lake was approximately 4,200 ha. The surface area of Victoria Lake Reservoir is 16,660 ha. Valentine Lake is 820 ha in extent and drains into the Victoria River, which flows northeast to Red Indian Lake, through the Millertown Dam, and into the Exploits River. Valentine Lake and Victoria River are part of the Exploits River Watershed.

Fish habitat at the mine site was characterized in ponds, bog holes, lakes and streams. Ponds surveyed were estimated to have a maximum depth of 2 m and contain a high proportion of fines and low amounts of aquatic vegetation, with surface areas ranging from 0.5 to 26 ha. Habitat was shallow and generally poor for spawning, young of the year (YOY), juvenile, and adult life stages of brook trout and Atlantic salmon (ouananiche). However, habitat was more suitable for threespine stickleback.

Several bog holes surveyed within the proposed footprint of Project infrastructure were frozen to the bottom and were therefore assumed to not be fish habitat. Fishing effort at these bog holes resulted in no fish catches, demonstrating that the bog holes within the Project footprint do not support fish.

For Victoria Lake Reservoir, water depths in the reservoir are likely 35 m greater than pre-dam depths. Shorelines drop steeply in the lake, limiting the littoral zone, with shorelines consisting of rock and sand. The lake is naturally devoid of aquatic vegetation; however, the lake was found to contain generally suitable habitat for spawning, YOY, juvenile and adult life stages of brook trout, Atlantic salmon (ouananiche) and Arctic char. For Valentine Lake, with a maximum water depth of 25.4 m, suitable habitat was determined to be present based on the depth preferences of brook trout, threespine stickleback and Atlantic salmon (ouananiche).

The streams that were surveyed within the Aquatic Survey Area (which included the mine site and areas immediately adjacent), were generally small (<5 m), shallow (<0.5 m), and slow flowing (<0.2 m/s). First order, low gradient streams that flowed through bog or wetland habitats were generally characterized by shallow flats with slow / negligible velocities, and fine grain substrates. The lower reaches of streams were generally more riffle / run habitat, associated with increased gradient and velocities, coarser substrates, well-defined channels, and generally permanent flow characteristics. Habitat quality in streams was highly variable. First order streams that drained wetlands were generally poor for spawning, YOY, juvenile and adult life stages of brook trout and Atlantic salmon (ouaninache) due to the large quantity of fine grain substrates, while providing more suitable habitat for threespine stickleback. Rocky reaches of streams provided suitable habitat for spawning and rearing habitat for YOY, juvenile and adult life stages of brook trout. Higher order streams with gravel and cobble substrates provided spawning habitat and rearing habitat for YOY and juvenile Atlantic salmon (ouaninache). Suitable fish habitat was also found at several proposed stream crossing locations.

In general, the surface water quantity and quality in the LAA is within the acceptable ranges for supporting cold water fish communities, with mean discharges ranging from 0.004 m^3/s to 0.352 m^3/s throughout the year. Mean monthly flows were found to be highest in June and July, with the lowest flows occurring in October and November, with some streams becoming intermittent, due to low flows. In pond, lake and stream sediments, there were no exceedances of the Canadian Sediment Quality Guideline Probable Effects Limits except for arsenic which was above the guidelines. In NL, naturally high arsenic levels are not uncommon and are influenced by bedrock geology, surficial and chemical processes and proximity to areas of mineralization (particularly copper and gold) (Serpa et al. 2009).

The lakes and ponds in the Aquatic Study Area were characterized by generally low primary productivity (i.e., the production of chemical energy into organic compounds by living organisms), while streams were characterized as having low to moderate primary productivity. Secondary productivity, characterized based on benthic invertebrate community descriptors; showed that density (number of individuals per m^2) was variable in ponds, lakes and streams; even within similar habitat types. Species evenness (a measure of how diverse a benthic community is) was low in ponds and moderate in lakes, while benthic invertebrate community diversity was moderate in both ponds and lakes. Overall, the benthic invertebrate communities were representative of unimpacted aquatic habitat.

There are no aquatic SAR known to occur with the Project Area, LAA or RAA.

7.5.2 Environmental Effects

7.5.2.1 Changes to the Environment

The potential environmental effects of the Project on fish and fish habitat prior to mitigation include:

- Changes in fish habitat quantity due to changes to the watershed area, fish passage, or alterations to streams (dewatering / infilling)
- Changes to fish habitat quality due to changes to the riparian area, watershed area, water quality, flows or equipment use in / near water.

- Changes to fish health and survival due to changes in water quality, placement of Project infrastructure, blasting, increased fishing pressure, and water extraction

The primary Project-related effects on fish and fish habitat will include the direct loss of fish habitat associated with pit development and the construction of mine infrastructure, changes to local drainage areas due to construction of stockpiles and open pits, dewatering during operation and flooding during closure of the open pits, and the introduction of treated contact water into the receiving environment through selected discharge points and indirectly through seepage.

For changes to fish health and survival, construction timing could have an effect should timing of activities occur during sensitive timing windows (i.e. during spawning or high rainfall) which could impact the survival of eggs. Indirect effects to fish health and survival could also occur (i.e. injury) during in-water construction activities or if access to critical habitats becomes blocked. Other activities which could impact fish health and survival during construction include de-watering, introductions of deleterious substances, removal of riparian vegetation which could increase predation, the use of explosives, and increased fishing pressures. During operation, similar effects could occur along with indirect effects due to water extraction and alteration of groundwater flows due to open pit mining. During decommissioning, effects will potentially result from filling the open pits which could strand fish in areas where stream flows have been reduced. Indirect effects could also occur if fish habitat quality is affected. If the pit lake turns over, water that discharges may affect fish health and survival by reducing levels of dissolved oxygen and introducing elevated concentrations of metals (Jennings et al. 2008).

7.5.2.2 Mitigation Measures

The mitigation measures presented Table 7.4 are proposed to avoid or reduce Project-related effects on fish and fish habitat.

Table 7.4 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Standard construction practices will be used, such as erosion and sediment control measures, placement and stabilization of excavated material, and seepage cutoff collars (pipes and culverts).	✓	-	-
	• Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Progressive erosion and sediment control measures will be implemented, as required.	✓	-	-
	• Where waste rock will be used for site earthworks and grading during construction and operational development, necessary test work will be conducted to avoid potentially acid generating materials from being used in construction.	✓	-	-
	• Cross drainage will be maintained to allow water to move freely from one side of the road to the other in areas of permanent or temporary access roads.	✓	✓	-

Table 7.4 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
	• Movement of equipment / vehicles will be restricted to defined work areas and roads, and specified corridors between work areas.	✓	✓	✓
Soil Management	• Soil stockpiles will be easily accessible, on well-drained ground, and away from bodies of water (minimum of 30 metres) and standing timber. A working space of at least 5 metres will be maintained around soil stockpiles.	✓	✓	-
	• Sediment control fences will be installed in areas where topsoil is exposed to erosion and siltation, such as slopes and embankments and approaches to stream crossings or water bodies. Sediment control fences will be inspected and maintained over the course of the construction phase until the disturbed area has stabilized and natural revegetation has occurred. Non-biodegradable materials used for Sediment control fences will be removed following revegetation.	✓	✓	✓
Works In or Near Fish Habitat	• In-water work will be planned to respect DFO timing windows to protect fish in Newfoundland and Labrador (DFO 2019).	✓	-	-
	• Siting of Project infrastructure will be designed to avoid fish habitat to the extent practicable. Where Harmful Alteration, Disruption or Destruction (HADD) of fish habitat cannot be avoided, the habitat will be offset, as required by the *Fisheries Act*, through the development and implementation of a Fish Habitat Offsetting Plan.	✓	-	-
	• Waste material (i.e., organic waste material, waste rock or construction debris) material will be stabilized or contained.	✓	✓	✓
Works In or Near Fish Habitat	• Weather advisories will be followed, and work will be scheduled to avoid high precipitation and runoff events or periods, which could increase potential for erosion/sedimentation.	✓	-	✓
	• The duration of instream works will be minimized. In-water worksites will be isolated from flowing water (i.e., by using a cofferdam) to contain or reduce suspended sediment where possible. Clean, low permeability material and rockfill will be used to construct cofferdams. When possible, machinery will be operated above the high-water mark or inside of isolated areas.	✓	-	-
	• Minimum flows will be maintained in watercourses where practicable. Where HADD of fish habitat cannot be avoided, habitat alternation, disruption or destruction will be offset. New culverts will be sized appropriately and designed to be passable to fish to maintain fish passage as described in Chapter 2.	✓	-	-
	• Use of explosives in or near water will be avoided, however, if required, will follow DFO blasting guidelines.	✓	-	-

Table 7.4 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
	• Best efforts will be made by a qualified environmental professional to relocate fish from areas of in-water works or areas of water drawdown to an appropriate location in the same watershed.	✓	-	-
	• Fish screens and/or other barriers will be installed and maintained to prevent fish from entering water withdrawal intakes.	✓	✓	✓
Air Emissions	• An Air Quality Management Plan will be developed and implemented as part of the EPP. The Air Quality Management Plan will specify the mitigation measures for the management and reduction of air emissions (including fugitive dust) during Project construction and operation.	✓	✓	✓
Vehicles / Equipment / Roads	• Haul roads, site roads and the access road will be maintained in good condition. This will include periodically regrading and ditching to improve water flow, reduce erosion, and to manage vegetation growth.	✓	✓	✓
Site Water Management	• Marathon will implement a Water Management Plan for the site which will incorporate standard management practices, including drainage control, excavation and open pit dewatering which collectively comprise the water management infrastructure currently designed as part of the Project scope. The Water Management Plan provides detail on runoff and seepage collection strategies and systems (e.g., local seepage collection ponds, berms, drainage ditches, pumps) to collect and contain surface water runoff and groundwater discharge from major Project components (open pit, waste rock piles, TMF, ore stockpile and overburden storage areas, process plant) during climate normal and extreme weather conditions.	✓	✓	✓
	• Progressive water management will be implemented over the life of the mine. This includes construction of water management infrastructure as an area is developed and decommissioning / rehabilitation of water management infrastructure as an area is decommissioned.	✓	✓	✓
	• Existing drainage patterns will be maintained to the extent feasible with the use of culverts and bridges.	✓	✓	-
	• Project water storage features (i.e., sedimentation ponds) will be used to attenuate peak discharges to the environment.	✓	✓	✓
	• Precipitation runoff from waste rock piles and other developed areas of the site will be collected via ditches and channels and directed to downstream sedimentation ponds.	✓	✓	-
	• Site ditching will be designed to reduce erosion and sedimentation through use of rock check dams, silt fences, plunge pools, and grading as appropriate.	✓	✓	✓
	• Snow will be cleared from ditches prior to the spring thaw, as practicable, to maintain the designed capacity of ditches and ability to convey surface runoff.	✓	✓	-

Table 7.4 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
	• Culverts will be inspected periodically to remove accumulated material and debris upstream and downstream of the culverts.	✓	✓	✓
	• Contact water collection ditches will be installed around the overburden stockpiles, ore stockpiles and waste rock piles to collect toe seepage. Contact water collection ditches will be designed to convey the 1:100-year storm event, and with positive gradients to limit standing water and maintain positive flow.	✓	✓	✓
	• Non-contact water will be diverted away from developed areas, where possible. Channels and berms will be constructed around the crest of the open pits or uphill of waste rock piles and other developed areas to divert natural precipitation and surface runoff away from contact with mining operations, where practicable.	✓	✓	✓
Site Water Management	• Runoff and groundwater seepage will be collected from the open pits, with water pumped to sedimentation ponds before being discharged to each pits' pre-development watershed area.	-	✓	-
	• Pond inlet and outlet structures will be configured to reduce inlet velocity and scour, and to meet sedimentation requirements. Pond outlets will be designed with subsurface inlets to mitigate against chemical stratification in ponds, thermal heating of discharge and ice blockage of outlets.	✓	✓	✓
	• Contact water sedimentation ponds will be designed to provide onsite storage of local runoff with the size and residence times designed to provide sediment removal to meet the MDMER effluent total suspended solids criterion of 15 mg/L (monthly mean concentration limit), with removal of particles down to 5 micron (µ) in size for up to the 1:10 Annual Exceedance Probability (AEP) flows.	✓	✓	✓
	• Sedimentation ponds will be designed to contain (without discharge) runoff resulting from storm events up to the 1:100 year AEP with spring snowmelt event, including emergency spillways and maintaining minimum freeboard of 0.5 m. The emergency spillways will accommodate flows up to the 1:200 AEP flow.	✓	✓	✓
	• Sedimentation ponds will be designed with active water storage that considers ice thickness during winter. Under an extreme storm event, only the stormwater in excess of the available storage at that time will be discharged to the environment via the emergency spillway to protect the collection ponds.	✓	✓	✓
	• Effluent will be treated prior to discharge to the receiving water environment, as required, to meet regulatory effluent criteria as well as criteria developed through the receiving water Assimilative Capacity Assessment.	✓	✓	✓
	• Effluent discharge rates will be maintained to below the highest rate used in the Assimilative Capacity Assessment.	✓	✓	✓

Table 7.4 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
Tailings Management	• The dams required for the tailings impoundment will be designed, constructed, operated and closed in accordance with the Canadian Dam Association (CDA) and Mining Association of Canada guidelines, Global Industry Standards on Tailings Management, as well as all applicable provincial requirements.	✓	✓	✓
	• Vegetation will be cleared within the TMF tailings containment zone prior to filling/flooding to reduce potential generation of methyl mercury (MeHg) water quality concerns.	✓	✓	✓
Tailings Management	• Shallow groundwater seepage from the TMF will be intercepted by seepage collection ditches and pumped back to the TMF via sump pumps.	✓	✓	✓
	• Cyanide detoxification within the mill using the sulphur dioxide / air oxidation process will result in the degradation of cyanide and precipitation of metals prior to discharge to the TMF.	-	✓	-
	• A water treatment plant will receive discharge water from the tailings pond and use proven processes to treat the water to meet MDMER limits prior to discharge to the polishing pond and subsequent discharge to the environment.	-	✓	-
	• As required by MDMER, a tailings / effluent emergency response plan will be developed, which will outline how a failure or malfunction of the TMF resulting in a release of tailings or tailings effluent will be managed.	-	✓	-
Materials Handling and Waste Management	• Sewage effluent will be treated and monitored in accordance with the NL *Environmental Control Water and Sewage Regulations* prior to discharge to the environment. Sludge generated as a by-product of the treatment of sewage will be disposed off-site by a licensed contractor.	✓	✓	-
	• Temporary use of existing sanitary sewage system at the exploration camp will be supplemented with mobile sanitary sewage storage facilities until the mine site system is operational.	✓	-	-
	• Reagents will be stored and handled within containment areas designed to hold more than the content of the largest tank, in the event of a leak or spill. Where required, each reagent system will be located within its own containment area to avoid mixing of incompatible reagents. Storage tanks will be equipped with level indicators, instrumentation, and alarms to prevent spills.	-	✓	-
	• Fuel will be obtained from a licensed contractor who will be required to comply with federal and provincial regulations including federal *Sulphur in Diesel Fuel Regulations*, and provincial *Storage and Handling of Gasoline and Associated Products Regulations.*	✓	✓	✓

Table 7.4 Mitigation Measures: Fish and Fish Habitat

Category	Mitigation	C	O	D
	• Fuel and hazardous materials storage on site will be a minimum of 200 m from a salmon river or tributary and 100 m from other waterbodies.	✓	✓	✓
	• Disposal and handling of waste oils, fuels and hazardous waste will be as recommended by the suppliers and/or manufacturers in compliance with federal, provincial and municipal regulations.	✓	✓	✓
Materials Handling and Waste Management	• Fuels and lubricants will be stored according to regulated containment methods in designated areas. Refueling, servicing, and equipment and waste storage will not take place within 30 m of watercourses to reduce the likelihood that deleterious substances will enter watercourses. Spill kits will be maintained at locations on-site during all Project phases.	✓	✓	✓
Employment and Expenditures	• 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.	✓	✓	✓
Rehabilitation and Closure	• Marathon will develop a Rehabilitation and Closure Plan that meets the requirements of the NL Department of Industry, Energy and Technology, Department of Environment, Climate Change, and Municipalities, and Department of Fisheries, Forestry and Agriculture. The plan will be reviewed and updated regularly until implemented.	✓	✓	✓
Rehabilitation and Closure	• At closure, following water quality testing, sedimentation ponds will be breached to allow drainage to the surrounding areas. These features will then be graded, contoured to re-establish drainage patterns and revegetated as required.	-	-	✓
	• Pre-mining site drainage patterns will be re-established to the extent practicable.	-	-	✓
	• Passive water quality treatment technologies will be employed, where and if required, for closure / post-closure including engineered wetlands to treat site seepage and runoff, as practicable.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.5.2.3 Significance of Residual Effects

Residual Project-related effects on fish habitat quantity are reduced through the application of best practices in accordance with DFO's "Measures to Protect Fish and Fish Habitat". Where residual adverse effects remain, these must be counterbalanced by offsetting through an authorization pursuant to the *Fisheries Act*, which will aim for a net gain of fish habitat. It was determined that changes to stream flow may occur in all Project phases. Streams with decreases in mean annual flow greater than 10% were

considered to result in adverse effects to fish habitat. With standard mitigation, and based on the existing Project design, the Project is conservatively anticipated to result in the direct and indirect loss of 183,537 m^2 of fish habitat (habitat alteration, disruption or destruction (HADD) of fish habitat requiring authorization under the *Fisheries Act)* within the LAA. The potential HADD associated with the access road has not yet been determined. Of the fish habitat lost, 30% is used by salmonids to carry out their life processes, with the remaining 70% used by sticklebacks. Overall, the effects to fish habitat are not expected to affect sustainability and productivity of the fisheries, and fish habitat loss will be offset with habitat of similar quality, and equal or higher quantity.

Residual Project-related effects to fish habitat quality are anticipated to be low in magnitude with the application of best practices in accordance with DFO's *Measures to Protect Fish and Fish Habitat* and given that discharges will be authorized and in compliance with applicable regulatory requirements. The assessment of residual Project-related effects to fish habitat quality as a result of emissions, discharges and wastes released into the aquatic environment are reliant on the results of the Assimilative Capacity Model completed in support of the Surface Water Resources VC (Section 7.4).

The residual environmental effects on surface water quality are predicted to be not significant, as effluent water quality will be below MDMER limits at the final discharge points and no watershed management targets will be contravened. Local water quality immediately downstream of some final discharge points and points where seepage enters surface water will experience increases of POPC above baseline levels and CWQG-FAL. However, these changes are expected to be contained within the boundaries of the LAA and to be dissipated within 300 m of entering one of the three ultimate receiving waterbodies. 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 negligible to low, given that prior to flooding, the TMF will be cleared to reduce the potential for methylmercury production and water collected in the TMF will be treated prior to release to meet authorized limits.

Residual Project-related effects to fish health and survival due to construction and installation of structures are not expected to occur since these structures will be designed to avoid impingement and entrainment of fish and to allow fish passage. Fish rescue will occur prior to construction of these works. Residual effects on fish survival due to increased angling by Project employees will not occur as prohibitions will be in place for all stages of the Project. Workers will not be permitted to fish on the mine site and will not be permitted to bring angling gear to site. During operation, effects related to water-based discharges are not expected to result in direct mortality of fish because water will be managed and treated to meet authorized limits prior to discharge. Sublethal effects that could compromise fish health are not expected since POPCs in effluents are expected to meet the CWQG-FAL at the discharge point or within a short distance of mixing (i.e., within 300 m) in the receiving environment. Use of explosives in or near water will be avoided and, if required, will follow DFO blasting guidelines. This approach is expected to result in few, if any, fish mortalities in nearby waterbodies. During decommissioning, rehabilitation and closure, the surface water layer of the pit lakes is expected to be well oxygenated. Given that discharge is predicted to meet MDMER limits, residual adverse effects on fish health and survival resulting from release of deleterious substances during this Project phase are anticipated to be negligible to low. To reduce the potential for stranding of fish during filling of the open pits during

decommissioning, water will be sourced from areas where withdrawal should not cause stranding, and stream flows will be monitored.

With mitigation and management measures, residual environmental effects on fish and fish habitat are predicted to be not significant, given the Project is predicted to not result in:

- 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
- An unauthorized Project-related alteration of fish habitat
- A change to the productivity or sustainability of fish populations or fisheries within the LAA where recovery to baseline is unlikely

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.6 VEGETATION, WETLANDS, TERRAIN AND SOIL

7.6.1 Existing Conditions

The Project is located within the Central Newfoundland Forest Ecoregion (NLDFLR, 2019a). The Project Area and LAA are also entirely within the Red Indian Lake Subregion. This subregion is dominated by Balsam fir, paper birch, and black spruce. Some rich, somewhat productive soils are present in this subregion, although these can succeed to alder (*Alnus* spp.) thickets following disturbances such as logging and fire (NLDFLR 2019b). The RAA extends into the Long Range Barrens Ecoregion to the north and the Maritime Barrens Ecoregion to the south (NLDFLR 2019a). The Ecological Land Classification (ELC) study identified 14 ecotypes in the ELC Area (ELCA) an 1,830.6 km^2 area. In the ELC, balsam fir forest, black spruce forest, kalmia-black spruce woodland (kalmia-black spruce forest and kalmia heath), mixedwood forest, regenerating forest, and alder thicket were considered forested ecosystem units; riparian thicket was listed as a riparian ecosystem unit; and wet coniferous forest, shrub / graminoid fen, and shrub bog were classified as wetland ecosystem units. The remaining three ecosystem units (exposed sand / gravel shoreline, open water and anthropogenic) were grouped as ‘sparsely vegetated, naturally non-vegetated, and anthropogenically altered / disturbed’ ecosystem units.

Through three field surveys, 290 vascular plant species were observed within the Project Area and adjacent portions of the LAA. No vascular plant SAR were observed during the surveys conducted in support of the Project. Several vascular plant SOCC were observed including:

- Short-scale sedge (S2)
- Nodding water nymph (S2)
- Perennial bentgrass (S2)

Of the species recorded during past work completed in support of the Project, 38 were determined to be exotic, or not native to the Island of Newfoundland. Of these 38 species, most are ruderal species that are typically found along roadsides or in other disturbed habitats and are not considered invasive. Although there is no official list of invasive species for Newfoundland and Labrador, four species have potential to be invasive, based on their growth form and status in other parts of the Atlantic Provinces:

- Reed canary grass (*Phalaris arundinacea*)
- Creeping buttercup (*Ranunculus repens*)
- Coltsfoot (*Tussilago farfara*)
- Broad-leaved cattail (*Typha latifolia*)

The Red Indian Lake Subregion, where the Project Area and LAA are located, consists of rolling hills, dense forest and organic deposits occurring in valleys and basins. Terrain (i.e., topography and landforms) varies across the LAA ranging from boggy areas, thin to thick till layers to bedrock outcrops. Soils across the LAA are complexes of organic and mineral soils reflecting the underlying topography. Elevation within the Project Area (which includes the access road) ranges from 160 m above sea level (m asl) to 437 m asl. The landscape is characterized by upland forests and interspersed lowlands (i.e., wetlands and peatlands and treed wetlands), and open water habitats. Scattered wetlands (specifically patterned fens and bogs) are common in the LAA and Project Area and occupy 280.3 km^2 (15.3%) of the ELCA. Based on the descriptions of ecotypes in the ELCA and the nationally accepted definition of wetlands [National Wetlands Working Group (NWWG) 1997], the majority of both alder thicket and riparian thicket are likely wetlands, and wetlands are present within black spruce forest and likely other forest types, although typically in localized areas that are difficult to differentiate using remote sensing. Therefore, the percentage of wetland within the Project Area and LAA is likely over 30%, rather than 22.4%, as indicated by the results of the ELC.

In the LAA and the Project Area, morainal deposits, or till, is the most commonly mapped parent material covering approximately 70% of the LAA and approximately 67% of the Project Area. Organic deposits were mapped as the dominant parent material for 13% of the LAA and 20% of the Project Area. Bedrock was mapped intermittently throughout the LAA and was primarily associated with hummocks and upper elevation ridge areas. Other less frequently mapped deposits include colluvial, fluvial, glaciofluvial, lacustrine, anthropogenic deposits along with bedrock and weathered bedrock.

For terrain stability, based on a review of the site topography and geological conditions (overburden and bedrock) for the Project Area, the potential for issues related to terrain stability is low. Slow mass movement (i.e., soil creep) was noted as the most common geomorphological process; however, areas with this process were not identified in spatial data. There are no recorded cases of landslides in the Project Area (NLDNR 2020c), and there is no evidence of landslide deposits in the Project Area based on spatial and field data (Stantec 2015). Subsidence related terrain stability concerns are also considered low for the Project Area, based on the low seismic hazard risk and the absence of subsidence-prone overburden soil types. Upland or mineral soils, and organic / wetland soils are common through the LAA and Project Area, representing the varied topography of the underlying bedrock, depth of surficial materials and drainage conditions.

For soil rehabilitation suitability, in general, the majority of the Project Area consists of upland forested ecosystem soils with variable ratings from Poor to Fair rehabilitation soil suitability ratings (i.e., shallow soils associated with bedrock), to Fair to Good for thick soils located along valley bottoms with minimal coarse fragments, medium textures and productive soil chemistry conditions.

7.6.2 Environment Effects

7.6.2.1 Changes to the Environment

The potential environmental effects of the Project on vegetation, wetlands, terrain and soils prior to mitigation include:

- Change in vegetation species diversity due to direct habitat loss or indirect changes such as to abiotic factors, habitat, or competition from invasive plants
- Change in community diversity due to direct habitat loss or indirect abiotic changes
- Change in wetland function due to direct disturbance or hydrological effects
- Change in terrain from loss of unique landforms, and terrain instability from destabilizing surficial materials along slopes and changes to drainage / slope hydrology Changes in soil quality from compaction, admixing, stockpiling and soil storage and soil contamination
- Changes in soil quantity from soil handling, transport, burial, and erosion

During construction, changes to vegetation species diversity will occur primarily through direct loss of vascular plant species (including any SAR or SOCC that may be present) as a result of mine site preparation and earthworks activities and vegetation clearing associated with access road upgrades. The removal of vegetation can also have indirect interactions on adjacent areas through edge effects, which may increase available light, temperatures, and access for herbivores. Project-related transportation can affect species diversity by introducing invasive or exotic species and through dust deposition. Emissions, discharges and wastes from the Project will include stormwater and runoff from construction areas. These changes may be extensive enough to affect plant species that cannot tolerate the changed hydrologic conditions. During operation, the use of excavated rock for engineered backfill may result in a change in soil characteristics, such as texture and chemistry, thereby influencing which plants may recolonize disturbed areas adjacent to the access road. During decommissioning, rehabilitation and closure, progressive and closure rehabilitation are expected to allow vegetation to recolonize most of the Project Area so that, over time, succession to natural plant communities will occur.

Changes to community diversity can result from direct loss of vegetation communities associated with construction. Water that is diverted as a result of Project activities can alter the hydrology of areas outside of the Project Area, potentially affecting plant species that cannot tolerate the changed hydrologic conditions and resulting in a change to the overall area of wetland or to wetland class or type. During operation, the use of excavated rock for engineered backfill, may result in a change in soil characteristics, thereby influencing which plants and plant communities may recolonize those areas. During decommissioning, rehabilitation and closure, it is expected that rehabilitation activities will affect community diversity as plants recolonize rehabilitated portions of the Project Area and form regenerating communities.

During construction, Project activities could result in the direct disturbance of wetlands or changes in wetlands indirectly through changes in hydrology. Clearing will remove trees and shrubs and damage understory vegetation, changing wetland types and area. Loss of wetland habitats will also reduce the carbon sequestration function of the Project Area. During the construction phase, water management and erosion control structures, in addition to clearing, infilling, and discharges may also alter hydrological outputs and inputs to wetlands outside the Project Area in the LAA, resulting in a change in wetland area, wetland class or type, or change in associated wetland function. Edge effects can also affect wetlands, as a result of site preparation and other clearing. During operation, access road maintenance has the potential to alter soil fertility and structure in adjacent wetlands. Groundwater drawdown and discharges during operation may also alter hydrological inputs and outputs of wetlands. During decommissioning, rehabilitation, and closure, plants will recolonize rehabilitated portions of the Project Area, and pre-Project drainage patterns will be re-established, where practicable. This may facilitate the re-establishment and development of wetlands within and adjacent to the Project Area.

For changes in soil quantity and quality, during construction, Project activities have the potential to result in a direct loss or alteration due to ground disturbance and vegetation clearing. Removal of soil from its native context during site clearing and stockpiling activities has the potential to disrupt natural chemical and biological processes. During construction, equipment use can cause compaction, admixing and rutting of surface soils, and result in dust emissions, altering soil chemistry. During decommissioning, rehabilitation, and closure, ground disturbance and Project-related traffic are the primary pathways causing effects on soil quantity and quality.

For changes in terrain and terrain stability, construction activities (i.e., blasting, grading, stockpiling) may result in changes to due to destabilizing surficial materials along slopes, changes to drainage / slope hydrology and creation of steep, unstable terrain conditions, which may result in exposed soils and loss of consolidation, increased bank erosion / channel incision along watercourses and steep terrain (berm, waste rock piles). These changes may also increase the potential for mass movement processes to occur. During operation, management of tailings, overburden, waste rock, and road use / maintenance also have the potential to result in similar effects as construction. During decommissioning, rehabilitation and closure, activities include the re-distribution of salvaged soils and recontouring, which also have the potential to result in mass movement events.

7.6.2.2 Mitigation Measures

The mitigation measures presented in Table 7.5 are proposed to avoid or reduce Project-related effects on vegetation, wetlands, terrain and soils.

Table 7.5 Mitigation Measures: Vegetation, Wetlands, Terrain and Soils

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• The boundaries of areas to be cleared will be well marked prior to the start of clearing activities.	✓	-	-
	• Sensitive areas (e.g., wetlands, hibernacula, mineral licks, roosts, caribou migration corridors) will be identified prior to construction and appropriate buffers will be flagged and maintained around these areas, where feasible.	✓	-	-
	• Existing riparian vegetation will be maintained to the extent practicable.	✓	-	-
	• Vegetation will be maintained around high activity areas to the extent practicable, to act as a buffer to reduce sensory (light and noise) disturbance.	✓	-	-
	• Clearing for road construction will be limited to the width required for road embankment, drainage requirements, and safe line of sight requirements. Trees will be cut close to ground level, and only large tree stumps will be removed, where practicable. Low ground shrubs will be left in place for soil stability and erosion protection purposes.	✓	-	-
Site Clearing, Site Preparation and Erosion and Sediment Control	• Vegetation will be removed from development areas in accordance with cutting permits.	✓	-	-
	• Standard construction practices will be used, such as erosion and sediment control measures, placement and stabilization of excavated material, and seepage cutoff collars (pipes and culverts).	✓	-	-
	• Construction areas will be routinely monitored to identify areas of potential erosion and to apply appropriate mitigation. Progressive erosion and sediment control measures will be implemented, as required.	✓	-	-
	• Where crossing of wetlands beyond the area to be cleared is unavoidable, protective layers such as matting or biodegradable geotextile and clay ramps or other approved materials will be used between wetland root / seed bed and construction equipment if ground conditions are encountered that create potential for rutting, admixing or compaction.	✓	-	-
	• To reduce the risk of introducing or spreading exotic and/or invasive vascular plant species, equipment will arrive at the Project site clean and free of soil and vegetative debris. Equipment will be inspected by Marathon personnel or designate and, if deemed to be in appropriate condition, will be approved for use. Equipment that does not arrive at the Project site in appropriate condition will not be allowed on the construction footprint until it has been cleaned, re-inspected and deemed suitable for use.	✓	-	-
	• Quarried, crushed material will be used for road building in and near wetlands, to reduce the risk of introducing or spreading exotic and/or invasive vascular plant species.	✓	-	-
	• Merchantable timber will be salvaged and used, or it will be made available to local communities for fuelwood.	✓	-	-
	• Construction materials (soils and rock) will not be sourced from locations known to contain invasive plant species.	✓	-	-

Table 7.5 Mitigation Measures: Vegetation, Wetlands, Terrain and Soils

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Environmental personnel responsible for site monitoring during construction will receive training to recognize species of conservation concern (SOCC) that may be present in Project Area.	✓	-	-
	• Known occurrences of plant SOCC will be avoided. If avoidance of plant SOCC is not possible, seed collection or transplant of the plant will be considered in consultation with the applicable regulators.	✓	-	-
	• Grading will be directed away from wetlands, where possible, and will be reduced within wetland boundaries unless required for site specific purposes.	✓	-	-
	• Ground level cutting / mowing / mulching of wetland vegetation will be conducted instead of grubbing, where practicable.	✓	-	-
Site Clearing, Site Preparation and Erosion and Sediment Control	• Slope stability will be considered with respect to the development of Project infrastructure, and if required a slope stability assessment will be conducted for areas where risks may exist. Where possible, construction in areas with potentially unstable terrain will be avoided. Where avoidance is not possible, best management practices will be implemented which may include: – Reduction of slope gradient with grading or terracing – Slope stabilization methods: retaining wall, drainage management, etc. – Geotextiles, wire mesh, shotcrete to manage erosion and rockfall potential – Revegetating soil slopes as soon as possible	✓	-	-
	• Cross drainage will be maintained to allow water to move freely from one side of the road to the other in areas of permanent or temporary access roads.	✓	✓	-
	• Movement of equipment / vehicles will be restricted to defined work areas and roads, and specified corridors between work areas.	✓	✓	✓
	• Native seed mix (free of non-native, invasive, and weed species) and native species (where available) will be used as erosion control on exposed soils and overburden stockpiles and during site rehabilitation.	✓	✓	✓
	• The requirement for broad-spraying of herbicide is not anticipated; spot-spraying may be required on occasion. If broad-spraying of herbicides is required, it will not be conducted within 30 m of plant SOCC, wetlands or waterbodies.	✓	✓	-
Soil Management	• During excavation, organic and mineral topsoil will be separated from cleared trees and brush and stored for future use during rehabilitation.	✓	-	-
	• Care will be taken to reduce topsoil and subsoil mixing during excavation.	✓	-	-
	• Soil salvage will occur during appropriate weather conditions (avoiding high winds and dry conditions) as practicable. Appropriate machinery will be used for salvage to avoid compaction.	✓	-	-
	• Organic and mineral topsoil will be stored and kept separate from subsoil or rock material used for construction.	✓	✓	-

Table 7.5 Mitigation Measures: Vegetation, Wetlands, Terrain and Soils

Category	Mitigation	C	O	D
Soil Management	• Soil stockpiles will be easily accessible, on well-drained ground, and away from bodies of water (minimum of 30 metres) and standing timber. A working space of at least 5 metres will be maintained around soil stockpiles.	✓	✓	-
	• Topsoil and organics will be stored in stable piles to decrease compaction effects.	✓	✓	-
	• Soil stockpiles will be constructed and maintained in lifts to achieve flatter slopes and permit terracing to reduce erosion and maintain moisture within the topsoil.	✓	✓	-
	• Longer term stockpiles will be seeded to reduce erosion due to wind and precipitation.	✓	✓	-
	• Marathon will develop and implement a Soil and Rock Management Plan as part of the Environmental Protection Plan, which will outline management practices for handling of overburden / soils and associated stockpiles. Soil management will also be conducted in accordance with the Rehabilitation and Closure Plan.	✓	✓	✓
	• Sediment control fences will be installed in areas where topsoil is exposed to erosion and siltation, such as slopes and embankments and approaches to stream crossings or water bodies. Sediment control fences will be inspected and maintained over the course of the construction phase until the disturbed area has stabilized and natural revegetation has occurred. Non-biodegradable materials used for Sediment control fences will be removed following revegetation.	✓	✓	✓
Air Emissions	• An Air Quality Management Plan will be developed and implemented as part of the EPP. The Plan will specify the mitigation measures for the management and reduction of air emissions during Project construction and operation.	✓	✓	✓
	• Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage by means of vegetating or covering the exposed surfaces.	✓	✓	-
Vehicles / Equipment / Roads	• Haul roads, site roads and the access road will be maintained in good condition. This will include periodically regrading and ditching to improve water flow, reduce erosion, and to manage vegetation growth.	✓	✓	✓
	• Vehicles will use existing roads / trails while operating at the mine site. All-terrain vehicles used by Marathon personnel will also be restricted to existing roads, trails and corridors to the extent possible.	✓	✓	✓
Site Water Management	• Marathon will implement a Water Management Plan for the site which will incorporate standard management practices, including drainage control, excavation and open pit dewatering which collectively comprise the water management infrastructure currently designed as part of the Project scope. The Water Management Plan provides detail on runoff and seepage collection strategies and systems (e.g., local seepage collection ponds, berms, drainage ditches, pumps) to collect and contain surface water runoff and groundwater discharge from major Project components (open pit, waste rock piles, TMF, ore stockpile and overburden storage areas, process plant) during climate normal and extreme weather conditions.	✓	✓	✓

Table 7.5 Mitigation Measures: Vegetation, Wetlands, Terrain and Soils

Category	Mitigation	C	O	D
Site Water Management	• Existing drainage patterns will be maintained to the extent feasible with the use of culverts and bridges.	✓	✓	-
	• Site ditching will be designed to reduce erosion and sedimentation through use of rock check dams, silt fences, plunge pools, and grading as appropriate.	✓	✓	✓
	• Culverts will be inspected periodically to remove accumulated material and debris upstream and downstream of the culverts.	✓	✓	✓
	• A maintenance schedule will be developed and implemented to provide for regular maintenance and inspection of site water management infrastructure, including culverts.	✓	✓	✓
Materials Handling and Waste Management	• Waste will be transported from site to be recycled, reused or disposed of in licensed / approved facilities. Non-reusable and non-recyclable wastes will be sent to the provincial waste management facility in Norris Arm, and reuse / recycling materials will be sent to the nearest management facility for each material type.	✓	✓	✓
	• Fuels and lubricants will be stored according to regulated containment methods in designated areas. Refueling, servicing, and equipment and waste storage will not take place within 30 m of watercourses to reduce the likelihood that deleterious substances will enter watercourses. Spill kits will be maintained at locations on-site during all Project phases.	✓	✓	✓
Rehabilitation and Closure	• Marathon will develop a Rehabilitation and Closure Plan that meets the requirements of the Department of Industry, Energy and Technology, Department of Environment, Climate Change, and Municipalities, and Department of Fisheries, Forestry and Agriculture. The plan will be reviewed and updated regularly until implemented.	✓	✓	✓
	• The volume of soils required for rehabilitation activities will be assessed, and a materials (soils) balance will be developed for the overall Project to ensure that sufficient soils are available for rehabilitation.	✓	✓	✓
	• Native seed mix (free of non-native, invasive, and weed species) and native species (where available) will be used as erosion control on exposed soils and overburden stockpiles and during site rehabilitation.	✓	✓	✓
	• Progressive rehabilitation (e.g., placement of soil cover and vegetation over waste rock piles, erosion stabilization and temporary vegetation of completed organics, topsoil, and overburden stockpiles) will be implemented.	-	✓	✓
	• Pre-mining site drainage patterns will be re-established to the extent practicable.	-	-	✓
	• Disturbed areas will be graded and/or scarified, covered with overburden and organic materials, where required, and seeded with native seed mix to promote natural plant colonization and succession.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.6.2.3 Significance of Residual Effects

Project-related residual effects on species diversity include the loss or change of up to 32.0 km^2 of vegetated areas and associated species within the mine site. Approximately 2.8 km^2 of additional vegetated areas and associated species will be changed or lost within the access road upgrades footprint. Hydrological changes through groundwater drawdown and hydrological discharges during construction and operation may also result in a change in species diversity. It is estimated that this could include vegetation species that occupy up to 6.3 km^2 of wetland vegetation communities. Altogether, construction activities could result in changes to plants within an area of 41.0 km^2, which represents approximately 2.2% of the ELCA. This is based on a conservative assumption that all habitat within the Project Area will be removed or altered; this likely overstates the effect since only a portion of the vegetation will be cleared within the Project Area.

With mitigation, the likelihood of introduction and spread of invasive and exotic species will be reduced. Dust deposition onto plants adjacent to the road and edge effects were conservatively estimated to occur within 200 m of the road, and could result in changes to species within approximately 24.7 km^2 of habitats adjacent to the access road footprint (approximately 1.3% of the ELCA). Of the three vascular plant SOCC, one individual of one species, nodding water nymph is within the footprint of the Marathon open pit and will be lost as a result of the Project. This species' provincial status rank of S2 indicates there are other known populations in the province; therefore, the loss of a single individual of nodding water nymph is not expected to lead to a change in the population attributes of the species. With mitigation, the magnitude of the residual effects from the Project on species diversity is predicted to be low because nearly all observed plant species are common and no changes to population attributes of common species are predicted. Additionally, the measurable change in habitat for SOCC will be less than 5% of the habitat within the ELCA.

For changes to community diversity, as described previously for species diversity, it is conservatively predicted that approximately 65.6 km^2 of vegetation communities could be altered by the Project through direct (clearing activities at the mine site) and indirect (e.g., edge effects and hydrological changes) effects. This represents approximately 3.6% of the 1,830.6 km^2 of vegetation communities within the ELCA. As the measurable change in the area of ecological communities will be less than 5% of the total area of ecological communities in the ELCA, the adverse residual effects on community diversity through a decline in the areal extent of ecological communities or vegetation types in the LAA is predicted to be low in magnitude.

During construction, Project-related residual effects include a direct loss of approximately 3.4 km^2 of wetlands within footprint of site features. An additional 9.7 km^2 of wetlands within the Project Area yet outside the site features footprint may be directly and/or indirectly affected by the Project. The extent and location of direct disturbance to wetlands associated with access road upgrades is assumed to be approximately 0.7 km^2; however, dust deposition could occur within 200 m of the road, resulting in changes to wetland function for an additional 10.2 km^2 of wetland vegetation communities beyond the access road footprint.

Disturbance to wetlands including changes to hydrological outputs and groundwater drawdown was conservatively estimated to result in an additional 6.3 km^2 of potentially affected wetland area. This

includes portions of a wetland complex located at the northern end of the mine site, of which approximately 56% falls within the Project Area and overlapping watersheds. Although this wetland complex will be affected by the Project, remaining wetlands in watersheds that do not overlap with the Project Area are expected to continue to provide habitat for waterfowl and drawdown effects are expected to occur largely in the bog portions of the wetland. Reduced flows into the Victoria River could result in a change in wetland area and function near the TMF; however, the mean annual flow in the Victoria River at the Surface Water Resources LAA boundary is expected to decrease by only 1%. Changes to wildlife habitat in the Victoria Steadies Sensitive Wildlife Area are not expected, given that it is located much further downstream than the Surface Water Resources LAA boundary. Overall, the magnitude of the effect on wetland function will be low because the measurable change in wetland area will be less than 5% of the total area of wetlands in the ELCA.

For terrain and terrain stability, residual Project-related effects include terrain stability issues and accelerated erosion which can occur during all phases of the Project; however, the implementation of mitigation will reduce adverse residual effects. Geotechnical investigations prior to construction will be conducted to identify unstable or potentially unstable areas. If required, slope stabilization techniques will be implemented. Given these measures, anticipated adverse residual effects related to terrain and terrain stability are anticipated to be low in magnitude.

For soil quality, with mitigation, the Project is predicted to result in a low adverse residual effect. Soil handling plans will address appropriate storage and replacement of topsoil and subsoil through the construction, operation and subsequent decommissioning, rehabilitation and closure phase of the Project. Stockpiled soils will be used for progressive rehabilitation during the life of the Project and soil storage time will be limited to the extent practicable. For soil quantity, management strategies and rehabilitation planning will provide a means to mitigate most potential Project-related residual effects. Even where some loss of in situ soils occurs through burial under waste rock or through erosion, excavated soils will be placed over most of the post-mine area through rehabilitation, and soil recovery will take place over time. Soils that have reduced quality from handling and stockpiling will recover through rehabilitation activities. With implementation of erosion control measures, the residual effect will not result in substantial changes to soil quantity and is predicted to be low in magnitude.

With mitigation and environmental protection measures, the residual environmental effects on vegetation, wetlands, terrain and soils are predicted to be not significant, given the Project is predicted to not result in:

- Threats to the long term persistence or viability of a vegetation 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 (i.e., change from a non-listed species to a species of management concern)
- Threats to the long term persistence or viability of a vegetation community 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
- 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

- Alteration of soil quality or quantity such that successful rehabilitation to self-sustaining ecosystems with an average capability relative to that present at existing conditions are prevented
- Substantial alteration of the function of ecologically or culturally important landforms
- Effects to unstable terrain such that successful slope stability mitigation measures do not prevent and/or protect as per regulatory guidelines

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.7 AVIFAUNA

7.7.1 Existing Conditions

The Project lies within the Central Newfoundland Forest Ecoregion. The region includes a variety of avifauna species commonly found in boreal forests on the Island of Newfoundland. Broadly, the avifauna groups present in this area include passerines, waterfowl, upland gamebirds and raptors.

Based on the available information, which included literature, Project-specific field studies, and federal and provincial databases, a total of 98 species of birds were identified as having the potential to occur in or near the LAA. The most commonly recorded passerine species included white-throated sparrow (*Zonotrichia albicollis*), ruby-crowned kinglet (*Regulus satrapa*), Swainson's thrush (*Catharus ustulatus*), boreal chickadee (*Poecile hudsonicus*), black-capped chickadees (*Poecile atricapillus*), Canada jay (*Perisoreus canadensis*), black-and-white warbler (*Niotilta varia*), yellow-bellied flycatcher (*Empidonax flaviventris*), and common loon (*Gavia immer*) (a waterbird). The raptors observed in the vicinity of the Project Area were boreal forest-dwelling species that rely on the habitat for nesting, hunting and breeding. Three SAR (olive-sided flycatcher, common nighthawk and rusty blackbird) and three SOCC (Caspian tern, bay-breasted warbler (*Setophaga castanea*) and Nashville warbler) were observed in the in the vicinity of the Project Area during field studies.

In general, waterfowl were common in wetland and open water habitats in the vicinity of the Project Area and LAA during spring breeding and fall staging periods. Canada goose (*Branta canadensis*), American black duck (*Anas rubripes*) and ring-necked duck (*Aythya collaris*) were common in the wetlands. Common loon occasionally occurred on the lakes. Other species, including green-winged teal (*Anas crecca*), common merganser (*Mergus merganser*) and Canada goose, were observed in the RAA. A Sensitive Wildlife Area along the Victoria River was identified as containing important waterfowl habitat (NL-EHJV 2008). While this area overlaps with the Project Area and LAA, the waterfowl habitat that was likely the focus of this designation are "steadies" on the Victoria River system located north of the mine site, before the river drains into Red Indian Lake (B. Adams, pers. comm, 2020).

Seven species of overwintering birds, including three upland gamebird species (ruffed grouse [*Bonasa umbellus*], spruce grouse [*Falcipennis canadensis*] and willow ptarmigan [*Lagopus lagopus*]), are also known to occur within the Project Area. Twelve habitat types were identified within the Project Area and LAA with approximately 75% of the Project Area consisting of upland, 20% consisting of lowland and 4% consisting of open water habitat. Within the LAA, approximately 69% consists of upland, 14% is lowland and 22% is open water habitat.

7.7.2 Environmental Effects

7.7.2.1 Changes to the Environment

The potential environmental effects of the Project on avifauna prior to mitigation include:

- Change in habitat due direct and/or indirect loss or alteration of habitat arising from to vegetation clearing, sensory disturbance and/or edge effects
- Change in mortality risk due to vegetation clearing activities, vehicular collisions, and indirect change through increases to predation and harvest pressure

The primary effects to avifauna habitat will occur during the construction phase through vegetation removal during site preparation and subsequent conversion of land cover type. These changes can create edge effects, and cause changes to noise, light availability, humidity, wind and temperature, which can influence which plants are able to grow and thrive in an area (Murcia 1995). During construction, indirect effects on habitat through sensory disturbance (e.g., noise, light pollution, dust and vibrations) could also occur, which may cause avifauna to avoid or abandon habitat and cause stress or other physiological effects. The effects of sensory disturbance could result in a change of habitat use around the mine site and/or access road. Noise can also affect the ability of land bird species to detect and find mates or prey (Barber et al. 2010).

During operation, changes in avifauna habitat from sensory disturbances will continue. The main noise generating sources associated with Project operation include blasting, processing equipment (e.g., rock breakers and feeders), and mobile sources, (e.g., trucks and heavy equipment). Other sources of sensory disturbance may include stationary lighting sources associated with buildings and infrastructure, as well as mobile sources. Water management activities during operation may also result in fluctuating water levels in adjacent waterbodies, causing direct change in habitat that can directly affect the habitat available for species that nest over water, along lake margins or in riparian areas.

During decommissioning, rehabilitation and closure, the rehabilitation and revegetation of the Project Area may restore habitat availability, with species returning to the area as some habitats are reestablished over time. As the open pits will remain as pit lakes, rehabilitation of the mine site footprint is unlikely to result in the complete reversal of some of the effects associated with the Project. Edge effects resulting from clearing activities during construction will be reduced during decommissioning as habitat is rehabilitated. The removal of mine infrastructure could also affect some species, such as barn swallow (*Hirudo rustica*), that are known to nest on infrastructure (COSEWIC 2011; Brown and Brown 1999). Sensory disturbances will cease upon closure, with reduced traffic levels and the cessation of Project activities resulting in increased habitat availability.

Potential changes to avifauna mortality risk during construction are attributed largely to clearing activities, which can result in the direct mortality of eggs or flightless birds. These effects are most pronounced during the nesting period. Other effects include collisions with vehicles and equipment, and increased harvest of waterfowl and gamebirds, which have the potential to continue throughout all Project phases. During operation, other effects include potential interactions of avifauna with the tailings pond / polishing pond, which could result in exposures to pollutants of potential concern. The presence of Project features

(e.g., roads) also create access routes predators, which could result in increased predation. Additionally, during decommissioning, rehabilitation and closure, the cessation of Project activities and associated sensory disturbance could result in an increase access for predators and hunters on roads and in edge habitats within the mine site, could indirectly result in avifauna mortality. Other species that use human structures, such as barn swallow, may also experience increased mortality risk as structures are removed.

7.7.2.2 Mitigation Measures

The mitigation measures presented in Table 7.6 are proposed to avoid or reduce Project-related effects on avifauna.

Table 7.6 Mitigation Measures: Avifauna

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Sensitive areas (e.g., wetlands, hibernacula, mineral licks, roosts, caribou migration corridors) will be identified prior to construction and appropriate buffers will be flagged and maintained around these areas, where feasible.	✓	-	-
	• Existing riparian vegetation will be maintained to the extent practicable.	✓	-	-
	• Environmental personnel responsible for site monitoring during construction will receive training to recognize species of conservation concern (SOCC) that may be present in Project Area.	✓	-	-
Air Emissions	• An Air Quality Management Plan (AQMP) will be developed and implemented as part of the EPP. The Plan will specify the mitigation measures for the management and reduction of air emissions during Project construction and operation.	✓	✓	✓
Vehicles / Equipment / Roads	• Vehicles and heavy equipment will be maintained in good working order and will be equipped with appropriate mufflers to reduce noise.	✓	✓	✓
	• Vehicles will use existing roads / trails while operating at the mine site. All-terrain vehicles used by Marathon personnel will also be restricted to existing roads, trails and corridors to the extent possible.	✓	✓	✓
	• Project vehicles will be required to comply with posted speed limits on the access road, site roads and haul roads to limit fugitive dust from vehicle travel on unpaved roads. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads). Additional speed restrictions will be implemented during caribou migration periods.	✓	✓	✓
Vehicles / Equipment / Roads	• Marathon will develop and implement a Traffic Management Plan to manage transportation of workers and materials to site, product leaving site, the number of vehicles accessing the site, and to reduce traffic delays.	✓	✓	✓
	• Marathon will implement traffic control measures to restrict public access to the mine site, which may include gating approaches, placing large boulders and/or gated fencing.	✓	✓	✓

Table 7.6 Mitigation Measures: Avifauna

Category	Mitigation	C	O	D
Light Emissions	• 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, and the lighting requirements for workspaces, as applicable.	✓	✓	✓
	• 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, to the extent practicable.	✓	✓	✓
Noise Emissions	• Project facilities and infrastructure will be designed to limit noise emissions.	-	✓	-
Tailings Management	• Cyanide detoxification within the mill using the sulphur dioxide / air oxidation process will result in the degradation of cyanide and precipitation of metals prior to discharge to the TMF.	-	✓	-
Wildlife / Avifauna Management	• An Avifauna Management Plan will be developed and implemented for the Project and will include such measures as conducting pre-clearing surveys for active migratory bird nests during the breeding bird season and buffer / set-back distances from active nests. Where practicable, clearing and grubbing during the breeding season will be avoided.	✓	✓	✓
	• Trees that provide actual or potential habitat will be retained where safe to do so and technically feasible. Removal activities, where required, will be scheduled to the extent practicable, outside the migratory bird breeding season. If tree clearing is required during the migratory bird breeding season, experienced environmental monitors will inspect the trees to assess occupancy before tree removal.	✓	-	-
	• The discovery of nests by staff will be reported to the Marathon environmental manager at site and appropriate action or follow-up will be guided by the Avifauna Management Plan.	✓	✓	✓
	• As waterfowl species are particularly sensitive to disturbance during critical breeding and brood-raising periods (from May to mid-July), personnel will be made aware of the importance of the surrounding wetlands to waterfowl and efforts will be made to reduce impacts on them during Project activities.	✓	✓	✓
	• Embankments of the TMF and of sedimentation ponds will be maintained free of vegetation. This will also limit the attraction of waterfowl and/or wildlife to these ponds for foraging or breeding.	✓	✓	-
Wildlife / Avifauna Management	• Avifauna use of the TMF ponds, open aquatic areas and other key Project locations will be monitored (primarily targeting waterfowl but also other wildlife species). If problematic avifauna use occurs, adaptive management measures (e.g., deterrents and/or exclusionary measures) will be implemented.	✓	✓	-

Table 7.6 Mitigation Measures: Avifauna

Category	Mitigation	C	O	D
Rehabilitation and Closure	• Marathon will develop a Rehabilitation and Closure Plan that meets the requirements of the Department of Industry, Energy and Technology, Department of Environment, Climate Change, and Municipalities, and Department of Fisheries, Forestry and Agriculture. The plan will be reviewed and updated regularly until implemented.	✓	✓	✓
	• Prior to demolishing existing building and infrastructure, surveys for breeding birds and for bats will be conducted as per the Avifauna Management Plan. Where practicable, existing buildings and infrastructure will be demolished outside of the migratory breeding bird season.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.7.2.3 Significance of Residual Effects

Approximately 35 km² of potential avifauna habitat will be potentially lost within the Project Area. This is based on a conservative assumption that all habitat within the Project Area will be lost; this likely overstates the effect since only a portion of the vegetation will be cleared within the Project Area. Seventy-eight percent of this habitat is forest and treed wetland (27 km²), which is important habitat for numerous avifauna species. Loss of high and moderate value habitat is likely to cause displacement of avifauna using these areas. Sensory disturbances from activities such as blasting, heavy equipment use, and traffic may cause avifauna to abandon important habitat features. It is conservatively assumed that approximately 51 km² of avifauna habitat is predicted to be altered due to sensory effects. With the application of mitigation measures, residual adverse effects are anticipated to be low in magnitude and localized to the LAA.

During operation, it is predicted that the Project is likely to cause a reduction in surface water quantity at several watercourses downstream of the mine. However, the magnitude of effects is predicted to be low and considered to be within the range of natural variability. Adverse effects to habitat available to avifauna (specifically waterfowl) beyond the Project Area are predicted to be low in magnitude. During decommissioning, rehabilitation and closure, revegetation and infilling or flooding of mining areas in the mine site will restore habitat value within the mine site for some avifauna species.

With respect to SAR / SOCC, predicted habitat loss from the Project was determined for representative SAR species. Of the SAR that could occur in the vicinity of the Project Area, predicted habitat loss was determined for olive-sided flycatcher and rusty blackbird (two of the three SAR species observed in the Project Area). Up to 11.4 km² of high and moderate value habitat could be directly lost for olive-sided flycatcher, and up to 11.5 km² of high and moderate value habitat for rusty blackbird. An additional 16.5 km² of high and moderate value habitat for olive-sided flycatcher, and up to 23.1 km² of high and moderate value habitat for rusty blackbird is conservatively predicted to be lost through indirect effects. Critical habitat, as defined by SARA, has not been designated for any of the avifauna SAR observed

within the Project Area, nor noted as potentially being within the LAA; therefore the Project does not result in the loss of critical habitat for those SARA listed avifauna species.

Residual Project-related effects on avifauna mortality risk during construction will be mitigated largely through avoidance of sensitive timing windows and through completing nest-sweep surveys and nest avoidance prior to clearing activities during the migratory bird breeding season if this period cannot be avoided. Mortality risk could occur through collisions with vehicles on the access road. However, Project-related traffic levels throughout the Project are low (peak of 18 vehicles per day on rotation change days during construction). Collisions with equipment and vehicles could also occur on the mine site, although as avifauna are predicted to generally avoid the mine site due to sensory disturbance, it is anticipated that incidents will be infrequent.

During operation, avifauna may use the tailings pond and polishing pond, thereby risking exposure to pollutants of potential concern. The embankments of the TMF and the water management ponds will be maintained free of vegetation to reduce attraction of waterfowl to these features. The Project does not create additional linear features, which will reduce the risk of Project-related indirect effects to wildlife mortality through increased predation. The number of birds nesting on anthropogenic structures during the operational phase of the Project is expected to be low, given that most species avoid close contact with humans and the mitigation measures to reduce avifauna mortality risk. During decommissioning, rehabilitation and closure, similar residual effects are expected to the construction phase.

With mitigation and management measures, residual environmental effects on avifauna are predicted to be not significant given the Project is not predicted to threaten the long term persistence, viability or recovery of an avifauna species population in the RAA, including effects that are contrary to or inconsistent with the goals, objectives or activities of recovery strategies, action plans and management plans.

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.8 CARIBOU

7.8.1 Existing Conditions

Woodland caribou on the Island of Newfoundland are recognized as a distinct population (Newfoundland Population) and are considered a SOCC (Special Concern by COSEWIC) (COSEWIC 2014). The Project, situated in central Newfoundland, is within the South Coast sub-population range (Wilkerson 2010; Schaefer and Mahoney 2013; Government of NL 2019a). This sub-population includes several herds, which share winter ranges near the south coast between Burgeo and the Connaigre Peninsula (Weir et al. 2014) yet have separate calving and summer ranges.

The RAA for the Caribou VC is based on the ranges of the following assessed herds: Buchans, Grey River, Gaff Topsails and La Poile (Government of NL 2019, 2020). Collectively, these herds represent approximately 36% of the caribou population on the Island of Newfoundland (Government of NL 2019a). The caribou population on the Island of Newfoundland has recently undergone a decline, most likely due

to a combination of food limitation with predation by coyotes. Recent population estimates indicate that the Grey River, Gaff Topsails and La Poile herds have decreased by 60-80% compared to population peaks recorded from the late 1980s. Recent surveys indicate that population trends for the assessed caribou herds may be stabilizing (Government of NL 2019a). The Project Area overlaps with the Grey River Caribou Management Area.

The Buchans herd moves between ranges and migrates from central Newfoundland during spring to wintering areas on the south coast. The Buchans herd has an overall range of approximately 15,650 km^2 between Sandy Lake to the north and the south coast of the Island of Newfoundland. The range of the Gaff Topsails herd (approximately 5,685 km^2) also occurs between Sandy Lake and the Twin Lakes in the north and Star Lake in the south. The Grey River and La Poile herds move between calving and summer ranges in south-west Newfoundland and winter range on the south coast. The range of the Grey River herd is approximately 15,500 km^2 and is generally located between Meelpaeg Lake in the north and the coast in the south, and between Highway 360 in the east and the area near Channel-Port Aux Basques in the west. The overall range of the La Poile herd (approximately 11,200 km^2) occurs between Channel-Port Aux Basques and St. Alban's in the east and extends no further north than Victoria Lake Reservoir.

While seasonal ranges are important for caribou, migration corridors are also important to maintain connectivity between seasonal ranges. Animals from the Buchans herd migrate through the Project mine site biannually, while resident caribou (Grey River herd) occur year-round within the Project Area. The La Poile herd has no overlap with the Project Area, and only a small portion of the winter range of the Gaff Topsails herd overlaps with the Project Area (less than 1 km^2 overlaps with the existing access road).

Habitat types ranked as high value for caribou are Balsam Fir Forest, Black Spruce Forest, Kalmia-Black Spruce Woodland and Open Wetlands. Habitat types ranked of moderate value to caribou include Open Water, Wet Coniferous and Mixedwood Forest. Based on these relative habitat value rankings, high and moderate ranked habitat for caribou is relatively abundant in the LAA, accounting for 98.9 km^2 or 77.9% of the LAA.

Predation is the primary cause of caribou calf mortality on the Island of Newfoundland, with approximately 90% of calf deaths attributed to predation (Lewis and Mahoney 2014). Other factors that may affect caribou populations on the Island of Newfoundland include parasites, hunting pressure, climate change, and habitat alteration from development.

7.8.2 Environmental Effects

7.8.2.1 Changes to the Environment

The potential environmental effects of the Project on caribou prior to mitigation include:

- Changes to caribou habitat due to direct and/or indirect loss or alteration of habitat arising from vegetation clearing and mine construction, and/or sensory disturbance (e.g., avoidance)
- Changes to caribou movement due to habitat loss and/or sensory disturbance (e.g., avoidance)
- Changes to caribou mortality risk due to vegetation clearing and site preparation activities, vehicular collisions, and indirect change in mortality risk (e.g., increased predation)

Change to caribou habitat during construction will be largely related to direct habitat loss from vegetation clearing. In addition to the removal of vegetation, earthworks may also alter soil layers, which could affect the habitat quality for plants that may regenerate post-closure. Sensory disturbances occur during construction and will continue through all Project phases. Avoidance of sensory disturbance may displace caribou to habitats that are less secure or have lower forage value or require higher energetic costs for movement. Use of less ideal habitat could lead to reduced survival and reproductive success. During operation, it is anticipated that sensory disturbance effects will continue (i.e., noise, dust, light). During decommissioning, rehabilitation and closure, removal of infrastructure and revegetating areas may result in restoration of some caribou habitat. However, it is anticipated that rehabilitated habitat will be of lower quality for caribou. Other activities such as flooding the mine pits will result in irreversible changes from baseline conditions. The level of sensory disturbance during decommissioning, rehabilitation and closure is anticipated to be reduced relative to other Project phases.

Change to caribou movement during construction will be primarily related to the placement of features and mine site development that overlap migration paths and act as an obstacle to movement. Caribou may also be reluctant to cross other features (e.g., ditches, power lines) if they present obstacles that are too high or wide. Sensory disturbances during construction may also cause caribou to avoid the Project Area. During operation, similar effects may occur with the continued presence of features and sensory disturbances (e.g., noise, dust, light). During decommissioning, rehabilitation and closure, areas of the mine site will be rehabilitated. However, some residual physical features will remain (e.g., pit lakes, waste rock piles) resulting in the persistence of altered habitat within the migration corridor. As the vegetation composition of the revegetated areas of the site may differ from baseline conditions, there may be continued avoidance of the Project Area if the habitat is not suitable for caribou migration. It is anticipated that sensory disturbance will be reduced during decommissioning, rehabilitation and closure relative to other Project phases.

Change to caribou mortality risk during the construction phase may occur directly through vehicular collisions, and indirectly through increased predation from hunting or predation. Clearing activities will alter habitat and increase edge habitat at the periphery of the mine site, which may be used by moose. The increased presence of moose could bring predators to the areas (e.g., coyotes, black bears), thereby increasing predation risk to caribou as well. An increase in Project-related hunting pressure is not anticipated as employees will not be permitted to hunt while on site or bring firearms to the site. The number of caribou licenses is determined by the provincial government based on herd size and health. During operation, similar effects are expected as in the construction phase. Interactions with the open pits or TMF during operation could result in direct caribou injury or mortality. Indirect change to mortality during operation could be affect by Project-related fragmentation of the range, which could limit access to preferred forage. Movement along a less suitable path may require higher energy expenditure, which could also affect the risk of indirect mortality. During decommissioning, rehabilitation and closure, there is potential for change to caribou mortality risk due to continued sensory disturbance and hunting pressures. Although, the change is expected to be low relative to construction or operation.

7.8.2.2 Mitigation Measures

The mitigation measures presented in Table 7.7 are proposed to avoid or reduce Project-related effects on caribou.

Table 7.7 Mitigation Measures: Caribou

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Vegetation will be maintained around high activity areas to the extent practicable, to act as a buffer to reduce sensory (light and noise) disturbance.	✓	-	-
Vehicles / Equipment / Roads	• Vehicles and heavy equipment will be maintained in good working order and will be equipped with appropriate mufflers to reduce noise.	✓	✓	✓
	• Vehicles will use existing roads / trails while operating at the mine site. All-terrain vehicles used by Marathon personnel will also be restricted to existing roads, trails and corridors to the extent possible.	✓	✓	✓
	• Project vehicles will be required to comply with posted speed limits on the access road, site roads and haul roads to limit fugitive dust from vehicle travel on unpaved roads. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads). Additional speed restrictions will be implemented during caribou migration periods.	✓	✓	✓
	• Caribou crossing on roads / features will be facilitated where they occur (e.g., crossing point across ditch) within the caribou migration corridor. The access road, site roads and haul roads will be designed for provision of low areas in the plowed snowbanks, where practicable, to facilitate wildlife movements: – Breaks in snowbanks will be created at approximately 200 m intervals, to the extent practicable, to provide wildlife crossing opportunities – Snow berms will typically be less than 1 m tall to facilitate caribou crossing – Where feasible, breaks in snowbanks will be aligned on opposing sides and with existing wildlife trails, where they occur, to facilitate caribou crossing	✓	✓	✓
	• Project-related air traffic (helicopter, airplane) will maintain a minimum ferrying altitude of 500 m to the extent feasible.	✓	✓	✓
	• Marathon will develop and implement a Traffic Management Plan to manage transportation of workers and materials to site, product leaving site, the number of vehicles accessing the site, and to reduce traffic delays.	✓	✓	✓
	• Marathon will implement traffic control measures to restrict public access to the mine site, which may include gating approaches, placing large boulders and/or gated fencing.	✓	✓	✓

Table 7.7 Mitigation Measures: Caribou

Category	Mitigation	C	O	D
Light Emissions	• 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, and the lighting requirements for workspaces, as applicable.	✓	✓	✓
	• 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, to the extent practicable.	✓	✓	✓
Noise Emissions	• Project facilities and infrastructure will be designed to limit noise emissions.	-	✓	-
Site Water Management	• Water management ditches will be designed to allow wildlife crossing opportunities, aligned with wildlife trails where practicable.	✓	✓	✓
Tailings Management	• Cyanide detoxification within the mill using the sulphur dioxide / air oxidation process will result in the degradation of cyanide and precipitation of metals prior to discharge to the TMF.	-	✓	-
Materials Handling and Waste Management	• Through proper handling and storage of industrial materials and debris, the mine site will be maintained in a manner that reduces the risk that caribou and other wildlife will encounter potential hazards.	✓	✓	✓
Wildlife / Avifauna Management	• The potential for on-site activity to be limited / restricted during caribou migration to reduce sensory disturbance will be reviewed with regulators.	✓	✓	✓
	• Activities in the Marathon pit area that may result in sensory disturbance to migrating caribou (e.g., blasting, loading, hauling) will be reduced or ceased while caribou are migrating through the corridor and within a set distance from the site (e.g., 10 km north or south). The extent of the activity reduction, and the conditions regarding caribou migration proximity will be determined in consultation with NLFFA-Wildlife Division and potentially developed under an adaptive management approach.	✓	✓	✓
Wildlife / Avifauna Management	• Wildlife-vehicle collisions, near misses or observations of wildlife (caribou, moose) road mortality on site roads and/or involving Project vehicles on the access road will be reported to the on-site environmental team and the NLDFFA-Wildlife Division. Adaptive management measures will be implemented should locations of high frequency wildlife-vehicle interactions be identified.	✓	✓	✓
Wildlife / Avifauna Management	• The on-site environment team will be notified if caribou are observed within 500 m of Project activities such as vegetation clearing, construction, heavy equipment use, and the environmental manager will determine if the activity will be reduced or delayed (in consultation with NLDFFA-Wildlife Division, as applicable).	✓	✓	✓
	• The TMF will be monitored daily during caribou migration for hazards to caribou and caribou activity. Observations or signs of caribou within 500 m of the TMF will be reported to the on-site environmental manager. If observed repeatedly, Marathon will employ mitigation measures, such as fencing at the TMF, to discourage caribou from accessing the area.	✓	✓	-

Table 7.7 Mitigation Measures: Caribou

Category	Mitigation	C	O	D
	• If caribou are observed near the open pits during migratory periods, fencing may be installed as needed around the crest of the pits to reduce the risk of caribou becoming entrapped or injured. Note that a barrier (usually large rock) is required to be installed adjacent to the pit crest for closure and is usually completed as part of progressive rehabilitation activities – this barrier could be erected to achieve both purposes. Marathon will consult with NLFFA-Wildlife Division on this issue.	✓	✓	✓
	• Caribou activities during the migratory periods will be monitored in the vicinity of the Project through visual observation, aerial surveys, and/or telemetry data from GPS (global positioning system) collars.	✓	✓	✓
	• To reduce the risk of caribou-vehicle collisions, caribou will have right-of-way except where deemed unsafe to site personnel. If wildlife is on a road, speed will be reduced and vehicle stopped if necessary, to allow wildlife to leave road.	✓	✓	✓
	• If a caribou mortality is observed or discovered on site or are reported by Project personnel, Marathon will report this event to NLDFFA-Wildlife Division as soon as possible.	✓	✓	✓
	• To reduce sensory disturbance, a visual survey for caribou will be conducted prior to blasting. If caribou are observed within a 500 m blasting radius buffer activity will be delayed until animals have left the buffer.	✓	✓	-
	• Pets will be prohibited on site.	✓	✓	✓
Employment and Expenditures	• 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.	✓	✓	✓
	• Workers will be bussed from nearby designated communities to the mine site for rotations.	✓	✓	✓
Rehabilitation and Closure	• Marathon will develop a Rehabilitation and Closure Plan that meets the requirements of the Department of Industry, Energy and Technology, Department of Environment, Climate Change, and Municipalities, and Department of Fisheries, Forestry and Agriculture. The plan will be reviewed and updated regularly until implemented.	✓	✓	✓
	• Linear features on the mine site (i.e., roads and power line corridors) not required for long-term monitoring will be decommissioned and rehabilitated to limit future hunting pressures on wildlife and restore habitat to pre-mine conditions where possible.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.8.2.3 Significance of Residual Effects

Change in Habitat

The amount of high and moderate-ranked caribou habitat that will be directly lost through site preparation (e.g., vegetation clearing and mine construction) will be 28.5 km^2. This was determined based on the

conservative assumption that all habitat within the Project Area will be directly lost this likely overstates the effect since only a portion of the vegetation will be cleared within the Project Area. Analysis of the assessed caribou herds showed that the winter, calving and spring migration / pre-calving ranges of the Grey River herd overlapped the Project Area. However, the percentage of overlap was less than 2% of the Grey River herd seasonal ranges. There was also some overlap between the seasonal ranges of Buchans herd and the Project Area (1% of the Buchans herd seasonal range). The La Poile herd had no seasonal range overlap with the Project Area, and the Gaff Topsails herd had a small amount of overlap with the existing access road during the winter.

Caribou habitat will also be indirectly affected by sensory disturbance (e.g., noise, light) arising from Project-related activities. Indirect habitat loss attributed to sensory disturbance within a 500 m buffer around the Project Area will be up to 57.3 km^2 of high and moderate-ranked habitat. When combined with direct habitat change in the Project Area, up to an estimated 85.8 km^2 of habitat will be altered. Given proposed mitigation measures and the amount of predicted habitat loss, adverse effects to caribou habitat are anticipated to be low in magnitude.

Change in Movement

With respect to change in movement, the effects of the Project on the migration of the Grey River, Gaff Topsails and La Poile herds are expected to be low, as these herds have little overlap with the Project Area and do not migrate through the site. However, effects are anticipated to be high in magnitude and adverse for the Buchans herd because of the overlap of the Project Area with a well-defined and well-used migration corridor. While changes in movement have been studied on the Island of Newfoundland and in other jurisdictions, there is uncertainty in how the residual effects of the Project will affect the movement of the Buchans herd following mitigation, and in what the long-term effects might be (e.g., reduced calving rates, increased predation). A Project-related change in movement could result in changes to timing of movement or movement rate, which may ultimately cause a change in recruitment or survival.

Change in Mortality Risk

With respect to change in mortality risk, caribou are expected to avoid construction activities due to sensory disturbance. Caribou are therefore anticipated to be at low risk of directly mortality from equipment and construction activities. The amount of overlap between the assessed herds and the Project Area is less than 2% for the Grey River herd and less than 1% for the Buchans herd and the seasonal ranges of the Gaff Topsails and La Poile herds have little to no overlap with the Project Area. The risk of direct mortality resulting from vegetation clearing and site preparation is considered negligible to low. Direct mortality caused by wildlife-vehicle collisions is expected to occur infrequently, as Project-related traffic volumes on the access road is estimated to be incremental to existing traffic volumes. Traffic on the haul roads within the mine site will be substantial. However, given this limited overlap, the Project-related risk of direct mortality resulting from vehicular collision on the access road and the site roads is considered negligible to low.

In addition to a change in direct mortality risk (e.g., vehicle collision), caribou mortality risk could be affected indirectly through Project-related changes that may affect predation risk (i.e., habitat fragmentation) or increase energy expenditure. While direct habitat change will be limited to the Project Area, a Project-related increase in predator abundance could extend into the caribou RAA. The Buchans and Grey River herds will be most affected by a potential increase in predators, as they have the greatest degree of overlap with the Project. However, at the low densities of predators reported for the Island of Newfoundland, a potential Project-related increase in predator density, and subsequently an increase in predation rate, is predicted to be low in magnitude. With the implementation of mitigation measures, a change in mortality risk for caribou resulting from the Project is still expected to be greatest for the Buchans and Grey River herds as their ranges overlap the Project Area. However, the magnitude is anticipated to be low in the construction and operation phases, and negligible to low during decommissioning for all assessed caribou herds.

Summary

A summary of the magnitude of residual effects on assessed caribou herds is provided in Table 7.8. With mitigation and management measures, residual environmental effects from the Project do not threaten the long term persistence or viability of the Grey River, La Poile and Gaff Topsails herds, and are not contrary or inconsistent with the goals, objectives and activities of recovery strategies, action plans and management plans. Project-related effects that may affect change in movement of Buchans herd are predicted to be high in magnitude. While caribou may be able to circumnavigate the Project, it is unclear what effects a deviation from a migratory corridor will have on the Buchans herd, some of which may not be realized for several years. Given these uncertainties and additional uncertainties related to the effectiveness of planned mitigation, the residual adverse effect of change in movement for the Buchans herd is conservatively predicted to be significant, and therefore, the residual adverse effects of the Project on caribou are predicted to be significant.

The prediction confidence for change in caribou movement is moderate to low. There is a high likelihood that Project-related effects will alter caribou movement compared to existing conditions. However, there is uncertainty in how movement of the Buchans herd will be affected by the Project and what the effect will be on the herd. This uncertainty has contributed to the conservative prediction of a significant residual effect on caribou.

Table 7.8 Magnitude of Project Residual Effects on Assessed Caribou Herds

	Herd			
Potential Environmental Effect	**Buchans**	**Gaff Topsails**	**Grey River**	**La Poile**
Change in habitat	Low	Low	Low	Low
Change in movement	High	Negligible	Low	Negligible
Change in mortality risk	Low	Low	Low	Low

Table 7.8 Magnitude of Project Residual Effects on Assessed Caribou Herds

Potential Environmental Effect	Herd			
	Buchans	**Gaff Topsails**	**Grey River**	**La Poile**
Caribou Herd Population Estimate				
Population Estimate[A]	4,112	1,824	2,022	3,154
Percent of Caribou Population on Island of Newfoundland (%)[B]	13.7%	6.1%	6.7%	10.5%

Notes:

[A] Government of NL 2020 – winter survey, mark-resight survey

[B] Percentages are rounded to one decimal place. Percentages are based on estimate of 30,000 caribou on Island of Newfoundland in 2019 (NLDFLR in Randell 2019)

Marathon understands and acknowledges the importance of caribou populations and migration as a part of the environment and to outfitters, Indigenous groups, the public and the province, as a whole. As the prediction of a potentially significant effect is partially a result of uncertainty in how Project activities may affect the migratory movement of the Buchans herd and the uncertainty of success of the proposed mitigation measures, Marathon is committed to working with regulators, Indigenous groups and stakeholders to develop comprehensive programs to monitor migration patterns and populations of the assessed herds. Marathon is currently working with provincial regulators as it conducts ongoing baseline monitoring programs and plans to continue and adapt these monitoring programs over the life of the Project.

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.9 OTHER WILDLIFE

7.9.1 Existing Conditions

The Project is in the Red Indian Lake Subregion of the Central Newfoundland Forest Ecoregion, which covers most of the central and northeastern portions of the Island. The region includes a variety of wildlife species commonly found in boreal forest on the Island of Newfoundland. Species confirmed in the Project Area include caribou, moose, black bear, Canada lynx, coyote, red fox, American marten (hereafter marten), muskrat, river otter (*Lutra canadensis*), southern red-backed vole, meadow vole, snowshoe hare and American red squirrel. Mink, ermine, northern long-eared bat, and little brown bat are also expected to occur in the vicinity of the Project. This section discusses wildlife other than caribou which are discussed separately in section 7.8.

Habitat types ranked as high value for key representative species of wildlife in the Project Area, LAA, and ELCA include: Mixedwood Forest, Alder Thicket, Riparian Thicket, Wet Coniferous Forest, Balsam Fir / Black Spruce Forests, Kalmia-Black Spruce Woodland, Regenerating Forest, and Open Water. High value habitats for focal species present in the Project Area range from 0.4% to 77.6%.

Wildlife SAR with potential to occur near the Project Area include the American marten and two bat species (northern long-eared bat and little brown bat). Marten have been observed within the Project Area (incidental sightings, and marten hair snag traps). While not detected in field studies, northern long-eared bat, and little brown bat are expected to occur in the vicinity of the Project. The nearest confirmed hibernation site is over 12 km from the Project Area. The Newfoundland population of marten is listed as Threatened and is protected under the *Species at Risk Act* (SARA) (COSEWIC 2007) and the NL *Endangered Species Act* (NL ESA), while the northern long-eared bat and little brown bat are designated as Endangered under SARA (COSEWIC 2013). High value habitat types for these species include Balsam Fir Forest, Black Spruce Forest, Mixedwood Forest and Wet Coniferous Forest.

7.9.2 Environmental Effects

7.9.2.1 Changes to the Environment

The potential environmental effects of the Project on other wildlife prior to mitigation include:

- Changes to wildlife habitat due to direct and/or indirect loss or alteration of habitat arising from vegetation clearing and mine construction, and/or sensory disturbance (e.g., avoidance), and edge effects
- Changes to wildlife mortality risk due to vegetation clearing and site preparation activities, vehicular collisions, and indirect change in mortality risk (e.g., increased predation)

Changes to wildlife habitat during construction is largely related to direct habitat loss from vegetation clearing. Earthworks may also alter soil layers, affecting the habitat quality post-closure. Sensory disturbances (e.g., noise, dust, light) also have the potential to occur during construction and will continue through all Project phases. Sensory disturbance may displace wildlife to habitats of lesser quality, which could lead to reduced survival and reproductive success. During operation, additional habitat is not anticipated to be lost through clearing, although indirect loss from sensory disturbance will persist. During decommissioning, rehabilitation and closure, removal of infrastructure, revegetating areas, and flooding the mine pits may result in restoration of some wildlife habitat, however other vegetated communities within the Project footprint are not expected to return to existing conditions. Some species may return to areas abandoned during construction and operation. The removal of Project infrastructure, however, could result in the loss of habitat if those structures are being used by wildlife.

Changes to wildlife mortality risk during the construction phase could occur directly through vehicular collisions and human-wildlife interactions / conflicts, and indirectly through increased predation from hunting, sensory disturbances, or habitat disturbances. Site clearing activities could result in direct mortality, particularly for young and immobile animals. The presence of Project workers could result in increased hunting / harvesting activity. The presence of garbage on site could also attract some animals, and wildlife can become dependent on garbage as a food source. During operation, similar effects are expected to the construction phase, with the addition of increased risk of injury or mortality should wildlife interact with the TMF.

Sensory disturbances may also indirectly affect wildlife mortality risk during all project phases, resulting in stress or other physiological effects or behavioral changes. For example, noise may affect the ability of

wildlife species to detect and find prey or mates. Sensory disturbances during operation are particularly relevant for bats, which can be sensitive to repeated vibration arousals, causing increased fat consumption and premature energy depletion, starvation, and reduced energy reserves for reproduction (ECCC 2015). During decommissioning, rehabilitation and closure, there is potential for changes to wildlife mortality risk due to continued sensory disturbance and traffic; however, the change is expected to be low relative to construction or operation. Wildlife that use human-made structures may also experience increased mortality risk as structures are removed during this phase.

7.9.2.2 Mitigation Measures

The mitigation measures presented in Table 7.9 are proposed to avoid or reduce Project-related effects on other wildlife.

Table 7.9 Mitigation Measures: Other Wildlife

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Sensitive areas (e.g., wetlands, hibernacula, mineral licks, roosts, caribou migration corridors) will be identified prior to construction and appropriate buffers will be flagged and maintained around these areas, where feasible.	✓	-	-
	• Existing riparian vegetation will be maintained to the extent practicable.	✓	-	-
Site Clearing, Site Preparation and Erosion and Sediment Control	• Vegetation will be maintained around high activity areas to the extent practicable, to act as a buffer to reduce sensory (light and noise) disturbance.	✓	-	-
	• Environmental personnel responsible for site monitoring during construction will receive training to recognize species of conservation concern (SOCC) that may be present in Project Area.	✓	-	-
Vehicles / Equipment / Roads	• Vehicles and heavy equipment will be maintained in good working order and will be equipped with appropriate mufflers to reduce noise.	✓	✓	✓
	• Project vehicles will be required to comply with posted speed limits on the access road, site roads and haul roads to limit fugitive dust from vehicle travel on unpaved roads. Speed limits will be set in accordance with provincial regulations and industry standards (e.g., for haul roads). Additional speed restrictions will be implemented during caribou migration periods.	✓	✓	✓

Table 7.9 Mitigation Measures: Other Wildlife

Category	Mitigation	C	O	D
Vehicles / Equipment / Roads	• Caribou crossing on roads / features will be facilitated where they occur (e.g., crossing point across ditch) within the caribou migration corridor. The access road, site roads and haul roads will be designed for provision of low areas in the plowed snowbanks, where practicable, to facilitate wildlife movements: – Breaks in snowbanks will be created at approximately 200 m intervals, to the extent practicable, to provide wildlife crossing opportunities – Snow berms will typically be less than 1 m tall to facilitate caribou crossing – Where feasible, breaks in snowbanks will be aligned on opposing sides and with existing wildlife trails, where they occur, to facilitate caribou crossing	✓	✓	✓
	• Project-related air traffic (helicopter, airplane) will maintain a minimum ferrying altitude of 500 m to the extent feasible.	✓	✓	✓
	• Marathon will implement traffic control measures to restrict public access to the mine site, which may include gating approaches, placing large boulders and/or gated fencing.	✓	✓	✓
Light Emissions	• 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, and the lighting requirements for workspaces, as applicable.	✓	✓	✓
	• 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, to the extent practicable.	✓	✓	✓
Noise Emissions	• Project facilities and infrastructure will be designed to limit noise emissions.	-	✓	-
	• Where practicable in accessible areas (e.g., along cleared rights-of-ways), trees and other vegetation will be left in place or encouraged to grow to obstruct the view of Project facilities, reducing the change in viewshed and muffling nuisance noise.	✓	✓	-
Site Water Management	• Water management ditches will be designed to allow wildlife crossing opportunities, aligned with wildlife trails where practicable.	✓	✓	✓
Tailings Management	• Cyanide detoxification within the mill using the sulphur dioxide / air oxidation process will result in the degradation of cyanide and precipitation of metals prior to discharge to the TMF.	-	✓	-
Materials Handling and Waste Management	• A Project-specific Waste Management Plan will be developed to address the collection, storage and transportation of hazardous and non-hazardous wastes generated from the Project. The Waste Management Plan will set out procedures for reducing Project-related waste and limiting demands on the regional landfill.	✓	✓	✓

Table 7.9 Mitigation Measures: Other Wildlife

Category	Mitigation	C	O	D
Wildlife / Avifauna Management	• Wildlife-vehicle collisions, near misses or observations of wildlife (caribou, moose) road mortality on site roads and/or involving Project vehicles on the access road will be reported to the on-site environmental team and the NLDFFA-Wildlife Division. Adaptive management measures will be implemented should locations of high frequency wildlife-vehicle interactions be identified.	✓	✓	✓
	• Observations of bat colonies, potential hibernacula sites, sick or dead bats will be reported to the provincial Wildlife Division at 709-637-2025. Bat sightings can also be reported to the toll-free bat hotline: 1-833-434-2287 (BATS).	✓	✓	✓
	• During the construction of buildings or other structures, bats will be discouraged from establishing roost sites by sealing openings of 15 mm in diameter or larger. Chutes and ducts will be sealed at the outside / top, so as to prevent entry by bats. Structures will be assessed to identify potential entry points before they become a problem.	✓	-	-
	• If a bat colony is found to exist within a Project structure, bats can remain there when it is safe for people and where there is no chance of contact with people. If it is not safe for bats to remain, Wildlife Division will be contacted to develop an approved removal plan.	✓	✓	✓
	• Open buckets, garbage bins, tubs or containers will be kept covered where practicable. Bats may fly into these open containers and may be attracted to standing water within them. Bats cannot climb slippery surfaces and are unable to fly straight up into the air, so can easily become trapped in such containers.	✓	✓	✓
	• Use of sticky traps for problem rodents will be avoided, as bats are often attracted to these.	✓	✓	✓
	• Large-diameter trees will be maintained to the extent possible; especially those that are old, dead or dying. These types of trees typically have the peeling bark, crevices and cavities that provide important natural roosting habitats for bats.	✓	-	-
	• Vegetation clearing will be avoided during the bird breeding season, if feasible, which will also protect other breeding wildlife species, by preventing the destruction of small mammal nests and bat maternity roosts. If avoidance is not practicable, pre-clearing surveys will be conducted for bat maternity roosts. Buffers / set back distances will be established if maternity roosts are identified.	✓	-	-
Employment and Expenditures	• 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.	✓	✓	✓

Table 7.9 Mitigation Measures: Other Wildlife

Category	Mitigation	C	O	D
Rehabilitation and Closure	• Marathon will develop a Rehabilitation and Closure Plan that meets the requirements of the Department of Industry, Energy and Technology, Department of Environment, Climate Change, and Municipalities, and Department of Fisheries, Forestry and Agriculture. The plan will be reviewed and updated regularly until implemented.	✓	✓	✓
	• Linear features on the mine site (i.e., roads and power line corridors) not required for long-term monitoring will be decommissioned and rehabilitated to limit future hunting pressures on wildlife and restore habitat to pre-mine conditions where possible.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.9.2.3 Significance of Residual Effects

Project-related residual effects on wildlife habitat include the direct loss of habitat for wildlife and habitat avoidance (i.e., indirect loss) due to sensory disturbance. Project activities will also result in some forest fragmentation, particularly within the mine site. Suitable roosting habitat for bats is abundant in the RAA and alternative roosts are predicted to be widely available in the surrounding areas, and it is anticipated that bats will be able to move to these sites (the only known hibernation site in the area is over 12 km away from the Project Area). The same logic is true for other large mammals, furbearers, small mammals and marten, who have widely available suitable habitat in the RAA; loss of habitat ranged from 2.1% to 8% of the ECLA for all of the key, representative species assessed.

Overall, adverse edge effects on wildlife from the Project are anticipated to be limited. Some edge effects will likely occur in the mine site. However, many wildlife species are tolerant of edges and some prefer this habitat. The Project Area is surrounded by relatively undisturbed forest, suggesting that alternative interior habitat is available. For sensory disturbances to habitat, noise pressures are described in Section 2.8.1.3. Studies have shown that noise related effects on wildlife can occur beyond 40 dBA (Shannon et al. 2016). This indicates there will likely be some noise related effects on wildlife from Project activities at the mine site, and these effects could expand beyond the LAA; however, the effects are largely localized to the area around the mine site.

Mitigation measures will be in place to reduce the effects on wildlife habitat. The Project footprint and disturbed areas will be limited to the extent possible. Sensitive areas (e.g., dens or roosts) will be flagged prior to clearing and construction and evaluated for additional mitigation measures (e.g., setbacks / buffers, seasonal timing of clearing activities). Mitigation measures to reduce sensory disturbance include noise reduction measures for equipment and machinery (e.g., appropriate mufflers) and limiting Project lighting. Lighting will be also directional where practicable. Given proposed mitigation measures and the amount of predicted habitat loss, adverse effects to wildlife habitat are anticipated to be low in magnitude.

Project-related residual effects on wildlife mortality include vegetation clearing, which can remove important habitat features, including dens, small mammal nests, and bat roosting trees. Newborn and

young animals are particularly vulnerable to this threat, as they may not be mobile not able to move out of the way of vegetation clearing machinery. Some accidental wildlife fatalities may also occur through wildlife-vehicle collisions on the access roads; however, such incidents are expected to be infrequent. Collisions with equipment and vehicles could also occur on the mine site. However, as wildlife is predicted to generally avoid the mine site due to sensory disturbance, it is anticipated that incidents will be infrequent. Project activity could also result in adverse human-wildlife encounters resulting from improper waste management (e.g., food, garbage, litter) and subsequent attraction of wildlife (e.g., bears, red foxes, coyotes) to the Project Area. Such situations can result in property damage, human injury, the development of wildlife dependence on human food sources, and lethal control of wildlife. There is also the risk of increased wildlife mortality from an increase in hunting, from increased access and human presence, and predation pressure, from Project-related changes to predator-prey dynamics. The access road is an existing feature and, therefore, the Project is contributing few new roads to the area.

The application of mitigation measures is predicted to reduce the likelihood of Project-related wildlife mortality. The risk of mortality during vegetation clearing can be reduced through the application of timing windows and other mitigation measures. For wildlife-human interactions / conflicts, a Project-specific Waste Management Plan will be implemented to address the collection, storage and transportation of waste, thereby reducing the likelihood of adverse human-wildlife conflicts. Additional mitigation measures will also be implemented, such as prohibiting pets on site. Hunting / harvesting of wildlife will be strictly prohibited on the mine site, preventing hunting by Project workers. Access by hunters and predator-prey relations are therefore anticipated to be largely unchanged. Given proposed mitigation measures and predicted change in mortality risk, adverse effects to wildlife habitat are anticipated to be low in magnitude during the construction and operation phases, and low to negligible during decommissioning.

With mitigation and management measures, residual environmental effects on wildlife are predicted to be not significant, given that the Project is not predicted to threaten the long term persistence, viability, or recovery of a wildlife species population in the RAA, including effects that are contrary or inconsistent with the goals, objectives or activities of recovery strategies, action plans and management plans. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.10 COMMUNITY SERVICES AND INFRASTRUCTURE

7.10.1 Existing Environment

Several municipalities are included within the community service and infrastructure LAA/RAA, including Grand Falls-Windsor, Badger, Buchans, Bishop's Falls, and Millertown, as well as the local service district (LSD) of Buchans Junction. Community service and infrastructure considers municipal services and infrastructure, permanent and temporary accommodations, health, education, recreation, transportation, utilities, policing and emergency services, education, and transportation located within the LAA/RAA.

Central Newfoundland Waste Management provides waste management services to the Central Region, including the communities in the LAA/RAA. The regional waste management site and the main landfill for the LAA/RAA is the Norris Arm Waste Management Facility, a lined landfill with leachate collection for

final disposal. The site has a life expectancy of approximately 92 years. Each municipality and the LSD of Buchans Junction receive potable water from surface water sources including Northern Arm Lake, Exploits River, Little Indian Brook, Buchans Lake, Lapland Pond, and Water Pond, which are treated at local water treatment facilities. Wastewater infrastructure for the communities in the LAA/RAA include a lagoon system, wastewater treatment plant, wetland treatment system, communal septic tank with contour disposal bed, and raw wastewater outfalls.

Outdoor recreation is common in the LAA/RAA and includes activities such as fishing, hunting, hiking, backcountry camping, and snowmobiling. Outdoor recreation facilities in the LAA/RAA include sports fields/tracks/courts, skateparks, a beach, several playgrounds, and the Mary March Wilderness Park. Indoor recreation includes stadiums in Grand Falls-Windsor and Buchans, as well as community centers, curling clubs, the Bishop's Falls Heritage Center, the Salmonid Interpretation Center, the Mary March Museum, the Gordon Pinsent Centre for the Arts, and the Lewis Miller Room Museum.

Housing for communities in the LAA/RAA ranges from 6,406 private dwellings in Grand Falls-Windsor to 54 private dwellings in Buchans Junction. Average housing costs range from $217,610 in Grand Falls-Windsor to $71,224 in Millertown (Statistics Canada 2017). Other temporary accommodations within the LAA/RAA include recreational vehicle parks, inns, hotels, motels, cabin rentals, lodges, campgrounds, and a bed and breakfast.

The major health care facility servicing Grand Falls-Windsor and neighboring communities, including the Towns of Badger and Bishops Falls, is the Central Newfoundland Regional Health Centre located in Grand Falls-Windsor. The Health Centre has approximately 130 acute care beds, 15 transitional long-term care beds, 45 physicians, 26 of whom are specialists, and 24-hour emergency services. Specialty services offered include radiology, psychiatry, pathology, and general surgery (Central Health n.d.). Within the LAA/RAA, ambulance services are based in Grand Falls-Windsor and Buchans.

There is one health care facility in Buchans, the A.M. Guy Memorial Health Centre, which has 22 beds. Millertown and Buchans Junction have no community health care facility and are serviced by the hospital in Buchans, which is approximately 30 minutes away. Long-term care in the LAA/RAA is available at Carmelite House in Grand Falls-Windsor and the A. M. Guy Memorial Health Centre in Buchans, with a combined total of 83 long-term care beds (Central Health n.d.). Construction on a new 60-bed long-term care home in Grand Falls-Windsor began in 2019, with an expected completion date of 2021 (NLDHCS and NLDTW 2019).

Policing services in the LAA/RAA are provided by the Royal Canadian Mounted Police (RCMP) pursuant to the Provincial Policing Agreement. The RCMP operates a detachment in Grand Falls-Windsor, which provides services to Badger, Buchans, LSD of Buchans Junction, Bishop's Falls, and Millertown, in addition to other communities. There is one correctional facility within the LAA/RAA, the Bishop's Falls Correctional Centre, which accommodates minimum security male inmates from Central NL (NL Department of Justice and Public Safety 2020). Fire services in the LAA/RAA include a combination of community fire departments and volunteer firefighters.

The province's Department of Advanced Education, Skills and Labour office in Grand Falls-Windsor provides employment services to residents in the RAA. Federal employment services are available through the Town's Service Canada office.

Education services within the LAA/RAA are provided by the Central Newfoundland and Labrador English School District and include a combination of public elementary schools, junior high schools, and high schools. Post-secondary institutions in the RAA include: College of the North Atlantic, Keyin College and Corona College in Grand Falls-Windsor, and the Central Training Academy in Badger.

Transportation in the LAA/RAA includes a combination of provincial highways, gravel roads, and old forestry roads. There is one port in the RAA, the Port of Botwood, used as a shipping port for pulp and paper products from the mill at Grand Falls-Windsor.

7.10.2 Environmental Effects

7.10.2.1 Changes to the Environment

The potential environmental effects of the Project on community services and infrastructure prior to mitigation include:

- Changes to local housing and temporary accommodations due to increased demand from Project activities and Project-related population growth
- Changes in local services and infrastructure due to increased demand from Project activities and Project-related population growth

The main Project interactions are a result of Project-related population increase and Project activities, which may place additional demands on community services and infrastructure, including housing, health and emergency services and infrastructure, utilities, education, recreation, transportation services and infrastructure.

Most of the Project physical activities (except for transportation along the access road, emissions, discharges and wastes, and utilities, infrastructure and other facilities) will not interact with community services and infrastructure. Production of Project waste materials destined for landfill (e.g., domestic waste) will place additional demands on the local landfill, and the movement of trucks, equipment, supplies and personnel will place additional demands on local roads. Except for landfill demand, the Project and the accommodations camp will operate independently of the LAA/RAA communities (e.g., power, water and wastewater systems will not rely on their resources). Therefore, the operation of utilities, infrastructure and other facilities will not place additional demands on existing community services and infrastructure, particularly utilities.

7.10.2.2 Mitigation Measures

The mitigation measures presented in Table 7.10 are proposed to avoid or reduce Project-related effects on community services and infrastructure.

Table 7.10 Mitigation Measures: Community Services and Infrastructure

Category	Mitigation	C	O	D
Vehicles / Equipment / Roads	• Marathon will develop and implement a Traffic Management Plan to manage transportation of workers and materials to site, product leaving site, the number of vehicles accessing the site, and to reduce traffic delays.	✓	✓	✓
Materials Handling and Waste Management	• Waste will be transported from site to be recycled, reused or disposed of in licensed / approved facilities. Non-reusable and non-recyclable wastes will be sent to the provincial waste management facility in Norris Arm, and reuse / recycling materials will be sent to the nearest management facility for each material type.	✓	✓	✓
Employment and Expenditures	• Marathon will work to develop cooperative protocols with responsible agencies to address access of Project personnel to emergency and other medical services, including employee medicals and check-ups.	✓	✓	✓
	• Workforce education will be provided to address topics such as: – healthy lifestyle choices – anti-harassment training – cultural awareness training – Marathon's health and safety policies	✓	✓	✓
	• Marathon will provide an Employee Assistance Program to Project personnel.	✓	✓	✓
	• Work schedules / rotations for Project workers, and the requirement to stay at the mine site accommodations camp during their rotation will deter workers from spending time in local communities and accessing community recreation services and facilities outside of working hours.	✓	✓	✓
	• Rotation changes will be scheduled so that all workers do not arrive in and leave the site at the same time, limiting Project-related demands on both road and air services and infrastructure.	✓	✓	✓
	• Arrivals / departures of employee traffic will be scheduled to occur earlier than the existing observed morning peak hour for local traffic and later than the existing observed afternoon peak hour, if needed.	✓	✓	✓
Site Facilities and Services	• An accommodations camp will accommodate construction, operation and closure workers.	✓	✓	✓
	• Power, water and wastewater treatment at the Project site and accommodations camp will be provided by Marathon and will not rely on resources within the LAA communities.	✓	✓	✓
	• Project-specific environmental management plans and monitoring programs will be developed, including a Waste Management Plan that sets out procedures for reducing Project-related waste and limiting demands on the regional landfill.	✓	✓	✓

Table 7.10 Mitigation Measures: Community Services and Infrastructure

Category	Mitigation	C	O	D
Site Facilities and Services	• Security services will be established on-site.	✓	✓	✓
	• An on-site first aid facility will be provided with paramedic / nurse / ambulatory technician and an ambulance, as required. Designated, trained personnel will provide transport to the nearest hospital when required. During Project construction and operation, first aid stations and equipment will be distributed through the site, as appropriate.	✓	✓	✓
	• Catering and recreation opportunities will be provided at the accommodations camp, including fitness equipment. The design of facilities will also consider culturally appropriate spaces.	✓	✓	✓
Engagement with Stakeholders, Indigenous Groups and the Public	• Marathon will continue to engage with local communities, including through the negotiation of Community Cooperation Agreements with the six communities in proximity to the Project Area. Community engagement will include regular updates on planned and ongoing Project activities, the timely dissemination of environmental, employment, contracting, and procurement information, and sponsorship of community programs, activities and initiatives, consistent with Marathon's corporate sponsorship policy and values.	✓	✓	✓
Accidental Event Prevention and Response	• Marathon will liaise with local emergency providers so that roles and responsibilities are understood, and that the necessary resources required to respond are in place.	✓	✓	✓
	• Emergency response plans will be developed, including spill prevention and response, emergency response measures, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.	✓	✓	✓
	• Appropriate Project personnel will be trained in fuel handling, equipment maintenance and fire prevention and response measures.	✓	✓	✓
	• Fire prevention and suppression systems will be maintained on site, including fire response vehicles and associated equipment, fire water distribution, sprinklers, fire extinguishers and other firefighting equipment.	✓	✓	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.10.2.3 Significance of Residual Effects

Changes to housing and accommodations may result from the presence of Project workers in the LAA/RAA increasing demand. The construction phase is estimated to require a peak labour force of approximately 625 FTEs (an average of 320 FTEs), while the operation phase is estimated to require a peak workforce of approximately 480 FTEs (an average of 300 FTEs). It is estimated that 90% of the construction and operation workforces will be sourced from NL. Approximately 65% will come from communities within the LAA/RAA. During construction and operation, workers will be accommodated at a 300-bed accommodations camp at the Project site, placing limited demand on current housing and accommodations in the LAA/RAA. During decommissioning, rehabilitation and closure, non-local Project

workers will likely have left the LAA/RAA, leading to a decrease in adverse effects on local housing and accommodations.

A variety of services will be provided at the accommodations camp, including water, wastewater, limited medical, and security, reducing demands on water, sewer, health and emergency health services, transportation, recreation services and infrastructure within the LAA/RAA. Power for the Project will be provided via a 66-kilovolt high voltage line to be constructed by NL Hydro from Star Lake to the main substation on the mine site. As a result, the Project will not place additional demands on existing power infrastructure in the LAA/RAA. Waste will be sent to the Norris Arm Waste Management Facility. With the implementation of a Project-specific Waste Management Plan, it is anticipated that the Project will not place additional demands on the local waste infrastructure beyond its capacity. The accommodations camp and work rotations make it unlikely that non-local workers will move their families to the LAA/RAA during the construction phase; however, some workers may move to the LAA/RAA during the operation phase. It was determined that there is spare capacity at LAA/RAA schools to accommodate these families.

Materials required for Project construction will be shipped to site by truck via an existing gravel access road from Millertown. Marathon plans to upgrade the road from a Class D gravel road to a Class A gravel road. This road will be maintained year-round by Marathon over the life of the Project. The access road is currently used by cabin owners and land and resource users along Red Indian Lake, and the improvement of the access road by Marathon will benefit these users through improved year-round access. During construction, it is estimated that traffic could include an average of six trucks per day for delivery of goods and a peak of 18 vehicles per day on rotation change days (one to two-day period each week). During operation, estimated traffic on access roads is estimated to be five trucks per day and a peak of 10 vehicles per day on rotation change days. The Trans-Canada Highway (Route 1) and Highway 370 through the LAA/RAA are major transportation routes and capable of accommodating Project-related transportation demands. Marathon will reduce the demands on transportation infrastructure by providing buses to move employees between designated local communities and the mine site.

During decommissioning, rehabilitation and closure, Project-related demand on community services and infrastructure will be reduced as non-local workers move away from the LAA/RAA due to diminishing employment.

With mitigation and environmental protection measures, the residual environmental effects on community services and infrastructure are predicted to be not significant, given that the Project is not predicted to result 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. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.11 COMMUNITY HEALTH

7.11.1 Existing Conditions

Existing conditions for community health within the LAA/RAA considered educational attainment, availability of services, infrastructure, and housing, rates of chronic and communicable disease and disability, mental health status, rates of substance abuse, crime and family violence, social connectivity, and community well-being based on community well-being index scores. Housing availability and affordability and health care services in the LAA/RAA are discussed in Section 7.10.1.

In general, educational attainment (e.g., secondary and post-secondary education) was similar in the LAA/RAA to the rest of the province. Within the LAA/RAA, 50.2% of the total population and 51.9% of the Indigenous population had completed post-secondary education compared to provincial averages of 51.6% and 49.5%, respectively (Statistics Canada 2017, 2018). Overall, females within the LAA/RAA accounted for a greater proportion of the total population with a college or university certificate, diploma or degree (59.2% of the population), while males generally accounted for a greater proportion of the population with an apprenticeship or trades certificate or diploma (50.1% of the population).

Bishop's Falls, Grand Falls-Windsor, Badger, Buchans, Buchans Junction, and Millertown fall within NL's Central Health Regional Health Authority (Central Health). Community health characteristics for the LAA/RAA are based largely on data from Central Health. In summary, the Central Health Region showed higher rates of arthritis, diabetes, asthma, and high blood pressure than the province, and females had higher rates of chronic disease than males in most instances (other than high blood pressure). From 2017 to 2018, 72.2% of Central Health residents perceived their mental health to be very good or excellent, which was slightly higher than 69.1% of the NL population. Rates of smoking and alcohol consumption were higher in the province than in the Central Health Region in 2017 to 2018, with approximately 20% of the provincial population smoking daily or occasionally versus 16.6% of the Central Health Region. Sexually transmitted and bloodborne pathogens were the most prevalent type of communicable disease in the province in 2016. Central Health had 7.3% of the total of these cases in 2016 relative to the province. The second most prevalent category of communicable disease in the province in 2016 was vaccine preventable disease; NL had 217 cases of which Central Health had 18 cases (8.3%) (NL Department of Health and Community Services 2016).

Policing services in the RAA/LAA are described in Section 7.10.1. Between 2014 and 2018, the total number of violent criminal code offences (e.g., murder, manslaughter, sexual assault, criminal harassment) in the Grand Falls-Windsor RCMP District increased 18.8% from 425 to 505. In NL in 2018, the number of child and youth family violence victims increased 3.0% from the previous year to 258 for a rate of 289 per 100,000 population (NL Statistics Agency 2019). Social connectivity was shown to be generally higher in NL relative to the rest of Canada, with 67% of Newfoundlanders and Labradorians reporting close ties to at least five family members, measurably higher than the national average of 55%.

An analysis of the community well-being index, which factors in education, labor force activity, income, and housing, showed that scores have increased for communities within the LAA/RAA from 1991 to 2016, with Millertown showing the highest score in 2016 at 80. Community well-being index scores for Grand

Falls-Windsor, Badger, Buchans and Bishop's Falls, ranged from 69 to 77 in 2016, compared to the province's score of 72.

7.11.2 Environmental Effects

7.11.2.1 Changes to the Environment

The potential environmental effects of the Project on community health prior to mitigation include:

- Changes in community well-being due to Project-related changes in population, employment and income
- Changes in physical health conditions due to Project-related discharges and emissions, directly exposing humans to contaminants, or changing access to country foods

Changes in community well-being within the LAA/RAA may be affected by Project-related employment, income and population changes. Project-related employment and income can affect levels of disposable income and labour force activity, potentially resulting in positive or adverse effects. Project-related employment and income also stimulate changes in population caused by the presence of a temporary non-local labour force in LAA/RAA communities. This population growth may change the demographics and social structure of nearby communities, and out-of-region workers could disrupt normal, daily living activities of local people and place additional demands on local services.

With respect to Project-related changes in population, it is estimated that non-local workers directly employed with the Project could result in an increase of the LAA/RAA's population of less than one percent. An increase in the population of LAA/RAA communities related to Project employment will increase demands on community services and infrastructure; however, given the planned use of a Project accommodations camp, Project-related effects are predicted to be negligible. It is not expected that capacity of schools in the LAA/RAA will be affected during any Project phase, since workers are unlikely to bring families with them to the LAA/RAA. Since the non-local Project workforce will represent less than one percent of the LAA/RAA population and because workers are likely to spend their work rotation in camp, limiting social interaction between Project workers and residents, it is not likely that rates of communicable disease will increase as a result of the Project.

Changes in physical health conditions are considered in relation to the LAA used for atmospheric environment and Indigenous groups (Figure 7-1) and are related to emissions, environmental contaminants, and sensory disturbances, which could impact community health through inhalation, ingestion, and dermal absorption. Emissions of air contaminants and fugitive releases of dust during blasting could cause changes in air quality which could directly affect the health (through inhalation) of people in the LAA. Project construction, operation and/or decommissioning, rehabilitation and closure activities could affect the quality of surface water through the discharge or seepage of metal-enriched water into the environment. Changes in water quality could affect the health of people through dermal contact or incidental ingestion of surface water while in the LAA. Changes to physical health conditions may also be affected through changes in access to and the availability of wildlife, fish and plants that are harvested for country foods. Sensory disturbance (e.g., noise, dust, visual) from Project activities, including increased traffic along the access road (e.g., bus and truck traffic), could result in avoidance of

the LAA by harvested wildlife species. Changes in noise levels could also disturb the sleep of people at camps within the LAA.

During the decommissioning, rehabilitation and closure phase, reduced levels of traffic and sensory disturbance are anticipated due to reduced levels of Project activities (in comparison to construction and operation). Habitat will ultimately be returned to natural conditions in many cases during post-closure, which will lessen the avoidance of the area by wildlife species.

7.11.2.2 Mitigation Measures

The mitigation measures presented in Table 7.11 are proposed to avoid or reduce Project-related effects on community health.

Table 7.11 Mitigation and Management Measures: Community Health

Category	Mitigation	C	O	D
Materials Handling and Waste Management	• Appropriate ventilation, fire and safety protection, eyewash stations, and Safety Data Sheet stations will be located throughout storage facilities for reagents.	-	✓	-
Employment and Expenditures	• Marathon will work to develop cooperative protocols with responsible agencies to address access of Project personnel to emergency and other medical services, including employee medicals and check-ups.	✓	✓	✓
	• Workforce education will be provided to address topics such as: – healthy lifestyle choices – anti-harassment training – cultural awareness training – Marathon's health and safety policies	✓	✓	✓
	• Marathon will provide an Employee Assistance Program to Project personnel.	✓	✓	✓
	• Work schedules / rotations for Project workers, and the requirement to stay at the mine site accommodations camp during their rotation will deter workers from spending time in local communities and accessing community recreation services and facilities outside of working hours.	✓	✓	✓
	• A Gender Equity and Diversity Plan will be implemented that meets the approval of the Minister of Industry, Energy and Technology and Minister Responsible for the Status of Women and Marathon will engage with both Indigenous groups during the development of the Plan. A business access strategy for members of underrepresented populations will be included in the plan.	✓	✓	✓
	• A Benefits Agreement will be implemented that meets the approval of the Minister of Industry, Energy and Technology and Minister Responsible for the Status of Women.	✓	✓	✓
	• Marathon will communicate employment information to local communities and Indigenous groups in a timely manner so that local and Indigenous residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.	✓	✓	✓
Employment and Expenditures	• Procurement packages will be developed with consideration for capacity and capabilities of local and regional Indigenous and non-Indigenous businesses.	✓	✓	✓

Table 7.11 Mitigation and Management Measures: Community Health

Category	Mitigation	C	O	D
Site Facilities and Services	• An on-site first aid facility will be provided with paramedic / nurse / ambulatory technician and an ambulance, as required. Designated, trained personnel will provide transport to the nearest hospital when required. During Project construction and operation, first aid stations and equipment will be distributed through the site, as appropriate.	✓	✓	✓
	• Marathon will implement COVID-19 protocols as necessary.	✓	-	-
Accidental Event Prevention and Response	• Mandatory safety orientations will be provided for employees.	✓	✓	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.11.2.3 Significance of Residual Effects

The Project construction labour force will peak at approximately 625 FTEs (an average of 320 FTEs) and that operation is estimated to require a peak workforce of approximately 480 FTEs (an average of 300 FTEs). It is estimated that 90% of the construction and operation workforces will be sourced from NL. Approximately 65% will come from communities within the LAA/RAA. Given employment and compensation estimates, the Project is expected to have a beneficial effect on community well-being index scores of LAA/RAA communities and result in positive effects on community well-being. Workforce education to encourage healthy lifestyle choices will help reduce potential adverse health effects related to negative coping mechanisms, such as drug and alcohol use. It is conservatively estimated that the Project will employ more non-Indigenous people than Indigenous people and more men than women given that Indigenous people and women are historically underrepresented in the fields of trades and construction. To address issues of diversity and inclusion, Marathon will implement the mitigation and management measures identified, including a Gender Equity and Diversity Plan and a business access strategy for members of underrepresented populations.

For physical health conditions, it was determined that maximum air emission concentrations are less than the applicable standards and are not expected to result in a change to physical health conditions in the LAA. Water quality modelling downstream of effluent discharge points also determined that if surface water from the receiving waterbodies were to be consumed, health risks would be negligible and would not result in a change to physical health conditions. Predicted maximum annual concentration of air particulates was determined to be only 8% of the guideline level; therefore, the potential for heavy metals in air particulates to affect the quality of terrestrial foods through deposition is considered negligible.

To assess the possible change in physical health conditions related to exposures to surface water, predicted concentrations of the parameters of potential concern 100 m downstream of the receiving points at Victoria Lake Reservoir, Valentine Lake and Victoria River were compared to health-based screening levels. Predicted concentrations (of parameters of potential concern) at the receiving waterbodies are below these health-based screening levels. The potential for heavy metals in water to

affect the quality of aquatic foods (primarily fish) is also considered to be low. Modelled water quality results indicate that under average conditions, concentrations of heavy metals in water will meet CWQG-FAL within 200 m downstream of the receiving points and are unlikely to result in substantive changes to country foods. Therefore, the potential for heavy metals in water to affect the quality of aquatic foods (primarily fish) is also considered to be low. For sound levels, during both construction and operation phases, the change in percent highly annoyed (%HA) is not predicted to exceed the Health Canada criterion of 6.5%.

Although the Project is anticipated to result in changes to air, water and sound, direct exposures are not expected to exceed health-based guidelines; therefore, the risk of adverse effects to physical health conditions from direct exposures is negligible, while the potential for a change in physical health related to country foods consumption is considered to be low. Both adverse and positive effects on community well-being are anticipated over the life of the Project, with adverse residual effects being low in magnitude. Adverse effects will be mitigated through measures, such as use of an accommodations camp, an Employee Assistance Program, and continued engagement with communities in the LAA/RAA.

With mitigation and management measures, residual environmental effects on community health are predicted to be not significant, given that the Project is not predicted to result in:

- The 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 reduction in the quality of ambient air, water, country foods, or sound at levels predicted to result in exposures that are higher than the health-based guidelines established by regulatory organizations, and are likely to result in a substantive change in the health of communities

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.12 EMPLOYMENT AND ECONOMY

7.12.1 Existing Conditions

Existing conditions for employment and economy within the LAA and RAA included consideration of the total and Indigenous population within the LAA and RAA; educational attainment within the LAA and RAA; labour force indicators; total and employment incomes; the mining industry, mineral exploration, the contribution of mining industries to the provincial economy, and direct mining employment; and economic contributions of outfitting businesses.

Population demographics of the LAA and RAA are summarized in Table 7.12. In general, educational attainment (e.g., secondary and post-secondary education) was similar in the LAA, as seen across the RAA (province). Within the LAA, 50.2% of the total population and 51.9% of the Indigenous population had completed post-secondary education compared to RAA (provincial) averages of 51.6% and 49.5%, respectively (Statistics Canada 2017, 2018). Overall, females within the LAA accounted for a greater proportion of the total population with a college or university certificate, diploma or degree, while males

generally accounted for a greater proportion of the population with an apprenticeship or trades certificate or diploma.

Table 7.12 Population Change – 2011 to 2016

Location	Dataset	Total Population			Indigenous Population[A]		
		Total	Male	Female	Total	Male	Female
LAA	2016	38,340	18,495	19,845	2,360	1,125	1,235
	% Change 2011-2016	2.8	2.8	2.8	43.0	55.2	33.5
RAA (NL)	2016	519,720	253,930	265,790	45,730	22,105	23,625
	% Change 2011-2016	1.0	1.3	0.7	27.7	23.9	31.5

Notes:
[A.] Indigenous and non-Indigenous totals may not sum to equal total population counts as they are based on a 25% population sample size.
2011 'Total Population' data from 2011 Census of the Population – Census Profile. 2011 'Aboriginal Population' data taken from 2011 National Household Survey – Aboriginal Profile.
Values shown in "Total" columns are the sum of male and female Census Subdivision (CSD) subsets taken from Statistics Canada's 2011 and 2016 Census Profile (Census of the Population). Due to Statistics Canada rounding (Statistics Canada 2019) totals may not exactly align with those shown on CSD Census Profiles and may not sum across tables.
Source: Statistics Canada 2012, 2014, 2017, 2018

In 2016, the total size of the LAA labour force was 17,785 of which 6.5% identified as Indigenous (Statistics Canada 2017, 2018). Generally, unemployment rates within the LAA and RAA were higher among males and Indigenous members of the labour force. Unemployment rates for the LAA were 20.1% and 11.2% for males and females, respectively, while unemployment in the RAA (provincial average) was 18.6% and 12.5%, for males and females, respectively. In the LAA, mining and construction employment fields are dominated by a male workforce (95.3% and 91.4%, respectively), with a similar trend observed for the Indigenous population within the LAA (60% and 100%, respectively). Average hourly wages in natural resource extraction for NL was $36.50, while average hourly wage for construction and professional services was $28.70 and $33.00, respectively. Except for mean total income among Indigenous males in the LAA, total incomes (mean and median) and employment incomes (mean and median) of the LAA were lower than RAA (provincial) incomes.

There is a long history of mining in the province, dating back to 1905 with the construction of the first base metals mine in 1926 by the Buchans Minerals Corporation. In 2018, mining and quarrying (inclusive of support activities) accounted for 6.6% ($2.0 billion) of total provincial gross domestic product (GDP) ($30.4 billion), of which, metal ore mining accounted 97.3% (Statistics Canada 2020). Except for 2009 (slightly less than $55 million), annual exploration expenditures in NL between 2006 and 2013 remained above $100 million, hitting a high of nearly $200 million in 2012. Gross Value of Mineral Shipments is anticipated to increase 163% from $1.5 billion in 2005 to a forecasted value of $4.1 billion in 2020 (DNR 2020). The only producing mines within the LAA are associated with Barite Mud Services Inc. (barite) near Buchans, China Minmetals Rare Earth Group Co. Ltd (antimony) near Glenwood, and Hi-Point Industries (1991) Ltd. (peat) near Bishop's Falls. From 2005-2020 in NL, exploration employment accounted for an annual average of 220 jobs while operational mining accounted for an annual average of 5,380 jobs.

Within the LAA, 13 outfitting companies offer bear, caribou and moose hunting, as well as angling. Rates range from approximately $6,100 to $11,900 for a moose hunt, $2,600 to $6,500 for a bear hunt, $5,750 to $13,000 for a caribou hunt, and $3,500 to $4,000 for salmon and trout fishing (Lake Douglas Hunting and Fishing Inc. 2016, Migule Mountain Outfitters 2017, Where-Ya-Wannabee Outfitters n.d., Red Indian Lake Outfitting and Tours 2020, 2G Outfitters n.d., Central Newfoundland Outfitters 2020). Most of the 13 outfitting companies within the LAA (11 confirmed) offer camp or lodge accommodation.

The nearest active outfitters to the Project Area include:

- Notch Mountain Outfitters located at the southwest end of Red Indian Lake
- Red Indian Lake Outfitting and Tours with their main lodge on the northern shore of Red Indian Lake
- Victoria Outfitters and Lodge, Snowshoe Lake Hunting and Fishing, Lake Douglas Hunting and Fishing Inc., Black Ridge Outfitters Ltd., and 2G Outfitters located within approximately 30 km of the southern shore of Red Indian Lake

These outfitters offer black bear and moose hunting, as well as salmon and trout fishing[2].

7.12.2 Environmental Effects

7.12.2.1 Changes to the Environment

The potential environmental effects of the Project on employment and economy prior to mitigation include:

- Changes to the regional labour force due to the Project's demand for labour and subsequent decrease in demand during decommissioning, rehabilitation and closure
- Changes in regional businesses due to Project spending and the resulting decrease in spending during decommissioning, rehabilitation, and closure
- Changes in economic activities of outfitters due to site clearing, and Project presence
- Changes in the economy due to Project employment and spending

Project demand for labour has the potential to have beneficial and adverse effects on the regional labour force. 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 in the decommissioning, rehabilitation, and closure phase.

For changes in regional businesses, positive effects include increased business revenue. 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 (e.g., workers leaving current employers to secure employment with the Project due to wage differentials or a desire to work on the Project) and wage inflation (e.g., to

[2] NL Tourism n.d., Black Ridge Outfitters Ltd. n.d., 2G Outfitters n.d., Newfoundland Labrador Outfitters Association 2013, Lake Douglas Hunting and Fishing Inc. 2016, Notch Mountain Outfitters 2019, Red Indian Lake Outfitting and Tours 2020, Victoria Outfitters and Lodge 2020). Notch Mountain Outfitters and Red Indian Lake Outfitting and Tours also offer caribou hunting (Notch Mountain Outfitters 2019, Red Indian Lake Outfitting and Tours 2020

attract and retain local workers, compensation may need to be increased). Adverse effects to outfitters operating in the LAA could result from loss of area available for outfitting due to restricted access at and around the mine site, change in quantity or availability of targeted species due to Project effects on wildlife, and/or change in the quality of the experience of outfitting activities due to visual or sensory disturbance from the Project.

Project spending will result in overall increased economic activity (i.e., GDP) in the LAA and RAA, and will also contribute to provincial and federal government revenues through royalty payments and taxation on production, labour, goods, and services.

7.12.2.2 Mitigation Measures

The mitigation measures presented in Table 7.13 are proposed to avoid or reduce Project-related effects on employment and economy.

Table 7.13 Mitigation and Management Measures: Employment and Economy

Category	Mitigation	C	O	D
Employment and Expenditures	• A Gender Equity and Diversity Plan will be implemented that meets the approval of the Minister of Industry, Energy and Technology and Minister Responsible for the Status of Women and Marathon will engage with both Indigenous groups during the development of the Plan. A business access strategy for members of underrepresented populations will be included in the plan.	✓	✓	✓
	• A Benefits Agreement will be implemented that meets the approval of the Minister of Industry, Energy and Technology and Minister Responsible for the Status of Women.	✓	✓	✓
	• Marathon will communicate employment information to local communities and Indigenous groups in a timely manner so that local and Indigenous residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.	✓	✓	✓
	• Marathon will work with the Province, educational and training institutions, Indigenous groups and stakeholders to identify skilled trade shortages relative to the Project and to identify training needs and opportunities to contribute to a sustainable Project workforce.	✓	✓	✓
	• On-the-job training programs and apprenticeship opportunities will be made available.	✓	✓	✓
Employment and Expenditures	• Summary reports will be provided to the provincial regulator that include information on the number of persons employed by 4-digit National Occupational Classification (NOC), the number of full- and part-time employed, the number of apprentices (by level) and journey persons for each applicable 4-digit NOC code, gender and source of the workforce.	✓	✓	✓
	• Procurement packages will be developed with consideration for capacity and capabilities of local and regional Indigenous and non-Indigenous businesses.	✓	✓	✓

Table 7.13 Mitigation and Management Measures: Employment and Economy

Category	Mitigation	C	O	D
	• Project purchasing requirements will be posted in a timely manner so that local and regional businesses can position themselves to compete to supply goods and services needed for Project construction and operation.	✓	✓	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.12.2.3 Significance of Residual Effects

Over the life of the Project, material and equipment costs are estimated at $1.1 billion (56.3% of total direct Project costs) and $357.2 million (18.1% of total Project costs), respectively. Over the life of the Project, total direct labour costs are estimated at $504.0 million. Average labour income is estimated at $151,000/ full-time equivalents (FTE) during construction, $77,000/FTE during operation, and $89,000/FTE during decommissioning, rehabilitation and closure.

Based on direct labour costs, a total of 4,861 FTEs of direct employment are estimated over the life of the Project (743 during construction, 3,823 during operation and 295 FTEs during decommissioning, rehabilitation and closure). A total of $433.9 million in direct labour income is estimated over the life of the Project ($112.7 million during construction, $295.2 million during operation, and $26.0 million during decommissioning, rehabilitation and closure). During the construction phase, most employment positions for the Project will be for heavy equipment operators, construction millwrights / industrial mechanics, and truck drivers. During the operation phase, most employment positions will be for heavy equipment operators, drillers and blasters, heavy duty equipment mechanics, and machine operators. During decommissioning, rehabilitation and closure, most employment positions will be similar to those during construction. Approximately 80% of direct employment effects are anticipated to occur in NL, and it is estimated that 50% of total direct employment requirements (65% of estimated employment effects in NL) could be filled by residents of the LAA due to recent closure of the Duck Pond Mine in the region. Based on demographics in the region, it is conservatively assumed that the Project will likely employ more non-Indigenous than Indigenous persons. It is also likely that the Project will employ more males than females, given that women are historically underrepresented in the fields of trades and construction. As the Project transitions into decommissioning, rehabilitation and closure, a decrease in workforce that ultimately results in the loss of employment (direct, indirect, and induced) will occur. Mitigating the magnitude of this loss of employment is the gained labour income, skills and experience workers realize while employed with the Project, which will help workers secure employment on future projects.

During operation, wages paid to the Project's direct workforce are expected to exceed the range of mean annual wages paid to NL workers employed in comparable industries and sectors. This difference could contribute to upward pressure on wages though increased competition for labour among local employers. This will be managed through maintaining wages consistent with NL's mining industry.

Overall, 45% of domestic indirect employment and labour income effects are expected to occur in NL while the remaining 55% occur in other parts of Canada. Expenditures occurring outside NL relate to goods and services not supplied by NL businesses (e.g., mining and mill equipment). In consideration of the LAA's industrial composition (e.g., large mining sector), existing labour force conditions, and using employment as a measure of capacity, businesses within the LAA are likely well positioned to compete for small- to medium-sized service and supply contracts, particularly those related to construction, transportation, and warehousing. Indirect Project employment in NL is estimated at 3,905 FTEs with $253.9 million in labour income. Indirect employment is expected to result in an increase of employed people in the LAA by 1.1% during pre-production, 1.9% during operation, and by 0.2% during decommissioning, rehabilitation, and closure. Induced employment is anticipated to generate 3,109 FTEs of employment for residents of NL, with induced labour income estimated at $155 million. Projected wages are between 185% and 191% greater than existing mean annual employment incomes in the LAA and RAA. As the Project transitions into decommissioning, rehabilitation and closure, a loss of Project expenditures is anticipated, also resulting in loss of indirect and induced employment.

For outfitting operations, it is anticipated that outfitters operating in the LAA for land and resource use (i.e., a smaller area than the LAA for employment and economy, Figure 7-1) will realize a small reduction in area available for guiding (roughly equivalent to 1% of the total moose / bear management area). A reduction in the quality of experience of outfitting activities could also be experienced through sensory disturbances and changes in the access to / abundance of wildlife and through increased hunting pressure from the Project's workforce. Given the relatively small reduction in area and the limited use of the area for resource use, along with the implementation of mitigation and management measures (e.g., prohibiting workers from hunting or bringing firearms to the mine site), adverse effects on outfitters operating near the Project Area range from negligible to low (low effects anticipated for outfitters that currently operate within a 1 km buffer around the mine site and a 500 m buffer around the access road) in magnitude. The Project may result in reductions in clientele and increased operating costs, whereas beneficial effects of the Project on local employment and income are not expected to translate into increased benefits to area outfitters.

For the economy, the Project is expected to have a moderate magnitude positive effect on the GDP of the LAA and RAA during construction and operation. As the Project transitions from operation and into and through decommissioning, rehabilitation and closure, Project contributions to the GDP of the LAA and RAA will cease. The Project is estimated to generate $292 million in direct, indirect and induced taxes for the Government of Canada, while the Government of NL is estimated to receive $398 million in direct, indirect and induced taxes.

With mitigation and management measures, adverse residual environmental effects on economy and employment are predicted to be not significant, given the Project is not predicted to result in:

- A distinguishable[3] change from current conditions and trends that cannot be managed or mitigated through adjustments to programs, policies, plans, or through other mitigation. A significant adverse

[3] "Distinguishable" means that the adverse effect is measurable, predictable, and attributable to one or more project or cumulative interactions (i.e., it is not within the boundaries of normal variation of the measurable parameter under baseline conditions).

effect occurs if there are residual adverse effects disproportionately experienced by one or more identified sub-populations.
- An economic loss, causing a decline in provincial GDP for four or more quarters.

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.13 LAND AND RESOURCE USE

7.13.1 Existing Conditions

The Project is in a rural setting, outside of municipal boundaries, and therefore is not located in an area subject to development and zoning controls. There are three communities within the RAA for land and resource use: Millertown, Buchans, and Buchans Junction. Protected water supply areas in the RAA, designated under section 39 of the *Water Resources Act*, include Buchans Lake, Water Pond, and Lapland Pond, located 43 km, 60 km and 63 km from the mine site, respectively. In the RAA, there are main roads in Buchans and Millertown and provincial highways connecting Millertown and Buchans to the Trans-Canada Highway. There are two “protected roads” near the Project Area: Highways 370 and 480; however, there are none within the Project Area. The RAA mainly includes unoccupied provincial Crown land, and recreational cabin use is permitted. There are 171 cabin plots and two cabin developments registered with Crown lands within the RAA and 21 outfitters registered with the Land Division, 9 of which are active according to Tourism NL. The nearest active outfitter is the Notch Mountain Outfitters Lodge, located approximately 11 km from the LAA. There are four commercial Crown land licences, which are associated with mining activities and hydroelectric dams.

Three provincial protected areas overlap the RAA: Little Grand Lake Ecological Reserve; Little Grand Lake Wildlife Reserve; and T’Railway Provincial Park. There are no provincially protected areas within the Project Area or LAA. A small portion (6.3 km^2) of proposed critical habitat for American Marten (Newfoundland population) overlaps the Project Area. With respect to waterfowl, a Sensitive Wildlife Area (Victoria Steadies Sensitive Wildlife Area) along the Victoria River has been identified as containing important waterfowl habitat. While this area overlaps with the Project Area and LAA, it was determined that the waterfowl habitat that was likely the focus of this designation are “steadies” on the Victoria River system located well to the north of the mine site, before the river drains into Red Indian Lake (B. Adams, pers. comm, 2020). Mary March Wilderness Park is the only privately-owned park near the Project. The park covers an area of 0.32 km^2 and includes hiking trails, ATV trails, 25 designated campsites, and 23 picnic sites. Moose, bear, caribou, small game, and furbearing management areas / units also overlap the RAA and LAA. The Project Area overlaps <1% of the wildlife management areas / units; except for the furbearing trapzone #83, with the Project Area overlapping 11% of this trapzone.

Resource use in the LAA/RAA includes mining, hydropower, forestry, hunting, trapping, outfitting and angling. Hunting for big game includes moose, caribou, and black bear and for small game includes showshoe hare, Arctic hare (*Lepus arcticus*), willow ptarmigan, rock ptarmigan (*Lagopus muta*), ruffed grouse and spruce grouse. Trapping of furbearing species also occurs in zones that overlap with the Project Area and LAA. Eleven furbearer species are managed and trapped in NL including beaver

(*Castor*), fox, Canada lynx, coyote, mink, muskrat, otter, red squirrel, weasel (*Mustela*), marten, and wolf (*Canis lupus*) (NLDFLR 2019c). The RAA overlaps with two Trap Zones in Fur Zone 4 and 16 Trap Zones in Fur Zone 7 while the Project Area overlaps with Trap Zones 14, 83, 221 and 239, all of which are in Fur Zone 7. Migratory bird game hunting also occurs in NL and could occur within the RAA. Angling occurs on a number of waterbodies in the RAA. There is an active recreational salmon fishery on the Exploits River, which flows northeast from Red Indian Lake. Brook trout, arctic char, and Ouananiche (*Salmo salar ouananiche*) are also commonly fished in the RAA.

The Valentine Lake area has been subject to exploration and mineralogical studies since the 1960s. The nearest mine to the mine site is the underground Duck Pond Mine, which began producing copper and zinc concentrates in 2007, and is located 30 km southeast of Buchans and is currently in the closure phase. There are nine quarry permits within the RAA; however, no quarries are located in the Project Area. Two quarries are located within the LAA: one less than 10 m from the mine site, and the other along the proposed upgraded site access road. There are twelve mineral tenure impost lands in the RAA, two of which also overlap with the Project Area and LAA. The Project is in Forest Management Divisions (FMDs) 12 and 13 and is part of Planning Zone 5. The RAA is also an area of substantial hydroelectric development; however only the Victoria Dam and spillway, which are part of the Bay d'Espoir Hydroelectric Development, are located within the LAA.

Recreational activities within the RAA primarily include hunting, trapping and fishing activities. Hiking, backcountry camping, snowmobiling, ATV use, canoeing and kayaking activities also take place. There are two groomed snowmobile trails in the RAA leading to the communities of Buchans and Millertown; however, there are no groomed trails in the LAA or Project Area (NLSF 2020).

7.13.2 Environmental Effects

7.13.2.1 Changes to the Environment

The potential environmental effects of the Project on land and resource use prior to mitigation include:

- Changes to land use due to restricted access to the mine site and sensory disturbances related to Project activities
- Changes to resource use due to disruption to harvesting activities, reduction in forest land, and sensory disturbances
- Change to recreational activities due to reduction in available land, reduction in access to lands, or reduced quality of the activities due to Project-related disturbances

During construction, mine site preparation and earthworks within the Project Area can change the use of lands through loss of area and restriction of access to designated lands, including provincial Crown lands and protected areas. Construction activities may also affect sensitive receptors (i.e., cabin users) due to sensory disturbances associated with noise and light emissions. During operation, activities will not result in additional loss of area and/or the restriction of access to designated lands beyond that previously incurred during construction; however, the development and presence of the topsoil, overburden, waste rock, LGO and HGO stockpiles may cause visual disturbances to the landscape. Decommissioning,

rehabilitation and closure activities can disrupt land use similar to construction activities; however, this phase will also allow for the restoration of affected land use and access.

During construction and operation, direct loss of local resource use areas could occur through mine site preparation, earthworks, and Project activities, as well as indirect loss through reduced and/or restricted access to the mine site. The Project may result in a sensory disturbance (e.g., noise, visual) to resource users and harvested wildlife, which may cause a reduction in wildlife hunting success, as well as greater pressure on game resources elsewhere. Construction activities will also result in loss of fish habitat, which could result in changes to local fish populations. The presence of Project workers could also increase the competition for species harvested by local resource users. Mine site preparation and earthworks will also remove potentially commercially harvestable timber which could affect the determination of annual allowable cut (AAC) levels. During operation, additional changes in water quality associated with emissions, discharges and wastes could occur in the aquatic environment and have the potential to affect fish health, growth, or survival which could result in greater pressure on fishery resources. Stockpile materials, as well as Project lighting, could be visible to resource users in the area, resulting in a change of perception of the area and discouraging use.

Changes to recreational activities may result during the construction phase from mine site preparation and earthworks. The physical presence of the Project will continue to affect recreational use and visual aesthetic values during operation. Sound emitted from Project activities, as well as the presence of material stockpiles also have the potential to affect recreational use (e.g., hiking / kayaking) through visual disturbance effects.

Sensory disturbances, access restrictions, and increased hunting pressures may continue through the Project decommissioning, rehabilitation and closure phase; however, this phase will also allow for the restoration of affected land used for resource purposes.

7.13.2.2 Mitigation Measures

The mitigation measures presented in Table 7.14 are proposed to avoid or reduce Project-related effects on land and resource use.

Table 7.14 Mitigation Measures: Land and Resource Use

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Merchantable timber will be salvaged and used, or it will be made available to local communities for fuelwood.	✓	-	-
	• Signage will be installed around the mine site to alert the public and land users of the presence of the Project and its facilities.	✓	✓	✓

Table 7.14 Mitigation Measures: Land and Resource Use

Category	Mitigation	C	O	D
Vehicles / Equipment / Roads	• Marathon will implement traffic control measures to restrict public access to the mine site, which may include gating approaches, placing large boulders and/or gated fencing.	✓	✓	✓
Noise Emissions	• Where practicable in accessible areas (e.g., along cleared rights-of-ways), trees and other vegetation will be left in place or encouraged to grow to obstruct the view of Project facilities, reducing the change in viewshed and muffling nuisance noise.	✓	✓	-
Employment and Expenditures	• 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.	✓	✓	✓
	• Workers will be bussed from nearby designated communities to the mine site for rotations to reduce effects of traffic on roads in the communities and the access road.	✓	✓	✓
Engagement with Stakeholders, Indigenous Groups and the Public	• Marathon will continue to engage with cabin owners within the Project Area to discuss their occupancy, potential future use of these cabins, and potential applicable mitigation measures.	✓	✓	-
	• Marathon will consult with NLDFFA in advance of construction to incorporate the harvesting of forestry resources in the Project Area as part of site preparation.	✓	-	-
	• Marathon will continue to engage with local resource users (hunters, outfitters, trappers, anglers) regarding the overlap of the Project with hunting, trapping, and fishing areas in the Project Area. This will include the communication of Project information, updates on ongoing and planned activities, and a discussion of issues and concerns and a potential means of addressing them.	✓	✓	✓
	• Project activities, locations, and timing will continue to be communicated to Indigenous groups, affected land and resource users, environmental non-government organizations, the provincial government, and local authorities throughout the life of the Project. In particular, Marathon 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.	✓	✓	✓
Rehabilitation and Closure	• Measures will be taken to address public health and safety requirements throughout rehabilitation and closure.	✓	✓	✓
Rehabilitation and Closure	• Desired land and resource end-uses will be considered in the preparation of the Rehabilitation and Closure Plan.	-	-	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.13.2.3 Significance of Residual Effects

Residual effects from Project activities on land use are associated with the loss / restriction of access to designated lands. The mine site overlaps approximately 32 km² of provincial Crown land area, which will have restricted access throughout the life of the Project. The Project-related effects are not anticipated to affect current provincially protected areas, as established under the Newfoundland and Labrador Parks and Protected Areas legislation. The Sensitive Wildlife Area is the closest protected area to the mine site; however, adverse effects on the Victoria Steadies Sensitive Wildlife Area are not anticipated given that the area that is the focus of protection is located much further downstream than the LAA boundary. There are cabin lots within the Project Area (three cabins) and the LAA (14 cabins), that may experience sensory disturbances as a result of the Project. The Project is anticipated to result in a relatively small change in sound levels to nearby cabin users that will be well below regulatory thresholds for noise. With the implementation of mitigation measures, residual effects to lands are anticipated to be low in magnitude.

With respect to a change in resource use, construction activities will restrict public access to the mine site throughout the life of the Project, resulting in a loss of area for resource use. The overlap of the mine site with wildlife management areas is relatively small (i.e., less than 1%), and there are alternate areas within the LAA where resource users could pursue these harvesting activities. Sensory disturbances (e.g., noise, dust, visual) as a result of the Project during construction and operation may also result in a change in resource use through the potential displacement of targeted species and reduced harvesting success rates within the LAA for local harvesters and outfitters. After application of these mitigation measures, the magnitude of change in mortality risk and change in habitat for avifauna, caribou and other wildlife is predicted to be low. Assuming the successful implementation of mitigation measures and the low levels of resource use within the LAA, it is therefore anticipated that associated effects to harvesting success rate is anticipated to be low in magnitude. As the mine site accounts for less than 1% of the total area of FMD 13, the impacts to commercial forestry and adverse effects on the AAC will be low as the AAC may still be achieved by relocating harvesting activities.

Visual effects from material stockpiles are anticipated during the operation phase; however, given there are low levels of resource activity identified within the LAA, residual effects are anticipated to be low. The access road upgrade / realignment will provide improved year-round access, potentially resulting in additional resources users within the LAA and increasing demand on resources. However, given it is an existing access road, the change in harvesting success is predicted to be low.

Residual effects on recreational use from construction and operation will primarily occur at the mine site where access will be restricted, and recreationalists may be displaced to other areas of the LAA. Construction and operation activities could also 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 is predicted to be below the regulatory threshold for noise. 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 change in recreational use is anticipated to be low in magnitude.

Decommissioning, rehabilitation and closure activities will ultimately lead to the restoration of access across most of the Project Area, as land within the mine site will be restored and reincorporated into the land base, with rehabilitation undertaken to achieve desired end land uses. This phase will also result in reduced sensory disturbances, and no new residual effects on areas or access for recreation, hunting, trapping, outfitting, and fishing are expected.

With mitigation and management measures, residual environmental effects on land and resource use are predicted to be not significant, given the Project is predicted to not result in:

- Non-compliance with established federal, provincial, or municipal land use designations, policies, or by-laws
- 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

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.14 INDIGENOUS GROUPS

7.14.1 Existing Conditions

There are two Mi'kmaq First Nation groups on the Island of Newfoundland potentially affected by / interested in the Project: Miawpukek First Nation (Miawpukek) and Qalipu Mi'kmaq First Nation (Qalipu). The Miawpukek Reserve is located at the mouth of the Conne River on the south coast of the Island of Newfoundland, approximately 113 km from the Project Area. The area of the reserve is approximately 620 ha. The total registered membership of Miawpukek is 3,063, of which approximately 33% live on reserve. Miawpukek's population is relatively young, with 34% of residents under the age of 25 (Michelin 2019). Languages spoken on the Miawpukek reserve include Mi'kmaq and English (INAC 2020).

Qalipu was registered as a band under the *Indian Act* in 2011. Although a registered band, Qalipu does not manage any reserve lands. Its members reside within 67 communities across the island, including within the nearby communities of Buchans and Millertown. Qalipu maintains satellite administrative offices in Glenwood, Grand Falls-Windsor, Stephenville and St. George's with a head office in Corner Brook. Qalipu currently has approximately 22,000 members.

Existing conditions for the First Nation groups considered health and socio-economic conditions, current use of lands and resources for traditional purposes, and physical and cultural heritage.

Miawpukek

According to traditional oral history, the Miawpukek reserve was established in 1870 and was one of many semi-permanent camping sites used by their people travelling throughout the Mi'kmaq Domain of Newfoundland, Labrador, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Maine (Miawpukek n.d.). Miawpukek ancestries include Mi'kmaq, Innu, Abenaki, and European lines

(Miawpukek n.d.). Land located in Conne River was set aside as a Colonial Reserve by Governor William McGregor in 1872 (Joe 2007).

Following establishment as a reserve in 1987, Miawpukek has become a self-proclaimed strong, vibrant community with nearly 100% full / part-time employment (Miawpukek n.d.). Members are employed in various roles such as nurses, educators, trades people, business people, lawyers, and care givers (Joe 2007). There are many Miawpukek owned and operated small businesses, such as Christmas tree farms, hunting camps and small fisheries, and the Miawpukek Gas Bar and Convenience Store (BP 2018). The community has also partnered with several outside communities and corporations in tourism and aquaculture ventures (INAC 2012).

Conne River Health and Social Services provides community health services, including clinical nursing services, a wellness centre, youth centre, nutrition centre, ambulance services, and on-call nurses (CRHSS n.d.). There is a volunteer fire department provided under the Conne River Health and Social Services Centre (MFN 2020). In 2017, Miawpukek opened a new school in the community, accommodating 240 students from pre-kindergarten to grade 12.

Based on the First Nations Food, Nutrition, and Environment Study, obesity was identified by participants of the study as a concern and is a major risk factor for diabetes and heart disease. Miawpukek has indicated that these results related to health from the FNFNES are representative of current conditions on reserve (MFN 2020). Miawpukek has seen a decline in recent years in the number of diabetics due to the use of modern medicine, educational awareness and improved nutrition (MFN 2020). In addition to diabetes and heart disease, cancer was noted as an increasing health concern for the Miawpukek (MFN 2020).

Harvesting efforts are undertaken by most of the on-reserve Miawpukek members. Approximately 75% participate in hunting activities, 60% participate in fishing activities and 60% participate in gardening (MFN 2020). In recent years, Miawpukek has seen an increase in traditional harvesting activity due in part to the increase in grocery costs (MFN 2020). Commonly consumed traditional foods by Miawpukek members include moose, caribou, beaver, rabbit, muskrat, grouse, goose, duck, blueberry (*Cyanococcus)*, raspberry (*Rubus idaeus*), Newfoundland tea berry (*Gaultheria hispidula*), partridge berry (*Vaccinium vitis-idaea*), and bakeapple (*Rubus chamaemorus*) (MFN 2020). The most frequently consumed fish by Miawpukek include cod (*Gadus morhua),* American eel, redfish (*Lutjanus campechanus)*, herring (*Clupea harengus*), lobster (*Nephropidae*), caplin (*Mallotus villosus*), and squid (MFN 2020). Due to declining populations, salmon is now generally reserved for special occasions, such as feasts, powwows and other celebrations. Species typically harvested by Miawpukek include caribou, moose, partridge, beaver, rabbit, muskrat and snowshoe hare (MFN 2020). Miawpukek harvest plants that support medicinal activities, such as cherry bark (used to treat sore throats, coughs and colds), lily pad roots (used to treat tumors, ulcers and inflamed skin) and alder (*Alnus*) (used for a variety of medicinal purposes including treatment of headaches and migraines) (MFN 2020). White pine (*Pinus strobus*) is also harvested. Miawpukek has noted that, while in the past its members harvested for traditional purposes in the area in which the Project is located, use of land and resources in this area has declined in recent years (MFN 2020).

Qalipu

In 1972, the Federation of Newfoundland Indians was formed and its primary goal was to obtain Mi'kmaq recognition and claim status under the federal *Indian Act* (Qalipu First Nation n.d.(a)). In 2008, the Government of Canada and Federation of Newfoundland Indians signed the Agreement for the Recognition of the Qalipu Mi'kmaq Indian Band to establish a landless band (INAC 2017). In 2011, Qalipu was registered as a band under the federal *Indian Act*.

Qalipu members live in communities throughout Newfoundland and Labrador which are occupied by Indigenous and non-Indigenous people, and therefore, use the infrastructure and services provided in these communities. Qalipu members access services and programs, including health and educational services, provided by municipal and provincial agencies, private businesses, and service agencies in communities and regions where they reside (Qalipu First Nation n.d.(a)). The Qalipu have several wholly owned commercial enterprises, including Mi'kmaq Commercial Fisheries Incorporated (MCF), Qalipu Management Services Incorporated, Qalipu Marine Holdings, and Qalipu Project Support Services Limited (Qalipu First Nation 2019). There are also business partnerships between the Qalipu and several construction firms. Qalipu members also harvest firewood and produce artisan crafts, which makes up an important component of the subsistence economy.

An Aboriginal Traditional Knowledge (ATK) Study was completed in 2020 by Qalipu to further Marathon's understanding of current use in central Newfoundland by the Qalipu. Survey topics included hunting moose, bear, caribou, and waterfowl, trapping furbearing animals, frequency of consumption of wild game, harvesting medicinal and food plants and berries as well as sacred Mi'kmaq sites. Twenty-two Qalipu members responded to the online survey. An Area of Interest (approximately a 10- to 20-km buffer of the mine site and a smaller buffer around the access road) was identified for the study. A total of 466 points were placed on a map of central Newfoundland, illustrating areas of current use. Of these 466 points, three were placed within the Area of Interest (0.64%) and zero were placed within the Project Area. Two of the three areas identified by the participants were related to trout harvesting, while the third was related to ptarmigan harvesting. No further information on the history of their activity in these areas were provided. Participants were asked if they actively participated in land use activities within the Area of Interest; all, except one participant, said no. The one participant indicated that they hunted moose and fished in the area.

7.14.2 Environmental Effects

7.14.2.1 Changes to the Environment

The potential environmental effects of the Project on Indigenous groups prior to mitigation include:

- Change in current use of lands and resources for traditional purposes due to Project activities altering the quantity, quality or availability of resources, accessibility of sites, or causing disturbances that alter use
- Change in Indigenous health conditions due to Project activities altering access and availability of country foods or altering quality of experiences / resources through emissions, discharges, and wastes

- Change in Indigenous socio-economic conditions caused by the Project activities creating sensory disturbances, altering availability or access of resources, altering community services and infrastructure, and altering incomes for Indigenous peoples
- Change in physical and cultural heritage due to Project activities causing loss or disturbance to sites, changing values or attributes of cultural and spiritual landscapes, and altering the experience of Indigenous peoples

Current Use

During construction and operation, activities will result in the loss of area or the restriction of access to lands, including those that may currently be used for traditional purposes. Project emissions can also result in sensory disturbance to current use of lands for traditional purposes within the LAA. Construction and operation activities within the Project Area can remove habitat for wildlife, fish and plants relied upon for traditional food, medicine, or materials, or change wildlife mortality / health, potentially reducing their numbers. The presence of workers at the mine site may increase hunting pressures on wildlife and increase competition for resources. During the decommissioning, rehabilitation and closure phase, reduced levels of traffic and sensory disturbance are anticipated due to reduced levels of Project activities. This phase will allow for the return of habitat for wildlife, fish and vegetation within the Project Area and the rehabilitation of affected land to as close to pre-mining conditions as practicable.

Health Conditions

Emissions of air contaminants during construction and operation may result from combustion of fossil fuels and dust generated by land clearing, blasting, ore handling and processing, and wind erosion which could directly affect the health (through inhalation) of Indigenous persons in the LAA. Particulates in air could also settle onto the soil and vegetation, which could then affect the quality of country foods, resulting in contaminant exposure via ingestion. Operation activities could also affect the quality of surface water through the discharge or seepage of metal-enriched water into the environment, which could affect health through dermal contact or incidental ingestion. Changes in stream water quality may also result in changes in fish tissue quality, resulting in indirect exposures via consumption of fish. Changes in access and availability of resources, along with a perceived decrease in quality of resources, may also have indirect health effects should consumption of country foods decrease. During the decommissioning, rehabilitation and closure phase, reduced levels of traffic and sensory disturbance are anticipated due to reduced levels of Project activities. This phase will restore natural conditions to as close to pre-mining conditions as practicable post-closure, which will lessen effects to health conditions.

Socio-economic Conditions

Project activities during construction and operation have the potential to cause a change in revenue for Indigenous groups through a change in physical access restrictions to harvesting areas, a change in harvested species distribution and abundance, the creation of competition for resource users, and the creation of sensory disturbance effects (i.e., noise, dust, visual). Construction and operation activities will result in the direct loss of land area and restriction of access to areas available for current use, along with creating sensory disturbances, thus affecting hunting and trapping activities. The overall experience of

Indigenous groups using the area for resource activities (i.e., hunting, trapping, fishing) may be altered by the presence of Project workers, as well as activities (i.e., sensory disturbances). Other socio-economic effects for Indigenous peoples include increased demands on local community services and infrastructure with the presence of Project workers, including effects to health, emergency, education, recreation, transportation, and utilities. Socio-economic conditions could also be affected through changes to employment and income as a result of the Project, which can manifest in both positive and adverse ways, such as lower financial barriers to accessing healthy market foods, or decreased financial barriers to harmful practices such as overeating, smoking, heavy drinking, and illicit drug use.

Physical and Cultural Heritage

Activities that require ground disturbance during the construction phase can result in the loss or disturbance of cultural heritage sites and areas. Alterations to the landscape and increased human activity resulting from improved access to the area also increases the potential that heritage resources, if present, may become more accessible to human disturbance. The Project may also alter or change the value or perceived quality of cultural and spiritual sites indirectly, through Project-related sensory disturbance to users from construction and operation activities.

7.14.2.2 Mitigation Measures

The mitigation measures presented in table 7.15 are proposed to avoid or reduce Project-related effects on Indigenous groups.

Table 7.15 Mitigation Measures: Indigenous Groups

Category	Mitigation	C	O	D
Site Clearing, Site Preparation and Erosion and Sediment Control	• Project footprint and disturbed areas will be limited to the extent practicable.	✓	-	-
	• Signage will be installed around the mine site to alert the public and land users of the presence of the Project and its facilities.	✓	✓	✓
Vehicles / Equipment / Roads	• Marathon will implement traffic control measures to restrict public access to the mine site, which may include gating approaches, placing large boulders and/or gated fencing.	✓	✓	✓
Employment and Expenditures	• 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.	✓	✓	✓
	• Workforce education will be provided to address topics such as: – healthy lifestyle choices – anti-harassment training – cultural awareness training – Marathon's health and safety policies	✓	✓	✓
	• Workers will be bussed from nearby designated communities to the mine site for rotations to reduce effects of traffic on roads in the communities and the access road.	✓	✓	✓

Table 7.15 Mitigation Measures: Indigenous Groups

Category	Mitigation	C	O	D
	• A Gender Equity and Diversity Plan will be implemented that meets the approval of the Minister of Industry, Energy and Technology and Minister Responsible for the Status of Women and Marathon will engage with both Indigenous groups during the development of the Plan. A business access strategy for members of underrepresented populations will be included in the plan.	✓	✓	✓
	• Marathon will communicate employment information to local communities and Indigenous groups in a timely manner so that local and Indigenous residents have an opportunity to acquire the necessary skills to qualify for potential Project-related employment.	✓	✓	✓
	• Procurement packages will be developed with consideration for capacity and capabilities of local and regional Indigenous and non-Indigenous businesses.	✓	✓	✓
Engagement with Stakeholders, Indigenous Groups and the Public	• Project activities, locations, and timing will continue to be communicated to Indigenous groups, affected land and resource users, environmental non-government organizations, the provincial government, and local authorities throughout the life of the Project. In particular, Marathon 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.	✓	✓	✓
Engagement with Stakeholders, Indigenous Groups and the Public	• Marathon will continue to engage with Indigenous groups, including Indigenous resource users, throughout the life of the Project. This will include the communication of Project information, updates on ongoing and planned activities, and a discussion of issues and concerns and a potential means of addressing them. This will also include a discussion of the development and implementation of Project-specific environmental management and monitoring plans.	✓	✓	✓
	• Marathon will continue to engage with Indigenous groups for the identification, review, and analysis of existing and available information on Indigenous land and resource use activities, to consider this early and throughout Project planning, design and implementation.	✓	-	-
Rehabilitation and Closure	• Desired land and resource end-uses will be considered in the preparation of the Rehabilitation and Closure Plan.	-	-	✓

Table 7.15 Mitigation Measures: Indigenous Groups

Category	Mitigation	C	O	D
Discovery and Protection of Heritage Resources	• Measures to be included in the Heritage and Cultural Resources Protection Plan to mitigate the potential of adverse effects on historic resources resulting from an accidental discovery: • Prior to construction, personnel will be made aware of potential historic resources in the area and understand their responsibility should they identify potential historic resources. • Personnel will be advised to report unusual findings to the Site Supervisor and not to touch such findings. • Work will be suspended in the immediate area should a potential resource be identified. • If features are found using heavy equipment, the equipment will not be moved so that historical information and evidence is left intact and not further disturbed. • The area of findings will be flagged to protect it from looting and further disturbance. • A qualified archaeologist or historic resources professional will be contacted by the Site Supervisor to conduct an assessment of the site.	✓	-	-

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.14.2.3 Significance of Residual Effects

Current Use

During construction, access to land within the mine site (32 km²) will be restricted for the life of the Project. Once clearing occurs, it is conservatively assumed that the mine site will no longer provide suitable wildlife habitat (approximately 2% of the LAA and 0.08% of the RAA). Based on information provided by Miawpukek, it is Marathon's understanding that its current land and resource use in the Project Area has declined in recent years. Based on the ATK study, active Qalipu land use in the Project Area appears to be limited as no current use was identified within the Project Area, and only three current use locations within the Area of Interest (two for trout fishing and one for ptarmigan harvesting) were identified. Given this, along with the implementation of mitigation measures, it is anticipated that loss of access to current use areas is low, with current use able to continue at current levels in the LAA and RAA.

For sensory disturbances affecting current use, it has been predicted that sound pressure levels related to Project construction and operation activities will be well below the regulatory threshold (Section 7.2.2); therefore, the anticipated indirect effects associated with sensory disturbance is considered low. Visual effects of the Project presence may degrade the quality of current use within the LAA and cause visual disturbance; however, given that levels of current use within the LAA appear to be low, residual effects are also anticipated to be low. Changes to wildlife mortality risk may affect the number of species available for harvesting and are described in Sections 7.7.2, 7.8.2 and 7.9.2.

After the implementation of the mitigation measures described in these sections, the number of direct wildlife mortalities resulting from the Project is expected to be small relative to existing sources of mortality within the RAA and it is predicted that abundant suitable habitat will remain for all focal species. For fish, change and/or loss of fish habitat and risk to mortality may result from the placement of infrastructure and equipment installation in streams or lakes. However, the Project has been designed to reduce loss of fish habitat. Given the design and mitigation measures described in Section 7.5.2, effects to fish habitat are not expected to affect the sustainability or productivity of the recreational fisheries, and fish habitat offsetting measures will be applied, mitigating affects to current use.

During decommissioning, rehabilitation and closure, effects on current use are anticipated to be reduced compared to construction activities. Decommissioning and closure activities will allow for the return of habitat and are therefore anticipated to have a low magnitude effect on current use within the LAA.

Health Conditions

Air contaminant dispersion modelling was conducted and described in Section 7.2. The results indicated that maximum concentrations of air contaminants are less than the applicable standards. Although the maximum 1-hour $PM_{2.5}$ concentration during Project operation is predicted to be higher than the Canadian Ambient Air Quality Standard (CAAQS), additional analysis confirmed that there are no exceedances of the CAAQS at locations outside of the Project Area. Based on these results, changes to air quality from the Project are not expected to result in a change to Indigenous health conditions in the LAA or RAA.

For water quality, expected concentrations of the parameters of potential concern 100 m downstream of the receiving points at Victoria Lake Reservoir, Valentine Lake, and Victoria River were compared to the health-based screening levels. Predicted concentrations at the receiving waterbodies are less than the health-based screening levels and therefore residual effects were determined to be negligible and would not result in a change to Indigenous health conditions.

For country foods, the potential for heavy metals in air particulate to affect the quality of terrestrial foods through deposition is considered negligible, as indicated by the low predicted concentrations of TSP (predicted maximum annual concentration is 8% of guideline). The potential for heavy metals in water to affect the quality of aquatic foods (primarily fish) is also considered to be low. Modelled water quality results indicate that under average conditions, concentrations of heavy metals in water will meet CWQG-FAL within 200 m downstream of the receiving points and are unlikely to result in substantive changes to country foods. Therefore, the potential for heavy metals in water to affect the quality of aquatic foods (primarily fish) is also considered to be low.

Given what appear to be low levels of harvesting activities by Miawpukek and Qalipu within the Project Area and LAA, it is unlikely that the consumption of country foods from the LAA constitutes a substantial portion of an Indigenous person's diet. The residual effect on changes in Indigenous health related to country foods consumption is therefore considered to be low in magnitude. For availability and accessibility of resources, given the relatively small area (i.e., 32 km^2) that will be restricted during the life of Project, and the alternative areas available for harvesting, the loss of access to areas currently used for country foods is anticipated to be low in magnitude.

Construction activities are not planned at night, and therefore, existing nighttime sound levels will not be affected at the sensitive receptor locations. Operation activities are not predicted to exceed the sleep disturbance threshold of 40 dBA recommended by Health Canada (2017) at sensitive receptor locations beyond the Project Area. The predicted nighttime sound level exceeded the sleep disturbance threshold of 40 dBA during operation at three locations; however, the percent highly annoyed (%HA) is not predicted to exceed the Health Canada criterion of 6.5%. Therefore, no residual adverse effects on Indigenous health (i.e., annoyance or sleep disturbance) is predicted.

Socio-economic Conditions

Residual effects are anticipated to include effects to economic and financial conditions through changes to harvesting activities, as well as changes to the use of and access to road infrastructure, medical, and other public services. Residual effects to current use, including harvesting, are anticipated to be low. It appears that there is limited harvesting by either Qalipu or Miawpukek within the Project Area and LAA. Given this, Project-related effects on harvesting success are anticipated to be low.

For effects on community services, Project workers will live at the accommodations camp, which will reduce potential effects on community services and infrastructure (Section 7.10.2.3), resulting in a negligible overall increased demand on local services from the Project. Project-related income effects are anticipated to be both positive and negative. Workforce education to encourage healthy lifestyle choices will help reduce potential adverse health effects. Employee training will include awareness about the potential effects that workers can have on their community and families through drug and alcohol use or other social concerns. Workers will also have access to an Employee Assistance Program. With the implementation of mitigation and enhancement measures, residual effects from the Project on change in socio-economic conditions are anticipated to be negligible to low in magnitude. During construction and operation, positive effects will be low in magnitude, conservatively characterized based on uncertainty with respect to levels of local employment and the extent to which Project wages will be realized by Indigenous people.

Physical and Cultural Heritage

Given there are no known registered heritage sites within the Project Area, and no cultural or spiritual sites within the Project Area that have been identified by Indigenous groups engaged by Marathon, no residual Project effect to heritage, cultural, or spiritual sites is anticipated. Cultural identity, opportunities for intergenerational knowledge transmission, and spiritual connections represent intangible values that may be affected. Therefore, Marathon is committed to continuing engagement with Indigenous groups to understand and respond to concerns as they arise throughout the life of the Project.

With mitigation and management measures, residual environmental effects on Indigenous groups are predicted to be not significant, given the Project is predicted to not result in:

- Long term loss of traditional use resources or access to lands relied on for current use practices or current use sites and areas, such that current use is critically reduced or eliminated from the LAA.
- Substantial disruption to current use activities and practices where biological resources or physical sites may not be significantly affected in the LAA

- Adverse effects on socio-economic conditions of affected Indigenous groups, such that there are associated detectable and sustained decreases in the quality of life of a community, including for subpopulations within a community, as applicable
- A reduction in the quality of air, water, country foods, or sound at levels predicted to result in exposures that are higher than the health-based guidelines established by regulatory organizations, and are likely to result in a substantive change in human health

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

7.15 HISTORIC RESOURCES

7.15.1 Existing Conditions

Previous archaeological work on the Island of Newfoundland indicates approximately 5,000 years of precontact Indigenous occupation in four distinct periods: two Palaeo-Eskimo and two of Amerindian affiliation. Indigenous occupation was demonstrably intensive along the coast. Interior occupation, primarily by Amerindian groups, and increasingly including some evidence for Palaeo-Eskimo occupation, appears to have been focused on near-coastal interior lakes, and major northeast to southwest-oriented lakes and rivers traversing the deep interior. Along these waterways, specific site locations tend to be associated with sandy coves and points of land, prominent constrictions in major waterways, stream confluences and stream mouths, and locations above or below falls and rapids. Historic European archaeological sites are known primarily from coastal areas until the twentieth century, although historic Mi'kmaq and Beothuk sites have been recorded, and may be anticipated, in deep interior settings on the Island.

Within the LAA, ethnohistoric evidence indicates that important caribou migration corridors approach and traverse the Project Area, and that there is theoretical potential for precontact sites of all periods in this area. With respect to historic resources, there is potential for Beothuk sites as the Project Area lies within the territory of the Beothuk and potential for historic Mi'kmaq sites dating to the second half of the nineteenth century into the twentieth century. A review of archaeological sites recorded to date within the RAA include:

- A cluster of historic-period Beothuk and precontact sites on Red Indian Lake, northeast of the Project Area
- A widely dispersed group of sites recorded on various interior lakes south and southwest of the Project Area
- Miscellaneous sites from the twentieth century recorded in locations surrounding the Project Area
- A series of ten archaeological sites recently identified on an 1875 map of Victoria River, believed to have been drawn and/or annotated by geologist J.P. Howley. These sites include both observed Beothuk wigwams dating to the eighteenth or nineteenth centuries, and the locations of Howley's own campsites. These sites have not been ground-truthed; however, they have been registered as archaeological sites with approximate coordinates in the Provincial Archaeological Office (PAO) site inventory. Three of these sites potentially lie in the vicinity of the Project Area.

A review of aerial imagery and LIDAR imagery identified 24 locations within the LAA with potential to yield archaeological resources. Most of these sites are associated with points of land, constrictions in lakes, stream confluences and river mouths. High-potential locations may, in many cases, have been affected by previous logging activities and hydroelectric development in the region; however, evidence from Red Indian Lake in particular indicates that sites may survive, in whole or in part, despite these effects. Although these areas lie within the LAA, only one of these locations (in the area of Marathon's exploration camp) lies within the Project Area. While this area of potential is within the Project Area, it does not overlap with the current footprint of Project infrastructure.

7.15.2 Environmental Effects

7.15.2.1 Changes to the Environment

The assessment of historic resources includes consideration of the following categories:

- Archaeological sites and materials
- Cultural / spiritual sites
- Paleontological sites and materials
- Architectural resources

No registered heritage structures are in the Project Area; therefore, architectural resources were not assessed further. The paleontological resources known to be in closest proximity to the RAA are the Carboniferous deposits found at Blanche Brook near Stephenville, approximately 104 km from the Project Area; therefore, given the distance between this site and the Project Area, no interactions or subsequent Project-related effects on these resources are predicted to occur.

Since historic resources, particularly archaeological resources, are present either immediately upon or close beneath the present ground surface, construction activities that involve initial ground disturbance such as earthworks and mine site preparation have the greatest potential to adversely affect them. 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 more accessible to human disturbance. No interaction is anticipated for heritage resources during Project operation or decommissioning, rehabilitation and closure, as activities associated with these phases would occur in areas already disturbed by construction.

7.15.2.2 Mitigation Measures

The mitigation measures presented in Table 7.16 are proposed to avoid or reduce Project-related effects on historic resources.

Table 7.16 Mitigation Measures: Historic Resources

Category	Mitigation	C	O	D
Discovery and Protection of Heritage Resources	• Mitigation measures to be applied with approval and appropriate permits issued by the Provincial Archaeology Office: – 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. – Ground-truthing of the three identified Victoria River sites will be undertaken in the event that the Project Area expands to interact with their hypothesized locations. – Review of historical fieldnotes pertaining to the Victoria River sites that are presently housed in the Provincial Archives will be undertaken in association with further field assessment. – 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.	✓	-	-
	• Measures to be included in the Heritage and Cultural Resources Protection Plan to mitigate the potential of adverse effects on historic resources resulting from an accidental discovery: – Prior to construction, personnel will be made aware of potential historic resources in the area and understand their responsibility should they identify potential historic resources. – Personnel will be advised to report unusual findings to the Site Supervisor and not to touch such findings. – Work will be suspended in the immediate area should a potential resource be identified. – If features are found using heavy equipment, the equipment will not be moved so that historical information and evidence is left intact and not further disturbed. – The area of findings will be flagged to protect it from looting and further disturbance. – A qualified archaeologist or historic resources professional will be contacted by the Site Supervisor to conduct an assessment of the site.	✓	-	-

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

7.15.2.3 Significance of Residual Effects

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. Mitigation measures will reduce the potential for finds of presently unknown sites to be discovered during the construction phase, and mitigation measures will be implemented in the event of an unexpected discovery of historic resources. Residual effects on historic resources resulting from Project construction activities are therefore not likely to occur. If disturbance or loss of historic resources did occur, it would occur as a single event(s) during construction activities and within the Project Area, during initial ground disturbance.

Because historic resources are static and finite, residual environmental effects which did occur would be adverse, permanent and irreversible.

With mitigation and management measures, residual environmental effects on Historic Resources are not predicted to occur. Results of the assessment of residual effects are presented in Appendix A; Table A-1.

7.16 DAM INFRASTRUCTURE

7.16.1 Existing Conditions

The Victoria Lake Reservoir and Victoria Dam structure are part of the Bay d'Espoir Hydroelectric Development. The Bay d'Espoir Hydroelectric Generating Facility is the largest hydroelectric plant on the Island of Newfoundland and includes three generating stations, six reservoirs, and associated dykes, dams, canals, and hydraulic structures. The generating stations comprising the Bay d'Espoir Development were built in stages beginning in 1967. There are four remote hydraulic structures associated with the Bay d'Espoir development: Ebbegunbaeg Control Structure; Salmon River Spillway Structure; Victoria Control Structure (i.e., the Victoria Dam); and Burnt Dam Spillway (NL Hydro 2012).

The Victoria Dam is a dam at the outlet of Victoria Lake Reservoir to the Victoria River, which naturally flowed north to Red Indian Lake (prior to construction of the dam). With a crest elevation of 326 m, this dam raised the natural lake elevation from 290 m to 325 m. The low supply level of the lake was set at 319 m by the Victoria Canal. In the late 1960s, Victoria Lake was diverted to the Victoria Canal, which flows into the White Bear drainage basin to the south. The Victoria Canal was designed to convey between 34 m^3/s (at low supply level) and 170 m^3/s (at full supply level) (Read and Cole 1972). The dam was constructed as a zoned rolled earth fill type with a central impervious core and a cutoff trench sealed on cleaned bedrock, grouted, where necessary. The maximum height of the dam above the river level is 58 m and the crest length is approximately 400 m.

The Victoria Lake Reservoir is typically charged to maximum annual operating level following the spring melt (June) and subsequently is drawn down to a minimum operating level in the March and April.

7.16.2 Environmental Effects

7.16.2.1 Changes to the Environment

There are two key interactions with respect to non-Project dam infrastructure and routine Project activities. The first is the potential direct effect of ground vibration from Project blasting on the nearby Victoria Dam. The second is the potential for indirect effects of Project-related changes to water quality and water quantity (e.g., changes to water levels and water chemistry) that could result in adverse effects to the Victoria Dam or on the Reservoir.

In the absence of mitigation, Project interactions with dam infrastructure could therefore result in the following potential effects:

- A change in water quality in Victoria Lake Reservoir

- A change in water balance in Victoria Lake Reservoir
- A change in dam stability for the Victoria Dam

Routine Project activities could affect or alter the natural flow regime thereby affecting operational flows required by the Victoria Dam and reservoir system. These changes could be caused by Project-related changes to surface vegetation cover, imperviousness, topography and drainage divides, slopes, open pit dewatering, seepage from stockpiles, and management of surface water runoff. Water withdrawal from Victoria Lake Reservoir for Project activities, including pit flooding for rehabilitation, could also affect operational water levels for the Victoria Dam.

Routine Project activities could potentially affect water quality through changes to the natural flow regime, contact water seepage and runoff, sedimentation and erosion rates, and process water discharges. These changes in water quality could potentially affect the Victoria Lake Reservoir and dam infrastructure.

Routine Project-related activities could also affect the stability of the Victoria Dam through induced seismic (vibrational) loading from Project blasting activities. Project-related blasting requirements is a key concern related to potential effects on the Victoria Dam and related non-Project infrastructure.

7.16.2.2 Mitigation Measures

The mitigation measures presented in Table 7.17 are proposed to avoid or reduce Project-related effects on dam infrastructure.

Table 7.17 Mitigation Measures: Dam Infrastructure

Category	Mitigation	C	O	D
Blasting	• An Explosives and Blasting Management Plan will be developed by Marathon and its selected, licenced blasting contractor(s) to provide direction for the safe storage, handling and use of explosives and explosive components at the Project site, to address the safety of the public and Project personnel, and protection of both the environment, Project components and the Victoria Dam. The Explosives and Blasting Management Plan will include requirements for Blast Design vibration limits and seismic monitoring for blasting activities.	✓	✓	-
	• Blasting activities will be included under a contract service agreement with the explosives supplier and who will have a valid blasters certificate issued by NLDECCM.	✓	✓	-
	• Blasting activities will be limited to only those areas required to achieve foundation grades for site development or open pit pioneering.	✓	-	-
	• Blasting for site development will be done by a certified blasting contractor who will develop a conservative Blast Design for engineering review and approval prior to carrying out the work. The Blast Design will be required to meet strict seismic (vibrational) limits at appropriate distances from any existing structures (Victoria Dam), developing infrastructure, and fish habitat.	✓	✓	-
	• Engagement with NL Hydro regarding blasting requirements, timing, vibration thresholds and monitoring	✓	✓	-

Notes:
C – Construction Activities; O – Operation Activities; D – Decommissioning, Rehabilitation and Closure Activities

7.16.2.3 Significance of Residual Effects

As described in Section 7.4, Project-related environmental effects will not cause a change in water quantity in Victoria Lake Reservoir greater than natural variability. Therefore, predicted residual effects on the Victoria Dam and Victoria Lake Reservoir operation associated with changes in water quantity are considered to be negligible.

As described in Section 7.4, Project-related environmental effects on the water quality in Victoria Lake Reservoir are not expected greater than 300 m from the discharge location into the lake and are predicted to not affect Victoria Lake Reservoir operation or Victoria Dam. Therefore, effects on the Victoria Dam and Victoria Lake Reservoir operation associated with changes in water quality are considered to be negligible.

An initial blasting impact assessment has been completed for the Project by Golder (Golder 2020) to evaluate the potential effects of open pit blasting on the Victoria Dam. The Victoria Dam is approximately equidistant from the two Project open pits at just under 3,800 m. Based on a conservative assessment, the estimated peak particle velocity transmitted to the Victoria Dam is 0.16 mm/s, which is well below the threshold at which a reduction in dam stability is likely to occur (50 mm/s). This information has been provided to NL Hydro for consideration by their engineers. This initial assessment will continue to be reviewed as further design and operation planning information is available for the Project.

Considering the proposed mitigation and management measures (primarily blasting management), the magnitude of residual effects from routine Project-related activities on the stability of non-Project dam infrastructure are anticipated to be negligible for all Project phases and limited to the LAA, as there are no predicted impacts on dams downstream based on the assessment of effect on the Victoria Lake Reservoir and Victoria Dam. The negligible residual effects are characterized as regular (pit production blasting), long term in duration and reversible. The ecological / socio-economic context is considered to be undisturbed.

With mitigation and management measures, residual environmental effects on dam infrastructure are predicted to be not significant, given the Project is not predicted to result in a measurable change in conditions potentially affecting non-Project dam infrastructure (e.g., vibrational loading), such that the infrastructure no longer conforms with applicable operation and design criteria.

Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

8.0 FOLLOW-UP AND MONITORING PROGRAMS

As per CEAA 2012, a follow-up program is a program for "verifying the accuracy of the environmental assessment (EA) of a designated project" and "determining the effectiveness of any mitigation measures." Proposed follow-up and monitoring programs identified as part of this environmental assessment will be used to:

- Verify the accuracy of environmental predictions
- Measure compliance with applicable licences, permits and other approvals
- Confirm adherence to general and specific mitigation measures
- Assess the effectiveness of mitigation and management measures
- Identify Project effects requiring further mitigation

Factors considered in determining the need for a follow-up program include:

- The nature and significance of predicted Project effects on VCs, especially environmentally sensitive areas, protected areas or areas under consideration for protection, and/or SAR/SOCC
- The nature and extent of Indigenous, stakeholder and public concerns raised about Project effects on a VC
- The level of confidence in effects assessment predictions
- The level of confidence in the effectiveness of mitigation measures
- The potential for and nature of cumulative environmental effects
- Data gaps in the effects assessment related to existing conditions or limited scientific knowledge regarding potential effects

As required by the Federal and Provincial EIS Guidelines, Marathon will develop follow-up and monitoring programs in consultation with government departments, Indigenous groups and stakeholders, and as required by conditions of EA approval. Results of the follow-up monitoring will be reported to the required government agency. Where monitoring results fall outside of those predicted in the EIS, the appropriate regulatory authorities will be consulted to determine the necessary course of action (for example, the development of additional mitigation, adaptive management, or further follow-up or monitoring).

It is anticipated that the follow-up program will change and evolve over the life of the Project in response to monitoring results, new and relevant academic and applied research, new and emerging technologies, and evolving industry best practices.

An overview of the conceptual EA follow-up and monitoring programs for the Project by VC is provided in Table 8.1.

Table 8.1 Conceptual EA Follow-up Program Elements

Targeted VCs	Overview of Follow-up / Monitoring Program / Study	Associated Plans
Atmospheric Environment	• The AQMP will specify the mitigation measures for the management and reduction of air emissions during Project construction, operation and decommissioning, and the proposed ambient air quality monitoring program • An ambient air quality (TSP, PM_{10} and $PM_{2.5}$ concentrations) monitoring program will be implemented and will be used to assess the effectiveness of the dust mitigation • Ambient meteorology monitoring will include meteorological monitoring (wind speed and wind direction) • Management of Project GHG emissions will be done in accordance with relevant GHG emissions management legislation • Sound pressure level monitoring programs, as required, will be conducted near the most affected receptor locations, including the accommodations camp • An indoor sound monitoring program will be conducted at the accommodations camp to confirm daytime and nighttime noise levels • No follow-up monitoring recommended with respect to ambient lighting	Air Quality Management Plan Greenhouse Gas Management Plan
Groundwater Resources	• As part of the Water Management Plan, a groundwater monitoring program will be implemented to monitor groundwater levels and groundwater quality including: • Monitoring wells at select locations around the open pit • Monitoring wells / drive point piezometers in the vicinity of, though not limited to, Valentine Lake, Victoria Lake Reservoir and Victoria River • Monitoring wells upgradient, cross gradient, and downgradient of the TMF and waste rock piles • Groundwater quality samples from monitoring wells will be monitored for general chemistry and select dissolved metals in spring, summer, and fall during construction, operation and closure (with the frequency progressively reduced based on monitoring results and Project phase) • Groundwater monitoring locations and requirements are addressed in the Operations C of A for the project.	Water Management Plan

Table 8.1 Conceptual EA Follow-up Program Elements

Targeted VCs	Overview of Follow-up / Monitoring Program / Study	Associated Plans
Surface Water Resources	• As part of operation, the following monitoring programs will be implemented: • Mine water effluent discharge, recycled tailings water, freshwater makeup, process water and potable water volumes will be recorded daily through gauges installed in distribution lines • Select monitoring locations will be equipped with real-time monitoring equipment in consultation with the Water Resources Management Division, NLDECCM, in accordance with a Real Time Water Quality Monitoring Agreement to be established for the Project • Hydrometric monitoring will be conducted at the final discharge points as well as at existing streams that are adjacent to the open pits • Flow monitoring of pumping equipment will be conducted, including the open pit dewatering, water withdrawal from Victoria Lake Reservoir, potable water to the water treatment plant, effluent discharge from TMF, and reclaim and tailings deposition rates • Surface water quality will be monitored at monitoring sites during all phases of the Project as outlined in the Surface Water Monitoring Plan	Water Management Plan Erosion and Sediment Control Plan Soil and Rock Management Plan Waste Management Plan
Fish and Fish Habitat	• Compliance monitoring will be conducted to confirm that mitigation measures are properly implemented, including: • Surface water quality monitoring during all phases of the Project • Monitoring effectiveness of the implemented Fish Habitat Offsetting Plan as authorized and required under the *Fisheries Act;* should the monitoring program indicate that the offsetting objectives are not being met, remedial actions or additional offsets as described in the Habitat Offsetting Plan would be considered, following consultation with DFO • An Environmental Effects Monitoring (EEM) program as required under the MDMER when the effluent flow rate of 50 m^3 per day is exceeded, based on the effluent deposited from all the final discharge points of the mine • Monitoring of pit lake water quality (decommissioning, rehabilitation and closure, and post-closure) to demonstrate that closure strategies are performing as intended	Fish Habitat Offsetting Plan Water Management Plan Erosion and Sediment Control Plan Soil and Rock Management Plan EEM under MDMER (when effluent flow rate of 50 m^3 per day is exceeded based on the effluent deposited from all the final discharge points of the mine)

Table 8.1 Conceptual EA Follow-up Program Elements

Targeted VCs	Overview of Follow-up / Monitoring Program / Study	Associated Plans
Vegetation, Wetlands, Terrain and Soils	• Pre-construction vegetation surveys will be conducted within the footprint of the access road upgrades • Compliance monitoring will be conducted to confirm environmental mitigation measures for vegetation and wetlands are implemented and properly maintained • Stockpile monitoring for soil quality and soil management measures to reduce site soil loss • Follow-up and monitoring will focus on soil stockpiles, the TMF, water management infrastructure, waste rock piles and open pit slopes • The potential for soil erosion and sedimentation of watercourses and waterbodies will be routinely assessed and mitigated • Follow-up surveys will be conducted over the mine life to allow for better prediction of potential areas of instability, and will allow for closure planning to take into account management of known residual instability • Unique landforms, including wetlands and eskers (if identified) will be observed though monitoring for compliance with identified mitigation measures	Environmental Protection Plan Soil and Rock Management Plan Erosion and Sediment Control Plan Rehabilitation and Closure Plan
Avifauna	• There will be regular inspection of facilities to determine if birds are nesting on or near anthropogenic structures during Project operation to comply with the MBCA and SARA and develop onsite bird control features to deter nesting on or near mine infrastructure, as applicable • Follow-up surveys will be conducted to determine accuracy of effects predictions for SARA-listed species (e.g., olive-sided flycatcher and rusty blackbird) found adjacent to the mine site • Breeding bird surveys will be conducted at varying distances from the mine infrastructure to determine accuracy of effects predictions on avifauna	Avifauna Management Plan
Caribou	• Follow-up and monitoring activities are likely to include the following, to be confirmed via continued consultation with NLDFFA-WD: • Deployment of telemetry collars on Buchans caribou and resident (Grey River) caribou in the anticipated zone of influence • Assessment of the effects of the Project on migration to identify changes in patterns of migration (e.g., timing, duration, location, stop-overs) • Monitoring of effects on resident caribou within the zone of influence during construction and operation • Aerial post-calving surveys of the Buchans herd and resident caribou within the zone of influence • Continuation of remote camera deployment and analysis of migration in spring and fall	Wildlife Monitoring and Management Plan Traffic Management Plan

Table 8.1 Conceptual EA Follow-up Program Elements

Targeted VCs	Overview of Follow-up / Monitoring Program / Study	Associated Plans
Caribou	• Marathon is proposing an adaptive management approach to address the potential Project-related adverse effects on caribou migration and populations in the Project Area.	Wildlife Monitoring and Management Plan Traffic Management Plan
Other Wildlife	• A follow=up program will be conducted for bats. Acoustic monitoring for bats will be conducted in the Project Area and LAA before and during construction and during operation, to determine species presence, general habitat use, and seasonal variation of bat occurrence. • A follow up program will be conducted for marten using snag trap surveys. Hair trap surveys were conducted at three sites during the winters of 2013 and 2018 to obtain baseline information of marten presence in the area. These surveys will be repeated during construction, operation and during and/or after decommissioning, to assess for changes in marten presence in comparison to existing conditions. If feasible, the same three locations will be surveyed to allow for a direct comparison.	Wildlife Monitoring and Management Plan
Community Services and Infrastructure	• A dedicated follow-up and monitoring program is not proposed for this VC	N/A
Community Health	• A dedicated follow-up and monitoring program is not proposed for this VC	N/A
Employment, Economy, and Business	• Follow-up and monitoring will be implemented in accordance with the Project's Benefits Agreement and Gender Equality and Diversity Plan. As part of this, quarterly summary reports for each phase of the Project will be developed.	Gender Equality and Diversity Plan
Land and Resource Use	• A dedicated follow-up and monitoring program is not proposed for this VC	N/A
Indigenous Groups	• A dedicated follow-up and monitoring program is not proposed for this VC. Marathon will continue to engage with the Indigenous groups throughout the life of the Project.	N/A
Historic Resources	• The Heritage and Cultural Resources Protection Plan will detail required follow-up monitoring in the event of an accidental discovery of historic sites or materials of significance.	Heritage and Cultural Resources Protection Plan

9.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

9.1 METHOD AND APPROACH

Effects of the environment on the Project to be considered in this assessment are those resulting in:

- A substantial change of the Project schedule
- A long -term interruption in Project operations
- Damage to Project infrastructure or equipment that results in a release of hazardous materials into the environment
- Damage to Project infrastructure resulting in a substantial increase in risks to the health and/or safety of Project personnel and/or the public, or substantial risks of a business interruption
- Damage to Project infrastructure resulting in repairs that could not be technically or economically implemented

The Project has been designed and will be carried out to withstand potential environmental forces, events and conditions, such as events related to climate (including weather and its variables), climate change, geologic hazards (such as seismic activity and landslides), and forest fires, which can affect the Project components and infrastructure, construction schedule, and operational performance. By addressing these potential effects through Project design, scheduling, applying standard engineering principles and practices, and peer reviewed design of critical and high risk components, as well as by following various codes and standards from the *National Building Code of Canada* and other sources, the Project is expected to be resilient to effects of the environment.

The scope of factors considered in the assessment of effects of the environment on the Project are presented in Table 9.1.

Table 9.1 Scope of Factors Considered for Effects of the Environment on the Project

Source of Environmental Effect	Environmental Category	Environmental Component
Weather and Climate	Climate	Temperature
		Precipitation (e.g., rain, snow)
		Wind
		Fog
	Extreme Weather Events	Snow
		Rain
		Wind
	Climate Change	Climate Projections

Table 9.1 Scope of Factors Considered for Effects of the Environment on the Project

Source of Environmental Effect	Environmental Category	Environmental Component
Natural Hazards	Geological	Landslides
		Rockfalls
		Subsidence
		Erosion
		Avalanches
		Earthquakes
	Forest Fires	Forest Fires

9.2 EFFECTS ASSESSMENT

9.2.1 Potential Effects

Potential effects of climate and climate change on the Project from extreme temperatures, heavy precipitation, fog, winds and storms include, though are not limited to, the following:

- Extreme precipitation and associated surface water runoff events have the potential to cause flooding, erosion, washout of site roads, haul roads and the access road, and overload of the Project's water management infrastructure and the TMF
- Failure of a watercourse crossing could result from a precipitation or snowmelt event that exceeds the design capacity, causing the loss of channel form due to erosion, or damage to other watercourse crossings downstream
- Extreme snow and ice also have the potential to increase loadings on buildings and other Project infrastructure and result in damage if the accumulated loading exceeds design loads
- Extreme snow and ice could also increase the risk of vehicle accidents on Project and access roads
- Reduced visibility (due to fog, heavy rainfalls, and extreme winds causing blowing snow, dust, or debris) could make maneuvering of equipment difficult and result in possible delays to construction schedules, mining operation, material movement, and/or the receipt of equipment and supplies
- Droughts could reduce water levels in surrounding watersheds, such as Victoria Lake Reservoir, where the Project water intake will be located

Potential effects of climate and climate change on the Project could damage Project infrastructure and equipment (e.g., water control structures and dams), which could in turn result in effects to the environment (e.g., releases to surface water and fish habitat). Adverse environmental effects from the malfunction of Project infrastructure are discussed in Chapter 10.

Potential effects from geological hazards include:

- Damage to infrastructure or equipment due to seismicity or terrain stability issues (landslides, rockfalls, erosion, and subsidence)

- Erosion can result in sedimentation, removal or movement of topsoil, the degradation of soil quality, structure and stability, and related adverse environmental effects
- Subsidence could cause damage to Project infrastructure or equipment by potentially causing structure collapse or power outage due to gradual or sudden changes in terrain stability
- Slope failure in the open pits could occur due to unanticipated geological or hydrogeological conditions, which could cause areas around the open pit to slump into the open pit

Potential effects of geological hazards on the Project could damage Project infrastructure and equipment (e.g., roads, dams, water management infrastructure), which could in turn result in effects to the environment (e.g., releases to surface water and fish habitat). Adverse environmental effects from the malfunction of Project infrastructure are discussed in Chapter 10.

Forest fires could damage Project infrastructure and equipment, which could in turn result in effects to the environment (e.g., socio-economic effects related to mine shutdown). Adverse environmental effects from the malfunction of Project infrastructure are discussed in Chapter 10.

9.2.2 Mitigation

The potential effects of climate and weather, geological hazards and forest fires on the Project will be managed though the following measures (Table 9.2).

Table 9.2 Summary of Mitigation: Effects of the Environment on the Project

Category	Mitigation	C	O	D
Effects of the Environment on the Project – Weather and Climate Change	• The Project will be designed and constructed to meet applicable engineering codes, standards and best management practices, such as the *National Building Code of Canada, the National Fire Code of Canada,* and *the Canadian Dam Association Guidelines*. The codes and standards account for weather variables, including extreme conditions, that could affect the structural integrity of buildings and infrastructure. Designs will also consider projected climate change over the life of the Project. For example, the NBCC contains design requirements to account for extreme weather on infrastructure such as: – critical structures, piping, tanks and steel selection to prevent brittle fracture at low ambient temperatures – electrical grounding structures for lightning protection – maximum motor ambient temperature – ice and freeze protection	✓	✓	✓
	• The potential effects of extreme weather including storms, precipitation, flooding/ice jams, and drought will be considered in Project planning, design and operation and maintenance strategies, including the selection of materials and equipment, and design of components, such as water management infrastructure and the TMF. These designs will consider projected climate change conditions over the life of the Project.	✓	✓	✓

Table 9.2 Summary of Mitigation: Effects of the Environment on the Project

Category	Mitigation	C	O	D
Effects of the Environment on the Project – Weather and Climate Change	• Marathon will regularly inspect and monitor Project infrastructure and equipment that may be impacted by the environment (in addition to its normal function) and take required action to maintain, repair and upgrade infrastructure / equipment as needed.	✓	✓	✓
	• Work activities will include allowance / procedures for delays due to poor weather.	✓	✓	✓
	• Contingency plans, including emergency back-up power for necessary operations, will be in place to manage delays, such as temporary power outages.	✓	✓	✓
	• Weather forecasts will be considered when planning construction and operation activities that may be affected by adverse conditions, such as TMF embankment raises, receipt of materials and supplies, and product deliveries, particularly deliveries of chemicals, reagents and diesel fuel. Where required, these activities will be scheduled for periods of favourable weather conditions.	✓	✓	✓
	• Weather forecasts will be regularly monitored and prior to extreme weather events, appropriate preventative measures will be taken to reduce the risk of damage to the Project. This will include site inspection by staff to secure loose items and identify other risks (for wind events), and inspection / maintenance of sediment and erosion control measures prior to and following precipitation events.	✓	✓	✓
Effects of the Environment on the Project – Geological Hazards	• The Project will be designed and constructed to meet applicable engineering codes, standards, and BMPs, including the NBCC and CANFEM, which provide standards of safety to account for geological hazards, including seismic activity.	✓	✓	✓
	• Water retaining structures, including dams for the TMF, will be designed, constructed, operated and closed in accordance with the recommendations provided by CDA; these guidelines also outline the minimum design criterion to account for geological hazards.	✓	✓	✓
	• Implementation of site-specific erosion and sedimentation control plans that will be developed during detailed design phase of the Project.	✓	✓	✓
	• Geotechnical investigations for all site infrastructure, open pits, and waste and ore piles will be completed prior to construction to further assess the site-specific conditions and associated risk of geological hazards; information obtained from these site-specific investigations will be used to complete the designs and meet the requirements as presented in NBCC, CANFEM and CDA.	✓	-	-
Effects of the Environment on the Project – Forest Fires	• Marathon's EMS will describe emergency response measures, training requirements, roles and responsibilities, and contact and reporting procedures in the event of a fire at or near the mine site or along the access road.	✓	✓	✓
	• Marathon will actively monitor wildfires that could affect the mine site and/or access road and coordinate with provincial authorities with respect to response, including the need for potential shutdown and evacuation of employees.	✓	✓	✓

Table 9.2 Summary of Mitigation: Effects of the Environment on the Project

Category	Mitigation	C	O	D
Effects of the Environment on the Project – Forest Fires	• On-site fire prevention and response equipment will be provided and maintained, and Marathon will have employees / teams that will be trained in safe fire response. While the purpose of this response training and equipment is to respond to fire scenarios on the mine site, NLDFFA would be responsible for response to a forest fire in the area not related to the Project.	✓	✓	✓
	• Project-related activities will be adjusted in case of a severe fire and as needed to protect the health and safety of employees.	✓	✓	✓

Notes:
C – Construction Activities
O – Operation Activities
D – Decommissioning, Rehabilitation and Closure Activities

9.2.3 Effects Assessment

Potential adverse effects on the Project by the physical environment through climate, extreme weather events linked to climate change, geological hazards, and forest fires have been, and will continue to be, an important consideration throughout the planning and engineering stages of the Project. These potential effects will continue to be considered during the construction, operation and decommissioning, rehabilitation and closure stages. The Project will rely on design standards and mining methods and technologies that have been tested and proven successful in similar environments across Canada. Marathon will also follow industry standards and best practices in designing for and preventing adverse effects of the environment on the Project, reducing the potential for:

- A substantial change of the Project schedule
- Risk to personnel, visitors and local stakeholders' safety and health
- A long term interruption in Project operation
- Damage to Project infrastructure or equipment that results in a release of hazardous materials into the environment
- Damage to Project infrastructure resulting in a substantial increase in risks to the health and/or safety of Project personnel and/or the public, or substantial risks of a business interruption
- Damage to Project infrastructure resulting in repairs that could not be technically or economically implemented

The design of the Project, including the development of mitigation measures, will reduce the potential for substantial adverse effects of the environment on the Project. Adverse environmental effects from accidental events and malfunctions are assessed in Chapter 10.

10.0 EFFECTS OF POSSIBLE ACCIDENTS AND MALFUNCTIONS

Accidents or malfunctions are events that occur outside the normal planned function or activity of the Project. Through good planning and Project design, the risks of accidents or malfunctions can be reduced or controlled. Part of the Project planning includes the development of emergency response and contingency plans for the construction, operation and decommissioning, rehabilitation and closure of the Project.

10.1 METHOD AND APPROACH

Accidents and malfunctions were assessed using the following approach:

- Selection of accidents or malfunctions that could occur during construction, operation, and decommissioning, rehabilitation and closure of the Project and result in potential environmental effects that require assessment
- Description of the selected accidental event and malfunction scenarios and identification of the Project design and safety measures that will be implemented to reduce or control the potential for each accident or malfunction
- Assessment of the potential residual adverse effects (after design and safety measures and emergency response measures have been applied) on VCs that would result from each accident or malfunction selected
- Determination of the significance of residual effects (after design and safety measures and emergency response measures have been applied) of each accident or malfunction

10.2 EFFECTS ASSESSMENT

This chapter summarizes the overall conclusions of the EIS, identifies renewable resources that may be affected by the Project, and highlights the benefits of the EA process, including through associated mechanisms such as public participation, increases in scientific knowledge, community and social benefits, and processes supporting gender equity, diversity and inclusion.

10.2.1 Potential Effects

The following potential accidents or malfunction scenarios have been identified as having the potential to occur during the Project:

- TMF Malfunction
- Open Pit Slope Failure
- LGO and HGO Stockpiles, and Waste Rock Piles Slope Failure
- Fuel and Hazardous Materials Spill
- Unplanned Release of Contact Water
- Sewage Treatment Plant Failure
- Over Blasting

- Fire / Explosion
- Vehicle Accident
- Watercourse Crossing Failure

Of the potential accidental event scenarios listed above, the following were not assessed further for the reasons provided below: open pit slope failure; sewage treatment plant failure; over blasting; and watercourse crossing failure.

- Open pit slope failure is anticipated to be addressed through design and pit slope management, with remaining residual effects confined to the Project Area, and specifically within the open pits, and thus unlikely to result in residual adverse effect on the VCs. Therefore, no further effects assessment is required.
- The sewage treatment facility will be built to applicable industry standards and codes and will be maintained and inspected on a regular basis. Therefore, negligible residual adverse effects on VCs are anticipated.
- Blasting is anticipated to occur in accordance with the mitigation measures described in Section 7.2.2.2. Furthermore, an Explosives and Blasting Management Plan will be developed. Given the safety measures and buffers in place, no residual adverse effects on VCs are anticipated beyond those effects assessed for routine blasting.
- Watercourse crossings will be designed to address precipitation events, including climate change parameters. Design, along with regular maintenance and monitoring, timely and effective response to watercourse crossing failures, and the implementation of mitigation measures described in Section 7.4.2.2. are expected to result in negligible residual adverse effects on VCs.

10.2.2 Mitigation Measures

For the remaining identified incidents, potential effects and key mitigation measures are described in Table 10-1.

Table 10.1 Description of Potential Effects and Mitigation Measures for Accidents and Malfunctions

Accident / Malfunction	Description of Potential Adverse Effects	Key Mitigation / Project Design
TMF Malfunction	In the event of a dam failure, liquid tailings would be released to the environment, affecting nearby waterbodies. 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. There is also potential for impacts to infrastructure and human health and safety.	• As required by the CDA, an Operation, Maintenance and Surveillance manual will be developed for the TMF which will dictate the frequency of dam inspections and dam safety reviews • As required by the CDA, a Public (Stakeholder) Safety Plan will be developed, which will identify the notifications procedures, warnings and alarms to be implemented in the event of a failure

Table 10.1 Description of Potential Effects and Mitigation Measures for Accidents and Malfunctions

Accident / Malfunction	Description of Potential Adverse Effects	Key Mitigation / Project Design
Overburden, LGO, HGO, and Waste Rock Piles Slope Failure	There is the potential for the release of contaminants or contact water into surface water and fish habitat.	• Progressive rehabilitation for waste rock piles • Incorporation of appropriate geotechnical design parameters and factors of safety, and proper construction
Fuel and Hazardous Materials Spill	A large spill may contaminate soil, groundwater and surface water, 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 Indigenous and non-Indigenous users.	• Meet or exceed federal and provincial regulations including federal *Sulphur in Diesel Fuel Regulations*, and provincial *Storage and Handling of Gasoline and Associated Products Regulations* • Transportation of hazardous materials will be conducted in compliance with the federal *Transportation of Dangerous Goods Act* • Marathon will regularly inspect and monitor Project infrastructure and equipment and take required action to maintain, repair and upgrade infrastructure / equipment as needed
Unplanned Release of Contact Water	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.	• Water management infrastructure for the Project is designed to reduce operational risks and environmental impacts and the system will be monitored and maintained over life of Project
Fire / Explosions	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. There is also risk to human health and safety. Fires arising from other causes (e.g., wildfires) and potentially affecting the Project are assessed as an Effect of the Environment on the Project (Chapter 9).	• Fire and explosion prevention measures and management, including on-site equipment and trained personnel • Emergency Response Plans will be developed, including emergency response measures, training, responsibilities, response equipment and materials, and contact and reporting procedures
Vehicle Accident	A vehicle collision could adversely affect wildlife and human health and safety. Potential effects resulting from a spill from a vehicle accident are discussed in the assessment of a fuel or hazardous material spill. Potential adverse effects caused by vehicle collisions with wildlife are assessed in Avifauna, Caribou, and Other Wildlife Chapters (Sections 7.7, 7.8 and 7.9, respectively).	• Marathon will develop and implement a Traffic Management Plan to manage transportation of workers and materials to site, product leaving site, and the number of vehicles accessing the site • Several traffic safety measures will be implemented to reduce the potential for vehicle malfunctions or accidents

10.2.3 Residual Effects

Marathon's environmental management policy is based on evolving best-practice standards for environmental performance in the mining industry. Marathon's approach to preventing accidents and emergency response planning is built on the same principles. Marathon understands the importance of preventing accidents and planning for emergencies before they occur. Regarding accident prevention, Marathon will achieve this using the following framework:

- Review the individual steps involved in Project construction, operation and decommissioning, rehabilitation and closure activities prior to the start of each Phase
- Analyze each step in the process to verify and update, if needed, the accident scenarios identified in this assessment of accidental events
- Review available best practice documents for each potential accident scenario
- Prepare site-specific accident prevention and emergency response plans with tactical plans, to be maintained on-site, and reviewed annually

While accident scenarios can be identified in advance and best practices can be in place to reduce the potential for occurrence, Marathon will also undertake the following steps and measures to be ready should an accident or emergency occur:

- Adopt an incident command system (ICS)
- Conduct annual emergency response exercises under the ICS system, including annual refresher training for key response personnel
- Review the potential accident scenarios annually and update as required with new best practices or newly identified potential accident scenarios, as applicable
- Maintain on site the supplies required to respond to the potential accident scenarios which will be identified in the emergency response plans

During an emergency, Marathon's hierarchy of key priorities and objectives is as follows:

- People – protect human life including Marathon employees and in the surrounding communities
- Environment – reduce harm to the environment
- Property – protect Marathon property and assets and respond to reduce additional negative impacts
- Business – facilitate business continuity

In the unlikely event of a major industrial accident or malfunction which results in a large-scale release into the environment, there is a potential for significant residual adverse effects to VCs. A significant effect may also occur in the unlikely event of a worst-case major accident resulting in a loss of life (e.g., vehicle accident or TMF failure). However, a significant effect is unlikely to occur given the Project design and safety measures in place to reduce the likelihood of an accident or malfunction, and the emergency response plans and contingency measures that will be in place to limit the extent and nature of potential environmental effects in the event of an accident or malfunction. For minor incidents with a higher likelihood of occurrence (e.g., small hydrocarbon spills from equipment), the residual effects are not likely to be significant, as these will be contained within the mine site and readily cleaned up. The prediction of significant adverse effects for the VCs identified in Table 10.2 assumes worst-case scenarios for the

events assessed. However, the risk of a significant effect occurring is low (or very low), given the Project design and safety measures that will be in place to reduce the likelihood of an accident or malfunction.

Table 10.2 Summary of Significance Determinations

VC Name	Accident or Malfunction Scenario					
	TMF Malfunction	**Slope Failure**	**Fuel and Hazardous Material Spills**	**Unplanned Release of Contact Water**	**Fire / Explosion**	**Vehicle Accident**
Atmospheric Environment	NS	NS	NS	NS	NS	NS
Groundwater Resources	NS	NS	NS	NS	NS	NS
Surface Water Resources	S*	NS	NS	NS	NS	NS
Fish and Fish Habitat	S*	NS	NS	NS	NS	NS
Vegetation, Wetlands, Terrain and Soils	NS	NS	NS	NS	NS	NS
Avifauna	NS	NS	NS	NS	NS	NS
Caribou	S*	NS	NS	NS	S*	NS
Other Wildlife	NS	NS	NS	NS	NS	NS
Community Services and Infrastructure	NS	NS	NS	NS	NS	NS
Community Health	S*	NS	NS	NS	NS	S*
Employment and Economy	NS	NS	NS	NS	NS	NS
Land and Resource Use	NS	NS	NS	NS	NS	NS
Indigenous Groups	NS	NS	NS	NS	NS	NS
Historic Resources	NS	NS	NS	NS	NS	NS
Dam Infrastructure	NS	NS	NS	NS	NS	NS

Notes:
*Unlikely to occur

11.0 CUMULATIVE ENVIRONMENTAL EFFECTS

11.1 APPROACH

Cumulative effects result from of the interaction of effects of multiple past, present and future projects and/or activities on a particular component of the environment. This chapter evaluates residual environmental effects of the Project (as assessed in Chapter 7) in the context of residual effects from past, present, ongoing and certain or reasonably foreseeable future physical activities (i.e., project or activities), to determine the potential for cumulative effects.

Two conditions must be met to initiate an assessment of cumulative effects on a VC:

- The Project is predicted to have adverse residual environmental effects on a VC
- The adverse residual effects from the Project overlap spatially and/or temporally with residual effects of other physical activities on a VC

If either condition was not met, an assessment of cumulative environmental effects was not completed. If the two conditions were met, then an assessment of cumulative effects on the VC was conducted. To determine if these two conditions were met, the following steps were completed:

- Identification of the VCs for the cumulative effects assessment
- Definition of the spatial and temporal boundaries of the assessment
- Identification of other past, present, ongoing, and future (i.e., certain or reasonably foreseeable) physical activities in the Regional Assessment Area (RAA) where residual environmental effects have potential to overlap spatially and/or temporally with those of the Project
- Where there is a spatial and/or temporal overlap, initiation of a cumulative effects assessment by:
    - identification / estimation of potential cumulative environmental effects
    - identification of additional mitigation measures, if required
    - determination of significance of potential adverse residual cumulative environmental effects
    - identification of follow-up, if required

The cumulative effects assessment used the same VC-specific residual effects criteria and significance definitions as the assessment of routine Project effects (Chapter 7).

11.3 CUMULATIVE EFFECTS ASSESSMENT

Past, present and ongoing activities / projects that are predicted to contribute to cumulative effects on VCs include mining and exploration, forestry, hunting, outfitting, trapping, and/or fishing, aquaculture, off-road vehicles, hydroelectric developments, and existing linear features. Potential cumulative effects of these past / present projects / activities have been considered in the existing conditions (i.e., baseline) and residual environmental effects (Section 7.0) and are not discussed further in the cumulative effects assessment. Future activities / projects that are predicted to contribute to cumulative effects on the Project include the Cape Ray Gold Project, Buchans Resources Limited Project and NL Hydro Power Line from Star Lake to the Project Area (Figure 11-1).

11.3.1 Atmospheric Environment

The contribution of Project-related residual adverse effects to cumulative effects include air, light, noise, and GHG emissions. However, the mine site is in a remote area with no substantive anthropogenic sources of air emissions, GHGs, noise or light occurring within 50 km except for ongoing exploration work within the Project Area. The GHG emissions from the Project are estimated to be 92,118 tonnes CO_2e/year and are anticipated to contribute 0.015% of total annual national emissions. These GHG emissions are expected to be a small fraction (0.84%) of NL's total emissions.

The construction of the NL Hydro Power Line from Star Lake to the mine is anticipated to spatially and temporally overlap with the construction of the Project, resulting in potential residual adverse effects contributing to cumulative effects. However, it is anticipated that noise, light, air, and GHG emissions will be low in magnitude compared to provincial and national GHG totals. Effects of this project will also be limited to the construction phase. For these reasons, the potential cumulative effects on air quality, sound quality and lighting are predicted to be not significant.

11.3.2 Groundwater

There are no pathways from reasonably foreseeable projects / activities that would act cumulatively with the Project resulting in a change in groundwater quantity or groundwater quality. Therefore, there are no potential cumulative effects from the Project and other reasonably foreseeable projects and activities.

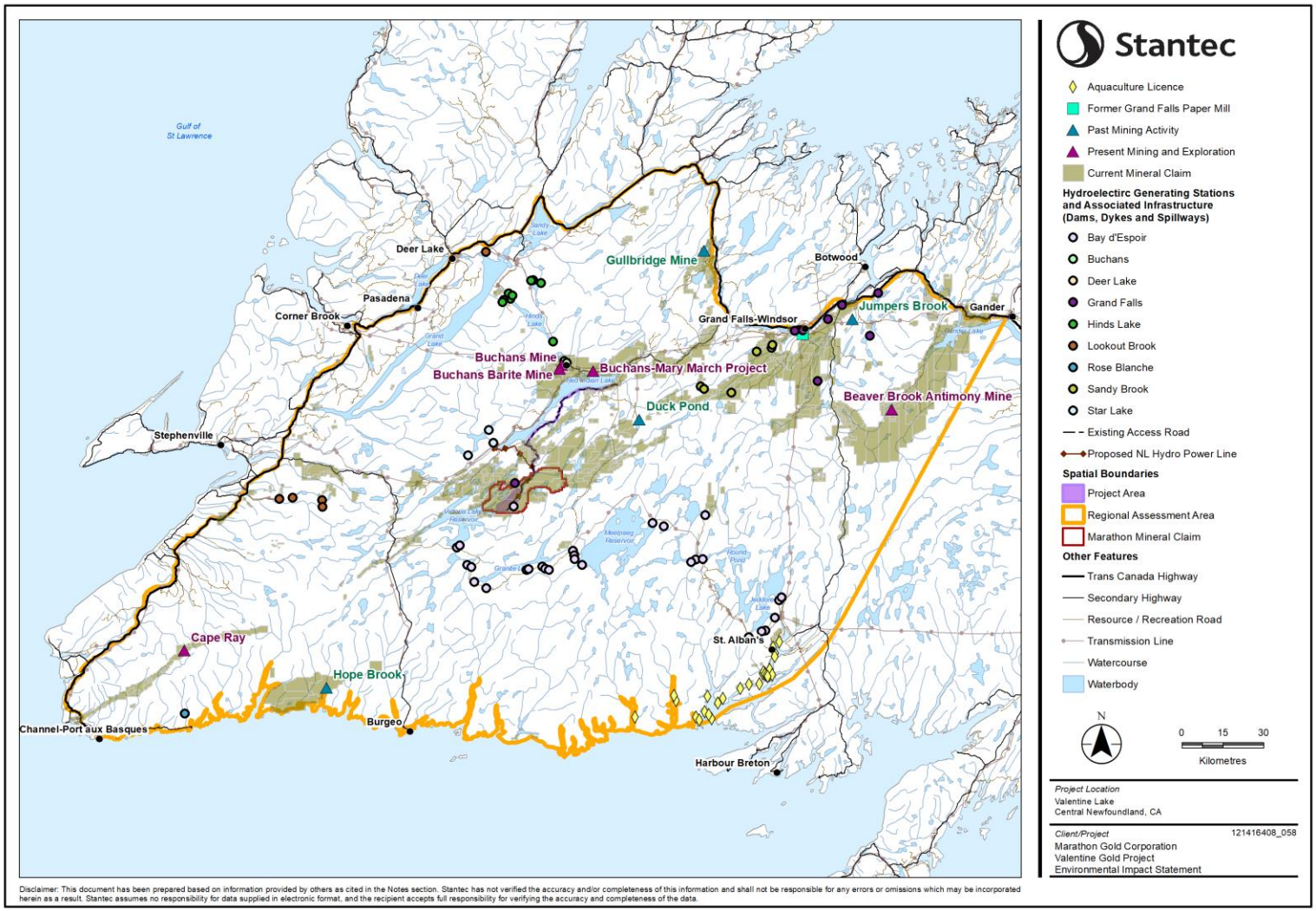

Figure 11-1 Other Projects and Activities Considered in the Cumulative Effects Assessment

11.3.3 Surface Water Resources

For surface water resources, only the NL Hydro Power Line is considered to have the potential for cumulative effects on surface water quantity and quality due to spatial and temporal overlap. It is assumed that similar regulatory standards and requirements will be applied to the power line project, along with the implementation of best practices and mitigation measures incorporated into design which will reduce interactions that would lead to residual cumulative effects. Therefore, the potential cumulative effects on surface water resources is predicted to be not significant.

11.3.4 Fish and Fish Habitat

Although the three identified future projects are anticipated to have similar effects as the Project, the Project and reasonably foreseeable future activities and projects will each only have a small contribution to change in fish habitat quality, quantity and fish health and survival in the RAA, as described below:

- Cape Ray Gold Project: studies indicate that waterways in the region are classified as good for spawning and/or rearing habitat for salmonid species (Nordmin 2016). With the implementation of mitigation measures for the Project as well as for future projects, cumulative effects to fish habitat quality, including salmon habitat, are not anticipated. Furthermore, the salmon population in the Project LAA is the Northeast Newfoundland Atlantic salmon population, which is Not-at-Risk, and therefore, cumulative environmental effects on sustainability of the salmon population are not anticipated. For other fish species, given the distance from the Valentine Gold Project, it is anticipated that residual adverse effects will not contribute substantially to overall cumulative effects.
- Buchans Resources Limited Project: is anticipated to have similar activities to the Project, although at a smaller scale. Given that the potential effects are similar, as the Project (which has been determined to be not significant), cumulative effects are not expected to result in a change in the productivity or sustainability of fish populations or fisheries within the cumulative effects RAA.
- NL Hydro Power Line from Star Lake: may result in a change in habitat quality for fish via the construction activities (i.e., clearing, accidental releases). However, with the implementation of standard mitigation measures and industry best practices, adverse effects to fish habitat quality are anticipated to be low.

Based on the above potential contribution of future foreseeable projects and activities to cumulative effects on fish and fish habitat, and with the assumption that standard mitigation measures will be applied and that the other projects in the area will be required to meet similar regulatory standards to the Project, the potential cumulative effects are predicted to be not significant.

11.3.5 Vegetation, Wetlands, Terrain and Soils

For vegetation, the contribution of Project-related residual adverse effects to cumulative effects on change in species / community diversity, wetland function, soils, and terrain will be low. For vegetation, in total (including all potential pathways), it is expected that plants within approximately 65.7 km^2 of vegetation habitat could be altered by the Project (approximately 3.6% of the ELCA). This represents less than 0.16% of vegetation habitat within the cumulative effects RAA (41,641 km^2). For wetlands, 30.2 km^2

of wetland habitat, or 4.0% of wetland habitat within the ELCA, may be directly or indirectly affected by the Project during construction and operation. This is equivalent to less than 0.07% of lost or altered wetland habitat from existing conditions within the cumulative effects RAA (41,641 km^2). An area of 34.8 km^2 is expected to be altered by the Project, including the removal or alteration of soils from the productive land base (soil quality), and loss of soils to burial and erosion (soil quantity). This represents less than 0.09% of land area altered from existing conditions within the cumulative effects RAA (41,641 km^2).

Other foreseeable projects and activities could also have residual adverse effects contributing to cumulative effects and are described below:

- Cape Ray Gold Project: given the distance of the Cape Ray Gold Project from the Project, residual adverse effects will not contribute substantially to cumulative effects, and residual cumulative effects will not threaten the long term persistence, viability or recovery of vegetation species in the cumulative effects RAA.
- Buchans Resources Limited Project: is likely to be of similar scale as the Project, which have been determined to be not significant.
- NL Hydro Power Line from Star Lake: will be subject to its own environmental assessment review and it is anticipated to have industry-standard mitigation measures to reduce residual adverse effects.

Given the above potential Project contributions, and with the assumption that other projects will have to comply to similar regulatory standards, adverse residual cumulative effects on vegetation community and species diversity, wetland function, soil quantity/quality and terrain/terrain stability were determined to be not significant.

11.3.6 Avifauna

The contribution of Project-related residual adverse effects to cumulative effects on change in habitat will be low, with up to approximately 34.8 km² of potential avifauna habitat removed within the Project Area and up to approximately 51 km² of avifauna habitat predicted to be changed due to sensory effects. This equates to a less than 0.13% reduction from existing conditions within the cumulative effects assessment RAA (41,641 km^2). The amount of high and moderate value habitat lost for the majority of species is less than 5% of the ELCA. For avifauna mortality, the contribution of Project-related residual adverse effects to cumulative effects will also be low, as the residual adverse effects on avifauna for the Project is predicted to be within the normal variability of existing conditions and is not expected to affect the long term persistence or viability of avifauna within the RAA.

Other foreseeable projects and activities could also have residual adverse effects contributing to cumulative effects and are described below:

- Cape Ray Gold Project: anecdotal reports suggest that the area may be used by migrating waterfowl in the spring and fall. Surveys revealed the presence of one species of raptor, with two ospreys (*Pandion haliaetus*) recorded (Nordmin 2016). Given its distance from the Project, it is anticipated that residual adverse effects from the Cape Ray Gold Project will not contribute substantially to cumulative

effects, and that residual cumulative effects will not threaten the long term persistence, viability, or recovery of avifauna or avifauna habitat in the cumulative effects RAA.

- Buchans Resources Limited Project: is anticipated to have similar project activities and mitigation measures as the Project. Therefore, the potential residual adverse effects resulting in effects to avifauna from the Buchans Resources Limited Project is anticipated to be at a smaller or similar scale as the Project and subject to similar mitigation measures and regulatory protections. It is unlikely that any overlapping effects on avifauna from the two projects will be substantive.
- NL Hydro Power Line from Star Lake: will likely require a 15 m cleared right-of-way, which could interact cumulatively with the Project. However, the NL Hydro Project will be subject to its own environmental assessment review and it is anticipated to have industry-standard mitigation measures to reduce residual adverse effects.

Given the limited area affected by the Project (34.8 km^2), that mortality risk is associated with specific and finite Project phases and activities for which mitigation measures exist, and that habitat for avifauna, including SAR and SOCC, is widespread throughout the RAA, it is anticipated that the cumulative environmental effects will not affect the long term persistence or viability of avifauna within the RAA. With the assumption that the Project's mitigation measures, and other projects' mitigation measures, will be implemented, and that similar regulatory standards will apply to these projects, residual cumulative effects for avifauna habitat and mortality risk were determined to be not significant.

11.3.7 Caribou

The contribution of Project-related residual adverse effects to cumulative effects on change in caribou habitat is anticipated to be low, with a decrease in the high and moderate-ranked habitat in the ELCA of 5.5%, which is 0.2% of the cumulative effects RAA (area: 40,484 km^2). Residual adverse effects of the Project contributing to cumulative effects on caribou mortality is anticipated to be within the range of normal variability of existing conditions, and is not expected to affect the long-term persistence or viability of the four assessed caribou herds within the RAA.

The Cape Ray Gold Project appears to have little overlap with caribou ranges. Therefore, it is anticipated that residual adverse effects from that project are not likely to interact cumulatively with the residual effects of the Project in the RAA. The Buchans Resources Limited Project is expected to have activities that are similar to the Project, with similar potential project effects on caribou habitat and mortality, with activities that overlap with the ranges of the Buchans and Gaff Topsails herds. However, effects on caribou are likely to be limited based on spatial extent, and therefore make a relatively small contribution to cumulative effects. For the NL Hydro Power Line, the creation of linear features within the RAA has the potential to fragment the habitat for caribou and increase mortality risk. However, it is anticipated that cumulative environmental effects resulting from these changes will not affect the long-term persistence or viability of the four assessed caribou herds within the RAA.

The Project has the potential to affect the migration of the Buchans herd. While the Cape Ray Gold and Buchans Resources Limited Projects are not anticipated to contribute to this effect, the NL Hydro Power Line will occur within the range of the Buchans herd and will likely be situated near the existing migration corridor. Therefore, it is possible that construction of the power line will incrementally contribute to

cumulative effects. With the implementation of the Project's mitigation measures, and assumed mitigation measures for the other projects, it is anticipated that cumulative environmental effects on change in movement may affect the long-term persistence or viability of the Buchans herd within the RAA. Uncertainty in how caribou may respond to cumulative effects on their migration path affects the certainty of cumulative effects on the long-term persistence or viability of the Buchans caribou herd within the RAA. With mitigation, the cumulative effects from the Project and reasonably foreseeable future activities are therefore predicted to be significant.

11.3.8 Other Wildlife

The contribution of Project-related residual adverse effects to cumulative effects on other wildlife will be low, with only a small portion of suitable habitat lost for the nine representative species in the ELCA. Results indicated that the percentage of habitat loss in the ELCA ranged from 2.1% (for muskrat) to 8.0% (for Canada lynx), which equates to less than 0.1% to 0.4% reduction from existing conditions within the cumulative effects RAA (41,641 km^2). It was determined that abundant suitable habitat will remain for all representative species in the ELCA, and especially so in the cumulative effects RAA. For foreseeable projects, the following contributions to cumulative effects are anticipated:

- Cape Ray Gold Project: is not anticipated to contribute substantially to cumulative effects on other wildlife habitat or mortality risk, given the distance from the Project and the large amount of suitable habitat within the cumulative effects RAA for other wildlife.
- Buchans Resources Limited Project: is anticipated to have similar effects on other wildlife habitat and mortality risk to the Project, although on a smaller scale and subject to similar mitigation measures and regulatory protections. It is unlikely that any overlapping effects on other wildlife from the two projects will be substantive.
- NL Hydro Power Line from Star Lake: will have some effects on other wildlife habitat and mortality risk. However, it is expected to have industry standard mitigation measures that will reduce potential effects

Based on the above anticipated contributions to cumulative effects from foreseeable projects, along with the implementation of industry standard mitigation measures, and with the assumption that future projects will follow similar regulatory standards to the Project, it was determined that these projects will not threaten the long term persistence, viability, or recovery of other wildlife species population (including SAR) in the cumulative effects RAA, and are therefore not significant.

11.3.9 Community Services and Infrastructure

Future projects and physical activities are predicted to act cumulatively with the Project to affect community services and infrastructure if they occur at the same time as the Project and require the temporary presence of a workforce in the RAA communities, placing additional demands on housing and temporary accommodations, as well as health and emergency, education, and municipal services and infrastructure, possibly beyond their capacity.

It is expected that the Project labour force will primarily live in the accommodations camp at the Project site, and so it is not likely to cumulatively interact with other projects for housing and temporary

accommodations. For the NL Hydro Power Line from Star Lake, the anticipated workforce is relatively small, and therefore is not anticipated to result in cumulative effects. Given the contribution of the Project and other projects to cumulative effects on community infrastructure and services, and with the assumption that current and reasonably foreseeable future projects and physical activities will be required to apply standard mitigation and other management measures to avoid or reduce their effect and comply with applicable regulatory requirements, the residual effect was determined to be not significant.

11.3.10 Community Health

The Project overlaps spatially and temporally with the Buchans Resources Limited Project and the NL Hydro Power Line. Community well-being may be positively affected by employment and income related to these projects, as increased disposable income will increase access of RAA residents to healthy lifestyles. This employment and income associated with the Buchans Resource Limited Project and the NL Hydro Power Line may also cause adverse effects on well-being as increased disposable income will decrease financial barriers to negative coping mechanisms (i.e., smoking, drugs). Additionally, these projects, with their associated biophysical effects could lead to adverse effects on the viability of country foods, and through their socio-economic effects, could create additional demands on local health services and infrastructure, contributing to cumulative effects on community health. It is anticipated that these other projects will be required to apply standard mitigation and other management measures to avoid or reduce their effects on community health (e.g., emergency response plans) and comply with applicable regulatory requirements. Therefore, with mitigation, the cumulative effects from the Project and reasonably foreseeable future activities are expected to be not significant.

11.3.11 Employment and Economy

Cumulative demand for labour from the Project and reasonably foreseeable future projects could result in additive contributions to labour drawdown and wage inflation that adversely affect regional businesses in the RAA. Because reasonably foreseeable future projects / activities are in early planning stages, it is conservatively assumed that residual effects of these projects / activities are similar in magnitude (i.e., low to moderate) and extent (extending to the RAA) as the Project. Given this, as well as the physical extent of the RAA, the location of projects / activities, shared workforce characteristics, and the potential for temporal overlap, there are potential contributions to cumulative effects with the Project. To mitigate the Project's contribution to cumulative effects, Marathon will pay its direct workforce wages that are consistent with NL's mining industry. It is anticipated, however, that similar mitigation and management measures would be implemented by proponents of reasonably foreseeable future projects, and therefore, the cumulative effects for labor and economy are expected to be not significant.

11.3.12 Land and Resource Use

For land use, the Project is not anticipated to affect current provincially protected areas. The contribution of Project-related residual adverse effects to cumulative effects on change in land use will be low, with approximately 34.8 km² of land use area affected within the Project Area. This represents a 0.3% reduction from existing conditions within the Land and Resource Use RAA and a 0.08% reduction from existing conditions within the cumulative effects RAA. Similarly, overlaps of the Project with forest, moose,

bear, and caribou management areas is approximately 1% for each. For resource use and recreation, noise and dust effects on nearby resource users are anticipated to be below regulatory thresholds. The Project is in a remote area with low levels of recreational use, with alternative areas available outside of the Project Area to support these activities.

For future projects, the following contributions to cumulative effects are anticipated:

- Cape Ray Gold Project: may contribute to cumulative effects on land and resource use. However, given the distance from the Project (126 km), it is anticipated that residual adverse effects will not contribute substantially to cumulative effects.
- Buchans Resource Limited Project: is anticipated to have similar project activities, the potential effects on land and resource use may be at a smaller or of similar scale as the Project and subject to similar mitigation measures and regulatory protections. It is unlikely that any overlapping effects on land and resource use from the two projects will be substantive.
- NL Hydro Power Line from Star Lake: may result in a change in species diversity for vegetation via the permanent removal and clearing of vegetation. However, these activities are anticipated to have industry-standard mitigation measures to reduce effects on land and resource use.

Overall, the Project and those projects and activities that may interact cumulatively are not likely to result in residual cumulative effects that will conflict with established federal, provincial, or municipal land use designations, policies, or by-laws. They are also not likely to create a change or disruption that restricts or degrades present land and resource use capacity within the cumulative effects RAA to a point where activities cannot continue at or near current levels over the long term and where compensation is not possible. Therefore, residual effects on land or resource use were determined to be not significant.

11.3.13 Indigenous Groups

The contribution of Project-related residual adverse effects to cumulative effects on change in Indigenous health conditions were determined to be low, based on changes in air quality, changes in water quality, changes in country foods (quality, access, and availability), and changes in sound quality (determined in Section 7.22). For changes in country foods, it was determined that effects will primarily occur at the mine site, which is in a remote area with low levels of current use and with low potential for country foods to be affected by emissions, discharges or wastes. Therefore, the potential for a change in Indigenous health or socio-economic conditions related to country foods consumption/harvesting was considered to be low. Furthermore, noise and dust effects to nearby users are anticipated to be below regulatory thresholds, and the Project Area has no known registered heritage sites or identified cultural or spiritual sites.

For the contribution of future project residual effects to cumulative effects on Indigenous groups, the following was identified:

- Cape Ray Gold Project: could have a overlapping effects with Project effects on Indigenous groups. However, given the distance from the Project, it is anticipated that Project residual adverse effects will not contribute substantially to cumulative effects.

- Buchans Resource Limited Project: is anticipated to have similar activities to the Project, and the potential effects on Indigenous groups would likely be at a smaller or of similar scale and subject to similar mitigation measures and regulatory protections. It is unlikely that any overlapping effects on Indigenous groups from the two projects will be substantive.
- The NL Hydro Power Line from Star Lake may result in a change in species diversity for vegetation via the permanent removal and clearing of vegetation. However, this project will have its own environmental assessment process and is anticipated to have mitigation measures to reduce effects on Indigenous groups.

Based on the Project's and other projects' potential contribution to cumulative effects, and given that other projects and activities in the RAA, including future projects and activities, will be required to comply with various mitigation measures and regulations, including engagement with Indigenous groups and communication of project activities and schedules, it was determined that residual effects are not likely to be significant.

11.3.14 Historic Resources

Cumulative effects resulting from the Buchans Resources Limited Project and the NL Hydro Power Line may lead to the disturbance or loss of historic resources during initial ground disturbance activities. Because historic resources are static and finite, any environmental effect which did occur would be adverse, permanent and irreversible. However, all development activities in the province are subject to the *Historic Resources Act*. New or on-going projects will be governed by routine application of the legislation related to archaeological resources, which serve to reduce potential adverse effects on historic resources. With the implementation of mitigation measures to reduce potential for presently unknown sites to be inadvertently disturbed or lost, and with the assumption that future foreseeable projects will be subject to similar regulatory requirements as the Project, the cumulative effects on historic resources are expected to be not significant.

12.0 CONCLUSIONS

This chapter summarizes the overall conclusions of the EIS, identifies renewable resources that may be affected by the Project, and highlights the benefits of the EA process, including through associated mechanisms such as public participation, increases in scientific knowledge, community and social benefits, and processes supporting gender equity, diversity and inclusion.

12.1.1 Benefits of the EA Process

12.1.1.1 Public Participation

The provincial and federal EA process benefits the people of Newfoundland and Labrador by outlining Marathon's obligations in relation to public participation and defining how public input is to be gathered, recorded and incorporated into the EA. The EA process requires that Marathon conduct a planned program of public participation and consultation, with minimum requirements outlined in the Federal and Provincial EIS Guidelines.

Chapters 5 and 6 summarize the public consultation and stakeholder engagement activities undertaken by Marathon to date. The EIS identifies key stakeholder groups, summarizes comments heard, identifies key issues of concern raised by the public and indicates Marathon's response to the concerns identified. This process ensures that public engagement activities are fulfilled, and that issues and concerns raised by stakeholders, as well as Marathon's responses, are documented and incorporated throughout the EIS.

The EA process has also served as a mechanism for Marathon to incorporate results of engagement in early Project planning to reduce and avoid environmental effects. As described in Section 2.3, several important aspects of the Project concept and engineering design have been modified, refined, and adapted to reduce potential adverse effects for incorporation into the EIS. These changes have been made during the Project Pre-Feasibility Study and in consideration of discussions with regulators, stakeholders and Indigenous groups, and in response to input received during public, Indigenous and regulatory review of the Registration / Project Description submitted to the federal and provincial governments in April 2019.

Marathon is committed to continuing and meaningful engagement with Indigenous groups, communities and stakeholders. Building and maintaining positive relationships with the people, communities and groups which are interested in or likely to be affected by the Project is key to securing and preserving the Project's social licence. Marathon's approach to public engagement is based on openness, transparency and inclusivity. Marathon has met and communicated with Indigenous groups, communities and a wide range of stakeholders to provide Project-related information on an ongoing basis and to create opportunities for dialogue to enhance Marathon's understanding of and inform its responses to issues and concerns.

Information which has been provided to Marathon through meetings, correspondence, workshops and other sessions has been taken into account in Project design process (for example, the decision not to use heap leach and the reconfiguration of the Project layout to reduce adverse impacts). Information

generated through engagement has been incorporated into the description of baseline conditions of VCs. The information provided has also influenced the assessment of potential Project effects for all VCs directly or indirectly. Public participation in the EA process via comments provided to regulators has the potential to further influence the environmental assessment of the Project.

Marathon is committed to continued engagement and consultation over the course of the Project life cycle. Marathon plans to hold a workshop with representatives of Indigenous groups to review proposed mitigation measures and has committed to involve each Indigenous group in monitoring. Marathon also plans to hold meetings with both Indigenous groups and communities following submission of the EIS to review the assessment results. Marathon has met and will continue to meet with fish and wildlife associations as well as other civil society organizations to discuss mitigations of specific, potential Project effects relating to fish and fish habitat and wildlife, and future monitoring requirements. Marathon will carefully consider the views expressed during ongoing engagement activities as the Project progresses and continue to consider these views in Project planning, design and execution.

12.1.1.2 Increases in Scientific Knowledge

Ongoing monitoring and analysis of data related to caribou movement and presence in the vicinity of the Project, as well as herd demographics such as proportion of calves for both migratory and resident caribou, will contribute to scientific knowledge both specifically regarding the caribou herds themselves (e.g., responses to sensory disturbance and altered migration) and more generally regarding caribou responses to industrial projects.

12.1.1.3 Community and Social Benefits

Marathon has committed to an approach to Project execution which will avoid or reduce adverse impacts and to create and enhance benefits. A central element of this approach is the development of positive working relationships with the communities in proximity to the Project. Marathon provides Project-related information to Indigenous groups, communities and stakeholders on an ongoing basis and maintains regular contact with each community through meetings (in-person, virtual and by conference call), e-mails and other forms of communication such as the quarterly newsletter. Ongoing efforts to hire local residents and to use local businesses to supply goods (groceries, fuel, hardware supplies) to the exploration camp will be increased as the Project progresses toward execution.

In February 2020, Marathon conducted a community survey to determine the specific interests and concerns of community residents. The majority of residents identified the socio-economic aspects of the Project, both positive and negative, as the subject of greatest interest. Recognizing the central importance of socio-economic concerns, Marathon has publicly committed to execute the Project to create and enhance local benefits. This commitment will be given formal expression in the Benefits Agreement and Gender Equity and Diversity Plan, which will be submitted for the approval of the Provincial government.

At the community level, Marathon has concluded Community Cooperation Agreements with five communities and is currently negotiating the terms of a sixth agreement. These agreements provide a framework for ongoing communication in relation to employment and business opportunities in order to

foster the fair and equitable representation of residents and local businesses in the Project workforce and the award of contracts. Marathon has made similar commitments respecting workforce and contracting participation to Indigenous groups and will continue to provide information respecting employment and business opportunities to all relevant parties.

As an integral aspect of Marathon's commitment to local benefits, Marathon has carried out a community investment program including sponsorship of local initiatives, such as the Red Indian Lake Fishing Derby and the Grand Falls-Windsor Minor Peewee AA Braves tournament. It has also contributed to industry initiatives such as the Mineral Resources Review 2019.

Marathon will continue to respond to individual requests for sponsorship support, building on the community-based approach to sponsorship and investment implemented in 2020. Under this approach, the communities of Buchans, Millertown, Buchans Junction, Badger, Grand Falls-Windsor and Bishop's Falls each received an allotment to be applied to community projects and activities, consistent with Marathon's corporate values. The identification of appropriate initiatives was undertaken by each community in consultation with Marathon. The allotments have been used by the communities to fund a wide range of initiatives ranging from seasonal community events (Bishop's Falls Winter Carnival), to support for local services (equipment for Millertown volunteer fire department, backhoe repairs) and enhancement of community infrastructure (Buchans stadium upgrades, Buchans Junction bridge repairs). Marathon's aim in providing the allotment is to support initiatives and events which:

- Are inclusive and promote broad-based community participation
- Are aimed at strengthening community cohesion
- Offer a demonstrable benefit to many community sectors
- Strengthen the community and leave a positive, long-term corporate legacy without creating dependency

In addition to the community allotment, in 2020, Marathon contributed $90,000 to local and regional initiatives to respond to community needs in the wake of COVID-19. Marathon's COVID-19 community response represented a matching investment of that awarded to Marathon via the Junior Exploration Assistance Program, back into the communities of central Newfoundland to help offset the adverse impacts that many essential local service organizations experienced on their normal fund-raising activities. This funding was distributed on a community and regional basis. The funding was applied on a community basis to support food security (gift cards, food), community wellness (upgrades to walking trails, support for Special Olympics, support for volunteer and charitable organizations), health and safety (PPE for essential workers, service groups) and educational support initiatives (purchase of Chromebooks, scholarship support). The regional component of the funding was donated to the South and Central Health Foundation and used for low-contact medical equipment, remote diagnostic tools, and support for long-term patients.

Marathon's commitment to sponsorship and community investment reflects the value that Marathon places on corporate social responsibility and the objective of establishing and maintaining positive relationships with the communities in proximity to the Project. As formalized by the terms of the individual Community Cooperation Agreements, Marathon will continue to work with each community to identify opportunities for the funding of programs, initiatives, events and activities that support community

capacity, well-being and cohesion. It will also continue to engage with communities, Indigenous groups and stakeholders to discuss Project design and execution with the goal of enhancing local benefits.

12.1.1.4 Benefits Agreement and Gender Equity and Diversity Plan

Marathon is committed to the promotion of the values of gender equity, diversity and inclusion. These values will be integrated into all aspects of Marathon's operations and provide the foundation for both a Benefits Agreement and a Gender Equity and Diversity Plan which will be submitted for the approval of the Minister of Industry, Energy and Technology (formerly the Department of Natural Resources) and the Minister for the Status of Women. Work on both the Agreement and the Gender Equity and Diversity Plan has commenced, and Marathon has met with representatives of the provincial government to discuss the applicable legal requirements. Marathon has also contacted relevant industry organizations, such as Trades NL and the Office to Advance Women Apprentices and has committed to engage with Indigenous groups and communities in the development of both the Agreement and the Plan.

The Benefits Agreement with the province will entrench the principle of local benefits in employment, training and business opportunities. The components of the Agreement will be incorporated into a Benefits Plan which will be binding on both Marathon and its contractors and supported by a corporate Benefits Policy. The Gender Equity and Diversity Plan will address access to training, employment and procurement and contracting opportunities for women, Indigenous persons and members of other underrepresented groups, such as persons with disabilities and visible minorities. This Plan will be binding on both Marathon and its contractors and be supported by corporate policies respecting diversity and inclusivity.

Both the Benefits Agreement and the Gender Equity and Diversity Plan will provide for ongoing collaboration with industry, government, educational and training institutions, Indigenous groups, communities and stakeholders to formulate strategies directed at local benefits creation and diversity and inclusion in the carrying out of the Project. The Plans will outline the goals and initiatives that will be implemented throughout the Project and the measures that will be implemented to ensure, to the extent possible, that there is fair and equitable access to the benefits associated with the Project.

12.1.2 Effects on Capacity of Renewable Resources

Renewable resources that may be affected by the Project:

- Atmospheric Environment
- Groundwater Resources
- Surface Water Resources
- Fish and Fish Habitat
- Vegetation, Wetlands, Terrain and Soils
- Avifauna
- Caribou
- Other Wildlife

In accordance with Section 4.1.6.3 of the Provincial EIS Guidelines, effects of the Project were thoroughly assessed. The assessment concluded that significant effects are not likely, and therefore, adverse

Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated, with the exception of caribou.

Woodland caribou on the Island of Newfoundland are recognized as a distinct population (Newfoundland Population) and are considered of Special Concern by COSEWIC (COSEWIC 2014). The RAA for the Caribou VC is based on the ranges of the following assessed herds: Buchans, Grey River, Gaff Topsails and La Poile (Government of NL 2019, 2020). Collectively, these herds represent approximately 36% of the total caribou population on the Island of Newfoundland (Government of NL 2019). The Buchans herd has an overall range of approximately 15,650 km^2 between Sandy Lake to the north and the south coast of the Island of Newfoundland and represents approximately 13.7% of the Island's caribou population.

Potential Project residual effects of change in habitat and mortality risk are predicted to be low magnitude for all four herds. The magnitude for change in movement for the Gaff Topsails, Grey River and La Poile herds is also predicted to be low. However, the residual effect for change in movement for one herd, the Buchans herd, is predicted to be high due to the amount of overlap of the Project with an existing migration corridor, and the proportion of collared caribou that use the path overlapping the Project.

Marathon is committed to an extensive follow-up and monitoring program, as described above, to reduce the likelihood that the Project will have a significant effect on the Buchans herd.

12.1.3 Overall Conclusions

Fifteen VCs were identified as relevant and important to the environmental assessment based on regulatory requirements and engagement with Indigenous groups and stakeholders. These were: Atmospheric Environment; Groundwater Resources; Surface Water Resources; Fish and Fish Habitat; Vegetation, Wetlands, Terrain and Soils; Avifauna; Caribou; Other Wildlife; Community Services and Infrastructure; Community Health; Employment and Economy; Land and Resource Use; Indigenous Groups; Historic Resources; and Dam Infrastructure.

The assessment included a characterization of the existing conditions within the spatial boundaries of each VC, including a discussion of the influences of past and present physical activities on the VC, leading to the current conditions. The assessment followed standard EA methods for describing Project interactions with each of the VCs and determining the potential environmental effects, including areas of federal jurisdiction, associated with the Project for the construction, operation, and decommissioning, rehabilitation and closure phases. The environmental effects assessment used a precautionary, conservative approach. Conservative assumptions have been made, so that potential adverse effects are generally overestimated rather than underestimated. Mitigation and environmental protection measures have been identified to reduce or eliminate adverse effects and the residual environmental effects have been characterized including a determination of their significance.

The environmental assessment predicts that routine Project activities will not cause significant adverse environmental effects on any of the VCs, with the exception of caribou. Similar results were determined for cumulative effects, where Project effects are considered in combination with the effects of other projects (past, present, and reasonably foreseeable future projects).

The general results of the assessment that relate to the key issues raised by regulators, Indigenous groups, and stakeholders, are summarized as follows:

- Employment and Economic Benefits: There are substantial employment and economic benefits to flow from the Project to the benefit of local communities, the central region of NL, and the province. The development of an on-site accommodations camp for all workers, on-site medical and emergency response resources will reduce potential effects on local community infrastructure and services. Local hiring and contracting policies for direct employment and contracts, and induced employment and business in the region will result in substantial benefits to the local and regional economy over a 15-year period (including construction, operation and decommissioning, rehabilitation and closure).
- Water Resources: The environmental assessment has determined there are no significant residual effects on groundwater or surface water resources resulting from routine Project activities, or from the cumulative effects of the Project in combination with other past, present, or reasonably foreseeable future projects. In the event of an accidental event such as a large spill of hazardous materials or effluent release, the risk of effects occurring is reduced based on contingency and emergency response plans. For a dam breach of the full-height TMF, there will be surface water effects in the Victoria River and a relatively small portion of Red Indian Lake only, and the effects are substantially reduced 2 km downstream from the TMF, in the Victoria River.
- Fish and Fish Habitat: The environmental assessment has determined there are no significant effects on fish and fish habitat that will result from routine Project activities, or from the cumulative effects of the Project in combination with other past, present, or reasonably foreseeable future projects. Some small streams and ponds on site will be affected by Project development and operation, most of which is habitat for threespine stickleback only. Marathon will develop and implement a Fish Habitat Offsetting Plan in consultation and with approval of Fisheries and Oceans Canada (DFO) that will create replacement habitat in a nearby location. For accidental events, a potential TMF dam breach carries the most substantial risk. The assessment has determined that for the worst-case TMF dam breach, effects will be limited to the Victoria River and a relatively small area of Red Indian Lake, and therefore will not affect Atlantic salmon resources in the Exploits River.
- Caribou: Potential Project residual effects of change in habitat and mortality risk are predicted to be low magnitude for all four herds. The magnitude for change in movement for the Gaff Topsails, Grey River and La Poile herds is also predicted to be low. However, the residual effect for change in movement for the Buchans herd is predicted to be high due to the amount of overlap of the Project with an existing migration corridor, and the proportion of collared caribou that use the path overlapping the Project. The Buchans herd, which is part of South Coast sub-population, represents 13.7% of the total caribou population on the Island. The prediction of a significant effect is established on a conservative basis, and reflects both the uncertainty in how Project activities may affect the migratory movement of the Buchans herd and what the long-term effects on the herd may be, and the uncertainty of success of the proposed mitigation measures. Marathon is committed to working with regulators, Indigenous groups and stakeholders to develop comprehensive programs to monitor migration patterns and populations of the caribou herds in the area, and in particular the Buchans herd. Marathon is currently working with provincial regulators to conduct ongoing baseline monitoring programs and plans to continue and adapt these monitoring programs over the life of the Project.

- Victoria Lake Reservoir and Victoria Dam: The environmental assessment has determined there are no significant effects on Victoria Lake Reservoir or Victoria Dam resulting from routine Project activities, or from the cumulative effects of the Project in combination with other past, present, or reasonably foreseeable future projects. Due to Marathon's re-location of the TMF downstream of the Victoria Dam, a worst-case TMF dam breach is also not expected to impact the Victoria Dam.

Follow-up and monitoring programs have been proposed for other VCs, as applicable, to verify the accuracy of the residual effects assessment, determine the effectiveness of mitigation measures, and monitor compliance with regulatory approvals, permits and authorizations.

In the unlikely event of a worst-case industrial accident or malfunction which results in a large-scale release into the environment, there is a potential for significant residual adverse effects to VCs. However, the risk of a significant effect occurring is low, given the Project design, maintenance and monitoring measures that will be in place to reduce the risk of an accident or malfunction occurring. In addition, emergency response plans and contingency measures will be in place to limit the extent and nature of potential environmental effects in the event of an accident or malfunction.

Marathon is committed to the successful development and operation of the Valentine Gold Project, and envisions an enterprise balancing commercial success with a safe working environment, effective environmental management, and the creation of lasting social benefit. Marathon will implement high standards of environmental performance as part of its commitment to safe and responsible environmental, social and economic development.

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APPENDIX A

Residual Effects Characterization

Table A- 1 Residual Effects Characterization and Signifciance Determination

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Phase	Mitigation Reference	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological/Socio-Economic Context		
Atmospheric Environment	s.5(1)(a)(iv) s.5(1)(c)(i)	Change in Air Quality	C	Refer to Section 7.1.2	L-M	LAA/RAA	ST	C	R	U	N	N/A
			O		M	LAA/RAA	MT	C	R	U	N	N/A
			D		L	PA	ST	R	R	U	N	N/A
		Change in Greenhouse Gas Emissions	C		L	N/A	ST	C	I	D	N	N/A
			O		M	N/A	MT	C	I	D	N	N/A
			D		N	N/A	ST	IR	I	D	N	N/A
		Change in Sound Quality	C		L	LAA/RAA	ST	C	R	U	N	N/A
			O		M	LAA/RAA	MT	C	R	U	N	N/A
			D		L	LAA/RAA	ST	R	R	U	N	N/A
		Change in Light Levels	C		L	LAA/RAA	ST	IR	R	U	N	N/A
			O		L	LAA/RAA	MT	C	R	U	N	N/A
			D		L	LAA/RAA	ST	IR	R	U	N	N/A
Groundwater Resources	s.5(1)(a)(iv) s.5(1)(c)(i)	Change in Groundwater Quantity	C	Refer to Section 7.2.2	L	PA	ST	C	R	U	N	N/A
			O		M	LAA/RAA	LT	C	I	U	N	N/A
			D		L	LAA/RAA	LT	C	I	U	N	N/A
		Change in Groundwater Quality	C		-	-	-	-	-	-	-	-
			O		L	LAA/RAA	LT	C	I	U	N	N/A
			D		L	LAA/RAA	LT	C	I	U	N	N/A
Surface Water Resources	s.5(1)(a)(iv) s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Surface Water Quantity	C	Refer to Section 7.3.2	L	LAA	LT	C	R / I	U	N	N/A
			O		L	LAA	LT	C	R / I	U	N	N/A
			D		L	LAA	LT	C	R / I	U	N	N/A
		Change in Surface Water Quality	C		L	LAA	LT	C	R / I	U	N	N/A
			O		L	LAA	LT	C	R / I	U	N	N/A
			D		L	LAA	LT	C	R / I	U	N	N/A
Fish and Fish Habitat	s.5(1)(a)(i) s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Fish Habitat Quantity	C	Refer to Section 7.4.2	M	PA	LT	C	I	D	N	N/A
			O		M	PA	LT	C	I	D	N	N/A
			D		M	PA	LT	C	I	D	N	N/A
		Change in Fish Habitat Quality	C		L	LAA	LT	C	I	D	N	N/A
			O		L	LAA	LT	C	I	D	N	N/A
			D		L	LAA	LT	C	I	D	N	N/A
		Change in Fish Health and Survival	C		L/M	LAA	LT	C	I	R	N	N/A
			O		N/L	LAA	LT	C	I	R	N	N/A
			D		L/M	LAA	LT	C	I	R	N	N/A

Table A- 1 Residual Effects Characterization and Signifciance Determination

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Phase	Mitigation Reference	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological/Socio-Economic Context		
Vegetation, Wetlands, Terrain and Soils	s.5(1)(a)(ii) s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Species Diversity	C	Refer to Section 7.5.2	L	LAA	LT	C	R/I	D	N	N/A
			O		L	LAA	LT	C	I	D	N	N/A
			D		L	LAA	MT	C	R	D	N	N/A
		Change in Community Diversity	C		L	LAA	LT	C	I	D	N	N/A
			O		L	LAA	LT	C	I	D	N	N/A
			D		L	LAA	MT	C	R	D	N	N/A
		Change in Wetland Function	C		L	LAA	LT	C	I	D	N	N/A
			O		L	LAA	LT	C	I	D	N	N/A
			D		L	LAA	MT	C	I	D	N	N/A
		Changes in Soil Quality	C		L	LAA	LT	C	R	D	N	N/A
			O		L	LAA	LT	C	R	D	N	N/A
			D		L	LAA	LT	C	R	D	N	N/A
		Changes in Soil Quantity	C		L	PA	ST	S/IR	R/I	D	N	N/A
			O		L	PA	MT	S/IR	R/I	D	N	N/A
			D		L	LAA	LT	S/IR	R/I	D	N	N/A
		Changes in Terrain (unique landforms)	C		L	LAA	LT	C	I	D	N	N/A
			O		L	LAA	LT	C	I	D	N	N/A
			D		L	LAA	LT	C	I	D	N	N/A
		Changes in Terrain Stability	C		L	LAA	LT	IR	R	D	N	N/A
			O		L	LAA	LT	IR	R	D	N	N/A
			D		L	LAA	LT	IR	R	D	N	N/A
Avifauna	s.5(1)(a)(iii) s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Habitat	C	Refer to Section 7.6.2	L-M	LAA	LT	C	I	D	N	N/A
			O		L-M	LAA	MT	C	R	D	N	N/A
			D		L-M	LAA	MT	C	R	D	N	N/A
		Change in Mortality Risk	C		L	LAA	ST	IR	R	D	N	N/A
			O		L	LAA	MT	IR	R	D	N	N/A
			D		L	LAA	MT	IR	R	D	N	N/A
Caribou	s.5(1)(a)(iv) s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Habitat	C	Refer to Section 7.7.2	L	RAA	LT	C	I	D	N	N/A
			O		L	RAA	LT	C	I	D	N	N/A
			D		L	RAA	LT	C	I	D	N	N/A
		Change in Movement	C		H	RAA	LT	C	I	D	S	L
			O		H	RAA	LT	C	I	D	S	L
			D		H	RAA	LT	C	I	D	S	L
		Change in Mortality Risk	C		L	RAA	MT	IR	R	D	N	N/A
			O		L	RAA	MT	IR	R	D	N	N/A
			D		L	RAA	ST	IR	R	D	N	N/A

Table A- 1 Residual Effects Characterization and Signifciance Determination

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Phase	Mitigation Reference	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological/Socio-Economic Context		
Other Wildlife	s.5(1)(a)(iv) s.5(1)(c)(i) s.5(1)(c)(iii)	Change in Habitat	C	Refer to Section 7.8.2	L-M	LAA	LT	C	I/R	D	N	N/A
			O		L-M	LAA	LT	C	R	D	N	N/A
			D		L-M	LAA	LT	C	R	D	N	N/A
		Change in Mortality Risk	C		L	PA	MT	IR	R	D	N	N/A
			O		L	PA	MT	IR	R	D	N	N/A
			D		L-N	PA	ST	IR	R	D	N	N/A
Community Services and Infrastructure	s.5(1)(a)(iv) s.5(1)(c)(i)	Change in Local Housing and Accommodation	C	Refer to Section 7.9.2	N	LAA/RAA	ST	C	R	R	N	N/A
			O		N	LAA/RAA	MT	C	R	R	N	N/A
			D		N	LAA/RAA	ST	C	R	R	N	N/A
		Change in Local Services and Infrastructure	C		L	LAA/RAA	ST	C	R	R	N	N/A
			O		L	LAA/RAA	MT	C	R	R	N	N/A
			D		L	LAA/RAA	ST	C	R	R	N	N/A
Community Health	s.5(1)(a)(iv) s.5(1)(c)(i)	Change in Community Well-Being	C	Refer to Section 7.10.2	L	LAA/RAA	ST	C	R	R	N	N/A
			O		L	LAA/RAA	MT	C	R	R	N	N/A
			D		L	LAA/RAA	ST	C	R	R	N	N/A
		Change in Physical Health Conditions	C		N-L	PA/LAA	ST-MT	C	R	D	N	N/A
			O		N-L	PA/LAA	ST-MT	C	R	D	N	N/A
			D		N-L	PA/LAA	ST-MT	C	R	D	N	N/A
Employment and Economy	s.5(1)(a)(iv) s.5(1)(c)(i)	Change in Regional Labour Force	C	Refer to Section 7.11.2	H*	LAA/RAA	ST	C	R	R	N	N/A
			O		H*	LAA/RAA	MT	C	R	R	N	N/A
			D		M	LAA/RAA	ST	C	I	R	N	N/A
		Change in Regional Business	C		L	LAA/RAA	ST	C	R	R	N	N/A
			O		L	LAA/RAA	MT	C	R	R	N	N/A
			D		L	LAA/RAA	ST	C	I	R	N	N/A
		Change in Economic Activity of Outfitters	C		N-L	LAA	ST	C	R	R	N	N/A
			O		N-L	LAA	LT	C	R	R	N	N/A
			D		N-L	LAA	LT	C	R	R	N	N/A
		Change in Economy	C		L*	LAA/RAA	ST	C	R	R	N	N/A
			O		M*	LAA/RAA	MT	C	R	R	N	N/A
			D		L*	LAA/RAA	ST	C	R	R	N	N/A

Table A- 1 Residual Effects Characterization and Signifciance Determination

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Phase	Mitigation Reference	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological/Socio-Economic Context		
Land and Resource Use	s.5(1)(a)(iv)	Change in Land Use	C	Refer to Section 7.12.2	L	PA/LAA	ST	IR	R	R	N	N/A
			O		L	PA/LAA	MT-P	C	R / IR	R	N	N/A
			D		L	PA/LAA	ST	IR	R / IR	R	N	N/A
		Change in Resource Use	C		N-L	PA/LAA	ST	IR	R	R	N	N/A
			O		N-L	PA/LAA	MT-P	C	R / IR	R	N	N/A
			D		N-L	PA/LAA	ST	IR	R / IR	R	N	N/A
		Change in Recreational Use	C		N-L	PA/LAA	ST	IR	R	R	N	N/A
			O		N-L	PA/LAA	MT-P	C	R / IR	R	N	N/A
			D		N-L	PA/LAA	ST	IR	R / IR	R	N	N/A
Indigenous Groups	s.5(1)(c)	Change in Current Use	C	Refer to Section 7.13.2	N-L	PA / LAA	ST	IR / C	R	R	N	N/A
			O		N-L	PA / LAA	ST-P	IR / C	R / IR	R	N	N/A
			D		N-L	PA / LAA	ST-P	IR / C	R / IR	R	N	N/A
		Change in Health Conditions	C		N-L	PA / LAA	ST	C	R	R	N	N/A
			O		N-L	PA / LAA	ST-MT	C	R	R	N	N/A
			D		N-L	PA / LAA	ST-MT	C	R	R	N	N/A
		Change in Socio-economic conditions	C		N-L	PA / RAA	ST	IR / C	R	R	N	N/A
			O		N-L	PA / RAA	ST-P	IR / C	R / IR	R	N	N/A
			D		N-L	PA / RAA	ST-P	IR / C	R / IR	R	N	N/A
		Change to Physical and Cultural Heritage (inside Project footprint)	C		N-H	PA	ST-P	S	R / IR	R	N	N/A
			O		-	-	-	-	-	-	-	-
			D		-	-	-	-	-	-	-	-
		Change to Physical and Cultural Heritage (outside Project footprint)	C		N-L	PA / LAA	ST	IR / C	R	R	N	N/A
			O		N-L	PA / LAA	ST-P	IR / C	R / IR	R	N	N/A
			D		N-L	PA / LAA	ST-P	IR / C	R / IR	R	N	N/A
Historic Resources	s.5(1)(c)(ii)	Loss or Disturbance of Historic Resources	C	Refer to Section 7.14.2	N-L	PA	P	S	I	U/D	N	N/A
			O		N-L	PA	P	S	I	U/D	N	N/A
			D		-	-	-	-	-	-	-	-

Table A- 1 Residual Effects Characterization and Signifciance Determination

Valued Components	Area of Federal Jurisdiction (CEAA, 2012 s.5 "environmental effect")	Potential Effect	Project Phase	Mitigation Reference	Residual Effect Characterization						Significance of Residual Effect	Likelihood of Significant Effect
					Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Ecological/Socio-Economic Context		
Dam Infrastructure	s.5(1)(c)(i)	Change in Surface Water Quantity	C	Refer to Section 7.15.2	N	LAA	LT	C	R	U	N	N/A
			O		N	LAA	LT	C	R	U	N	N/A
			D		N	LAA	LT	C	R	U	N	N/A
		Change in Surface Water Quality	C		N	LAA	LT	C	R	U	N	N/A
			O		N	LAA	LT	C	R	U	N	N/A
			D		N	LAA	LT	C	R	U	N	N/A
		Change in Dam Stability	C		N	LAA	LT	R	R	U	N	N/A
			O		N	LAA	LT	R	R	U	N	N/A
			D		N	LAA	LT	R	R	U	N	N/A
					Magnitude: N: Negligible L: Low M: Moderate H: High	**Geographic Extent:** PA: Project Area LAA: Local Assessment Area RAA: Regional Assessment Area	**Duration:** ST: Short-term MT: Medium-term LT: Long-term P: Permanent	**Frequency:** S: Single event IR: Irregular event R: Regular event C: Continuous	**Reversibility:** R: Reversible I: Irreversible	**Ecological/Socio-Economic Context:** D: Disturbed U: Undisturbed R: Resilient N: Not resilient	**Significance:** S: Significant N: Not Significant	**Likelihood:** U: Unlikely L: Likely N/A: Not applicable

Key/Note:

* Indicates a positive effect

Environmental Effects under CEAA 2012:

5(1)

(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:
- (i) fish as defined in section 2 of the *Fisheries Act*,
- (ii) aquatic species as defined in subsection 2(1) of the *Species at Risk Act*,
- (iii) migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act*, 1994, and
- (iv) any other component of the environment that is set out in Schedule 2 of [CEAA 2012];

(b) a change that may be caused to the environment that would occur
- (i) on federal lands,
- (ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or
- (iii) outside Canada; and

(c) with respect to Aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on
- (i) health and socio-economic conditions,
- (ii) physical and cultural heritage,
- (iii) the current use of lands and resources for traditional purposes, or
- (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Certain additional environmental effects must be considered under section 5(2) of CEAA 2012 where the carrying out of the physical activity, the designated project, or the project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA 2012.

5(2)

(a) a change, other than those referred to in paragraphs (1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and

(b) an effect, other than those referred to in paragraph (1)(c), of any change referred to in paragraph (a) on
- (i) health and socio-economic conditions,
- (ii) physical and cultural heritage, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.