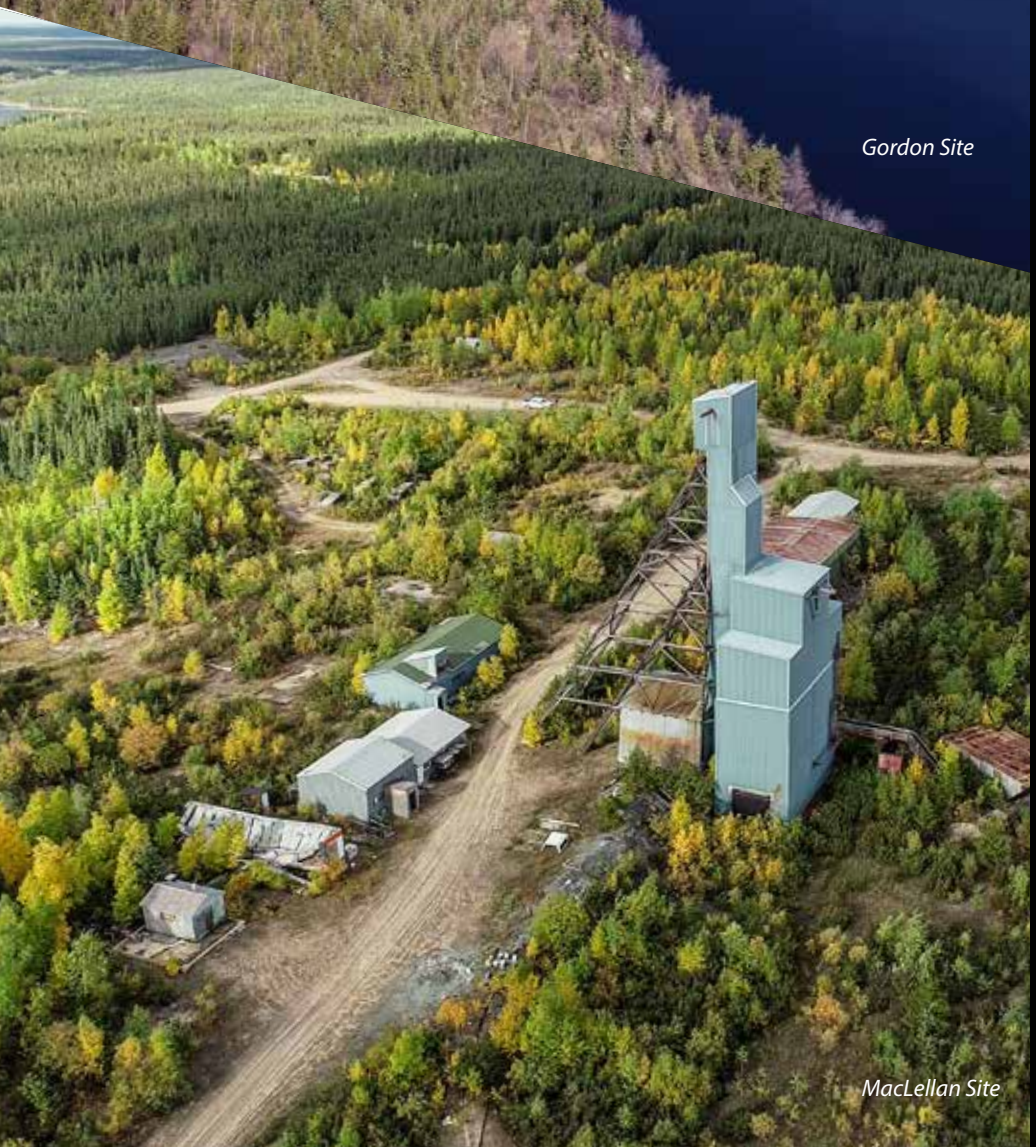
Gordon Site



MacLellan Site

LYNN LAKE GOLD PROJECT

ENVIRONMENTAL IMPACT STATEMENT

MAY 2020

Summary of the EIS

ALAMOS GOLD INC.

Stantec

ALAMOS GOLD INC.

Lynn Lake Gold Project
Environmental Impact Statement
Summary of the EIS

Stantec

Prepared by:

Stantec Consulting Ltd.

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Acronyms and Abbreviations

AAQC	Ambient Air Quality Criteria
Alamos	Alamos Gold Inc.
CAAQS	Canadian Ambient Air Quality Standards
CD Regulation	Classes of Development Regulation
CIP	carbon in pulp
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COPC	carcinogenic chemicals of potential concern
DARD	Department of Agriculture and Resource Development
dBA	a-weighted decibel sound level
dBL	linear (unweighted) decibel sound level
DFO	Fisheries and Oceans Canada
DIDO	drive-in/drive-out
DPM	diesel particulate matter
EA	environmental assessment
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
ETMA	East Tailings Management Area
FIFO	fly-in/fly-out
FTE	full-time equivalent
GDP	gross domestic product
GHG	greenhouse gas

HA	high annoyance
ha	hectare
HCN	hydrogen cyanide
HQ	hazard quotient
ILCR	incremental lifetime cancer risk
kg	kilograms
kt	kilotonne
kt/yr	kilotonne/year
kV	kilovolt
L/d	litres per day
LAA	Local Assessment Area
MCC	Manitoba Conservation and Climate
MDMER	Metal and Diamond Mining Effluent Regulations
MRSA	mine rock storage area
Mt	million tonnes
N_2O	nitrous oxide
NO_2	nitrogen dioxide
PAH	polycyclic aromatic hydrocarbon
PDA	Project Development Area
PM	particulate matter
PM_{10}	respirable particulate matter with an aerodynamic diameter less than 10 µm
$PM_{2.5}$	fine particulate matter with an aerodynamic diameter less than 2.5 µm
POPC	parameters of potential concern
PR	Provincial Road

RAA	Regional Assessment Area
RCMP	Royal Canadian Mounted Police
ROM	run-of-mine
ROW	right of way
SAR	species at risk
SO_2	sulphur dioxide
SOCC	species of conservation concern
TLRU	traditional land and resource use
TMF	Tailings Management Facility
TSP	total suspended particulate
TSS	total suspended solids
VC	valued component
VOC	volatile organic compound

Glossary

Access road	A road that affords access into and out of a construction or operation area.
Acid rock drainage	The acidic water that is created when sulphide minerals are exposed to air and produce sulphuric acid.
Adsorption	The process by which a solid holds molecules of a gas or liquid as a thin film.
Advective	Refers to the horizontal movement of water.
Aggregate	A quarry mineral that is used solely for construction purposes or as a constituent of concrete other than the manufacturing of cement and includes sand, gravel, clay, crushed stone, and crushed rock.
Alternative methods	Different ways of carrying out the same activity, including different technologies, locations, designs and methods of operation.
Alternatives to	Are functionally different ways of approaching or dealing with a problem or opportunity.
Ambient air quality	Refers to the quality of air in the surrounding environment.
Artifact	Any object showing evidence of manufacture, alteration or use by humans; also referred to as cultural or archaeological material.
Atmosphere	Refers to the layers of gases surrounding the Earth.
Barrier	In an acoustical sense, an obstacle composed of a berm, wall or fence that is free of gaps within or below of its extent and of sufficient mass to reduce transmission of sound through it.
Baseline conditions	Pre-project environmental conditions.
Bedrock	Solid rock that underlies loose material such as soil, sand, clay, and gravel.
Brownfield	An abandoned, vacant, derelict, or underutilized commercial, industrial, or institutional property where past actions have resulted in actual or perceived contamination or threats to public safety, and where there is active potential for redevelopment.
Burial	Heritage resources that consist of isolated burials, abandoned cemeteries, and found human remains.
Camp site	With respect to heritage resources, indicated by the presence of generalized debris such as stone flakes and tools, pottery fragments, hearths, and bone fragments.

Canadian Environmental Assessment Act, 2012 (CEAA 2012)	A federal Act respecting the environmental assessment of certain activities and the prevention of significant adverse environmental effects.
Chemicals of potential concern	Project -related chemical elements and compounds that have the potential to elicit adverse human or ecological health effects.
Carcinogen	A substance directly involved in the promotion of cancer.
Climate	The statistical average (mean and variability) of weather conditions over a substantial period of time (typically 30 years), accounting for the variability of weather during that period (Catto 2006).
Climate change	An acknowledged change in climate that has been documented over two or more periods, each with a minimum of 30 years; a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer.
Combustion	Burning, or rapid oxidation, accompanied by the release of energy in the form of heat and light.
Commercial fishery	A commercial fishery is one where fish is harvested under the authority of a licence for the purpose of sale, trade, or barter.
Conservative estimate	The assessment uses conservative assumptions and methods to increase the level of confidence in the estimate.
Contact water	Water that comes into contact with mine activities including the open pit, waste rock storage area runoff, ore milling and processing runoff and the Tailings Management Facility.
Contingency	A provision for an unforeseen event or circumstance.
Country foods	Foods that may be produced in an agricultural or backyard setting, or that are harvested through hunting, gathering, or fishing activities, but that are not for commercial sale.
Criteria air contaminant	Substances that are identified by government agencies as being the primary chemicals of concern associated with combustion sources. They include total particulate matter (PM), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), sulphur dioxide, nitrogen oxides, and carbon monoxide.
Crown land	Land belonging to the Province of Manitoba or the Government of Canada. It does not include: (a) land, the surface rights, mining rights or the mining and surface rights of which are under lease or licence of occupation from the Crown; (b) land in the actual use or occupation of the Crown, the Crown in right of Canada, or of a department of the Government of Canada or a ministry of the Government of Manitoba;

	(c) land the use of which is withdrawn or set apart or appropriated for a public purpose; or (d) land held by a ministry of the Government of Manitoba ("terre de la Couronne").
Cultural landscape	Areas or locations that are important in exemplifying human use or shaping of the natural landscape.
Cumulative effects	An assessment of cumulative effects is required under CEAA 2012 and is defined as the environment effects that are likely to result from a project in combination with other physical activities that have or will be carried out.
Cyanidation	A technique for extracting gold from ore by converting the gold to a water-soluble complex.
Deleterious substance	Any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of water quality so that is rendered or is likely to be rendered, deleterious to fish or fish habitat or to the use by man of fish that frequent the water.
Dewatering	To remove groundwater or surface water from an area for construction purposes.
Diamicton	A sediment resulting from dry-land erosion that is unsorted to poorly sorted and contains particles ranging in size from clay to boulders, supported in a mixture of mud or sand. The term is most commonly applied to unsorted glacial deposits (i.e., glacial till).
Direct employment	Labor that is hired directly by the Project.
Dissolved oxygen	The amount of gaseous oxygen (O_2) dissolved in an aqueous solution. Oxygen dissolves into water by diffusion from the surrounding air, by aeration and as a waste product of photosynthesis.
Drawdown	The change in water level (between the static water level and the surface of the cone of depression) caused by pumping a groundwater well.
Dust	Any airborne, finely divided solid or liquid material including particulate matter of all size ranges.
Ecological risk assessment	A scientific method used to examine the nature and magnitude of risks from the exposure of plants and animals to contaminants in the environment.
Effluent	The wastewater discharged to a receiving waterbody.
Electrowinning	Process of recovering metals, such as gold or silver, from solution by passing a current through the solution. Electrons from the current chemically reduce the gold and/or silver ions, to form a solid metal compound on the cathode.

Elution	A process of extracting one material from another by washing with a solvent.
Emissions	Technically, all solid, liquid, or gaseous discharges from a processing facility, but normally referring to Air Emissions (with solids referred to as residue and liquids as effluent).
Engagement	Two-way communication to share information and viewpoints, understand comments and interests, and address or resolve issues.
Environment	The environment is broadly defined under the *Canadian Environmental Assessment Act*, 2012 as the components of the Earth and includes: • land, water, and air, including all layers of the atmosphere; • all organic and inorganic matter and living organisms; and • the interacting natural systems that include components referred to in a) and b).
environmental assessment (EA)	Environmental assessment is a study, which assesses the potential environmental effects (positive or negative) of a proposal. Key components of an environmental assessment include consultation with government agencies and the public; consideration and evaluation of alternatives; and, the management of potential environmental effects. Conducting an environmental assessment promotes good environmental planning before decisions are made about proceeding with a proposal.
Environment Act	A Manitoba Act that provides for the protection, conservation, and wise management of the environment in Manitoba.
Environment Act Proposal Guidelines	A provincial document that provides a framework for the preparation of an Environmental Assessment Report.
Environmental Impact Statement (EIS)	A report submitted to be approved by Impact Assessment Agency in accordance with the *Canadian Environmental Assessment Act*, 2012 to facilitate an understanding of a project, the existing environment and potential environmental effects of a project by agencies, members of the public and Indigenous communities.
Exposure	Any condition which provides an opportunity for an external substance in the environmental media to enter the body of an organism and is typically defined in terms of intensity (how much), frequency (how often), and duration (how long). Acute exposures are short-term and often to higher concentrations whereas chronic exposures are long term and usually to lower concentrations. Exposure can be continuous or intermittent.
Exposure pathway	The course a potential stressor (e.g., chemical, noise) takes from its source to the person(s) being contacted.
Fish habitat	Spawning grounds and any other areas, including nursery, rearing, food supply or migration areas, on which fish depend directly or

	indirectly to carry out their life processes, as defined under the former *Fisheries Act*.
Follow-up and Monitoring Programs	A follow-up program is a requirement under section 2(1) of the former CEAA 2012 and is designed to verify the accuracy of the effects assessment and the effectiveness of mitigation measures to reduce adverse effects of a designated Project. The goal of the monitoring is to determine the mitigation or compensation measures to reduce adverse effects are properly implemented.
Furbearer	An animal of a species or type listed in Division 2 of Schedule A of *The Wildlife Act*, c. W130 (Manitoba) or declared by the regulations to be a furbearing animal, or any part thereof.
Glaciolacustrine	Pertaining to, derived from, or deposited in glacial lakes (i.e., deposits and landforms composed of suspended material brought by meltwater streams flowing into lakes bordering the glacier).
Greenhouse gases	Gaseous compounds that inhibit the release of heat from the atmosphere (e.g., carbon dioxide, methane, and nitrous oxide).
Gross domestic product	The monetary value of all goods and services produced within a country's borders in a specific time period.
Groundwater	Water that occurs beneath the land surface and fills the pore spaces of soil or rock below the saturated zone.
Groundwater recharge	The amount of precipitation that infiltrates into the ground to replenish the groundwater.
Grubbing	The removal and disposal of stumps and roots remaining after vegetation clearing.
Induced employment	Labour hired by industries that produce and provide consumer items purchased by people who are directly or indirectly employed on the Project.
Labour force	Persons employed and unemployed aged 15 years and over.
Lease	A type of Crown land tenure that grant exclusive rights to Crown minerals and mineral access rights for mining and production purposes. Producing leases are granted for 21-year renewable terms.
Local assessment area	Encompasses the area in which both: a) there is a potential for Project-related environmental effects (direct or indirect); and b) there is a reasonable expectation that those potential effects in the local assessment area will be a concern. The local assessment area encompasses the Project development area and is VC-specific.
Leaching	The process where contaminants are dissolved into a liquid solution (e.g., water) facilitating their movement into the environment.
Long-term Effect	A residual effect that extends into post-closure.

Metal leaching	The process when metals are dissolved into a liquid solution (e.g., water).
Mining claim	A parcel of Crown mineral land that is staked out, acquired, or held as claim to explore for and develop minerals. Claims can vary in size from 16 ha to 256 ha. Mining claims remain in good standing for two years and can be renewed annually for an indefinite period.
Mining rights	The rights to minerals located in, on or under the land. Also referred to as mineral rights.
Mitigation	Measures taken to reduce, or control effects on the environment.
Mixedwood forest	Forest canopy is a mixture of coniferous and deciduous trees.
Monitoring	Periodic or continuous surveillance or testing to determine the characteristics of a substance or the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.
Night-time	Defined as the hours from 23:00 to 07:00 according to Ministry of Transportation guideline “Environmental Guide for Noise”.
Overburden	The natural unconsolidated sediments and organic soils that overlie bedrock.
Participation rate	Percentage of people participating in the labour force aged 15 and over, excluding institutional residents.
Particulate matter	A particle in solid or liquid phase that is suspended in air or water.
Potable water	Water suitable for drinking.
Precipitation	The action or process of precipitating a substance from a solution.
Precontact period	The period of First Nation occupation and settlement prior to the arrival of Europeans. The period is generally divided into Early (12,000 to 6,500 BP), Middle (6,500 to 2,500 BP) and Late (2,500 to 300 BP).
Project development area	The combined Project footprint of facility components, as well as the anticipated area of physical disturbance associated with all phases of the Project.
Protected area	A protected area prohibits, through legal means, logging, mining (including aggregate extraction), and oil, petroleum, natural gas, or hydro-electric development.
Quarry	An open excavation or pit from which stone, gravel or sand is obtained by digging, cutting, or blasting.
Quarry withdrawal area	An area from which quarry minerals may be withdrawn on Crown land.
Receptor	A human, plant, bird or animal, or environmental component that could come to harm when exposed to a hazard.

Redox (reduction-oxidation)	A type of chemical reaction in which the oxidation states of atoms are changed.
Regional assessment area	Provides the broad contextual boundary within which project-specific effects were characterized. It includes land that may be relevant to the assessment of any wider-spread direct and indirect effects of the Project. It is also the area within which there is a potential for cumulative and socio-economic effects. The regional assessment area encompasses the Project development area and the local assessment area and is Valued Component-specific.
Residual environmental effects	Environmental effects occurring from the Project remaining after mitigation.
Riparian	Refers to terrain, vegetation or simply a position adjacent to or associated with a watercourse, waterbody, or flood plain.
Determination of significance	A conclusion as to whether the designated project is likely to cause significant adverse environmental effects taking into account the implementation of appropriate mitigation measures.
Sound	A wave motion in air, water, or other media. It is the rapid oscillatory compression changes in a medium that propagate to distant points. It is characterized by changes in density, pressure, motion, and temperature as well as other physical properties. Not all rapid changes in the medium are due to sound (e.g., wind distortion on a microphone diaphragm).
Sound level	Generally, sound level refers to the weighted sound pressure level obtained by frequency weighting, usually A- or C-weighted, and expressed in decibels. Also identified as noise level in this report.
Species at Risk	An extirpated, endangered, or threatened species or a species of conservation concern, as defined by the *Species at Risk Act*.
Species of conservation concern	Species that are rare, disjunct, or at risk throughout their range, or in Manitoba, and in need of further research. Encompasses species listed under *The Endangered Species and Ecosystems Act* of Manitoba or have a special designation by the Committee on the Status of Endangered Wildlife in Canada.
Sport fish	Fish species that are targeted by recreational anglers and desired in commercial and Indigenous fisheries (e.g., trout, pike).
Stack	A chimney, smokestack, or vertical pipe that discharges flue gas or used air.
Sub-watershed	A smaller geographic sub-unit of a watershed that consists of smaller drainage areas.
Surface rights	Every right to land other than the mining rights.

Tailings	Crushed or ground rock and process effluents that are generated in a mine processing plant.
Tailings management facility	An engineered facility to store mine waste in the form of tailings from the ore milling and processing plant.
Till	Material that is composed of a gravel and clay mixture.
Total suspended particulate	Airborne particles that are less than 100 micrometers in size. They are used as a parameter to assess air quality.
Traditional knowledge	Encompasses both traditional ecological knowledge and traditional land and resource use knowledge.
Traditional Land and Resource Use	An Indigenous nation's use of land, water, and resources, within a traditional territory, lands, or occupancy area.
Valued component	Components or attributes of the biophysical and socio-economic environment that are important for ecological, scientific, social, cultural, economic, historical, archaeological, or aesthetic reasons.
Watercourse	Any flowing water including rivers, streams, and overland flow paths.
Watershed	A catchment basin or area including the land that is drained by a watercourse and its tributaries. Watershed boundaries are defined by heights of land. Boundaries are set where a height of land causes water to flow away from the watercourse.
Wetland	Land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity in a wet environment.
Wildlife	In keeping with Environment and Climate Change Canada, the term is generally applied to birds and mammals, and sometimes defined to include reptiles and amphibians. Generally, it excludes fish, invertebrates, and plants.
Zone of Influence	The area of land within or adjacent to a construction site that potentially may be affected by vibrations emanating from a construction activity where the peak particle velocity measured at the point of reception is equal to or greater than 5 mm/sec at any frequency.

1.0 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

1.1 INTRODUCTION

The Lynn Lake Gold Project (the Project) is the proposed redevelopment of two historical gold mines near Lynn Lake, Manitoba by Alamos Gold Inc. (Alamos; the Proponent). Alamos is a Canadian-based intermediate gold producer with diversified production from three operating mines in North America: the Young-Davidson and Island Gold Mines in northern Ontario, Canada, and the Mulatos Mine in Sonora, Mexico. Alamos has a leading growth profile with exploration and development projects in Mexico, Turkey, Canada, and the United States.

This document is a summary of the Environmental Impact Statement (EIS) submitted to the Impact Assessment Agency of Canada (IAAC; formerly Canadian Environmental Assessment Agency) pursuant to the *Canadian Environmental Assessment Act, 2012* and to Manitoba Conservation and Climate (MCC; formerly Manitoba Sustainable Development) as an Environment Act Proposal pursuant to requirements of *The Environment Act* (Manitoba). Construction of the Project is subject to regulatory approvals, with commissioning anticipated two years following construction.

Information summarized in this document is provided in the EIS and Environment Act Proposal, including supporting documents submitted to the IAAC and MCC.

1.2 REGULATORY SETTING

1.2.1 Federal Regulatory Requirements

Under the *Canadian Environmental Assessment Act*, 2012, federal environmental assessments (EAs) are required for 'designated projects' consisting of one or more physical activities specified in the *Regulations Designating Physical Activities* (the Regulations). The IAAC is responsible for the administration of federal EAs for metal mines under CEAA 2012.

Section 16 of the Regulations specifies ore production and input capacity thresholds for gold mines and metal mills. Ore production capacities for the Gordon and MacLellan sites will vary by year. The maximum ore production capacity for the Project (i.e., total mineralized material to be extracted from the open pits at both sites, excluding overburden and mine rock [waste]) is estimated to exceed the thresholds specified under the Regulations thus requiring an EA to be conducted.

The Project may also be considered an expansion of an existing gold mine under Section 17 of the Regulations because the total area of mine operations will increase by more than 50% over the areas of both the original (historical) mine operations and current mine site footprints. Exceeding this threshold also requires an EA. The Project is not expected to receive financial support from any federal authorities, and

the use of federal lands is not anticipated to be required in support of the Project. The nearest parcel of federal land is associated with a Royal Canadian Mounted Police (RCMP) detachment located approximately 6 km southwest of the MacLellan site.

Other potentially relevant federal legislation that may apply to the Project and require issuance of an authorization (i.e., license, permit, certificate) for the Project approval include:

- *Canadian Environmental Protection Act*
- *Explosives Act*
- *Fisheries Act*
- *Migratory Birds Convention Act*
- *Navigable Waters Protection Act*
- *Species at Risk Act*
- *Transportation of Dangerous Goods Act.*

1.2.2 Provincial Regulatory Requirements

Provincially, the *Classes of Development Regulation* (CD Regulation) under *The Environment Act* of Manitoba identifies 'Class 1', 'Class 2' and 'Class 3' developments that must undergo a provincial EA and obtain a licence in accordance with the Act prior to construction, alteration, or operation. Section 3(5) of the CD Regulation classifies mines and milling facilities as Class 2 developments. The Project may also involve one or more water development and control activities that are considered Class 2 developments under section 3(9) of the CD Regulation, such as stream channel alterations that affect fish mobility and fish habitat. The Project is not expected to involve any of the water development activities listed as Class 3 development triggers under section 4(4) of the CD Regulation.

The Environmental Approvals Branch of MCC has advised that it considers the proposed Project activities at the Gordon and MacLellan sites to constitute separate "developments" that will require separate licenses under *The Environment Act* of Manitoba. The Environmental Approvals Branch will allow both sites to be assessed in a single EIS under the provincial EA process.

Other potentially relevant provincial legislation that may apply to the Project and require issuance of an authorization (i.e., permit, license, lease) for the Project approval include:

- *The Mines and Minerals Act*
- *The Crown Lands Act*
- *The Dangerous Goods Handling and Transportation Act*

- *The Endangered Species and Ecosystems Act*
- *The Fisheries Act*
- *The Forest Act*
- *The Heritage Resources Act*
- *The Public Health Act*
- *The Traffic and Transportation Modernization Act*
- *The Water Rights Act*
- *The Wildfires Act*
- *The Wildlife Act*
- *The Workplace Safety and Health Act.*

2.0 PROJECT OVERVIEW

2.1 PROJECT LOCATION

The Gordon site is located 55 km east of the town of Lynn Lake by vehicle (14U 412400E 6307800N), and the MacLellan site is located 8 km northeast of Lynn Lake by vehicle (14U 380900E 6307500N, Map 1). The distance between the Gordon and MacLellan sites is approximately 30 km (57 km by vehicle). Lynn Lake is located approximately 820 km (1,083 km by vehicle) northwest of Winnipeg.

2.2 PROJECT BACKGROUND, OVERVIEW, AND OBJECTIVES

The Lynn Lake Gold Project consists of two primary deposit sites, which are both located near Lynn Lake, Manitoba: the 'Gordon' site and the 'MacLellan' site. Alamos intends to construct (redevelop), operate and eventually close/reclaim open pit gold mines at both these historical mine sites.

The Gordon site, historically referred to as the Farley Lake site, was formerly operated as a two-pit open pit gold mine between 1996 and 1999. After closure, the site underwent a reclamation process and currently consists of a 15-kilometre (km) gravel access road, a bridge across the Hughes River, two mine rock storage areas and two overburden storage areas that have been capped, and two water-filled open pits (Map 2). All buildings and infrastructure have been removed, as shown below in a present-day aerial photograph of the Gordon site (Photo 1).

Photo 1 Aerial Photograph of Gordon Site

The MacLellan site was formerly operated as an underground gold and silver mine between 1986 and 1989; closed as a result of high operating costs and falling gold prices. Ore was trucked to a mill facility in Lynn Lake for processing. The site has been in a 'care and maintenance' phase since closure with very little reclamation completed, as shown below in a present-day aerial photograph of the MacLellan site (Photo 2). The site currently consists of a 4.6-km gravel access road, power transmission line (abandoned pole line), infrastructure from the former underground mine, maintenance and other storage buildings, and former mine water settling ponds (Map 3). Some of the existing infrastructure will be demolished during the Project construction phase; however, some demolition activities may be phased, depending on the location of the former infrastructure and its overlap with the footprint for the new mine infrastructure.

Photo 2 Aerial Photograph of MacLellan Site

Alamos proposes to develop new mine infrastructure at the MacLellan site, including an open pit, a central ore milling and processing plant, associated infrastructure, ore and overburden stockpiles, a mine rock storage area (MRSA), and a Tailings Management Facility (TMF). New infrastructure at the Gordon site will be limited to an open pit, ore and overburden stockpiles, a MRSA, and minor supporting infrastructure for equipment storage and maintenance. There will be no milling or tailings produced at the Gordon site.

Construction, operation, and decommissioning/closure of mining infrastructure at the Gordon and MacLellan sites are considered a single Project for the EIS. The objective of the Project is to produce gold (doré bullion) for sale. The current estimates are for a total Project mine excavation of 325 Mt with a maximum 8,250 t/day design processing rate and an estimated 13-year Project mine life. The total ore to be mined from the open pits at both sites is estimated to be approximately 34.9 Mt (26.9 Mt from the MacLellan site and 8 Mt from the Gordon site).

2.3 PROJECT ACTIVITIES AND COMPONENTS

The preliminary site layouts for the redeveloped Gordon and MacLellan sites are shown on Maps 4 and 5. Based upon the preliminary site layouts, the Project infrastructure at the Gordon and MacLellan sites, excluding access roads, will be located within the boundaries of those mining claims and leasehold lands, which are registered with the provincial Mines Branch in the name of Carlisle Goldfields Limited, a wholly-owned subsidiary of Alamos. The mine operation at both sites is a conventional open pit with shovel and truck removal of the mine rock and ore produced during blasting. The key activities and components associated with each mine site of the Project are described below.

2.3.1 Gordon Site

2.3.1.1 Open Pit

The Gordon resource will be developed as an open pit mine operation. During pre-production 2.3 Mt of mine rock and overburden will be removed, and 29 kilotonnes (kt) of ore will be stockpiled. The run-of-mine (ROM) ore (i.e., raw/unprocessed ore that is intended for immediate processing rather than stockpiling) from the Gordon site will be transported via highway trucks to the mill feed storage area and crushing plant at the MacLellan site for short-term storage and initial crushing before it is used as feedstock for the adjacent ore milling and processing plant. The Gordon open pit overlaps with a portion of a historical mine rock storage area (MRSA). Mine rock from the historical MRSA will be moved to the new Gordon MRSA.

The total quantity of material to be mined from the Gordon open pit during Project mine operation is approximately 59 Mt, which includes ore material of 8 Mt. The anticipated ultimate depth of the Gordon open pit is approximately 225 m. The open pit will be developed in a series of benches based on the pit design parameters with drilling and blasting completed on each bench. The pit slopes will be designed based on industry standards and the results of site-specific geotechnical investigations.

The mine operation is a conventional open pit with shovel and truck removal of the mine rock and ore produced during blasting. Ramp widths will be designed to accommodate the deployed type and size of the mine equipment and vehicles.

The Gordon site will provide ore as mill feed starting in Year 1 through to Year 6 of Project operation. Some ore will be stockpiled on site during pre-production years. The mining rate (including ROM, as well as ore, overburden [if applicable and including topsoil, muskeg, etc.], and mine rock to be stockpiled) at the Gordon site is planned to peak at 16.0 Mt/year or approximately 50,000 t/day (rounded for seasonal considerations and to account for downtime) in Year 2. Mine operation at the Gordon site is planned to cease after Year 5. The transfer of Gordon ore will continue into Year 6.

2.3.1.2 Ore, Overburden, and Mine Rock Stockpiles/Storage Areas

Ore will be stockpiled at the Gordon site and used as feedstock for the ore milling and processing plant at the MacLellan site. The peak stockpile at the Gordon site will be 1.6 Mt. The ore stockpile area is proposed

to be approximately 96,200 m^2, located south of the open pit at the Gordon site (Map 4). The anticipated maximum surface area of each stockpile/storage area ranges from 33,800 m^2 for the ore stockpiles to 618,100 m^2 for the mine rock storage area. The anticipated maximum total heights range from 10-50 m. Seepage/runoff collection ditches will be constructed around the perimeter of each stockpile/storage area and directed to a series of sumps and/or small ponds at topographic lows. Water collected in the sumps and/or small ponds will be pumped to a site water management pond for management and/or treatment (if required) prior to discharge. Depletion of stockpiled material is anticipated in Year 6.

2.3.1.3 Transportation of Ore

Based on a conservative (i.e., likely overestimate) assumed haulage rate of 4,100 t/d, the Project is estimated to require seven truckloads per hour (for 20 hours/day) between the Gordon and MacLellan sites during the six years of mining operation.

2.3.1.4 Water Supply and Distribution

Fresh water at the Gordon site will be provided by two submersible pumps from Gordon Lake via a buried 100 mm high density polyethylene pipeline to the fresh/fire water tank located at the site. Two pumps will supply fresh water to various locations such as the truck shop and truck wash. Potable water will be obtained from the fresh-water treatment plant located at the MacLellan site. The water will be trucked to a central storage facility that will be set up on the Gordon site (Map 4).

2.3.1.5 Power Supply and Distribution

Power for the Gordon site will be supplied on site via two 300 kW diesel generators. Power distribution will be via 4.16 kilovolt (kV) overhead lines, cable tray and underground conduits, with local outdoor type e-houses for transformers and load centres at each point of utilization.

2.3.1.6 Fuel Storage and Distribution

Tanker trucks will deliver diesel and gasoline fuels to the Gordon site on an as-needed basis for use by heavy equipment and Project vehicles, as well as for the site generators. Propane will be considered for space heating. Fuels will be stored in approved above-ground storage tanks equipped with secondary containment. Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements. Stationary and mobile mine equipment will be fueled with a fuel-dispensing truck.

2.3.1.7 Roads

The main access to the Gordon site will be via the existing Provincial Road (PR) 391, which is under the authority of Manitoba Infrastructure. PR 391 is an all-weather road connecting Thompson, Manitoba, and Lynn Lake. PR 391 will be used by personnel, material deliveries, and haulage trucks transporting material from the Gordon site to the ore milling and processing plant at the MacLellan site.

The existing 15-km site access road from PR 391 is expected to be upgraded to safely accommodate Project-related traffic, including the bridge crossing of the Hughes River. These upgrades are included in

the assessed scope of the Project. The access road from PR 391 to the Gordon site will continue to be under Alamos care and control during operation. Alamos will own and maintain internal site roads at the Gordon site, which will allow movement of Project personnel, equipment, and materials on the site. Large haul truck traffic and other site vehicular traffic will be separated where appropriate. For example, large mine haul trucks being used at the Gordon site will have dedicated roads from the open pit to the various dump points and to the central maintenance and shift changeover area.

2.3.1.8 Buildings and Yards

Proposed buildings include a security building to control access to the Gordon site and a small office. The Gordon site will have a truck shop with bays to service open pit trucks and other surface equipment, as well as general maintenance facilities. It will be equipped with overhead cranes and will provide adequate space for the storage of tool cabinets and other items required for maintaining the mobile fleet. The truck shop will also support truck wash and fueling activities and provide personnel services and office facilities for daily management issues.

Three parking areas will be developed to service Project personnel, site visitors, mobile mine fleet and road haul trucks. Laydown areas will also be required for the outdoor storage of equipment, maintenance, and construction equipment, as well as facilities for the construction and operation phases.

2.3.1.9 Site Lighting and Security

General site lighting will be a combination of power line pole-mounted fixtures and building-mounted fixtures at the offices, shop, and other miscellaneous buildings. Lighting will be designed to reduce spill-over light (i.e., unwanted outdoor light shining further than anticipated).

2.3.1.10 Explosive Storage

Emulsion explosives with non-electric detonators will be used during operation. Explosive storage will be located at the MacLellan site.

2.3.1.11 Sewage Treatment

For the Gordon site, sewage will be conveyed by gravity to two septic tanks at the truck shop and administration building. It will then be trucked to the MacLellan site for processing at a 60 m^3/day sewage treatment plant.

2.3.1.12 Domestic Solid Waste Handling

Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices. Solid waste will be collected and recycled to the extent practical. Non-hazardous domestic solid waste will be deposited

at the landfill in Lynn Lake. Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations (e.g., the Hazardous Waste Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba, *Canadian Environmental Protection Act* and associated regulations, and the *Transportation of Dangerous Goods Act* and associated regulations).

2.3.1.13 Water Development and Control

As part of the development at the Gordon site, the existing built diversion channel flowing from Gordon Lake to Farley Lake via a tributary will require adjustment to the north (Map 4). The new channel will be designed to safely pass the 1 in 100-year return period storm and will be developed to consider long-term fish passage and habitat between Gordon and Farley lakes. Water management structures such as diversion ditches and interceptor wells will be constructed to collect, divert, and release non-contact water to the environment.

A series of groundwater interceptor wells located between the ultimate footprint of the open pit and Gordon and Farley lakes will be used to mitigate a reduction in groundwater discharge to Gordon and Farley lakes as a result of open pit dewatering during operation and pit filling during mine closure. At this time, the interceptor wells are anticipated to be sited between the pit and the nearby lakes approximately 40 m from the boundary of the ultimate open pit limit. Groundwater extracted from the interceptor wells (originating from the adjacent lakes) will be pumped to a water management pond prior to being recirculated to Gordon and/or Farley lakes. If required, the water will be treated to meet applicable federal and provincial regulatory requirements prior to discharge to the environment, including the authorized limits of deleterious substances specified in Schedule 4 of the Metal and Diamond Mine Effluent Regulations (MDMER). The engineering design for these wells will be finalized during the detailed design phase for the Project.

No amendment(s) to Schedule 2 of the MDMER are anticipated to be required for the Project. The MRSA at the Gordon site, and the MRSA and TMF at the MacLellan site, have been sited outside of and away from fish-bearing watercourses.

Alamos will request a paragraph 35(2)(b) *Fisheries Act* Authorization from Fisheries and Oceans Canada (DFO) for the “harmful alteration, disruption or destruction” of fish habitat that will occur as a result of Project activities.

2.3.2 MacLellan Site

2.3.2.1 Open Pit

The MacLellan resource will be developed as a conventional open pit mine operation with shovel and truck removal of the mine rock and ore produced during blasting. During pre-production, 8.9 Mt of mine rock and overburden will be removed and 405 kt of ore will be stockpiled. The total quantity of material to be excavated from the MacLellan open pit during Project operation is approximately 266 Mt; this includes 26.9 Mt of ore.

The anticipated depth of the MacLellan open pit is approximately 450 m. The open pit will be developed in a series of benches based on the pit design parameters with drilling and blasting completed on each bench.

Mining operations after Year 5 will take place exclusively at the MacLellan site, with an expected peak mining rate of 28.0 Mt/year (in Years 6 and 7). Ore will be stockpiled at the MacLellan site, and used as feedstock for the ore milling and processing plant when ore production is less than the plant capacity. The peak stockpile at the MacLellan site will be 2.7 Mt. The ore stockpiles at MacLellan will be active until the end of mine operation.

2.3.2.2 Mill Feed Storage & Crushing Plant

ROM ore from both sites will be transported to a pad directly adjacent to the ore milling and processing plant at the MacLellan site (Map 5) for short-term storage before it is used as feedstock for the plant.

A truck dump and crushing circuit is proposed to be located south of the ore milling and processing plant at the MacLellan site (Map 5). The crushing circuit will feed the ore milling and processing plant. Ore will be transported to the ore milling and processing plant by a conveyor system. Potential dust emissions will be reduced through dust containment (e.g., enclosure) and collection systems.

2.3.2.3 Ore Milling and Processing Plant

Ore milling and processing will be carried out at the MacLellan site. The ore milling and processing plant is designed to process 7,500 t/day of ore, with a maximum potential process rate of 8,250 t/day. Ore will first be crushed in a two-stage jaw and cone crushing circuit. Processing will continue with semi-autogenous grinding, then further grinding in a closed-circuit ball mill and cyclone circuit. This process will produce fine-ground ore that will be thickened from 33% to 50% solids. Once thickened, the ore will go through a pre-aeration, leaching, and carbon-in-pulp (CIP) process. The cyanidation process for gold recovery will begin in the leach tank circuit, which will consist of four mixing tanks interconnected with launders to allow slurry to flow sequentially to each tank in the train. Once the ore slurry has passed through the leach tank circuit, the slurry will flow to the first of six CIP absorption tanks. Ore slurry will flow continuously from the first CIP tank to the last, while carbon will be pumped counter current from the last tank to the first. The countercurrent process will be repeated until the carbon, progressively loaded with gold, advances to the first CIP tank, where it will be washed and transferred to the acid wash column. The carbon will be acid-washed and residual acid on the carbon, if any, will be neutralized with both the acid and neutralization solutions being discharged to the tailings pump-box. The washed and loaded carbon will then be stripped of gold and silver by reversing the adsorption kinetics using a sodium hydroxide and cyanide solution (approximately 3% each by volume). After completion of the elution process, stripped carbon will be fed into the carbon regeneration kiln feed hopper before it is re-introduced to the CIP circuit. Gold and silver will be recovered in three electrowinning cells by stainless steel framed cathodes, after which the gold sludge will be smelted and refined into gold doré bars ready for transport to a certified facility for further processing. The slurry from the last CIP tank will be sent to the cyanide detoxification circuit (Air/SO_2 oxidation process) for cyanide destruction prior to discharge to the tailings pump-box and then to the TMF. As part of the cyanidation process, sodium cyanide will be transported to the processing plant as brickets in 18 tonne isotainers. Deliveries will be required every 2-3 days.

The TMF is proposed to be located approximately 1.5 km from the ore milling and processing plant (Map 5). Water demand at the ore milling and processing plant will be met with reclaimed water from the TMF to reduce the need for fresh surface water demand. Dewatering water from the open pit and other mine contact water (i.e., water, surface water or groundwater, that comes into contact with the mine or mine rock material) will be collected in a site water management pond for management and/or treatment (if required) prior to discharge.

2.3.2.4 Ore, Overburden, and Mine Rock Stockpiles/Storage Areas

Ore at the MacLellan site will be stockpiled south of the mill for future processing (Map 5). The peak stockpile will be 2.7Mt with an anticipated maximum surface area of 115,500 m^2 and height of 30 m. The MacLellan site will also contain stockpile areas for removed overburden (8.2 Mt) and mine rock (23.9 Mt). The overburden stockpile area is proposed to be located to the west of the MRSA, while the MRSA is proposed to "wrap around" the south and east sides of the TMF (Map 5). Overburden storage area will be 181,800 m^2 and reach a height of about 30 m, while the mine rock storage area will take up 3,561,300 m^2 and reach a height of 45 m.

Seepage/runoff collection ditches will be constructed around the perimeter of each stockpile/storage area and directed to a series of sumps and/or small ponds at topographic lows. Water collected in the sumps and/or small ponds will be pumped to a site water management pond (the TMF collection pond) for management and/or treatment (if required) prior to discharge. Mine rock that is classified as potentially acid generating or metal leaching that is expected to produce runoff may require additional mitigation, such as blending, dry and/or wet covers, and/or treatment.

2.3.2.5 Transportation of Ore

Ore mined at the MacLellan site will remain on site.

2.3.2.6 Tailings Management Facility

The TMF site was selected in consideration of technically and economically feasible alternatives, environmental constraints, the use of natural topography for containment, existing land tenure, the spatial footprint of the Project, and the benefits of having tailings contained in a single facility. The final TMF site selection considered the federal Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Government of Canada 2016) and was designed to not overlap spatially with any fish-bearing waters (Map 5).

The TMF will be constructed in three stages: Stage 1, Stage 2 and Ultimate. The volume of tailings progressively stored at each stage is 2.0 Mm^3, and 9.3 Mm^3, 23.1 Mm^3, respectively. The TMF dams will be raised as needed to provide additional storage capacity. It is projected that three dam raises will be required during the operating period, with the final two raises completed in consecutive years.

The TMF dams will consist of a low permeability core constructed of suitable rockfill materials (i.e., clean, non-acid generating, relatively free draining) with internal bedding and filter zones, and upstream and

downstream shells of granular material. Most of the dam materials are expected to be locally available from borrow sources.

The potential effects associated with acid rock drainage and metal leaching will be mitigated by collecting and containing seepage/runoff from the TMF. Containment structures for the TMF will be designed in accordance with the Canadian Dam Association *Dam Safety Guidelines* (CDA 2013, 2014). Foundation seepage will be controlled via low permeability seepage cutoffs. A downstream seepage collection system, consisting of a series of sumps in combination with a buried weeping tile or rockfill finger drain system, will be installed during the starter dam construction. This system will capture and redirect seepage to the TMF collection pond.

2.3.2.7 Sewage Treatment

The average sanitary wastewater flow rate will be approximately 60,000 L/d. A package treatment plant will be required with a discharge consisting of an outfall pipe and diffuser to the selected surface water receiver (likely the Keewatin River west of the MacLellan site). Effluent will be treated to meet applicable regulatory requirements (e.g., Wastewater Systems Effluent Regulations under the federal *Fisheries Act*) prior to discharge to the environment.

2.3.2.8 Domestic Waste Handling

Waste disposal will follow a Waste Management Plan for the Project, which will be developed in accordance with applicable regulations (e.g., *The Waste Reduction and Prevention Act* of Manitoba and the provincial Collection and Disposal of Wastes Regulation under *The Public Health Act*) and best practices. Solid waste will be collected and recycled to the extent practical. Non-hazardous domestic solid waste will be deposited at the landfill in Lynn Lake (approximately 4 km northeast of the community along PR 391), which has three to five years of space left and potentially another 20 years of capacity. Waste oils, fuels, and hazardous wastes (if any) will be safely handled and transported as recommended by the suppliers and/or manufacturers and in compliance with applicable federal, provincial, or municipal regulations (e.g., the Hazardous Waste Regulation under *The Dangerous Goods Handling and Transportation Act* of Manitoba, *Canadian Environmental Protection Act* and associated regulations, and the *Transportation of Dangerous Goods Act* and associated regulations).

2.3.2.9 Utilities and Infrastructure

A potable water treatment plant with a capacity of 92,000 L/d is required to produce water for both the Gordon and MacLellan sites. The source of fresh water will be the Keewatin River, located to the west of MacLellan site. This system will also provide potable water for personnel working at the Project site. Raw water will be used for non-potable use such as fire water.

Personnel, material deliveries, and haulage trucks transporting material to the ore milling and processing plant will access the MacLellan site via the existing all-weather PR 391 and the existing access road (Map 5). The potential need for upgrades to PR 391 and/or weight exception requirements to support the

Project is currently being discussed with the highway authority (i.e., Manitoba Infrastructure). The existing 4.6-km MacLellan site access road will be used to access the site. Upgrades to the existing access road will be required involving the removal of existing granular and placement of new material and compacted granular. The existing side ditches will be cleared or reconstructed based on a suitable design. Alamos will own and maintain internal site roads at the MacLellan site, which will allow movement of Project personnel, equipment, and materials on the site. The existing 15-km site access road from PR 391 to the Gordon site is expected to be upgraded to safely accommodate Project-related traffic including the bridge crossing of the Hughes River.

Power for the MacLellan site will be supplied by Manitoba Hydro Line 6. The Project will require upgrades to the existing power supply transmission line between Laurie River and Lynn Lake and Lynn Lake's Copper Street Station from 69 kV to 138 kV. A new 138 kV-34.5 kV substation (located approximately 1 km from the Copper Street Station) and a new 8 km 34.5 kV overhead distribution line into the MacLellan site will also be required to accommodate the Project. Required upgrades to the power distribution system are expected to be assessed, built, owned, and operated by Manitoba Hydro. The upgraded system will also be entirely under the care and control of Manitoba Hydro and is therefore excluded from the scope of the Project to be assessed.

Diesel and gasoline fuels will be delivered by tanker trucks and fuels will be stored in approved above-ground storage tanks equipped with secondary containment. Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements. Stationary and distant mine equipment will be fueled with a fuel-dispensing truck.

Pipelines will be needed on site to transport and dispose of contact water between various facilities, including the open pit, ore milling and processing plant, and TMF. A 10-inch high-density underground pipeline will also be constructed to provide fresh water from the Keewatin River for potable and process water (make-up) requirements.

Buildings and yards proposed for the site include parking areas, security buildings, administration offices, truck shop, laboratory, plant control room, workshop, warehouse, laydown areas, and work camp. Building structures will be amalgamated where possible.

Explosives storage requirements for emulsion explosives with non-electric detonators to be used and stored at the MacLellan site during operation will be determined in consultation with the selected explosives supplier and will be established in accordance with a National Standard and the facility will be licensed under the *Explosives Act*.

A 100-bed temporary construction camp will be established as part of the site preparation activities and will be located north of the processing plant at the MacLellan site. The temporary camp will be used throughout the pre-production phase of the Project during which a permanent, 300-bed camp will be also be established. The permanent camp will be used throughout operation of the Project.

2.3.2.10 Water Development and Control

No watercourse re-alignments are required, and no fish-bearing streams will be overlain with mine rock, the TMF, or other associated mine infrastructure at the MacLellan site. As a result, no amendment to Schedule 2 of the MDMER is anticipated; however, it is expected that a small pond ('East Pond') located south of the open pit will drain as a result of development of the open pit (Map 5). Alamos will request a *Fisheries Act* Authorization from DFO for the "harmful alteration, disruption or destruction" of fish habitat that will occur with the East Pond at the MacLellan site.

It is expected that approximately 60-70 m^3/day of fresh water will be withdrawn from the Keewatin River for use as potable water and 40 m^3/hour of fresh water will be withdrawn from the Keewatin River for use as process (make-up) water once there is sufficient water in the TMF to supply reclaim water. Water withdrawal for potable water is not anticipated to result in substantial changes to water level, flow, or pH in the Keewatin River. Diversion ditches will be constructed to collect, divert, and release non-contact water to the environment.

2.4 PROJECT DEVELOPMENT

2.4.1 Construction Phase Overview

Construction (i.e., site preparation, physical construction/equipment installation, pre-production, and commissioning) will be scheduled once all regulatory approvals are in place and is expected to take approximately two years to complete. Some limited pre-production may occur during this period. Project construction activities will be carried out concurrently at both mine sites. Construction of the temporary construction camp will be done early, as part of the site preparation activities at the MacLellan site.

Ore will be stored in stockpiles until the facility is operational. Construction will begin with clearing the areas for the Project components. Cleared merchantable timber will be sold, and any remaining cleared vegetation will be stockpiled/stored on site for future use in reclamation activities. Dust suppression and water containment will be used during the earthworks program.

Access road upgrades connecting the sites to PR 391 (i.e., upgrades to the existing 15-km access road at the Gordon site and 4.6 km access road at the MacLellan site) are proposed to be developed in conjunction with site preparation activities. Any watercourse re-alignment works that may be required (Gordon site) will be initiated early.

Starter dams for the TMF embankments at the MacLellan site will be constructed, and the embankments will be raised as storage requirements increase over the mine life. The ore stockpile and mine rock storage pads will be grubbed and graded, and foundations will be prepared.

An aggregate crusher and a concrete batch ready mix plant will be required on site during construction. The portable crusher and concrete batch plant used during construction may remain on site or be contracted

out on a periodic basis. Raw materials used for crushing will be non-acid generating mine rock from the open pit, if suitable, and/or materials from nearby approved pits or borrow areas.

Services, including the power supply, waste handling and fresh water supply systems, will be installed. The power supply will be provided into the MacLellan site by Manitoba Hydro.

Footings and foundations for buildings and structures associated with the ore milling and processing plant will be poured in place. Pre-packaged and field-erected ancillary facilities, including the buildings, fueling, tanks and processing equipment, will be delivered to the site and installed. Other equipment will be set up in their appropriate locations, and electrical and mechanical connections will be completed.

Removal of overburden for the open pit areas will occur in preparation for mining activities. The overburden, where suitable, will be used on site during construction with excess stored on site for future use in reclamation activities.

The mechanical and electrical systems associated with the Project will be commissioned as construction is completed. Commissioning activities for the Project will include commissioning of the power distribution system and control, contact water collection systems, open pit dewatering system, tailings management water reclaim system, the ore milling and processing plant, and on-site fueling system. Following commissioning, the Project will start commercial operation.

2.4.2 Operation Phase Overview

Operation (i.e., ore and mine rock extraction, processing, and waste management) is expected to take approximately 13 years to complete. Mining operations are expected to commence at both sites in Year 1. Operation at the Gordon site will be undertaken for six years while operation at the MacLellan site will be undertaken for the entire life of the Project (i.e., 13 years). The ore stockpiled during operation (both sites) will provide additional feedstock to the ore milling and processing plant during the Project.

The operating life of the Project is estimated to be 13 years (excluding the pre-production period estimated at one to two years). As operation continues, the open pits will become progressively deeper, and related overburden, ore stockpiles, MRSAs, and the TMF, will increase in size. Solid and liquid wastes will be managed to comply with applicable federal and provincial regulatory requirements. Ore from the Gordon site will be transported via highway trucks to the ore milling and processing plant at the MacLellan site in the first six years of Project operation. Based on an assumed haulage rate of 4,100 t/d, the Project is estimated to require 7 truckloads per hour (for 20 hours/day) between the Gordon and MacLellan sites during this period.

2.4.3 Decommissioning/Closure Phase Overview

Active reclamation/closure is scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site, and this decommissioning is expected to take approximately 5-6 years to complete at each site. It will be followed by 10 years of post-closure monitoring and between 11 and 21 years of pit filling.

At the end of Project operation, the main features will include the open pits, mill processing facilities, offices, storage areas, TMF, and MRSAs. A Conceptual Closure Plan has been developed and will be implemented, in accordance with the Mine Closure Regulation under *The Mines and Minerals Act* of Manitoba and associated *General Closure Plan Guidelines* (MARD n.d.), to remove redundant facilities and restore the Gordon and MacLellan sites following the completion of mining activities. The primary objective of closure activities will be to establish physical, chemical, and biological stability at the sites, and to meet desired end land functions and uses. The Conceptual Closure Plan will be updated throughout the Project lifetime as necessary to reflect the environmental requirements in place at the time of closure.

3.0 ALTERNATE MEANS OF CARRYING OUT THE PROJECT

Project environmental assessments must consider and discuss technically and economically feasible, alternative means of carrying out the project and provide potential environmental effects of such alternative means, pursuant to section 19(1)(g) of CEAA 2012. The assessment of alternative means for this project was completed in accordance with the CEA Agency's Operational Policy Statement "Addressing 'Purpose of' and 'Alternative Means' under the *Canadian Environmental Assessment Act*, 2012".

The EIS Guidelines require that the alternative means analysis address the following key Project components:

- Ore transportation (considering means and routing)
- Access to the project sites
- Location of key project infrastructure
- Ore processing methods/technologies
- Fuel storage and distribution
- Power supply
- Management of water supply and wastewater
- Water management and location of final effluent discharge points
- Diversion channel adjustments
- Mine waste disposal and final effluent discharge (considering methods and sites)
- Workforce accommodations and transportation.

The provincial *Environment Act* Proposal guidelines state that alternatives may consider one or more of the following: products to be provided, process technologies to be used, as well as feasibility and project siting.

Each option for the alternative means is summarized in Table 3-1. The preferred alternative means form the basis for the Project to be assessed (i.e., assumed to be the base case that is assessed for environmental effects in the EIS).

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Ore Transportation					
Ore transport by truck	Yes	Yes	Yes	Existing roads available for use; no other options for ore transportation.	Yes (No other options were assessed as off-site ore processing was identified as inefficient and increases environmental footprint)
Access to Project Sites					
Access via PR 391, and established access road from PR 391 to the MacLellan site	Yes	Yes	Yes	Using the existing access road reduces the Project footprint, thereby reducing effects to the environment.	Yes
Construction of a new access road at the MacLellan site	Yes	Yes	Yes	The development of a new access road may result in a loss and/or alteration of habitat, including vegetation and wetlands. There is potential for interactions with surface water and fish and fish habitat, creation of new access and requirement for an additional access point onto PR 391.	No
Ore Milling and Process Plant Location Analysis					
Current Location (north of open pit)	Yes	Yes	Yes	The process plant location was selected to increase efficiency and reduce environmental effects.	Yes

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Original Location (east of East Pond)	Yes	Yes	Yes – less efficient due to larger footprint.	Larger footprint than Option 1 with increased habitat alteration including upstream watershed diversion. Further from the mill.	No
Ore Milling and Process Plant at Gordon Site	Yes	Yes	No	Not assessed further*	No
Tailings Management Facility (TMF) Location Analysis					
Current Location (north west of Minton Lake)	Yes	Yes	Yes	Smaller footprint, a lower volume for dam construction, a higher storage capacity to dam volume ratio, limited to no upstream watershed diversion. Avoids deposition of mine tailings into fish-bearing watercourses or waterbodies.	Yes
Original Location (immediately north of Minton Lake)	Yes	Yes – less storage capacity than current location.	Yes	Located on the other side of watershed divide from the MacLellan site.	No
Gordon Location	Yes	Yes	No	Not assessed further*	No
Ore, Overburden and Mine Rock Stockpiles/Storage Area Location Analysis					
North of Open Pit	Yes	Yes	Yes	Allows for lower stockpile heights. This location also has optimal hauling distance, for greater efficiency and reduced environmental effects.	Yes

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
South of Open Pit	Yes	Yes	Yes	Higher stockpiles and less optimal hauling distances with lower efficiencies and greater environmental effects.	No
Ore Processing Methods/Technologies Analysis					
Cyanidation	Yes	Yes. Sodium cyanide remains the primary reagent used for gold processing today because it allows for efficient extraction of gold from low-grade ore.	Yes	Spills of sodium cyanide are possible, although rigorous management procedures will be in place.	Yes
Gravity separation	Yes	Yes	No	Not assessed further*	No
Flotation concentration	Yes	Yes	No	Not assessed further*	No
Fuel Storage and Distribution Analysis					
Fuels stored in approved above-ground storage tanks*	Yes	Yes	Yes	Meets regulated requirements for protection of the environment.	Yes (No other options assessed as they were not considered technically or economically viable to meet applicable regulations and standards)

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Power Supply Analysis					
On-site diesel generators	Yes	Yes	Yes; higher costs at MacLellan site given higher power requirements.	On-site diesel generators at the MacLellan site would result in higher environmental effects (e.g., air emissions), if used to meet total operational power needs.	Yes – for the Gordon site
Option 1 (Convert Copper Street Station) – Manitoba Hydro	Yes	Yes	Yes	System modifications within the existing Copper Street Station footprint with a short tap connection to a new substation located in close proximity.	Yes – for the MacLellan site
Option 2 (Construct new station)	Yes	Yes	Not assessed further*	Not assessed further*	No
Option 3 (New line from Laurie River Station to Project line)	Yes	Yes	No	Option includes the longest transmission line (75 km) which would result in the greatest alteration or loss of vegetation and wildlife habitat.	No

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Option 4 (New substation and overhead distribution line – Alamos)	Yes	Yes	Yes	Substation option is closer to the MacLellan site and the required land area is available. The distribution line, while crossing two watercourses and two muskeg areas, will follow along existing an access road using single wood poles which reduces the clearing footprint and therefore reduces the loss and/or alteration of habitat. H-frame structures will be used at long span crossings only.	Yes – for the MacLellan site
Water Supply Analysis					
Surface water (Keewatin River)	Yes	Yes	Yes	Potable water will be obtained from potable water treatment plant at MacLellan site.	Yes
Water supplied by Town of Lynn Lake	Yes	No.	Existing plant unable to meet demands	Not assessed further*	No
Wastewater Analysis					
Treated at the sewage treatment facility	Yes	Yes (at the MacLellan site)	Yes	Treatment to standards at MacLellan site prior to discharge.	Yes – at the MacLellan site
Septic tank(s)	Yes	Yes (at the Gordon site)	Yes	Sewage transported for treatment to the MacLellan site.	Yes – at the Gordon site

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Lagoons	Yes	No; sewage lagoons will not provide adequate sewage treatment capacity	Not assessed further*	Not assessed further*	No
Water Management and Effluent Discharge Points Analysis					
Collect contact water locally and treat through central contact water collection pond and/or treatment plant prior to discharge*	Yes	Yes	Yes	Limit potential adverse environmental effects to surface water, groundwater and fish and fish habitat.	Yes (No other options were assessed given that under normal operation, there will be no discharge of water from the TMF to the environment thus avoiding potential for effects to surface water and groundwater)
Diversion Channel Analysis					
Option 1 (Channel from Gordon Lake to tributary of Farley Lake)	Yes	Yes	Yes	Channelized ditch without habitat features that does not offset the loss of the existing channel.	No
Option 2 (Channel from Gordon Lake to a tributary of Farley Lake with fish habitat features)	Yes	Yes	Yes	Longer channel that includes fish habitat features and offsets the loss of the existing channel at a ratio of 1 to 1.	Yes
Mine Waste Disposal and Final Effluent Discharge Methods Analysis					
Conventional Disposal in TMF (50% solids)	Yes	Yes	Yes	Easier to collect seepage from a conventional tailings facility.	Yes

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Dry Stack Option (>80% solids)	Yes	Yes; more difficult to maintain.	No; additional costs for transport, placement, processing, compaction of tailings.	Not assessed further*	No
Final Effluent Discharge					
No Final Effluent Discharge from TMF under Normal Operating Conditions	Yes	Yes	Yes	Limit potential adverse environmental effects to surface water, groundwater and fish and fish habitat.	Yes (No other options were assessed given that under normal operation, avoidance of discharge of water from the TMF is feasible and will avoid potential for effects to surface water and groundwater)
Workforce Accommodation and Transportation Analysis					
Permanent camp facility on-site	Yes	Yes	Yes	A permanent camp would reduce Project cost and increase efficiency. This option would reduce traffic and associated effects. It would also reduce worker / local interactions.	Yes

Table 3-1 Summary of Alternatives Analysis

Option	Legally Acceptable?	Technically Feasible?	Economic-ally Feasible?	Environmental / Socio-Economic Considerations	Preferred Option
Off-site camp	Yes	No; a camp within the town of Lynn Lake was not selected given substantial infrastructure upgrades that would be required to accommodate the camp.	Not assessed further*	Not assessed further*	No
Use of housing within Lynn Lake	Yes	No; insufficient housing stock.	Not assessed further*	Not assessed further*	No
Combined use of off-site housing and triplex units within Lynn Lake	Yes	No; insufficient housing stock.	Not assessed further*	Not assessed further*	No
*N/A -Not assessed further as it was determined to be not legally, technically, and/or economically feasible.					

4.0 ENGAGEMENT

Integral to the environmental assessment process was the consideration and incorporation of knowledge and feedback from Indigenous communities, stakeholders, the public, and regulators obtained through engagement. Alamos' responses to comments and concerns that were raised, and information provided through engagement has been addressed through direct responses, modifications to Project design (e.g., relocating Project components to avoid fish habitat). This information has been and incorporated throughout the EIS, through updates to baseline information (e.g., species presence), identification of features of importance (e.g., model receptor locations), and conformation of potential effects to be assessed (e.g., effects of blasting and wildlife mortality due to Project transportation).

4.1 REGULATORY ENGAGEMENT

The regulatory authorities that are expected to have an interest in the Project are identified in Table 4-1.

Table 4-1 Relevant Regulatory Authorities and Jurisdictions

Federal Government	Provincial Government	Municipal Government
• Canadian Environmental Assessment Agency (now IAAC) • Environment and Climate Change Canada • Fisheries and Oceans Canada • Health Canada • Natural Resources Canada • Indigenous Services Canada	• Manitoba Growth, Enterprise, and Trade (now Manitoba Agriculture and Resource Development) • Manitoba Indigenous and Northern Relations • Historic Resources Branch of Manitoba Sport, Culture, and Heritage • Manitoba Sustainable Development (now MCC) • Workplace Safety and Health of Manitoba Finance	• Town of Lynn Lake

Regulatory engagement activities undertaken to date by Alamos have included telephone calls, email communications, in-person meetings, and presentations. Key issues identified and discussed during the regulatory engagement activities undertaken to date have pertained to:

- The provincial requirement to obtain separate licenses under *The Environment Act* for the Gordon and MacLellan sites.
- The importance of redesigning the TMF to avoid interactions with waters frequented by fish.
- The importance of proactively engaging the local First Nation community and other potentially affected Indigenous communities.

- The importance of local economic benefits, including job opportunities and youth summer work experience.
- The importance of using town housing in Lynn Lake.
- The importance of fish and fish habitat offsetting requirements under the *Fisheries Act*.
- The importance of caribou habitat, including discussions regarding the baseline studies, whether offsetting is required, and the potential effect on Critical Habitat.
- The regulator review of air quality and the planned approach to air dispersion modelling for the Atmospheric Environment.
- The identification of the potentially affected or interested Indigenous communities.
- The proper documentation of areas of heritage value at the mine sites prior to demolition.

Regulatory engagement with government will continue throughout the EA process and will remain ongoing (on an as-needed basis) for the duration of the Project. It is understood that there will also be several government-led engagement opportunities during the federal and provincial EA processes (e.g., public review and comment periods for EA-related documents).

As a responsible corporate citizen, Alamos is also committed to providing Project and corporate updates to interested government officials, as appropriate.

4.2 STAKEHOLDER AND PUBLIC ENGAGEMENT

The following is a preliminary list of the types of non-regulatory and non-Indigenous stakeholders that have been identified as potentially having an interest in the Project:

- Business/economic stakeholders (e.g., local businesses, business associations, and industry groups).
- Development corporations.
- Local community members (e.g., residents and property owners).
- Local services (e.g., fire and police departments, hospitals).
- Non-governmental organizations.
- Research/academic organizations.

Alamos has conducted various stakeholder and community engagement activities with the groups identified above, including meetings, telephone interviews and presentations at career fairs. Additional stakeholders are expected to be identified as the Project progresses.

Six open house public meetings have been held to date: four have been held in Lynn Lake for members of the local community including Marcel Colomb First Nation, one has been held in Winnipeg, Manitoba for Marcel Colomb First Nation members residing in the city, and one has been held in Nelson House for members of the local community including Nisichawayasihk Cree Nation. The open houses were advertised using posters, mail-outs, word of mouth, and social media. The events were informal drop-in style open houses. The events held on March 25, 2015, in Lynn Lake and March 26, 2015, in Winnipeg were attended by 42 individuals. The event held on February 3, 2020 in Nelson House was attended by 19 individuals. The events held on April 26, 2016, May 1, 2017, and February 4, 2020, in Lynn Lake were attended by 70, 53, and 46 people, respectively. At these events, the Proponent and Proponent Team distributed handouts and delivered a formal presentation to share Project information and solicit feedback/input. Attendees were invited to fill out questionnaires to provide feedback as well as any inquiries or issues that they wanted to raise.

In general, the questions, comments and concerns identified on the questionnaires completed at the open houses pertained to:

- Opportunities for employment and economic development in local communities.
- Opportunities for education/training, employment, and engagement specifically for members of Marcel Colomb First Nation.
- Opportunities for improved housing or other benefits specifically for local First Nations communities.
- Project infrastructure.
- The status and results of environmental baseline studies.
- Potential Project-related effects on water quantity and quality, soil quality, fish and fish habitat, wildlife, traplines, vegetation, human health, the local economy, local housing, community services and infrastructure, Marcel Colomb First Nation/Black Sturgeon Reserve, and the current use of lands and resources for traditional purposes by Indigenous peoples.
- Tailings containment.
- Site remediation.
- Potential accidental events.
- The importance of ongoing consultation and engagement.

The following topics were rated ‘very important’ in the opinions of more than 60% of the questionnaire respondents:

- Tailings and mine rock management.
- Wildlife and fish habitat.
- Employment.
- Groundwater and surface water.
- Plants.
- Air quality.
- Contracts and business opportunities.
- Training and job skills.
- Community health.

When asked to list various environmental aspects in order of importance (in the 2017 questionnaire only), surface water and groundwater was ranked as the most important aspect by the highest percentage (33%) of respondents, while wildlife and fish habitat was ranked the most important by the second highest percentage (27%). The environmental aspect identified as second most important by the highest percentage of respondents was wildlife and fish habitat (31%). The environmental aspect identified as third most important by the highest percentage of respondents was evenly split between community health, contracts and business opportunities, training and job skills, and increased traffic (each 13%).

Proponent-led stakeholder and community engagement will continue throughout the EA process and will remain ongoing (on an as-needed basis) for the duration of the Project. It is understood that there will also be several additional government-led engagement opportunities during the federal and provincial EA processes (e.g., public review and comment periods for EA-related documents).

4.3 ENGAGEMENT WITH INDIGENOUS PEOPLES

Based on 2016 census data (the latest census data available at the time this document was prepared), Indigenous people account for approximately 18% of the total population of Manitoba, which includes approximately 223,310 First Nations, Métis, and Inuit people (Statistics Canada 2017a).

Based on current understanding of traditional lands located in proximity to, and/or downstream or downwind from, Project activities and components, the following seven Indigenous nations have been identified by the CEA Agency (now IAAC) as expected to be “most affected” by the Project:

- Marcel Colomb First Nation
- Mathias Colomb Cree Nation

- Nisichawayasihk Cree Nation
- O-Pipon-Na-Piwin Cree Nation
- Manitoba Metis Federation
- Peter Ballantyne Cree Nation
- Barren Lands First Nation.

The IAAC also identified additional Indigenous nations that may also be affected by the Project, but "to a lesser degree". These communities include:

- Métis Nation – Saskatchewan Northern Region 1
- Métis Nation – Saskatchewan Eastern Region 1
- Hatchet Lake First Nation
- Northlands Denesuline First Nation
- Sayisi Dene First Nation.

Between 2014 and present, Alamos has been engaging with Indigenous nations in the Project area to introduce the Project, receive feedback, and document potential issues and concerns. The 12 identified Indigenous nations have been contacted to discuss the potential effects of the Project on their community. Alamos has used several engagement methods to present the Project information, facilitate discussion, and solicit feedback on the Project from Indigenous nations. These engagement methods were selected based on responses to initial communications with Indigenous nations on how they would like to be engaged on the Project and include: information packages, community meetings, meetings with leadership, follow-up phone calls, e-mails, and text messages, traditional land and resource use studies, committee and liaison positions, site tours, fieldwork opportunities and cultural awareness activities.

The comments and concerns that have been raised by Indigenous nations and documented during the engagement activities undertaken were summarized in letters to the nations sent on December 3, 2019 for verification and are further summarized in Table 4-2 below. Table 4-2 summarizes the comment/concern raised and where in this EIS Summary the comment/concern is addressed. This table is current with information received up to May 22, 2020 and is included as a summary and is not intended to represent a complete list of issues discussed with Indigenous nations throughout the Project.

Integral to the environmental assessment process was the consideration and incorporation of knowledge from Indigenous communities. Information, and Alamos' responses to comments, and concerns that were raised through engagement with Indigenous communities has been addressed through direct responses

and incorporated throughout the EIS, through updates to baseline information (e.g., species presence), identification of features of importance (e.g. model receptor locations), and conformation of potential effects to be assessed (e.g. effects of blasting, wildlife mortality due to Project transportation).

Table 4-2 Summary of Key Issues Raised by Indigenous Nations

Environmental Component	Comment/Concern Raised	How Comment was Considered in the Environmental Assessment (Refers to Sections in this EIS Summary)
Atmospheric Environment, Noise and Vibration	• Noise and air quality effects are of high importance for the EIS • Effects of blasting on the community • Large amount of noise, dust, and other emissions from the Project • Vehicle and truck traffic and disturbance/dust and associated environmental contamination • Effects to air quality • Potential effect to climate change • Increased dust resulting from increased traffic along roadways through resource management area	• See Section 5.4 • See Section 5.5 • See Section 5.19.1
Groundwater	• Need to protect natural springs • Groundwater effects are of high importance for the EIS • High-impact activities associated with exploration work must be accompanied by a monitoring Elder	• See Section 5.6 • See Section 8.0
Fish and Fish Habitat	• Jumbo whitefish at Simpson Lake whose population was totally depleted after the Farley Lake Mine opened • Poor water quality due to mining affecting fisheries • Fish and fish habitat are of high importance for the EIS • Decrease in fish and aquatic species due to increased harvesting	• See Section 5.7 • See Section 5.8 • See Section 5.13 • See Section 5.19.5
Surface Water	• Need for water quality monitoring • Cumulative effects in Cockeram Lake due to historical tailings seepage and potential MacLellan effects • Concern about deleterious substances entering a waterbody • Long-term effects from the Project on fresh-water supply, including volume quality and cost of remediation in the event of an environmental disaster • Surface water, tailings, and mine rock management effects are of high importance for the EIS • High potential for acid rock drainage and issues for water management at the sites • Potential concerns including water quality and effects to resources	• See Section 5.7, 5.19.4 • See Section 5.13 • See Section 8.0 • See Section 7.0

Environmental Component	Comment/Concern Raised	How Comment was Considered in the Environmental Assessment (Refers to Sections in this EIS Summary)
Surface Water continued	• Overprinting of aquatic habitats and seepage causing degradation of water quality, quantity and affecting wetlands, rivers, lakes, and wildlife • Concern over the potential contamination of Reindeer Lake • Need for 3rd party monitoring/testing of water in Hughes River • Effects to water quality • Potential effects of increased traffic, potential release of hazardous materials as a result of transportation of dangerous goods	• See Section 5.7, 5.19.4 • See Section 5.13 • See Section 8.0 • See Section 7.0
Wildlife and Wildlife Habitat	• Effects to terrestrial habitat • Wildlife effects and increased traffic are of high importance in the EIS • Concern over moose and caribou population • Effects to land and animals due to mining • High-impact activities must be accompanied by a monitoring Elder • Wildlife collision risks with heavy truck traffic • Cumulative effects on already vulnerable ecosystem • Decrease in migratory birds, game, and fur-bearing animals within traditional territory, to due to increased harvesting • Overprinting of aquatic habitats and seepage causing degradation of water quality, quantity and affecting wetlands, rivers, lakes, and wildlife • Loss and fragmentation of habitat for sensitive species • Effects to barren ground caribou • Expect that the local hunters will be most concerned about effects on the migration of woodland caribou • Potential effects to species at risk, migratory birds, and big game species	• See Section 5.10 • See Section 5.13 • See Section 5.19.7
Vegetation and Wetlands	• Effects to plants are of high importance in the EIS • High-impact activities must be accompanied by a monitoring Elder • Effects to terrestrial habitat • Overprinting of aquatic habitats and seepage causing degradation of water quality, quantity and affecting wetlands, rivers, lakes, and wildlife • Potential effect of invasive species (weeds) introduced by vehicle traffic within the resource management area	• Se Section 5.6See Section 5.9 • See Section 8.0 • See Section 8.0

Environmental Component	Comment/Concern Raised	How Comment was Considered in the Environmental Assessment (Refers to Sections in this EIS Summary)
Community Services and Infrastructure	• Concern over the discussion of potential use of water truck for hauling potable water for the Project, including wear and tear • Lack of opportunities and amenities in the community, causing social problems • Interest in Alamos' support to purchase and establish housing • Potential effect to road condition and proper qualification and procedures for drivers (Project related) – safety along roadways • Potential increase of vehicle accidents due to increased traffic • Spill response protocol along roadways within resource management area	• See Section 5.12 • See Section 7.0
Indigenous Peoples	• Information regarding the Environmental Committee should be shared via newsletter or website • Lack of meaningful Section 35 consultation • Issues with understanding the environmental baseline study results • Concerns not being listened to and addressed meaningfully • Community members should be involved in environmental studies • Bring school kids to Gordon site to learn about effects and opportunities • Need to keep Winnipeg-based members informed of potential job opportunities • Potential to build cabins on Hughes Lake as part of Impact Benefit Agreement • Compensation for effects to traditional activities • Need for cultural sensitivity training for contractors • No knowledge sharing would take place without a written agreement about compensation • Approach should involve arriving at an accommodation agreement before discussing traditional knowledge sharing • Desire to review baseline data and have an opportunity for an independent consultant to conduct studies to compare results • Would like to complete TLRU study for Granville Lake community • Request for an open house and tour of the Project site • Questions regarding the level of engagement due to time period between contact • Some treaty land entitlement lands are close to the Gordon site • Concern over wording in the community profiles • Concern over number of interviews proposed for TLRU Study	• See Section 5.11 • See Section 5.17

Environmental Component	Comment/Concern Raised	How Comment was Considered in the Environmental Assessment (Refers to Sections in this EIS Summary)
Indigenous Peoples continued	• Need for community meetings to ask questions and register concerns • Concern regarding draft Federal Final EIS guidelines • Anticipate that Métis Nation of Saskatchewan - Eastern Region 1 should be engaged given the location of the Project.	• See Section 5.11 • See Section 5.17
Current Use of Lands and Resources for Traditional Purposes	• Water quality and aquatic and terrestrial habitat and the potential side effect on hunting and fishing in the area • Concern over effect to traplines • Exploratory helicopter flying over reserve during moose and goose season infringes on treaty rights • Traditional land and resource use is of high importance in the EIS • Access concerns over gate at bridge on Hughes River • Large amount of earth moving required for the Project and large changes to ground structure, aesthetics, and associated effects to rights • Concept of a sacred site is not compatible with Mathias Colomb Cree Nation world view • Intersection with Project/transportation routes and traplines • Decrease in wildlife resources due to increased harvesting by non-members (i.e., employees and contractors from elsewhere) • Effects on current harvesters who are active in the Project areas and also effects to collective rights • Project is located within a region with known contemporary and historical use for fishing, hunting, trapping, and cultural purposes • Workforce will bring people who will engage in hunting, fishing, and recreation that could negatively affect wildlife • Harvest of barren ground caribou in Manitoba • Project is within traditional territory of the Southend community • Effects to barren-ground caribou due to their reliance on caribou meat • Expect that the local hunters will be most concerned about effects on the migration of woodland caribou • Hunted caribou at South Indian Lake in winter of 2018 and there are concerns over effects to barren ground caribou herds	• See Section 5.10 • See Section 5.13 • See Section 5.15 • See Section 5.17

Environmental Component	Comment/Concern Raised	How Comment was Considered in the Environmental Assessment (Refers to Sections in this EIS Summary)
Heritage Resources	• Ensure that any unmarked traditional burial grounds are not disturbed • Potential damage to archeological and cultural sites in and around Lynn Lake	• See Section 5.14
Labour and Economy	• Training requirements and potential government support • Interest in education and training, job shadowing • Training needs for the Environmental Committee	• See Section 5.11 • See Section 5.12
Labour and Economy continued	• Prioritize opportunities in education, employment, and information flow • Employment, contracts, business opportunities, training, increased traffic, and job skills are of high importance for the EIS • Interest in job availability • Lack of community capacity, training, to benefit from mine development • Need community liaison/councilor to mentor trainees and employees • Training should have a pre-life skills/essential skills component to deal with hardship and addiction issues • Positive overall for employment, training, and economic development opportunities for members • Concern over drilling contractors and lack of partnering opportunities • Interest in exploring transportation aspects such as trucking or courier services • Waste dumps may not be an issue if there is potential for economic spin-off such as ski-hill • Open pit could be used for fish farming post operation • Negative effects include increased alcohol use from increased incomes • Opportunities for associated projects to benefit children and youth • Need for programming and funding for social programming to address socio-economic issues • Mining may be feasible for Mathias Colomb Cree Nation if they had a controlling share in the mine • Interested in training programs/training alliance • Indigenous trades training for workforce readiness • Would like to enhance funding and streamline the educational process • Guaranteed job at the end of training to pursue partnership	• See Section 5.11 • See Section 5.12

Environmental Component	Comment/Concern Raised	How Comment was Considered in the Environmental Assessment (Refers to Sections in this EIS Summary)
Labour and Economy continued	• Job opportunities for members • Interest in building housing for the Project and training and business opportunities • Opportunities for First Nation businesses to be involved in the Project • Interest in potential economic development opportunities • Interest in provision of construction services through Métis N4 Construction Inc. and would like to discuss mandatory minimums for Indigenous procurement • Request for written contract that would guarantee employment as part of the Project • Interested in economic benefits/opportunities, commitments to employment and training • Concern for local people being pushed out of jobs • Interested in partnerships that will be offered • Biggest positive of the Project is job creation • The people have work experience with mining and would be interested in employment opportunities • Would like to be integrated into future employment opportunities • Interested in workforce and business opportunities	• See Section 5.11 • See Section 5.12
Cumulative Effects	• Concern over long-term effects and cumulative effects • Post-mining legacy concerns • Concern about ongoing industrial activities at Mile 30	• See Section 5.19
Human Health	• Public safety risks with heavy truck traffic • Large workforce numbers of outsiders and associated adverse effects on already vulnerable communities and harvesting areas • Cumulative effects on already vulnerable people • Effect on socio-economic conditions due to resource depletion by non-members	• See Section 5.13 • See Section 5.15 • See Section 5.16 • See Section 5.17
Land and Resource Use	• People used to boat over Reindeer Lake and come shopping in Lynn Lake, likely 20 years ago	• See Section 5.13

5.0 SUMMARY OF EFFECTS ASSESSMENT, MITIGATION AND DETERMINATION OF SIGNIFICANCE

5.1 ENVIRONMENTAL SETTING

The Project, located in North Central Manitoba, is approximately 322 km northwest of Thompson, 1,085 km northwest of Winnipeg, and 100 km east of Kinoosao, Saskatchewan (Map 1). The Project is in a remote, sparsely populated and rugged region of the Boreal Shield Ecozone.

Primary resource uses in the region include mining activities and limited forestry. Hunting, trapping, water-oriented recreation, including sport fishing, and other forms of tourism are important activities. There are two communities near the Project: the Town of Lynn Lake and the Black Sturgeon Reserve (Marcel Colomb First Nation). These communities are connected by PR 391, which runs southeast from Lynn Lake to the Town of Leaf Rapids and the City of Thompson.

The area supports peat-covered hummocky glacial deposits underlain by an expanse of Precambrian bedrock. Bedrock in the region is typically covered by 2 to 4 m of overburden. The terrain consists of mostly hilly, till-veneered bedrock, with intervening low areas of organic terrain. The terrain ranges from level to moderately sloping, with most slopes ranging from 0 to 15%. Surficial geology of the Lynn Lake area consists primarily of till. The till deposits are generally thin, range from 1 to 3 m in thickness, and are generally found overlying bedrock. The texture of the till found in the Lynn Lake area is generally sandy and contains a large proportion of debris derived from crystalline shield lithologies. Glaciolacustrine deposits comprise nearshore sand and gravel as well as massive to laminated sand, silt and clay that accumulated in the deeper areas of glacial Lake Agassiz. Permafrost is typically found in 10% to 50% of the land in the Lynn Lake area (Heginbottom et al. 1995). When present, the permafrost generally has low to moderate ice content.

Soils in the region are comprised of mineral soils, which are dominant on sandy, acidic till, with organic soils typical in bogs and peat plateaus, and widespread discontinuous permafrost (Smith et. al. 1998). Soil thickness is variable and ranges from 0 metres, in areas of exposed bedrock at the Gordon Site to more than 2 m; however, depth to bedrock is commonly 0.3 to 2 metres below the surface. Within the Churchill River Upland Ecoregion, Dystric Brunisols are the dominant soils on sandy acidic till, while Gray Luvisols are dominant on well to imperfectly drained clay deposits (Smith et al.1998). Across the Project area, soils include Brunisolic, Cryosolic and Organic soil orders. Brunisols occupy the largest proportion of the Project area, followed by Cryosols then Organic soils. At the Gordon site, the most extensive soils within terrestrial areas belong to the Fay Lake soil units which represents 42% of the site. At the MacLellan site, the most extensive soils within terrestrial areas belong to the Hat Lake and Wuskwatim soil units, which represent 34% and 32% of this area, respectively.

Contiguous tracts of boreal forest span the area with jack pine (*Pinus banksiana*) common in well-drained areas, and black spruce (*Picea mariana*) and tamarack (*Larix laricina*) species abundant in wetter areas.

The area is home to diverse wildlife species such as beaver (*Castor canadensis*), moose (*Alces alces*), black bear (*Ursus americanus*), American marten (*Martes americana*), and a variety of migratory bird species. Numerous wetlands, lakes, rivers, and streams are found throughout the area due to impermeable bedrock and poorly drained soils in peat filled depressions. These waterbodies are a part of the Churchill River Watershed that drains into the Hudson Bay to the east (Smith et. al. 1998). The Project lies within four subwatersheds of the broader Granville Lake Watershed: Hughes River, Lower Keewatin River, Lower Lynn River, and Cockeram Lake. Surface water around the Gordon site drains southward into the Hughes River, via Farley, Swede and Ellystan lakes, which in turn discharge into Barrington River and Southern Indian Lake on the Churchill River. Around the MacLellan site, water flows south into the Keewatin River and southeast through Cockeram Lake and Sickle Lake before discharging into Granville Lake on the Churchill River, upstream of Southern Indian Lake. Fish inhabiting the area include northern pike (*Esox lucius*), walleye (*Sander vitreus*), lake whitefish (*Coregonus clupeaformis*), and brook stickleback (*Culaea inconstans*).

5.2 ENVIRONMENTAL ASSESSMENT APPROACH

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 communities and other potentially affected members of the public or interested parties.

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

- Atmospheric Environment
- Noise and Vibration
- Groundwater
- Surface Water
- Fish and Fish Habitat
- Vegetation and Wetlands
- Wildlife and Wildlife Habitat
- Labour and Economy
- Community Services, Infrastructure and Wellbeing
- Land and Resource Use
- Heritage Resources
- Current Use of Lands and Resources for Traditional Purposes

- Human Health
- Indigenous Peoples.

The environmental assessment approach incorporates the following key considerations:

- Identifying the activities and components of the Project.
- Predicting and evaluating potential changes to the environment and the likely effects on identified valued components (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.

Integral to the EA process was the consideration and incorporation of knowledge from the local community and from Indigenous nations. Community knowledge and traditional knowledge that was acquired between November 19, 2014 and May 22, 2020, through public participation and engagement with Indigenous communities and that Alamos had access to from project-specific traditional land and resource use studies has been incorporated into the EIS.

The factors considered for the environmental assessment for the Project include the following:

- Purpose of the Project.
- Alternative means of carrying out the Project that are technically and economically feasible and environmental effects of such alternative means.
- Environmental effects of the Project, including effects due to malfunctions or accidents which may occur in connection with the Project.
- Consideration of cumulative effects of the Project in combination with other past, present, and reasonably foreseeable future projects and physical activities.
- Significance of the environmental effects identified.
- Public comments and Indigenous nation input.

- Technically and economically feasible mitigation measures to avoid or reduce adverse effects or enhance positive effects.
- Requirements for follow-up program.
- Changes to the Project caused by the environment.

5.3 ASSESSMENT BOUNDARIES

5.3.1 Spatial Boundaries

Spatial and temporal boundaries are identified for the assessment and assist in quantifying effects. Spatial boundaries set the geographic areas over which the assessment will be conducted. Temporal boundaries set the timeframe to be considered.

Spatial boundaries for the assessment were selected based on the geographic extent over which Project activities and their effects on VCs are likely to occur, as well as other ecological, technical, and social considerations. Three geographic areas were defined for VC assessment purposes – the Project Development Area (PDA), Local Assessment Area (LAA) and Regional Assessment Area (RAA).

- The PDA encompasses the immediate area in which Project activities and components occur plus a 30-m buffer and is the anticipated area of direct physical disturbance associated with the construction and operation of the Project (i.e., the Project footprint; see Maps 1 and 2).
- The 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 PDA and is selected in consideration of the geographic extent of effects.
- The RAA is the area established for context for the determination of significance of project-specific effects. It is also the area in which potential cumulative effects are assessed. The RAA encompasses both the PDA and LAA and is VC-specific.

5.3.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects during the Project's construction, operation, and decommissioning/closure phases over relevant timescales. The temporal boundaries for the Project consist of the following phases:

- Construction – two years (scheduled to be carried out concurrently from Year -2 to Year -1 at both sites).
- Operation – 13 years (scheduled to be carried out from Year 1 to Year 6 at the Gordon site and from Year 1 to Year 13 at the MacLellan site).

- Decommissioning/closure – five to six years of active closure (scheduled to begin in Year 6 at the Gordon site and in Year 14 at the MacLellan site). Active closure will be followed by post-closure, which is the time period during which active reclamation measures are complete, but monitoring is still required. The expected duration for post-closure is approximately 10 years. Pit filling is expected to take 11 years at the Gordon site and 21 years at the MacLellan site under average conditions. Permanent closure will occur when the site is stable, and monitoring is no longer required.

5.4 ATMOSPHERIC ENVIRONMENT

5.4.1 Existing Environment

Three distinct subcomponents were described to characterize the atmospheric environment baseline conditions: climate and meteorology, ambient air quality and greenhouse gases (GHGs).

The Project is in a region characterized by short, cool summers and long, cold winters. Long-term climate data indicates that the mean annual air temperature is -3.2°C. The coldest monthly average temperature is -24°C (January) and the highest monthly average temperature is 16°C (July). The total annual precipitation is 478 mm, with 318 mm falling as rain, and the remainder as snow.

Existing air quality reflects the remote location of the Project and the current lack of industrial activities in the area. Existing dust levels are low and attributed to traffic on unpaved roads and other human activities such as the use of wood stoves and open fires. The average $PM_{2.5}$ and PM_{10} concentrations at the MacLellan site in 2016 were 2.9 µg/m³ and 4.6 µg/m³, representing baseline concentrations in the LAA. The overall average dustfall measured in 2016 was 0.33 mg/dm²/day, representing the baseline dustfall in the LAA. Representative baseline concentrations of nitrogen dioxide (NO_2), carbon monoxide (CO) and sulphur dioxide (SO_2) were based on analysis of ambient air monitoring data from the Fort Smith continuous monitoring station in the Northwest Territories. Baseline ambient concentrations of hydrogen cyanide (HCN), metals, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) are assumed negligible because of the remote location of the Project and the absence of industrial activities in the LAA. Overall, the existing air quality in the LAA can be characterized as very good.

5.4.2 Environmental Effects

5.4.2.1 Change to the Environment

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

- change in air quality
- change in GHGs.

Emissions of air contaminants and GHGs to the atmospheric environment may result in a change in air quality or a change in atmospheric GHGs.

Emissions during construction, pre-production, and decommissioning/closure at the Gordon site are associated with the operation of the off-road construction and mining equipment, and movement of construction material for the construction and decommissioning of the major components of the Project such as internal haul roads and stockpile pads. Emissions during operation at the Gordon site are associated with diesel combustion exhaust from the mining equipment and fugitive dust emissions generated from mining activities and wind erosion. The Gordon site emissions include emissions associated with ROM ore haulage on PR 391.

Emissions during construction, pre-production, and decommissioning/closure at the MacLellan site are associated with the operation of the off-road construction and mining equipment, and movement of construction material for the construction and decommissioning of the major components of the Project such as internal haul roads, stockpile pads, ore milling and processing plant infrastructure and the TMF. Emissions during operation at the MacLellan site are associated with diesel combustion exhaust from the mining equipment, fugitive dust emissions generated from mining activities and wind erosion, fugitive dust emissions from the mill feed storage area and crushing plant, emissions from the ore milling and processing plant and the TMF.

Construction, operation, and decommissioning/closure activities will result in GHGs from the combustion of diesel fuel, consumption of purchases electricity, detonation of explosives and land clearing.

5.4.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on air quality and GHGs at the Gordon and MacLellan sites:

- Enclosure of the mill feed storage area and crushing plant conveyors and the fine ore stockpile to reduce fugitive dust emissions. Particulate emissions from the enclosed conveyors and fine ore stockpile are assumed negligible.
- Use of dust collection/control systems (e.g., baghouse) at the primary crusher and the processing plant gold room to reduce PM emissions. Use of a wet scrubber at the secondary crusher. The dust collection efficiencies of the dust collectors and wet scrubber are considered in the calculation for PM emissions.
- Optimization of haul roads and infrastructure to reduce transportation and haul distances.
- Optimization of the TMF to reduce the area of exposed dry surfaces to reduce the potential for windblown dust emissions.
- Enclosed leaching and adsorption processes at the ore milling and processing plant to reduce fugitive HCN emissions due to volatilization loses.
- Limited concentration of WAD-cyanide (after cyanide detoxification) in water discharge to the TMF to 10 mg/L to reduce fugitive HCN emissions from the TMF pond.

- Engines and exhaust systems will be properly maintained to keep construction and mining equipment in good working condition.

- The concentration of sulphur in diesel fuel shall not exceed 15 mg/kg, as per the Sulphur in Diesel Fuel Regulations (ECCC 2002) that came into effect in 2006 for on-road vehicles and in 2010 for off-road equipment. This sulphur concentration is used in the emissions quantification for the Project.

- Haul trucks and vehicle idling times will be reduced to the extent possible.

- Cold starts will be limited to the extent possible.

- On-site haul roads and access roads will be maintained in good condition, with regular inspections to monitor loose dust on the roads to reduce dust "track out" onto public roads.

- During dry periods, water will be applied to haul roads and access roads to reduce 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. A 75% control efficiency due to watering is applied to the quantified PM emissions from haul roads and access roads for the Project based on the Western Regional Air Partnership Fugitive Dust Handbook (WRAP 2006).

- Chemical dust suppressants will be applied to haul roads as an alternative option to watering. While chemical dust suppressants can be more effective at controlling fugitive dust than watering, they are also more expensive and can have adverse effects. Therefore, chemical dust suppression will be applied on an as-needed basis during high wind conditions or if measured ambient PM concentrations are in exceedance of the Manitoba Ambient Air Quality Criteria and if an increase of watering is determined ineffective or unfeasible at the time. Examples of suppressants include chlorides, petroleum products, liquid polymer emulsions, and agglomerating chemicals. These suppressants, if required, will be applied, as per the manufacturer's recommendations, to preclude unintended environmental effects.

- Haul truck speed on the on-site haul roads will be limited to 35 km/h (loaded) and 40 km/h (empty). Vehicle speed on the access roads will be limited to 40 km/h.

- Track-out of material to PR 391 will be reduced by dust sweeping and truck wheel washing stations prior to entering onto PR 391.

- Surfaces of topsoil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.

5.4.2.3 Residual Effects

Project construction and operation will result in the release of contaminants that will change ambient air quality. The air quality assessment focuses on Project operation because the operation phase has the greatest potential for adverse effects to air quality. The quantities of air contaminants released during the worst-case year of construction (Q2 Year -2 to Q1 Year -1 for both the Gordon and MacLellan sites) are substantively less than the worst-case year of operation (Year 2 for the Gordon site and Year 7 for the MacLellan site). The quantities of air contaminants released during decommissioning/closure are typically much less than construction and operation, are short-term in duration during active reclamation, and can be managed to negligible or acceptable levels through the application of standard operating procedures and best management practices. Therefore, the effects on air quality in the construction and decommissioning/closure phases will be less than during operation.

Maximum ambient concentrations and dustfall for the substances of interest are predicted for the worst-case year of operation at the Gordon site and ore haul on PR 391 (Year 2) and the worst-case year of operation at the MacLellan site (Year 7).

For the Gordon site, the model results indicate that the maximum predicted 1-hour average NO_2, CO and SO_2 concentrations and 24-hour average TSP and PM_{10} concentrations are greater than the respective AAQC (Manitoba Sustainable Development 2005). The maximum predicted 1-hour average NO_2 and SO_2 concentrations are greater that the Canadian Ambient Air Quality Standards (CAAQS; CCME 2017). For the MacLellan site, the model results indicate that the maximum predicted 1-hour average NO_2 concentrations and 24-hour average TSP and PM_{10} concentrations are greater than the respective AAQC. The maximum predicted 1-hour average NO_2 concentration is greater that the CAAQS. For the other gaseous and particulate criteria air contaminants, dustfall and metals, the maximum predicted values are less than the applicable AAQC for both sites.

During the construction phase, construction and mining equipment exhausts, blasting using an ammonium nitrate fuel oil emulsion and land clearing are sources of GHG emissions. These GHG emissions consist primarily of carbon dioxide (CO_2), with smaller amounts of methane and N_2O. GHG emissions estimated to be released from the Gordon site during the worst-case year of construction are approximately 16.0 kt carbon dioxide equivalent (CO_2e) and are conservatively estimated to contribute to approximately 0.074% and 0.002% to annual provincial and national GHG emission totals, respectively. Approximately 64.6 kt CO_2e are estimated to be released during the worst-case year of construction at the MacLellan site, and are conservatively estimated to contribute to approximately 0.30% and 0.009% to annual provincial and national GHG emission totals, respectively.

During the operation phase, GHG emission sources include emissions from heavy off-road equipment, on-highway trucks and vehicles, the stationary generator, and blasting. GHG emissions estimated to be released from the Gordon site during the worst-case year of operation are approximately 36.5 kt CO_2e, and are conservatively estimated to contribute approximately 0.17% and 0.005% annually to the provincial and national GHG emission totals, respectively, while the MacLellan site operation is estimated to produce 68.3 kt CO_2e during the worst-case year, contributing approximately 0.32% and 0.009% annually to the provincial and national GHG emission totals.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on air quality and GHGs are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.5 NOISE AND VIBRATION

5.5.1 Existing Environment

5.5.1.1 Noise

Noise levels in the RAA varied, with lowest levels in remote areas and highest levels in residential communities. Dominant noise sources in remote areas of the RAA (e.g., First Nation trapping areas and fishing camps) are wildlife, birds, insects, occasional aircraft flyovers, vegetation rustling, and wind noise. Noise levels were similar between day and night, with daytime summer levels averaging 34.3 dBA and nighttime levels averaging 33.4 dBA. Rural recreational areas like the lake-shore environments of Burge Lake were slightly higher, with summer daytime noise levels averaging 40.6 dBA and nighttime 35.2 dBA. Noise sources contributing to these levels were from residents' activities, local traffic, watersport and recreational activities, occasional aircraft flyovers, vegetation rustling, wildlife, insects, and water ripple noise. Nighttime noise consisted of occasional wildlife calling and dawn bird chorus during sunrise.

Similar noise levels were found within the Black Sturgeon Reserve (Marcel Colomb First Nation). Average summer noise levels in this sparsely populated area was 39.4 dBA during the day and 37.9 dBA at night. Sounds were attributed to residential and recreational activities during the daytime and earlier part of the nighttime period (due to longer daylight hours), and occasional dog barking, wildlife calling, and dawn bird chorus during sunrise.

Baseline sound levels at receptors located in the community of Lynn Lake were based on levels advised in Health Canada Noise Guidance (Health Canada 2017) for quiet rural communities (i.e., population density of 28 per square km). The Health Canada quiet rural community baseline daytime sound level is 45 dBA and nighttime level 35 dBA. This actual baseline sound level is likely to be higher because the population density at Lynn Lake is more than 28 per square km; however, the quieter baseline sound level is considered a more conservative approach.

5.5.1.2 Vibration

In contrast to audible noise, the background environmental ground-borne vibration levels in an outdoor rural area without local human activities is typically below the threshold of human perception (65 vibration velocity in decibel scale; FTA 2018). The typical threshold of human perception of ground vibration is 0.5 millimeters per second peak particle velocity (ISEE 2011); however, the perceptibility threshold varies from person to person. In rural and remote areas, vibration effects are uncommon.

5.5.2 Environmental Effects

5.5.2.1 Change to the Environment

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

- change in noise levels
- change in vibration levels.

During construction, noise emission from activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in noise levels. During operation, noise emitted from the processing facility and mobile equipment (i.e., haul trucks) will result in a change in noise levels. In the decommissioning/closure phase, noise emissions from excavation and reclamation activities will result in a change in noise levels.

In the construction phase, activities such as site preparation, utility and infrastructure development, and processing facility construction will result in a change in vibration levels. Project construction activities such as earthworks, piling, and drilling were considered to cause potential vibration effects. During the operation phase, blasting activities at both the Gordon site and the MacLellan site will result in ground-borne vibration and air overpressure. The vibration effects from ground vibration and air overpressure on human receptors were considered. In the decommissioning/closure phase, excavation and reclamation activities will result in a change in vibration levels.

5.5.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on noise and vibration levels during construction and operation at the Gordon and MacLellan sites:

- Where possible, large stationary machinery (i.e., crushers) will be located inside buildings.
- Fully enclosed conveyor between buildings in processing plant.
- Large transportation trucks will be used to reduce the number of trips.
- Mobile equipment will have exhaust mufflers.
- Work camp building walls and roof will include noise-insulated panels.
- Work camp building will include air conditioning system such that double pane windows and insulated doors can be closed during the summer season.
- Reduce heavy fleet idling when not operating, where practical.

Mitigation will be achieved by blast design related to quantities of explosives, blast hole locations and time delays between blasts. The mitigation measures that apply to both the Gordon and MacLellan sites are summarized as follows:

- Highest explosive per time delay that do not exceed 207.9 kg.
- Only one hole/delay will be fired in the blast.
- Minimum time delay between holes in blasts will not be less than 8 milliseconds (ms).

The specific mitigation measures for receptor ID 76 and ID 73 (potential Indigenous receptors) near the Gordon site are as follows:

- The reduced blast charge of 43 kg can be increased if the distance between the blast and closest receptor ID 76 and ID 73 is more than 1,430 m and 2,170 m (distance based on receptor location to pit boundary), respectively.
- The reduced blast charge of 43 kg can be increased if monitoring results indicate air overpressure level below 120 dBL at ID 76 and ID 73.
- Engagement with Marcel Colomb First Nation to discuss the potential of a seasonal mitigation approach, which relaxes the reduced blast charge of 43 kg during off-season period when trapping activities at receptors (ID 76 and ID 73) is not expected.

5.5.2.3 Residual Effects

High annoyance (HA) is a measure used to estimate a community response to noise levels. Health Canada uses the change in %HA as an appropriate indicator of noise-induced human health effects. Project-related changes in %HA at receptors are predicted to be below the 6.5% target for the construction phase and therefore in compliance with the Health Canada Noise Guidance (Health Canada 2017).

Similarly, low frequency noise effects are not expected at receptors because the predicted sound levels are below the Health Canada Noise Guidance targets (Health Canada 2017).

During construction, daytime and nighttime outdoor noise levels at the temporary work camp are predicted to be 56.7 dBA. To reduce noise effects on workers, temporary work camp buildings will be designed in a manner that reduces noise by 30 dB when windows are closed. Based on a building transmission loss of 30 dB, the Project-related construction noise level inside the temporary work camp is predicted to be 26.7 dBA, which is below the target for sleep disturbance (i.e., 30 dBA; World Health Organization 1999). As a result, no noise-related sleep disturbances of workers are predicted from the Project construction during the daytime and nighttime period.

The closest receptors to potential construction activities at the Gordon and MacLellan sites are located far enough away (i.e., over 1 km) that structural damage due to construction equipment (e.g., pile driver,

compactor) vibration is unlikely. The blasting plan will consider distance to receptors and will size the charges to avoid exceeding regulatory targets at receptors (i.e., 120 dBL).

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on noise levels and vibration levels are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.6 GROUNDWATER

5.6.1 Existing Environment

Groundwater flow in the Project area is strongly influenced by topography, which results in flow originating from high areas to low areas. Measured groundwater levels vary from 314 to 326 m above mean sea level. Recharge is associated with topographic high areas and discharges to surface water features within the topographic low areas. At the Gordon site, overall, the regional groundwater flow within the overburden is to the east in the central and southern portions of the LAA/RAA and to the northeast in the northern portion of the LAA/RAA. At the MacLellan site, overall, the regional groundwater flow within the overburden is to the south, southeast across the MacLellan site LAA/RAA.

Overall groundwater quality in the Project area meets the *Manitoba Provincial Water Quality Guidelines* for drinking water (MWS 2011) and the *Canadian Drinking Water Quality Guidelines* (Health Canada 2019) except for iron and manganese. Concentrations of these parameters are typically elevated in groundwater within northern areas in Manitoba and are reflective of the natural mineralization and geochemical processes in the area.

In areas of historical mine activities there was no clear difference in shallow groundwater quality between areas associated with historical mine operations and background areas with respect to drinking water guidelines. Seepage from historical MRSAs had concentrations of sulphate, arsenic, iron, and manganese that exceeded the drinking water guidelines. There are no known groundwater users located within the LAA/RAA for the Gordon and MacLellan sites.

Background groundwater quality also meets the more stringent provincial and federal guidelines for the protection of freshwater aquatic life except fluoride and phosphorous. Within the historical mine operational areas, groundwater quality exceeds these guidelines for fluoride, phosphorous, and iron. Seepage from historical MRSAs had concentrations of arsenic, cadmium, copper, iron, phosphorous, and zinc above the provincial and federal guidelines for the protection of freshwater aquatic life.

5.6.2 Environmental Effects

5.6.2.1 Change to the Environment

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

- change in groundwater quantity and/or flow
- change in groundwater quality.

At the Gordon site, groundwater quantity and/or flow and subsequently the mass loading of parameters from groundwater to surface water will primarily be affected by the lowering of groundwater levels through initial dewatering of the historical East and Wendy pits and local dewatering for the installation of foundations. The initial development of the ore stockpile, overburden stockpile, and MRSA (and the alteration of the historical south MRSA) also have the potential to affect groundwater recharge and consequently groundwater quantity and/or flow at the Gordon site. Groundwater quantity may also be affected during construction through changes in infiltration rates through compaction of ground surfaces, stripping of topsoil, timber harvesting, and removal of vegetation in the PDA. During operation at the Gordon site, dewatering of the open pit will result in a change in groundwater flow patterns and redirect groundwater recharge originating from the historical MRSA and the new MRSA to the open pit, where it will be collected and pumped to a settling pond prior to discharge to the environment. Groundwater recharge from the historical MRSAs and new MRSA may affect the quality of groundwater discharging to lakes and wetlands Drawdown resulting from open pit dewatering at the Gordon site may affect local groundwater users located within the predicted zone of influence.

At the MacLellan site, the primary Project effect on groundwater quantity and/or flow during construction is related to dewatering of the historical underground workings and starter pit and local dewatering for the installation of utilities and buildings and dam foundations for the TMF as well as from changes to infiltration rates resulting from the construction of roads and mine components. During operation, effects are related to the lowering of water levels through continued dewatering of the open pit and mounding of the water table through continued operation of the TMF. Dewatering of the historical underground workings and open pit and local dewatering for the installation of utilities and buildings and dam foundations for the TMF have the potential to change groundwater levels and flow patterns and subsequently the mass loading of parameters from groundwater to surface water at the MacLellan site. Water pumped from the open pit will be collected and pumped to a collection pond and/or the TMF. Pumped water may be sent to the process plant and used for mill processing prior to being sent to the TMF with tailings. Groundwater recharge from the MRSA and TMF have the potential to affect groundwater and surface water quality where groundwater discharges to lakes and wetlands. Following completion of operation, dewatering of the open pit will cease the open pit will fill with water and groundwater levels will return to near baseline conditions.

Following completion of operation, dewatering of the open pits will cease, and the open pits will fill with water. As the open pits fill, groundwater levels will slowly recover, and the groundwater flow patterns, will return to near baseline conditions. At the MacLellan site, closure of water management facilities will result

in the removal of contact water collection systems that may result in groundwater originating from the MRSA and TMF discharging to the natural environment.

5.6.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on groundwater quality and quantity:

- Limit construction footprint (i.e., PDA) to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the PDA.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Intercept groundwater flowing into the open pit prior to discharge at the pit wall and return water generated from pumping groundwater interceptor wells to Gordon and Farley lakes to offset a reduction in groundwater discharge. The groundwater interceptor wells are an integral part of the open pit dewatering strategy and are therefore included in the effects assessment as mitigation.
- Use standard construction methods, such as seepage cutoff collars, where trenches extend below the water table to mitigate preferential flow paths.
- Install contact water and seepage collection ditches around the perimeter of the MRSA and TMF to mitigate the migration of seepage. The seepage collection is an integral component of the MRSA and TMF design at the MacLellan site and therefore included in the effects assessment as mitigation.

5.6.2.3 Residual Effects

During the construction phase, changes to groundwater infiltration are considered to have a minor effect on groundwater resources. Residual effects from temporary dewatering and contact water collection are anticipated to be low, as the groundwater pumping will be short-term on an as-needed basis. The residual effects from the initial dewatering of the historical Wendy and East pits at the Gordon site and dewatering of the starter pit, historical underground workings, and the initial operation of the TMF at the MacLellan site will be most notable during the construction and operation phases. The predicted change in groundwater table and resulting drawdown at the end of construction period in the area of the Wendy and East pits, is a reduction of approximately 1.0 m or more within 800 m of the pits. In the area of the MacLellan starter pit, groundwater levels are predicted to be lowered by approximately 1 m or more within 200 m of the pits. With respect to groundwater discharge to surface water, discharge to Marie Lake is predicted to be 227 m^3/day less at the end of construction compared to baseline conditions. Farley and Gordon lakes are also predicted to change from receiving groundwater to a groundwater recharge feature at the end of construction. The loss of groundwater discharge to Farley and Gordon lakes will be mitigated by the return of pumped water from the groundwater interceptor wells. Groundwater discharge to the Keewatin River is anticipated to increase from baseline conditions due to mounding of the water table associated with the TMF. Changes to the groundwater discharge rates for remaining lakes and watercourses are expected to be relatively small (generally less than 86 m^3/d) compared to baseline conditions.

During operation, at the Gordon site, dewatering of the open pit will lower the water table by up to 1 m that extends approximately 1,200 m from the open pit, increasing to more than 10 m within 600 m of the open pit. At the MacLellan site, dewatering of the open pit will lower the water table by up to 1 m that extends over an area of approximately 800 m south of the open pit, increasing to more than 10 m within 600 m of the open pit. There are no known groundwater users located within the LAA/RAA and therefore, no water supply wells or groundwater takings that supply potable water within the extent of drawdown. Groundwater drawdowns of greater than 10 m are predicted to occur beneath a small portion of wetlands located north to northwest of the open pit and PDA at the Gordon site. Changes in groundwater flow and discharge to surface water features due to dewatering are predicted for Gordon, Farley, and Marie lakes where the lakes will shift from gaining groundwater under baseline conditions to surface water recharging groundwater at the end of operation. For Marie Lake, a reduction in groundwater levels of up to 1 m to the north of the lake compared to baseline condition is predicted, resulting in a reduction in groundwater discharge to the lake by 246 m^3/d compared to baseline conditions. The loss of groundwater discharge to Farley and Gordon lakes will be mitigated by the return of pumped water from the groundwater interceptor wells. The rate of groundwater discharge to Payne Lake, Minton Lake, Lake 2 (near MacLellan site), and Lake 3 (near MacLellan site) increases from baseline conditions to the end of operation due to mounding of the water table in the vicinity of the TMF. The rate of groundwater recharge from watercourse Kee3-B2-A1 (watercourse from East Pond to Tributary of Keewatin River) increases at the end of operation compared to baseline conditions due to dewatering of the open pit. For the remaining watercourses and lakes, the changes to groundwater discharge are relatively small (generally less than 84 m^3/d) compared to the baseline conditions.

Following completion of operation, dewatering of the open pit will cease and water levels will begin to rise within the open pit to a maximum water elevation of 315 m above mean sea level, at the Gordon site and 330 m above mean sea level at the MacLellan site, which reflects the local groundwater table at closure. The water table is predicted to return to near baseline conditions, except for a small area at the Gordon site between the pit lake and Farley Lake where groundwater levels are predicted to be about 0.5 m lower than baseline and at the MacLellan site where the TMF is predicted to result in mounding of the water table. The rate of groundwater discharge to surface water are predicted to return to near baseline rates once the open pits are full and a pit lake has formed except for Payne Lake, Lake 3, Kee3-B2-A1, and Kee3-Pay1 (watercourse connecting Payne Lake and Keewatin River). Groundwater discharge to Payne Lake, Lake 3, Kee3-B2-A1, and Kee3-Pay1 increases in closure compared to baseline conditions due to mounding of the water table associated with the TMF.

Residual effects on groundwater quality are predicted as a result of recharge through the historical MRSAs and new MRSAs with elevated concentrations of parameters above background. Dewatering of the historical East and Wendy pits and the open pits will influence groundwater flow patterns during construction and operation and redirect groundwater recharge originating from the historical MRSAs to the historical pits and open pits where it will be pumped to a settling pond prior to discharge to the environment. During dewatering of the historical pits and open pit treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment. During construction, recharge originating from the historical MRSAs are predicted to be redirected from surface water receivers to the open pit. During

operation and closure, groundwater recharge from the MRSAs and TMF is predicted to be elevated above the drinking water guidelines for nitrate+nitrite, total cyanide, sulphate, aluminum, antimony, arsenic, manganese, sodium, and/or uranium. The predicted groundwater flow pathway of seepage from the MRSAs and TMF is mainly confined to the PDA with a small portion extending into the LAA until the seepage originating from the MRSAs and TMF discharges to surface water. The main surface water receivers of seepage from the MRSAs and/or TMF are the Gordon Lake, Farley Lake, Susan Lake, Keewatin River, and Minton Lake. The effects assessment for groundwater quality was conservative in that attenuation of groundwater quality along the groundwater flow path from the source to the receptor was not considered. No groundwater supply wells are known to be located within the flow pathways of seepage from the MRSAs and TMF.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on groundwater quantity and quality are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.7 SURFACE WATER

5.7.1 Existing Environment

Most of the lakes within and near the two study areas are shallow (<4 m deep) and do not thermally stratify during the summer. Background water quality generally reflects geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions (<80 mg/L total dissolved solids), soft (hardness <75 mg/L as calcium carbonate ($CaCO_3$)), and neutral to slightly acidic. Parameters such as total phosphorus, aluminum, chromium, and iron are naturally elevated (or low in the case of pH) and occasionally do not meet applicable guidelines. Water in the Wendy Pit and East Pit have elevated concentrations of some general parameters relative to background levels, are deep (>70 m), and chemically stratify year-round, suggesting that metal leaching from the exposed pit walls has affected water quality in the pits. Flooding within the region can be triggered by extreme precipitation, rapid snow melt, ice jams, and beaver activity, with peak flows generally occurring during the spring freshet. Beaver activity is extensive within the Gordon and MacLellan LAAs and can produce high water levels in both streams and lakes.

The LAA at the Gordon site is characterized by small lakes and streams many of which are intermittent and usually flow for short periods in the spring. Muskeg bogs and wetlands are common throughout the LAA at the Gordon site. General flow direction in the Gordon LAA is north to south from Gordon Lake towards Ellystan Lake. Within the LAA, water flows from Gordon Lake to Farley Lake through a constructed diversion channel, from Farley Lake to Swede Lake through an approximately 4 km long, beaver dam-impounded stream, and from Swede Lake to Ellystan Lake. Baseline water quality guideline exceedances in the Gordon site LAA include nitrite, fluoride, total phosphorus, total aluminum, total arsenic, total hexavalent chromium, total copper, total iron, and total zinc. These guideline exceedances were generally attributable to local geochemistry and watershed characteristics, including rock outcroppings, beaver impoundments, and muskeg bogs.

The LAA at the MacLellan site is characterized by larger lakes and rivers than at the Gordon site. Cockeram Lake is the largest lake by surface area in the LAA at the MacLellan site with a surface area of approximately 21 km^2. Surface water flow in the MacLellan site PDA is north to south towards Cockeram River. The Keewatin River flows north to south within the LAA and drains the western part of the PDA, Dot Lake, Payne Lake, and small tributaries. The Cockeram River flows north to south within the LAA and drains the eastern portion of the PDA, Lobster Lake, Minton Lake, and several unnamed lakes. Water flows from the Keewatin River and the Cockeram River into Cockeram Lake. Run-off from the MacLellan site enters the Keewatin River via a stream that drains a small pond (East Pond) to the south and several smaller tributaries that drain to the west. East Pond was the main water collection area for the previous MacLellan Mine. Baseline data collection results indicate that historical mining activities at the MacLellan site have affected and continue to affect water quality in the East Pond. Despite these elevated concentrations in the East Pond, drainage from the MacLellan site does not have a measurable effect on water quality in the Keewatin River; water quality parameter concentrations were similar upstream and downstream of the MacLellan site. This is likely due to the relatively small volume of water draining the MacLellan site in comparison to the volume of the Keewatin River.

The former East Tailings Management Area (ETMA) is located immediately east of the Town of Lynn Lake and adjacent to Lynn River and Eldon Lake. Lynn River drains into the Keewatin River downstream of the MacLellan site. The ETMA stored tailings for three now-closed copper, gold and nickel mines that operated between 1953 and 1975. Elevated concentrations of aluminum, copper, nickel, cadmium, cobalt, and zinc were observed in waterbodies downstream of the ETMA (i.e., Eldon Lake, Lynn River, Keewatin River, and Cockeram Lake). These metals showed a general downward concentration gradient as a function of distance from the ETMA (i.e., concentrations generally decreased with increasing distance downstream from the ETMA). This spatial concentration gradient, which is evident between Eldon Lake and Sickle Lake, suggests that the ETMA continues to influence water quality in Eldon Lake, Lynn River, the Keewatin River, Cockeram Lake, and potentially Sickle Lake (which is also downstream of the former Burnt Timber Mine near Shortie Lake). There is no apparent remaining influence of the ETMA or the Burnt Timber Mine on water quality as far downstream as Granville Lake.

5.7.2 Environmental Effects

5.7.2.1 Change to the Environment

The potential environmental effects of the Project on surface water, prior to mitigation, include:

- change in surface water quantity
- change in surface water quality.

Changes to the environment for surface water quantity are assessed by site and by mine phase.

At the Gordon Site, surface water quantity and/or flow may be affected by the following physical activities during construction: site preparation; construction of mine components, and water management facilities;

construction of utilities, infrastructure, and other facilities; and construction of water development and control features. Interceptor wells will pump non-contact groundwater from the vicinity of the open pit to Gordon and Farley lakes, and dewatering of the existing pits will also occur in this phase. These changes are anticipated to temporarily increase flows downstream of the PDA.

At the MacLellan site, surface water quantity and/or flow could be affected by the following physical activities during construction: site preparation; construction of mine components and water management facilities; construction of utilities, infrastructure, and other facilities; and construction of water development and control including dewatering of pit and underground workings. The TMF will be used to store and recycle water for ore processing. Water from dewatering activities, including dewatering of the existing mine shaft, will be pumped and stored in the TMF. At the MacLellan site, construction and operation of the fresh-water intake in the Keewatin River is not anticipated to result in substantial changes to water quantity; however, water development and control activities will alter surface water quantity.

During construction, changes to water quality at the Gordon site are attributed to dewatering of the East and Wendy pits and discharging of groundwater pumped from the groundwater interceptor wells. At the MacLellan site, changes to water quality during construction are attributed to discharge of mine effluent from the collection pond to Keewatin River.

During operation, effects on surface water quantity and flow will be from the temporary changes in flows to downstream waterbodies as a result of continued dewatering and the use of interceptor wells for groundwater management, and from temporary and permanent changes in watershed area due to construction within the PDA. At the Gordon Site, flows from the interceptor wells will affect downstream surface water flows in hydraulically connected water bodies by changing historical discharge patterns. Contact water at the site will be gravity-drained towards collection sumps and pumped to the collection pond, changing local drainage patterns and affect the quantity and timing of flows in downstream water bodies. Site development and the presence of infrastructure will also affect surface water quantity by reducing infiltration and increasing runoff. At the MacLellan site, rock, overburden, and ore stockpiles will capture infiltrated water and store as pore-water, which will decrease inputs to groundwater and hydraulically connected surface waterbodies, including East Pond and its outlet. Water management will affect surface water quantity through the collection, storage, and recycling of contact water, the diversion of non-contact water, and the use of fresh water from the Keewatin River. At the MacLellan site, contact water will be managed so that no discharge from the TMF is anticipated to occur under average climate conditions.

During operation, changes to water quality at the Gordon site may result from discharge of groundwater pumped from the groundwater interceptor wells to Gordon and West Farley Lakes and discharge of contact water from the collection pond to West Farley Lake. At the MacLellan site, changes to water quality during this phase may result from discharge of mine effluent from the collection pond to Keewatin River and groundwater seepage from the TMF and MRSA to unnamed Keewatin River tributaries draining East Pond and Payne Lake, and to Minton Lake. During decommissioning, active closure, and post-closure at the Gordon Site, the removal of Project infrastructure and reclamation of associated land will decrease runoff while increasing infiltration. Changes to catchment areas within the PDA are anticipated to remain and surface water runoff will be directed to the open pit. Groundwater interceptor wells will continue to operate

throughout this phase until the open pit is filled. Changes to surface water are anticipated before and after the pit is filled and may result in changes to surface water quantity and/or flow in hydraulically connected water bodies. Closure of water management facilities will result in the removal of contact water collection systems and result in changes to surface water drainage patterns. The Gordon Lake – Farley Lake diversion channel will remain in place past closure. Original drainage paths will be restored to the extent possible.

During decommissioning, active closure, and post-closure at the MacLellan Site, surface water quantity and/or flow will be affected by the removal of Project infrastructure, rehabilitation and reclamation of infrastructure land, re-establishment of drainage patterns to the extent feasible, and the filling of the open pit. Removal of Project infrastructure and reclamation of land will decrease runoff while increasing infiltration and evapotranspiration. Once mining is completed and dewatering is terminated, the open pit will begin to fill from groundwater inflow, direct precipitation, surface water runoff, and water from the TMF. This will affect groundwater levels and gradients, which will result in positive changes to natural surface water quantity and/or flow in adject surface water features, possibly including the Keewatin River, East Pond, and the East Pond outlet.

During the decommissioning, reclamation, and closure phase, water quality changes may result at the Gordon site from discharge of groundwater pumped from the groundwater interceptor wells, and from overflow from the open pit. At the MacLellan site, changes in water quality may result from the overflow from the open pit to the unnamed Keewatin River tributary (KEE3-B1).

5.7.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on surface water quantity and flow:

- Limiting construction footprint and disturbed areas (i.e., PDA) to the extent practicable.
- Grading perimeter and access roads of open pits to divert runoff away from the open pits to reduce contact water.
- Maintaining access roads by periodically regrading and ditching to improve water flow.
- Maintaining existing drainage patterns with the use of culverts. Inspection of culverts periodically to remove accumulated material and debris to avoid erosion, flooding, habitat damage, property damage, and mobilization of sediment.
- Collecting runoff and groundwater seepage from underground/open pit dewatering, overburden and ore stockpiles, TMF and MRSAs.
- Designing for collection, storage, and reuse of contact water (runoff and seepage), only discharging excess water after reuse and treatment, as necessary.

- Balancing timing of recycling from sources to relieve storage pressures on contact water collection ponds.
- Constructing and using perimeter runoff and contact water collection ditches to collect overland flow and toe seepage, intercept shallow groundwater flow, and divert non-contact water away from the Project components.
- Installing groundwater interceptor wells between the open pit and Gordon and Farley lakes to mitigate groundwater inflow to the pit (thereby reducing volume of contact water) and to reduce the potential dewatering of Gordon and Farley lakes.
- Pumping excess water to collection ponds as needed.
- Designing contact water collection ditches to convey the 1:25-year storm event and with positive gradients to limit standing water and maintain positive flow.
- Designing contact-water collection ponds with active water storage that considers ice thickness during winter.
- Configuring pond inlet and outlet structures to reduce inlet velocity and scour and meet sedimentation requirements.
- Designing and operating the TMF with no discharge to the environment during operation through reclaiming and recycling surplus water from the TMF to meet mill demand during operation.
- Refilling open pit at closure to return groundwater levels to baseline conditions.
- Implementing Project-specific environmental management and monitoring programs including a Surface Water Monitoring and Management Plan, Groundwater Monitoring Plan, Erosion and Sediment Control Plan, Beaver Dam and Beaver Activity Management Plan, and development of Emergency Response and Spill Prevention and Contingency Plans for implementation in the event of an accident or malfunction.

Additional mitigation measures to avoid or reduce potential effects to surface water quality, beyond those already described to avoid or reduce potential effects on surface water quantity, at the Gordon site are:

- Design of water management facilities to collect and treat (as required) contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Transporting domestic waste to the sewage treatment plant at the MacLellan site.
- Aerating Wendy and East pits to encourage precipitation of elements that form oxides (e.g., iron oxide) and to break down thermal stratification prior to dewatering.

- Aerating groundwater from groundwater interceptor wells to encourage precipitation of elements that form oxides (e.g., iron oxide) and to increase dissolved oxygen concentrations prior to discharge to Gordon and Farley lakes.
- Dust suppression measures for exposed ground areas of the PDA, to reduce atmospheric deposition to surface water.
- Sediment and erosion control measures during construction to limit the release of TSS and turbidity.
- Expediting the re-filling of open pits during closure to reduce exposure of pit walls.
- Treating and handling of building material that is used in water to avoid the release or leaching of substances that would reduce water quality.

Additional mitigation measures to avoid or reduce potential effects on surface water quality, beyond those already described to avoid or reduce potential effects on surface water quantity, at the MacLellan site are:

- Design of water management facilities to collect and treat (as required) surplus contact water such that effluent meets applicable federal and provincial regulatory requirements, including the authorized limits of deleterious substances specified in Schedule 4 of the MDMER (amended), prior to discharge to the environment.
- Designing the TMF with two cells to allow progressive development during operation to reduce fresh-water requirements.
- Operating the TMF as a non-discharging facility during operation through decommissioning and reclamation.
- Recycling water between the TMF and the processing facility to the maximum extent possible during operation to reduce fresh-water make-up requirements.
- Implementing passive treatment options (e.g., controlled pit stratification, fertilizer amendment, flow segregation) in the open pit should monitoring show that pit water quality is not suitable for release to the environment during the approximately 20 years anticipated to fill the open pit with contact water at the conclusion of mine operation.
- Using a closed circuit for cyanide use and cyanide destruction in the processing plant (via Air/SO_2 oxidation and precipitation of metals) prior to release to the TMF.
- Constructing groundwater cut-off ditches to reduce groundwater seepage from the TMF reaching Minton Lake.
- Treating domestic waste in an average 60,000 L/day sewage treatment plant so that it meets “Wastewater Systems Effluent Regulations” under the *Fisheries Act* prior to discharge to the Keewatin River via a pipeline and diffuser.

5.7.2.3 Residual Effects

Surface Water Quantity

At the Gordon site, the mean annual flows at inlets to Gordon Lake and Farley Lake are predicted to decrease by 29% and 27%, respectively, due to changes in catchment areas and runoff due to the Project infrastructure. These changes persist throughout future mine phases into post-closure.

Similarly, at the MacLellan site, discharge in the unnamed Keewatin River tributary KEE3-B1 (QM04) is predicted to result in a decrease in mean annual flow of 64% ; this change in flow is persistent through the operation and early years of the decommissioning, reclamation, and active closure phases of the Project.

During construction at the Gordon Site, the mean annual flow at the outlet of Gordon Lake (QF03) is predicted to increase by 7% and is primarily due to the addition of pumped flows from the interceptor wells. Farley Creek (QF05) is anticipated to experience an increase in mean annual flows of 66% due to the addition of dewatering flows from the pits. Conditions downstream of Farley Lake are anticipated to experience similar monthly patterns, but reduced or attenuated effects due to the larger waterbodies with higher flows. During operation, mean annual flow in Farley Creek is anticipated to increase 43%, with similar reduced/attenuated flows downstream of the PDA. During decommissioning and active closure, mean annual flow is anticipated to decrease by 6% and during post-closure by 8%.

During construction at the MacLellan site, mean annual flow at the outlet of Minton Lake (QM07) is predicted to decrease by 19% from the baseline conditions. This change in streamflow at the Minton Lake outlet is generally persistent through subsequent phases of the Project. The change is primarily related to in the loss of catchment area and subsequent runoff due to the Project infrastructure. During closure at the MacLellan site, a decrease in mean annual discharge of 56% is predicted for KEE3-B1 increasing from 0.035 m^3/s to 0.070 m^3/s (99% increase) once the open pit is filled. Once the open pit is filled, the increased catchment area of KEE3-B1 will cause the long-term increase in streamflow. Routing the outflow from the pit lake was done to address concerns expressed by Fisheries and Oceans Canada.

Ice regime at the Gordon Site is likely to be affected within (and downstream of) Farley Lake due to the additional flows from the dewatering of the pits and the interceptor wells during the construction phase. These additional flows are anticipated to have temperatures that vary from the historical baseline surface water temperatures. Change in ice regime at the MacLellan site is expected to be limited in extent to small streams.

Surface Water Quality

Water quality of each potential source of discharge to the receiving environment at both the Gordon and MacLellan sites is predicted to be below the short-term applicable water quality guidelines and below Schedule 4 effluent limits of the MDMER for the Expected Case and Upper Case scenarios (with the exception of ammonia exceeding the upper case at the MacLellan site). At the Gordon site, fluoride and phosphorus were identified as POPCs because concentrations are predicted to exceed modelled baseline by more than 20% and applicable long-term water quality guidelines in modelled waterbodies. The maximum fluoride concentrations in the Gordon site LAA are expected to be 0.19 mg/L in West Farley Lake

during the construction phase, which is approximately 1.6 times the long-term applicable guidelines and 2.5 times Expected Baseline fluoride concentration. The maximum phosphorus concentrations in the Gordon site LAA are expected to be 0.027 mg/L in West Farley Lake for a single month during construction, which is approximately 1.1 times higher than the long-term applicable guideline and 1.2 times higher than the Expected Baseline phosphorus concentration. For the Gordon site, Project residual effects associated with the identification POPCs are predicted to be limited to the LAA and in West Farley Lake (phosphorus) and Gordon Lake, West Farley Lake, East Farley Lake, and Swede Lake (fluoride).

At the MacLellan site, total aluminum, arsenic, cadmium, copper, dissolved cadmium, and fluoride were identified as POPCs. All POPCs occur in the post-closure phase and maximum concentrations associated with the identification of these POPCs consistently occur at assessment node KEE3-B1 (i.e., the unnamed tributary to Keewatin River that will directly receive overflow from the flooded pit). For the MacLellan site, the maximum:

- Total aluminum concentrations are expected to be 0.20 mg/L which is approximately two times the long-term applicable guidelines and 29 times modelled expected baseline.
- Total arsenic concentrations are expected to be 0.203 mg/L which is approximately 4.5 times the long-term applicable guidelines and 21 times modelled expected baseline.
- Total copper concentrations are expected to be 0.0059 mg/L, approximately 1.5 times higher than the long-term applicable guideline and 17 times the modelled expected baseline.
- Total and dissolved cadmium concentrations are expected to be 0.0025 mg/L, approximately 8 times higher than the long-term applicable guideline (total cadmium) and 6 times the applicable guideline (dissolved) and over 490 times the modelled upper baseline.
- Total fluoride concentrations are expected to be 0.21 mg/L, approximately 1.7 times higher than the long-term applicable guideline and 4.7 times the modelled expected baseline.

Significance of Residual Effects

The Project will result in changes to surface water quantity within the Gordon site and MacLellan site LAAs. Project-induced changes to surface water quantity have the potential to cause adverse effects to fish through changes in fish habitat. The Project will result in changes to surface water quality within the Gordon site and MacLellan site LAAs. Project-induced changes to surface water quality have the potential to cause adverse effects to fish and other aquatic biota exposed to elevated concentrations of the identified POPCs.

With mitigation and environmental protection measures, the residual environmental effects on surface water quantity and quality are predicted to be not significant and the predicted changes are not expected to result in community (i.e., species composition and relative abundance) or population-level effects (i.e., survival,

growth, or reproduction) to fish and aquatic life. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.8 FISH AND FISH HABITAT

5.8.1 Existing Environment

Most of the lakes near the Gordon and MacLellan sites are shallow (less than 4 m deep) and do not stratify during the summer. Background surface water quality generally reflects geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions, soft, and neutral to slightly acidic in pH. Some parameters (e.g., dissolved oxygen, pH, total phosphorus, aluminum, chromium, and iron) are naturally elevated and occasionally do not meet water quality guidelines. Common large-bodied species include northern pike, walleye, lake whitefish (*Coregonus clupeaformis*), white sucker (*Catastomus commersoni*), yellow perch (*Perca flavescens*), and burbot (*Lota lota*). Common small-bodied fish species include emerald shiner (*Notropis atherinoides*), spottail shiner (*Notropis hudsonius*), brook stickleback and slimy sculpin (*Cottus cognatus*). Northern pike, walleye and lake whitefish are the most commonly angled fish in the area. One aquatic species at risk, the western Hudson Bay populations of lake sturgeon (*Acipenser fulvescens*), is present in the Hughes River, and is reported to be present in the Keewatin River. No other species at risk are expected within the LAA. Lake sturgeon is classified as “endangered” by the Committee on the Status of Endangered Wildlife in Canada.

Lakes at the Gordon site are generally shallow, with an average depth of <5 m. Emergent, floating, and submergent vegetation is present and is typically the most abundant cover source for fish in these lakes. Most lakes within the LAA at the Gordon site provide spawning, rearing, and overwintering habitat for large-bodied and small-bodied fish species. Streams at the Gordon site are generally small (1.6 m to 5.2 m wide) with low gradients (<1%) and substrates dominated by fines and organic material. Cover types include aquatic and overhanging vegetation, debris, and boulders.

Lakes at the MacLellan site are generally shallow (average depths <3 m) except for East Pond, macrophytes are abundant in all lakes within the LAA at the MacLellan site and were the dominant or co-dominant cover type in the littoral zone of most lakes. Most of the lakes within the LAA at the MacLellan site provide spawning, rearing, and overwintering habitat for large-bodied and small-bodied fish species. Except for the Keewatin and Cockeram rivers, streams at the MacLellan site are generally small (<5 m wide and <1 m deep) with low gradients (<1%), fine silt and organic substrates, and numerous beaver dams. Cover types include aquatic and overhanging vegetation, debris, and boulders.

A total of 17 fish species are known to occur in the lakes and streams near the Project. Small-bodied fish species are most prevalent in streams and small, shallow lakes including: brook stickleback, ninespine stickleback (*Pungitius pungitius*), log perch (*Percina caprodes*), trout perch (*Percopsis omiscomaycus*), emerald shiner, spottail shiner, longnose dace (*Rhinichthys cataractae*), lake chub (*Couesius plumbeus*), and slimy sculpin. Large-bodied fish species are more prevalent in larger, deeper lake and include northern pike, walleye, yellow perch, lake whitefish, burbot, cisco (*Coregonus artedi*), white sucker, and longnose sucker (*Catostomus catostomus*). Larger lakes, such as Cockeram Lake, typically support a greater diversity of fish and fish habitat than smaller lakes in the Project area. Northern pike are the most

widespread large-bodied species in the lakes of the Project area, while brook stickleback are the most widespread small-bodied species in the lakes and streams. Northern pike, brook stickleback, and white sucker were the most widely distributed fish species in lakes at the Gordon site. Northern pike and brook stickleback were the most widely distributed fish species in the lakes at the MacLellan site. Measured levels of metals in fish tissue were generally low and below guideline concentrations for protection of aquatic life and human consumption. Sediments at the sample sites in the LAA at both the Gordon site and MacLellan site were comprised largely of silt and clay with metal concentrations generally below guidelines. Some exceedances were observed at Marnie Lake, Farley Lake/Creek and Susan Lake. Several sediment quality guideline exceedances were observed at the sample sites at the MacLellan site, indicating that the former ETMA, located immediately east of the Town of Lynn Lake and adjacent to the Lynn River and Eldon Lake, has resulted in elevated metal concentrations in the sediments of lakes and streams downstream from historic mining activities.

5.8.2 Environmental Effects

5.8.2.1 Change to the Environment

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

- change in fish habitat
- change in fish health, growth, or survival.

Gordon Site

In the Gordon site LAA, during the construction phase, effects on fish and fish habitat include alteration of surface flows from changes to watershed boundaries and from dewatering, and changes in physical habitat due to Project infrastructure (i.e., diversion channel realignment between Gordon and Farley lakes). During the operation phase, changes in fish habitat will result from changes to groundwater, water withdrawals and discharges. During decommissioning/closure, changes to fish habitat will result from alterations in surface flows when groundwater fills the open pits, and changes in habitat area.

At the Gordon site, changes to fish health, growth, and survival will result from releases of sediment, from dewatering of the East Pit and Wendy Pit during the construction phase, from discharge of groundwater pumped from the groundwater interceptor wells, from discharge of contact water during the construction and operation phase, and from overflow from the open pit to Farley Lake during the post-closure phase.

MacLellan Site

During the construction phase, changes in fish and fish habitat will result from alteration of surface water flows from changes to watershed boundaries through project infrastructure such as the sumps, ponds, and drainage ditches. Changes to physical habitat will also occur in the MacLellan site LAA due to new road crossing infrastructure and the new intake structure in the Keewatin River. During the operation phase,

changes to fish and fish habitat will result from alterations in surface flows from changes in the groundwater table with the presence of the open pits and from the operation of project infrastructure such as drainage ditches, sumps, and water withdrawals. These alterations are expected to impact hydraulically connected waterbodies (i.e., East Pond and the East Pond outlet, located south of the open pit at the MacLellan site, and the Keewatin River). During the decommissioning/closure phase, fish and fish habitat changes will result from alteration of surface flows as groundwater fills the open pit, affecting the water table and releasing water to the Keewatin River via a new trench.

At the MacLellan site, changes to fish health, growth and survival will result from the release of sediment, from dewatering of the existing underground mine workings during the construction phase, and from discharge of contact water during construction and operation. Additional effects on fish health, growth and survival will result from the discharge of effluent from the wastewater treatment plant, from seepage of the TMF during operation, closure, and post-closure, and from overflow from the open pit to the Keewatin River tributary at the end of the decommissioning/closure phase.

5.8.2.2 Mitigation Measures

Most of the mitigation measures to reduce Project-related effects on fish habitat are related to avoidance measures and to the mitigation measures proposed to reduce Project-related effects on surface water quantity (Section 5.7.2.2).

Additional mitigation measures relating to availability of habitat area, common to both sites are:

- Sizing new culverts to convey the 1:100-year flood and using open-bottom structures where practical to maintain fish habitat values and fish passage.
- New road crossings will be sized and installed following Manitoba Infrastructure guidelines (DFO and MNR 1996).
- Designing open pit outlets so they are impassable to fish, to discourage fish from colonizing open pits in post-closure.
- Offsetting unavoidable habitat losses in accordance with the Fish Habitat Offsetting Plan.

Mitigation measures to avoid or reduce Project-related changes in fish habitat, including those potentially due to changes in groundwater and surface flows, at the Gordon site are:

- Constructing a new diversion channel to convey surface run-off from Gordon Lake to Farley Lake.
- Trucking potable water to the Gordon Mine site from the MacLellan Mine site to limit the fresh-water withdrawal requirements at the Gordon Mine site to those needed for fire suppression, safety showers, and truck washes.
- Constructing and operating groundwater interceptor wells on either side of the open pit to capture and return groundwater and surface water to Gordon and Farley Lakes that would otherwise flow into the open pit.

- Directing contact water from the collection ditches around the MRSA, overburden stockpile, and mine infrastructure to the open pit during closure to reduce the filling period.
- Continuing to operate the groundwater interceptor wells during closure while the open pit fills with water and progressively reducing their pumping rates until the water level in the open pit reaches the elevation of the surrounding groundwater table.

Mitigation measures to avoid or reduce the Project-related changes in fish habitat, including those potentially due to changes in groundwater and surface flows, at the MacLellan site are:

- Restricting water withdrawal rates from the Keewatin River to <10% of instantaneous discharge at all times.
- Collecting and conveying non-contact water to the collection pond for discharge to the Keewatin River during operation.
- Designing the TMF with two cells to allow progressive development during operation to reduce water management requirements.
- Recycling water between the processing facility and the TMF to reduce fresh-water requirements from the Keewatin River during operation.
- Implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Directing water from the TMF and MRSA to the open pit during closure to reduce the filling period.

Additional mitigation measures to reduce potential effects of the Project to fish habitat, including standard mitigation measures identified in DFO's "Measures to Protect Fish and Fish Habitat" (DFO 2019), are:

- Limit disturbance areas around waterbodies to maintain existing riparian vegetation and promote recovery of riparian vegetation by marking buffer zones around sensitive habitats and work areas; using existing access routes; reducing soil compaction by using weight-distributing materials under machinery.
- Maintain fish passage by avoiding obstructing watercourses or otherwise interfering with fish movement.

Most of the mitigation measures to reduce Project-related effects on fish health, growth, or survival are the same as those proposed to reduce Project-related effects on surface water quality (Section 5.7.2.2)

Mitigation measures to reduce potential effects of changes in surface water quality on fish health, growth, or survival at both sites are:

- Grading perimeter and access roads to divert runoff away from the open pits and fish-bearing waterbodies.

- Maintaining access roads by periodically regrading and ditching to improve water flow and reduce erosion.
- Using dust suppression measures (Section 5.4.2.2) for exposed ground areas within the PDA during dry periods as necessary to reduce dust deposition to surface waters.
- Constructing non-contact water ditches upslope of overburden stockpiles, MRSAs, ore stockpiles, mine infrastructure and the TMF to reduce contact water volumes.
- Constructing contact water collection ditches around the MRSAs, overburden stockpiles, and ore stockpiles to convey the 1:25-year storm event to collection ponds.
- Constructing contact water collection ponds to contain (without discharge) run-off from a 1:100-year storm event with active storage that considers maximum ice thickness in winter.
- Designing collection pond inlets and outlets to reduce water velocities, scour (erosion of sediment) and pond stratification potential (chemical or thermal).
- Maintaining culverts in access road crossings to remove accumulated material and debris to reduce erosion, flooding, and sediment mobilization.
- Implementing sediment and erosion control measures during construction to limit the release of total suspended solid (TSS) and turbidity in lakes and streams.
- Implementing Project-specific environmental management and monitoring programs including:
  - Surface Water Monitoring and Management Plan.
  - Groundwater Monitoring Plan.
  - Explosives Management Plan.
  - Erosion and Sediment Control Plan.
  - Wildlife Monitoring and Management Plan.
  - Emergency Response and Spill Prevention and Contingency Plans, which will include the measures listed in Measures to Protect Fish and Fish Habitat (DFO 2019).
- Implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Filling the open pits at closure with contact water to reduce the duration of pit wall exposure and to return groundwater levels to baseline conditions.

Mitigation measures to reduce potential effects of changes in surface water quality on fish health, growth, or survival that are specific to the Gordon site are:

- Constructing a new diversion channel prior to the decommissioning of the existing diversion channel between Gordon and Farley lakes to maintain water levels.
- Aerating Wendy and East pits to encourage precipitation of elements that form oxides (e.g., iron oxide), to break down of thermal and chemical stratification, and to increase dissolved oxygen concentrations prior to dewatering.
- Installing and operating groundwater interceptor wells between the open pit and Gordon Lake and Farley Lake to maintain water levels in Gordon and Farley lakes.
- Aerating groundwater from the interceptor wells in collection ponds to encourage iron precipitation and increase dissolved oxygen concentrations prior to discharge to Gordon Lake and Farley Lake.
- Transporting domestic waste to the sewage treatment plant at the MacLellan site.

Mitigation measures to reduce potential effects of changes in surface water quality on fish health, growth, or survival that are specific to the MacLellan site are:

- Constructing contact water collection ditches around the TMF to convey the 1:25-year storm event to the collection pond.
- Pumping water from the existing underground works to the TMF for storage and eventual use in the processing facility.
- Designing the TMF with two cells to allow progressive development during operation to reduce water management requirements.
- Operating the TMF as a non-discharging facility during operation through reclaiming TMF water for use in the ore processing mill.
- Recycling water between the TMF and the mill to the maximum extent possible during operation to reduce fresh-water make-up requirements.
- Using a closed circuit for cyanide use and cyanide destruction in the processing plant (via Air/SO_2 oxidation and precipitation of metals) prior to release to the TMF.
- Constructing groundwater cut-off ditches to reduce the volume of groundwater seepage from the TMF entering Minton Lake during post-closure.
- Treating domestic waste in an average 60,000 L/day sewage treatment plant so that it meets “Wastewater Systems Effluent Regulations” under the *Fisheries Act* prior to discharge to the Keewatin River via a pipeline and diffuser.
- Implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.

- Implementing passive treatment options (e.g., controlled pit stratification, amendment, flow segregation) in the open pit if required, should monitoring show that pit water quality is not suitable for release to the environment during the timeframe anticipated to fill the open pit with water at the conclusion of operation.

Additional mitigation measures to reduce potential effects of the Project to the health, growth, or survival of fish and aquatic biota are:

- Requiring heavy machinery working near water to be kept in good working condition, to be re-fueled no closure than 50 m from any waterbody or watercourse, and to be filled with biodegradable hydraulic fluids.
- Identifying and flagging riparian zones within which heavy machinery is prohibited from entering.
- Limiting in-water works to outside of the northern Manitoba Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat (DFO 2020b) as practical.
- Isolating in-water work areas and conducting fish rescues, including East Pond at the MacLellan site, Wendy and East pits at the Gordon site, the Diversion Channel at the Gordon site, and other locations where instream construction will be required.
- Implementing runoff, erosion, and sediment control measures to reduce the amount of water available to become sediment laden, the amount of sediment that is mobilized through erosion, and the amount of sediment that is conveyed to waterbodies. Additional details will be available in the Erosion and Sediment Control Plan. The final plan will include the measures listed in the Measures to Protect Fish and Fish Habitat (DFO 2019).
- Monitoring the effectiveness of construction management plan mitigation measures during construction activities near water, including total suspended solids and/or turbidity and comparing measured valued to MWQSOG (MWS 2011) and CCME guidelines (CCME 2002).
- Using a heat exchanger, where required, to heat or cool water from Wendy Pit and East Pit prior to discharge to Farley Lake during construction and water from the groundwater interceptor wells prior to discharge to Gordon and Farley lakes to maintain the temperature regime in both lakes so as not to negatively affect primary and secondary production rates and alter important behavioral cues for fish (i.e., spawning and overwintering cues).
- Installing screens on the water intakes that are sized using DFO's "Interim Code of Practice: End of Pipe Fish Protection Screens for Small Water Intakes in Freshwater" (DFO 2020a). The screens will be sized based on the weakest swimming fish species in the Keewatin River (burbot, an anguilliform swimming species) and Farley Lake (white sucker and yellow perch, two subcarangiform swimming fish species).
- Restricting water withdrawal rates to <10% of the instantaneous discharge of the Keewatin River at all times.

- Limiting the size, timing, and setback distances of blasting charges to avoid percussive injuries to fish or damage to incubating eggs. Blasting protocols tailored to the Gordon and MacLellan sites and their fish species assemblages will be developed during Project permitting, using guidance outlined in the "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky 1998).

- Establishing and enforcing a worker code-of-conduct for employees brought into work at the LLGP that would limit potential over-fishing of lakes, stream, and rivers in the Project area (e.g., restricting fishing in lakes of streams of a specific size, those used by local Indigenous communities for subsistence or traditional purposes, or determined to contain already depressed populations by Manitoba Conservation and Climate).

5.8.2.3 Residual Effects

The main adverse residual environmental effect on fish habitat is direct losses of fish habitat and changes to water quality affecting fish health and survival. For effects to fish habitat, with the development of the Fish Habitat Offsetting Plan, no net loss to habitat is expected. The re-alignment of the existing diversion channel at the Gordon site will result in the harmful alteration, disruption, or destruction of fish habitat. Alamos will include a new habitat enhanced diversion channel as part of its application for a paragraph 35(2)(b) *Fisheries Act* Authorization from DFO. Dewatering of East and Wendy pits at the Gordon site may result in a harmful alteration, disruption, or destruction of fish habitat due to the presence of fish. However, the pits are artificial habitats and the fish are isolated from other populations. Alamos will continue to discuss the pits with DFO and will include offsetting for the pits in its application for a paragraph 35(2)(b) *Fisheries Act* Authorization, if required.

For effects to fish health and survival, modelling was used to predict water quality at various nodes in lakes and streams at the Gordon site and MacLellan site and are summarized below.

For the Gordon site, two parameters of potential concerns (POPCs) were predicted for the "expected case", fluoride and phosphorus. Water quality modelling results indicated that the short-term (three month) increase in total phosphorus concentrations during construction and two-fold increase in inorganic nitrogen during operation would not be expected to result in eutrophication of West Farley Lake. For fluoride, the maximum predicted concentrations at the Gordon site were more than 2.5 times lower than the proposed toxicity benchmark of 0.5 mg/L for fish and aquatic biota; therefore, adverse effects on fish health, growth, or survival are not expected.

For the MacLellan site, the following POPCs were identified for the "expected case": total aluminum, total arsenic, total and dissolved cadmium, total copper, and total fluoride. Using site-specific baseline data for dissolved organic carbon, hardness, and pH from the small Keewatin River tributary (KEE3-B1), the maximum predicted concentrations of total aluminum were found to be approximately five times lower than the US EPA (2018) total aluminum long-term guideline. Total arsenic concentrations were predicted to be higher than applicable guidelines in two months during post closure; otherwise concentrations are predicted to be well below guidelines levels (<0.02 mg/L). For cadmium, water quality modelling results indicated that predicted total and dissolved cadmium guideline exceedances were predicted to occur during post-closure,

allowing Alamos to monitor water quality in the open pit as it fills with water and to amend water quality in the open pit, if necessary, prior to its discharge to the small Keewatin River tributary. For copper, water quality modelling results indicated that while total copper concentrations are predicted to exceed the long-term total copper CEQG during post-closure, the occurrences are rare, the magnitude of exceedance is low, and the CEQG is likely over-conservative based on the relationship between copper toxicity and water hardness. For fluoride, water quality modelling results indicated that the maximum predicted fluoride concentration in the small Keewatin River tributary is 0.21 mg/L, which is below this fluoride toxicity benchmark.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on fish and fish habitat are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.9 VEGETATION AND WETLANDS

5.9.1 Existing Environment

The RAA is located within the Boreal Shield Ecozone, Churchill River Upland Ecoregion, Reindeer Lake Ecodistrict, which is dominated by black spruce dominated uplands and permafrost and non-permafrost wooded bogs and patterned fens (Smith et al. 1998). Almost half of the LAA is upland (6,992 ha, 46%), much of the other half is wetland (6,452 ha, 42%), with the remaining areas classified as water (1,353 ha, 9%) and anthropogenic (484 ha, 3%). Conifer-dominated forests are the most common forest type occurring throughout the LAA and RAA, with most being dense, followed by open and sparse. Mixedwood forests were also present in the LAA and RAA but were much less common. Wildfires have occurred within the RAA and are a natural disturbance on the landscape that result in a mosaic of various successional stages within habitat patches.

Field surveys documented 200 plant species within the Project area. A total of 19 species of conservation concern (SOCC) have been documented in the Churchill River Upland Ecoregion; however, no federally protected plant species listed under Species at Risk Act grow in the habitat types found in the RAA. Occurrences of provincially ranked SOCC were recorded in the RAA including Lake Quillwort (*Isoetes lacustris*), small water-lily (*Nymphaea tetragona*), Northern woodsia (Woodsia alpine), Shrubby willow (*Salix arbusculoides*), and Boreal locoweed (*Oxytropis borealis*); however, no SOCC were found to occur within the PDA.

All the species of interest to Indigenous communities were recorded in the RAA and are common species in Manitoba with the exception of small water lily and shrubby willow. Commonly occurring species (average >20% cover) include various species of birch, jack pine, moss, and spruce. Less commonly occurring species observed include Mooseberry (*Viburnum edule*), Red raspberry (*Rubus idaeus*), and Wild strawberry (*Fragaria virginiana*) (1 observation each).

5.9.2 Environmental Effects

5.9.2.1 Change to the Environment

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

- change in landscape diversity
- change in plant community diversity
- change in plant species diversity
- change in wetland function.

During construction, changes to vegetation and wetlands will occur during site preparation, water development and control, and through emissions, discharges and wastes at both sites. During operation, effects to vegetation and wetlands are not anticipated, except from water management and emissions, discharges and wastes at both sites since no additional clearing is anticipated in this phase. Decommissioning of the mine sites will occur within existing disturbance and will not result in greater fragmentation, and thus not negatively interact with vegetation and wetlands. Reclamation at both sites may positively effect landscape, community and species diversity and wetland functions by reclaiming to native upland or native wetland state in some areas.

5.9.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on vegetation and wetlands at both sites:

- Native areas disturbed by the Project will be covered and reseeded using a native upland seed mix for rehabilitation and to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity at closure.
- Equipment will arrive at Project site clean and free of soil and vegetative debris. Equipment will be inspected and if deemed to be in appropriate condition, will be approved for use and identified with a suitable marker or tag. 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.
- Sensitive areas, such as wetlands, will be buffered by 30 m and clearly marked prior to clearing.
- Silt fencing will be installed and maintained to reduce deleterious substances from entering adjacent to wetlands or waterbodies.
- Vegetation clearing will occur during dry and frozen conditions, when possible.

- A protective layer 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.
- A native seed mix will be used to assist in reducing invasive plant species spread and establishment as well as for erosion control on exposed soils.
- Topsoil and subsoil piles will be monitored for invasive plant species growth during construction and corrective measures (e.g., spraying, mowing, hand-pulling) will be implemented to avoid growth and establishment.
- Certified No.1 seed will be used to reseed areas, unless Certified No. 1 seed is not available for selected reclamation species (i.e., native species).
- Unless a certificate of weed analysis can be provided, construction material sources used for supplies of sand, gravel, rock, straw, and mulch will be visually inspected to determine whether they are free of invasive species propagules to the extent possible. If sources are suspected as having invasive species propagules, they should be sampled, and lab analyzed to determine whether they meet the requirements of the responsible regulatory agency prior to obtaining or transporting material to the Project site. If sampling cannot be completed, post construction monitoring for invasive species will be completed.
- If pesticide is required, a pesticide use permit will be obtained under *The Environment Act* (Manitoba).
- Known occurrences of SOCC will be avoided. If avoidance of plant SOCC is not possible, seed collection or transplant of the plant will be considered.
- Broad-spraying herbicide within 30 m of plant species or ecological communities of conservation concern, wetlands or waterbodies will not be conducted. Spot spraying, wicking, mowing, or hand picking are acceptable measures for control of regulated weeds in these areas.
- Dust suppression, as described in Section 5.4.2.2 will be applied.
- Sediment fencing and/or other appropriate measures will be used to prevent erosion and siltation into adjacent wetlands.
- Grading will be directed away from wetlands, where possible.
- The removal of vegetation in wetlands will be reduced to the extent possible.
- Ground level cutting/mowing/mulching of wetland vegetation instead of grubbing, will be conducted where possible.
- Grading within wetland boundaries will be reduced unless required for site specific purposes.
- 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.

- Frost packing, snow, ice, geotextile swamp mats or access mat will be used for access through wet areas.

5.9.2.3 Residual Effects

For residual effects on landscape diversity, it was determined that construction of the Gordon site will result in an expansion of the existing developed area, with no new habitat patches anticipated to be created in or around this site, resulting in a temporary adverse reduction in habitat patch area. At closure, there is no loss of large intact patches from the LAA. During reclamation, the Project will result in an increase in patch area and a reduction in patch perimeter. At the MacLellan site, it was determined that some vegetation patches will be totally lost during construction and operation; however, with the reclamation of both sites, the result is a low magnitude, positive change in the RAA for the long-term.

For residual effects on community diversity, it was determined that mitigation and reclamation activities will result in an increase in reclaimed native upland of 156.7 ha, an increase in water of 15.5 ha, and a decrease in wetland plant communities of 66.5 ha in the LAA of the Gordon site. In the LAA of the MacLellan site, it was determined that the Project will result in a loss of 370.9 ha of wetland plant communities, and an addition of 576.3 ha of reclaimed upland and 61.8 ha of water. Change in plant community diversity will largely occur once during the construction and operation; however, indirect effects to plant communities from dust deposition will occur continuously, resulting in an overall adverse effects to community diversity during construction that last through operation.

For residual effects on species diversity, construction at the Gordon site is anticipated to directly affect one known plant SOCC occurrence, boreal locoweed (*Oxytropis borealis*). Shrubby willow (*Salix arbusculoides*) may also be indirectly affected by open pit dewatering during construction and operation. Development of the Gordon site is also predicted to adversely affect species of traditional use during construction and operation. At the MacLellan site, construction and operation are not anticipated to directly affect known plant SOCC occurrences; however, SOCC and plants of interest to Indigenous communities may be indirectly adversely affected by drawdown from dewatering of the open pit and dust deposition.

For residual effects on wetland function, construction is expected to result in a direct loss of 660.0 ha of wetland area as a result of clearing activities and a loss of 66.5 ha of wetland function and services at the Gordon site. Direct wetland loss is anticipated to be 370.9 ha at the MacLellan site. Groundwater drawdown during construction and operation at both sites may alter the class, plant species composition and decomposition rates of wetlands. Dewatering may also result in the thawing of permafrost within the LAA of both the Gordon and MacLellan sites, reducing carbon sequestration. The results overall indicate a direct and indirect reduction to wetland functions; however, loss of a type of wetland function is not expected in the RAA.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on vegetation and wetlands are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.10 WILDLIFE AND WILDLIFE HABITAT

5.10.1 Existing Environment

The Project is located in the Boreal Shield Ecozone, Churchill River Upland Ecoregion, and Reindeer Lake Ecodistrict (Smith et al. 1998), which is characterized by coniferous boreal forest and poorly drained peatlands, underlain with glacial deposits and Precambrian bedrock.

Baseline data indicates the Project area is home to American marten, American red squirrel (*Tamiasciurus hudsonicus*), beaver, black bear, Canadian lynx (*Lynx canadensis*), fisher (*Martes pennant)*, grey wolf (*Canis lupus)*, mink (*Neovison vison)*, moose, red fox (*Vulpes Vulpes)*, river otter (*Lontra canadensis)*, snowshoe hare (*Lepus americanus)*, weasel (*Mustela erminea)*, wolverine (*Gulo gulo)*, eastern red bat (*Lasiurus borealis)*, hoary bat (*Lasiurus cinereus)*, little brown myotis (*Myotis lucifugus)*, and various small rodents (e.g., voles).

Results of field studies and background data collection indicate that 33 mammal species potentially occur in the RAA, 20 of which were observed during field studies, including woodland caribou. A total of 101 wildlife species were observed during baseline surveys: 20 mammals, 79 birds, two amphibians. Focal mammalian species include boreal woodland caribou (*Rangifer tarandus caribou)*, moose, gray wolf, black bear, and American marten.

One hundred and ninety-eight bird species have the potential to breed in the Project area (MB BBA 2019): 62 waterbirds, four upland gamebirds, 18 raptors, and 114 songbirds. Common birds observed during baseline studies were mallard (*Anas platyrhynchos)*, ring-necked duck (*Aythya collaris)*, Canada goose (*Branta canadensis)*, common loon (*Gavia immer)*, swamp sparrow (*Melospiza georgiana)*, ruby-crowned kinglet (*Regulus calendula)*, Tennessee warbler (*Oreothlypis peregrina)*, dark-eyed junco (*Junco hyemalis)*, and yellow-rumped warbler (*Setophaga coronate)*.

Two species of amphibian were detected during baseline field surveys and are known to breed within the RAA: wood frog (*Lithobates sylvaticus*) and boreal chorus frog (*Pseudacris maculate)*. The boreal habitats within the RAA support a diverse insect community, including beetles, moths, spiders, mayflies, and dragonflies.

The RAA overlaps the current or historical ranges of 14 species at risk (SAR), including four mammals (little brown myotis, northern myotis (*Myotis septentrionalis*), wolverine, woodland caribou); eight birds (horned grebe (*Podiceps auratus*), yellow rail (*Coturnicops noveboracensis*), short-eared owl (*Asio flammeus*), common nighthawk (*Chordeiles minor)*, olive-sided flycatcher (*Contopus cooperi)*, bank swallow (*Riparia riparia)*, barn swallow (*Hirundo rustica)*, and rusty blackbird (*Euphagus carolinus*)); one amphibian (northern leopard frog (*Lithobates pipiens*)), and one insect (yellow-banded bumble bee (*Bombus terricola*))

(Government of Canada 2019). The RAA also overlaps the current ranges of three SOCC including two birds (trumpeter swan (*Cygnus* buccinator) and evening grosbeak (*Coccothraustes vespertinus*)), and one insect (transverse lady beetle (*Coccinella transversoguttata*)) (Government of Canada 2019). Field observations of SAR and SOCC during project specific baseline studies included little brown myotis, wolverine, common nighthawk, olive-sided flycatcher, barn swallow, and woodland caribou. The Project is located in the Province of Manitoba's woodland caribou Kamuchawie Management Unit, and woodland caribou are reported to typically occur more than 80 km southwest of the RAA (pers. comm. 2015). The Project (MacLellan site) also overlaps the Manitoba North Range (MB9), an area delineated as potentially containing critical habitat for woodland caribou; however, habitat within the RAA contains a relatively high degree of disturbance (i.e., Town of Lynn Lake, MacLellan site, fires within 40 years) and currently provides limited suitable habitat for woodland caribou.

Wildlife habitat in the RAA is a mosaic of terrestrial and wetland habitats intersected by extensive stream and lake systems that is relatively undisturbed. Some wildlife species may be more sensitive to Project-related environmental effects and some species also warrant additional regulatory concern, such as SAR Mortality risk in the RAA is primarily attributable to traffic-related mortality, hunting and trapping activities, and predation while wildlife health in the RAA is related largely to water quality and ambient air quality.

5.10.2 Environmental Effects

5.10.2.1 Change to the Environment

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

- change in wildlife habitat
- change in wildlife mortality risk
- change in wildlife health.

During the construction phase, effects on wildlife and wildlife habitat are related primarily to site preparation activities causing habitat loss, habitat disturbance, sensory disturbance and health effects from emissions, discharges, and wastes, and mortality risks related to vehicle transportation. Construction related emissions, discharges, and wastes are not anticipated to be at levels that would be lethal to wildlife or that would affect wildlife mortality risk.

During the operation and the decommissioning/closure phases, it is anticipated that activities and infrastructure will be located on cleared, disturbed land and that no wildlife will be present, resulting in no additional effects on wildlife habitat. Emissions, discharges, and wastes during these phases is also anticipated to be the primary pathway of effects on wildlife health and wildlife habitat; however, exposures to wildlife are not anticipated to be at levels that would be lethal; therefore, no changes are anticipated to wildlife mortality risk during these phases.

5.10.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on wildlife and wildlife habitat at the Gordon site:

- Design for limitation of construction footprint (i.e., PDA) to the extent possible.
- Design for use of down-lighting, a technique of directing night lighting downward, to reduce light effects on wildlife adjacent to the PDA.
- Design for maintenance of a 30 m naturally vegetated buffer around wetlands, waterbodies, and watercourses.
- Design for restriction of unauthorized access to habitat adjacent to the PDA.
- Design for provision of low areas in the ploughed snowbanks of access and on-site roads, where practical, to facilitate wildlife movements across and out of road corridors.
- Design for scheduling vegetation clearing and site preparation activities outside the breeding period for migratory birds (Zone C7; May 7 to August 7; ECCC 2019). If activities that could result in risk of harm cannot be avoided, Alamos will develop and implement a Project-specific Wildlife Monitoring and Management Plan that outlines how risk of harm will be managed in accordance with ECCC guidance. This plan will be developed in liaison with ECCC and federal agencies.
- Flag environmentally sensitive areas (e.g., seeps and springs, mineral licks, dens, roosts, stick nests, hibernacula) prior to clearing and construction, and evaluation of the features for additional mitigation measures (e.g., setbacks).
- Retain actual or potential habitat trees where safe and technically feasible to do so. If removal is required, removal activities will be scheduled, to the extent practical, outside the core maternity roosting season for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) and breeding season for birds (Zone C7; May 7 to August 7; ECCC 2019). If habitat tree removal or general tree clearing is required during the maternity roosting period, a qualified biologist will review the trees to make a determination on occupancy before removal. This measure will also reduce the risk to other species that use trees for denning or shelter (e.g., American marten).
- Maintain vegetation cover along the boundaries of high activity areas (e.g., access roads) to reduce sensory (noise and visual) disturbance.
- Report the discovery of nests or other animal dwellings (e.g., lodges, dens) to Alamos, and appropriate action or follow-up will be guided by the Wildlife Monitoring and Management Plan. Report to the Wildlife and Fisheries Branch of DARD for direction on follow-up actions in necessary.

Mitigation measures at the MacLellan site are the same as indicated for the Gordon site with the additional mitigation measure specific to the removal of the existing infrastructure at the MacLellan site:

- Demolish existing buildings and infrastructure outside of the nesting window for birds (Zone C7; May 7 to August 7; ECCC 2019) and the maternity roosting period for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) as per the Wildlife Monitoring and Management Plan.

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on wildlife and mortality at the Gordon site:

- Design for scheduling vegetation clearing and site preparation activities outside the breeding period for migratory birds (Zone C7; May 7 to August 7; ECCC 2019). If activities that could result in risk of harm cannot be avoided, Alamos will develop and implement a Project-specific Wildlife Monitoring and Management Plan that outlines how risk of harm will be managed in accordance with ECCC guidance. This plan would be developed in liaison with ECCC.
- Flag environmentally sensitive areas (e.g., amphibian breeding ponds, dens, roosts, stick nests, hibernacula) prior to clearing and construction, and evaluation of the features for additional mitigation measures (e.g., setbacks).
- Report the discovery of nests or other animal dwellings (e.g., lodges, dens) to Alamos, and appropriate action or follow-up will be guided by the Wildlife Monitoring and Management Plan. Report to the Wildlife and Fisheries Branch of DARD for direction on follow-up actions in necessary.
- Retain actual or potential habitat trees where safe and technically feasible to do so. If removal is required, removal activities will be scheduled, to the extent practical, outside the core maternity roosting season for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) and breeding season for birds (Zone C7; May 7 to August 7; ECCC 2019). If habitat tree removal or general tree clearing is required during the maternity roosting period, a qualified biologist will review the trees to make a determination on occupancy before removal. This measure will also reduce the risk to other species that use trees for denning or shelter (e.g., American marten).
- Implement road safety measures such as speed limits and signage to reduce the chance for wildlife collisions both on site and between sites.
- Report wildlife encounters and problem wildlife concerns or sightings to Alamos and appropriate action or follow-up will be guided by the Wildlife Monitoring and Management Plan.
- Follow best management practices for general site housekeeping to reduce wildlife attraction (e.g. food and chemical storage, prompt removal of roadkill).
- Include wildlife awareness training during site orientation to reduce the risk of human-wildlife conflict.
- Control site access by resource users during post-closure.

Mitigation measures at the MacLellan site are the same as indicated for the Gordon site with the following additional mitigation measure specific to the removal of the existing infrastructure at the MacLellan site:

- Demolish existing buildings and infrastructure outside of the nesting window for birds (Zone C7; May 7 to August 7; ECCC 2019) and the maternity roosting period for bats (May 1 to August 31; Fenton and Barclay 1980; Barclay 1982, 1984) as per the Wildlife Monitoring and Management Plan.
- Maintain cyanide concentrations below guidelines. Project activities will be aligned with the standards of practice set out in the International Cyanide Management Code.
- Manage vegetation around collection ponds and the TMF to deter wildlife and consider additional mitigation measures (e.g., fencing, netting, bird/bat deterrents) if monitoring identifies concerns regarding wildlife use of these areas.

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on wildlife health at the Gordon site:

- Project infrastructure and facilities designed to avoid sensitive areas (e.g., watercourses, important habitat types) to the extent possible, within watershed boundaries, and PDA reduced to the extent practical.
- Design and maintenance for control of fugitive dust emissions from roads, material handling, and storage areas/stockpiles and from equipment emissions.
- Design for administrative controls, including a no idling policy to reduce emissions from vehicles and mobile equipment.
- Design for adherence to applicable Transport Canada emission requirements for new mobile equipment on site.
- Design for use of perimeter berms and runoff and contact-water collection ditches.
- Design for fuel storage in approved above ground storage tanks equipped with secondary containment systems in accordance with federal and provincial regulation and standards.
- Design of sewage treatment plant and water management facilities to treat effluent to levels that will meet applicable federal and provincial guidelines of toxicity.
- Dispose and handle waste oils, fuels, and hazardous waste as recommended by the suppliers and/or manufacturers in compliance with federal, provincial, and municipal regulations.
- Bird deterrents, if required, to keep migratory birds from using collection pond during construction and operation and/or the open pit during closure.

MacLellan Site

Mitigation measures at MacLellan site are the same as indicated for Gordon site with the addition of mitigation measures specific to the milling and processing of ore and TMF:

- Design for enclosure of mill feed storage area and use of wet scrubbers (or equivalent).
- Design of water management facilities to collect and treat (as required) surplus contact water and design for cyanide detoxification.
- Manage vegetation around collection ponds and the TMF and consider additional mitigation measures (e.g., fencing, netting, bird/bat deterrents) if monitoring identifies concerns regarding wildlife use of these areas.
- Bird deterrents, if required, to keep migratory birds from using the TMF and contact ponds during construction and operation and/or the open pit during closure.

5.10.2.3 Residual Effects

Wildlife Habitat

Residual effects on wildlife habitat during the construction phase are related to the direct loss or alteration of habitat within the LAA. Species that occupy disturbed and rocky habitats, such as common nighthawk, are most likely to be affected by the alteration of developed land, whereas birds, furbearers and moose are most likely to be affected following the loss of the terrestrial and wetland habitats. An indirect loss or alteration of wildlife habitat is also expected through sensory disturbance, edge effects, and altered wetland function that can result in habitat avoidance and reduced habitat effectiveness for wildlife, including migratory birds, SAR and SOCC, moose, and furbearers, in areas adjacent to the PDA.

During the operation phase, residual effects on wildlife habitat are related to the indirect loss or alteration of wildlife habitat through sensory disturbance resulting in habitat avoidance and reduced habitat effectiveness for wildlife in areas adjacent to the PDA, as described above during the construction phase. Chronic sensory disturbance during mining operation will terminate following completion of operation phase. Increased traffic volumes associated with the Project may increase the existing level of indirect effects to wildlife (i.e., avoidance) along PR 391 and the Gordon site access road, but effects are not expected to extend far beyond the PDA. The effects to wildlife resulting from sensory disturbance are expected to be similar as those described above during the construction phase. Wildlife occupying the LAA are already subject to some degree of altered habitat effectiveness and it is expected that sensory disturbance from the Project will temporarily increase the degree of altered habitat effectiveness causing some wildlife species to potentially avoid the portions of the LAA or relocate to undisturbed areas.

During the decommissioning/closure phase, potential Project-related environmental effects for a change in habitat, both direct and indirect, are largely positive, with the exception of the removal of mine infrastructure which may adversely affect species such as barn swallow that rely on anthropogenic structures for nesting.

With the implementation of the proposed mitigation measures, the overall effect on wildlife habitat is anticipated to be low in the construction and operation phases, resulting in a <10% and <5% change in wildlife habitat and SAR and SOCC habitat in the LAA, respectively.

Wildlife Mortality Risk

Residual effects on wildlife mortality are largely related to site preparation activities during the construction phase, including vegetation clearing and earthworks. During construction, there is potential for increased mortality risk to small mammals and amphibians due to their limited mobility, risks to overwintering amphibians and mammals, as well as increased risk of vehicle-related wildlife mortality.

During operation, effects to wildlife mortality risk are largely related transportation of ore to on-site stockpiles and to the mill at the MacLellan site and other Project-related traffic. Increased mortality risk due to traffic is anticipated to be short-term as the Gordon site will only be operational for six years. An increase in mortality risk is also possible where the trapping of problem beavers at water control structures is required, potential increase in drowning at the TMF at the MacLellan site, potential for bird collisions with towers and guy wires, and human-wildlife conflicts from animals attracted to waste piles at the site (e.g., bears).

During the decommissioning/closure phase of the Project, activities are expected to have similar residual effects as those described above for the construction phase. The closure phase and post-closure activities are expected to have more enduring effects, primarily as it relates to the indirect mortality of wildlife resulting from increased access by predators to the site such as wolves and humans to gain access to prey species. Given that the Project will not result in increased linear features or create new access to sites, residual effects are deemed to be low.

SAR and SOCC are not uniquely susceptible to a change in mortality risk during all project phases in comparison to other species.

Wildlife Health

Residual effects on wildlife health during the construction phase are associated with air emissions (i.e., combustion products, rock dust) from Project activities (e.g., vehicular traffic). With the implementation of the proposed mitigation measures, the residual effect on wildlife health resulting from fugitive dust escaping into the environment is expected to be low. During operation, residual effects on wildlife health are expected to increase with the increase in air emissions produced during operation activities. Air emissions will be continuous through operation and some heavy metals contained in rock dust are known to be persistent in the environment, and potentially toxic to wildlife. With the implementation of mitigation measures (e.g., dust control), the residual effects of operation of the Project on wildlife health at Gordon site is expected to be low. At the MacLellan site, similar effects are anticipated with the addition of the milling and processing of ore during operation and the TMF which may create additional residual effects on wildlife health. These additional effects during the operation phase are associated with water management ponds, chemical contamination of the environment from the TMF, and an increase in air emissions (i.e., rock dust) from the mill and processing plant. Based on results from the ecological risk assessment, the overall residual effect on wildlife health is anticipated to be negligible to low at both sites.

During decommissioning/closure, residual effects on wildlife are expected to be similar as those described above during the construction and operation phase. SAR and SOCC and migratory birds are not uniquely susceptible to a change in wildlife health during the project phases in comparison to other species.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on wildlife and wildlife habitat are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.11 LABOUR AND ECONOMY

5.11.1 Existing Environment

The Town of Lynn Lake and Black Sturgeon Reserve, Manitoba, represent all populated Census Subdivisions within 30-km of the Gordon and MacLellan sites and are included in the LAA. The RAA encompasses other Census Subdivisions within 100 km of the Gordon and MacLellan sites including the Town of Leaf Rapids and the community of Granville Lake. The population of Lynn Lake was recorded to be 490 in 2016 with an Indigenous population of approximately 48% (Statistics Canada 2017a). The town of Leaf Rapids has an estimated population of 580 (Statistics Canada 2017a). The City of Thompson serves as regional hub for approximately 72,000 people (Northern Region of Manitoba). Four First Nations exist within the RAA including the Black Sturgeon Reserve (Marcel Colomb First Nation), the community of Granville Lake (Mathias Colomb Cree Nation), the community of South Indian Lake Indian Settlement (O-Pipon-Na-Piwin Cree Nation) and the community of Kinoosao (Peter Ballantyne Cree Nation).

The economies in the area have historically been based on mining as the primary industry. Currently, the economy within the LAA is heavily reliant on government funding with some fishing and hunting tourism. Businesses in the Town of Lynn Lake include accommodations, grocery, and gas and several small businesses. Public facilities such a school and hospital also exist in the LAA.

Gross domestic product (GDP) in the LAA was estimated to be approximately $26 million in 2016. Labor force was estimated at approximately 175 persons in Lynn Lake in 2016 with an Indigenous labor force of approximately 40%. Employment in Lynn Lake was largely in educational services, healthcare and social assistance, and transportation and warehousing. Within the RAA, employment was found to be greatest in mining, quarrying, and oil and gas extraction, followed by health care and social assistance, and educational services. Employment in the LAA was greatest in education, law and social, community and government service occupations, followed by business, finance and administration occupations, all of which were female dominated. Employment in trades, transport and equipment operations were also prevalent with males accounting for the entirety of this employment occupation. Occupational employment in the RAA was greatest in sales and service, followed by trades, transport and equipment operation and occupations in education, law and social, community and government services. Industry and occupational employment trends were similar in the LAA and RAA when looking at total population and the Indigenous population.

In Lynn Lake, approximately 46.4% of the total population has completed post-secondary education compared to 28.6% of the town's Indigenous population. The median annual income was $31,250 for the Town of Lynn Lake, with the median income of the town's Indigenous population at $25,605. Average hourly wages for positions likely required for the Project in positions such as forestry, oil and gas, mining, technical services, and construction range from approximately $28.33 to $33.92.

5.11.2 Environmental Effects

5.11.2.1 Change to the Environment

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

- change in regional labour force
- change in regional business
- change in regional economy.

Demand for labour and regional expenditures are the primary pathways through which the Project may affect labour and economy. Project demand for labour has the potential to both beneficially and adversely affect local and regional labour forces. Beneficial effects include increases in local employment (direct, indirect, and induced) during all phases. Adverse effects primarily relate to decreased demand for labour as the Project transitions from operation into and through decommissioning/closure, resulting in loss of direct employment. Project spending has potential to both beneficially and adversely affect local and regional businesses. Beneficial effects include increases in business revenue. Potential adverse effects of Project spending on regional businesses primarily relate to increased demand for local labour, goods, and services, which can lead to labour scarcity and increased labour costs. Project spending will result in overall increased economic activity (i.e., GDP) in the LAA and RAA. The Project will also pay property taxes, or provide grants in lieu, to the municipality of Lynn Lake and contribute to provincial and federal government revenues through taxation on labour, goods and services.

5.11.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce adverse Project-related effects and to enhance beneficial effects on labour and economy, to the extent possible:

- Inform residents and Indigenous communities of job and procurement opportunities during all Project phases and implement a policy of local hire where priority is given to the workers from the LAA, followed by other parts of the RAA, other parts of Manitoba, and other parts of Canada.
- Post job qualifications in advance and identify available training programs and providers so that local and Indigenous residents can acquire the necessary skills and qualify for potential Project-related employment.

- Identify potential shortages of workers with specific skill requirements, and work with training and education facilities, Indigenous communities, and local communities to increase opportunities for local community members to obtain training required for Project participation.
- Require workers (not inclusive of summer students) 19 years and younger to have completed grade 12 or have an appropriate equivalency to prevent young people from leaving school prematurely.
- Workforce education to encourage healthy lifestyle choices, sensitivity training and strict enforcement of Alamos' health and safety policies.
- Develop work packages that consider the capacity and capabilities of local and regional businesses and plan for working with local and Indigenous-owned businesses to enhance their potential for successfully bidding on Project contracts regarding the supply of goods and services.
- Post Project purchasing requirements in advance so that local and regional businesses can position themselves to effectively compete to supply goods and services needed for Project construction and operation.
- Design for completion of timber removal in accordance with *The Forest Act* of Manitoba.
- Work with local communities to develop training programs (e.g., contract opportunities) oriented to Project operational needs.

5.11.2.3 Residual Effects

Labor Force

Residual effects on local and regional labor force relates to direct employment. It is estimated that an annual average direct workforce of 406 full-time equivalents (FTE) will be required over the two-year construction period, a 412 FTE workforce over the 13-year operational period, and an annual 90 FTE workforce during decommissioning/closure with 5% of direct Project sourced from the LAA and the remaining 95% of labour demand satisfied using a fly-in/fly-out (FIFO) or drive-in/drive-out (DIDO) workforce recruited from other parts of the RAA and Manitoba. With the implementation of mitigation and management measures, and in consideration of local employment estimates, the Project is expected to result in positive, low magnitude effects on direct employment within the LAA and RAA. The loss of employment at the closure of the Project is a known effect and will be anticipated by Project workers. Mitigating the magnitude of this loss of employment is the gained labour income, skills and experience workers realize while employed with the Project; therefore, the loss of employment following closure of the Project is anticipated to be low. With the implementation of mitigation and management measures, Project residual effects on the local and regional labour force are expected to be positive in direction but low in magnitude during construction and operation.

Businesses

Residual effects on local and regional businesses relates to indirect and induced employment. Alamos estimates that over the life of the Project $493.1 million in capital expenditure and $1.9 billion in operational spending (PwC 2020a, 2020b) will occur within Manitoba. The degree to which local businesses will benefit from Project contracting and supply opportunities, and therefore result in indirect employment, depends on several factors, including their size, capability, and capacity to accommodate Project requirements. It is believed that local businesses in the LAA are likely positioned to respond to small- to medium-sized service and supply contracts and highly likely that a greater percentage of Project expenditures on goods and services will occur within other parts of the RAA. In both cases (LAA and RAA), indirect employment effects are anticipated to be positive in direction but low in magnitude.

Based on induced employment estimates for the Northern Region, residual effects on induced employment were determined to be a 9.0% increase (over baseline conditions) in the number of employed persons within the Lynn Lake area during construction, a 13.5% increase during operation, and a 1.9% increase during decommissioning/closure.

Wages paid to the Project's direct workforce are predicted to show a measurable variance from existing conditions in Lynn Lake; therefore, the Project has the potential to contribute to upward pressure on wages though increased competition for labour within the LAA and RAA. To manage the Project's contribution to upward pressure on wages, Alamos will pay its direct workforce wages that are consistent with Manitoba's mining industry. Combined with the small anticipated size of the Project's local direct workforce, adverse effects on local and regional businesses in terms of upward pressure on wages and associated increased difficultly to recruit or retain workers is expected to be low.

Local and Regional Economies

Residual effects on local and regional economy relates to GDP and municipal taxes. Alamos estimates that direct Project contributions to Provincial GDP will total a net present value (5% discount rate) of $664 million over the life of the Project, comprised of $637 million in direct effects, $6 million in indirect effects and $21 million in induced effects. The Project is expected to have a moderate magnitude positive effect on the GDP of the LAA and RAA. As the Project transitions from operation and into and through decommissioning/ closure Project contributions to the GDP of the LAA and RAA will cease. Property taxes payable by the Project are inherently beneficial to the municipal government of Lynn Lake. The Project is therefore expected to result in a positive residual effect on municipal government revenues.

Significance of Residual Effects

With mitigation and environmental protection measures, the adverse residual environmental effects on labour and economy are predicted to be not significant. Positive effects on labour force, businesses and local and regional economies are also anticipated. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.12 COMMUNITY SERVICES, INFRASTRUCTURE AND WELLBEING

5.12.1 Existing Environment

The existing environment for community services, infrastructure, and wellbeing was characterized by analysis of housing and temporary accommodations (including campgrounds), education, recreation, heath care, social, and emergency services, transportation, utilities, community wellbeing index scores and self-reported health characteristics.

The results indicated that in 2016, the Town of Lynn Lake had 263 private dwellings of which 176 were occupied by usual residents (Statistics Canada, 2017a). Most housing is at least forty years old and in poor condition or unlivable in 2016. In 2016, there were 272 private dwellings in Leaf Rapids, 67% of them occupied by usual residents (Statistics Canada 2017b). The Black Sturgeon Reserve has 14 housing units. Overcrowding is an issue on the Reserve, with an average occupancy of 14 people per unit. Construction on an additional 14 and 8 housing units began in 2018 and 2019, respectively, but has not yet been completed (pers. comm. 2019). Temporary accommodations in the LAA include two hotels in Lynn Lake, and a lodge and bed and breakfast in Leaf Rapids. In the RAA, temporary accommodations include lodges, camps, campgrounds, and 15 hotels, motels, and bed-and-breakfasts with more than 600 rooms in the City of Thompson (City of Thompson 2018; Travel in Manitoba 2020).

In the LAA and RAA, education services are provided through Frontier School Division, Area 1, except for the City of Thompson, with services provided by the Mystery Lake School Division. West Lynn Heights School, in Lynn Lake, serves the Lynn Lake and Black Sturgeon Reserve. In 2018, West Lynn Heights School had an enrollment of 179, the Leaf Rapids Education Centre, had a total enrolment of 175, and the Oscar Blackburn school in South Indian Lake had an enrollment of 261. There are seven schools in the City of Thompson with a total enrolment of 3,163 students in 2018. The University College of the North, located in Thompson, is the only college in the RAA and it has over 500 students annually (City of Thompson 2018).

Municipal recreation facilities in the LAA include the Jim MacLellan Arena in Lynn Lake, which is used for activities such as curling, skating, and hockey, basketball, and volleyball. A fitness centre opened at the arena in November 2019 (Marcel Colomb First Nation Members 2019). There is also an unsupervised beach, public libraries, a gymnasium, theatre, nine-hole golf course, outdoor sports fields, and a youth center in the LAA. In the RAA, The City of Thompson has a range of municipal recreational facilities and trails as well as facilities serving the broader region, such as the Vale Regional Community Centre.

The LAA is located within the service delivery area for the Northern Regional Health Authority. The Lynn Lake Hospital is the only hospital in the LAA. It is a 19-bed (including eight long-term care beds) facility with a 24-hour emergency room, a lab and X-ray. Leaf Rapids Health Centre runs a physician-staffed clinic that is open on weekdays and a nurse-run emergency room. In the RAA, the Thompson General Hospital is the largest hospital in northern Manitoba and provides 71 acute care beds, including a 10-inpatient bed, acute-care adult psychiatric unit. In Lynn Lake, social services programs include a hostel, employment counseling, parenting skills training, childcare, youth drop-in center, and social development programs. Social services

in the Town of Leaf Rapids include a healthy baby program, public health education and youth support. More extensive social services are available in the City of Thompson. In 2017, the Hope North Recovery Centre opened to provide mental health and addictions services for area youth in crisis (Darbyson 2017). The Lynn Lake RCMP detachment provides police services to the Town of Lynn Lake and Black Sturgeon Reserve. The Town of Leaf Rapids and the community of South Indian Lake have their own RCMP detachments. Volunteer fire services operate in the LAA and both Lynn Lake and Leaf Rapids have 24-hour emergency medical services with one ambulance in each community. In the RAA, emergency services are provided by Thompson Fire & Emergency Services, which provide fire protection and emergency medical service to the city and surrounding area.

The MacLellan site is connected to the Town of Lynn Lake by Provincial Road (PR) 391 and the MacLellan site access road, an all-weather gravel road. The Gordon site is also accessible from the Town of Lynn Lake by way of PR 391 and an all-weather road. Provincial roads are maintained by Manitoba Infrastructure Region 5. The Town of Lynn Lake is accessible only by PR 391, which connects the Town of Lynn Lake and Black Sturgeon Reserve with the Town of Leaf Rapids and City of Thompson. Other transportation includes the Lynn Lake airport servicing the LAA and the Thompson Airport servicing the RAA.

Water and wastewater services in the LAA include curbside garbage pick-up for residents and businesses in the Town of Lynn Lake and the Black Sturgeon Reserve, which is disposed of at the Lynn Lake Waste Disposal Site. Water in the Town of Lynn Lake comes from West Lynn Lake. The water treatment plant (Level 3) and distribution network (Level 1) are operated by the Town. Water and wastewater services are generally exclusive to the community. Wastewater facilities consist of a gravity-fed collection system (Level 1) with three lift stations and a lagoon. Marcel Colomb First Nation operates its own water treatment plant and sewage lagoon on the Black Sturgeon Reserve. In the RAA, the Thompson waste disposal ground services the City of Thompson, the Local Government District of Mystery Lake, the Wuskwatim Generating Station, the Keeyask Generating Station, and the Paint Lake Provincial Park. The City of Thompson operates two wastewater treatment facilities.

Within the LAA, the Community Wellbeing Index score (based on education, labor, income, and housing) for the Town of Lynn Lake was 74 in 2016. The 2016 scores for the Town of Leaf Rapids and South Indian Lake were 68 and 44, respectively. The City of Thompson’s Community Wellbeing Index score was 76. Low education and income scores are common to all three RAA communities.

Health characteristics in the LAA were analyzed based on data from rural and Indigenous populations. Results include: statistically greater percentage of females than males reporting very good or excellent levels of perceived health and perceived mental health; statistically greater percentage of the population with an obese body mass index, who are occasional or daily smokers, and who engage in heavy drinking; and statistically greater percentage of females than males reporting that they are satisfied or very satisfied with life.

5.12.2 Environmental Effects

5.12.2.1 Change to the Environment

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

- change in housing and temporary accommodations
- change in local services and infrastructure
- change in transportation services and infrastructure
- change in community wellbeing.

Potential changes to community services and infrastructure will result from an in-migration of Project workers to the LAA as a result of the Project, therefore increasing demand on existing services and infrastructure, including health, emergency, education, recreation, and utilities. In the LAA, the population has been decreasing due to mine closures and, as a result, community services and infrastructure have been scaled back. Most facilities are at least 40 years old and in need of repair, upgrading or replacement. It is assumed that workers' families will not relocate to Lynn Lake and that most workers will operate on a FIFO or DIDO rotation.

During construction and operation, a temporary increase in population in the LAA is expected as a result of the Project, which has potential to place additional demands on local availability of housing, accommodations, with workers primarily accommodated at a work camp at the MacLellan site. Most of the physical Project activities, with the exception of wastes and emissions, movement of trucks, equipment, supplies and personnel within the LAA, and utilities, infrastructure and other facilities at both sites, will not affect community services and infrastructure; however, demands on local policing and other social service providers may increase if Project-related income is spent on illicit activities. An increase demand is also expected for healthcare and emergency services by temporary Project workers, and/or related to accidents or malfunctions of the Project activities during this phase. The construction and operation activities will also affect transportation services and infrastructure through the creation of additional traffic in the LAA and RAA.

During decommissioning/closure, there will be a reduction in environmental effects on community services and infrastructure as a result of a reduction in demand on them as workers move away due to diminishing employment. Potential changes in community wellbeing will result from a change in employment and income and change in population associated with each phase of the Project and its activities.

5.12.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on community services and wellbeing and are applicable for both Project sites:

- Implementation of a worker housing strategy.
- Work camp at the MacLellan site to accommodate workers during construction and operation.
- During construction, first aid facilities will be supplied by the Engineering, Procurement, and Construction Management contractor. First-aid personnel will provide transport to Lynn Lake hospital when required. During operation, first aid facilities will be supplied by a dedicated first aid/mine rescue office in each of the site administration offices. Site security personnel will be trained as Emergency Medical Service first responders, and when required, provide transfer to Lynn Lake hospital.
- Power, water, and wastewater treatment will be provided by Alamos and will not rely on resources within the Town of Lynn Lake.
- Development of a Waste Management Plan because there will be a Project demand for landfill capacity for construction and non-hazardous domestic solid waste during operation. Alamos will liaise with planners in Lynn Lake regarding these needs and potential requirements for landfill expansion.
- Mandatory safety orientations for new employees.
- Control of access to the PDA using a security gate and guard house, and by employing on-site security staff.
- Site security services to help limit demands on the local police system.
- Careful control of flammable material (such as fuels and explosives) on site.
- Training of Project personnel in fuel handling, equipment maintenance, and fire prevention and response measures.
- Implementation of work schedules for Project workers (e.g., 12 hours per day, seven days per week) that deter FIFO/DIDO workers from spending time off shift in local communities and accessing community recreation services and facilities outside of working hours.
- Scheduling of alternating work shifts so that all workers do not arrive in and leave the area at the same time will limit Project-related demands on both traffic and air services and infrastructure.
- Liaise with local emergency providers so that roles and responsibilities are understood, and that the necessary resources required to respond are in place.

- Maintenance of fire prevention and suppression systems on site, including water supplies, sprinklers, fire extinguishers and other firefighting equipment.
- Workforce education to encourage healthy lifestyle choices, sensitivity training and strict enforcement of Alamos' health and safety policies. For example, sensitivity training would raise the level of awareness about the potential effects that workers can have on the community and their families through drug and alcohol use or other social concerns.
- Access to Employee Assistance Program for Project personnel, and requirement for pre-employment physicals.
- Development of cooperative protocols with responsible agencies to deal with access of Project personnel to emergency and other medical services.
- Development and implementation of Project-specific environmental management plans and monitoring programs, including a Waste Management Plan that sets out procedures for reducing Project-related waste and limiting demands on local landfills.
- Development and implementation of Project-specific Emergency Response and Spill Prevention and Contingency Plans will reduce the likelihood and severity of accidents and potential fires.
- Scheduling of alternating work shifts so that workers do not arrive in and leave the area at the same time will limit Project-related demands on both traffic and air services and infrastructure.
- Upgrading and resurfacing the existing access roads to the MacLellan and Gordon sites.
- Implement standard construction procedures, including traffic control, to reduce traffic delays during construction. The procedures will be developed during ongoing planning and engineering design to address traffic staging to reduce delays.
- Providing bussing services between the temporary camp and Gordon site.
- Encouraging carpooling among locally resident construction and operation workers.
- Scheduling arrivals/departures of employee traffic to occur earlier than the existing observed a.m. peak hour for local traffic and later than the existing observed p.m. peak hour if needed.

5.12.2.3 Residual Effects

Housing and Temporary Accommodations

With the implementation of a Project accommodations strategy, including a work camp during construction and operation, residual effects on housing and temporary accommodation are expected to negligible.

Local Services and Infrastructure

With the construction of the work camp, the presence of non-local workers during construction and operation is not anticipated to place additional demands on power, water, and wastewater services and infrastructure. Power for the MacLellan site will be supplied by Manitoba Hydro via infrastructure built by Alamos and diesel generators will also be used to supply power to the Gordon site. Potable water will be provided by treating filtered fresh water through a vendor-supplied potable water treatment plant. The sewage from the Gordon and MacLellan site buildings will be collected for processing at the MacLellan sewage treatment plant. Waste disposal will follow a Waste Management Plan for the Project with solid waste collected and if practical, recycled. Alamos will provide emergency response services sufficient in size and capability to respond to emergency situations at the mine and Project-related demands on education and recreation will be supplied by the work camp. With the application of mitigation and management measures, the residual adverse effects on the capacity of local services and infrastructure during all Project phases are predicted to be low.

Transportation Services and Infrastructure

Residual effects on transportation and infrastructure are largely related to the increased use of roadways in the LAA and RAA during the construction, operation, and decommissioning/closure phases. The existing road surface of the Gordon site access road will require increased maintenance activity, and at least one 6-km section of PR 391 will likely require resurfacing. The existing 15-km site access road from PR 391 to the Gordon site will also be upgraded and resurfaced prior to the start of the Project construction. With the implementation of mitigation measures, the residual adverse effect of the Project on transportation services and infrastructure is predicted to be low.

Community Wellbeing

Given the LAA's declining population and low level of unemployment, it is assumed that 95% of direct labour will be recruited from outside the LAA. Residual effects on community wellbeing are largely related to labor force, income, education, and housing, assessed by the Community Wellbeing Index. The Project is anticipated to result in negligible changes in existing conditions related to housing and is not anticipated to have a measurable positive or adverse effect on education; therefore, Project residual effects on wellbeing within the LAA are predicted to be positive and conservatively characterized as low. Project workforce during the construction and operation phases could result in a 10% increase in the LAA's population. Because this demographic profile of workers differs from that of the LAA, FIFO/DIDO workers are expected to change the demographic profile of the LAA which, in the extreme case could lead to a adverse interactions between usual residents and workers, increased crime and reliance on negative coping

mechanisms. In consideration of mitigation measures, population-related residual effects on social cohesion are conservatively assumed to be adverse in direction and moderate.

Significance of Residual Effects

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

5.13 LAND AND RESOURCE USE

5.13.1 Existing Environment

Land use types within the townsite of Lynn Lake include residential and commercial service and retail developments. There are no parks or protected areas within the PDA or LAA. Within the RAA, most of the land outside the built-up townsite is designated as “Limited Development” land use under the development plan where mineral exploration and development are encouraged. The RAA is mainly unoccupied provincial Crown land in the Thompson Community and Regional Planning Area of northwest Manitoba which includes provincial parks, subdivisions, and various land use permits (e.g. camps, lodges, cabins). Federal Crown land within the RAA includes First Nations Reserves and Treaty Land Entitlement land. There are two provincial parks within the RAA: Burge Lake Provincial Park (10 ha) and Zed Lake Provincial Park (14 ha). There are no other conservation areas or ecological reserves within the RAA. However, the RAA encompasses the provincial Kamuchawie Caribou Management Unit and the federal Woodland Caribou Manitoba North Range (MB9), where animals from the Manitoba North Range herd were observed during field studies. There are no other wildlife management areas within the RAA.

There are two campgrounds in the RAA, at Burge Lake and Zed Lake provincial parks. Recreational land use activities within the RAA include sport fishing, hiking, camping, snowmobiling, cross-country skiing, snowshoeing, and ice fishing. Resource use in the RAA includes hunting and outfitting. The Town of Lynn Lake promotes outdoor recreation opportunities during all seasons. Common activities include ice fishing, snowmobiling, ice-skating, cross-country skiing, snowshoeing, tobogganing, dog-sled racing, wildlife viewing, canoeing, kayaking, and recreational hunting.

Resource use in the general Lynn Lake area is characterized by activities such as hunting, fishing, trapping, mining, and limited forestry. Common big game species found in the RAA include moose, black bear, and gray wolf. Upland game birds hunted include grouse, ptarmigan, and migratory game birds. Grey Owl Outfitters holds a black bear allocation area that overlaps with a small portion of the LAA and the PDA for the MacLellan site. The RAA falls within the Pukatawagan and Southern Indian Lake Registered Traplines with a total of 20 registered traplines, all of which have had trapper permits. There are no commercial fish waterbodies overlapped by the PDA. There are portions of two listed commercial fish lakes (Cockeram and Cartwright lakes) within the LAA and there are 17 commercial fish waterbodies in the RAA. Watercourses in the RAA and LAA support a recreational sport fishery. There are no sport fish lakes within the PDA for

the Gordon and MacLellan sites. Mineral exploration activity in the Lynn Lake area and surrounding region has focused on copper, lead, zinc, gold, silver, nickel, and cobalt. The PDA and LAA have historically been subject to mining development and currently, the Gordon site has been reclaimed and the MacLellan site is under care and maintenance with recent activity of new claims being staked in this area (as of the fall of 2019). The Project LAA also encompasses one quarry withdrawal area. Productive forest land is scattered throughout the RAA. The productive forest land in the PDA represents a very small area of the total productive forest land in the LAA and RAA (ranging from 6.3% to 0.2% respectively).

5.13.2 Environmental Effects

5.13.2.1 Change to the Environment

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

- change in land use
- change in recreation
- change in resource use.

Changes to land use as a result of the Project includes consideration of compatibility with land use plan designations and zoning, the potential to degrade land and cause disturbance and nuisance effects (e.g., construction noise, dust, disruption to access), restriction of access. and visibility of project components from Project clearing and construction activities within the PDA. Decommissioning/closure activities have the potential to disrupt land use but may ultimately result in the restoration of access and land use.

Changes to recreation as a result of the Project include direct loss of, or loss of access to, recreation areas. During construction, activities may reduce the available land base for various recreational activities, affect changes in accessing recreational areas within the PDA, and may also affect recreation through sensory disturbance (i.e., noise, visual aesthetics). Population increase associated with the construction phase can also increase competition for resources. During operation of the Project, the presence of structures could affect recreational use and visual aesthetic values; however, the Project will likely only be visible to receptor sites in the immediate vicinity. Other Project effects on recreation include access restrictions to recreational use areas, and noise effects. During decommissioning/closure, recreation activities may be disrupted or intruded on through sensory disturbance from rehabilitation activities, but decommissioning may ultimately restore access.

Changes to resource use as a result of the Project may occur during construction and operation through the direct loss of, or access to, local resource use areas as well as disruption to resource activities. Disturbance effects on resource use considers the reduction in wildlife harvesting success as result of sensory disturbance (e.g., noise, visual), increased pressure on the resource (e.g., hunting, trapping, and fishing) and direct effects on those wildlife species. The presence of workers during construction could also result in an increase in competition for species harvested by hunters and trappers and anglers. The Project also has is the potential to affect productive forest land. Decommissioning/closure activities can also disrupt

or intrude on local resource use activities, but decommissioning may ultimately restore access and availability of resources.

5.13.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on land and resource use and are applicable for both Project sites:

- Signage will be installed around the perimeter of the PDA to alert local land and resource users of the presence of the Project and its facilities.
- Project lighting will be limited to that which is necessary for safe and efficient Project activities. Directional lighting will be used to limit the transmission of light outside of the PDA. Portable lighting equipment will be positioned to limit visibility at nearby receptors, to the extent feasible.
- Noise mitigation measures will be selected and installed as described in Section 5.5.2.2.
- Workers will be prohibited from bringing firearms and fishing gear to the sites while working to limit competition for wildlife and fish species of value to resource users.
- Alamos will post warning signs on the access roads and distribution line ROW to discourage unauthorized access and snowmobiling due to safety concerns.
- Alamos will implement traffic control measures which may include gating approaches to Project access roads, placing large boulders and/or gated fencing to restrict public access to the PDA.
- Alamos will engage local land and resource users (e.g., recreational harvesters) and the Town of Lynn Lake to address, to the extent possible, issues related to the removal and inaccessibility of lands and resources within the PDA at Project sites, including the restriction in use of the Gordon site access road, and with local boaters to address navigation issues as well as access and safety issues related to navigation along watercourses affected by the Project, including engagement regarding the need to provide marked portages to circumvent obstructions.
- Desired end land and resource uses will be considered in the preparation of the conceptual Closure Plan as part of Project rehabilitation.
- The Project footprint will be limited to the extent possible (i.e., PDA) including site clearing and disturbance associated access routes and distribution line ROW.
- Existing access roads and trails will be used to the extent possible; renewed access routes will be developed in compliance with provisions of *The Mines and Minerals Act* (in the case of the Gordon site).
- Work schedules will be implemented for Project construction workers (subject to FIFO employment) to deter workers from hunting locally outside of working hours during a shift.

- Workers will be prohibited from bringing firearms and fishing gear to the sites while working to limit competition for wildlife and fish species of value to resource users.
- Alamos will communicate the schedule of Project activities throughout the construction, operation, and decommissioning/closure phases to potentially affected local resource users and MCC Regional Officials.
- Alamos will engage with local resource users (hunters, outfitters, trappers, anglers) and MCC Regional Officials to address to the extent possible the potential conflict, disturbance, or access restrictions to hunting, trapping, and fishing areas in the PDA, and availability of wildlife and fish resources.
- Timber removal will be completed in accordance with *The Forest Act* (Manitoba).
- Merchantable timber may be salvaged and used, if feasible, to enhance carbon storage, or it will be made available to local communities for fuelwood.

5.13.2.3 Residual Effects

Land Use

For the Gordon site, the PDA intersects with approximately 269 ha of provincial Crown land. The Gordon site is located within the Marcel Colomb First Nation community interest zone. Given the small area of provincial Crown land affected by the PDA (269 ha for the Gordon site), Project disturbance is predicted to be of low magnitude. There are two remote cabins within the Gordon site LAA (occupancy unknown). During construction, low frequency noise and vibration effects are not expected at receptors because predicted levels are below applicable targets. Overall, the residual effects for the Gordon site are anticipated to be low (low to moderate for noise). Given the small areas of provincial land are affected by the MacLellan site PDA (938 ha within the LAA) and approximately 10 ha of land for the distribution line ROW, residual effects are predicted to be low. For both sites, some access restrictions are anticipated to be in place for the period of construction; however, with the implementation of the mitigation measures, the residual effects are anticipated to be low. The Project's overall presence will also result in some visual disturbance and will be long-term in duration (i.e., from reclamation of stockpiles). During decommissioning/closure activities, no new interactions with designated lands, including those associated with access, are anticipated.

Recreation

During construction, residual effects on recreation will primarily occur in the PDA where access will be restricted, resulting in a shift of recreational users to other areas of the LAA. The lands within the PDA are not considered "prime" recreational land, given that they are former mine sites and there are alternative lands within the LAA available for recreational use. The continued use of the Keewatin River as a recreational canoe route is not expected to be affected by the Project. Low frequency noise effects are not expected at receptors because the predicted sound levels are below the Health Canada targets; however, recreational activities may be disturbed by other noise during construction. This disruption is expected to be short-term and irregular in frequency. The presence of construction workers is predicted to result in increased demand for outdoor recreation within the LAA. Residual effects described for the construction

phase will continue throughout operation consisting of ongoing noise associated with truck usage, and restriction in use of access roads. The addition of the presence of the ore stockpile, overburden stockpile, and the mine rock storage area and other Project infrastructure may result in some visual disturbance to recreational users. However, modelled analyses suggest that mine infrastructure and stockpile/storage areas would barely be visible or marginally so. Decommissioning/closure activities may cause disruption (e.g., through sensory and/or nuisance effects) but may ultimately restore access for recreational activities.

With the implementation of mitigation measures, residual effects from the Project on recreation are anticipated to be low in magnitude for each Project phase.

Resource Use

During construction, Project clearing and construction activities will lead to a loss of area for resource harvesting in the PDA. Project construction may also result in temporary sensory disturbance (e.g., construction noise, visual) and nuisance effects (e.g., traffic) displacing big game or furbearers and reducing harvesting success rates in the LAA for hunting and trapping. These disturbances may also affect the experience quality for hunters/outfitters and trappers and could cause habitat avoidance and/or a change in habitat use around the site, decreasing interest in guide outfitting services in a certain area. Predicted sound level of short-term construction activities (e.g., pile driving at a bridge crossing) will be below the Health Canada noise level target. There are currently no commercially fished waterbodies within the PDA or LAA and increased competition for hunting and fishing resources that are of interest will be mitigated through the prohibition of hunting/fishing gear for workers at the sites. The Project will result in a decline in net merchantable timber in the RAA and LAA. During operation, sensory and visual disturbance effects described for the construction phase are expected to continue as a result of the presence of the Project and resultant heavy truck traffic. Project components may be barely or marginally visible from certain vantage points. The noise assessment results for the operation phase indicate that nighttime equivalent sound levels from the Project will be below applicable thresholds. During Project decommissioning/closure, no new residual effects on areas or access for hunting, outfitting, trapping, and fishing are expected. The decommissioning/closure phase is also expected to result in less pressure on resources, as some areas may become accessible again for commercial harvest activities.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on land and resource use are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.14 HERITAGE

5.14.1 Existing Environment

A heritage resources impact assessment for the environmental assessment was conducted at the Gordon and MacLellan sites in August 2015. No heritage resource sites were recorded in the Gordon site PDA and there is a low potential for such resources to be present based on predictive modelling and assessment results. There are 10 recorded sites within the MacLellan site PDA. Sites were intact except for one which was a historic building that was in the initial stages of collapse. Three of the MacLellan recorded sites, all from the Historic Period, were concluded to be camp sites. Artifacts observed included a folding stove, a steel washtub, and several tin cans and bottles (Evans 2012). Other sites were found to likely be related to early mineral exploration camps, temporary habitation sites, or storage buildings. For the RAA (covering a relatively large area owing to the historical and precontact mobility of Indigenous peoples), records indicated that ancestors of the Swampy Cree, Rock Cree, Dene, and Métis lived and harvested resources throughout the RAA for the past 200 years (Provincial Archives of Manitoba, n.d.). Marcel Colomb First Nation participants stated that the MacLellan site PDA was used on a limited basis. There are 781 heritage resource sites recorded in the RAA, most of which date to the Precontact Period.

5.14.2 Environmental Effects

5.14.2.1 Change to the Environment

During construction and operation, changes to heritage resources could result from removal of vegetation, causing soil movement and displacing shallowly buried artifacts. Grading and compaction of the site during construction could also potentially disturb or destroy heritage resources. During operation, heritage resources could be disturbed through brushing of previously undisturbed areas, subsoil removal and regrading of access roads, soil removal for Project infrastructure, grading, and compaction.

The are no potential effects pathways for Project decommissioning/closure at either the Gordon or MacLellan sites as heritage resources concerns will have been addressed during construction or operation, and decommissioning/closure will not result in ground disturbance to areas not previously disturbed during the Project.

5.14.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid Project-related effects on heritage resources and are applicable for both Project sites:

- Implementation of the Heritage and Cultural Resources Protection Plan when heritage or cultural resources, or objects thought to be heritage or cultural objects, are exposed.
- Protective barriers placed around heritage resource sites that are inadvertently found during construction so that the area can be protected while work proceeds.

- Evaluation by a professional archaeologist of PDA changes or added development components.
- Education of construction contractors for the appropriate protocols if heritage or cultural resources, or objects thought to be heritage or cultural resources, are discovered.
- Controlled surface collection or salvage excavation of discovered heritage resource sites, or a portion thereof, that cannot be avoided.
- Construction monitoring by a professional archaeologist in areas that are heritage sensitive such as sites identified as being culturally sensitive by Indigenous engagement.
- Education of construction contractors for the appropriate protocol if heritage or cultural resources, or objects thought to be heritage or cultural resources, are discovered.
- As-found recording of site HfMf-7, a shed related to historical mining activity.

5.14.2.3 Residual Effects

None of the Project components currently interact with known heritage resources; therefore, there is a low potential for a change to the number of heritage resource sites because of the Project. There are no previously recorded heritage resource sites within the Gordon site PDA and LAA and the potential for heritage resources is low at the Gordon site. The archaeological sites recorded within the MacLellan site PDA are outside of the areas proposed for development. Baseline information from Indigenous nation members indicate that there are no known burial sites; cultural landscapes; sacred, ceremonial, or culturally important places, objects, or things; nor is there archaeological potential and/or artifact places at these sites; therefore, there are no anticipated residual effects on heritage resources.

There are no anticipated residual effects on heritage resource at either the Gordon or MacLellan site; therefore, no determination of significance was undertaken. Results of the assessment are presented in Appendix A; Table A-1.

5.15 CURRENT USE OF LANDS AND RESOURCES FOR TRADITIONAL PURPOSES

5.15.1 Existing Environment

Indigenous nations who have expressed traditional interests in the RAA as of May 22, 2020, include Marcel Colomb First Nation, Mathias Colomb Cree Nation/Granville Lake Community, Peter Ballantyne Cree Nation, Manitoba Metis Federation, and the Métis Nation – Saskatchewan Eastern Region 1. Indigenous nations who have indicated through engagement they do not undertake traditional practices in the RAA as of May 22, 2020, include O-Pipon-Na-Piwin Cree Nation, Nisichawayasihk Cree Nation, Barren Lands First Nation, Hatchet Lake First Nation, Northlands Denesuline First Nation, Sayisi Dene First Nation and the

Métis Nation – Saskatchewan Northern Region 1. The results of the information gathering process indicated that current use for traditional purposes occurs in the PDA, LAA, and RAA.

Marcel Colomb First Nation

Marcel Colomb First Nation is the nearest First Nation to the Project. They have a long history of traditional harvesting and practice in the RAA. Project-specific traditional land and resource use (TLRU) studies indicate that traditional land use for Marcel Colomb First Nation includes plant harvesting in the RAA for food, medicines, fuel, shelter, and transportation. Food species include blueberry, and cranberry, among others. Medicinal species include rat root, spruce (gum), and seneca root, among others. Construction/craft/fuel species include spruce, birch, trembling aspen, and jack pine used for a variety of purposes such as soap, cabins, roofing, fuel, tent poles, toboggans, and snowshoes. Fish has also long been a staple food source for Marcel Colomb First Nation. Fished species include lake trout, goldeye, sucker, trout, sturgeon, northern pike (jackfish), whitefish (tullibee), and pickerel (walleye). Marcel Colomb First Nation reported traditionally hunting moose, deer, caribou, bear, beaver, rabbit, geese, ducks, grouse (spruce/unspecified), ptarmigan, and swan. Trapping for beaver, mink, muskrat, lynx, otter, marten, rabbit, wolverine, fox, and ptarmigan is also an important traditional activity for Marcel Colomb First Nation. Marcel Colomb First Nation members have traveled extensively throughout the region over land and on water using long established trails and routes, with reported cabins and camps on lakes and rivers in the RAA and beyond. Marcel Colomb First Nation has also reported that the narrows on Goldsand Lake in the RAA is a place of cultural importance. Cultural values associated with traditional land and resource use include gaining and sharing knowledge and experiences of living on the land, only harvesting what is needed, and a sense of enjoyment for the traditional way of living, despite its hardships.

Mathias Colomb Cree Nation

Mathias Colomb Cree Nation identifies the Project as within its traditional territory and asserts the Indigenous right to harvest there. Based on secondary information sources, fishing, commercial fishing, guiding, subsistence hunting, trapping, and guiding for commercial hunting lodges are staples of the economy (INAC 2005). The completion of a TLRU study is ongoing.

Peter Ballantyne Cree Nation

Peter Ballantyne Cree Nation identifies the Project as within its traditional territory and asserts the Indigenous right to harvest there. Secondary data sources have indicated that the commercial fishery and a sport fishing lodge have been staples of the economy (INAC 2005). The completion of a TLRU study is ongoing.

Manitoba Metis Federation

The Manitoba Metis Federation have documented that Métis harvesters have used, and continue to use, the lands and waters around the Project. They assert their right to use the lands and waters for various purposes including subsistence harvesting, non-commercial trapping, and cultural and traditional uses. Plants and natural materials used for food, medicine, and other purposes include blueberries, chaga,

cranberries, raspberries, Saskatoon, strawberries, and wild mint. Medicinal plants reported include muskrat root and Labrador tea. Manitoba Metis Federation have indicated that fishing is an important harvesting activity and commonly harvested species include lake whitefish, lake sturgeon, northern pike, pickerel, rainbow trout, sauger, suckers, and yellow perch. Manitoba Metis Federation identified 35 country foods species hunted and trapped in the last year in the RAA including moose, grouse, chickens, ducks, geese, and ptarmigans. Manitoba Metis Federation identified non-commercial trapping and snaring locations, five sites used for cultural, ceremonial, spiritual, and traditional purposes, and identified access routes or trails within 100 km of the Project.

Métis Nation – Saskatchewan Eastern Region 1

Métis Nation - Saskatchewan Eastern Region 1 identifies that species of interest move through the Project RAA. Through engagement, Métis Nation - Saskatchewan Eastern Region 1 has specifically expressed concern regarding effects of the Project on woodland caribou.

O-Pipon-Na-Piwin Cree Nation

Through engagement, O-Pipon-Na-Piwin Cree Nation has indicated to Alamos that its members do not currently have traditional practices in the Project RAA, but the Band Council noted that some treaty land entitlement areas were close to the Gordon site in the RAA. They expressed concern regarding water quality and its effect on fish health. Reports indicate that the area between Southern Indian Lake and Tadoule Lake, east of the RAA, is intimately known and intensively used by O-Pipon-Na-Piwin Cree Nation (Hrenchuk 1991).

Nisichawayasihk Cree Nation

Nisichawayasihk Cree Nation has indicated to Alamos that its members do not currently have traditional practices in the Project RAA. However, the Nisichawayasihk Cree Nation Land Guardians raised concerns about the potential effects of increased truck traffic on PR391 on their Resource Management Area, including introduction of invasive species and potential spills in the RAA. Reports also indicate the area between Southern Indian Lake and Tadoule Lake, north of the RAA, is intimately known and intensively used by Nisichawayasihk Cree Nation (Hrenchuk, 1991).

Barren Lands First Nation

Through engagement, Barren Lands First Nation advised Alamos that its members do not currently participate in traditional practices within the RAA. Reports indicate that subsistence fishing, commercial fishing, subsistence hunting, trapping, and guiding for commercial hunting lodges are staples of the Barren Lands First Nation economy (INAC, 2005).

Hatchet Lake First Nation

Hatchet Lake First Nation has advised Alamos that their members do not currently participate in traditional practices within the RAA. Secondary sources indicate that Hatchet Lake First Nation is concerned that the Beverly Qaminirjuaq herds of caribou, which travel through northwestern Manitoba, are subject to over-harvesting (CEAA 2007).

Northlands Denesuline First Nation

Northlands Denesuline First Nation advised Alamos that their members do not currently participate in traditional practices within the RAA. Reports indicate that Northlands Denesuline First Nation members consume goose, grouse, caribou, moose, wild berries such as blueberries and cranberries, nuts, and fish such as trout, lake whitefish and walleye (Chan et al., 2010). Reports also indicate that subsistence fishing is one of the bases of the Northlands Denesuline First Nation economy (INAC, 2005).

Sayisi Dene First Nation

Sayisi Dene First Nation advised Alamos that their members do not currently participate in traditional practices within the RAA. Reports indicate that Sayisi Dene First Nation members consume goose, grouse, caribou, moose, wild berries such as blueberries and cranberries, nuts, and fish such as trout, lake whitefish and walleye (Chan et al., 2010). Reports also indicate that subsistence fishing is one of the bases of the Sayisi Dene First Nation economy (INAC, 2005) and that trapping occurs less now among Sayisi Dene First Nation harvesters, due to price of fuel (Petch, 1998).

Métis Nation – Saskatchewan Northern Region 1

Métis Nation - Saskatchewan Northern Region 1 advised Alamos that their members do not currently participate in traditional practices within the RAA.

5.15.2 Environmental Effects

5.15.2.1 Change to the Environment

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

- changes to availability of traditionally used resources
- changes in access to traditionally used resources or areas
- changes to current use sites or areas
- changes to experience of current use and cultural values associated with traditionally used resources.

Availability of resources currently used for traditional purposes can be affected by a change in the landscape that removes habitat for species relied upon for traditional use, or by a change in mortality or health of these species in such a way that their numbers are affected.

During the construction phase, habitat will be lost in the PDA. During site preparation, direct and indirect loss of habitat will result from vegetation clearing, dewatering, and sensory disturbances that can fragment habitats and reduce ecological function. Noise from construction activities may also disturb wildlife and contribute to avoidance of the area by traditional harvesters. Changes to mortality risk can also affect availability of traditional resources through increased vehicular traffic, human-wildlife interactions, effects on predator-prey interactions and indirectly on health of harvested species by soil compaction or dust on plants.

During the operation phase, transportation within the LAA is the primary activity with potential to cause wildlife mortality and change the availability of traditionally harvested resources. The presence of utilities, site infrastructure, facilities, and fluctuating water levels may also increase wildlife mortality, or alter wildlife habitat. Noise, light, and vibration is also expected to be a primary pathway that could potentially change the availability of traditional resources through wildlife avoidance.

During the decommissioning/closure phase, the Project is anticipated to increase availability of traditional resources through a lessening in sensory disturbances, vehicular collisions, and reclamation of habitat.

Access to resources currently used for traditional purposes can be affected by restrictions to access of lands. During construction, access to sites may be restricted for safety reasons. During operation, changes to access may also result from operation of utilities, infrastructure, and other facilities. During the decommissioning/closure phase, access is anticipated to improve.

During construction, changes in traditional cultural and spiritual sites and areas can be affected directly through the physical removal of the resource itself by land clearing and infrastructure development, or indirectly through sensory disturbances, noise, light, and other emissions. During operation, sensory disturbance as well as the physical presence of utilities, site infrastructure, and facilities or water management activities may disturb a site or render a site or area inaccessible. During the decommissioning/closure phase, the level of sensory disturbance due to wastes and emissions activities will be reduced in comparison to operation, with a return to baseline conditions during post-closure.

Changes to the environment resulting from the Project that have the potential to affect cultural values associated with traditional land and resource use include changes in access or sensory disturbances such as noise, light, and dust that may directly or indirectly interfere with cultural transmission by shared experience of traditional practices.

5.15.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on traditional land and resource use. Mitigation measures that are relevant to availability of traditionally harvested resources at the Gordon site will include the following:

- Wetland buffering, silt fencing, and timing of vegetation clearing as described in Section 5.9.2.2 will reduce habitat loss or loss of traditionally important species.
- Dust suppression, as described in Section 5.4.2.2 will reduce sensory disturbance, effects to habitat or traditionally harvested species.
- Erosion and sediment control measures during construction and timing works outside of sensitive periods will reduce alteration or loss of fish habitat.
- Workers will be prohibited from bringing firearms and fishing gear to the sites while working to limit competition for wildlife and fish species as described in Section 5.13.2.2.
- Mitigation as described in Section 5.8.2.2 will reduce effects on traditionally important fish species and habitat.
- Offsetting lost habitat area.
- Relevant mitigation for groundwater as described in Section 5.6.2.2 to reduce effects on traditionally important species and resources.
- Relevant mitigation for wildlife and wildlife habitat as described in Section 5.10.2.2 to reduce effects on traditionally important species and resources.
- Relevant actions in the Wildlife Monitoring and Management Plan to reduce effects on traditionally important species and resources.

Mitigation measures at MacLellan site are the same as indicated for Gordon site with the following additional mitigation measure specific to the removal of the existing infrastructure at MacLellan site:

- Surface Water Monitoring and Management Plan.
- Relevant mitigations as described in Section 5.10.2.2. to mitigate effects on wildlife habitat.

Mitigation measures that are relevant to changes in access of resources currently used for traditional purposes, applicable for both the Gordon and MacLellan sites, will include the following:

- Site access by traditional harvesters will be controlled during post-closure as per the Conceptual Closure Plan. Alamos' ongoing engagement may result in developing alternative access to resource harvesting areas.

- Existing access roads and trails will be used to the extent possible; access routes will be developed in compliance with provisions of *The Crown Lands Act* and *The Mines and Minerals Act*.

Mitigation measures that are relevant to changes in cultural and spiritual sites specific to the Gordon site will include the following:

- Although no known cultural and spiritual sites or areas are in the PDA, Alamos' ongoing engagement program will facilitate development of mitigation measures if these are reported or discovered during construction and operation phases.
- Design for limitation of Project footprint (i.e., PDA) to the extent possible.
- Design for use of down-lighting, a technique of directing night lighting downward, to reduce light effects adjacent to the PDA.
- Buffers around wetlands, waterbodies, and watercourses as described Section 5.9.2.2 will be maintained to reduce effects to cultural and spiritual sites or areas.
- Design for restriction of unauthorized access adjacent to the PDA.
- Maintain vegetation cover along the boundaries of high activity areas (e.g., access roads) to reduce sensory (noise and visual) disturbance.
- The Heritage and Cultural Resources Protection Plan will be implemented when previously unidentified heritage or cultural resources, or objects thought to be heritage or cultural objects, are exposed. Additional mitigation measures for heritage resources are addressed in Section 5.14.2.2.

Mitigation measures that are relevant to changes in cultural and spiritual sites specific to the MacLellan site are the same as indicated for the Gordon site plus:

- Controlled surface collection or salvage excavation as addressed in Section 5.14.2.2 will be implemented for any discovered heritage resource sites, or a portion thereof, that cannot be avoided.

5.15.2.3 Residual Effects

The residual effects on availability of lands and resources for traditional use during the construction phase is largely related to site preparation. Site preparation will require removal of habitat in the PDA. Once cleared, the PDA will provide no suitable wildlife habitat, except for a few species that prefer developed sites. Site preparation and water development will also negatively affect fishing, hunting, and trapping activities that currently occur. The residual effect of construction traffic on wildlife mortality is expected to be minor in the LAA. Overall, the residual effects on change in resource availability during the construction phases of the Project is low. During operation, wildlife will avoid the PDA and LAA due to continuous

disturbance caused by emissions such as noise, light, and traffic throughout the duration of operation. Increased dust and POPCs could affect vegetation and fish distribution and health. Residual effects on mortality risk during this phase due to trapping of nuisance animals, conflicts with infrastructure, and vehicle collisions, is limited in area and numbers of individuals, and not expected to have population level effects. Finally, decommissioning/closure activities are expected to reverse the residual effects to resource availability and therefore are generally positive.

The residual effects on access to lands and resources for traditional use are related to clearing of natural vegetation or earthworks activities during construction and operation. This will remove one travelway from use within the MacLellan PDA and affect several travelways that cross the Gordon Lake access road, altering patterns of access to travel routes harvesting areas in the LAA. Overall, the residual effect on change in access during the construction and operation of the Project is low. Residual effects on access in the closure phase are anticipated to be positive with access ultimately being restored to some areas.

The residual effects on cultural and spiritual sites are largely related to site preparation activities and sensory disturbance. The Project will require the disturbance of landscape in the PDA. No traditional or cultural sites or areas are known to exist within the PDA; however, some sites may experience sensory disturbances due to light, dust, and noise. These sites may also experience effects due to the removal of visual buffers. Overall, the residual effect is low.

The experience of Indigenous peoples on the land, cultural identity, opportunities for intergenerational knowledge transmission, and spiritual connections represent intangible values, which are largely subjective and conditional, reflecting beliefs, perceptions, values, and qualitative experience. As such, for changes to the environment that affect cultural values or importance associated with traditional land and resource use, it is not possible to establish meaningful and applicable measurable parameters or assess these values to current assessment conventions. Therefore, potential effects on cultural values have not been subject to an effects assessment using the same methodology. Rather, when an Indigenous nation has identified a related concern, the subjective and experiential components of current use that cannot be measured are here considered qualitatively. Residual effects on cultural values using this assessment methodology include transmission of cultural practices and teachings between generations, the sacredness of lands and waters as a whole, changes to experiences on the land, and a responsibility to protect and care for the land.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on traditional land and resource use are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.16 HUMAN HEALTH

5.16.1 Existing Environment

Existing conditions for human health are characterized by the calculated Baseline Case concentration ratios, hazard quotients (HQs), and incremental lifetime cancer risks (ILCRs) of contaminants currently existing in the environment. The concentration ratio applies to non-cancer health risks associated with the inhalation of criteria air contaminants such as NO_2, SO_2, and $PM_{2.5}$. The HQ applies to non-cancer health risks associated with ingestion exposures of metals in drinking water and food. The ILCR applies to carcinogenic health risks associated with exposure to carcinogenic chemicals of potential concern (COPC).

Exposure pathways include direct contact with soil (ingestion and dermal contact), ingestion of wild meat, fish, plants and surface water and inhalation (air emissions) of contaminants. At both the Gordon and MacLellan sites, baseline CRs for NO_2, SO_2 and $PM_{2.5}$ were below the benchmark concentration ratio of 1.0, representing a negligible human health risk. The Baseline Case HQs for metal exposures through ingestion were generally below the risk acceptability benchmark of 0.2, with some exceedances for methylmercury, primarily due to consumption of fish, and manganese and thallium, primarily due to consumption of wild meat, traditional plants and/or backyard garden produce. Baseline Case CRs could not be calculated for inhalation risk associated with diesel particulate matter (DPM), HCN, volatile organic compounds, polycyclic aromatic hydrocarbons, and metals because air concentration data were not available in this remote region.

5.16.2 Environmental Effects

5.16.2.1 Change to the Environment

Changes to human health as a result of the Project are measured based on predicted human exposure to a contaminant through ingestion, inhalation, and dermal contact. Atmospheric emissions (vehicle exhaust, and rock and ore dust) and water discharges (e.g. effluent and seepage) from the Gordon site and the MacLellan site project activities could increase COPC concentrations in ambient air, soil, water, and sediment. This can lead to increases of these chemicals in secondary environmental media including vegetation, wild meat, and fish tissue. In the absence of mitigation measures, potential changes in air may affect the health of Off-Duty Workers housed in the Worker Camp, and potential changes in air, water, and country food quality may affect the health of human receptors who live in either region and who may engage in hunting, trapping, traditional, and recreational activities.

5.16.2.2 Mitigation Measures

A number of mitigation measures have already been incorporated for both sites as detailed in previous sections. A summary of these mitigation measures as they pertain to human health is outlined below:

- The use of dust suppressants (e.g., water and chemical), dust collectors (e.g., baghouse and wet scrubbers at crushers) and dust enclosures at mill feed conveyors and storage areas as described in Section 5.4.2.2.
- An Air Quality Management Plan.
- Water management as described in Section 5.6.2.2 and Section 5.7.2.2, including surface water runoff control practices, diversion of fresh water away from the Project by designing culverts and ditches, management of contact water (by construction of collection pits, ponds, ditches and culverts), installation of groundwater interceptor wells and dewatering ditches, and implementing soil covers and vegetation to reduce infiltration into the TMF and MRSAs by increasing evapotranspiration capacity.

5.16.2.3 Residual Effects

Inhalation Exposure

For the Gordon and MacLellan sites, the assessment of potential human health risks associated with inhalation exposures to NO_2 found that predicted annual average NO_2 concentrations were below the 2025 annual average NO_2 CAAQS. Three and four special receptor locations at the Gordon and MacLellan sites, respectively, had a maximum predicted 1-hour NO_2 concentration in exceedance of the 2025 1-hour NO_2 CAAQS. Maximum exceedances were found to occur 0.38% of the time over the 5-year period at the Gordon site and 0.37% of the time at the MacLellan site. Based on the analysis it was determined that occasional exceedances of the 2025 1-hour NO_2 CAAQS represent a negligible human health risk for people who may be in the area. The CRs associated with inhalation to carcinogenic compounds are below 1.0, meaning that the incremental lifetime cancer risk associated with emissions from the Project is below cancer risk acceptability benchmark established by Health Canada (2012).

For the work camp, with the exceptions of 1-hour exposure to NO_2 and 2-hour exposures to DPM, the CRs associated with inhalation exposures for COPC are below the benchmark of 1.0. Over the 5-year period that was modelled, 1-hour NO_2 concentrations were predicted to exceed the 2025 CAAQS 695 times (1.6% of the time). Considering the results of the assessment of potential health risks associated with inhalation exposures to 1-hour NO_2, inhalation exposure to NO_2 was found to represent a negligible human health risk for Off-Duty Workers housed at the Worker Camp. The DPM concentrations were predicted to exceed the 2-hour air quality standard of 10 $\mu g/m^3$ on two occasions, representing 0.009% of the time. Given that the predicted exceedances of the short-term (2-hour) exposure limit are small and of short duration, and that the health effects associated the 2-hour limit are based on mild and reversible effects in sensitive members of the population (asthmatics), it was determined that for Off-Duty Workers, inhalation exposures to DPM represents a negligible human health risk. The CRs associated with inhalation exposures to SO_2, $PM_{2.5}$, HCN, volatile organic compounds, polycyclic aromatic hydrocarbons and metals are below 1.0 and thus, were found to represent a negligible human health risk for Off-Duty Workers.

Ingestion Exposure

In general, the risks associated with total ingestion exposures to metals are below the non-cancer risk acceptability benchmark of HQ<0.2 established by Health Canada. For several compounds, the total ingestion non-cancer risks exceed the acceptability benchmark; however, changes in non-carcinogenic and carcinogenic health risks due to Project-related chemicals are less than the applicable benchmarks and therefore, negligible and not significant at both sites. Risks related to sediment contact were evaluated and considered minor in the region. The average of the predicted future concentrations of metals in the lakes in the Gordon region and the MacLellan region are less than the applicable Canadian drinking water guidelines; therefore, health risks related to metal exposures are considered negligible.

Noise and Vibration

Noise levels predicted at each of the human health special receptor locations in the Gordon and MacLellan regions were below the Health Canada 6.5% highly annoyed target and were also below the World Health Organization sleep disturbance noise guideline of 40 dBA. Based on these results, noise and vibration represent negligible human health risks.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on human health are predicted to be not significant. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.17 INDIGENOUS PEOPLES

5.17.1 Existing Environment

Existing conditions for Indigenous peoples are described based on the conditions for Indigenous health, Indigenous socio-economics, current use of lands and resources, Indigenous physical and cultural heritage, and Indigenous or Treaty rights. The Indigenous communities engaged on the Project have Indigenous or Treaty rights which are recognized and affirmed in Section 35(1) of the *Constitution Act, 1982* and as such have constitutional protection to these rights in Canada.

Health care for Indigenous communities in Manitoba is provided by the federal First Nations and Inuit Health Branch and through Regional Health Authorities. Health care for Indigenous communities in Saskatchewan is provided by the federal FNIHB and through the Saskatchewan Health Authority. The First Nations Regional Health Survey indicated that almost two-thirds (59.8%) of First Nation adults, one third (33.2%) of First Nation youth, and over one-quarter (28.5%) of First Nation children had one or more chronic health conditions. Chronic health conditions such as diabetes, arthritis, hypertension, allergies, and chronic back pain were the most reported conditions among First Nation adults. Indigenous communities engaged on the Project hunt, fish, trap, and gather for the purposes of consumption and these activities are an integral component of Indigenous health. Baseline CR for compounds of potential concern were found to be below

the risk acceptability benchmarks established by Health Canada. The HQs for metal exposures through ingestion were generally below the risk acceptability benchmark of 0.2, with some exceedances for methylmercury, primarily due to consumption of fish, and manganese and thallium, primarily due to consumption of wild meat, traditional plants.

Generally, participation rates in the labour force among the Indigenous population were lower than total population participation rates within Lynn Lake and the RAA and greater than provincial Indigenous averages. Indigenous communities engaged on the Project operate businesses such as construction, food retail, fueling service, casino operations, forestry, and emergency services. Guided sportfishing, commercial fishing, and trapping are also important sources of income for Indigenous communities in the RAA.

A total of 781 heritage resources sites have been recorded in the RAA. and of that 11 sites were identified within the MacLellan PDA and LAA. Marcel Colomb First Nation has also reported multiple burial sites in the RAA and stated that Goldsand Lake is a culturally important area that may house burial sites. Additionally, Manitoba Metis Federation identified access routes, campsites, and cultural sites within 100 km of the Project sites including a cemetery with Métis affiliation located near Lynn Lake.

Each of the First Nations engaged are signatories to one of the following historical treaties; Adhesions to Treaty No. 5, Treaty No. 6 or Treaty No 10. The terms of each treaty differ but generally stipulate that First Nations have the right to hunt, trap, fish, and gather resources in their traditional territory until lands are taken up for development or settlement. Métis Nations engaged on the Project have Indigenous rights as affirmed by Section 35(1) of the *Constitution Act.* The harvesting rights of the Manitoba Métis Nation are codified in the Manitoba Metis Federation Metis Laws of the Harvest.

5.17.2 Environmental Effects

5.17.2.1 Change to the Environment

Changes to Indigenous peoples were characterized based on:

- changes to Indigenous health conditions
- changes to Indigenous socio-economic conditions
- changes to Indigenous physical and cultural heritage
- changes to current use
- changes to Indigenous or Treaty Rights.

During construction, changes to Indigenous health conditions, socio-economic conditions, physical and cultural heritage, current use and Indigenous or Treaty Rights are related to site preparation, transportation, infrastructure, water development, and mine components, including emissions, discharges, and wastes. During operation, changes are related to the presence of Project infrastructure and mine operations,

including tailings management at the MacLellan site and the storage/stockpiling of ore, mine rock, and overburden at both sites. During decommissioning/closure, effects are predominately related to active closure activities at both sites (i.e., emissions, discharges, and wastes). Other effects during all Project phases include effects related to transportation within the LAA (i.e., movement of trucks, equipment, supplies) and socio-economic effects related to employment and expenditures. Change in disposition of Crown land (Crown land taken up by the PDA) may affect the ability to exercise Indigenous or Treaty Rights or may also constrain the selection of Treaty Land Entitlement lands under the Manitoba Treaty Land Entitlement Framework Agreement.

5.17.2.2 Mitigation Measures

The mitigation measures presented below are proposed to avoid or reduce Project-related effects on Indigenous Peoples and are applicable for both Project sites.

Key mitigation measures which will be implemented to reduce changes in Indigenous health include:

- Avoidance through Project design.
- Avoidance through timing of Project activities and potential scheduling of construction during periods of lower sensitivity or least effect.
- Incorporation of plant species of interest to Indigenous communities into rehabilitation plans where appropriate and technically feasible.
- Signage.
- Ongoing engagement with Indigenous communities regarding their concerns, mitigation of potential Project effects on TLRU, and potential monitoring opportunities.
- Design for implementation of work schedules for Project construction workers (12 hours per day, seven days per week) will deter workers from hunting and fishing locally outside of working hours during a shift.
- Development and implementation of Project-specific environmental management and monitoring plans, and discussion with Indigenous communities regarding these plans.
- Implementation of the additional mitigation measures outlined in Sections 5.8.2.2, 5.9.2.2, 5.10.2.2, and Section 5.13.2.2.

Mitigation measures which will be implemented to reduce adverse changes in Indigenous socio-economic conditions include:

- Engagement of local land and resource users (e.g., Indigenous guides), affected tenure holders (trappers), and the Town of Lynn Lake to address, to the extent possible, issues related to the removal

and inaccessibility of lands and resources within the PDA at Project sites, including the restriction in use of the Gordon site access road.

- Engagement of with local resource users (hunters, outfitters, trappers, anglers) and MCC Regional Officials as described in 5.13.2.2.
- Continued collaboration with Indigenous communities and continued work towards potential training and education partnerships with Manitoba Keewatinowi Okimakanak Inc, the Northern Manitoba Sector Council, and Atoskiwin Training and Employment Centre to provide opportunities for Indigenous people to obtain skills and training required for Project participation.
- With Alamos's support, Marcel Colomb First Nation has previously facilitated activities intended to increase Indigenous cultural awareness for Project employees. Alamos will continue to engage with Marcel Colomb First Nation in supporting development and presentation of these activities and events.
- Workers will be prohibited from bringing firearms and fishing gear to the sites while working as described in 5.13.2.2.
- Alamos will communicate the schedule of Project activities throughout the construction, operation, and decommissioning/closure phases to affected Indigenous communities.
- Development and implementation of Project-specific environmental management and monitoring plans, and discussion with Indigenous communities regarding these plans.
- Implementation of the mitigation measures for site security, worker transportation, and work scheduling as described in 5.12.2.2.
- Implement standard construction procedures and a Traffic Management Plan to reduce traffic delays during construction. The Traffic Management Plan will be developed during ongoing planning and engineering design to address traffic staging to reduce delays.
- If during operation workers and their families relocate to Lynn Lake, Alamos will collaborate with the Town of Lynn Lake and surrounding Indigenous communities to discuss appropriate monitoring or management plans to address draws on services.
- Alamos is in discussions with Manitoba Infrastructure regarding the need for upgrades to PR 391 and/or weight exception requirements to support the Project.
- Design to enhance potential positive effects as described in 5.11.2.2.

Key mitigation measures which will be implemented to reduce changes to Indigenous physical and cultural heritage include:

- Consideration of mitigation measures proposed by Indigenous communities.
- Ongoing engagement with Indigenous communities regarding their concerns, mitigation of potential Project effects on traditional land and resource use, and potential monitoring.

- Development and implementation of Project-specific environmental management and monitoring plans, and discussion with Indigenous communities regarding these plans.
- Implementation of the mitigation measures for heritage resources as described in 5.14.2.2.
- Training of staff in the recognition of archaeological features and objects such as precontact Indigenous material culture, and 19th and 20th century Euro-Canadian material culture.
- Review the potential and documented historical use and occupation of the PDA and LAA with staff.
- Potential for the hiring of Indigenous field support staff as part of an environmental monitoring team.

5.17.2.3 Residual Effects

Indigenous health conditions may be affected by changes in the availability of country foods and value or perceived quality of country foods. The availability of country foods within the PDA is currently limited by the former mine sites. The Project will result in approximately 1,210 ha of upland and wetland disturbance in the PDA and is expected to increase wildlife mortality and habitat loss for wildlife, fish, and plants within the PDA. Although vehicular collisions and human-wildlife conflicts may result in mortality for a few individual animals, the health of harvested resources at a population level is not anticipated to change within the RAA. The health risks associated with inhalation and ingestion exposures to COPCs and noise levels are below applicable guidelines and are not expected to cause human health effects.

Residual effects to Indigenous socio-economic conditions are anticipated to Indigenous peoples living and working within the LAA and RAA. Project construction may affect, restrict, or change the land base available for recreational activities, including hunting and fishing. Project construction and operation may change Indigenous socio-economic conditions through the loss of land area, restriction of access to designated lands and competition with additional recreational land users, thereby affecting commercial trapping, and guiding hunters that Indigenous peoples engage in. Portions of Pukatawagan Registered Traplines 30, 32, 36, and YTC will be removed through development of the PDA and Registered Traplines adjacent to the PDA may also be affected by Project related dust and noise. Construction activities and equipment can also affect recreational and cabin users in the LAA through sensory disturbance affecting the quality of the recreation experience. Visual quality within the LAA is also expected to change overall with the Project, as portions of the ore stockpile, overburden stockpile, and mine rock storage area at MacLellan site will be visible from viewpoints within the LAA. The Project will not place additional demands on power, water, and wastewater services and infrastructure; however, Traffic volumes however are expected to increase as a result of the Project, particularly along PR 391 between the Gordon and MacLellan sites, resulting in residual effects on traffic volumes for Marcel Colomb First Nation members who reside in Black Sturgeon Reserve. Bussing of workers to and from the job sites is anticipated to reduce overall vehicle traffic on PR 391. Recognizing that the Indigenous population represents 40% of Lynn Lake's labour force and just over 37% of the RAA labour force, Indigenous people may experience temporal and financial effects as a result of the Project, including increased income during construction and operation and loss of employment at closure, resulting in both positive and adverse effects related to wellbeing and social cohesion.

Residual effects to Current Use and Indigenous physical and cultural heritage are described in Sections 5.14 and 5.15. The Project is expected to affect the availability of lands and resources for traditional use, access to lands and resources for traditional use, cultural and spiritual sites and the cultural values or importance associated with traditional land and resource use. The Project is expected to directly interact with physical and cultural heritage sites and areas through the physical removal of, or changes to, features and indirectly through Project-generated emissions.

Impacts to Indigenous or Treaty rights are related to changes to the availability of resources, changes in access to resources, changes to areas of cultural importance, and changes to the conditions that support the exercise of Indigenous rights. Where the Project has a residual effect on Current Use, as described in Section 5.15, that has been considered as a residual effect on Indigenous or Treaty rights. Residual effects on fish, wildlife, and plant species health are anticipated as described in Sections 5.8, 5.9, and 5.10, potentially impacting Indigenous and Treaty rights related to consumption of those resources; however, effects are not anticipated at population levels. Residual effects on Indigenous socio-economic conditions are anticipated such as impacts to fishing, trapping, and recreation as described in Section 5.11, potentially impacting the ability to exercise Indigenous or Treaty Rights; however, it is anticipated that the exercise of these rights will be able to continue at similar levels as under baseline conditions. Residual effects to Indigenous physical and cultural heritage are also anticipated as described in Section 5.14 and 5.15. Visual quality within the LAA is expected to change overall with the Project, and sensory disturbances are also likely, potentially impacting the exercise of Indigenous or Treaty Rights.

Significance of Residual Effects

With mitigation and environmental protection measures, the residual environmental effects on Indigenous peoples with respect to health, socio-economic conditions, current use, and physical and cultural heritage are predicted to be not significant. A significance determination for residual effects on Indigenous or Treaty Rights has not been undertaken as part of the EIS however the severity of impacts are characterized in keeping with IAAC's *Interim Guidance: Assessment of Potential Impacts on the Rights of Indigenous Peoples*. Results of the assessment, including characterization and significance determination of residual effects are presented in Appendix A; Table A-1.

5.18 SUMMARY OF RESIDUAL EFFEECTS

Project residual effects were determined for 14 VCs including: atmospheric environment, acoustic environment, groundwater, surface water, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, labour and economy, community services, infrastructure and well-being, land and resource use, heritage resources, current use of lands and resources for traditional purposes, human health, and Indigenous peoples. The summary of this assessment is included in Appendix A; Table A-1.

Based on the results of the environmental assessment, including implementing the identified mitigation measures, the Project as planned will not result in significant adverse residual environmental effects.

5.19 CUMULATIVE EFFECTS

The project residual effects may interact cumulatively with residual environmental effects from other physical activities (past, present, and future reasonably foreseeable). The assessment of cumulative effects is initiated with a determination of whether two conditions exist:

- The Project has residual environmental effects on the VC, and
- The residual effects could act cumulatively with residual effects of other past, present, or reasonably foreseeable future physical activities.

Past, present, and reasonably foreseeable future projects/ physical activities include mineral development, mineral exploration, water and waste projects, residential and community development, infrastructure development, traditional land and resource use, and recreation activities.

5.19.1 Atmospheric Environment

Cumulative effects on air quality depend on the proximity of the Project to the other facilities. Changes in air quality associated with an industrial facility tend to be the greatest near the facility and decrease with increasing distance from the facility area. Activities such as traditional land and resources use, hunting, outfitting, trapping, fishing, and recreation activities have negligible air and GHG emissions. Future mineral development activities are located further than 10 km from the Project and therefore, are not expected to have an overlapping effect with the Project with respect to air quality. The reasonably foreseeable mineral exploration activities in Lynn Lake and the surrounding area include claim staking and advanced exploration. Claim staking activities have negligible air and GHG emissions. Air emissions (primarily PM emissions) associated with advanced exploration are short in duration and much smaller in magnitude than Project emissions and are not expected to overlap with the maximum model predicted ambient air quality concentrations associated with the Project emissions. Overall, the potential cumulative effects of the Project and other reasonably foreseeable emission sources on air quality and GHG are considered negligible.

5.19.2 Noise and Vibration

There are no cumulative noise or vibration effects with past projects and activities because the effects cease after the activities are completed and there is no temporal overlap with Project effects.

For current projects, the existing sound level described in the baseline conditions for acoustic environment considers existing activities resulting in noise emissions (i.e., residential, industrial, commercial, and natural environment) in the RAA; therefore, the contribution of existing projects and activities are considered in the assessment of Project residual effects. For future projects, mining development is the only activity likely to generate substantial noise and vibration emission but would be at sufficient distance from the Project that an overlap in effects is unlikely. Cumulative noise and vibration effects from a future project or activity are therefore not anticipated.

5.19.3 Groundwater

The Project involves the redevelopment of at least a portion of the Farley Mine (historical) and MacLellan Mine (historical); therefore, the cumulative effect of the Project with the Farley Mine (historical) and MacLellan Mine (historical) is included in the assessment of change in groundwater quantity and quality (i.e., effect of the proposed Project on baseline conditions) and are not discussed further as a cumulative effect.

For future projects, groundwater effects would be located in different sub-watersheds than the Project and occur at a distance of more than 2 km from the boundaries of the RAA and are not expected to have measurable cumulative effects on groundwater quantity or quality. With the implementation of current best management and design mitigation measures, the Project is not anticipated to result in residual effects on groundwater quantity beyond the immediate vicinity and therefore cumulative effects with the Project on most future projects or activities are not anticipated. Effects on groundwater quantity from Water and Waste Projects, Residential and Community Development, and Infrastructure Development would be restricted to possible temporary dewatering required during construction only. The magnitude of drawdown is anticipated to be low due to the limited depths that these types of infrastructure are typically installed. Given this, no cumulative effects with future projects and/or activities are anticipated.

5.19.4 Surface Water

Current and past activities have already affected surface water quantity in the RAA; the effects of these past and present projects on surface water are therefore captured in the baseline water quantity datasets and analysis. Short-term effects to surface water quantity are anticipated to decrease with increasing downstream distance from the sites. Short-term effects to surface water quantity are anticipated to decrease with increasing downstream distance from the sites. At the Gordon site, lake levels at Ellystan Lake are anticipated to experience negligible effects from the Project. At the MacLellan site, short-term effects from the Project are low or negligible at QM06 along the Keewatin River and at QM11 along the Cockeram River; therefore, downstream of these points do not have the potential for cumulative environmental effects. Long-term substantial effects to surface water quantity are anticipated to be limited to the LAA at the Gordon site and the PDA at the MacLellan site once the open pits have completed filling.

For water quality, Project residual effects do not extend beyond the Gordon and MacLellan LAAs; therefore, cumulative effects have not been identified beyond the LAA. Other nearby projects (e.g., Ruttan Mine and Fox Mine) are outside of the RAA and therefore cumulative effects to water quality are not anticipated. There are also several community sewage treatment plants or on-site sewage treatment systems that could produce effluent containing nutrients; however, these facilities are outside of the LAA. Future mineral exploration or mining project developments could contribute nutrients and metals to the local downstream aquatic environment; however, any effects to water quality from other projects would likely be outside of the Project LAAs. Given the absence of spatial overlap described above, future projects are not expected to interact cumulatively with Project residual effects to changes in water quality.

5.19.5 Fish and Fish Habitat

Project residual effects on fish health, growth, and survival were limited to within the LAA. Past and present resource activities (such as hunting, fish, and berry picking) and physical activities such as traditional land use, resource use activities, and recreation are not likely to have measurable residual effects on surface water quality and, thus, are not expected to interact cumulatively with Project effects on fish health, growth or survival. Some past and current activities have already changed surface water quality in the RAA (e.g., Farley Lake Mine (historical) and MacLellan Mine (historical); these effects are reflected in the water quality, fish, and fish habitat datasets for the Project and captured in the surface water quality assessment. For infrastructure effects, there are several community sewage treatment plants or on-site sewage treatment systems that could produce effluent containing nutrients and metals, having a cumulative effect on fish health, growth, or survival; however, these facilities are outside of the LAA. Future mineral exploration or mining project developments could also contribute nutrients and metals to the local downstream aquatic environment; however, these effects are also outside of the Project LAAs. For recreation activities, there is an annual fishing derby held on Burge Lake which could have cumulative effects on fish; however, Burge Lake is located upstream of the Gordon site and no Project residual effects are expected in this area. Overall, the potential cumulative effects of the Project and other reasonably foreseeable future projects and activities on fish health, growth, and survival are not anticipated.

5.19.6 Vegetation and Wetlands

Expansion of ongoing projects and future projects may interact cumulatively with the Project as a result of vegetation clearing, wetland clearing, dust creation, and alterations to surface run-off and groundwater inputs to wetlands. Clearing of vegetation and dust creation in addition to what is proposed by the Project may fragment habitat patches, reduce patch area, increase patch perimeter, reduce native upland and wetland plant community area and change plant community composition, affecting landscape and community diversity. It is expected that ongoing and future projects will be developed using standard mitigation measures to reduce cumulative effects to landscape diversity. With the implementation of mitigation measures, it is anticipated that cumulative effects on landscape and community diversity will be low in magnitude because the landscape within the RAA is relatively intact and it is unlikely that large habitat patches will be lost from the RAA. Expansion of ongoing projects and future projects may also lead to an indirect loss of species diversity due to the introduction and spread of regulated weeds and dust deposition resulting in a reduction of native upland and wetland plant community area, affects to SOCC habitat, competition with regulated weed species and reduced productivity. With the implementation of standard mitigation measures, cumulative effects on species diversity are predicted to be medium to high in magnitude because the location and abundance of SOCC is unknown. Cumulative effects on wetland function may occur from future mineral development and residential development, resource use and recreation, which will result in a reduction of wetland area from the RAA, in addition to what is planned by the Project. Cumulative effects on wetland functions are predicted to be low in magnitude because the landscape within the RAA is largely intact, wetlands occupy more than 35% of the RAA, and no wetland class or community type would likely be lost as a result of cumulative effects.

5.19.7 Wildlife and Wildlife Habitat

Past, present, and reasonably foreseeable future projects and activities have the potential to result in a cumulative increase in wildlife habitat loss or alteration from direct loss through vegetation clearing and dewatering activities or indirectly through sensory disturbance and edge effects. Past and present projects affect 340 ha (2%) of land in the LAA and <1% in the RAA. The residual effects on wildlife habitat from future physical activities are anticipated to be minimal given that the RAA has been subject to a relatively low amount of anthropogenic disturbance in the past and the and reasonably foreseeable future activities and projects are not at a scope or scale that would cause a substantive contribution to the direct and indirect loss or alteration of wildlife habitat in the RAA, including for SAR and SOCC. The residual cumulative effects resulting from traditional land use, resource use activities, and recreation, site preparation activities, and increased traffic could contribute to a minor increase in wildlife mortality risk in the RAA beyond existing conditions. Given the short-term nature of exploration trails, the Project's mitigation to reclaim the PDA following closure and implement road safety measures, the Project's cumulative contributions to mortality risk in the RAA are anticipated to be minor.

5.19.8 Labor and Economy

Should future mineral development and exploration occur within the RAA and transition into completion or decommissioning/ closures phases at the same time as the Project (13 years from the beginning of Project construction), it is possible that cumulative losses of direct employment, increased demand for labour, upward pressure on wages, loss of spending on goods and services and losses in GDP contributions to the economy could occur. Given the size of the RAA labor force, and with the implementation of the proposed mitigation measures, these cumulative effects are anticipated to be low magnitude and short-medium term in duration. It is highly likely that should other projects and physical activities overlap temporally and spatially with the Project, cumulative positive effects on local and regional labour forces, businesses and economy would occur.

5.19.9 Community Services, Infrastructure, and Wellbeing

Past and present projects and activities have been included in the baseline conditions and assessment for community services, infrastructure, and wellbeing. Future projects and physical activities may act cumulatively with the Project if they occur at the same time as the Project and require the temporary presence of a workforce in the RAA communities. It is anticipated that the Project work camp will accommodate the entire Project workforce and associated infrastructure (i.e., water, sewer, power, emergency services) with spare capacity, and is not likely to compete with other projects; therefore, residual cumulative effects in the RAA are likely to be negligible. It is anticipated that the workforces associated with local services and infrastructure activities (water and waste projects, residential and community development) are likely to be local and relatively small and will have an overall benefit to infrastructure services through increased future capacity, therefore adverse effects are negligible. For community wellbeing, low magnitude cumulative increases in the RAA's population and individual and household income could occur, resulting in negligible magnitude changes in population and individual and household income within the RAA. This is largely because a FIFO/DIDO workforce, which will be lodged in an accommodation camp and will return to home communities following completion of work rotations.

5.19.10 Land and Resource Use

With respect to change in land use, there are no developments in the RAA that spatially and temporally overlap with the Project's residual environmental effects. Resource use and development in the RAA is limited to mineral development at the Gordon and MacLellan sites and other mineral exploration activity (i.e., claim staking) outside of these sites. No timber harvest through the allocation of timber sales or timber leases are present in the RAA. Future projects and activities have the potential to interact cumulatively with the Project with respect to the degradation of recreational opportunities, activities, disturbance and nuisance effects, and restriction of access; however, there is limited interaction potential in the RAA overall for cumulative effects on recreation since there is sufficient area within the RAA for these activities to occur in the future. Overall, cumulative effects to recreation are considered low. For resource use, cumulative effects may occur from future mineral exploration activities, including degradation and disturbance effects due to noise disturbance, damage to areas and sites, visual aesthetics, as well as change in access and loss of wildlife habitat; however, the potential for cumulative interactions is limited given the lack of reasonably foreseeable future projects and activities and given the remaining area within the RAA for these activities to occur in the future. For mineral resources, future mineral exploration activity within the RAA, should it occur, can cause degradation and disturbance effects during site development causing a low magnitude cumulative effect for the life of the project.

5.19.11 Heritage Resources

It has been concluded that the Project will not have residual effects on heritage resources at either the Gordon or MacLellan sites. Therefore, since there are no residual effects, there are no cumulative effects.

5.19.12 Traditional Land and Resource Use

The potential for cumulative effects associated with past and ongoing projects and activities is addressed in the assessment of Project effects on baseline conditions for the VCs most related to traditional land and resource use and discussed above (e.g., wildlife and habitat, fish and fish habitat, land and resource use). The effects of future projects and activities may interact cumulatively with the residual effects of the Project by affecting resource use activities (e.g., hunting and trapping), access to resources or spiritual or cultural sites, or indirectly effecting cultural value. Activities that can affect traditional land and resource use include developments that involve land clearing, construction of infrastructure, waste management, and the use of heavy equipment causing sensory disturbances. The Project will affect availability and access to resources through increased risk of wildlife mortality by vehicular collisions, human interactions, habitat loss for wildlife by vegetation clearing (<1% of the RAA) and sensory disturbance, potential loss of fish habitat and plants by vegetation clearing during construction. Future projects and activities may further affect traditional resources or access; however, the effect is anticipated to be low magnitude.

5.19.13 Human Health

Potential human health risks associated with past and present projects and physical activities in the LAA have been captured in the baseline assessment. For future projects and activities, pathways for residual cumulative effects on human health include changes in air quality and water quality, affecting human exposure through ingestion, inhalation, and dermal exposure. The air quality assessment determined that the Project cumulative effects with other reasonably foreseeable projects and activities was negligible. The surface water quality assessment determined that there was no potential for cumulative effects given that any effects to water quality from other projects would likely be limited to areas outside of the Project LAAs and would not overlap spatially. In the absence of cumulative effects between the Project and other projects and activities on air quality or surface water quality, there is no potential for cumulative effects on human health from the Project or other reasonably foreseeable projects.

5.19.14 Indigenous Peoples

The Project will affect Indigenous health conditions by reducing the availability of harvested species and altering access to areas where country foods are harvested. The residual effects of future mineral exploration and mineral development activities may act cumulatively with the residual effects of the Project to result in changes to the availability of harvested species, access to country food harvesting areas and potentially the perceived value of country food. Cumulative effects on surface water quality are not anticipated as Project residual effects will not overlap spatially with the effects of other foreseeable projects. The effects of future projects and activities also have the potential to interact with the Project's residual effects and increase demands on community infrastructure and services which could result in a cumulative reduction in available capacity and/or quality of services for Indigenous peoples living within the LAA; however, the labour forces required for future projects and activities are likely to be local and relatively small. For future community service and infrastructure projects, users generally benefit as these projects will increase capacity of local services and infrastructure and the Project is not expected to compete with other projects for services and infrastructure since power, water, and wastewater infrastructure for the Project will be built by Alamos. Cumulative effects on cultural and spiritual sites are not anticipated, as the Project does not directly interact with sites or areas, however an increase in noise, dust and light, resulting in altered cultural experiences may interact cumulatively with future projects and activities.

5.19.15 Results of Cumulative Effects Assessment

Taking into account the findings of the environmental assessment, including implementing the identified mitigation measures, it has been concluded that the Project is not likely to cause significant adverse cumulative effects.

6.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

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 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 assessment considered the following environmental forces, events, and conditions:

- Climate (including weather and its variables, such as temperature, precipitation, fog/visibility, winds, and extreme weather events).
- Climate change.
- Geologic hazards (including seismic activity, erosion, landslides, and subsidence).
- Forest fires.

6.1 CLIMATE AND CLIMATE CHANGE

Existing climate conditions in the region include a mean annual temperature of -3.2 °C with minimum and maximum monthly mean temperatures of -8.6°C and 16.2°C, respectively. The total average annual rainfall was estimated at 318 millimeters (mm) and the total average snowfall at 208 centimeters (cm) (ECCC 2019a). On average, the region experiences approximately 77.4 hours (3.2 days) per year when visibility is less than 1 km due to fog. The maximum hourly wind speed in the region is 13.9 m/s, observed in June. Extreme weather events considered in the assessment include severe storms, tornadoes, flooding, landslides, and wildfires. Climate change predictions for the region indicate that the mean annual temperature in the area is predicted to increase by 1.8°C. The projected mean annual precipitation for the area is expected to increase from 463.5 mm to 491.4 mm; this represents a 6% increase in precipitation.

Climate change effects on the Project include:

- Damage to Project infrastructure and equipment (e.g., increased structural loading).
- Additional effort for snow clearing and removal.
- Reduced visibility and inability to manoeuvre equipment.
- Delays to construction activities.

- Reduced site accessibility for workers.
- Interruptions to Project operation, and product delivery to market.

The following mitigation measures will be implemented to mitigate potential effects of climate and climate change:

- The Project will be designed and constructed to meet applicable engineering codes, standards, and best management practices. These include applicable building safety, industry codes, and standards for weather variables such as climate and weather, including the *National Building Code of Canada*.
- Project design will consider normal and extreme weather conditions that may arise and will include measures for climate adaptation. For example, power equipment, including distribution lines, wires, and conductors, would be designed and rated for climatic conditions that can reasonably be expected over the life of the Project.
- Delays due to poor weather or additional effort for snow clearing/removal will be anticipated and can sometimes be predicted. Allowance for these events will be included in the construction schedule. It is not anticipated that they would substantially affect the Project schedule beyond delays that reasonably be expected.
- Mining, administration, and processing plant staff offices will be close together to limit walking distance during extreme cold weather.
- The potential effects of extreme weather, including storms, precipitation, flooding/ice jams, and drought will be considered in Project design and operation, including the selection of materials and equipment.
- The tailings management facility (MacLellan site) is equipped with an emergency spillway to allow safe routing of increased flows due to precipitation. The design flooding event for the operation of the Project was selected as 1/3 between the 1 in 1000-year and the probable maximum flood, according to the Canadian Dam Association (CDA) Dam Safety Guidelines. The design flooding event for the closure (passive care) phase of the Project was selected as 2/3 between the 1 in 1000-year and the probable maximum flood.
- Environmental management plans will be implemented, including a groundwater management plan, a surface water monitoring and management plan, and an erosion and sediment control plan.
- Regular maintenance and safety inspections will be conducted on Project infrastructure and equipment.
- An emergency response and spill prevention and contingency plan will be implemented, including measures prescribed for the provision of emergency response planning, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.
- The proponent will monitor observed effects of the environment on the Project and will take action to maintain, repair and upgrade infrastructure/equipment, as required.

Although it is likely that Lynn Lake will experience extreme weather conditions during the life of the Project and residual effects related to project delays, the potential adverse effects on the Project during these events have been taken into consideration by Project design and planning. Therefore, substantive changes to Project schedule or damage to Project infrastructure from climate and climate change are not anticipated.

Potential effects of climate and climate change on the Project has the potential to result in damage to Project infrastructure and equipment (e.g., water control structures and dams) which could therefore result in effects to the environment (e.g., releases to surface water and fish habitat). Adverse environmental effects from the malfunction of Project infrastructure is assessed in Section 7.0.

6.2 GEOLOGICAL HAZARDS

Existing conditions for geological hazards were outlined in the assessment. It was determined that Manitoba is the province least likely to experience earthquakes in Canada with the entire province is classified as “low” for seismic hazard (NRCan 2015). The regional landscape surrounding the Project is flat to gently undulating, limiting the potential for geotechnical hazards associated with steep slopes, such as landslides. Field investigations identified both the Gordon site and the MacLellan site as being at high risk for wind erosion and low risk for water erosion and irregular topography related to thaw subsidence was identified at the Project site.

Geological hazards that may impact the Project include:

- Seismic activity could interrupt Project operation or result in damage to Project infrastructure.
- Susceptibility to landslides, although recent studies suggest low susceptibility of materials to landslide in the PDAs (Bobrowsky and Dominguez 2012).
- The failure of erosion and sedimentation control structures and the risk of wind and water erosion occurring at the Gordon site and the MacLellan site
- Subsidence which could cause damage to Project infrastructure or equipment, by weakening buildings and potentially causing building collapse or power outage, and by twisting/damaging roads and underground infrastructure such as pipes

The following mitigation measures will be implemented to mitigate potential effects of geological hazards:

- The Project will be designed and constructed to meet applicable engineering codes, standards, and best management practices. These include applicable building safety, industry codes, and standards for geologic hazards, including the *National Building Code of Canada*, which provides standards of safety to account for seismic activity, and will form the basis of design and construction of the Project.
- The tailings management facility and dams will be founded on bedrock.

- The tailings management facility dams are designed to withstand a 1 in 2,475-year seismic event during operation, and ½ between a 1 in 2,475-year and a 1 in 10,000-year event for passive closure, according to the CDA Dam Safety Guidelines.
- Regular maintenance and safety inspections will be conducted on Project infrastructure and equipment.
- An emergency response and spill prevention and contingency plan will be including measures prescribed for the provision of emergency response planning, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.
- The proponent will monitor observed effects of the environment on the Project, and will take action as required to maintain, repair and upgrade infrastructure/equipment as required.
- An investigation of the nature, degree and extent of permafrost will be conducted to support the final infrastructure siting and design.

The potential effects of geologic hazards, including seismic events, landslides, erosion, and subsidence will be considered and incorporated into the planning, design, construction, operation, and decommissioning/closure of the Project to reduce the potential for long-term damage to infrastructure and equipment, and changes to construction or operation of the Project. With the application of the mitigation measures listed above, substantial residual effects of geologic hazards on the Project are not anticipated.

Potential effects of geological hazards on the Project has the potential to result in damage to Project infrastructure and equipment (e.g., slope failures) which could therefore result in effects to the environment (e.g., releases to surface water and fish habitat). Adverse environmental effects from the malfunction of Project infrastructure is assessed in Section 7.0.

6.3 FOREST FIRES

Baseline forest fire risk was characterised using the mean fire weather index in Lynn Lake, when the risk of forest fires is highest (June to August), which ranged from 5-10 (from 1981 to 2010). This is in the lower range of possible forest fire risk, the lowest being 0-5 and the highest being a rating over >30 (NRCan 2019).

Forest fires could potentially result in the following effects on the Project:

- Reduced visibility due to smoke, causing difficulty in maneuvering equipment on site or delays in the receipt/delivery of materials.
- Delays in project schedule.
- Damage to infrastructure, equipment, or roads.
- Safety issues for personnel or render the site inaccessible to workers (e.g., at present, there is only one road leaving Lynn Lake).
- Loss of electrical power, and subsequent loss of production.

The following mitigation measures will be implemented to mitigate potential effects of forest fires:

- The *National Fire Code of Canada* and the Manitoba *Fires Prevention and Emergency Response Act* will be adhered to.
- Regular maintenance and safety inspections will be conducted on Project infrastructure and equipment.
- An emergency response and spill prevention and contingency plan will be implemented, including measures prescribed for the provision of emergency response planning, training, responsibilities, clean-up equipment and materials, and contact and reporting procedures.
- First response firefighting activities will be conducted by the mine rescue team using on-site water trucks and emergency medical services equipment.
- Onsite fire prevention and response equipment will be provided and maintained, and employees will be trained in safe fire response.
- Work procedures and Project schedules will be adjusted in case of a severe fire, including mine shut down and evacuation in the event of a forest fire.

Mitigation listed above will reduce the potential effects that forest fires could have on Project schedule and/or Project infrastructure and components. If a forest fire were to occur close to the Project, emergency measures would be implemented quickly to control and/or extinguish the fire prior to contact with Project components. Given the mitigation above, substantial delays to Project schedule or damage to infrastructure are not anticipated as a result of forest fires.

Potential effects of forest fires on the Project has the potential to result in damage to Project infrastructure and equipment, which could therefore result in effects to the environment (e.g., socio-economic effects related to mine shutdown). Adverse environmental effects from the malfunction of Project infrastructure is assessed in Section 7.0.

6.4 RESIDUAL EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Based on the assessment of existing conditions, potential effects, mitigation measures, and residual effects characterization, there were found to be no environmental attributes that, during the Project, are anticipated to have the potential to result in:

- A substantial change to the Project construction schedule (e.g., a delay resulting in the construction period being extended by a construction season).
- A substantial change to the Project operation schedule (e.g., an interruption in servicing such that annual production targets cannot be met).
- Substantial damage to the Project infrastructure resulting in increased safety risk,

- Substantial damage to the Project infrastructure resulting in adverse effects to the environment, or
- Substantial damage to the Project infrastructure resulting in repairs that could not be technically or economically implemented.

Therefore, the residual effects of the environment on the Project during construction, operation, and decommissioning/closure of the Project are not significant.

7.0 EFFECTS OF POTENTIAL ACCIDENTS AND MALFUNCTIONS

7.1 POTENTIAL ACCIDENTS AND MALFUNCTIONS

The Project is inherently designed to prevent accidents and malfunctions primarily through adherence to accepted design codes and standards. Most accidental events that could be expected to occur are small spills that are easily cleaned up on site with little or no environmental consequences. Emergency response and contingency plans will be advanced and implemented to effectively respond to accidents and malfunctions to reduce the magnitude and duration of adverse environmental and social effects.

Potential accidents and malfunctions that have been assessed include:

- Malfunction of the TMF which could lead to the release of untreated tailings solids and water.
- Malfunction of the seepage and contact water collection system and site water management pond which could lead to the release of untreated contact water into the receiving environment.
- Malfunction of a component of the processing system which could result in the release of liquids, reagents, or gases.
- Malfunction of the sewage treatment system which would result in the release of untreated effluent, domestic sewage, or reagents. Failure of the treated effluent discharge pipeline would also result in the release of treated effluent.
- Failure of the storage and dispensing facilities for gasoline and diesel fuels which would result in the release of petroleum-based pollutants. Failure of the on-site storage and handling facilities for hazardous materials which would result in the release of these materials. Collision or mechanical malfunctions involving construction equipment, mining equipment, or transport trucks which may result in the release of hazardous materials such as mill reagents, hydraulic fluid and fuel, or other non-hazardous materials such as construction material.
- Slope failure in the open pit which would result in areas adjacent to the open pit slumping into the open pit, and potential unintended expansion of the Project footprint.
- Slope failure of the materials storage area which would result in the release of mine rock, overburden, or ore outside the storage areas.
- Uncontrolled or unmanaged blasting which would cause damage resulting from dust and fly rock extending beyond defined boundaries and resulting in excess noise and vibration to the surrounding properties.

- A fire or explosion which may result in the destruction of Project infrastructure and vegetation and natural features within or beyond the PDAs, and the release of smoke, combustion gases and ash.
- Accidental collisions from the operation of Project vehicles or heavy equipment which could result in human or wildlife mortality or injury.

Of the accidents and malfunctions assessed, five events were identified as having potential to cause a residual adverse effect on VCs, if they occurred, and were further assessed, including:

- Tailings Management Facility Malfunction
- Release of Untreated Contact Water
- Spills from Vehicle Malfunctions or Transportation Accidents
- Ore, Overburden, and MSA Slope Failure
- Vehicle Accidents.

7.2 EMERGENCY RESPONSE MEASURES

The preliminary emergency response measures and capacities for the scenarios described below will be further developed during detailed Project design. Emergency response measures will be prepared in accordance with federal and provincial legislation and guidelines, and corporate policies and procedures for the protection of human health and the environment (including species at risk). Measures will be prescribed for the provision of emergency response planning, training, responsibilities, cleanup equipment and materials, and contact and reporting procedures.

7.2.1 Tailings Management Facility Malfunction

For its construction, the TMF is designed to mitigate for malfunctions with the presence of collection ditches and sump pits. Liquid tailings would be collected by collection ditches and sump pits and pumped back into the TMF. TMF dam design was derived in consideration of the tailing deposition and water management plans.

During operation, the implementation of a systematic performance monitoring program is critical to maintaining the physical integrity of the dams and ancillary structures at the TMF. Such a program will include environmental monitoring together with regular visual inspections of the facility and monitoring of piezometric levels within the containment dams.

The likelihood of a TMF dam failure will be assessed during detailed Project design; however, Alamos will develop contingency planning and implement engineering and quality controls during the design, construction, and operational phases to comply with applicable design standards and best practices.

In the event of a TMF dam failure, preliminary emergency response measures would include:

- Stop pumping tailings to the TMF.

- Stop pumping runoff from mine rock storage area to the TMF.
- Notification to authorities, emergency responders, local residents, and Indigenous communities.
- Notification to Engineer of Record.
- Develop a specific remedial action and monitoring plan for the event and initiate remedial action.

Additional information on preliminary emergency response measures and capacities will be further developed during detailed Project design. Emergency response measures will be prepared in accordance with federal and provincial legislation and guidelines, and corporate policies and procedures for the protection of human health and the environment (including species at risk). Measures will be prescribed for the provision of emergency response planning, training, responsibilities, cleanup equipment and materials, and contact and reporting procedures.

7.2.2 Release of Untreated Contact Water

An accidental release of contact water or seepage of contact water from the contact water collection system into the environment has potential to result in changes to groundwater, surface water and fish and fish habitat. In the event of the release of untreated contact water due to failure of the contact water collection system, where feasible, preliminary emergency response measures include pumping water back into the collection system and repairing the containment structure.

7.2.3 Spills from Vehicle Malfunction or Transportation Accidents

Several traffic safety measures will be implemented to reduce the potential for vehicle malfunctions or accidents as a result of the Project. These include, but are not limited to, the following:

- Project vehicles will be driven by trained and competent drivers who will use approved routes.
- Highway laws will be obeyed, including seasonal weight restrictions, speed limits, traffic signage and requirements for permit for oversized loads.
- Project vehicles will be manually inspected on a daily basis to confirm there are no problems.
- Mine roads will be properly constructed and maintained.
- Internal speed checks will be carried out by mine security.
- Mine vehicles will be required to have beacon lights and flagging.
- Radio controlled roads on MacLellan and Gordon sites.
- Access to the mine sites will not be permitted or public vehicles.

7.2.4 Ore, Overburden, and MRSA Slope Failure

Emergency response measures and standard operating procedures for slope failure will be developed during detailed Project design.

7.2.5 Vehicle Accidents

Several traffic safety measures will be implemented to reduce the potential for vehicle malfunctions or accidents as a result of the Project. These include, but are not limited to, the following:

- Project vehicles will be driven by trained and competent drivers who will use approved routes.
- Highway laws will be obeyed, including seasonal weight restrictions, speed limits, traffic signage and requirements for permit for oversized loads.
- Project vehicles will be manually inspected on a daily basis to confirm there are no problems.
- Proper construction and maintenance of mine roads.
- Internal speed checks will be carried out by mine security.
- Merging lines on highway turnoffs to mine sites, in coordination with Manitoba Infrastructure.
- Mine vehicles will be required to have beacon lights and flagging.
- Radio controlled roads on MacLellan and Gordon sites.
- Access to the mine sites will not be permitted or public vehicles.

7.3 RESIDUAL EFFECTS

7.3.1 Groundwater

A TMF malfunction could affect groundwater quality depending upon the magnitude of the failure and the time elapsed until cleanup. The effect on groundwater quality, as a result of a TMF failure, would extend from the TMF toward surface water features. Localized infiltration would be limited due to surface flow toward the Keewatin River and Minton Lake. Tailings solids may be deposited near the breach location and downgradient low-lying areas but will be cleaned up where possible to limit infiltration and long-term effects to groundwater.

A release of untreated contact water would have the potential to affect groundwater quality and has potential to affect groundwater and surface water quality where groundwater discharges to surface water. The release of untreated contact water is not predicted to be released to areas where groundwater supply users are identified. Residual adverse effects on groundwater are predicted to be moderate in magnitude, occur mainly in the PDA but may extend to the Groundwater LAA, short-term, and reversible.

7.3.2 Surface Water

A TMF malfunction would have the potential to affect water quality and quantity of nearby waterbodies, depending on the location of the leak or breach. If breached, the TMF could potentially release material into the Minton watershed, Payne Lake, and to the Keewatin watershed. Potential effects to Payne Lake may include substantial water quality and sediment quality alteration. Residual adverse effects on surface water are of high magnitude, potentially extending to the Surface water Regional Assessment Area (RAA) dependent on the magnitude of the malfunction, long-term and potentially irreversible within the PDA.

There are potential effects to surface water quality through excess seepage or accidental release of contact water from mine rock stockpiles, collection ditches, and/or from contact water collection systems. Waterbodies in the Surface Water/Fish and Fish LAA at the MacLellan site that could potentially be affected are Payne Lake, Lobster Lake, Minton Lake, Cockeram River, and the unnamed lakes both downstream and upstream of Minton Lake. Residual adverse effects to surface water are predicted to be low in magnitude, localized to the Surface Water/Fish and Fish LAA, short-term in duration, and reversible.

A vehicle collision or mechanical failure resulting in a spill of fuel or hazardous material that could cause a localized change in surface water quality if the event occurred near a waterbody. Residual adverse effects on surface water are predicted to be moderate to high in magnitude, limited to the Surface Water LAA, short-term in duration and reversible.

Mine rock has the potential to affect surface water quality if released into lakes and streams in the immediate vicinity and downstream of the Gordon and MacLellan sites in the event of a slope failure. Analysis of the results of preliminary geochemical testing indicate that the Project may result in the generation of mine rock that could have the potential for ARD and ML and associated changes to pH and release of contaminants. Residual adverse effects on surface water are predicted to be moderate in magnitude, localized to the Surface Water/Fish and Fish Habitat LAA, short-term, and reversible.

7.3.3 Fish and Fish Habitat

Malfunction of the TMF and release of tailings liquids and solids into these waterbodies could affect water quality and quantity, and result in sediment deposition in fish habitat, with consequent change in fish habitat, and potential change in fish health, growth, or survival due to lethal or sublethal effects. The primary causes of effects on fish and fish habitat would be related to changes in water and sediment quality, sediment deposition, and increased turbidity. There is potential for long-term toxicological effects to fish and benthic invertebrate communities from the take up of contaminants from the sediment given they live in and on the sediment. Residual adverse effects on fish and fish habitat are of high magnitude, potentially extending beyond the LAA, and be medium-term and potentially irreversible.

Given the low magnitude of adverse environmental effects to surface water quality, a release of untreated contact water would not be expected to result in lethal or sub-lethal effects on fish due to changes in water quality. Depending on the volume of contact water released, there is potential for the physical disturbance of fish habitat. Fish, including eggs, if present during the event, could be affected by sedimentation through

partial or total loss of a fish population, temporary changes in benthic community composition, and/or alteration of the availability of benthic food sources. Residual adverse effects on fish and fish habitat are predicted to be moderate in magnitude, limited to the Surface Water/Fish and Fish LAA, medium-term and reversible.

A vehicle collision or mechanical failure resulting in a spill of fuel or hazardous material near fish habitat may lead to localized fish mortality, or chronic or acute toxicity to fish populations which can result in changes in fish health, growth or survival (e.g., number of fish mortalities, fish tissue metal concentration, fish community composition). Residual adverse effects on fish and fish habitat are predicted to be moderate to high in magnitude, limited to the Fish and Fish Habitat LAA, short-term and reversible.

An unexpected increase in suspended solids from a slope failure into a water body has the potential to cause acute mortality in fish, with sediment deposition resulting in potential affects to spawning habitats. Mortality of fish would be a one-time event and risk of mortality is not anticipated to persist over time. Furthermore, fish communities would be anticipated to recover over time. Residual adverse effects on fish and fish habitat are predicted to be moderate magnitude, limited to the Surface Water/Fish and Fish Habitat LAA, short-term, and potentially reversible.

7.3.4 Vegetation and Wetlands

The release of tailings from TMF malfunction would cause the release of tailings into local vegetation communities, which may result in native plant communities being lost or altered and/or direct loss of wetland area or change in wetland form. Changes in water levels due to liquid tailings may also have a limited and temporary effect on vegetation and wetlands. Residual adverse effects on vegetation and wetlands are moderate to high in magnitude, within the Vegetation and Wetlands LAA, medium to long-term, and potentially irreversible depending on the effectiveness of reclamation.

A release of untreated contact water would have the potential to affect vegetation and wetlands, depending upon the magnitude of the failure and the time elapsed until cleanup. Effects may include direct loss or alteration of native vegetation communities, species of conservation concern or traditional use plant species. There is also potential for direct loss or alteration of wetland area or alteration of surface or groundwater flow patterns. Residual adverse effects on vegetation and wetlands are predicted to be moderate in magnitude, occur mainly in the PDA but may extend to the Vegetation and Wetlands LAA, short-term, and reversible.

A vehicle collision or mechanical failure resulting in a spill of fuel or hazardous material would have the potential to affect vegetation and wetlands. Effects may include direct loss or alteration of native vegetation communities, species of conservation concern or traditional use plant species. There is also potential for direct loss or alteration of wetland area or alteration of surface or groundwater flow patterns. Project-related transportation at both sites are not expected to interact with vegetation and wetlands because vegetation clearing will occur at the site preparation stage of construction for the entire PDA.

7.3.5 Wildlife

TMF malfunction may result in the direct loss or alteration of wildlife habitat, increased mortality risk, and/or changes to wildlife health. As noted above, there is potential for water quality to be affected in Cockeram Lake, which is used by waterfowl and ungulates (e.g., moose), and therefore may affect their habitat. Residual adverse effects on wildlife and wildlife habitat are moderate in magnitude, within the LAA, medium to long-term, and potentially irreversible.

Vehicle-related wildlife mortality has the potential to affect a wider range of species, including migratory birds, species at risk and species of conservation concern, and large mammals. Residual effects from a vehicle accident on wildlife is further described in Section 5.10.

7.3.6 Traditional Land and Resource Use

A release of tailings from the TMF has the potential to affect land and resource uses such as hunting, trapping, gathering, and fishing. Flooding and infilling caused by the release of liquid and solid tailings could temporarily restrict travel and resource use within the Land and Resource Use/Current Use LAA. This effect would dissipate once flood waters recede and solid tailings were remediated. Residual adverse effects on vegetation communities, fish and fish habitat, and wildlife and wildlife habitat could occur due to TMF malfunction, as described in the sections above. These effects could in turn affect land and resource use in the PDA and potentially the Land and Resource Use/Current Use LAA. Residual adverse effects on land and resource use are predicted to be moderate magnitude, limited to the Land and Resource Use/Current Use LAA, medium- to long-term and potentially irreversible.

In the event of a vehicle collision or mechanical failure resulting in a spill of fuel or hazardous material may affect the viability of, restrict access to, or cause loss of areas used for recreation or traditional use An effect on fish and wildlife habitat could result in localized reductions in fish and wildlife abundance, health or condition that could limit the quality of the fishing, trapping, and hunting resources within the PDA. However, land and resource use are not anticipated within the PDA during Project construction and operation. Residual adverse effects on land and resource use and traditional uses are predicted to be moderate magnitude, limited to the Land and Resource Use/Current Use LAA, short-term, and reversible.

A failure of a mine rock or overburden slope could affect fishing for recreational and traditional purposes and trapping (e.g., aquatic furbearers) in a localized area, should the affected area be used for such activities. Residual adverse effects on land and resource use and traditional uses are predicted to be low magnitude, limited to the Land and Resource Use/Current Use LAA, short-term, and reversible

7.3.7 Heritage Resources

The potential for effects on heritage resources may include disruption of known or unknown heritage sites and would depend upon the size and location of the TMF malfunction and the proximity to known and potential heritage resources. In a conservative assessment, residual adverse effects on heritage resources are not anticipated due to their distance from the TMF.

7.3.8 Human Health

In the event of a TMF failure, water discharges could increase chemicals of potential concern (COPC) concentrations in soil, water, and sediment. This can lead to increases of these chemicals in secondary environmental media including vegetation, wild meat, and fish tissue. Possible changes in water and country food quality may affect the health of human receptors who live in either region and who may engage in hunting, trapping, traditional and recreational activities. Residual adverse effects on human health would be of low magnitude, potentially extending beyond the Human Health LAA, and be medium-term and potentially irreversible.

In the event of a spill from a vehicle, discharges could increase COPC concentrations in soil, water, and sediment. This could lead to increases of these chemicals in secondary environmental media including vegetation, wild meat, and fish tissue. There is also potential for persistent contamination of fish tissue and fish health due to long-term contamination of bottom sediments. Residual adverse effects on human health would be of moderate magnitude, potentially extending beyond the Human Health LAA, and be medium-term and reversible.

A vehicle accident has the potential to result in injury to or loss of life. There is some pedestrian activity along PR 391; while the level of activity is low, it could be altered by a haul program. Although public injury or mortality as a result of a trucking accident cannot be ruled out, the likelihood is very low given the mitigation. In the unlikely event of a vehicle collision resulting in serious injury or loss of life, residual adverse effects on human health would be high in magnitude and irreversible

7.4 SUMMARY

In the unlikely event of a major industrial accident at the site involving a large-scale environmental release, a significant adverse effect is possible for some valued components. Some accidental events are predicted to be of potentially high consequence with very low probability (e.g., TMF failure and tailings release); however, significant adverse residual effects from Project-related accidents and malfunctions are not likely and management planning, including adherence to design standards, addresses these risks.

8.0 PROPOSED FOLLOW-UP AND MONITORING PROGRAM

Proposed mitigation and environmental management measures have been developed for all VCs based on preliminary Project planning and design. These mitigation measures will be refined as Project design and engineering progress and will be informed by the outcomes of the EA process (including the results of EA-related modelling, as well as the results of additional public and Indigenous engagement carried out in support of the EA).

Opportunities for the reduction of potential adverse environmental effects will continue to be incorporated in the design and engineering of Project components and the planning, scheduling, and carrying out of activities during all phases of the Project. Currently proposed mitigation measures are anticipated to result in compliance with applicable environmental legislation and regulatory requirements, including the *Fisheries Act* and *Migratory Bird Convention Act*.

Proposed mitigation and environmental management measures include development and implementation of the following Project-specific environmental management and monitoring plans and consultation with applicable federal and provincial regulators and engagement with potentially affected Indigenous communities regarding these plans.

- Emergency Response and Spill Prevention and Contingency Plans
- Soil Management and Rehabilitation Plan
- Mine Rock Management Plan
- Groundwater Monitoring Plan
- Surface Water Monitoring and Management Plan
- Waste Management Plan
- Air Quality Management Plan
- Noise Monitoring Plan
- Greenhouse Gas Management Plan
- Explosives Management Plan
- Heritage and Cultural Resources Protection Plan
- Vegetation and Weed Management Plan

- Erosion and Sediment Control Plan
- Wildlife Monitoring and Management Plan
- Fish Habitat Offsetting Plan and Fish Salvage Plan
- Environmental Effects Monitoring Plan
- Closure Plan.

If an unexpected deterioration in the environment is observed as part of a follow-up or monitoring program, intervention mechanisms will include adaptive management may include an investigation of the cause of the deterioration and identification of existing and/or new mitigation measures.

Alamos will plan for communication of Project activities, locations and timing throughout construction, operation, and closure to affected Indigenous communities, land and resource users, interest groups, the provincial government, and local authorities leading up to construction and throughout the life of the Project. In addition, as part of the Adaptive Management Framework, the environmental management and monitoring program and associated plans will be assessed regularly to verify implementation and the continued suitability, adequacy, and effectiveness as part of Alamos' commitment to continual improvement. The review of the program will identify elements and associated plans in need of revision and will evaluate performance against established performance objectives.

The review will include:

- The environmental management and monitoring program and constituent plans.
- Legislation, approvals, environmental compliance approval changes.
- Community complaints, enquiries, and corrective actions.
- Community and regulatory liaison and feedback.

9.0 BENEFITS OF THE PROJECT

Alamos is committed to development of a Project that contributes to the long-term health and viability of the natural environment and supports economic diversity and vibrant local communities (Alamos Gold Inc. 2019). The Project will have a range of positive effects associated with increased direct, indirect, and induced employment, business growth, and tax and royalty contributions to governments. Secondary positive effects are also anticipated through Project contributions to Gross Domestic Product (GDP). These benefits will occur over the short-term during construction and medium-term during operation. Specifically, an economic analysis based on spending estimates (PwC 2020a) concludes that the positive effects of the Project will include:

- Employment
    - The Project will create 11,030 person-years of employment in Manitoba from construction to active closure. During this time, the Project will result in the equivalent of 6,652 person-years of employment in the northern region of Manitoba and approximately 400 people being directly employed on an annual basis (PwC 2020a).
- Provincial and federal economic activity
    - The Project will result in an increase in GDP of $965.0 million for Manitoba, and $663.8 million for Manitoba's Northern Region, from construction to active closure (PwC 2020a). The Project's GDP contribution outside of Manitoba was not estimated.
- Expenditure on labour, goods and services
    - It is estimated that, over the life of the Project, there will be $493.1 million in capital and $1.9 billion in operational spending in Manitoba (PwC 2020). An estimate of the regional expenditures is not currently available, but the total expenditure on labour in Manitoba's Northern Region is expected to be approximately $546.4 million over the construction to active closure phase (PwC 2020a).
- Government revenues
    - Estimated total revenues for the Government of Canada over the life of the Project will amount to $160.8 million.
    - The Project will generate an estimated $155.3 million in revenues for the Province of Manitoba over the same period, including an estimated $10.8 million third-party royalty in the first two years of production from the Gordon site.
    - Total local taxes are estimated to be $34.4 million (PwC 2020a). Based on its experience elsewhere, Alamos expects to pay property taxes, or grants-in-lieu, to the Town of Lynn Lake while the MacLellan site is operating. However, the amount to be paid has yet to be negotiated between the Town and Alamos.

Alamos supports economic diversity and vibrant local communities and is committed to establishing local collaborations that will contribute to achieving economic and social development goals identified by stakeholders, address local aspirations and concerns, and provide benefits. Alamos will also continue to share information and undertake open and transparent Indigenous, community, and stakeholder engagement activities throughout the life of the Project and has sought to promote local benefits by working with these groups with the aim of establishing benefits-related agreements. Initiatives that will help provide employment, training, and business opportunities include:

- Employment
    - Locally posting job qualifications in advance and identify available training programs and providers for local and Indigenous residents to help them obtain the necessary skills to qualify for potential Project-related employment.
    - Working with local communities to develop training programs oriented to Project operational needs.
- Business
    - Locally posting Project purchasing requirements in advance so that local, regional, and Indigenous-owned businesses can position themselves to effectively compete to supply goods and services needed for Project construction and operation.
    - Continuing to work with local, regional, and Indigenous-owned businesses to enhance their potential for successfully bidding on Project goods and services contracts.

There will also be beneficial effects on local community wellbeing as a result of Project-related employment and income, and associated changes to individual and household disposable incomes. For example, this will result in increased time and reduced financial barriers to engage in subsistence and family-related activities and healthy eating.

The design and configurations presented in the EIS have evolved over time and will continue to advance in concert with detailed engineering and permitting requirements. The design has been refined to address various environmental and engineering constraints and opportunities, and in response to information and comments received from Indigenous communities, the public, stakeholders, and regulators. For example, during preliminary Project planning, the size and configuration of the TMF at the MacLellan site was adjusted to avoid fish-bearing watercourses.

In addition to the Project design changes that have resulted in environmental benefits, the work associated with developing the EIS has resulted in a substantial increase in environmental and socio-economic information throughout the area based on years of field work, literature research and engagement with knowledge holders. This information, which has become available to the public through the EIS process, and reviewed by government authorities, Indigenous communities and stakeholders, is represented throughout the EIS (Volumes 1 to 3) including technical data reports and analytic studies contained in Volumes 4 and 5 of the regulatory filing.

10.0 CONCLUSIONS

Taking into account the findings of the environmental assessment, including implementing the identified mitigation measures, it has been concluded that the Project is not likely to cause significant adverse environmental effects, including effects of the environment on the Project and cumulative effects.

In the unlikely event of a major industrial accident or malfunction involving a large-scale release into the environment (e.g., major TMF failure with discharges of tailings into local waterbodies and other habitats outside the PDA, or spill from vehicle malfunction or collision into a waterbody), there is a potential for significant residual adverse effects to surface water and fish and fish habitat. A significant effect may also occur in the unlikely event of major accident resulting in a loss of life (i.e., vehicle accident). However, mitigation and conformity with industry standards (e.g., dam design and monitoring and emergency response and contingency planning) make a significant effect unlikely to occur.

Engagement has been ongoing prior to and throughout the EA process, and will continue with agencies, local Indigenous communities, and stakeholders through the life of the Project. The Project will have both environmental and socio-economic benefits including remedial measures to address the removal of historical mine infrastructure at the MacLellan site, economic development and job creation, and social benefits including potential local and regional Project-related employment, training programs, increased local and regional business revenue, tax revenue, capacity and capabilities, and potential for the supply of goods and services.

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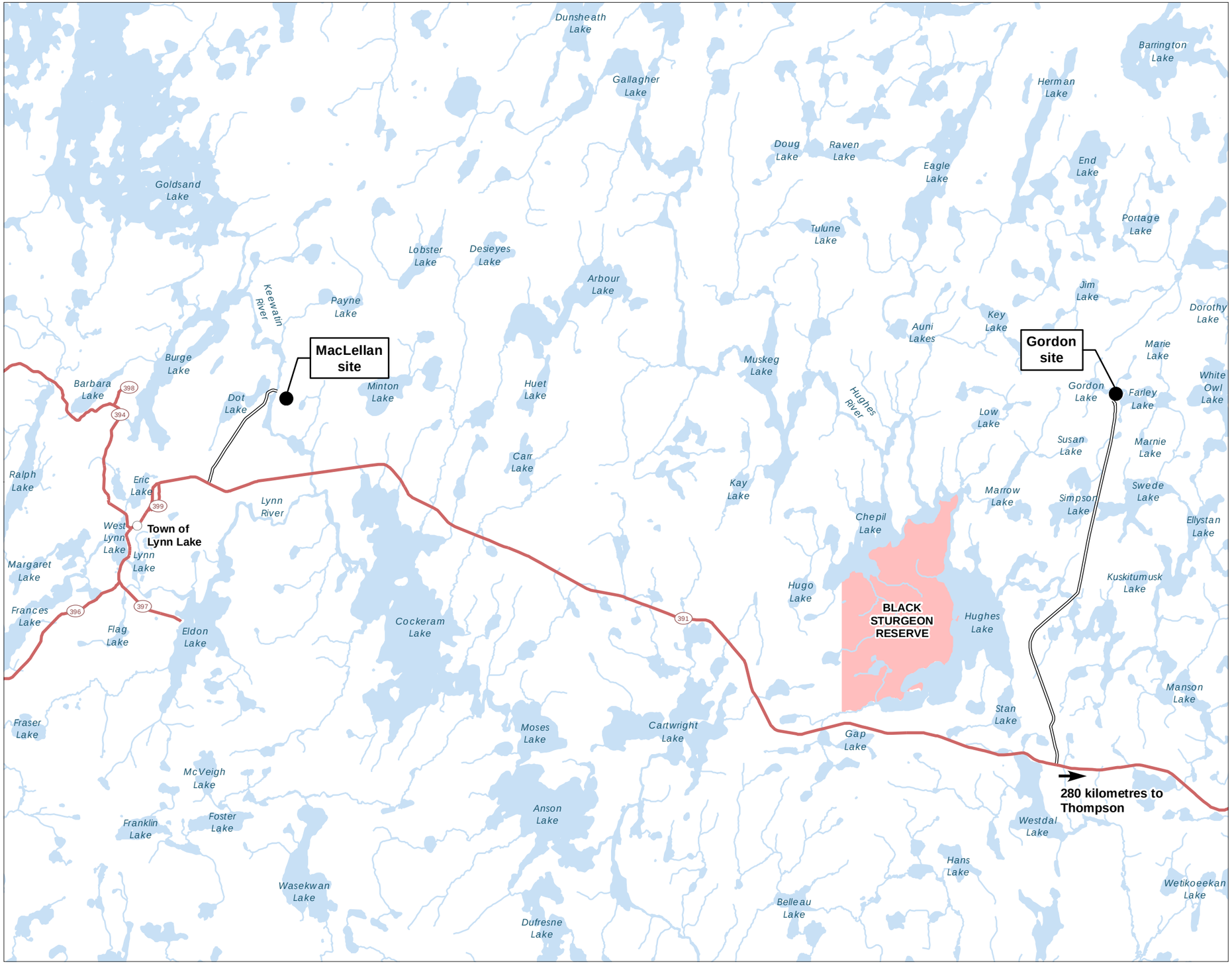
11.2 PERSONAL COMMUNICATIONS

2015. Regional Wildlife Manager, Manitoba Department of Agriculture and Resource Development. Conversation with Wildlife Biologist, Stantec Consulting Ltd., Winnipeg, Manitoba, March 2nd, 2015.

2019. Senior Environmental and Community Relations Coordinator, Alamos Gold Inc. Telephone call with Principle, Environmental Services, Stantec Consulting Ltd., Winnipeg, Manitoba, October 3, 2019.



Stantec

Alamos Gold Inc.

Landbase

- Existing Access Road
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

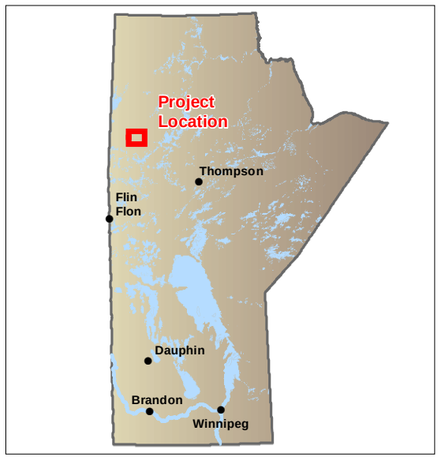
0 2.5 5 Kilometres

(At original document size of 11x17)
1:150,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N

2. Base Data Sources: Government of Manitoba and Government of Canada



Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-04-02
Technical Review by ASomers on 2020-04-02
Senior GIS Review by GKroupa on 2020-04-02

Client/Project 111473008

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.

1

Title

General Project Area

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Stantec

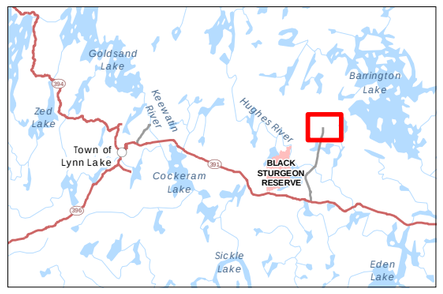
Alamos Gold Inc.

Historical Mine Infrastructure

Existing Infrastructure Associated with Historical Mine

Landbase

Existing Access Road



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(At original document size of 11x17)
1:20,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Imagery: SPOT-7 imagery, BlackBridge Gemoatics Corp. July 2015.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2019-10-24
Technical Review by ASomers on 2019-10-24
Senior GIS Review by GKroupa on 2019-12-11

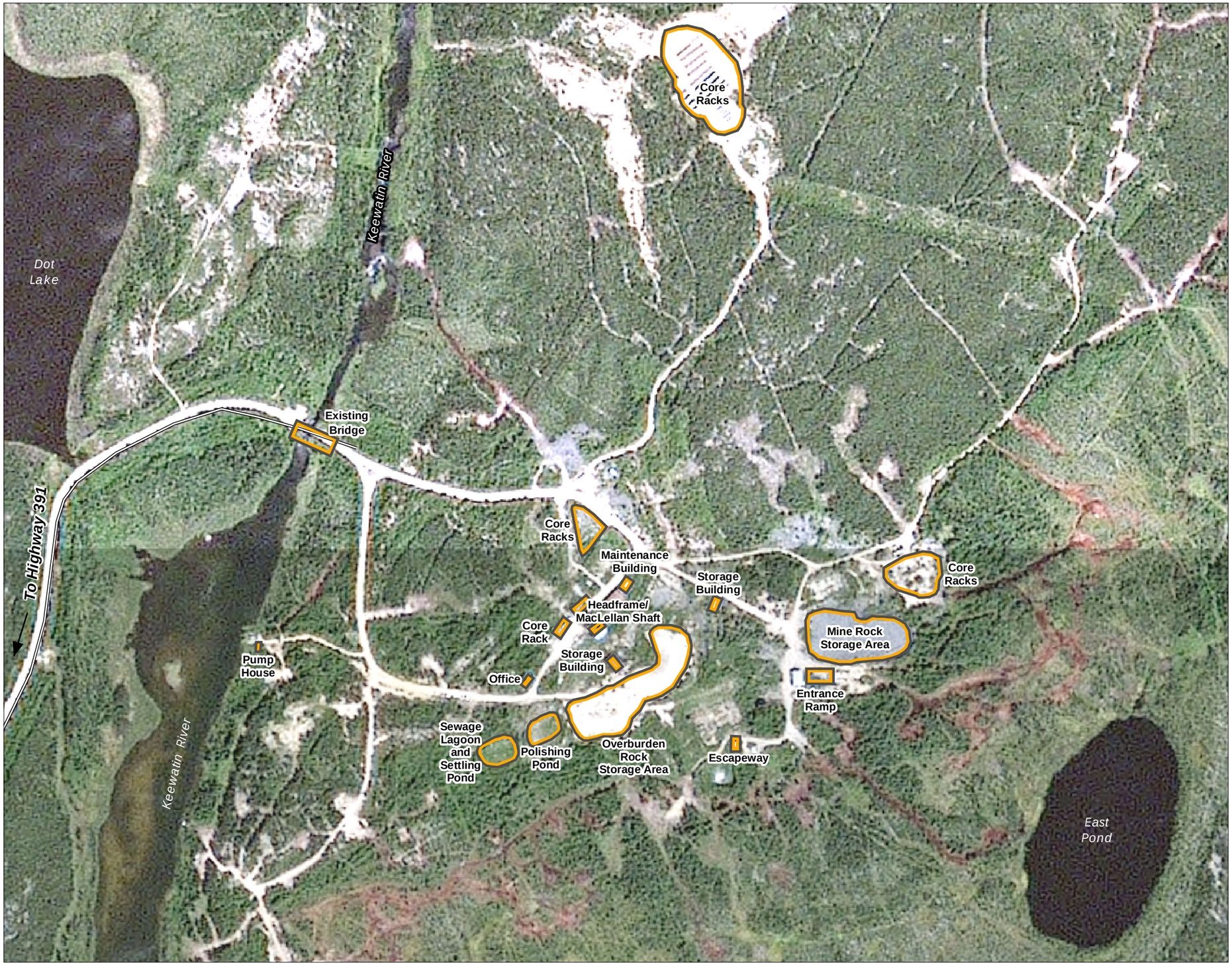
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473008

Map No.
2

Title
Existing Gordon Site

G:\...GIS Project Folder\111473008 LGP EA\Figures\Executive Summary\Map2_ExistingGordonSite_20200416.mxd Revised: 2020-04-16 By: ACampigotto



Stantec

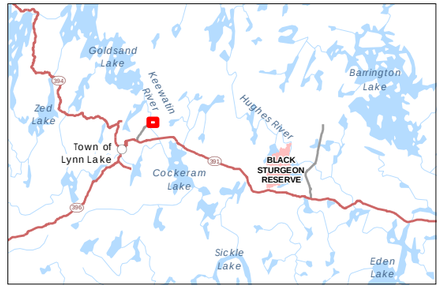
Alamos Gold Inc.

Historical Mine Infrastructure

Existing Infrastructure Associated with Historical Mine

Landbase

Existing Access Road



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(At original document size of 11x17)
1:5,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Imagery: SPOT-7 imagery, BlackBridge Gemoatics Corp. July 2015.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2019-10-24
Technical Review by ASomers on 2019-10-24
Senior GIS Review by GKroupa on 2019-12-11

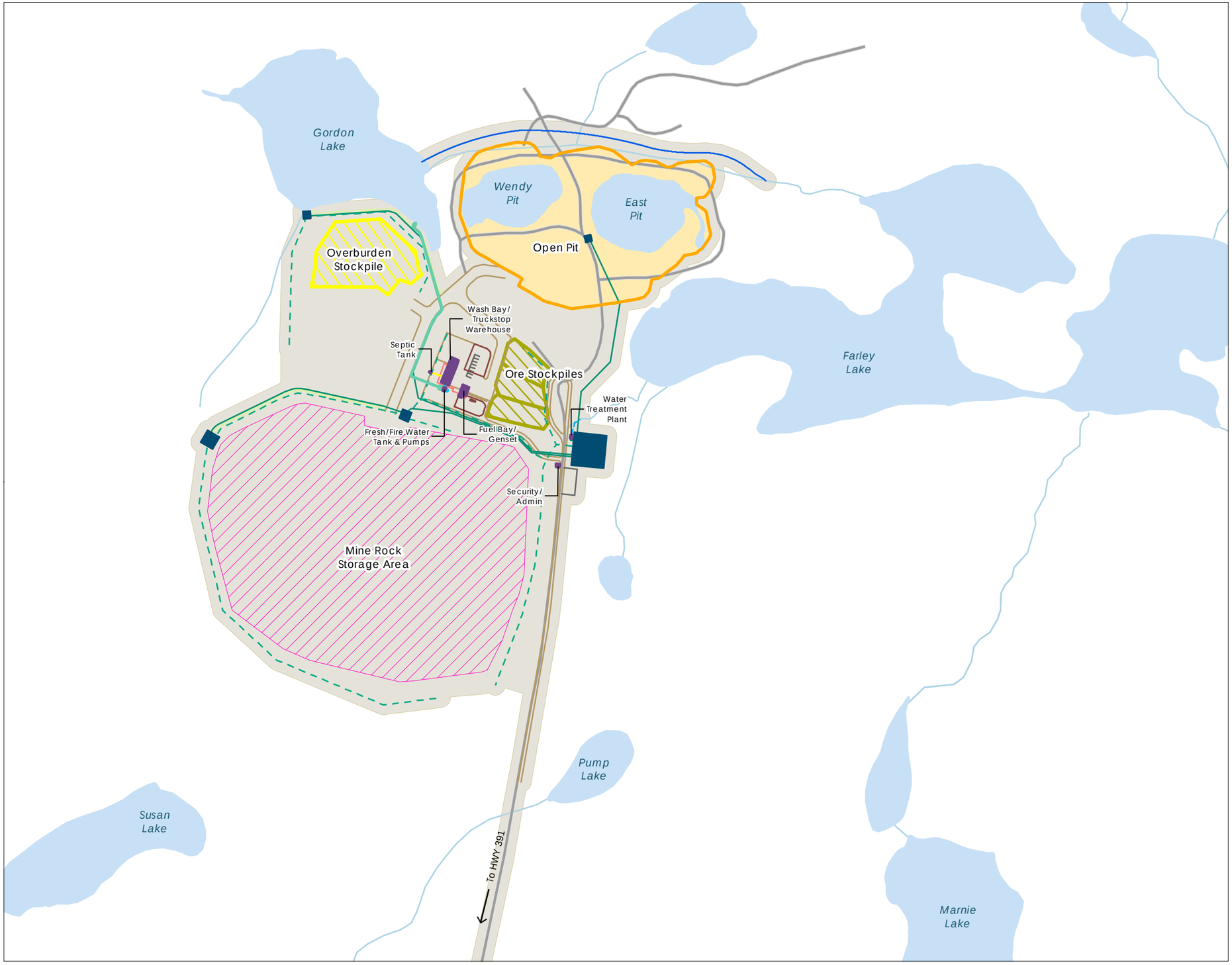
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473008

Map No.
3

Title
Existing MacLellan Site

G:\...\GIS\Project Folder\111473008 LGP EA\Figures\Executive Summary\Map3_ExistingMacLellanSite_20200416.mxd Revised: 2020-04-16 By: ACampigotto



Stantec

Alamos Gold Inc.

Project Infrastructure

- Proposed Open Pit
- Potential Ore Stockpile
- Potential Mine Rock Storage Area
- Potential Overburden Stockpile
- Project Development Area
- Buildings
- Pond

Site Access

- Proposed Site Access Road
- Drainage Road

Other Infrastructure

- Construction Temporary Facility
- Parking
- Diversion Channel
- Fresh Water Pipe
- Sewer
- Potable Water
- Drainage Ditch - Clean water
- Drainage Ditch - Potentially Contaminated
- Drainage Pipe
- Fire Water

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres

(At original document size of 11x17)
1:12,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2019-12-03
Technical Review by CAnseeuw on 2019-12-03
Senior GIS Review by GKroupa on 2019-12-11

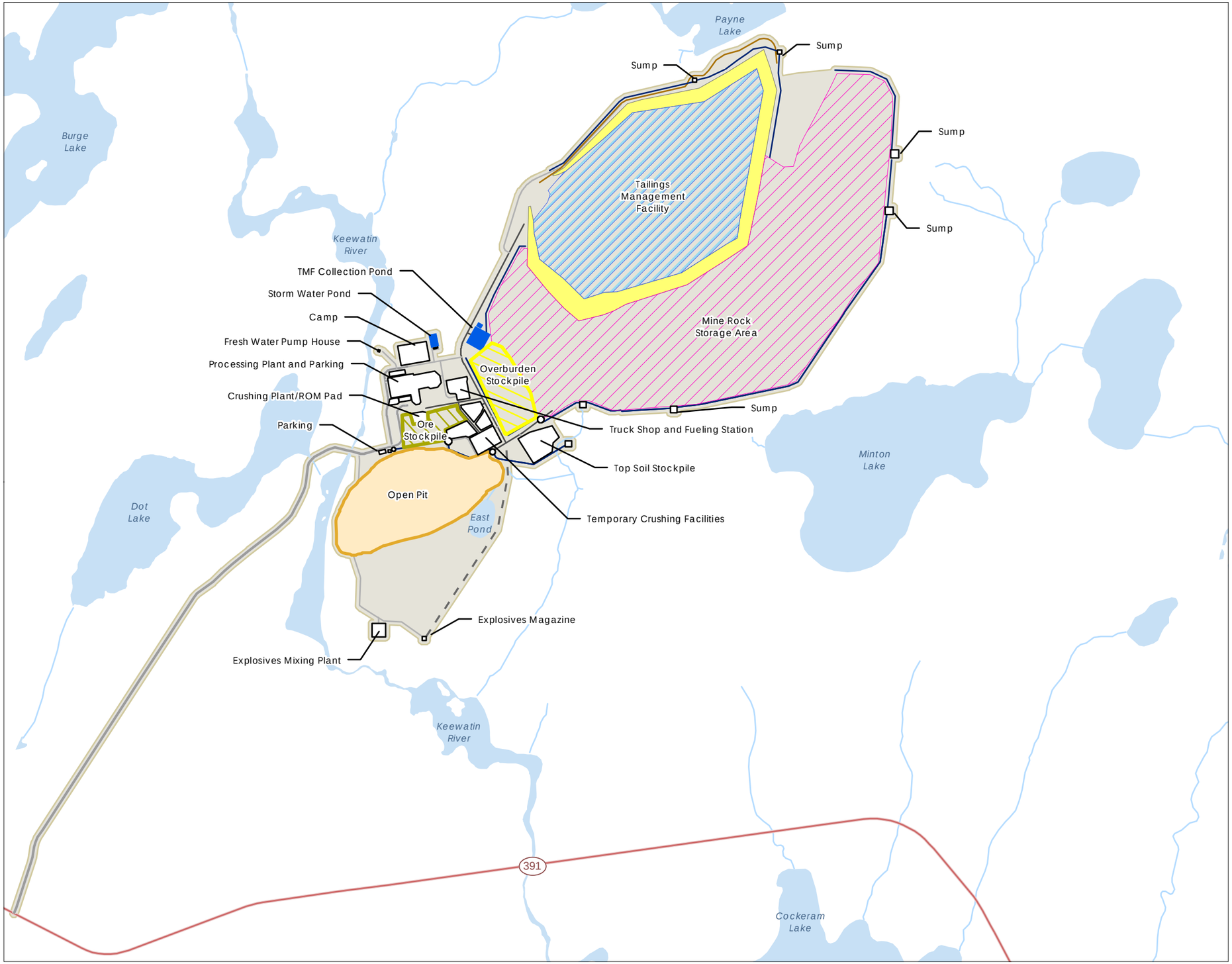
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473008

Map No.
4

Title
Gordon Site Plan

G:\ GIS Project Folder\111473008 LLGP EA\figures\Executive Summary\Map4_GordonSitePlan_20200416.mxd Revised: 2020-05-12 By: ACampigotto



Stantec

Alamos Gold Inc.

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Proposed Mine Rock Stockpile
- Proposed Overburden Stockpile
- Proposed Ore Stockpile
- Proposed Tailings Management Facility
- Proposed Tailings Management Facility Pond
- Other Proposed Ponds
- Other Proposed Areas
- Drainage Ditch
- Access Road
- Haul Road
- Inplant Road
- Toe Road
- Future Access Road

Landbase

- Highway
- Existing Access Road
- Watercourse
- Waterbody

N

0 0.5 1 Kilometres

(At original document size of 11x17)
1:30,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. Project Infrastructure features provided by QPit and Ausenco.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2020-05-08
Technical Review by ASomers on 2020-05-08
Senior GIS Review by GKroupa on 2020-05-08

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473008

Map No.
5

Title
MacLellan Site Plan

G:_GIS Project Folder\111473008_LGP EA\Figures\Executive Summary\Map5_MacclellanSitePlan 20200519.mxd Revised: 2020-05-19 By: ACampigotto

Appendix A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

APPENDIX A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Value Component: Atmospheric Environment											
Change in air quality • Atmospheric dispersion of air emissions from Project equipment and activities during operation	5(2)(a)	C	A	L	LAA	ST	A	IR	R	D	Not significant
		O	A	L/M/H	LAA	MT	A	IR	R	D	Not significant
		D	A	N	LAA	LT	A	IR	R	D	Not significant
Change in atmospheric greenhouse gases (GHG) • GHG emissions from Project equipment and activities during construction and operation	5(2)(a)	C	A	L	N/A*	ST	N/A	C	I	D	Not significant
		O	A	L	N/A*	MT	N/A	C	I	D	Not significant
		D	A	N	N/A*	LT	N/A	IR	I	D	Not significant
Note: *Geographic extent during construction and operation is not applicable as the effect is determined at the provincial, national and global scales. Geographic extent during decommissioning/closure is not applicable because the effect is global.											
Valued Component: Acoustic Environment											
Change in noise level • Noise emissions from Project equipment and activities, including pile driving, ore movement, and equipment operation	5(2)(a)	C	A	L-M	RAA	ST	N/A	C	R	D	Not significant
		O	A	L-M	RAA	MT	N/A	C	R	D	
		D	A	L-M	RAA	ST	N/A	C	R	D	
Change in vibration level • Vibration from activities such as pile driving, compacting, and haul truck traffic • Blast-related ground-borne vibration and air overpressure	5(2)(a)	C	A	N-L	LAA	ST	N/A	R	R	D	Not significant
		O	A	N-M	RAA	MT	N/A	R	R	D	
		D	A	N-L	LAA	ST	N/A	R	R	D	
Valued Component: Groundwater											
Change in groundwater quantity and/or flow • Project activities will result in changes in groundwater recharge and changes to groundwater levels and flow. A decrease in groundwater levels may result in loss of yield to dug or drilled wells, reducing their ability to meet water supply requirements. • As a pathway to surface water and wetlands, a decrease in groundwater levels and changes in the natural groundwater flow could affect discharge to nearby surface water bodies (assessed in Chapter 9 of EIS) and water levels within wetlands (assessed in Chapter 11 of EIS).	5(2)(a)	C*	A	H	PDA & LAA/RAA	MT	A	C	R	D	Not significant
		C**	A	H	PDA & LAA/RAA	MT	A	C	R	D	
		O*	A	H	PDA & LAA/RAA	MT	A	C	I	D	
		O**	A	L	PDA & LAA/RAA	MT	A	C	I	D	
		D	A	L	LAA/RAA	LT	A	C	I	D	
Note: *= Gordon site; **= MacLellan site											

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; N – No sensitivity; M – Moderate sensitivity; H – High sensitivity; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient: NR – Not Resilient;

APPENDIX A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Change in groundwater quality • Changes in groundwater levels and flow direction and recharge or infiltration from the Project activities may alter groundwater quality in dug or drilled wells, reducing their ability to meet water supply requirements without treatment. • As a pathway, recharge or infiltration from Project activities may result in changes to groundwater quality discharging to surface water (assessed in Chapter 9).	5(2)(a)	C	P	M	PDA & LAA/RAA	ST	A	C	I	D	Not significant
		O	A	M	PDA & LAA/RAA	LT	A	C	I	D	
		D	A	M	PDA & LAA/RAA	LT	A	C	I	D	
Valued Component: Surface Water											
Change in surface water quantity • Change in lake levels and stream flows due to diversion, extraction, storage, or discharge of surface water during development, operation, and closure of the open pits, TMF, MRSAs, and associated mine infrastructure.	5(2)(a)	C*	A	H	LAA	ST	N/A	C	R	D	Not significant
		C**	A	N	LAA	ST	N/A	C	R	D	
		O*	A	H	LAA	MT	N/A	C	R	D	
		O**	A	N	LAA	MT	N/A	C	R	D	
		D*	A	N	LAA	LT	N/A	C	I	D	
		D**	A	N	LAA	LT	N/A	C	I	D	
Change in surface water quality • Change in surface water quality associated with any mine effluent releases or surface runoff during construction, operation and closure of the open pits, TMFs, MRSAs, and associated mine infrastructure.	5(2)(a)	C	A	M	LAA	MT	N/A	R	R	D	Not significant
		C**	A	L	LAA	MT	N/A	R	R	D	
		O*	A	M	LAA	MT	A	R	R	D	
		O**	A	L	LAA	MT	N/A	R	R	D	
		D*	A	M	LAA	LT	A	R	I	D	
		D**	A	M	LAA	LT	N/A	R	I	D	
Note: *= Gordon site; **= MacLellan site											
Valued Component: Fish and Fish Habitat											
Change in fish habitat • Change in physical habitat due to mine infrastructure • Altered lake levels and stream flow (timing, duration, volume) for surface water due to construction of water management facilities and pits	5(1)(a)(i) 5(2)(a)	C*	A	H	LAA	MT	A	C	R	D	Not significant
		C**	A	L	LAA	ST	A	R	R	D	
		O*	A	H	LAA	MT	A	C	R	D	
		O**	A	L	LAA	ST	A	R	R	D	
		D*	A	H	LAA	MT	A	C	R	D	
		D**	A	L	LAA	ST	A	R	R	D	
Note: *= Gordon site; **= MacLellan site											

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; N – No sensitivity; M – Moderate sensitivity; H – High sensitivity; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient: NR – Not Resilient;

APPENDIX A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Change in fish health, growth or survival • Lethal effects due to dewatering, infilling, blasting, change in angling pressure, or entrainment in water intakes • Change in water quality parameters that influence habitat suitability: dissolved oxygen, temperature, total suspended solids • Chronic or acute toxicity effects due to changes in water and sediment quality from mine effluent releases	5(1)(a)(i) 5(2)(a)	C	A	N	LAA	LT	A	R	I	R	Not significant
		O	A	N	LAA	LT	A	R	I	R	
		D	A	N	LAA	LT	A	R	I	R	
Valued Component: Vegetation and Wetlands											
Change in landscape diversity • Fragmentation of native plant community patches arising from native vegetation clearing	5(2)(a)	C	A/P	L	RAA	LT	N/A	S	R	D	Not significant
		O	A/P	L	RAA	LT	N/A	S	R	D	
		D	A/P	L	RAA	LT	N/A	S	R	D	
Change in community diversity • Direct loss or alteration of native vegetation communities, including ecological communities of management concern arising from native vegetation clearing • Indirect alteration of native vegetation communities, including ecological communities of management concern from the introduction or establishment of regulated weeds, vegetation control (i.e., herbicide application) or deposition of dust and contaminants	5(2)(a)	C	A	L	PDA	LT	N/A	C	I	D	Not significant
		O	A	L	PDA	LT	N/A	C	I	D	
		D	A	L	PDA	LT	N/A	C	I	D	
Change in species diversity • Direct loss of plant SOCC or traditional use plant species due to vegetation clearing • Indirect loss of plant SOCC or traditional use plant species due to the introduction or establishment of regulated weeds, vegetation control (i.e., herbicide application) or deposition of dust and contaminants	5(2)(a)	C	A	M-H	LAA	LT	N/A	C	I/R	U	Not significant
		O	A	M-H	LAA	LT	N/A	C	I/R	U	
		D	A	M-H	LAA	LT	N/A	C	I/R	U	
Change in wetland functions • Direct loss or alteration of wetland area or change in wetland type from vegetation clearing or alteration of surface or groundwater flow patterns • Indirect loss or alteration of wetland area, structure or function (i.e., nutrient cycling and carbon sequestration)	5(2)(a)	C	A	M	LAA	LT	N/A	C	I/R	U	Not significant
		O	A	M	LAA	LT	N/A	C	I/R	U	
		D	A	M	LAA	LT	N/A	C	I/R	U	

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; N – No sensitivity; M – Moderate sensitivity; H – High sensitivity; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient: NR – Not Resilient;

APPENDIX A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Valued Component: Wildlife and Wildlife Habitat											
Change in habitat • Direct and/or indirect loss or alteration of habitat due to vegetation clearing, sensory disturbance (e.g., avoidance), and/or edge effects.	5(1)(a)(iii), 5(2)(a)	C	A	*/ M/H**	RAA	ST	A	S	R	D/U	Not significant
		O	A	L	RAA	MT	A	C	R	D/U	
		D	P/A	L	RAA	LT	A	C	R	D/U	
Change in mortality risk • Direct change in mortality risk due to vegetation clearing activities, vehicular collisions, human-wildlife conflicts, and indirect change in mortality risk due to predation and harvest pressure.	5(1)(a)(iii), 5(2)(a)	C	A	L	LAA	ST	A	IR	R	D/U	Not significant
		O	A	L	LAA	MT	A	IR	R	D/U	
		D	A	L	LAA	LT	A	IR	R	D/U	
Change in wildlife health • Activities associated with construction, operation, and/or decommissioning/closure of the Project may result in increased risk of exposure of wildlife to contaminants.	5(1)(a)(iii), 5(2)(a)	C	A	N-L	LAA	LT	A	C	R	D/U	Not significant
		O	A	N-L	LAA	MT	A	C	R	D/U	
		D	A	N-L	LAA	LT	A	C	R	D/U	
Note: * magnitude moderate to high for MacLellan site as effects will result in a >10% change in wildlife habitat and >20% change in SAR and SOCC habitat. **Wildlife uses L, M, H for Timing to better reflect critical life stages for species. H – high sensitivity.											
Valued Component: Labour and Economy											
Change in local and regional labour force • Project demand for labour	5(1)(c)(i), 5(2)(b)(i)	C	P	L	LAA/ RAA	ST	N/A	C	R	NR/R	Not significant
		O	P	L	LAA/ RAA	MT	N/A	C	R	NR/R	
		D	A	L	LAA/RAA	ST	N/A	C	I	NR/R	
Change in local and regional business • Project regional expenditures • Project direct employment	5(1)(c)(i), 5(2)(b)(i)	C	P	L	LAA/RAA	ST	N/A	C	R	NR/R	Not significant
		O	P	L	LAA/RAA	MT	N/A	C	R	NR/R	
		D	A	L	LAA/RAA	ST	N/A	C	I	NR/R	
Change in local and regional economy • Project regional expenditures • Project direct employment • Project property taxes	5(1)(c)(i), 5(2)(b)(i)	C	P	L-M	LAA/RAA	ST	N/A	C	R	R	Not significant
		O	P	L-M	LAA/RAA	MT	N/A	C	R	R	
		D	A*	M	LAA/RAA	ST	N/A	C	I	R	

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; N – No sensitivity; M – Moderate sensitivity; H – High sensitivity; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient: NR – Not Resilient;

APPENDIX A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Valued Component: Community Infrastructure, Services and Well-being											
Change in housing and temporary accommodations • Demand on housing and temporary accommodations may be affected by Project activities and Project-related population growth.	5(2)(b)(i)	C	A	N	LAA	MT	N/A	C	R	NR	Not significant
		O	A	N	LAA	MT	N/A	C	R	NR	
		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Change in local services and infrastructure • Demand on local services and infrastructure may be affected by Project activities and Project-related population growth.	5(2)(b)(i)	C	A	L	LAA	MT	N/A	C	R	R	Not significant
		O	A	L	LAA	MT	N/A	C	R	R	
		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Change in transportation services and infrastructure • Demand on transportation services and infrastructure may be affected by Project activities and Project-related population growth.	5(2)(b)(i)	C	A	L	LAA	MT	N/A	C	R	R	Not significant
		O	A	L	LAA	MT	N/A	C	R	R	
		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Change in community well-being • Project-related employment has the potential to increase individual and household income, increase disposable income, and reduce financial barriers to beneficial health practices or negative coping mechanisms. • Project-related population growth has potential to change the demographics of nearby communities and result in changes to community cohesion • The Project has the potential to change (increase or decrease) the amount of time individuals and households have to participate in recreational, subsistence, and family-related activities through gained employment	5(2)(b)(i)	C	P/A	L/M	LAA	MT/ LT	N/A	C	R	NR	Not significant
		O	P/A	L/M	LAA	MT/ LT	N/A	C	R	NR	
		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Valued Component: Land and Resource Use											
Change in land use • Project activities incompatible with applicable land use plans and zoning • Disturbance and nuisance effects on property (noise, dust) • Project presence and site activities may affect use/future development	5(2)(a)	C	A	L-M	PDA/ LAA	ST-LT	N/A	IR/C	R/IR	D	Not significant
		O	A	L-M	PDA/ LAA	ST-LT	N/A	IR/C	R/IR	D	
		D	A	L-M	PDA/ LAA	ST-LT	N/A	IR/C	R/IR	D	

Legend Key: Project Activity: C – Construction; O – Operation; D – Decommissioning/Closure; **Direction:** P – Positive; A – Adverse; **Magnitude:** N – Negligible; L – Low; M – Moderate; H – High; **Geographic Extent:** PDA – Project Development Area; LAA – Local Assessment Area; RAA – Regional Assessment Area; **Duration:** ST – Short-term; MT – Medium-term; LT – Long-term; **Timing:** A – Applicable; N/A – Not Applicable; N – No sensitivity; M – Moderate sensitivity; H – High sensitivity; **Frequency:** S – Single; IR – Irregular; R – Regular; C – Continuous; **Reversibility:** R – Reversible; I – Irreversible; **Ecological/Socio-economic Context:** D – Disturbed; U – Undisturbed; R – Resilient: NR – Not Resilient;

APPENDIX A SUMMARY OF EFFECTS ASSESSMENT FOR ROUTINE PROJECT EFFECTS AND ACTIVITIES

Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Change in recreation • Project clearing may result in the loss of area available for recreational use • Project presence and site activities may affect access to or quality of recreational use (inclusive of land and water-based activities)	5(2)(a)	C	A	L-M	PDA/ LAA	ST-LT	A	IR/C	R/IR	D	Not significant
		O	A	L-M	PDA/ LAA	ST-LT	A	IR/C	R/IR	D	
		D	A	L-M	PDA/ LAA	ST-LT	A	IR/C	R/IR	D	
Change in resource use • Project can reduce productive forest land, annual allowable cut (AAC) and merchantable timber, and cause disturbance to high- value forest sites • Disruption effects to development/extraction (minerals and aggregate) • Can disrupt resource harvesting success (hunting, trapping, fishing)	5(2)(a)	C	A	L	PDA/ LAA	ST-LT	N/A	S/IR/C	R/IR	D	Not significant
		O	A	L	PDA/ LAA	ST-LT	N/A	S/IR/C	R/IR	D	
		D	A	L	PDA/ LAA	ST-LT	N/A	S/IR/C	R/IR	D	
Valued Component: Heritage Resources											
Change to heritage resources • Project components requiring ground disturbance have the potential to change the horizontal and vertical context of known or potential heritage resource sites	5(1)(c)(iv), 5(2)(b)(iii)	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not significant
		O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Valued Component: Current Use of Lands and Resources for Traditional Purposes											
Change in availability of resources currently used for traditional purposes • Vegetation clearing associated with Project construction could result in a loss of habitat for species of traditional importance, including plants and animals relied on for traditional hunting, trapping, or plant harvesting • Loss or alteration of fish habitat resulting from disturbance to watercourses • Sensory disturbance from Project operation has the potential to affect the availability of habitat for species traditional importance • An increase in hunting or fishing pressure by non-Indigenous people has the potential to affect the availability of traditionally used species • Potential effects on wildlife, fish, and vegetative health that could affect the availability of traditional resources	5(1)(c)(iii)	C	A	L	LAA	LT	A	C	R	D	Not significant
		O	A	L	LAA	LT	A	C	R	D	
		D	A	L	LAA	LT	A	C	R	D	

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			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Change in access to resources or areas currently used for traditional purposes • Loss, alteration or restriction of access (including trails and travelways) to current lands and resources used for traditional purposes	5(1)(c)(iii)	C	A	L	LAA	LT	A	C	R	D	Not significant
		O	A	L	LAA	LT	A	C	R	D	
		D	A	L	LAA	LT	A	C	R	D	
Change to traditional cultural and spiritual sites and areas • Project construction and operation could result in a loss or alteration of identified current use harvesting sites, habitation areas, cultural and sacred sites • Indirect effects on the experience of Indigenous peoples which adversely alter the perceived values of current use sites or areas	5(1)(c)(ii) 5(1)(c)(iii)	C	A	L	LAA	MT	N/A	C	R	D	Not significant
		O	A	L	LAA	MT	N/A	C	R	D	
		D	A	L	LAA	MT	N/A	C	R	D	
Change to the environment that affects cultural value or importance associated with current use* • Indirect effects on the experience of Indigenous peoples which adversely alter the perceived value of access to traditional resources for current use or current use sites and areas • Change to values or attributes of the area that make it important • Presence of worker or increased access to the area by non-Indigenous peoples • Sensory disturbance from Project construction and operations has the potential to affect • Changes that could detract from use of the area or lead to avoidance of the area as a result of real and perceived disturbance of the environment	5(1)(c)(ii) 5(1)(c)(iii)	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not applicable
		O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Valued Component: Human Health											
Change in human health • Inhalation of contaminants of potential concern (COPC) emissions in air • Ingestion and dermal contact with COPC in soil due to Project emissions. • Ingestion of COPC in surface water due to Project emissions. • Ingestion of COPC in backyard produce, traditional plants, wild meat, and fish due to Project emissions and uptake of COPC from soil, water and/or tissue. • Ingestion and dermal contact with COPC in sediment due to Project emissions.	5(1)(c)(i), 5(2)(b)(i)	C	A	N	LAA, RAA	LT	N/A	C	I	D	Not significant
		O	A	N	LAA, RAA	LT	N/A	C	I	D	
		D	A	N	LAA, RAA	LT	N/A	C	I	D	

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Table A-1 Summary of Effects Assessment for Routine Project Effects and Activities

Potential Effect	Area of Federal Jurisdiction CEAA, 2012	Project Activity	Residual Effects								Significance of Residual Effect
			Direction	Magnitude	Geographic Extent	Duration	Timing	Frequency	Reversibility	Ecological and Socio-economic Context	
Valued Component: Indigenous Peoples											
Indigenous Health Conditions Considered: - Change to lands and resources currently used for traditional purposes - Change in human health	5(1)(c)(i)	C O D	A	M	LAA	LT	A	IR	I/R	D	Not significant
Indigenous Socio-economic Conditions Considered: - Change to land and resource use - Change in community services, infrastructure, and well-being - Change in labour and economy	5(1)(c)(i)	C O D	A, P	M	LAA	LT	A	C	R	D	Not significant
Indigenous Physical and Cultural Heritage Considered: - Change to heritage resources - Change to lands and resources currently used for traditional purposes	5(1)(c)(ii)	C O D	A	L	LAA	LT	N/A	C	I	D	Not significant

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