Lynn Lake Gold Project:
Gordon Mine Plan Amendment
Notice of Alteration / Notice of Change

October 6, 2025

Prepared for:

Prepared by:
Stantec Consulting Ltd.
500-311 Portage Avenue
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Project/File:
111473084

Stantec

Notice of Alteration Form

Manitoba

File No. : 6074.00	Environment Act Licence No. : 3390

Legal name of the Licensee: Alamos Gold Inc.

Name of the development: Lynn Lake Gold Project Gordon Gold Mine

Category and Type of development per Classes of Development Regulation:

Mining — Mines, other than pits and quarries

Licensee Contact Person: Mr. Colin Webster, Vice President Sustainability & External Affairs
Mailing address of the Licensee: Brookfield Place, 181 Bay Street, Suite 3910
City: Toronto Province: ON Postal Code: M5J 2T3
Phone Number: (416) 770-3483 Fax: Email: CWebster@alamosgold.com

Name of proponent contact person for purposes of the environmental assessment (e.g. consultant):
Ms. Karen Mathers, Senior Principal, Stantec Consulting Ltd.

Phone: (204) 799-6159	Mailing address: 500-311 Portage Avenue, Winnipeg MB
Fax:	R3B 2B9

Email address: karen.mathers@stantec.com

Short Description of Alteration *(max 90 characters):*

Change in Project components from the licensed Project

Alteration fee attached: Yes: ☐ No: ☑

If No, please explain:

Date: October 6, 2025

Signature:

Printed name: Colin Webster

A complete Notice of Alteration **(NoA)** consists of the following components:

- ☑ **Cover letter**
- ☑ **Notice of Alteration Form**
- ☑ **1 electronic copy of the NoA detailed report** (see "Information Bulletin - Alteration to Developments with Environment Act Licences")
- ☑ **$500 Application fee, if applicable** (Cheque, payable to the Minister of Finance)

Submit the complete NoA to:
Director, Environmental Approvals Branch
Environment and Climate Change
Box 35, 14 Fultz Blvd
Winnipeg MB R3Y 0L6
EABDirector@gov.mb.ca
For more information:
Toll-Free: 1-800-282-8069
Phone: 204-945-8321 Fax: 204-945-5229
https://www.gov.mb.ca/sd/permits_licenses_approvals/eal/ licence/index.html

Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")

Executive Summary

As part of the Lynn Lake Gold Project (the Project), Alamos Gold Inc. (Alamos; 'the proponent') plans to operate the Gordon Gold Mine, (hereinafter referred to as the 'Gordon site') near the Town of Lynn Lake in northern Manitoba. The Gordon site is regulated under *Environment Act* Licence No. 3390 and the conditions stipulated therein (March 6, 2023) and a Decision Statement issued under the *Canadian Environmental Assessment Act, 2012* as documented by the Impact Assessment Agency of Canada (IAAC), dated March 5, 2023. The Decision Statement outlines conditions in relation to environmental effects that Alamos must comply with.

This Notice of Alteration (NOA)/Notice of Change (NOC) request has been prepared by Stantec Consulting Ltd. (Stantec) on behalf of Alamos and is submitted to both:

- Manitoba Environment and Climate Change (MECC) in support of a request for a NOA to Licence No. 3390. The Gordon site is considered a Class 2 Development under the Classes of Development Regulation (MR 164/88); and
- The IAAC to notify it of the change and request an amended Decision Statement in relation to the Lynn Lake Gold Project through submission of a NOC in accordance with conditions 2.16 and 2.17 of the federal Decision Statement.

Alamos understands that the above-noted approvals are required from both regulatory authorities prior to proceeding. This report documents the relevant portions of the currently licensed Gordon site, the proposed alterations, the potential environmental effects and planned mitigation measures associated with the proposed alterations, and description of any changes to the characterization of residual effects from what was presented in the Environmental Impact Statement (EIS; Stantec 2020a) and Environment Act Proposal (EAP) Report for the Gordon site (Stantec 2020b). The works proposed are instrumental to the planned construction works and future operation of the Gordon site.

The proposed alterations encompasses a small increase to the mine tonnage (approximately 12%, due to a lower cutoff grade and adjustment to the open pit footprint) and modifications to the approved Gordon site layout, inclusive of the adjustment of footprints of several of the Project components, the removal of the development of the planned diversion ditch (no longer required), and the addition of one new Project component. The components that have been modified through engineering detailed design since the Project was approved include the mine rock storage area (MRSA), facility area (including buildings), ore and overburden stockpiles, and water management structures (sumps, collections ponds, discharge pipeline). The new Project component is the historical non-acid generating MRSA to the north of the open pit, proposed to be used as a source of construction borrow material (borrow source).

In accordance with the EIS and the EAP Report, the Project Development Area (PDA), encompasses the immediate area in which Project activities and components occur plus a buffer (between 30 and 50 metre [m], depending on the area) and is the anticipated area of direct physical disturbance associated with the construction and operation of the Project. Overall, the revised Gordon PDA (291.2 hectares [ha]) is slightly larger than what was assessed in the EIS by 21.8 ha (269.4 ha).

The approved EIS and EAP Report included assessments completed to meet regulatory requirements, including assessing project-specific environmental effects. The assessments focused on valued components (VCs), which are environmental components of certain value or interest to regulators, Indigenous Nations, and other parties and were identified based on the biophysical and socio-economic elements that would potentially be affected by the Project, including at the Gordon site. Biophysical and socio-economic VCs that could be affected through interactions of the environment and the proposed alterations were identified to scope the assessment. The rationale for selecting each VC and potential general interactions between the proposed alteration and the VCs remain as originally described in the EIS prepared for the Project (i.e., Gordon and MacLellan sites) and the EAP Report for the approved Gordon site. The VCs that were assessed as part of the EIS and EAP Report, are assessed as part of this NOA/NOC. The Project activities and components that are proposed to be altered as part of this NOA/NOC that may interact with the VCs are identified in the respective VC sections.

Potential interactions of the proposed alterations and the environment were evaluated with likely interactions examined to assess residual effects on the assumption of typical mitigation measures representative of best practices and previous construction methods employed at the Gordon site.

Based on information available to date and as presented in this NOA/NOC, residual effects of the proposed alterations are characterized using the same approach as presented in the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) for the following VCs:

- Atmospheric Environment
- Noise and Vibration
- Groundwater
- 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 by Indigenous Peoples
- Human Health
- Indigenous Peoples

**The proposed alterations will not result in additional adverse effects on vegetation and wetlands at the Gordon site and there is no change to the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) conclusions for vegetation and wetlands, however, the vegetation and wetlands LAA has changed from what was presented in the EIS and EAP Report because of groundwater drawdown and changes in the PDA. The vegetation and wetlands LAA is based on a 100 m buffer around the furthest expected groundwater drawdown contour, a 1 km buffer around the updated NOA/NOC PDA extent, and also a 1 km buffer around the PR 391 highway. The changes decrease the vegetation and wetlands LAA by 123.5 ha from that presented in the EIS and EAP Report.*

Based on information available to date and as presented in this NOA/NOC, residual effects characterizations in this NOA/NOC differ from the residual effects characterizations presented in the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) for the following VCs:

- Surface Water
- Fish and Fish Habitat

Results of the updated surface water balance model do not change the characterization of residual effects to surface water quantity (i.e., stream flows and lake levels) from those presented in the EIS. However, results of the updated surface water quality model do change the characterization of residual effects to surface water quality from those presented in the EIS. This is because of updates to the groundwater and surface water quality models that address the proposed alterations to the Gordon site for this NOA/NOC and the use of more stringent Federal Environmental Quality Guidelines (FEQGs; total iron only) resulted in changes to the magnitude and frequency of guideline exceedances, the location and timing of guideline exceedances, and two new parameters of potential concern (POPCs) compared with the EIS. With the exception of the following differences, the characterization of residual effects to surface water quality for this NOA/NOC are the same as the EIS.

- Negligible magnitude residual effects to surface water quality are predicted to occur in Gordon Lake, West Farley Lake, and East Farley Lake during construction in consideration of the proposed alterations. This is because, with the change to pump water in the existing pit lakes (East and Wendy pits) to the Hughes River instead of Farley Lake, there are no parameters predicted to exceed baseline concentrations by more than 20% and any provincial or federal water quality guideline in Gordon Lake, West Farley Lake, or East Farley Lake during construction.
- Moderate magnitude residual effects to surface water quality are predicted to occur during operation in consideration of the proposed alterations. This is because maximum nitrite concentrations are predicted to exceed baseline concentrations by more than 20% and the Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-FAL) in West Farley Lake during operation, but adverse effects to fish and other aquatic biota in West Farley Lake are not expected to occur because the assumptions used to predict nitrite concentrations in West Farley Lake are conservative and because the predicted nitrite concentrations are below the sub-lethal effect concentrations for the most abundant fish and benthic invertebrate species present in West Farley Lake.

- Moderate magnitude residual effects to surface water quality are predicted to occur during the decommissioning/closure phase in consideration of the proposed alterations. This is because total iron concentrations are predicted to exceed baseline concentrations by more than 20% and the FEQG for total iron in Gordon Lake during closure, but adverse effects to fish and other aquatic biota in Gordon Lake are not expected to occur because the surface water quality model did not account for any reduction in total iron concentrations resulting from aeration of groundwater prior to pumping to Gordon Lake and because high dissolved organic carbon (DOC) concentrations in Gordon Lake are expected to attenuate sub-lethal toxicological affects to fish and other aquatic biota. The duration of the residual effect to surface water quality during decommissioning/closure is long-term because total iron concentrations are predicted to remain elevated in perpetuity in Gordon Lake post-closure.

Changes to the approved Gordon site and changes to the updated surface water quality model change the characterization of residual effects to fish habitat at the Gordon site. Due to the smaller changes in flow predicted in Farley Creek during construction and operation for this NOA/NOC, and because the flow reductions now predicted to occur in Farley Creek during decommissioning/closure are relatively small compared with the volume of water within the wetted channel of Farley Creek at any time, the magnitude of residual effects to fish habitat at the Gordon site is expected to be moderate (i.e., a measurable change in habitat area, monthly flows or lake surface area that is greater than the range of natural variability, but that does not affect the ability of fish to use the habitat to carry out one or more of their life processes).

Changes to the approved Gordon site and changes to the updated surface water quality model change the characterization of residual effects to fish health, growth, or survival at the Gordon site. Like in the EIS, fluoride and total phosphorus are also predicted to be POPCs in Gordon and Farley lakes for this NOA/NOC, but it is the identification of total iron as a POPC in Gordon Lake during closure and post-closure and nitrite as a POPC in Farley Lake during operation that has resulted in a change in the characterization of residual effects to fish health, growth, or survival for this NOA/NOC. If modelled water quality predictions in Gordon and Farley lakes are proven accurate by the Surface Water Management and Monitoring Plan (SWMMP) and no other mitigation measures are implemented, the magnitude of residual effects on fish health, growth, or survival would be expected to be moderate (i.e., a measurable change in the abundance, structure, or health metrics in focal fish populations that is greater than the range of natural variability but not large enough to affect the productivity of the focal fish populations). The geographic extent, duration, timing, frequency, reversibility, and ecological context of the residual effects on fish health, growth, or survival would be expected to remain unchanged from the EIS (i.e., local, long-term, applicable, multiple regular event, irreversible, and resilient, respectively).

Overall, the proposed alterations described in this NOA/NOC are not substantial, and changes to the characterization of residual effects are limited. All changes are either fully captured and mitigated under the existing management and monitoring plans or reflect removals (i.e., such as the elimination of the diversion channel) rather than additions. As such, while these changes may warrant administrative updates to the federal Decision Statement and the provincial Environment Act Licence No. 3390, they do not result in new or unmitigated impacts and therefore would not require additional conditions or changes to existing conditions requiring additional requirements.

Alamos remains committed to developing and operating the Project inclusive of the proposed alterations in a manner that provides environmental protection for VCs and long-term benefits for the region. The additional mitigation measures identified in Section 3.3, which are beyond those identified in the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) will be incorporated (change from Version 0 to Version 1) into the applicable Management and Monitoring Plans, which are living documents following approval of this NOA/NOC.

A draft of this NOA/NOC was shared to all Indigenous Nations involved in the Project. This NOA/NOC was also discussed with the Indigenous Nations participating in the Environmental Advisory Committee. No feedback has been received to date. If any feedback is received, Alamos will address it with the respective Indigenous Nation(s) and share this information with the Province and IAAC.

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Acronyms / Abbreviations

°C	degrees Celsius
%	percent
%HA	percent highly annoyed
<	less than
>	greater than
≤	less than or equal to
µg/m^3	microgram per cubic metre
AAQC	Ambient Air Quality Criteria
AEMP	Aquatic Effects Monitoring Plan
Alamos; 'the proponent'	Alamos Gold Inc.
ANFO	ammonium-nitrate fuel oil
AQMMP	Air Quality Management and Monitoring Plan
BC MOE	British Columbia Ministry of Environment
BMP	Best Management Practice
CAAQS	Canadian Ambient Air Quality Standards
CAC	criteria air contaminants
Carlisle	Carlisle Goldfields Limited
CCME	Canadian Council of Ministers of the Environment
CEMI	Centre for Excellence in Mining Innovation
CCREM	Canadian Council of Resource and Environment Ministers
CEA Agency	Canadian Environmental Assessment Agency
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEMI	Centre for Excellence in Mining Innovation
CFIA	Canadian Food Inspection Agency
CO	carbon monoxide
COPC	chemical of potential concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CR	concentration ratio
CSM	conceptual site model

CWQG-FAL	Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life
d/y	days per year
dB	decibel
dBA	A-weighted decibel
dBL	linear decibel
DFO	Fisheries and Oceans Canada
DOC	dissolved organic carbon
DPM	diesel particulate matter
EA	environmental assessment
EAC	Environmental Advisory Committee
EAP	Environment Act Proposal
ECCC	Environment and Climate Change Canada
EEM	environmental effects monitoring
EIS	Environmental Impact Statement
ESEA	*Endangered Species and Ecosystems Act*
FDS	final discharge point
FEQG	Federal Environmental Quality Guidelines
FTA	Federal Transit Administration
g/m²	grams per square metre
g/m²/30-day	grams per square metre per 30-day period
GCDWQ	Guidelines for Canadian Drinking Water Quality
GDP	gross domestic product
GHG	greenhouse gas
GMMP	Groundwater Management and Monitoring Plan
Gordon site	Gordon Gold Mine
h/y	hour per year
ha	hectare
HADD	harmful alteration, disruption, or destruction
HC_5	hazardous concentration
HCN	hydrogen cyanide
HCRPP	Heritage and Cultural Resources Protection Plan
HH	human health

HHRA	human health risk assessment
HQ	hazard quotient
HRB	Historic Resources Branch
HRIA	Heritage Resource Impact Assessment
Hz	Hertz
IAAC	Impact Assessment Agency of Canada
IBA	Impact Benefit Agreement
in/s	inch per second
IR	Information Request
kg	kilogram
km	kilometre
km/h	kilometres per hour
km^2	square kilometre
L/s	litres per second
LAA	Local Assessment Area
L_d	daytime equivalent sound level
L_{dn}	day-night average sound level
L_{eq}	equivalent sound level
L_n	nighttime equivalent sound level
LFN	low frequency noise
LLGP, the Project	Lynn Lake Gold Project
m	metre
m/s	metres per second
m^3/d	cubic metres per day
m^3/s	cubic metres per second
MacLellan site	MacLellan Gold Mine
MAD	mean annual discharge
MB CDC	Manitoba Conservation Data Centre
MDMER	Metal and Diamond Mining Effluent Regulation
MECC	Manitoba Environment and Climate Change
MECP	Manitoba Environment, Climate and Parks
mg/L	milligram per litre

MHHL	Manitoba Health and Healthy Living
MHSAL	Manitoba Health Seniors and Active Living
MINR	Manitoba's Department of Indigenous and Northern Relations
mm	millimetre
mm/s	millimetre per second
MNL	mitigation noise level
MRSA	mine rock storage area
ms	milliseconds
MSD	Manitoba Sustainable Development
Mt	million tonne(s)
MWQSOG	Manitoba Water Quality Standards, Objectives, and Guidelines
MWQSOG-FAL	Manitoba Water Quality Standards, Objectives, and Guidelines for Protection of Freshwater Aquatic Life
NO	nitrous oxide
NO_2	nitrogen dioxide
NOA	Notice of Alteration
NOC	Notice of Change
OEHHA	Office of Environmental Health Hazard Assessment
OMECP	Ontario Ministry of Environment, Conservation, and Parks
OSA	ore storage area
PAH	polycyclic aromatic hydrocarbon
PDA	Project Development Area
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
POPC	parameter of potential concern
ppb	parts per billion
PPV	peak particle velocity
PR	Provincial Road
RAA	Regional Assessment Area
rms	root mean square
SAR	species at risk
SARA	*Species at Risk Act*

SO_2	sulphur dioxide
SOCC	Species of Conservation Concern
SSD	Species Sensitivity Distribution
Stantec	Stantec Consulting Ltd.
SWMMP	Surface Water Management and Monitoring Plan
the Project	Lynn Lake Gold Project
TIA	Tailings Impoundment Areas
TK	traditional knowledge
TMR	technical modelling report
TRV	toxicological reference values
TSP	total suspended particulate
TSS	total suspended solids
UCLM	upper confidence limit of the mean
US EPA	United States Environmental Protection Agency
VC	valued component
VdB	Vibration Velocity in Decibel Scale
VOC	volatile organic compounds
VWMP	Vegetation and Weed Management Plan
WHO	World Health Organization

1 Introduction

1.1 Alteration Overview

As part of the Lynn Lake Gold Project (the Project), Alamos Gold Inc. (Alamos; 'the proponent') plans to operate the Gordon Gold Mine, (hereinafter referred to as the 'Gordon site') near the Town of Lynn Lake in northern Manitoba (Map 1, Appendix A). Alamos is seeking approval to proceed with proposed alterations to the approved Gordon site. The proposed alterations include modifications to the open pit, mine rock storage area (MRSA), ore and overburden stockpiles, facility area (including buildings), and water management structures (i.e., sumps, collections ponds, discharge pipeline). The proposed alterations also include the addition of the historical non-acid generating MRSA, which will be used as a construction borrow source, and the removal of the previously planned adjustments to the diversion ditch, which is no longer required. The proposed alterations are further described in Section 2.

The Gordon site is regulated under *Environment Act* Licence No. 3390 and the conditions stipulated therein (March 6, 2023) and a Decision Statement issued under the *Canadian Environmental Assessment Act, 2012* as documented by the Impact Assessment Agency of Canada (IAAC), dated March 5, 2023. The Decision Statement outlines conditions in relation to environmental effects that Alamos must comply with.

Provincially, Section 14(1) of *The Environment Act* requires a proponent to notify the Director (for Class 1 and 2 developments) if the proponent intends to alter a licensed development so that it no longer conforms to licence conditions or has the potential to change the environmental effects (Manitoba Environment, Climate and Parks (MECP 2022; now Manitoba Environment and Climate Change [MECC]). The key consideration for assessing a proposed alteration and preparing and submitting a Notice of Alteration (NOA) from what was assessed in the environmental assessment (EA) phase is the significance of the environmental and human health effects as a result of the proposed alteration and whether there is sufficient detail to allow the Director to determine whether the effects of the proposed alteration are significant, insignificant, or nonexistent (MECP 2022).

Federally, per the following Decision Statement conditions, Alamos is required to prepare and submit a Notice of Change (NOC) to IAAC for the proposed alteration (as a separate parallel filing):

> *Change to the Designated Project*
>
> > *2.16 If the Proponent is proposing to carry out the Designated Project in a manner other than described in condition 1.8, the Proponent shall notify the Agency in writing in advance of carrying out those proposed activities. As part of the notification, the Proponent shall provide:*
> >
> > *2.16.1 a description of the proposed change(s) to the Designated Project and the environmental effects that may result from the change(s);*
> >
> > *2.16.2 any modified or additional measure to mitigate any environmental effect that may result from the change(s) and any modified or additional follow-up requirement; and*

> *2.16.3 an explanation of how, taking into account any modified or additional mitigation measure referred to in condition 2.16.2, the environmental effects that may result from the change(s) may differ from the environmental effects of the Designated Project identified during the environmental assessment.*
>
> *2.17 The Proponent shall submit to the Agency any additional information required by the Agency about the proposed change(s) referred to in condition 2.16, which may include the results of consultation with Indigenous groups and relevant authorities on the proposed change(s) and environmental effects referred to in condition 2.16.1 and the modified or additional mitigation measures and follow-up requirements referred to in condition 2.16.2.*

This NOA/NOC request has been prepared by Stantec Consulting Ltd. (Stantec) on behalf of Alamos and is submitted to both:

- MECC in support of a request for a NOA to Licence No. 3390. The Gordon site is considered a Class 2 Development under the Classes of Development Regulation (MR 164/88); and
- The IAAC to notify it of the change and request an amended Decision Statement in relation to the Lynn Lake Gold Project through submission of a NOC.

Alamos understands that the above-noted approvals are required from both regulatory authorities prior to proceeding.

This NOA/NOC report (the report) documents the relevant portions of the currently licensed Gordon site, the proposed alterations, and the potential environmental effects and planned mitigation measures associated with the proposed alterations. The works proposed will be instrumental to the planned construction works and future operation of the Gordon site. Important to note is that while construction of the Lynn Lake Gold Project commenced in February 2025, no work has been undertaken at the Gordon site at this time. Construction of the Gordon Gold Mine in relation to *Environment Act* Licence No. 3390 and the federal Decision Statement is anticipated to begin in January 2026.

1.2 The Proponent

For the purposes of development licensing, the proponent is Alamos. For further information regarding the Gordon site please contact the following:

Mr. Colin Webster
Vice President Sustainability & External Affairs
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Email: CWebster@alamosgold.com

This NOA/NOC request was prepared by Stantec Consulting Ltd (Stantec). The local contact is: Ms. Karen Mathers, M.Sc., P.Geo. FGC, PMP.

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1.3 Land Ownership and Mineral Rights

The Gordon site, historically referred to as the Farley Lake site, has not been in operation since 1999. The Gordon site was purchased by Carlisle Goldfields Limited (Carlisle) in 2011. In 2014, Carlisle and AuRico Gold Inc., formed a joint venture for the potential redevelopment of the Gordon mine site. Alamos subsequently inherited the joint venture in 2015 when it merged with AuRico Gold Inc. Alamos then became the holder of the rights to the existing mining claims and mineral leases through the acquisition of Carlisle in 2016.

Alamos is the current holder of the rights to those historical mining claims and mineral leases. Since approval of the Lynn Lake Gold Project (LLGP) in March 2023, Alamos has transferred further relevant mineral claims to leases at the Gordon site.

1.3.1 Existing Land Use

The Gordon site formerly operated as a two-pit open pit gold mine between 1996 and 1999. After closure in 1999, the Gordon site underwent a reclamation process and currently continues to consist of a 15-kilometres (km) gravel access road, a bridge across the Hughes River on the access road, two MRSAs and two overburden storage areas that have been capped, and two water-filled open pits. All buildings and above-ground infrastructure have been removed. The present-day condition of the Gordon site is as described in the Environmental Impact Statement (EIS; Stantec 2020a) and the Environment Act Proposal (EAP) Report for the Gordon site (Stantec 2020b) as no construction activities have commenced and there have been no other changes to the Gordon site. Construction of the Gordon Gold Mine in relation to *Environment Act* Licence No. 3390 and the federal Decision Statement is anticipated to begin in January 2026. No work will be conducted in areas outside the current approved PDA until this NOA/NOC is approved.

1.4 Previous Reports and Supporting Studies

The Project (including the Gordon and MacLellan sites) was subject to an EA prepared under *The Environment Act* as well as the *Canadian Environmental Assessment Act, 2012*. An EIS for the Lynn Lake Gold Project (Stantec 2020a) and an EAP Report for the Gordon site (Stantec 2020b) were prepared. The Environmental Approvals Branch of MECC issued a licence for the Gordon site (Licence No. 3390) on March 6, 2023. A federal Decision Statement was also issued for the Project (Gordon and MacLellan sites) subject to conditions on March 5, 2023.

1.5 Scope of the Assessment

1.5.1 Spatial and Temporal Boundaries

1.5.1.1 Spatial Boundaries

For the purposes of this NOA/NOC, the Project Development Area (PDA) for the Gordon site refers to the immediate area that Project activities and components occur in, plus a buffer, and is the anticipated area of direct physical disturbance (Map 2, Appendix A).

The Local Assessment Area (LAA) and Regional Assessment Area (RAA) spatial boundaries for this NOA/NOC are consistent with the various identified valued component (VC) spatial boundaries as previously defined (Stantec 2020a and 2020b).

- The LAA for the Gordon site encompasses the area in which environmental effects (direct or indirect) associated with the Project can be predicted or measured for assessment. The LAA encompasses the PDA and is selected in consideration of the geographic extent of effects (Stantec 2020a and 2020b).
- The RAA for the Gordon site is the area established for context for the determination of significance of project-specific effects. The RAA encompasses both the PDA and LAA and is VC-specific (Stantec 2020a and 2020b).

1.5.1.2 Temporal Boundaries

For the purposes of this NOA/NOC, the temporal boundaries consist of the following Project phases:

- Construction (i.e., site preparation, physical construction/equipment installation, pre-production, and commissioning) is expected to take approximately 3 years to complete (Year -3, Year -2, Year -1). Some limited pre-production may occur during this period. Project construction activities will be carried out concurrently at the Gordon and MacLellan sites.
- Operation (i.e., ore and mine rock extraction, processing, and waste management) will follow construction and is expected to take approximately 7 years to complete (Years 1 to 7). Mining operation is expected to commence at the Gordon and MacLellan sites in Year 1. Mining at the Gordon site will be undertaken for 5 years (i.e., during Years 1 to 5). Management of stockpiles at the Gordon site is expected to occur for an additional two years (i.e., during Years 6 and 7) after active mining.
- Decommissioning/closure will begin at the cessation of operation at the Gordon site. Progressive rehabilitation is expected to occur during the final years of operation. Closure is scheduled to begin in Year 6 at the Gordon site and is expected to take approximately 5 years to complete. 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 will match the duration of open pit filling. Permanent closure will occur when the site is stable, and monitoring is no longer required.

1.5.2 Assessment Approach

The approved EIS and EAP Report (Stantec 2020a and 2020b) included assessments completed to meet regulatory requirements, including assessing project-specific environmental effects. The assessments focused on VCs, which are environmental components of certain value or interest to regulators, Indigenous Nations, and other parties and were identified based on the biophysical and socio-economic elements that would potentially be affected by the Project, including at the Gordon site. The VCs considered are listed in Table 1.1.

Table 1.1 Valued Component Considered in the Environmental Impact Statement and Environmental Act Proposal Report

Valued Components	
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 by Indigenous Peoples
Human Health	Indigenous Peoples

The approved EIS and EAP Report (Stantec 2020a and 2020b) included assessments of the effects of the Project on the VCs, and characterized the effects in terms of direction, magnitude, geographic extent, frequency, duration, reversibility, and context according to the terms provided (Stantec 2020a and 2020b). The environmental effects of the proposed alterations will be mitigated as described in the EIS and EAP Report. This NOA/NOC presents an updated assessment of the proposed alterations to consider whether there are changes to the conclusions of the EIS and EAP Report (Stantec 2020a 2020b).

1.6 Engagement

The Gordon site is located on unoccupied Provincial Crown land within an area that is a former mine site. As previously noted, construction at the Gordon site has not yet started. In relation to the proposed alterations (see Section 2), details were discussed during the past Environmental Advisory Committee meetings detailed in Table 1.2.

Table 1.2 Environmental Advisory Committee Meeting Details

EAC Meeting	Attending Indigenous Nations
Meeting #1 – October 23, 2023 (virtual)	Manitoba Métis Federation, Nisichawayasihk Cree Nation, Marcel Colomb First Nation, Mathias Colomb Cree Nation, O-Pipon-Na-Piwin Cree Nation, Métis Nation – Saskatchewan
Meeting #2 – January 22, 2024 (virtual)	Marcel Colomb First Nation, Manitoba Métis Federation, Peter Ballantyne Cree Nation, Métis Nation Saskatchewan, O-Pipon-Na-Piwin Cree Nation
Meeting #3 – April 22, 2024 (virtual)	Marcel Colomb First Nation, Métis Nation Saskatchewan
Meeting #4 – August 12, 2024 (virtual)	Marcel Colomb First Nation, Métis Nation Saskatchewan, O-Pipon-Na-Piwin Cree Nation, Nisichawayasihk Cree Nation
Meeting #5 – October 21, 2024 (virtual)	Marcel Colomb First Nation, Métis Nation Saskatchewan
Meeting #6 – January 20, 2025 (virtual)	Marcel Colomb First Nation, Métis Nation Saskatchewan
Meeting #7 – May 23, 2025 (in person)	Marcel Colomb First Nation, Nisichawayasihk Cree Nation, Northlands Denesuline First Nation, O-Pipon-Na-Piwin Cree Nation

The meeting on May 23, 2025 included site visits, construction updates, and an outlook on future development changes/plans. Alamos' Independent Environmental Monitor also participated in the in-person 7th meeting, providing an introduction and overview of her role and responsibilities. These added in-person activities and discussions were followed by a formal Environmental Advisory Committee meeting, which was also accessible virtually for Indigenous Nations that were not able to attend in-person.

The minutes, presentations and shared documents related to each Environmental Advisory Committee meeting noted in Table 1.2 were (and will continue to be) shared with all 13 Nations involved in the Project even if they do not attend a meeting.

In addition, Alamos has ongoing engagement with Marcel Colomb First Nation – specifically through additional subcommittees (in relation to the signing of the Impacts Benefits Agreement in summer 2023), which were formed for full integration of Traditional Knowledge throughout all of Alamos' work within Marcel Colomb First Nation's Community Interest Zone.

More recently and similarly, Alamos has signed an Impacts Benefit Agreement with Mathias Colomb Cree Nation in winter 2025. Sub-committees are being developed but engagement has been ongoing through the EAC and Nation specific engagement efforts.

A draft of this NOA/NOC was shared with all Indigenous Nations involved in the Project. No feedback has been received to date. If any feedback is received, Alamos will address it with the respective Indigenous Nation(s) and share this information with the Province and IAAC. Based on the above, all Indigenous Nations involved with the Project have been made aware of the proposed alterations.

No formal public engagement is planned beyond the placement of the NOA/NOC on the respective MECC and IAAC public registries for public review and comment as required.

1.7 Funding

Alamos will provide funding for the subject works described in this NOA/NOC.

2 Alteration Description

2.1 Purpose and Rationale

The purpose of the proposed alteration is to enhance the efficiency, sustainability, and effectiveness of the Project by optimizing infrastructure layout, minimizing new environmental disturbance, maximizing resource recovery, and leveraging existing site features where possible. Alamos is proposing to modify the approved Gordon site to include footprint adjustments for several of the Project components; increase in mined tonnage; remove the previously planned adjustments to the diversion ditch as it is no longer required to support the Project; and add the historical non-acid generating MRSA, which is proposed to be used as a construction borrow source.

2.2 Existing Conditions

The existing conditions at the Gordon site remain as originally described in the EIS (Stantec 2020a) prepared for the Project (i.e., Gordon and MacLellan sites) and the EAP Report prepared for the approved Gordon site (Stantec 2020b).

2.3 Proposed Alteration

The presently licensed Gordon site is presented in Map 3, Appendix A. Since the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) were developed:

- The overall mined tonnage has increased by approximately 11%, due to the adjusted open pit footprint but more so due to a lower cut-off grade.
- Detailed engineering has advanced, which has resulted in alteration to the approved Gordon site layout, inclusive of:
    - the adjustment of several Project component footprints (changes to the PDA layout) – the MRSA, facility area (including buildings), ore and overburden stockpiles, and water management structures (sumps, collections ponds, discharge pipeline)
    - the removal of the development of the planned diversion ditch (no longer required), and
    - one new Project component – the non-acid generating historical MRSA to the north of the open pit which is proposed to be used as a source of construction borrow material (borrow source).

The adjusted site layout is shown in Map 2, Appendix A. Table 2.1 lists the proposed alterations to the footprint layout (in comparison with that presented in the EIS [Stantec 2020a]) for the Gordon site.

An update of the light assessment for the Project based on the adjusted site layout is presented in the Summary of Light Modelling Results for the Lynn Lake Gold Project Revised 2023 Mine Design (Appendix B).

Table 2.1 Gordon Site Feature Footprint Layout Changes

Mine Feature	EIS Footprint Layout Area (ha)	Proposed Footprint Layout Area (ha)
Mine Rock Storage Area (MRSA) (modified by detailed design)	65.41	60.17
Open Pit (enlarged during detailed design to access additional resources)	29.01	36.72
Ore Storage/Ore Stockpiles (modified by detailed design)	3.38	8.80
Overburden Storage/Stockpile (modified by detailed design)	5.43	17.80
Collection Pond/Ponds/ Discharge Pipeline (modified by detailed design with sumps also sited)	1.32	2.29
Sump 1 (sited during detailed design)	n/a	0.60
Sump 2 (sited during detailed design)	n/a	1.66
Facility Area (sited during detailed design)	n/a	2.26
Gen Set Area (sited during detailed design)	n/a	0.13
Interceptor Wells Pond (sited during detailed design)	n/a	0.18
Stockpile Borrow Source (new addition)	n/a	7.30
Topsoil Storage Area (sited during detailed design)	n/a	4.13
Adjusted Diversion Ditch (removed during detailed design as no longer required)	6.84	n/a

Notes:
n/a – not applicable, ha – hectares

In accordance with the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b), the PDA, encompasses the immediate area in which Project activities and components occur plus a buffer (between 30 and 50 metres (m) depending on the area) and is the anticipated area of direct physical disturbance associated with the construction and operation of the Project. The Project activities footprint and PDA for both the proposed layout and the existing layout are presented in Table 2.2. The Gordon site access road is included in the PDA totals.

Table 2.2 Gordon Site Project Development Area Changes

Scenario	Area (ha)
EIS Layout Footprint	104.8
EIS PDA	269.4
Proposed Layout Footprint	142.0
Proposed PDA	291.2

As previously noted, construction of the Gordon site in relation to *Environment Act* Licence No. 3390 and the federal Decision Statement is anticipated to begin in January 2026.

With approval of this NOA/NOC, the Project components will be constructed, operated, and closed as described in the EIS (Stantec 2020a), but in the reconfigured mine layout (see Map 2, Appendix A). This will occur in continued accordance with the current Project approval requirements, already-committed mitigation measures, and developed Management and Monitoring Plans (Version 0 finalized and shared in January 2025), which include detailed Adaptive Management approaches (as required).

2.4 Alteration Schedule

The proposed schedule for the alteration described in this NOA/NOC aligns with the Project phases described in Section 1.5.1.2.

3 Environmental Effects and Mitigation

3.1 Project Interactions and Valued Components

Biophysical and socio-economic VCs that could be affected by the Project were defined in the EIS prepared for the Project (i.e., Gordon and MacLellan sites) (Stantec 2020a). The rationale for selecting each VC and potential general interactions between the Project and the VCs remain as originally described in the EIS and the EAP Report for the approved Gordon site (Stantec 2020b).

The VCs identified in Table 1.1 were assessed as part of the EIS and EAP Report (Stantec 2020a and 2020b) and are re-assessed as part of this NOA/NOC because of the increased mine tonnage and adjusted or refined components. The Project activities and components that are proposed to be altered as part of this NOA/NOC that may interact with the VCs are identified in the respective VC sections.

3.2 Residual Effects Criteria

Terms used to characterize the residual environmental effects are summarized in Table 3.1.

Table 3.1 Definition of Terms Used to Characterize Residual Environmental Effects

Characterization	Description	Quantitative Measure or Qualitative Categories
Direction	The long-term trend of the residual effect	**Positive** — an improvement in the VC compared with existing conditions and trends **Adverse** — a decline in the VC compared with existing conditions and trends **Neutral** — no change in the VC from existing conditions and trends
Magnitude	The amount of change in the VC relative to existing conditions	**Negligible** — no measurable change **Low** — a change that falls within the level of natural variability **Moderate** — a measurable change which is unlikely to affect the VC **High** — a measurable change which is likely to affect the VC
Geographic Extent	The geographic area in which an environmental effect occurs	**PDA** — residual effects are restricted to the PDA **LAA** — residual effects extend into the LAA **RAA** — residual effects extend to other adjacent areas of the property into the RAA

Characterization	Description	Quantitative Measure or Qualitative Categories
Frequency	When the residual effect occurs and how often	**Single event** — residual effect occurs once throughout the life of the dewatering work **Multiple irregular event** — residual effect occurs sporadically and intermittently (no set schedule) throughout **Multiple regular event** — residual effect occurs repeatedly and regularly throughout **Continuous** — residual effect occurs continuously throughout the life of the dewatering work
Duration	The period of time required until VC returns to existing condition, or the effect can no longer be measured or otherwise perceived	**Short-term** — residual effect restricted to a duration of 2 weeks **Medium-term** — residual effect extends to 1 year **Long-term** — residual effect extends for longer than 1 year
Reversibility	Whether the VC can return to existing condition after the proposed alteration activity ceases	**Reversible** — the effect is likely to be reversed after activity completion and decommissioning **Irreversible** — the effect is unlikely to be reversed even after decommissioning
Ecological and Socio-economic Context	Existing condition and trends in the area where environmental effects occur	**Undisturbed** — area is relatively undisturbed or not adversely affected by human activity **Disturbed** — area has been substantially previously disturbed by human development or human development is still present

3.3 Assessment of Environmental Effects

This section presents the assessment of environment effects for the VCs identified in Table 1.1 as having potential interactions with the proposed alterations. This assessment is based on the EIS (Stantec 2020a) prepared for the Project (i.e., Gordon and MacLellan sites) and the EAP Report for the approved Gordon site (Stantec 2020b).

3.3.1 Atmospheric Environment

The atmospheric environment includes air quality and greenhouse gases (GHGs). As outlined in Appendix C, the Project activities and components that are proposed to be altered that may interact with the atmospheric environment and were therefore assessed as part of this NOA/NOC, include but are not limited to the PDA layout, open pit, MRSA, topsoil storage area, location of diesel generator, diesel generator power output, facility area, and blasting parameters.

3.3.1.1 Regulatory and Guideline Setting

3.3.1.1.1 Guideline Criteria

The applicable regulatory criteria for air quality include the Manitoba Ambient Air Quality Criteria (AAQC; Manitoba Sustainable Development (MSD), now MECC [MSD 2005]), Ontario's Ambient Air Quality Criteria (Ontario Ministry of Environment, Conservation, and Parks [OMECP] 2020) in the absence of Manitoba AAQC for specific substances of interest, and the Canadian Ambient Air Quality Standards (CAAQS, Canadian Council of Ministers of the Environment [CCME] 2017). These are provided in Table 3.2. The Manitoba AAQC include two concentration levels: Maximum Acceptable Level Concentrations and Maximum Desirable Level Concentrations. The more stringent Maximum Desirable Levels are used in the air quality assessment. In the absence of specific Manitoba AAQC for dustfall, the Ontario 30-day and annual average AAQC were used in the assessment.

The CAAQS were developed as part of the Air Quality Management System (CCME 2012a) with the objective of driving continuous improvement of ambient air quality in Canada. The CCME describes the process for selecting monitoring stations, measuring pollutant concentrations, and determining achievement of the CAAQS (CCME 2019; CCME 2012b). Determining achievement of the CAAQS is based upon the measured air quality concentrations at community monitoring stations and comparing those with the CAAQS and then assigning an air quality status to one of four management levels (CCME 2019; CCME 2012b). The four air quality management levels require progressively more rigorous actions by jurisdictions as air quality concentrations approach or exceed the CAAQS, thereby allowing proactive management actions to be undertaken to reduce emissions and avoid exceedances of the CAAQS (CCME 2019).

The CCME guidance on determining achievement of the CAAQS (CCME 2019) states that:

"CAAQS were not developed as facility level regulatory standards. Rather, they are used by provinces and territories to guide air zone management actions intended to reduce ambient concentrations below the CAAQS and prevent CAAQS exceedances."

In this context, predicted ambient concentrations due to the Project are compared with the CAAQS for information purposes and do not imply compliance with the AAQC at the "Project Boundary."

Table 3.2 Applicable Guideline Criteria for Air Quality

Substance	Averaging Period	Manitoba Ambient Air Quality Criteria [a] (µg/m³)		Ontario Ambient Air Quality Criteria [b] (µg/m³)	2025 Canadian Ambient Air Quality Standards [c] (µg/m³)
		Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration		
Gaseous Criteria Air Contaminants (CAC)					
NO_2	1-hour	**400**	—	400	**79 (42 ppb) [d]**
	24-hour	**200**	—	200	—
	Annual	100	**60**	—	**23 (12 ppb) [e]**
CO	1-hour	35,000	**15,000**	36,200	—
	8-hour	15,000	**6,000**	15,700	—
SO_2	1-hour	900	**450**	690	**170 (65 ppb) [f]**
	24-hour	300	**150**	275	—
	Annual	60	**30**	55	**10 (4.0 ppb) [g]**
Other Gaseous Species					
HCN	1-hour	**40**	—	—	—
	24-hour	—	—	**8**	—
	Annual	**3**	—	—	—
Particulate Matter					
TSP	24-hour	**120**	—	120	—
	Annual	70 [h]	**60 [h]**	60 [h]	—
PM_{10}	24-hour	**50**	—	50	—
$PM_{2.5}$	24-hour	30	—	30	**27 [i]**
	Annual	—	—	—	**8.8 [j]**
Dustfall	30-day	—	—	**7 g/m²**	—
	Annual	—	—	**4.6 g/m² [h]**	—
Metals					
Arsenic	24-hour	**0.3**	—	0.3	—
Cadmium	24-hour	**2**	—	0.025	—
	Annual	—	—	0.005	—
Copper	24-hour	**50**	—	50	—
Lead	24-hour	**2**	—	0.5	—
	30-day	**0.7**	—	0.2	—

Substance	Averaging Period	Manitoba Ambient Air Quality Criteria [a] (µg/m³)		Ontario Ambient Air Quality Criteria [b] (µg/m³)	2025 Canadian Ambient Air Quality Standards [c] (µg/m³)
		Maximum Acceptable Level Concentration	Maximum Desirable Level Concentration		
Nickel	24-hour	**2**	—	0.2	—
	Annual	—	—	0.04	—
Zinc	24-hour	**120**	—	120	—

Notes:

NO_2 - nitrogen dioxide; CO - carbon monoxide; SO_2 - sulphur dioxide; HCN - hydrogen cyanide; TSP - total suspended particulate; PM_{10} - particulate matter less than 10 microns; $PM_{2.5}$ - particulate matter less than 2.5 microns; µg/m³ - microgram per cubic metre; g/m^2 - grams per square metre; ppb - parts per billion; "—" not available

[a] Manitoba Ambient Air Quality Criteria (MSD 2005)

[b] Ontario Ambient Air Quality Criteria (OMECP 2020)

[c] Canadian Ambient Air Quality Standards (CCME 2017)

[d] The 1-hour CAAQS for NO_2 is referenced to the three-year average of the annual 98th percentile of the NO_2 daily maximum 1- hour average concentrations (effective 2025) (CCME 2017).

[e] The annual CAAQS for NO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average NO_2 concentrations (effective 2025) (CCME 2017).

[f] The 1-hour CAAQS for SO_2 is referenced to the three-year average of the annual 99th percentile of the SO_2 daily maximum 1- hour average concentrations (effective 2025) (CCME 2017).

[g] The annual CAAQS for SO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average SO_2 concentrations (effective 2025) (CCME 2017).

[h] Annual geometric mean

[i] The CAAQS for 24-hour $PM_{2.5}$ is referenced to the annual 98th percentile of daily 24-hour average concentrations, averaged over three years (effective 2020) (CCME 2017).

[j] The CAAQS for annual $PM_{2.5}$ is referenced to the three-year mean of annual average concentrations (effective 2020) (CCME 2017).

Values in **BOLD** text represent the ambient air quality criteria that are used for the EIS and EAP Report (Stantec 2020a and 2020b)

3.3.1.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to the air quality:

> *6.1 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, measures to mitigate emissions of dust and fugitive particulates within the Project development areas, taking into account the standards and criteria set out in the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards and Manitoba's Ambient Air Quality Criteria. The Proponent shall implement these measures from construction through decommissioning. In doing so, the Proponent shall:*
>
> > *6.1.1 apply dust suppressants, including water, that do not contain chemicals and have the least potential for adverse environmental effects, on haul and access roads during periods when dust generation is expected or occurring, including periods of drought and high winds;*
> >
> > *6.1.2 locate all stationary machinery and equipment used for processing ore indoors, where technically and economically feasible, including the crushing plant and conveyors feeding into the ore milling and processing plant;*
> >
> > *6.1.3 ensure all equipment and vehicles used, including equipment and vehicles operated by third-party contractors, are serviced and maintained in accordance with the manufacturer's maintenance guidelines to meet or exceed applicable emission standards, including Tier 4 emission standards for off-road equipment with off-road diesel engines, pursuant to the Off-Road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission Regulations and Off-Road Compression-Ignition Engine Emission Regulations;*
> >
> > *6.1.4 develop and implement policies to reduce the fuel consumption of equipment and vehicles operating in the Project development areas, including no-idling and limited cold start policies; and*
> >
> > *6.1.5 establish speed limits on the roads located in the Project development areas, taking into account the recommended speed limits in Environment and Climate Change Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities and by requiring and ensuring that speed limits are respected, including by installing signs indicating speed limits.*

3.3.1.2 Environmental Effects

The dispersion modelling methodology used to assess the potential effects of the proposed alterations on air quality is identical to the methodology used in the EIS (Stantec 2020a). The details of CALPUFF model setup, CALMET meteorological data, receptor grid, nitric oxide (NO) to nitrogen dioxide (NO_2) conversion, and particulate matter deposition can be found in the Air Quality Technical Modelling Report (TMR), Volume 5 Appendix A in the EIS (Stantec 2020a).

The model predicted 1-hour and 8-hour average concentrations are based on the maximum hourly emission rates. The model predicted 24-hour, monthly and average concentrations are based on the daily average emission rates that consider the actual operating hours per day for each mining activity. Baseline concentrations are added to the model predicted maximum concentrations to account for other existing emission sources (natural and anthropogenic) that are not directly included in the model simulation. The model predicted maximum concentrations with the baseline contribution are compared with the Manitoba AAQC and the CAAQS. The CAAQS are reference values for regional air quality management and are applicable to measured ambient concentrations at human receptor locations away from the industrial facility boundaries. The maximum predicted concentrations in the LAA are compared with the CAAQS in this context and do not imply compliance with the AAQC at the Project Boundary. The maximum predicted concentrations are based on areas along and outside the new adjusted Project Boundary (i.e., locations where public access is not restricted). The predicted maximum concentrations and dustfall for the Gordon site, for this update, are presented in the Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design memo (Appendix C).

3.3.1.2.1 Maximum NO_2 Concentrations

The maximum predicted 1-hour NO_2 concentration, 415 micrograms per cubic metre (µg/m³), is greater than the Manitoba AAQC (400 µg/m³). The maximum predicted 24-hour and annual NO_2 concentrations are 74.2 and 10.4 µg/m³, respectively and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average NO_2 concentration in the metric of the CAAQS (284 µg/m³) is greater than the 1-hour CAAQS (79 µg/m³). The maximum predicted NO_2 concentrations at human health (HH) receptors for all averaging periods are less than the Manitoba AAQC. The maximum predicted 1-hour average NO_2 concentrations are greater than the 1-hour CAAQS at three HH receptors (receptor ID 73, 76 and 77 in TMR Appendix D Table E-2 (Stantec 2020a).

The maximum predicted 1-hour NO_2 concentration, 415 µg/m³, is 10% less than the maximum predicted value in the EIS TMR (Stantec 2020a) and the maximum frequency of exceedance is reduced from 2 hours per year (h/y) to 1 h/y. The maximum predicted 1-hour (CAAQS) NO_2 concentration is 27% greater than the maximum predicted value in the EIS TMR and the maximum frequency of exceedance increases from 99 days per year (d/y) to 101 d/y.

3.3.1.2.2 Maximum CO Concentrations

The maximum predicted 1-hour, and 8-hour carbon monoxide (CO) concentrations are 14,832 and 4,345 µg/m³, respectively and are less than the Manitoba AAQC. The predicted concentrations are 8 to 12% lower than the maximum predicted values in EIS TMR (Stantec 2020a).

3.3.1.2.3 Maximum SO_2 Concentrations

The maximum predicted 1-hour, 24-hour, and annual sulphur dioxide (SO_2) concentration are 422, 42.6, and 2.60 µg/m³, respectively, and are less than the Manitoba AAQC and annual CAAQS. The maximum predicted 1-hour average SO_2 concentration in the metric of the CAAQS (382 µg/m³) is greater than the 1-hour CAAQS (170 µg/m³). The maximum predicted SO_2 concentrations at HH receptors for all averaging periods are less than the Manitoba AAQC and CAAQS.

The maximum predicted 1-hour SO_2 CAAQS concentration, 415 µg/m³, is 12% greater than the maximum predicted value in the EIS TMR (Stantec 2020a) and the maximum frequency of exceedance increases from 5 d/y to 12 d/y.

3.3.1.2.4 Maximum Total Suspended Particulate (TSP) Concentrations

The maximum predicted 24-hour TSP concentration, 734 µg/m³, is greater than the Manitoba AAQC (120 µg/m³). The maximum predicted annual TSP concentration,15.8 µg/m³, is less than the Manitoba AAQC. At three HH receptors, the maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC (receptors ID 73, 76, and 77 in TMR Appendix D Table E-2 [Stantec 2020a]).

The maximum predicted TSP concentrations are 7% to 21% greater than the maximum predicted TSP concentrations in the EIS TMR (Stantec 2020a). The maximum frequency of exceedance increases from 73 d/y to 94 d/y.

3.3.1.2.5 Maximum PM_{10} Concentrations

The maximum predicted 24-hour particulate matter <10 microns (PM_{10}) concentration, 406 µg/m³, is greater than the Manitoba AAQC (50 µg/m³). At four receptors, the maximum predicted PM_{10} concentrations are greater than the Manitoba 24-hour AAQC (receptors ID 72, 73, 76, and 77 in TMR Appendix D Table E-2 (Stantec 2020a).

The maximum predicted PM_{10} concentration is 12% greater than the maximum predicted PM_{10} concentrations in the EIS TMR (Stantec 2020a). The maximum frequency of exceedance increases from 110 d/y to 119 d/y.

3.3.1.2.6 Maximum $PM_{2.5}$ Concentrations

The maximum predicted 24-hour and annual particulate matter less than 2.5 microns ($PM_{2.5}$) concentrations are 25.7 µg/m³ and 7.40 µg/m³, respectively, and are less than the CAAQS. The maximum predicted $PM_{2.5}$ concentrations at HH receptors for all averaging periods are less than the CAAQS.

The maximum predicted $PM_{2.5}$ concentrations are 8% to 9% greater than the maximum predicted $PM_{2.5}$ concentrations in the EIS TMR (Stantec 2020a).

3.3.1.2.7 Maximum Dustfall

The maximum predicted 30-day and annual average dustfall are 6.50 grams per square metre per 30-day period (g/m²/30-day) and 4.51 g/m²/30-day, respectively, and are less than the Ontario AAQC. The maximum predicted 30-day and annual average dustfall at HH receptors are less than the dustfall criteria.

The maximum predicted dustfall values are 33% to 36% greater than the maximum predicted dustfall concentrations in the EIS TMR (Stantec 2020a).

3.3.1.3 Summary of Mitigation Measures

Mitigation measures will be implemented to manage and reduce Project emissions during construction and operation as described in the EIS (Stantec 2020a). As described in the developed Air Quality Management and Monitoring Plan (AQMMP; Version 0, January 2025), ambient air quality and meteorology monitoring will be implemented to provide an understanding of meteorological conditions and off-site ambient concentrations, and to determine the need for additional mitigation. The air quality monitoring program will include continuous meteorological monitoring (wind speed and wind direction), continuous (real time) monitoring of particulate matter (TSP, PM_{10}, $PM_{2.5}$) and dustfall monitoring. Based on the current wind conditions and measured ambient concentration levels, appropriate and effective mitigation options will be implemented to reduce Project emissions. This emissions mitigation management is referred to as “adaptive management”.

Mitigation measures to reduce air and GHG emissions that were incorporated in the Project design are described in the AQMMP and Greenhouse Gas Management Plan (both Version 0, January 2025). Emission mitigation measures during Project construction and operation are based on standard Best Management Practices (BMPs) for the reduction of air emissions from construction activities (Environment and Climate Change Canada [ECCC] 2005) and mining activities (Centre for Excellence in Mining Innovation [CEMI] 2010). These are described in detail in the plans.

Additional mitigation measures will be implemented on an as-needed basis as discussed in the adaptive management aspects of the plans.

3.3.1.4 Residual Effects

Compared with the results in the EIS, the air quality effects from the Project activities marginally increased at some receptors. When there is an increase in the model predicted concentrations, the associated change/increase in the frequency of exceedance is low. In conclusion, the results of the updated air quality assessment (Appendix C) do not change the characterization of residual effects as presented in the EIS (Stantec 2020a).

Consistent with the EIS, after applying the mitigation measures, the proposed alterations at the Gordon site will not change the characterization of Project residual effects on air quality, and there is no change to the EIS conclusions (Stantec 2020a).

3.3.2 Noise and Vibration

Noise and vibration resulting from the Project have the potential to affect human health and well-being, land and resource use, wildlife and wildlife habitat, and fish and fish habitat (Stantec 2020a). As outlined in Appendix D, the Project activities and components that are proposed to be altered that may interact with the noise and vibration VC and were therefore assessed as part of this NOA/NOC, include but are not limited to the changes in the PDA layout outlined in Table 2.1, open pit and MRSA, general infrastructure, and mine production capacity.

3.3.2.1 Regulatory and Guideline Setting

3.3.2.1.1 Guideline Criteria

Noise

The Province of Manitoba Guidelines for Sound Pollution (Province of Manitoba n.d.) provides environmental sound level objectives for the assessment of noise in the outdoor environment. The highest desirable level for residential areas is 55 dBA (A-weighted decibel) during the daytime (7:00 AM to 10:00 PM) and 45 dBA during the nighttime (defined as 10:00 PM to 7:00 AM).

Federally, Health Canada's Guidance for Evaluation Human Health Effects in Impact Assessment: Noise (Health Canada 2023a) provides noise targets for annoyance, sleep disturbance, and low-frequency noise effects. Health Canada's approach to noise assessment is based on several international standards and technical publications. This document and the technical standards and publications it references can be used as guidance for noise assessments.

The Health Canada Noise Guidance uses daytime or nighttime equivalent sound levels (L_d and L_n, respectively), adjusted day-night average sound levels (L_{dn}), and percent highly annoyed (%HA) to quantify noise effects for activities with a duration of more than 12 months. The daytime sound level (L_d) is a 15-hour time average over the daytime period from 7:00 AM to 10:00 PM. The nighttime sound level (L_n) is a 9-hour time average over the nighttime period from 10:00 PM to 7:00 AM. The adjusted day-night average sound level (L_{dn}) is a 24-hour time-averaged L_{eq}, with a 10-decibel (dB) penalty applied to nighttime hours and adjustments made for certain characteristics of sound such as tonality or impulsiveness.

Based on Health Canada Noise Guidance, the noise target for the highest change in %HA is 6.5%. Impulsive and tonal characteristics of source noise are accounted for in the %HA calculations because their presence can increase annoyance. If the change in %HA is exceeded, effects are considered to be of concern and may require mitigation.

For activities with a duration of less than 12 months, Health Canada Noise Guidance considers the mitigation noise level (MNL) to assess noise effects. The MNL was used as a target for reducing noise annoyance effects related to short-term construction activities such as pile driving. If the noise effects from the activities exceed the MNL, the implementation of mitigation measures is recommended to reduce the effect. The MNL of 47 dBA (L_{dn}) for a quiet suburban or rural community is applicable.

For sleep disturbance, Health Canada Noise Guidance recommends targeting an indoor sound level of no more than 30 dBA L_{eq} for continuous noise during the sleep period. Health Canada also recommends that an outdoor-to-indoor transmission loss with windows at least partially open is 15 dBA and fully closed windows are assumed to reduce outdoor sound levels by approximately 27 dBA; such that the corresponding outdoor sound level targets for sleep disturbance are 45 dBA and 57 dBA for partially open windows and fully closed windows, respectively. More recently, the World Health Organization (WHO) (2009) has published nighttime noise guidelines that are intended to protect the public, including the most vulnerable groups, from adverse health effects associated with sleep disturbance due to nighttime noise. The recommended annual average is 40 dBA L_n to be considered outdoors.

Sounds with strong low frequency noise (LFN) content may result in noise-induced rattles within buildings, resulting in greater annoyance. Health Canada Noise Guidance recommends that the energy sum of the linear sound levels in the 16, 31.5 and 63-Hertz (Hz) octave bands not exceed 70 linear decibel (dBL).

Vibration

Manitoba does not have provincial guidelines for vibration. Provincially, the OMECP provides guidance on blast-related vibration which is referenced herein in absence of Manitoba guidance. The OMECP Guidelines on Information Required for the Assessment of Blasting Noise and Vibration (OMECP 1985) guidance recommends the following vibration targets:

- Standard targets - ground vibration of 12.5 millimetres per second (mm/s) and air overpressure of 128 dBL.
- Cautionary targets - ground vibration of 10 mm/s and air overpressure of 120 dBL.

The cautionary targets of 10 mm/s and 120 dBL are the most conservative blast-related vibration targets in this assessment. These targets will be applied to all receptors outside the Project Development Area (PDA).

Federally, Health Canada Noise Guidance only provides threshold for air overpressure effect. The guidance recommends that little or no public annoyance is expected to result from any number of daytime sonic booms per day if their measured or predicted peak value is below 125-10 logN (dBL) where N is number of blasts per day. For one blast per day, the limit is 125 dBL. At receptors inside the PDA, such as the permanent work camp, the Health Canada overpressure target of 125 dBL will be used.

For non-blast-related construction activities, there is no Manitoba or federal construction vibration guidance available for remote locations or smaller population centers. As published codes and guidance for non-blast related vibration levels are limited, the United State Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018) is referenced for the ground-borne vibration target.

Structural damage targets for ground-borne vibration are expressed in terms of peak particle velocity (PPV) levels in inch per second (in/s) or mm/s. The structural damage target at a residential building due to ground-borne vibration effect is the PPV of 0.2 in/s or 5 mm/s for non-engineered timber and masonry buildings. The human annoyance target for frequent ground-borne vibration is 72 VdB (Vibration Velocity in Decibel Scale). Annoyance target for ground-borne vibration is expressed in terms of root mean square (rms) velocity levels in VdB.

3.3.2.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to noise and vibration:

> *6.2 The Proponent shall implement measures, during all phases of the Designated Project, to avoid exceedances of the thresholds for noise and vibration, identified in Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise at sensitive receptors identified in the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement. In doing so, the Proponent shall: develop, prior to construction, a protocol for receiving and addressing feedback related to the exposure to noise and vibration generated by the Designated Project. The Proponent shall provide the protocol to the Agency and Indigenous groups prior to construction, and make the protocol publicly available online. As part of the protocol, the Proponent shall:*
>
> > *6.2.1.1 identify how a person may provide feedback, how the Proponent will handle the feedback received, including ranking and responding to feedback received according to the anticipated level of impacts, and how the Proponent may implement modified or additional mitigation measures(s) and/or follow-up requirement(s) in response to the feedback received;*
> >
> > *6.2.1.2 record any feedback received as soon as feasible, no later than 48 hours after receiving the feedback; and*
> >
> > *6.2.1.3 implement, as soon as technically feasible, any modified or additional mitigation measure and/or follow-up requirement that the Proponent deems necessary to respond to the feedback received.*
>
> *6.5 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures as it pertains to noise and vibration from the Designated Project on the health of Indigenous peoples. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:*
>
> > *6.5.1 monitor noise and vibration levels at receptors identified in Volume 1 Chapter 7 Tables 7-7 to 7-10 of the Environmental Impact Statement, and at any other human receptors identified in consultation with Indigenous groups.*

3.3.2.2 Environmental Effects

3.3.2.2.1 Noise

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.

The assessment considered noise effects during the construction phase and operation. The time period from Year -1 was chosen for the construction phase assessment at the Gordon site because it represents a worst-case scenario of equipment usage during activities such as bulk earth work. Year 3 of the Gordon site operation was chosen for the operation phase assessment because it represented the production year with the highest mining rate. The operation scenario includes noise emissions from the Gordon site during the worst-case years.

Details on methods and results are presented in the Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update memo (Appendix D).

During the construction phase the predicted Project L_d and L_n sound levels at all residential receptors near Gordon site are below the Manitoba noise guideline (i.e., Manitoba Guidelines for Sound Pollution) target of 55 dBA daytime and 45 dBA nighttime. During the operation phase the predicted Project L_d and L_n sound levels at all residential receptors near Gordon site are below the Manitoba noise guideline target of 55 dBA daytime and 45 dBA nighttime.

For the construction and operation phases, change in %HA associated with the Project is compared with the threshold of 6.5%HA advised by Health Canada Noise Guidance. The change in %HA at a receptor is based on the difference between the baseline %HA and total (Project and Baseline) %HA.

At the Gordon site, the changes in %HA at all receptors are below the 6.5% target for the construction phase. The changes in %HA associated with the Project operation phase at the Gordon site are below the 6.5% target for the operation phase. The results indicate compliance with the Health Canada Noise Guidance.

As a target for the LFN issue, Health Canada Noise Guidance recommends that the energy sum of the linear sound levels in the 16, 31.5 and 63-Hz octave bands at a receptor location not exceed 70 dBL. Potential for LFN noise effect is low at receptors near the Gordon site during the operation phase because the predicted sound level results are below the target of 70 dBL.

The outdoor nighttime annual sound level of 40 dBA was used as the sleep disturbance noise target for this assessment update, based on the World Health Organization Night Guidelines for Europe (WHO 2009). The L_n results indicate that the nighttime equivalent sound levels from the Project are below 40 dBA at all residential receptors. No noise-related sleep disturbances of residential receptors are expected from the Project construction and operation during the nighttime period.

Table 3.3 below summarizes the comparisons of noise effects between the EIS TMR (Stantec 2020a) and current NOA/NOC updates at the most impacted receptors (ID77 and ID76) for the construction and operation phase, respectively.

Table 3.3 Comparison of Noise Effects – Gordon Site

Phase	Receptor	L_d or L_d (dBA)			L_{dn} (dBA)			Change in %HA (%)		
		2020 EIS	NOA/NOC Update	Changes	2020 EIS	NOA/NOC Update	Change	2020 EIS	NOA/NOC Update	Change
Construction	ID77	30.7	33.8	+3.1	37.1	40.2	+3.1	2.2	3.3	1.1
Operation	ID76	38.5	39.9	+1.4	44.9	46.3	+1.4	4.8	5.5	+0.7

3.3.2.2.2 Vibration

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 the Gordon 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.

During the construction phase, heavy equipment such as excavators, compactors, piling equipment, and haul trucks will be used. The ground-borne vibration effect due to high impact piling equipment, excavator, compactor, and large bulldozer were assessed at receptors closest to the construction activities. These pieces of equipment were selected in this assessment because they typically produce higher vibration levels than other construction equipment.

The greatest distance that will result in a structural damage vibration level target of 0.2 in/s or 5 mm/s (FTA 2018) is 29 m for impact pile driving, 8 m for a compactor or excavator, 4.5 m for a bulldozer, and 4.5 m for drilling. Vibration beyond these distances from the activities are not expected to cause structural damage.

This distance is expected to be less for other heavy equipment required for construction that have lower vibratory emissions. The closest receptor to potential construction activities at the Gordon site is located at a distance more than 1 km (ID 76 and ID 73). These receptors are located at a sufficient distance that structural damage due to construction equipment vibration is unlikely.

The greatest distance at which the vibration levels are above the human annoyance target of 72 VdB (FTA 2018) is 280 m for impact pile driving, 71 m for a compactor or excavator, 42 m for a bulldozer, and 42 m for drilling. This distance is expected to be less for other heavy equipment required for construction that have lower vibratory emissions. The closest receptors to potential construction activities at the Gordon site are both located at more than 1 km. These receptors are located at sufficient distances that annoyance due to construction equipment vibration is unlikely. The predicted vibration levels at the closest receptor for the Gordon site is below the annoyance target of 72 VdB.

During the operation phase, the primary vibration effects are ground vibration and air overpressure due to blasting activities within the open pit at the Gordon site. Given the same distance from a blast to the receptor, the primary factor affecting vibration is the explosive charge per delay. The highest explosive charge specification in the blast design is 230 kilograms (kg) per hole per delay for the Gordon site. However, the explosive charge could be reduced during operation due to Gordon site conditions.

The closest receptors to the Gordon site open pit are receptors ID 76 and ID 73 at the approximate distance of 1.4 km and 2.2 km, respectively. These receptors are potential First Nations' traditional land users.

The highest blast charge of 230 kg will result in ground-borne vibration below the vibration target of 10 mm/s at all receptors for the Gordon site. The predicted air overpressures are below the vibration target of 120 dBL at all receptors, except for receptor ID 73 and ID 76 near the Gordon site. The predicted air overpressure at receptor ID 73 and 76 is 121 dBL and 124 dBL, respectively. When the blast charge is reduced from 230 kg to 43 kg per hole per delay, the predicted overpressures at receptor ID 73 and ID 76 meet the 120 dBL target.

The primary factor in the blasting plan that influences the air overpressure is the charge-weight per delay. Charge weight dictates the amount of energy release. Decreasing the charge-weight per delay will effectively reduce the overpressure effect. The blasting plan will consider distance to receptors and will size the charges to avoid exceeding regulatory targets at receptors.

Other mine plan factors such as depth of burial, volume of displaced rock, delay time interval, and type of explosive will also affect the overpressure. A deeply buried or heavily confined charge will cause mostly ground vibration. Lightly confined blast will transfer most blast energy to atmosphere. Blast that displaces large volume of rock create high air overpressure with low frequency content.

Air overpressure monitoring can be conducted at nearby receptors during a blast event to confirm vibrations are below regulatory targets. With mitigation measures the overpressures are predicted to meet the most conservative target of 120 dBL at all receptors outside the PDA.

Table 3.4 below summarizes the comparison of the highest vibration effects due to blasting between the EIS TMR (Stantec 2020a) and current NOA/NOC update at the most impacted receptor (ID76) for the operation phase.

Table 3.4 Comparison of Vibration Effects – Gordon Site

Mine Site	Receptor	Ground-borne Vibration (mm/s)			Overpressure (dBL)		
		2020 EIS	NOA/NOC Update	Changes	2020 EIS	NOA/NOC Update	Changes
Gordon	ID76	3.1	3.4	+0.3	123	124	+1

3.3.2.3 Summary of Mitigation Measures

3.3.2.3.1 Noise

The mitigation measures for noise are identical to mitigation measures recommended in the EIS (Stantec 2020a). The following measures will be implemented as needed to reduce potential noise effects during construction and operation:

- Where possible, large stationary machinery (i.e., crushers) will be located inside buildings.
- Fully enclosed conveyor between buildings in the processing plant.
- Large transportation trucks will be used to reduce the number of trips.
- Mobile equipment will have exhaust mufflers.
- Reduce heavy fleet idling when not operating, where practical.

The operational sound levels listed in the Noise and Vibration Impact Assessment TMR (Volume 5, Appendix B, Stantec 2020a) and the Memo of Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update (Appendix D) are the estimated equipment sound power levels used in the acoustic modelling; it is assumed that these acoustical specifications are achievable by the suppliers. If the sound power level cannot be achieved, additional mitigation measures may be required.

3.3.2.3.2 Vibration

In an adaptive management approach, mitigation measures presented in this section will be implemented as needed, and monitoring will help to confirm effectiveness. Mitigation will be achieved by blast design. The mitigation measures that apply to Gordon sites are summarized as follows:

- Highest blasting charge per hole that do not exceed 230 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).in blasts will not be less than 8 ms.

The specific mitigation measures for receptor ID 73, ID 76 and ID 77 near the Gordon site are as follows:

- The reduced blast charge of 43 kg can be increased if the distances between the blast and closest receptor ID 76, ID 73 and ID 77 are more than 1,420 m, 2,125 m, and 2,255 m, respectively (distance based on receptor location to pit boundary).
- The reduced blast charge of 43 kg can be increased if monitoring results indicate air overpressure level is below 120 dBL at ID 73, ID 76, and ID 77.
- 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 73, ID 76, and ID 77) is not expected.

3.3.2.4 Residual Effects

The Noise and Vibration Impact Assessment Update memo (Appendix D) summarizes the noise and vibration assessment results based on the design changes for the Gordon site. The predicted results are different from the EIS results (Stantec 2020a). The design changes marginally increases both noise and vibration effects at some receptors in comparison with the EIS (Stantec 2020a). However, the assessment update results indicate that the Project will remain compliant with the applicable noise and vibration thresholds at all receptors. After the application of mitigation measures, the proposed alterations at the Gordon site will not change the characterization of Project residual effects on noise and vibration and there is no change to EIS conclusions.

3.3.3 Groundwater

Groundwater includes domestic, commercial, and industrial groundwater-source water supplies, and the groundwater component of freshwater ecosystems, including stream flow, vegetation, and wetlands. The Project activities and components that are proposed to be altered that might interact with groundwater and were therefore assessed as part of this NOA/NOC, include: adjustment of the footprint of the MRSA, open pit, and ore storage area. In addition, the removal of the historical north MRSA and partial removal of the historical south MRSA was included in the updated mine plan. Although the interceptor wells were included in the EIS, the number and alignment of the interceptor wells were optimized for this NOA/NOC and effects assessment for groundwater.

3.3.3.1 Regulatory and Guideline Setting

3.3.3.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on groundwater quantity and quality includes the consideration of the following federal legislation:

- The *Fisheries Act* restricts or controls the deposit of deleterious substances into waters or locations frequented by fish unless authorized by regulation. The Metal and Diamond Mining Effluent Regulation (MDMER) define unionized ammonia, arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids (TSS), and radium 226 as deleterious substances and Schedule 4 of the MDMER imposes limits on their concentrations in effluent at the final discharge point to the receiving body of water. The MDMER defines effluent as seepage containing any deleterious substances that flows over, through, or out of the site of the mine.
- The Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life (CWQG-FAL) which are used conservatively as screening criteria for areas where groundwater is anticipated to discharge to surface water.
- Federal Environmental Quality Guidelines (FEQG) are recommended chemical thresholds that identify the concentration below which there is a low likelihood of direct adverse effects from the chemical on aquatic life exposed via water or sediment, or where chemicals may bioaccumulate in wildlife that may consume aquatic life. FEQGs are developed by ECCC to support federal environmental quality monitoring, risk assessment and risk management activities on substances for which the CCME guidelines do not yet exist or are not reasonably expected to be updated in the near future. The FEQGs are used conservatively as a screening criterion for areas where groundwater is anticipated to discharge to surface water. Where the CWQG-FAL and the FEQGs differ, the more recent update for the given parameter is used.
- Guidelines for Canadian Drinking Water Quality which are based on current published scientific research related to health effects, aesthetic effects, and operational conditions of various parameters in drinking water.

The assessment of potential Project-related environmental effects on groundwater quantity and quality includes the consideration of the following provincial legislation:

- The *Mines and Minerals Act* and *Mine Closure Regulation* under Part 14 of The *Mines and Minerals Act* sets out standards for mine closure.
- The *Environment Act* contains general provisions associated with Class 1, 2, and 3 developments that can be used to protect surface water and groundwater quality.
- The *Water Protection Act* is the principal statute governing water management and water quality in Manitoba. The Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG) under Part 2 of The *Water Protection Act* sets out prescribed water quality standards for several activities, including drinking water, freshwater aquatic life, and common classes of discharge.

3.3.3.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to groundwater:

> *Condition 3.4 The Proponent shall develop, prior to construction and in consultation with relevant authorities, and implement and maintain, during all phases of the Designated Project, measures to mitigate any potential effects to water levels in Farley Lake and Gordon Lake due to groundwater drawdown resulting from Designated Project activities. In doing so, the Proponent shall intercept and/or redirect groundwater flowing towards the open pits with wells and/or other mitigation measures, as applicable, before it enters the open pits. The Proponent shall submit these measures to the Agency before implementing them.*
>
> *Condition 3.6 The Proponent shall adjust, during construction, the rate of release of water into Farley Lake and Gordon Lake from dewatering the East and Wendy pit lakes and from groundwater intercepted pursuant to condition 3.4 in order to maintain lake levels within the range of natural variability predicted in Volume 2 Chapter 10 of the Environmental Impact Statement and Appendix A Attachment IAAC-48 of the Proponent's Information Request Responses Round 1, Package 1 (Canadian Impact Assessment Registry Reference Number 80140, document #54).*
>
> *Condition 3.7 The Proponent shall collect contact water and seepage from the Project development areas, including seepage and recharge from the tailings management facility, mine rock storage areas, overburden and ore stockpiles, and seepage input to groundwater that flows into the open pits, and tret it, as necessary, before releasing it into the receiving environment during all phases of the Designated Project to ensure that any deposits are made in accordance with the Metal and Diamond Mining Effluent Regulations and the pollution prevention provisions of the Fisheries Act. When treating contact water and seepage, the Proponent shall take into account Manitoba's Water Quality Standards, Objectives, and Guidelines, the Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines of the Protection for Aquatic Life, and Environment and Climate Change Canada's Federal Environmental Quality Guidelines.*
>
> *Condition 3.12 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quality, taking into account Environment and Climate Change Canada's Metal Mine Technical Guidance for Environmental Effects Monitoring. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:*
> *3.12.3 monitor, beginning during construction, water quality in groundwater near the open pits, Farley Lake, Gordon Lake, the Keewatin River, the unnamed tributary of the Keewatin River, Minton Lake, the unnamed lakes northeast of Minton Lake, Payne Lake, Pump Lake, and Susan Lake, up and down gradient from the tailings management facility, mine rock storage areas, ore and overburden stockpiles, and seepage collection systems. Monitoring shall be conducted for all*

contaminants that may have adverse effects on fish and fish habitat, including antimony, arsenic, iron, sodium, sulphate, and uranium at the Gordon site and aluminum, antimony, arsenic, cobalt, total cyanide, iron, lead, nitrate, nitrite, sodium, and sulphate at the MacLellan site;

Condition 3.13 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quantity. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

3.13.2 monitor, during all phases of the Designated Project, groundwater levels, gradients and hydraulic conductivity of all hydrogeological units, as identified in the groundwater model in Volume 5 Appendix E and G of the Environmental Impact Statement, with well depths ranging from near surface to a minimum of 115 meters below ground to characterize contaminant transport via groundwater at the depth of the groundwater model for the Designated Project. Monitoring wells shall be installed near the open pits, the tailings management facility, mine rock storage areas, ore and overburden stockpiles, and fish bearing wetlands within the local assessment areas that intersect the Project development areas; and

3.3.3.2 Environmental Effects

3.3.3.2.1 Groundwater Quantity

A groundwater model was constructed and used to predict the effects of the Project, as per the NOA/NOC mine plan, on groundwater quantity. Details of the modelling and model results are presented in Appendix E.

Construction

During construction, the Project activities and components that might interact with groundwater quantity and result in an environmental effect include site preparation, construction of mine components, utilities and infrastructure, and dewatering of the East and Wendy pits. As part of this NOA/NOC, additional Project activities for the construction phase of the Project include removal of the historical north MRSA, partial removal of the historical south MRSA, and storage/stockpiling of mine rock (new MRSA) and associated water management. In the EIS, the new MRSA wasn't anticipated to be constructed until the start of operation. Project components are described in Section 2.

The environmental effects resulting from site preparation and temporary dewatering for foundations and installation of infrastructure remain consistent with the EIS.

The predicted drawdown contours at the end of construction (pre-production period) are presented on Map 17, Appendix E. Dewatering of the East and Wendy pits is anticipated to result in the drawdown of the water table up to 1 m within 500 m of the historical open pits. The extent of drawdown and the resulting effects is consistent with the EIS. In this NOA/NOC, the MRSA contact water collection ditch was simulated which resulted in an area of about 350 m of water table drawdown in the vicinity of the western to northwestern portion of the MRSA where the contact water collection ditch may potentially intersect the water table. The MRSA contact water collection ditch was not simulated in the EIS.

The corresponding changes to groundwater discharge to surface water features at the end of the construction period were predicted using the groundwater flow model and are presented in Table 3.5. The direction of groundwater flow into (discharge) or out of (recharge) each watercourse and lake are predicted to remain consistent between baseline and construction except for Gordon and Farley lakes and the diversion channel (FAR6). Gordon and Farley lakes and the diversion channel (FAR6) shift from gaining groundwater under baseline conditions to surface water recharging groundwater at the end of construction. The water pumped from the interceptor wells (0.10 cubic metres per second [m^3/s]) will be returned to Gordon and Farley lakes and indirectly to the diversion channel (FAR6) during construction to offset a reduction in groundwater discharge (0.091 m^3/s). The changes to the groundwater flow rates for remaining lakes and watercourses are relatively small (generally less than 0.001 m^3/s) compared with baseline conditions. The overall anticipated effect on flow rates in the surface water features is evaluated in the effects assessment for surface water (Section 3.3.4).

The predicted effects of dewatering the historical East and Wendy pits on groundwater discharge to surface water features at the end of construction are consistent with the EIS except for Marie Lake. Marie Lake was predicted to shift from groundwater discharge to surface water recharging groundwater in the EIS. In this updated assessment of effects, dewatering the historical East and Wendy pits is predicted to have a negligible effect on groundwater discharge to Marie Lake (i.e. less than 0.001 m^3/s change in groundwater discharge rate at end of construction compared with baseline conditions).

Operation

During operation, the Project activities and components that might interact with groundwater quantity and result in an environmental effect include open pit mining, storage/stockpiling of mine rock (new MRSA), and water management. The Project activities are consistent with the EIS; however, the size of the infrastructure has been updated in this assessment of effects to be consistent with the NOA/NOC mine plan as described in Section 2.

The primary Project effect on groundwater quantity and/or flow during operation is the lowering of the groundwater table through continued dewatering of the historical Wendy and East pits as they are developed into the ultimate open pit. The groundwater interceptor wells installed during construction will remaining in place during operation to reduce groundwater inflow to the open pit due to a high permeability zone in the shallow bedrock associated with the Wendy and East faults.

Two pumping rates for the interceptor wells were simulated and are presented in Appendix E, however, the higher pumping rates are presented in this effects assessment for the purpose of the NOA/NOC. At the end of operation, when the open pit is dewatered to its full extent, groundwater flow into the open pit is predicted to be about 0.033 m^3/s with the interceptors pumping at a rate of 0.047 m^3/s. Despite the higher dewatering rate, the drawdown cone is predicted to be slightly smaller than the EIS as additional seepage from Gordon and Farley lakes is induced, which limits the extent of drawdown compared with the EIS. The effects of freezing of the pit wall on groundwater inflow was simulated and predicted to result in a cyclical pattern with lower inflow rates in the winter and higher inflow rates in non-freezing months. With pit wall freezing, groundwater inflow rates are predicted to be about 0.01 m^3/s in the winter months and about 0.065 m^3/s in the spring and summer months near the end of operation (with the interceptor wells operating at a combined rate of about 0.085 m^3/s).

The predicted groundwater drawdown contours at the end of operation are presented on Map 20 of Appendix E. The 1 m drawdown contour is predicted to extend approximately 500 m to the north and 1,000 m to the southwest of the open pit, increasing to more than 20 m of drawdown within 300 m of the open pit. The drawdown extent is limited to the east and west due to recharge to groundwater from Gordon and Farley lakes. The extent of drawdown related to the presence of the MRSA contact water collection ditch is masked by larger effects on the water table from pit dewatering and pumping from the interceptor wells.

Table 3.5 presents the comparison of baseline groundwater discharge rates with effects of dewatering at the end of the operation period. Gordon and Farley lakes, as well as the diversion channel (FAR6) are predicted to shift from gaining from groundwater to losing to groundwater, as was also predicted during construction. The lake north of the Open pit (Lake 3) is also predicted to shift from gaining to losing during operation. The water pumped from the interceptor wells (0.11 m^3/s) will be returned to Gordon and Farley lakes during operation to offset the reduction in groundwater discharge in the two lakes (0.12 m^3/s). The changes to the groundwater flow rates for remaining lakes and watercourses are relatively small (generally less than 0.001 m^3/s) compared with baseline conditions. The overall anticipated effect on flow rates in the surface water features is evaluated in the effects assessment for surface water (Section 3.3.4).

Decommissioning/Closure

Following completion of operation, dewatering of the open pit will cease and water levels will begin to rise within the open pit until they stabilize as there is no outlet to the open pit. The groundwater interceptor wells were assumed to continue to operate during the initial stages of decommissioning/closure and decrease with time as the pit lake stage increases. The MRSA will be covered and revegetated and reach a steady state infiltration rate which is greater than the construction and operation infiltration rate for the MRSA. The Project activities are consistent with the EIS, however the size of the infrastructure in this assessment of effects has been updated to reflect the mine plan in this NOA/NOC as described in Section 2.

At a pit lake stage of 315 metres above sea level, the open pit was predicted to become a “flow through” lake with groundwater flowing into the lake on the upgradient side and out on the downgradient side. Map 23 of Appendix E presents the predicted groundwater drawdown contours in closure when the pit lake has formed. The water table is predicted to have returned to near baseline conditions in the vicinity of the open pit but remains below baseline conditions by up to 5 m in the vicinity of the MRSA contact water collection ditch. After removal of the MRSA contact water collection ditch, groundwater levels in the vicinity of the MRSA are anticipated to also return to near baseline conditions.

Table 3.5 presents the comparison of baseline groundwater discharge rates with effects of dewatering in closure once the pit lake has formed. The groundwater flows to the receptors are predicted to return to near baseline rates (within 0.001 m^3/s of baseline conditions) once the pit is full except for Farley Lake. In closure, groundwater discharge to Farley Lake is predicted to increase by 0.002 m^3/s compared with baseline conditions.

Comparison with the EIS

The predicted groundwater inflow rate to the open pit at the end of operation is similar (within 10%) to that predicted for the EIS. Since the EIS, a pumping test and additional modelling was completed to support detailed design of the interceptor well system. The interceptor well system is designed to intercept seepage from Gordon and Farley lakes prior to entering the open pit and return the water to the lakes to mitigate potential changes in lake level due to open pit dewatering. Capturing the water prior to entering the open pit is anticipated to limit effects of blasting residual and metal leaching on groundwater quality and therefore limit potential treatment prior to returning the water to the lakes. In the EIS, 14 interceptor wells were simulated whereas in this updated modelling 11 interceptor wells were simulated. The interceptor well locations were also shifted slightly to the south so more of the wells are in the zone of fractured bedrock. As a result, the combined predicted pumping rate from the interceptor wells increased from approximately 0.014 m^3/s in the EIS to 0.11 m^3/s in this updated modelling.

The water table drawdown related to open pit dewatering is slightly smaller (the extent is about 200 to 500 m smaller) than that predicted in the EIS. The smaller drawdown cone is the result of increased seepage from Gordon and Farley lakes to the open pit compared with that in the EIS.

Like the EIS, the seepage from lakes and rivers remains consistent with baseline conditions throughout the various phases of mine life, except for Gordon and Farley Lakes. In both the EIS and this model update, Gordon and Farley lakes are predicted to shift from gaining from groundwater to losing to groundwater. The change in rate of seepage from Gordon and Farley lakes at the end of operation was predicted to be 0.028 m^3/s in the EIS and 0.12 m^3/s in this updated modelling. The interceptor wells were optimized in terms of number of wells and pumping rate to offset the increased seepage from the lakes to the open pit which is why there are more interceptor wells, and the pumping rate was increased to 0.11 m^3/s in this updated modelling. The effect to water levels in Gordon and Farley lakes from the Project are predicted to be mitigated using the interceptor wells.

Table 3.5 Estimated Groundwater Discharge to Surface Water Features

Receiver	Net Groundwater Discharge to Receiver (m^3/s)						
	Baseline[1]	End of Construction[1]	Change from Baseline	End of Operation[1]	Change from Baseline	Closure[1]	Change from Baseline
Lakes							
Susan Lake	0.00236	0.00240	0.00003	0.00221	-0.00016	0.00218	-0.00019
Pump Lake	-0.00057	-0.00054	0.00003	-0.00057	0.00001	-0.00055	0.00003
Marnie Lake	-0.00030	-0.00023	0.00007	-0.00025	0.00005	-0.00024	0.00006
Marnie Lake North	0.00024	0.00025	negligible	0.00023	-0.00002	0.00024	negligible
Gordon Lake	0.00340	-0.04167	-0.04506	-0.05496	-0.05836	0.00340	0.00001
Farley Lake	0.00893	-0.03667	-0.04559	-0.06016	-0.06909	0.01122	0.00229
Marie Lake	-0.00231	-0.00221	0.00010	-0.00226	0.00005	-0.00227	0.00004
Lake 3	0.00050	0.00021	-0.00029	-0.00072	-0.00123	0.00062	0.00012
Watercourses							
Watercourse connecting Susan and Marrow Lakes (SUS3)	0.00044	0.00045	0.00001	0.00045	0.00001	0.00045	negligible
Tributary of Simpson Lake (FAR3-SIM2)	0.00115	0.00115	negligible	0.00114	-0.00001	0.00113	-0.00002
Tributary of Swede Lake (FAR3-A1)	0.00059	0.00059	0.00001	0.00059	0.00000	0.00058	negligible
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	0.00013	0.00013	0.00001	0.00011	-0.00002	0.00013	negligible
Tributary of Farley Lake (FAR5-A1)	0.00003	0.00002	-0.00001	-0.00003	-0.00006	0.00003	negligible

Receiver	Net Groundwater Discharge to Receiver (m^3/s)						
	Baseline[1]	End of Construction[1]	Change from Baseline	End of Operation[1]	Change from Baseline	Closure[1]	Change from Baseline
Southern Tributary of Gordon Lake (FAR7-A1)	0.00013	0.00010	-0.00003	0.00005	-0.00008	0.00007	-0.00006
Diversion Channel (FAR6)	0.00006	-0.00013	-0.00019	-0.00013	-0.00019	0.00006	0.00001
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	0.00009	0.00009	negligible	0.00009	negligible	0.00009	negligible
Watercourse Connecting Marie and Farley Lakes (FAR5-MAR3)	-0.00004	-0.00004	0.00001	-0.00005	-0.00001	-0.00005	negligible
Northern Tributary of Gordon Lake (FAR7B1)	-0.00001	-0.00001	negligible	-0.00001	negligible	0.00000	negligible
Water Management Features							
MRSA Contact Water Collection Ditch	n/a	0.00087	n/a	0.00049	n/a	6.3E-04	n/a
Interceptor Wells	n/a	0.10012	n/a	0.10601	n/a	n/a	n/a

Notes:

[1] Positive groundwater discharge value represents flow from groundwater to receiver

n/a – not applicable

3.3.3.2.2 Groundwater Quality

The effects assessment for groundwater quality involved an evaluation of seepage quality from mine infrastructure and predicting the fate of seepage from the mine infrastructure. The predicted seepage quality from the MRSAs was assessed in the EIS and remains consistent with the EIS in consideration of this NOA/NOC. As described in Chapter 8.0 of the EIS (Section 8.4.3.3 of the EIS), indicator parameters of groundwater seepage from the MRSA were identified as sulphate, antimony, arsenic, sodium, and uranium, meaning concentrations of these parameters in seepage from the MRSA were above the drinking water guidelines (Guidelines for Canadian Drinking Water Quality [GCDWQ] and MWQSOG Drinking Water) or GW3.

For this NOA/NOC, the assessment of effects to groundwater quality focused on the fate of recharge from the MRSAs for each phase of mine life, particularly the groundwater flow path, discharge rate, and travel times. A groundwater model was constructed and used to predict the fate of recharge from the mine components, as defined per the NOA/NOC mine plan. Details of the modelling and model results are presented in Appendix E.

Construction

During construction, seepage from the MRSAs (historical and new) has the potential to affect groundwater quality. The historical north MRSA will be removed in construction (either used for construction or placed in the new MRSA) which is different than the EIS which assumed the north MRSA remained throughout each phase of mine life. The historical south MRSA footprint will be reduced by 80% to allow development of the open pit, which is greater than the 37% reduction assumed in the EIS. The new MRSA will be built in the construction phase to accommodate rock from the historical south and north MRSAs which is also different than the EIS which assumed the new MRSA would commence in the operation phase.

The groundwater flow model was used to predict the flow pathway, discharge location, and flux of water recharging the groundwater flow systems from beneath the MRSAs at the end of construction, when the historical East and Wendy pits are fully dewatered. Detailed methods and results of the groundwater flow modelling are provided in Appendix E.

Table 3.6 provides a summary of the discharge fluxes and advective travel times of recharge originating from the historical south MRSA and MRSA at the end of construction when the historical East and Wendy pits are fully dewatered. The particles originating from the historical south MRSA are predicted to be captured by the interceptor wells with a mean advective travel time of approximately one year. The particles originating at the MRSA are predicted to discharge to the MRSA contact water collection ditch or be captured by the interceptor wells with a mean travel time of less than one year. The flow path of seepage from the MRSAs is confined to the PDA. No groundwater supply wells are known to be in the PDA and groundwater originating from the historical south MRSA and MRSA is predicted to discharge to surface water and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality is assessed in Section 3.3.4.

Operation

During operation, the MRSAs (historical and new) have the potential to affect groundwater quality. As the footprint of the MRSA and the historical south MRSA have changed as part of this NOA/NOC, the groundwater flow model was used to predict the flow pathway, discharge location, and flux of water recharging the groundwater flow systems from beneath the MRSAs at the end of operation when the open pit is fully dewatered. Detailed methods and results of the groundwater flow modelling is provided in Appendix E.

Table 3.6 provides a summary of the discharge fluxes and advective travel times of recharge originating from the historical south MRSA and MRSA once the ultimate extent of the open pit has been fully dewatered. The particles originating from the historical south MRSA are captured by the interceptor wells or discharge to the open pit with mean advective travel time of one and two years, respectively. Approximately 72% of the recharge from the MRSA discharges to the open pit or is captured by the interceptor wells or MRSA contact water collection ditch with mean advective travel times of approximately two to four years. About 0.8% of recharge ($3x10^{-6}$ m^3/s) from the MRSA is predicted to discharge to Susan Lake with a mean advective travel time of approximately five years. The annual volumes of recharge from the MRSA predicted to discharge to Susan Lake during the operation phase represent 0.21% of the total predicted annual groundwater discharge to Susan Lake. The remaining recharge from the MRSA (28%), remains in the groundwater system during the operation phase. Recharge from the ore storage area (OSA) discharges to the open pit or is captured by the interceptor wells with mean advective travel times of two and three years, respectively.

The flow path of seepage from the MRSAs is mainly confined to the PDA with small portion of seepage extending to the south of the PDA toward Susan Lake. No groundwater supply wells are known to be in the PDA or the flow path of seepage from the MRSA. Groundwater originating from the MRSAs (historical and new) is predicted to discharge to the open pit, MRSA contact water collection ditches, interceptor wells and/or surface water and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Section 3.3.4.

Decommissioning/Closure

During decommissioning/closure, as the open pit fills, groundwater levels will slowly recover, and the groundwater flow patterns will return to near baseline conditions once the open pit has filled. The groundwater flow model was used to predict the flow pathway, discharge location, and flux of water recharging the groundwater flow systems from beneath the MRSAs in closure. Detailed methods and results of the groundwater flow modelling is provided in Appendix E.

In closure, the MRSA is covered and revegetated. The rate of recharge through the new MRSA was based on modelling conducted as part of the EIS that predicted the recharge rate out the base of the MRSA at different phases of wetting up. The wetting up time is the time to reach a steady-state saturation condition in the MRSA, where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of recharge from the base of the MRSA. The MRSA is predicted to be wet up 19 years after the start of closure. Therefore, the recharge rate from the MRSA was increased in closure

groundwater model simulations compared with operation groundwater model simulations. The contact water collection ditch around the MRSA remains in closure until contact water quality is suitable for discharge to the environment and so the contact water collection ditch was simulated in the assessment of effects to groundwater quality for closure.

Table 3.6 provides a summary of the discharge fluxes and advective travel times of recharge originating from the historical south MRSA and MRSA once the pit lake has formed. The particles originating from the historical south MRSA discharge to the pit lake with a mean advective travel time of less than one year. Approximately 95% of the recharge from the MRSA discharges to the pit lake or the MRSA contact water collection ditch with mean advective travel times of approximately one and two years, respectively. Approximately three percent of recharge from the MRSA discharges to Simpson Lake with a mean advective travel time of 14 years. The annual volume of recharge from the MRSA predicted to discharge to Simpson Lake during the closure period represents 0.8% of the total predicted annual groundwater discharge to Simpson Lake. In comparison to operation, there is no predicted seepage from the MRSA to Susan Lake. In closure, the recharge rate of the MRSA increases due to steady state saturation of the MRSA. As a result of the increased recharge from the MRSA, the recharge is driven deeper into the groundwater flow system, bypassing Susan Lake in closure. The remaining recharge from the MRSA (6%), remains in storage in the groundwater system at the end of the closure period.

The flow path of seepage from the MRSAs is mainly confined to the PDA with small portion of seepage extending to the south of the PDA toward Simpson Lake. No groundwater supply wells are known to be in the PDA or the flow path of seepage from the MRSA. Groundwater originating from the MRSAs (historical and new) is predicted to discharge to the open pit, MRSA contact water collection ditches, interceptor wells and/or surface water and not to areas where groundwater supply users are known to be located. The effect of the changes in mass loading to surface water receivers on surface water quality, is assessed in Section 3.3.4.

Comparison with the EIS

Receptors of groundwater seepage from mine infrastructure remained consistent with the EIS, except for Simpson Lake. A portion of seepage (2.2E-05 m^3/s or 3% of seepage from the MRSA) is predicted to discharge to Simpson Lake whereas in the EIS there was no predicted seepage from the MRSA to Simpson Lake. The rate of seepage from the MRSA to Simpson Lake represents 0.8% of the overall predicted groundwater discharge to Simpson Lake and therefore is not anticipated to affect the water quality of Simpson Lake. A full assessment of the effect of groundwater discharge on surface water quality is assessed in Section 3.3.4.

Table 3.6 Predicted Groundwater Discharge Rates from Mine Rock Storage Areas and Ore Storage Areas to Receiving Environment.

Source	Receptor	Baseline				End of Construction				End of Operation				Closure (Pit Lake)			
		Discharge (m^3/s)	Travel Time (years)			Discharge (m^3/s)	Travel Time (years)			Discharge (m^3/s)	Travel Time (years)			Discharge (m^3/s)	Travel Time (years)		
			Min	Mean	Max		Min	Mean	Max		Min	Mean	Max		Min	Mean	Max
Historical North MRSA	East Pit	4.6E-05	15	70	171	-	-	-	-	-	-	-	-	-	-	-	-
	Wendy Pit	4.5E-05	16	116	759	-	-	-	-	-	-	-	-	-	-	-	-
Historical South MRSA	Farley Lake	1.1E-04	991	1,036	1,226	-	-	-	-	-	-	-	-	-	-	-	-
	East Pit	4.4E-05	61	188	500	-	-	-	-	-	-	-	-	-	-	-	-
	Interceptor Wells	-	-	-	-	1.8E-07	1	1	>1	1.1E-06	1	1	1	-	-	-	-
	Open Pit	-	-	-	-	-	-	-	-	1.9E-05	1	2	3	-	-	-	-
	Pit Lake	-	-	-	-	-	-	-	-	-	-	-	-	1.8E-05	<1	<1	1
MRSA	MRSA Contact Water Collection Ditch	-	-	-	-	9.8E-05	<1	<1	>1	1.5E-04	<1	1	4	6.1E-05	<1	1	4
	Interceptor Wells	-	-	-	-	4.9E-06	1	1	>1	6.9E-05	1	2	4	-	-	-	-
	Open Pit	-	-	-	-	-	-	-	-	2.3E-04	2	4	>6	-	-	-	-
	Susan Lake	-	-	-	-	-	-	-	-	4.6E-06	5	5	>6	-	-	-	-
	Pit Lake	-	-	-	-	-	-	-	-	-	-	-	-	6.0E-04	<1	2	18
	Simpson Lake	-	-	-	-	-	-	-	-	-	-	-	-	2.2E-05	9	14	27
Ore Storage Area	Interceptor Wells	-	-	-	-	-	-	-	-	4.2E-05	1	2	2	-	-	-	-
	Open Pit	-	-	-		-	-	-	-	6.4E-05	2	3	4	-	-	-	-

Predictions of travel time of seepage from mine infrastructure also changed relative to the EIS. The porosity of the upper, intermediate, and deep bedrock in the EIS groundwater flow model was 0.2. In the model update to support this NOA/NOC, the porosity of the shallow bedrock and faulted shallow bedrock was set to 0.06 and 0.0003, respectively while the porosity for the upper, intermediate, and deep bedrock layers was set to 0.0001. The porosity of the shallow bedrock (faulted and unfaulted) was calibrated in the groundwater flow model to the results of pumping tests. These porosity values reflect discussions and sensitivity analysis completed through the Information Requests after the submission of the EIS (IR-IAAC-83, IR-IAAC-R2-72). In addition, the travel times for Gordon in the EIS were presented as years and after the EIS it was determined that the travel times for Gordon in the EIS were days, which means travel times in the EIS should have been presented as tens of years instead of thousands of years. The porosity does not affect the flux, or specific discharge, of groundwater through the rock, the porosity only affects the predicted timing of seepage from the mine infrastructure discharging to the receiver. As a result, the predicted travel times of seepage from mine infrastructure decreases from tens to thousands of years in the EIS to tens of years in this model update. The predictions of seepage rates and travel times from mine infrastructure remain conservative in that processes along the groundwater flow path such as dispersion and geochemical reactions were not simulated and would serve to increase groundwater flow travel times and decrease concentrations along the groundwater flow path.

3.3.3.3 Summary of Mitigation Measures

The mitigation measures for groundwater quantity and quality are the same as the mitigation measures recommended in the EIS (Stantec 2020a) and described in the Groundwater Management and Monitoring Plan (GMMP; Version 0, January 2025). The conceptual design of some of the mitigation measures have been optimized for the updated mine plan. No additional mitigation measures are required in relation to this NOA/NOC. Alamos is committed to the follow-up and monitoring, and adaptive management (if and as required) that is described in the GMMP.

3.3.3.4 Residual Effects

3.3.3.4.1 Groundwater Quantity

During construction, residual environmental effects related to dewatering the historical Wendy and East pits will occur through construction phase and into operation. The changes to groundwater quantity and flow were characterized in the EIS as adverse, medium-term, continuous, and reversible. The magnitude was high within the PDA and LAA/RAA, as the change in groundwater level was anticipated to be greater than 5 m. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context. The results of the updated groundwater assessment for this NOA/NOC do not change the characterization of these residual effects for construction.

At the end of operation, the lowering of water levels through continued dewatering of the historical Wendy and East pits and the development and dewatering of the open pit will result in a change in groundwater quantity and flow at the Gordon site. The changes were characterized in the EIS as adverse, medium-

term, continuous, irreversible, and will be confined to the LAA/RAA. The magnitude was high within the PDA and LAA/RAA as the change in groundwater level will be greater than 5 m. The magnitude will be reduced during decommissioning/closure as the open pit fills to form a pit lake. Timing (i.e., natural seasonal variations in precipitation) may affect dewatering rates due to natural seasonal variations, particularly during the spring period when higher groundwater levels are expected; however, these variations would not be considered a Project-related effect. The groundwater quantity in the LAA/RAA is disturbed with respect to ecological context. The results of the updated groundwater assessment for this NOA/NOC do not change the characterization of these residual effects for operation.

In closure, once the pit lake has filled, the drawdown around the open pit will be reduced to near baseline conditions. The changes in groundwater levels in proximity of the open pit were characterized in the EIS as adverse, long-term, continuous, irreversible, and will be confined to the LAA/RAA. The magnitude was low within the PDA and decreased to negligible in the LAA/RAA as the change in groundwater level was less than 1 m. Timing may affect water levels (i.e., natural seasonal variations), particularly during the spring period when higher groundwater levels are expected, but this is not considered a Project-related effect. From an ecological context, the areas where the water level changes occur are disturbed for groundwater availability. The results of the updated groundwater assessment for this NOA/NOC do not change the characterization of these residual effects for closure.

Compared with the results of the EIS, the effects of the Project on groundwater quantity due to the proposed alterations remain similar and where they differ (i.e., Gordon and Farley Lake), measures were simulated to mitigate the potential effect. In conclusion, the results of the updated groundwater assessment do not change the characterization of residual effects as presented in the EIS (Stantec 2020a).

3.3.3.4.2 Groundwater Quality

The residual effect on groundwater quality during construction was characterized in the EIS as positive, as no new source of groundwater mass loading was introduced during construction, a portion of the historical south MRSA was relocated, and the seepage from the historical MRSAs was redirected from Gordon and Farley Lake to the open pit. With the proposed alterations, the new MRSA will be operational in construction phase of mine life which means a new source of loading is introduced to the groundwater flow system in construction. However, the seepage from the MRSAs will be captured by the MRSA contact water collection ditch and/or open pit dewatering, redirecting seepage from the historical MRSAs from Gordon and Farley Lake and therefore the residual effect is still characterized as positive. The effects on groundwater quality during construction were characterized in the EIS as short-term, continuous, irreversible, and will be confined to the PDA. The magnitude is moderate because water quality and discharge fluxes for most parameters are predicted to result in temporary reductions in the mass loading from historical MRSAs to surface water receivers within the LAA/RAA relative to baseline conditions. No existing or foreseeable groundwater users are in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA is disturbed based on existing parameter loadings from historical mining activities. The results of the updated groundwater assessment for this NOA/NOC do not change the characterization of these residual effects for the construction phase.

The effects on groundwater quality during operation were characterized in the EIS as adverse, long-term, continuous, irreversible, confined to the LAA/RAA, and mainly to the PDA. The magnitude was moderate because water quality and loading for some parameters were predicted to increase but not impact groundwater supply users beyond the PDA. No existing or foreseeable groundwater users were in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA was disturbed based on existing parameter loadings from historical mining activities. The results of the updated groundwater assessment for this NOA/NOC do not change the characterization of these residual effects for the operation phase.

The effects on groundwater quality during closure were characterized in the EIS as adverse, long-term, continuous, irreversible, are confined to the LAA/RAA, and mainly to the PDA. The magnitude was moderate as water quality and loading for some parameters are predicted to increase above the GCDWQ or MWQSOG (drinking water) but will not impact groundwater supply users beyond the PDA. No existing or foreseeable groundwater users are in the areas with groundwater quality that exceeds the GCDWQ or MWQSOG (drinking water). The ecological context of the LAA/RAA was disturbed based on existing parameter loadings from historical mining activities. The results of the updated groundwater assessment for this NOA/NOC do not change the characterization of these residual effects for the operation phase.

Compared with the results of the EIS, the effects of the proposed alterations on groundwater quality remain similar and where they differ (i.e., Gordon and Farley Lake), measures were simulated to mitigate the potential effect. In conclusion, the results of the updated groundwater assessment do not change the characterization of residual effects as presented in the EIS (Stantec 2020a).

3.3.4 Surface Water

Surface water includes surface water quantity and surface water quality in freshwater waterbodies and watercourses adjacent to or downstream of the Project. Surface water is important as a source of potable water for humans, for wildlife and freshwater aquatic biota as habitat, and for supporting commercial, recreational, traditional, and industrial activities.

The proposed alterations to the approved Project that may interact with surface water quantity and quality are changes to the open pit footprint and overall mined rock tonnage, changes to the MRSA, ore and overburden storage areas, facility area water management infrastructure footprints, including removal of the approved diversion channel between Gordon and Farley lakes, and use of the historical north MRSA as a borrow source. In addition, the number and alignment of the groundwater interceptor wells were optimized for this NOA/NOC.

3.3.4.1 Regulatory and Guideline Setting

3.3.4.1.1 Federal

Assessment of the proposed alterations to the approved Gordon site on surface water quantity and quality considered the following federal legislation, policies, and guidelines:

- *The Fisheries Act*, which restricts or controls the deposit of deleterious substances into waters or locations frequented by fish unless authorized by regulation.
- The MDMER, which defines unionized ammonia, arsenic, copper, cyanide, lead, nickel, zinc, TSS, and radium 226 as deleterious substances and Schedule 4 of the MDMER imposes limits on their concentrations in effluent at the final discharge point (FDS) to the receiving body of water. The MDMER requires environmental effects monitoring (EEM) for mines that discharge mine effluent to the receiving environment at a rate exceeding 50 cubic metres per day (m^3/day).
- CWQG-FAL, which are intended to be protective of all forms of aquatic life and all aspects of the aquatic life cycle during acute and/or chronic exposure regimes. The guidelines were used to identify parameters of potential concern (POPCs).
- Guidelines for Canadian Drinking Water Quality which are based on current published scientific research related to health effects, aesthetic effects, and operational conditions of various parameters in drinking water.
- The Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada (Fisheries and Oceans Canada [DFO] 2013), which provides guidance on the management of flows required to maintain the ecological functions that sustain fisheries in streams and rivers potentially affected by water withdrawals or diversions.
- Federal Environmental Quality Guidelines (FEQG), which are recommended chemical thresholds that identify the concentration below which there is a low likelihood of adverse effects from the chemical on aquatic life exposed via water or sediment, or where chemicals may bioaccumulate in wildlife that may consume aquatic life. FEQGs are developed by ECCC to support federal environmental quality monitoring, risk assessment and risk management activities on substances for which the CCME guidelines do not yet exist or are not anticipated to be updated in the near future.

3.3.4.1.2 Provincial

Assessment of the proposed alterations to the approved Gordon site on surface water quantity and quality included consideration of the following provincial legislation, policies, and guidelines:

- *The Drinking Water Safety Act*, which addresses construction, operation, and monitoring of drinking water systems in Manitoba.
- *The Environment Act*, which contains provisions associated with Class 1, 2, and 3 developments that can be used to protect surface water quality. It also requires provincial assessment and licensing for proposed alteration to streams in Manitoba.

- *The Water Protection Act*, the principal statute governing water management and water quality in Manitoba. The MWQSOG under Part 2 of *The Water Protection Act* sets out prescribed water quality standards for various activities, including drinking water, freshwater aquatic life, and common classes of discharge.
- *The Water Rights Act*, the legislative mechanism governing allocation of water resources and construction of water control works within Manitoba.
- *The Mines and Minerals Act* and Mine Closure Regulation under Part 14 of *The Mines and Minerals Act*, which sets out standards for mine closure.
- *The Public Health Act*, which is intended to enable the delivery of public health services to protect and promote the health and wellbeing of the people of Manitoba. Regulations can be enacted under *The Public Health Act* regarding pollution of wells, groundwater, surface water, and springs, as well as construction, provision, maintenance, and operation of potable and wastewater systems.
- *The Water Resources Conservation Act*, which requires that any removal of water from Manitoba's water basins be conducted in quantities that would not, individually or collectively, have substantial adverse effects on the ecological integrity of Manitoba's water resources or their associated ecosystems.

3.3.4.1.3 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to surface water:

> *3.4 The Proponent shall develop, prior to construction and in consultation with relevant authorities, and implement and maintain, during all phases of the Designated Project, measures to mitigate any potential effects to water levels in Farley Lake and Gordon Lake due to groundwater drawdown resulting from the Designated Project activities. In doing so, the Proponent shall intercept and/or redirect groundwater flowing towards the open pits with wells and/or other mitigation measures, as applicable, before it enters the open pits. The Proponent shall submit these measures to the Agency before implementing them.*
>
> *3.5 The Proponent shall, when releasing and collected water into Farley Lake and Gordon Lake, including groundwater intercepted pursuant to condition 3.4 and water from dewatering the East and Wendy pit lakes:*
>
> > *3.5.1 aerate, or treat by other means, water collected from the East and Wendy pit lakes, prior to release into Farley Lake and Gordon Lake, in accordance with condition 3.7, to precipitate oxides, increase dissolved oxygen concentrations, and prevent chemical stratification; and*

3.5.2 release collected water into Farley Lake and Gordon Lake in a manner than maintains the lake temperature at the point of release within baseline temperature variations to protect fish and fish habitat, unless otherwise authorized by Fisheries and Oceans Canada.

3.6 The Proponent shall adjust, during construction, the rate of release of water into Farley Lake and Gordon Lake from dewatering the East and Wendy pit lakes and from groundwater intercepted pursuant to condition 3.4 in order to maintain lake levels within the range of natural variability predicted in Volume 2 Chapter 10 of the Environmental Impact Statement and Appendix A Attachment IAAC-48 of the Proponent's Information Request Response Round 1, Package 1 (Canadian Impact Assessment Registry Reference Number 80140, document #54)

3.7 The Proponent shall collect contact water and seepage from the Project development areas, including seepage and recharge from the tailings management facility, mine rock storage areas, overburden and ore stockpiles, and seepage input to groundwater that flows into the open pits, and treat it, as necessary, before releasing it into the receiving environment during all phases of the Designated Project to ensure that any deposits are made in accordance with the Metal and Diamond Mining Effluent Regulations and the pollution prevention provisions of the Fisheries Act. When treating contact water and seepage, the Proponent shall take into account Manitoba's Water Quality Standards, Objectives, and Guidelines, the Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines of the Protection for Aquatic Life, and Environment and Climate Change Canada's Federal Environmental Quality Guidelines.

3.10 The Proponent shall manage, during all phases of the Designated Project and in consultation with Environment and Climate Change Canada and any other relevant authorities, acid-generating and metal-leaching and potentially acid-generating and metal-leaching tailings and waste, including from the tailings management facility, mine rock storage areas and ore stockpiles. In doing so, the Proponent shall:

3.10.1 characterize, prior to construction, the acid rock drainage and metal-leaching potential of overburden and other mine rock to be used for construction;

3.10.2 only use materials that are not acid-generating, non-potentially acid-generating and non-metal-leaching during construction, including for earthworks and grading, unless not technically or economically feasible, if not technically or economically feasible, the Proponent shall preclude water and oxygen ingress into the materials used;

3.10.3 conduct geochemical testing of generated waste rock and tailings during operation to Identify potentially acid-generating and metal-le aching waste material and verify the magnitude and onset of potential acid rock drainage in waste rock and tailings;

3.10.4 taking into account results of geochemical testing referred to in condition 3.10.3. implement measures to delay onset and magnitude of acid rock drainage in waste rock, Including blending potentially acid generating with non-potentially acid generating during operation; and

3.10.5 cover all acid-generating, potentially acid-generating, and potentially metal-leaching tailings and waste, including waste in the tailings management facility and mine rock storage areas, during decommissioning with an oxygen-limiting barrier in a manner determined by a qualified individual.

3.11 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, and implement and maintain during all phases of the Designated Project, measures to control erosion and sedimentation within the Project development areas in a manner consistent with the Fisheries Act and its regulations, and taking into account Environment and Climate Change Canada's Environmental Code of Practice for Metal Mines, and Fisheries and Oceans Canada's Measures to Protect Fish and Fish Habitat. The Proponent shall submit these measures to the Agency before implementing them. As part of these measures, the Proponent shall:

3.11.1 install intake pipes pointing upwards and away from sediment; and

3.11.2 equip contact water discharge pipes with diffusers.

3.12 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quality, taking into account Environment and Climate Change Canada's Metal Mine Technical Guidance for Environmental Effects Monitoring. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

3.12.1 determine, in consultation with Indigenous groups, Environment and Climate Change Canada, and any other relevant authorities, the location and extent of mixing zones in water bodies that may be affected by the Designated Project;

3.12.2 monitor water quality in the East and Wendy pit lakes, newly formed pit lakes, tailings management facility, mine rock storage areas, contact water collection ponds, and receiving water bodies and watercourses upstream and downstream of the Project development areas, including at the edge and downstream of the edge of mixing zones identified pursuant to condition 3.12.1, Arbor Lake, Burge Lake, Cockeram Lake, Ellystan Lake, Farley Creek, Farley Lake, Gordon Lake, the Hughes River, the Keewatin River, the unnamed tributary of the Keewatin River, Minton Lake, Payne Lake, Susan Lake and Swede Lake, for all contaminants that may have adverse effects on fish and fish habitat, including aluminum, antimony, arsenic, calcium, copper, cyanide, fluoride, hexavalent chromium, iron, magnesium, methylmercury, phosphorus, selenium, and total and dissolved cadmium. Monitoring shall be conducted as follows:

3.12.2.1 beginning during construction and continuing through decommissioning, except in the East and Wendy pit lakes, and the newly formed pit lakes; and

3.12.2.2 beginning during construction in the East and Wendy pit lakes, and beginning during decommissioning and continuing through post-closure in the newly formed pit lakes, until water quality is stable and improving and any contact water or seepage potentially released meets the Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines of the Protection for Aquatic Life and Manitoba's Water Quality, Standards, Objectives, and Guidelines pursuant to condition 3.7;

3.12.4 monitor, during construction and operation, total suspended solids and turbidity in fish bearing water bodies where Designated Project activities are undertaken in or near water frequented by fish; and

3.12.5 develop, in consultation with relevant authorities, and implement modified or additional mitigation measures, if the results of monitoring conducted pursuant to condition 3.12.2, 3.12.3 and 3.12.4 demonstrate any unanticipated effects attributable to the Designated Project, taking into account the Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines of the Protection for Aquatic Life or Manitoba's Water Quality Standards, Objectives, and Guidelines, whichever is most protective of fish and fish habitat, and predicted concentrations identified in Volume 1 Chapter 9 of the Environmental Impact Statement.

3.13 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quantity. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

3.13.1 monitor, during all phases of the Designated Project, surface water instantaneous flows, lake levels and pH levels within Arbor Lake, Burge Lake, Cockeram Lake, Ellystan Lake, Farley Creek, Farley Lake, Gordon Lake, the Keewatin River, the unnamed tributary of the Keewatin River, Minton Lake, Payne Lake, Susan Lake, Swede Lake, fish-bearing wetlands within the local assessment areas, the East and Wendy pit lakes, newly formed pit lakes, the tailings management facility, and contact water collection ponds to verify the environmental assessment predictions identified in Volume 2 Chapter 10 of the Environmental Impact Statement and Appendix A Attachment IAAC-48 of the Proponent's IR Responses Round 1, Package 1 (Canadian Impact Assessment Registry Reference Number 80140, document #54);

3.13.2 monitor, during all phases of the Designated Project, groundwater levels, gradients and hydraulic conductivity of all hydrogeological units, as identified in the groundwater model in Volume 5 Appendix E and G of the Environmental Impact Statement, with well depths ranging from near surface to a minimum of 115 meters below ground to characterize contaminant transport via groundwater at the depth of the groundwater model for the Designated Project. Monitoring wells shall be installed near

the open pits, the tailings management facility, mine rock storage areas, ore and overburden stockpiles, and fish bearing wetlands within the local assessment areas that intersect with the Project development areas; and

3.13.3 develop, in consultation with relevant authorities, and implement modified or additional mitigation measures, if the results of monitoring conducted pursuant to condition 3.13.1 and 3.13.2 demonstrate unanticipated effects attributable to the Designated Project.

3.15 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and the effectiveness of the mitigation measures as they pertain to acid rock drainage and metal leaching into the receiving environment from the Project development areas, including from the mine rock storage areas, ore stockpiles, and the tailings management facility. The Proponent shall implement the follow-up program during all phases of the Designated Project. In doing so, the Proponent shall:

3.15.1 verify that the covers installed at the mine rock storage areas and tailings management facility pursuant to condition 3.10.5 perform and continue to perform as predicted in Volume 1 Chapter 5 of the Environmental Impact Statement during all phases of the Designated Project, including post-closure.

3.3.4.2 Environmental Effects

3.3.4.2.1 Surface Water Quantity

Assessment Methods

The EIS surface water balance model was updated to reflect the changes presented in Section 2 and results of the effects assessment for groundwater presented in Section 3.3.3 of this NOA/NOC. Details of the updated NOA/NOC water balance, including the results, are presented in Appendix F.

A schematic diagram of flow pathways and model nodes (Appendix F) is shown in Figure 3.1. Summary results, including the effects of the Project on streamflows (at different model nodes) and lake levels, are presented in Table 3.7 to Table 3.22.

Figure 3.1 Water Balance and Water Quality Model Nodes

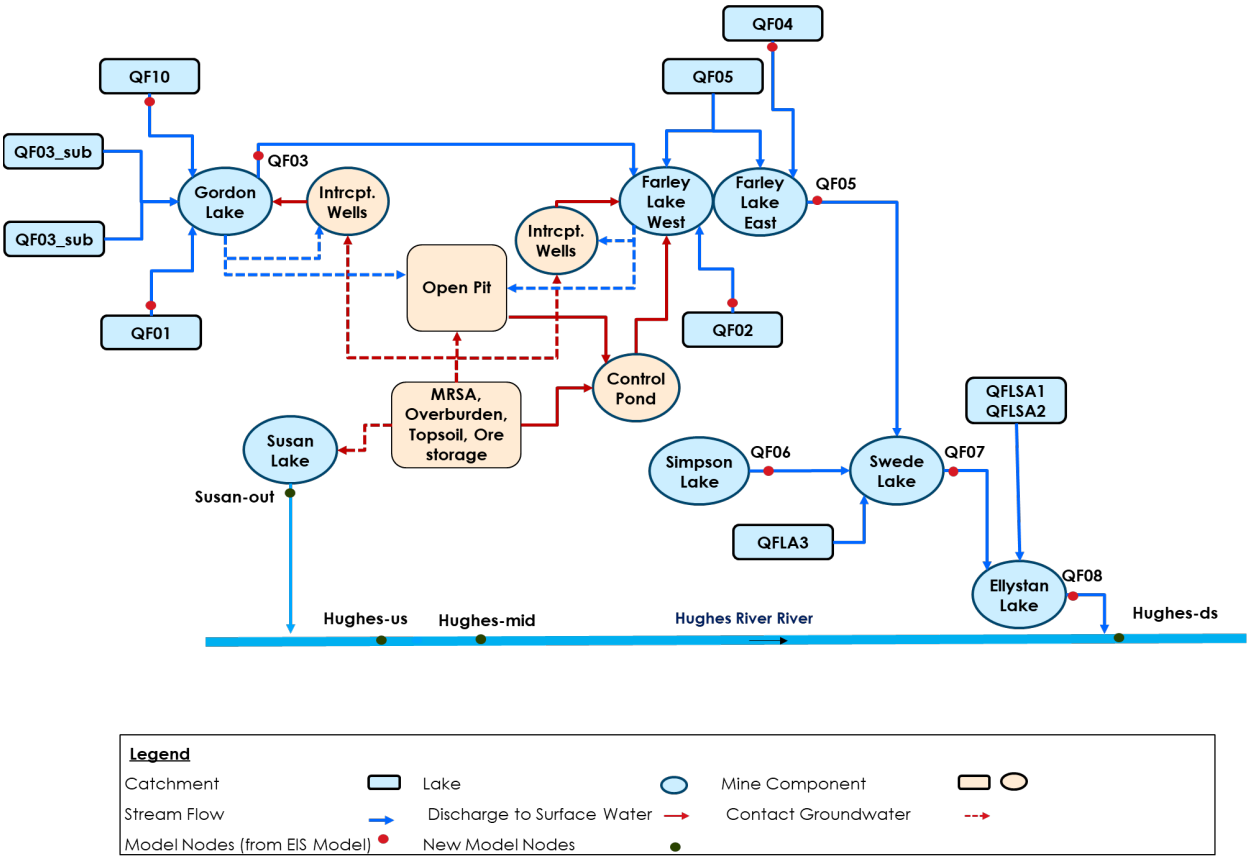


Table 3.7 Simulated Average Monthly and Annual Streamflows at Model Node QF01

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.003	0.003	0.000	0%	0.003	-0.001	-19%	0.002	-0.001	-44%	0.002	-0.001	-44%
Feb	0.002	0.002	0.000	0%	0.002	0.000	-20%	0.001	-0.001	-44%	0.001	-0.001	-44%
Mar	0.001	0.001	0.000	-1%	0.001	0.000	-20%	0.001	0.000	-44%	0.001	0.000	-44%
Apr	0.002	0.002	0.000	-1%	0.002	0.000	-21%	0.001	-0.001	-44%	0.001	-0.001	-44%
May	0.019	0.019	0.000	-1%	0.015	-0.004	-21%	0.011	-0.008	-44%	0.011	-0.008	-44%
Jun	0.020	0.019	0.000	-1%	0.015	-0.004	-22%	0.011	-0.009	-44%	0.011	-0.009	-44%
Jul	0.011	0.011	0.000	-2%	0.009	-0.002	-22%	0.006	-0.005	-44%	0.006	-0.005	-44%
Aug	0.009	0.009	0.000	-2%	0.007	-0.002	-23%	0.005	-0.004	-44%	0.005	-0.004	-44%
Sep	0.010	0.010	0.000	-2%	0.008	-0.002	-23%	0.006	-0.005	-44%	0.006	-0.005	-44%
Oct	0.011	0.010	0.000	-3%	0.008	-0.003	-24%	0.006	-0.005	-44%	0.006	-0.005	-44%
Nov	0.010	0.010	0.000	-3%	0.007	-0.002	-24%	0.005	-0.004	-44%	0.005	-0.004	-44%
Dec	0.006	0.006	0.000	-3%	0.005	-0.002	-25%	0.003	-0.003	-44%	0.003	-0.003	-44%
Annual	**0.009**	**0.009**	**0.000**	**-2%**	**0.007**	**-0.002**	**-22%**	**0.005**	**-0.004**	**-44%**	**0.005**	**-0.004**	**-44%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.8 Simulated Average Monthly and Annual Streamflows at Model Node QF02

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.002	0.002	0.000	-1%	0.002	0.000	-22%	0.001	-0.001	-44%	0.001	-0.001	-45%
Feb	0.002	0.001	0.000	-2%	0.001	0.000	-22%	0.001	-0.001	-44%	0.001	-0.001	-45%
Mar	0.001	0.001	0.000	-2%	0.001	0.000	-23%	0.000	0.000	-44%	0.000	0.000	-45%
Apr	0.001	0.001	0.000	-2%	0.001	0.000	-23%	0.001	-0.001	-44%	0.001	-0.001	-45%
May	0.014	0.014	0.000	-2%	0.011	-0.003	-24%	0.008	-0.006	-44%	0.008	-0.006	-45%
Jun	0.014	0.014	0.000	-3%	0.011	-0.003	-24%	0.008	-0.006	-44%	0.008	-0.006	-45%
Jul	0.008	0.008	0.000	-3%	0.006	-0.002	-25%	0.005	-0.004	-45%	0.005	-0.004	-45%
Aug	0.007	0.006	0.000	-4%	0.005	-0.002	-25%	0.004	-0.003	-45%	0.004	-0.003	-45%
Sep	0.008	0.007	0.000	-4%	0.006	-0.002	-26%	0.004	-0.003	-45%	0.004	-0.003	-45%
Oct	0.008	0.008	0.000	-5%	0.006	-0.002	-26%	0.004	-0.004	-45%	0.004	-0.004	-45%
Nov	0.007	0.007	0.000	-5%	0.005	-0.002	-27%	0.004	-0.003	-45%	0.004	-0.003	-45%
Dec	0.004	0.004	0.000	-6%	0.003	-0.001	-27%	0.002	-0.002	-45%	0.002	-0.002	-45%
Annual	**0.006**	**0.006**	**0.000**	**-3%**	**0.005**	**-0.002**	**-24%**	**0.004**	**-0.003**	**-44%**	**0.004**	**-0.003**	**-45%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.9 Simulated Average Monthly and Annual Streamflows at Model Node QF03

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.009	0.009	0.000	0%	0.008	-0.001	-9%	0.007	-0.002	-21%	0.007	-0.002	-21%
Feb	0.006	0.006	0.000	0%	0.005	-0.001	-9%	0.005	-0.001	-21%	0.005	-0.001	-21%
Mar	0.003	0.003	0.000	0%	0.003	0.000	-10%	0.002	-0.001	-21%	0.002	-0.001	-21%
Apr	0.006	0.006	0.000	0%	0.005	-0.001	-10%	0.004	-0.001	-21%	0.004	-0.001	-21%
May	0.055	0.055	0.000	-1%	0.049	-0.006	-10%	0.043	-0.012	-21%	0.043	-0.012	-21%
Jun	0.056	0.056	0.000	-1%	0.050	-0.006	-10%	0.044	-0.012	-21%	0.044	-0.012	-21%
Jul	0.032	0.032	0.000	-1%	0.028	-0.003	-11%	0.025	-0.007	-21%	0.025	-0.007	-21%
Aug	0.026	0.026	0.000	-1%	0.023	-0.003	-11%	0.021	-0.006	-21%	0.021	-0.006	-21%
Sep	0.030	0.030	0.000	-1%	0.026	-0.003	-11%	0.024	-0.006	-21%	0.024	-0.006	-21%
Oct	0.031	0.030	0.000	-1%	0.027	-0.004	-11%	0.024	-0.007	-21%	0.024	-0.007	-21%
Nov	0.028	0.028	0.000	-1%	0.025	-0.003	-12%	0.022	-0.006	-21%	0.022	-0.006	-21%
Dec	0.018	0.017	0.000	-1%	0.015	-0.002	-12%	0.014	-0.004	-21%	0.014	-0.004	-21%
Annual	**0.025**	**0.025**	**0.000**	**-1%**	**0.022**	**-0.003**	**-11%**	**0.020**	**-0.005**	**-21%**	**0.020**	**-0.005**	**-21%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.10 Simulated Average Monthly and Annual Streamflows at Model Node QF05

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.038	0.038	0.000	0%	0.052	0.015	39%	0.029	-0.009	-23%	0.056	0.019	50%
Feb	0.025	0.025	0.000	0%	0.040	0.015	60%	0.018	-0.007	-30%	0.045	0.020	79%
Mar	0.013	0.015	0.002	11%	0.029	0.016	120%	0.008	-0.006	-43%	0.034	0.021	159%
Apr	0.024	0.026	0.003	11%	0.047	0.024	99%	0.016	-0.007	-30%	0.057	0.033	139%
May	0.232	0.234	0.002	1%	0.248	0.016	7%	0.206	-0.026	-11%	0.248	0.016	7%
Jun	0.239	0.240	0.001	1%	0.244	0.006	2%	0.212	-0.026	-11%	0.238	0.000	0%
Jul	0.135	0.136	0.002	1%	0.146	0.012	9%	0.118	-0.017	-13%	0.145	0.011	8%
Aug	0.111	0.115	0.004	3%	0.123	0.012	11%	0.096	-0.015	-13%	0.123	0.011	10%
Sep	0.126	0.130	0.004	3%	0.141	0.014	11%	0.110	-0.016	-13%	0.142	0.016	12%
Oct	0.131	0.135	0.005	4%	0.144	0.013	10%	0.114	-0.016	-13%	0.146	0.015	12%
Nov	0.119	0.125	0.006	5%	0.131	0.012	10%	0.104	-0.015	-13%	0.132	0.013	11%
Dec	0.074	0.083	0.008	11%	0.088	0.013	18%	0.063	-0.011	-15%	0.090	0.015	21%
Annual	**0.106**	**0.109**	**0.003**	**4%**	**0.120**	**0.014**	**33%**	**0.092**	**-0.014**	**-19%**	**0.122**	**0.016**	**42%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.11 Simulated Average Monthly and Annual Streamflows at Model Node QF06

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.017	0.017	0.000	0%	0.017	0.000	0%	0.017	0.000	0%	0.017	0.000	0%
Feb	0.011	0.011	0.000	0%	0.011	0.000	0%	0.011	0.000	0%	0.011	0.000	0%
Mar	0.006	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%
Apr	0.010	0.010	0.000	0%	0.010	0.000	0%	0.010	0.000	0%	0.010	0.000	0%
May	0.102	0.102	0.000	0%	0.102	0.000	0%	0.102	0.000	0%	0.102	0.000	0%
Jun	0.105	0.105	0.000	0%	0.105	0.000	0%	0.105	0.000	0%	0.105	0.000	0%
Jul	0.059	0.059	0.000	0%	0.059	0.000	0%	0.059	0.000	0%	0.059	0.000	0%
Aug	0.049	0.049	0.000	0%	0.049	0.000	0%	0.049	0.000	0%	0.049	0.000	0%
Sep	0.056	0.056	0.000	0%	0.056	0.000	0%	0.056	0.000	0%	0.056	0.000	0%
Oct	0.057	0.057	0.000	0%	0.057	0.000	0%	0.057	0.000	0%	0.057	0.000	0%
Nov	0.052	0.052	0.000	0%	0.052	0.000	0%	0.052	0.000	0%	0.052	0.000	0%
Dec	0.033	0.033	0.000	0%	0.033	0.000	0%	0.033	0.000	0%	0.033	0.000	0%
Annual	**0.047**	**0.047**	**0.000**	**0%**	**0.047**	**0.000**	**0%**	**0.047**	**0.000**	**0%**	**0.047**	**0.000**	**0%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.12 Simulated Average Monthly and Annual Streamflows at Model Node QF07

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.081	0.081	0.000	0%	0.096	0.015	18%	0.072	-0.009	-11%	0.100	0.019	23%
Feb	0.054	0.054	0.000	0%	0.069	0.015	28%	0.047	-0.007	-14%	0.074	0.020	37%
Mar	0.029	0.030	0.002	5%	0.045	0.016	56%	0.023	-0.006	-20%	0.050	0.021	74%
Apr	0.051	0.054	0.003	5%	0.074	0.024	46%	0.044	-0.007	-14%	0.084	0.033	65%
May	0.500	0.502	0.002	0%	0.516	0.016	3%	0.474	-0.026	-5%	0.516	0.016	3%
Jun	0.514	0.515	0.001	0%	0.520	0.006	1%	0.487	-0.026	-5%	0.514	0.000	0%
Jul	0.291	0.292	0.002	1%	0.302	0.012	4%	0.274	-0.017	-6%	0.301	0.010	4%
Aug	0.240	0.243	0.004	1%	0.251	0.012	5%	0.225	-0.015	-6%	0.251	0.011	5%
Sep	0.272	0.276	0.004	1%	0.286	0.014	5%	0.256	-0.016	-6%	0.288	0.016	6%
Oct	0.281	0.286	0.005	2%	0.294	0.013	5%	0.265	-0.016	-6%	0.297	0.015	5%
Nov	0.256	0.263	0.006	2%	0.268	0.012	5%	0.241	-0.015	-6%	0.269	0.013	5%
Dec	0.160	0.169	0.009	5%	0.174	0.013	8%	0.149	-0.011	-7%	0.176	0.016	10%
Annual	**0.228**	**0.231**	**0.003**	**2%**	**0.242**	**0.014**	**15%**	**0.214**	**-0.014**	**-9%**	**0.244**	**0.016**	**20%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.13 Simulated Average Monthly and Annual Streamflows at Model Node QF08

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.137	0.137	0.000	0%	0.152	0.015	11%	0.128	-0.009	-6%	0.156	0.019	14%
Feb	0.091	0.091	0.000	0%	0.107	0.015	17%	0.084	-0.007	-8%	0.111	0.020	22%
Mar	0.048	0.050	0.002	3%	0.064	0.016	33%	0.043	-0.006	-12%	0.070	0.021	44%
Apr	0.086	0.089	0.003	3%	0.110	0.023	27%	0.079	-0.007	-8%	0.119	0.033	38%
May	0.844	0.846	0.002	0%	0.860	0.016	2%	0.818	-0.026	-3%	0.861	0.017	2%
Jun	0.868	0.869	0.001	0%	0.874	0.006	1%	0.841	-0.026	-3%	0.868	0.000	0%
Jul	0.491	0.492	0.002	0%	0.502	0.012	2%	0.474	-0.017	-3%	0.501	0.011	2%
Aug	0.405	0.408	0.004	1%	0.416	0.012	3%	0.390	-0.015	-4%	0.416	0.011	3%
Sep	0.459	0.463	0.004	1%	0.474	0.014	3%	0.443	-0.016	-3%	0.475	0.016	3%
Oct	0.475	0.479	0.005	1%	0.488	0.013	3%	0.458	-0.016	-3%	0.490	0.015	3%
Nov	0.433	0.439	0.006	1%	0.445	0.012	3%	0.418	-0.015	-3%	0.446	0.013	3%
Dec	0.271	0.279	0.008	3%	0.284	0.013	5%	0.260	-0.011	-4%	0.286	0.015	6%
Annual	**0.386**	**0.388**	**0.003**	**1%**	**0.399**	**0.014**	**9%**	**0.371**	**-0.014**	**-5%**	**0.401**	**0.016**	**12%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.14 Simulated Average Monthly and Annual Streamflows at Model Node Susan Outflow

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.002	0.002	0.000	0%	0.002	0.000	0%	0.002	0.000	0%	0.002	0.000	0%
Feb	0.001	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%
Mar	0.001	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	1%	0.001	0.000	1%
Apr	0.001	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%
May	0.013	0.013	0.000	0%	0.013	0.000	0%	0.013	0.000	0%	0.013	0.000	0%
Jun	0.014	0.014	0.000	0%	0.014	0.000	0%	0.014	0.000	0%	0.014	0.000	0%
Jul	0.008	0.008	0.000	0%	0.008	0.000	0%	0.008	0.000	0%	0.008	0.000	0%
Aug	0.006	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%
Sep	0.007	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%
Oct	0.007	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%
Nov	0.007	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%
Dec	0.004	0.004	0.000	0%	0.004	0.000	0%	0.004	0.000	0%	0.004	0.000	0%
Annual	**0.006**	**0.006**	**0.000**	**0%**	**0.006**	**0.000**	**0%**	**0.006**	**0.000**	**0%**	**0.006**	**0.000**	**0%**

Note:

0.0% and 0.000 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.15 Simulated Average Monthly and Annual Streamflows at Model Node Hughes-us

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	6.54	6.54	0.00	0%	6.54	0.00	0%	6.54	0.00	0%	6.54	0.00	0%
Feb	4.36	4.36	0.00	0%	4.36	0.00	0%	4.36	0.00	0%	4.36	0.00	0%
Mar	2.31	2.31	0.00	0%	2.31	0.00	0%	2.31	0.00	0%	2.31	0.00	0%
Apr	4.11	4.11	0.00	0%	4.11	0.00	0%	4.11	0.00	0%	4.11	0.00	0%
May	40.30	40.30	0.00	0%	40.30	0.00	0%	40.30	0.00	0%	40.30	0.00	0%
Jun	41.44	41.44	0.00	0%	41.44	0.00	0%	41.44	0.00	0%	41.44	0.00	0%
Jul	23.42	23.42	0.00	0%	23.42	0.00	0%	23.42	0.00	0%	23.42	0.00	0%
Aug	19.31	19.31	0.00	0%	19.31	0.00	0%	19.31	0.00	0%	19.31	0.00	0%
Sep	21.94	21.94	0.00	0%	21.94	0.00	0%	21.94	0.00	0%	21.94	0.00	0%
Oct	22.66	22.66	0.00	0%	22.66	0.00	0%	22.66	0.00	0%	22.66	0.00	0%
Nov	20.67	20.67	0.00	0%	20.67	0.00	0%	20.67	0.00	0%	20.67	0.00	0%
Dec	12.93	12.93	0.00	0%	12.93	0.00	0%	12.93	0.00	0%	12.93	0.00	0%
Annual	**18.41**	**18.41**	**0.00**	**0%**	**18.41**	**0.00**	**0%**	**18.41**	**0.00**	**0%**	**18.41**	**0.00**	**0%**

Note:

0.0% and 0.00 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.16 Simulated Average Monthly and Annual Streamflows at Model Node Hughes-mid

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	6.54	6.54	0.00	0%	6.54	0.00	0%	6.54	0.00	0%	6.54	0.00	0%
Feb	4.36	4.36	0.00	0%	4.36	0.00	0%	4.36	0.00	0%	4.36	0.00	0%
Mar	2.31	2.31	0.00	0%	2.31	0.00	0%	2.31	0.00	0%	2.31	0.00	0%
Apr	4.11	4.11	0.00	0%	4.11	0.00	0%	4.11	0.00	0%	4.11	0.00	0%
May	40.30	40.49	0.19	0%	40.30	0.00	0%	40.30	0.00	0%	40.30	0.00	0%
Jun	41.44	41.62	0.17	0%	41.44	0.00	0%	41.44	0.00	0%	41.44	0.00	0%
Jul	23.42	23.46	0.03	0%	23.42	0.00	0%	23.42	0.00	0%	23.42	0.00	0%
Aug	19.31	19.31	0.00	0%	19.31	0.00	0%	19.31	0.00	0%	19.31	0.00	0%
Sep	21.94	21.94	0.00	0%	21.94	0.00	0%	21.94	0.00	0%	21.94	0.00	0%
Oct	22.66	22.66	0.00	0%	22.66	0.00	0%	22.66	0.00	0%	22.66	0.00	0%
Nov	20.67	20.67	0.00	0%	20.67	0.00	0%	20.67	0.00	0%	20.67	0.00	0%
Dec	12.93	12.93	0.00	0%	12.93	0.00	0%	12.93	0.00	0%	12.93	0.00	0%
Annual	**18.41**	**18.44**	**0.03**	**0%**	**18.41**	**0.00**	**0%**	**18.41**	**0.00**	**0%**	**18.41**	**0.00**	**0%**

Note:

0.0% and 0.00 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.17 Simulated Average Monthly and Annual Streamflows at Model Node Hughes-ds

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	6.68	6.68	0.00	0%	6.70	0.02	0%	6.67	-0.01	0%	6.70	0.02	0%
Feb	4.45	4.45	0.00	0%	4.47	0.01	0%	4.45	-0.01	0%	4.47	0.02	0%
Mar	2.36	2.36	0.00	0%	2.37	0.02	1%	2.35	-0.01	0%	2.38	0.02	1%
Apr	4.20	4.20	0.00	0%	4.22	0.02	1%	4.19	-0.01	0%	4.23	0.03	1%
May	41.15	41.34	0.19	0%	41.16	0.01	0%	41.12	-0.03	0%	41.16	0.01	0%
Jun	42.31	42.49	0.17	0%	42.32	0.01	0%	42.28	-0.03	0%	42.31	0.00	0%
Jul	23.91	23.95	0.04	0%	23.93	0.02	0%	23.90	-0.01	0%	23.92	0.01	0%
Aug	19.72	19.72	0.00	0%	19.73	0.01	0%	19.70	-0.02	0%	19.73	0.01	0%
Sep	22.40	22.40	0.00	0%	22.41	0.01	0%	22.38	-0.02	0%	22.41	0.01	0%
Oct	23.14	23.14	0.00	0%	23.15	0.01	0%	23.12	-0.02	0%	23.15	0.01	0%
Nov	21.11	21.11	0.00	0%	21.12	0.01	0%	21.09	-0.02	0%	21.12	0.01	0%
Dec	13.20	13.21	0.01	0%	13.21	0.01	0%	13.19	-0.01	0%	13.21	0.01	0%
Annual	**18.79**	**18.83**	**0.03**	**0%**	**18.81**	**0.01**	**0%**	**18.78**	**-0.01**	**0%**	**18.81**	**0.01**	**0%**

Note:

0.0% and 0.00 m^3/s in the Table represent < 0.1% and < 0.001 m^3/s, respectively.

Table 3.18 Simulated Average Monthly and Annual Water Levels at Gordon Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	315.18	315.18	0.00	315.17	-0.01	315.15	-0.03	315.15	-0.03
Feb	315.13	315.13	0.00	315.12	-0.01	315.11	-0.02	315.11	-0.02
Mar	315.07	315.07	0.00	315.06	-0.01	315.05	-0.02	315.05	-0.02
Apr	315.13	315.13	0.00	315.12	-0.01	315.10	-0.03	315.10	-0.03
May	315.47	315.47	0.00	315.45	-0.02	315.42	-0.05	315.42	-0.05
Jun	315.48	315.48	0.00	315.45	-0.03	315.43	-0.05	315.43	-0.05
Jul	315.37	315.37	0.00	315.35	-0.02	315.33	-0.04	315.33	-0.04
Aug	315.33	315.33	0.00	315.32	-0.01	315.30	-0.03	315.30	-0.03
Sep	315.36	315.36	0.00	315.34	-0.02	315.32	-0.04	315.32	-0.04
Oct	315.36	315.36	0.00	315.34	-0.02	315.32	-0.04	315.32	-0.04
Nov	315.35	315.35	0.00	315.33	-0.02	315.31	-0.04	315.31	-0.04
Dec	315.27	315.27	0.00	315.25	-0.02	315.24	-0.03	315.24	-0.03
Annual	**315.29**	**315.29**	**0.00**	**315.27**	**-0.02**	**315.26**	**-0.03**	**315.26**	**-0.04**

Note:

0.00 m in the Table represents < 0.01 m.

Table 3.19 Simulated Average Monthly and Annual Water Levels at Farley Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	313.55	313.55	0.00	313.57	0.02	313.53	-0.02	313.57	0.02
Feb	313.52	313.52	0.00	313.55	0.03	313.50	-0.02	313.56	0.04
Mar	313.48	313.49	0.00	313.53	0.05	313.44	-0.04	313.54	0.06
Apr	313.52	313.53	0.00	313.56	0.04	313.49	-0.03	313.57	0.05
May	313.68	313.69	0.00	313.69	0.01	313.67	-0.01	313.69	0.01
Jun	313.69	313.69	0.00	313.69	0.00	313.68	-0.01	313.69	0.00
Jul	313.64	313.64	0.00	313.65	0.01	313.63	-0.01	313.65	0.01
Aug	313.62	313.63	0.01	313.63	0.01	313.61	-0.01	313.63	0.01
Sep	313.63	313.64	0.01	313.64	0.01	313.62	-0.01	313.64	0.01
Oct	313.64	313.64	0.00	313.65	0.01	313.63	-0.01	313.65	0.01
Nov	313.63	313.63	0.00	313.64	0.01	313.62	-0.01	313.64	0.01
Dec	313.59	313.61	0.02	313.61	0.02	313.58	-0.01	313.61	0.02
Annual	**313.60**	**313.60**	**0.00**	**313.62**	**0.02**	**313.58**	**-0.02**	**313.62**	**0.02**

Note:

0.00 m in the Table represents < 0.01 m.

Table 3.20 Simulated Average Monthly and Annual Water Levels at Simpson Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	297.21	297.21	0.00	297.21	0.00	297.21	0.00	297.21	0.00
Feb	297.17	297.17	0.00	297.17	0.00	297.17	0.00	297.17	0.00
Mar	297.13	297.13	0.00	297.13	0.00	297.13	0.00	297.13	0.00
Apr	297.17	297.17	0.00	297.17	0.00	297.17	0.00	297.17	0.00
May	297.40	297.40	0.00	297.40	0.00	297.40	0.00	297.40	0.00
Jun	297.41	297.41	0.00	297.41	0.00	297.41	0.00	297.41	0.00
Jul	297.33	297.33	0.00	297.33	0.00	297.33	0.00	297.33	0.00
Aug	297.31	297.31	0.00	297.31	0.00	297.31	0.00	297.31	0.00
Sep	297.33	297.33	0.00	297.33	0.00	297.33	0.00	297.33	0.00
Oct	297.33	297.33	0.00	297.33	0.00	297.33	0.00	297.33	0.00
Nov	297.32	297.32	0.00	297.32	0.00	297.32	0.00	297.32	0.00
Dec	297.27	297.27	0.00	297.27	0.00	297.27	0.00	297.27	0.00
Annual	**297.28**	**297.28**	**0.00**	**297.28**	**0.00**	**297.28**	**0.00**	**297.28**	**0.00**

Note:

0.00 m in the Table represents < 0.01 m.

Table 3.21 Simulated Average Monthly and Annual Water Levels at Swede Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	297.15	297.15	0.00	297.17	0.02	297.14	-0.01	297.18	0.03
Feb	297.12	297.12	0.00	297.14	0.02	297.11	-0.01	297.15	0.03
Mar	297.08	297.08	0.00	297.10	0.02	297.07	-0.01	297.11	0.03
Apr	297.11	297.12	0.00	297.14	0.03	297.10	-0.01	297.16	0.05
May	297.46	297.46	0.00	297.47	0.01	297.45	-0.01	297.47	0.01
Jun	297.47	297.47	0.00	297.47	0.00	297.45	-0.02	297.47	0.00
Jul	297.34	297.34	0.00	297.35	0.01	297.32	-0.02	297.34	0.00
Aug	297.30	297.30	0.00	297.31	0.01	297.29	-0.01	297.31	0.01
Sep	297.32	297.33	0.00	297.33	0.01	297.31	-0.01	297.33	0.01
Oct	297.33	297.33	0.00	297.34	0.01	297.32	-0.01	297.34	0.01
Nov	297.31	297.32	0.01	297.32	0.01	297.30	-0.01	297.32	0.01
Dec	297.24	297.25	0.00	297.25	0.01	297.23	-0.01	297.25	0.01
Annual	**297.27**	**297.27**	**0.00**	**297.28**	**0.01**	**297.26**	**-0.01**	**297.29**	**0.02**

Note:

0.00 m in the Table represents < 0.01 m.

Table 3.22 Simulated Average Monthly and Annual Water Levels at Ellystan Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	282.88	282.88	0.00	282.89	0.01	282.88	0.00	282.89	0.01
Feb	282.85	282.85	0.00	282.86	0.01	282.84	-0.01	282.86	0.01
Mar	282.80	282.80	0.00	282.82	0.02	282.79	-0.01	282.82	0.02
Apr	282.84	282.85	0.01	282.86	0.02	282.84	0.00	282.87	0.03
May	283.06	283.06	0.00	283.07	0.01	283.06	0.00	283.07	0.01
Jun	283.07	283.07	0.00	283.07	0.00	283.06	-0.01	283.07	0.00
Jul	283.01	283.01	0.00	283.01	0.00	283.00	-0.01	283.01	0.00
Aug	282.99	282.99	0.00	282.99	0.00	282.98	-0.01	282.99	0.00
Sep	283.00	283.00	0.00	283.00	0.00	283.00	0.00	283.00	0.00
Oct	283.00	283.00	0.00	283.01	0.01	283.00	0.00	283.01	0.01
Nov	282.99	282.99	0.00	283.00	0.01	282.99	0.00	283.00	0.01
Dec	282.95	282.95	0.00	282.95	0.00	282.94	-0.01	282.95	0.00
Annual	**282.95**	**282.95**	**0.00**	**282.96**	**0.01**	**282.95**	**-0.01**	**282.96**	**0.01**

Note:

0.00 m in the Table represents < 0.01 m.

Construction

Aside from the discharge from Wendy and East pits into Hughes River (approved separately in summer 2025), no additional Project activities were identified in this NOA/NOC that might interact with surface water quantity for the construction phase of the Project, beyond those noted in the EIS. Like the EIS, during construction, the Project activities and components that might interact with surface water quantity and result in environmental effects include:

- Site preparation, including vegetation removal, topsoil stripping, ground compaction, and the decommissioning and removal of existing historical buildings, which may reduce infiltration and evapotranspiration and increase runoff. Removal of the historical north and south MRSAs were not included as a change in the water balance as recharge through these features were consistent with the recharge for the remainder of the groundwater flow model domain but were assessed further in the effects to surface water quality in Section 3.3.4.2.2.
- Construction of mine components, including vegetation removal, topsoil stripping, ground compaction, and building construction, which may result in reduced infiltration and evapotranspiration and increased runoff.
- Dewatering of Wendy and East pits into Hughes River, which may reduce streamflow in the existing downstream environment of these pits (i.e., Farley Lake) and increase streamflow in Hughes River.
- Pumping groundwater from interceptor wells (installed between the open pit and Gordon Lake and Farley Lake) and discharging it to Gordon and Farley lakes.

Collectively, these activities are predicted to result in up to a 6% reduction or 11% increase in flows, and up to a 0.02 m increase in lake levels at various modelling nodes, during different months (Table 3.7 to Table 3.22).

Operation

There were no additional Project activities identified in this NOA/NOC that might interact with surface water quantity for the operation phase of the Project beyond those described in the EIS. Like the EIS, during operation, the Project activities and components that might interact with surface water quantity and result in environmental effects include:

- Dewatering of the open pit into Farley Lake via the collection pond
- Collection of contact runoff from the MRSA, overburden storage area, ore storage area, and topsoil storage area into the collection pond and discharging it into Farley Lake
- Pumping of groundwater from interceptor wells (installed between the open pit and Gordon Lake and Farley Lake) and discharging it to Gordon and Farley lakes

Collection of contact runoff from the MRSA, overburden storage area, ore storage area, and topsoil storage area reduces the natural catchment area and streamflow at nodes QF01, QF02, and QF03, as well as the water level in Gordon Lake (Table 3.7, Table 3.8, Table 3.9, and Table 3.18).

Since contact water from these disturbed areas (where runoff is higher than in undisturbed areas, as described above) is discharged to Farley Lake, streamflow at QF05 and water levels in Farley Lake are predicted to increase (Table 3.10 and Table 3.19).

Nodes and lakes downstream of QF05 and Farley Lake (i.e., QF07, QF08, Swede Lake, and Ellystan Lake) show similar (but dampened) effects compared with those of QF05 and Farley Lake (Table 3.12, Table 3.13, Table 3.21, and Table 3.22).

Predicted changes in streamflow and lake levels at QF06, Susan Outflow, Hughes-us, Hughes-mid, Hughes-ds, and Simpson Lake are not substantial (less than 1% as shown in Table 3.11, Table 3.14, Table 3.15, Table 3.16, Table 3.17, and less than 0.01 m as shown in Table 3.20).

Decommissioning/Closure

There were no additional Project activities identified in this NOA/NOC that might interact with surface water quantity for the decommissioning/closure phase of the Project beyond those noted in the EIS. Like the EIS, during closure, the Project activities and components that might interact with surface water quantity and result in environmental effects include:

- Closure and reclamation of the MRSA, closure of the collection pond, and the rerouting of runoff from reclaimed areas to fill the open pit
- Pumping of groundwater from interceptor wells (installed between the open pit and Gordon Lake and Farley Lake) and discharging it to Gordon and Farley lakes. Dewatering of interceptor wells will continue (at a lower pump rate compared with the operation phase) until the pit lake forms and overflows (approximately 12 years, like the EIS model).

Flow reduction at QF01, QF02, and QF03, as well as water level reduction in Gordon Lake, continues during closure, primarily due to the reduction of their natural catchment area, which become disturbed areas. The average flow and water level reductions during closure are greater than those of operation (Table 3.7, Table 3.8, Table 3.9, and Table 3.18) because these areas have reached their maximum footprint by the start of closure, whereas in the operation phase, the disturbed area footprint gradually increased over time.

Since contact water from these disturbed areas is rerouted to fill the pit (rather than being discharged into Farley Lake), streamflow at QF05 and water level in Farley Lake are predicted to decrease (Table 3.10 and Table 3.19). When the pit fills and overflows at post-closure, like the operation phase, QF05 flows are predicted to increase.

Nodes and lakes downstream of QF05 and Farley Lake (i.e., QF07, QF08, Swede Lake, and Ellystan Lake) show similar (but dampened) effects compared with those of QF05 and Farley Lake (Table 3.12, Table 3.13, Table 3.21, and Table 3.22).

Predicted changes in streamflow and lake levels at QF06, Susan Outflow, Hughes-us, Hughes-mid, Hughes-ds, and Simpson Lake are not substantial (less than 1% as shown in Table 3.11, Table 3.14, Table 3.15, Table 3.16, Table 3.17, and Table 3.20).

Comparison with the EIS

The EIS model results (Stantec 2020a and 2020b) and updated model results (Table 3.7 to Table 3.22) indicate the following effects (Table 3.23 and Table 3.24):

- QF01 and QF02:
    - Both the EIS and updated models predict reductions in average monthly streamflows under project-affected conditions.
- QF03:
    - The EIS model predicted monthly flow increases of over 100% during construction and operation compared with existing conditions. The updated model predicts small reductions in flow instead, primarily due to optimization of the interceptor well placements and pumping rates.
    - Both the EIS and updated models predict reductions in average monthly streamflows during closure and post-closure compared with existing conditions.
- QF05:
    - The EIS model predicted flow increases of greater than 300% during construction and operation compared with existing conditions. The updated model predicts less than 120% increase in flow in construction and operation compared with existing conditions. The difference in predicted increase in flow due to the Project is attributed to dewatering the historical open pits into Hughes River (instead of dewatering into Farley Lake) and optimization of the interceptor well pumping system.
    - At closure, the updated model predicts flow reductions of up to 43% in winter (December through April) and 13% during the open water season (May through November; Table 3.10) compared with existing conditions. These reductions are predicted as the pit fills. Note that the 43% winter flow reduction corresponds to a decrease of only 0.006 m^3/s from an average annual flow of 0.092 m^3/s. The EIS model did not predict as high a percentage of winter flow reduction, due to its different surface water and groundwater inputs.
    - At post-closure, the updated model predicts flow increases of up to 159% during the winter months (equivalent to only 0.02 m^3/s increase in flow, due to increased baseflows and disturbed areas) and 12% during the open water season (Table 3.10) compared with existing conditions. The predicted increase in flow for post-closure compared with existing conditions in the EIS model was less than the predicted increase in flow in the updated model.
- QF06: Both the EIS and updated models predict less than 1% change in flow between existing conditions and each Project phase.

- QF07 and QF08: These downstream nodes observed similar flow change patterns to QF05 between the EIS model and updated model.
- Susan Outflow, Hughes-us, Hughes-mid, and Hughes-ds: The updated model predicts less than 1% change in flow for each Project phase compared with existing conditions. Streamflows at these locations were not assessed in the EIS model.
- Gordon Lake, Farley Lake, Swede Lake and Ellystan Lake: Both the EIS model and updated model predict average monthly water level changes of less than 0.10 m for each Project phase compared with existing conditions.
- Simpson Lake: The updated model predicts changes of less than 0.01 m in average monthly water levels for each Project phase compared with existing conditions. The water levels at this lake were not assessed in the EIS model.

Table 3.23 Comparison of Updated Water Balance Model Results with EIS Results – Monthly Streamflows

Model Node	Source	Construction		Operation		Closure (Pit Filling)		Post-Closure		Maximum of All Phases[3]	
		decrease[1]	Increase[2]	decrease[1]	Increase[2]	decrease[1]	Increase[2]	decrease[1]	Increase[2]	Decrease[3]	Increase[3]
QF01	EIS[4]	-31%	0%	-31%	0%	-31%	0%	-31%	0%	-31%	0%
	Updated[5]	-3%	0%	-25%	0%	-44%	0%	-44%	0%	-44%	0%
QF02	EIS[4]	-33%	0%	-33%	0%	-33%	0%	-33%	0%	-33%	0%
	Updated[5]	-6%	0%	-27%	0%	-45%	0%	-45%	0%	-45%	0%
QF03	EIS[4]	-3%	133%	-3%	133%	-18%	0%	-21%	0%	-21%	133%
	Updated[5]	-1%	0%	-12%	0%	-21%	0%	-21%	0%	-21%	0%
QF05	EIS[4]	0%	378%	0%	342%	-8%	10%	-3%	28%	-8%	378%
	Updated[5]	0%	11%	0%	120%	-43%	0%	0%	159%	-43%	159%
QF06	EIS[4]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Updated[5]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
QF07	EIS[4]	0%	139%	0%	136%	-3%	4%	-1%	9%	-3%	139%
	Updated[5]	0%	5%	0%	56%	-20%	0%	0%	74%	-20%	74%
QF08	EIS[4]	0%	76%	0%	84%	-3%	3%	-1%	4%	-3%	84%
	Updated[5]	0%	3%	0%	33%	-12%	0%	0%	44%	-12%	44%
Susan Outflow	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	0%	0%	1%	0%	1%	0%	1%
Hughes-us	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hughes-mid	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Model Node	Source	Construction		Operation		Closure (Pit Filling)		Post-Closure		Maximum of All Phases[3]	
		decrease[1]	Increase[2]	decrease[1]	Increase[2]	decrease[1]	Increase[2]	decrease[1]	Increase[2]	Decrease[3]	Increase[3]
Hughes-ds	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	1%	0%	0%	0%	1%	0%	1%

Notes:

1 maximum decrease of monthly flows during each Phase of the Project. For example, in Table 3.13 (for QF08), during construction, maximum increase of average monthly flows is 3% which occurs in March, April, and December. This 3% flow change is shown in this table, for 'updated' results for 'QF08' flow decrease during 'construction'.

2 maximum increases of monthly flows during each Phase of the Project.

3 maximum of percent decrease and increase values for individual phases, as provided in the construction, operation, closure (pit filling) and post-closure columns of this table.

4 EIS model results (Stantec 2020a and 2020b)

5 Updated model Results (Table 3.7 to Table 3.17)

0%: Lower than 1% change in streamflow

n/a: not assessed in the EIS model

Table 3.24 Comparison of Updated Water Balance Model Results with EIS Results – Monthly Lake Levels

Model Node	Source	Construction		Operation		Closure (Pit Filling)		Post-closure		Maximum of All Phases[3]	
		decrease[1]	Increase[2]	decrease[1]	Increase[2]	decrease[1]	Increase[2]	decrease[1]	Increase[2]	Decrease[3]	Increase[3]
Gordon Lake	EIS[4]	0.00	0.08	0.00	0.08	-0.03	0.00	-0.04	0.00	-0.04	0.08
	Updated[5]	0.00	0.00	-0.03	0.00	-0.05	0.00	-0.05	0.00	-0.05	0.00
Farley Lake	EIS[4]	0.00	0.26	0.00	0.25	-0.02	0.01	-0.01	0.03	-0.02	0.26
	Updated[5]	0.00	0.02	0.00	0.05	-0.04	0.00	0.00	0.06	-0.04	0.06
Simpson Lake	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Swede Lake	EIS[4]	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
	Updated[5]	0.00	0.01	0.00	0.03	-0.02	0.00	0.00	0.05	-0.02	0.05
Ellystan Lake	EIS[4]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Updated[5]	0.00	0.01	0.00	0.02	-0.01	0.00	0.00	0.03	-0.01	0.03

Notes:

[1] maximum decrease of monthly water level during each Phase of the Project. For example, in Table 3.18 (for Gordon Lake), during operation, maximum reduction of average monthly lake level is 0.03 m which occurs in June. This -0.03 m level change is shown in this Table, for 'updated' results for Gordon Lake' water level decrease during 'operation'.

[2] maximum increase of monthly water level during each Phase of the Project.

[4] EIS model results (Stantec 2020a and 2020b)

[5] Updated model Results (Table 3.18 to Table 3.22)

0.00: Lower than 0.01m in lake level

n/a: not assessed in the EIS model

3.3.4.2.2 Surface Water Quality

Assessment Methods

The EIS surface water quality model was updated to reflect modifications to the approved Gordon site described in Section 2.3, results of the NOA/NOC groundwater modelling presented in Section 3.3.3.2.2, and updates to the mine rock and ore volumes and geochemical source terms since submission of the EIS.

As in the EIS, the updated NOA/NOC water quality model included two scenarios: an “Expected Case” scenario based on average climate conditions, average baseline water quality in the receiving environment, average groundwater quality, and average geochemical source term concentrations, and an ”Upper Case” scenario based on average climate conditions paired with 95th percentile baseline water quality in the receiving environment, and 95th percentile geochemical source terms. However, like the EIS, only the Expected Case scenario predictions were used to identify POPCs and to assess residual effects on surface water quality in the receiving environment. Results from the Upper-Case scenario were provided only to show potential extreme changes in the predicted water quality parameters even though the likelihood of these predictions occurring during any Project phase is very low.

The updated surface water quality model utilized the same assessment nodes (Table 3.25 and Figure 1-1 in Appendix F) and approach as the EIS surface water quality model except for the modifications listed below. A detailed description of the modifications to the surface water quality model is presented in Appendix F.

- Three new model nodes on the Hughes River were added to the updated model. These assessment nodes are located upstream of the pit dewatering discharge point, immediately downstream of the pit dewatering discharge point, and downstream of the confluence of the Ellystan Lake outflow. These nodes were added to the updated model due to the proposal to dewater the existing Wendy and East pits into Hughes River during the construction phase.
- The mine rock tonnage in the updated model (51.9 million tonnes [Mt]) was increased by 4% compared with the EIS model. However, the ore tonnage (7.9 Mt) and estimate of potentially acid generating mine rock in the updated model was the same as in the EIS model.
- In the updated model, Wendy Pit receives seepage from the historical north MRSA pre-construction, East Pit receives seepage from the historical North and South MRSAs pre-construction, groundwater interceptor wells near Farley Lake receive seepage from the historical South MRSA during construction and operation, and the open pit receives seepage from the historical South MRSA during operation and closure. By comparison, Gordon Lake received seepage from the historical north MRSA and West Farley Lake received seepage from the historical South MRSA pre-construction and during closure in the EIS model (Stantec 2020a) while seepage from the historical north and south MRSAs was captured by the interceptor wells during construction and operation.

- Use of the historical north MRSA as a borrow source was assumed to contribute no contaminant load to the downstream receiving environment during and after construction in the updated model.
- The percentage of total nitrogen loss used for the expected case scenario source term in the updated model was 0.5%, which is higher than the 0.2% value used in the EIS model. The percentage of total nitrogen loss used for the upper-case scenario in the updated model was 1.5%, which is higher than the 1% value used in the EIS model.
- The open pit volume and pit wall rubble mass was increased by approximately 9% in the updated model compared with the EIS model.
- Total and dissolved concentrations in seepage from the MRSA discharging to surface water are equal in the updated model whereas this assumption was not applied in the EIS model. This change was made to reflect that particulates are not expected to transport through an aquifer.
- The mass addition and removal rates applied to lakes for the upper-case source terms are the same as the expected case source terms in the updated model whereas mass addition and removal rates for the upper-case source terms differed from those used for the expected case source terms in the EIS.

Table 3.25 Gordon Site Assessment Nodes

Assessment Node Name	Corresponding Water Quality Site	Assessment Node Description
Susan Lake	AQF11	Downstream of the PDA and upstream of Hughes Lake
Gordon Lake	AQF2	Adjacent to PDA; will receive discharges from groundwater interceptor wells
West Farley Lake	AQF34	Adjacent to PDA; planned to receive discharge from collection pond and open pit
East Farley Lake	AQF9	Eastern basin of Farley Lake; linked to West Farley Lake via a narrow channel
Swede Lake	AQF15	Downstream of East Farley Lake
Ellystan Lake	AQF20	Downstream of Swede Lake; farthest node downstream of the PDA
Hughes River US	AQF41*	Upstream of pit dewatering effluent discharge point
Hughes River Mid	AQF40A*	Downstream of pit dewatering effluent discharge point.
Hughes River DS	AQF43*	At confluence of Ellystan Lake outflow

Note:

*New node in NOA/NOC

Like the EIS, POPCs were identified for instances in which at least a single month's predicted concentration exceeded modelled baseline by at least 20% while also exceeding the applicable guideline(s). However, unlike the EIS which relied only on the long-term and short-term CWQG-FAL and Manitoba Water Quality Standards, Objectives, and Guidelines for Protection of Freshwater Aquatic Life (MWQSOG-FAL) to identify POPCs, the assessment of the proposed alterations to the approved Gordon site used the more recently published FEQGs in addition the CWQG-FAL and MWQSOG-FAL for those parameters for which FEQGs existed (i.e., total aluminum, total cobalt, dissolved copper, total hexavalent chromium, total iron, dissolved lead, dissolved strontium, and total vanadium). The FEQGs are equivalent to long-term water quality guidelines and, because the FEQGs are more recent and based on the current state of science compared with CWQG-FALs and MWQSOG-FALs, only the FEQG was used to identify POPCs in this updated assessment for parameters which had an FEQG.

Construction

Since the EIS was filed in 2020, Alamos has submitted a prior NOA/NOC to allow dewatering of the existing two open pits at the Gordon site to the Hughes River instead of Farley Lake. While not part of this NOA/NOC, this change will allow Alamos to dewater the two existing pits in two to three months instead of approximately two years and would eliminate potential changes in water levels, stream flows, water temperatures, and water quality in Farley Lake and Farley Creek. This change was approved in summer 2025 and has been incorporated into the updated water balance/water quality model for this NOA/NOC.

Besides dewatering the existing pits to the Hughes River, the only new Project activity that has the potential to affect surface water quality in the receiving environment during construction is use of the existing north MRSA as a borrow source for construction material. Use of the north MRSA as a borrow source removes a source historical contamination to surface water via groundwater and, therefore unlike the EIS, was assumed to contribute no contaminant load to surface or groundwater for the NOA/NOC. The other construction activities that have the potential to affect surface water quality during construction at the Gordon site that are the same the EIS, are:

- Site preparation (i.e., tree clearing, grading, and grubbing)
- Construction of mine components (e.g., MRSA, ore, overburden and topsoil storage areas, facilities area, roads
- Construction of water management infrastructure (e.g., collection ditches, sumps, and ponds)
- Discharge of groundwater pumped from interceptor wells installed between the open pit and Gordon and Farley Lakes
- Collection of surface contact water to a collection pond with discharge to Farley Lake.

Using the existing north MRSA for borrow material and other site preparation activities have the potential increase sediment loading to waterbodies and watercourses downstream or downslope of the PDA. Except for groundwater pumped from the interceptor wells west of the open pit to Gordon Lake, all surface contact water runoff will be directed to a collection pond and discharged to West Farley Lake.

Operation

There are no new activities proposed to the approved Gordon site during the operation phase that were not assessed or modelled in the EIS. However, the size and layout of various mine components (e.g., open pit, MRSA, ore, overburden, and topsoil stockpiles) have changed since the EIS (Table 2.1 and Map 2) and these proposed changes have the potential to alter contact water volumes and loadings reporting to the collection pond during operation; these proposed changes have been incorporated into the updated water balance/water quality model. Operation activities that continue to have the potential to affect surface water quality in the receiving environment that are to the same as the EIS, are:

- Release of sediment during stockpiling of ore, overburden, topsoil, and mine rock and maintenance of access roads
- Discharge of groundwater pumped from interceptor wells into Gordon Lake and Farley Lake
- Collection of surface contact water to a collection pond, including blast residues from the open pit, with discharge to Farley Lake

Decommissioning/Closure

There are no new Project components or activities proposed to the approved Gordon site during the decommissioning/closure phase that were not assessed or modelled in the EIS.

Decommissioning/closure activities that continue to have the potential to affect surface water quality in the receiving environment that are to the same the EIS are:

- Release of sediment during reclamation of ore, overburden, and topsoil storage areas, the facilities area, and MRSA
- Discharge of groundwater pumped from interceptor wells into Gordon Lake and Farley Lake (until open pit is filled with water)
- Discharge of contact water from the collection pond to the open pit
- Discharge of water from the open pit into Farley Lake (once the pit has filled)

During decommission/closure, Project infrastructure will be removed, the water intake and effluent pipes will be removed from the Gordon and Farley Lakes, collection ponds will be dewatered and decommissioned and contact water ditches and sumps will be realigned to direct contact water to the open pit by gravity. As the pit fills, groundwater pumping rates in the interceptor wells will be gradually reduced until the pit is filled with water. The pit is expected to fill in approximately 12 years (instead of 11 years in the EIS) under average climate and runoff conditions at the Gordon site. Once the open pit is filled, groundwater interceptor wells will be decommissioned and water in the pit lake will flow into West Farley Lake via a new channel constructed between the existing diversion channel and in the northeast corner of the pit.

Like the historical East and Wendy pit lakes at the Gordon site, the new pit lake is expected to become meromictic (i.e., chemically and thermally stratified), with denser, more saline (i.e., higher concentrations of dissolved metals and salts), and less oxygenated water in the lower monimolimnion and less dense, less saline, and more oxygenated water in the upper mixolimnion. The chemocline separating these two zones exists between 10 m and 15 m depth in the historical East and Wendy pit lakes at the Gordon site. A similar chemocline depth is expected to develop in the new pit lake at the Gordon site.

Comparison with the EIS

Four water quality parameters were identified as POPCs in the updated NOA/NOC water quality model for the Expected Case scenario: fluoride, total iron, nitrite, and total phosphorus (Table 3.26). This is two more POPCs than were identified for the EIS; total iron and nitrite were not identified as POPCs for the EIS, but fluoride and total phosphorus were. Differences between the POPCs identified for this NOA/NOC and the EIS are:

- Fluoride is identified as a POPC in West Farley Lake and East Farley Lake during operation and post-closure phases for the NOA/NOC but not during construction and closure phases as it was in the EIS. The reason for the exclusion of fluoride as a POPC in West Farley Lake and East Farley Lake during construction for the NOA/NOC is because Wendy and East pits will now be dewatered to Hughes River and not West Farley Lake (which drains into East Farley Lake). The reason for the exclusion of fluoride as a POPC in West Farley Lake and East Farley Lake during closure for the NOA/NOC is because contact water from the collection pond is diverted to the open pit to accelerate pit filling and because the open pit doesn’t overflow to Farley Lake until post-closure.
- Fluoride is not identified as a POPC in Gordon Lake during any mine phases for the NOA/NOC but was identified as a POPC in Gordon Lake during all mine phases in the EIS. This difference is due to a change in fate of seepage from the historical north and south MRSAs in closure and changes in the predicted flow rates from the interceptor wells to Gordon Lake. In the EIS, seepage from the historical north and south MRSAs was predicted to discharge to Gordon Lake in closure. In this NOA/NOC, seepage from the historical north and south MRSAs is not predicted to discharge to Gordon Lake in closure because the north MRSA and most of the south MRSA will be removed during construction. In addition, the predicted flow from the interceptor wells to Gordon Lake is lower in this NOA/NOC than in the EIS based on the updated groundwater model results and optimization of the interceptor well system design (Appendix D of the Gordon Mine Plan NOA/NOC).

- Total iron is identified as a POPC in Gordon Lake during closure and post-closure phases for the NOA/NOC but was not identified as a POPC in Gordon Lake in the EIS. In the EIS, the difference in total iron concentration between baseline and closure and post-closure phases was slightly lower than the 20% criteria for identification of POPCs. For the NOA/NOC, the surface water catchment area of Gordon Lake is reduced in closure and post-closure compared with the EIS which results in a large enough increase in total iron concentrations in Gordon Lake during closure and post-closure phases to exceed the 20% criteria for identification of POPCs. In addition, predicted total iron concentrations during closure and post-closure phases in Gordon Lake exceed the more stringent FEQG for total iron that is used in this NOA/NOC but was not used for the EIS.
- Nitrite is identified as a POPC in West Farley Lake during operation for the NOA/NOC but was not identified as a POPC in the EIS because the percentage of residual total nitrogen from blasting in the open pit for the Expected Case source terms was increased to 0.5% in the updated model compared with 0.2% used in the EIS model (Appendix F). The greater residual total nitrogen percentage in the open pit during operation results in greater total nitrogen loads in the collection pond, which receives contact water from the open pit, which is then discharged to West Farley Lake during operation.
- Total phosphorus is identified as a POPC in East Farley Lake during closure for the NOA/NOC, but total phosphorus was identified as a POPC in West Farley Lake during construction for the EIS. The reasons for these differences are: 1) water in the existing Wendy and East pits will no longer discharge to West Farley Lake during construction (it will now discharge to the Hughes River); 2) dissolved phosphorus loadings from groundwater pumped to Gordon and West Farley lakes during operation were used in the NOA/NOC instead of the total phosphorous loadings from groundwater that were used during operation in the EIS (dissolved concentrations were considered more representative of groundwater than total concentrations because aquifers typically filter out particulate matter); and 3) total phosphorus concentrations in East Farley Lake exceed the MWQSOG during summer low flow conditions in the updated model.

Fluoride, total iron, nitrite, and total phosphorus were carried forward in the assessment of residual effects on surface water quality using the methods described in Section 9.4.2.1 of the EIS. These four POPCs were also assessed for their potential to cause acute or chronic toxicological effects to fish and other aquatic biota in Section 3.3.5.2.2 of this assessment.

Table 3.26 Comparison of Parameters of Potential Concern Predicted in Receiving Environment at the Gordon Site for the Expected Case Between the EIS Model and Updated Model

Parameter of Potential Concern (POPC)	Assessment Node Associated with Identification of POPC	EIS				NOA/NOC			
		Phase Associated with Identification of POPC				Phase Associated with Identification of POPC			
		Construction	Operation	Closure	Post-Closure	Construction	Operation	Closure	Post-Closure
Fluoride	Gordon Lake	x	x	x	x	-	-	-	-
	West Farley Lake	x	x	x	x	-	x	-	x
	East Farley Lake	x	x	x	x	-	x	-	x
Total Iron	Gordon Lake	-	-	-	-	-	-	x	x
Nitrite	West Farley Lake	-	-	-	-	-	x	-	-
Total Phosphorus	West Farley Lake	x	-	-	-	-	-	-	-
	East Farley Lake	-	-	-	-	-	-	x	-

Notes:

- no POPC predicted

x POPC predicted

Parameters of Potential Concern

Predicted concentrations for fluoride, total iron, nitrite, and total phosphorus (i.e., the four POPCs identified for the Expected Case scenario) during operation, closure, and post-closure phases at the Gordon site are summarized in Table 3.27 to Table 3.30, respectively. Each table includes predicted mean and maximum concentrations at each assessment node associated with the POPC for the Expected Case, summarized by phase, as well as the magnitude of the predicted maximum concentration above the modelled baseline concentration, the appropriate water quality guideline and the percentage of months in each phase that the parameter concentration is predicted to exceed the appropriate guideline. Similar statistics are provided for the predicted POPC concentrations for the Upper-Case scenario. Details of the surface water quality modelling and model results are presented in Appendix F. Graphical representations of predicted POPC concentrations in the receiving environment over time are provided in Appendix G.

POPCs were predicted to occur in Gordon Lake, West Farley Lake, and East Farley Lake during operation, closure, and/or post-closure phases. Descriptions of these waterbodies and explanations for why POPCs were predicted to occur is provided below:

- Gordon Lake is a fish-bearing waterbody located upstream of the existing Wendy and East pits in the headwaters of the Ellystan Lake watershed, a tributary watershed of the Hughes River. Gordon Lake currently drains into Farley Lake through a constructed diversion channel and will continue to do so throughout the Project now that the new diversion channel has been removed from the Project Description. Gordon Lake will receive groundwater pumped from the interceptor wells installed between Gordon Lake and the west side of the open pit during construction, operation, and closure phases.
- West Farley Lake is the largest and deepest of the three basins that make up Farley Lake, a fish-bearing lake in the Ellystan Lake watershed. West Farley Lake receives inflow from Gordon Lake (via the constructed diversion channel that drains into North Farley Lake), its surrounding watershed, and the two existing pit lakes (Wendy and East pits). West Farley Lake has a maximum depth of 10.8 m and stratifies in the summer. During construction and operation, West Farley Lake will receive effluent from a collection pond that will receive contact water from the PDA and groundwater pumped from the interceptor wells installed between West Farley Lake and the open pit. West Farley Lake will receive overflow from the filled pit lake post-closure.
- East Farley Lake is the smallest and shallowest of the three basins that make up Farley Lake. East Farley Lake receives inflow from West Farley Lake and drains to Swede Lake via Farley Creek at its eastern most location. East Farley Lake is <1 m deep and does not stratify in summer. Changes in water quality in East Farley Lake during operation, closure, and post-closure phases are due entirely to inflows from West Farley Lake (East Farley Lake will not receive any effluent discharges directly)

Table 3.27 Predicted Fluoride Concentrations, by Phase, at Gordon Site Model Nodes Associated with Exceedances of Screening Criteria for the Expected and Upper-Case Scenarios

Model Scenario	Node	Phase	Number of Years in Phase	Long-term CWQG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term CWQG-FAL	
Expected Case	West Farley Lake	Construction	2	0.12	0.0742	0.104	0.0769	0.114	-	-	-
		Operation	5	0.12	0.0742	0.104	0.0980	0.135	1.3	1.1	8%
		Closure	12	0.12	0.0742	0.104	0.0786	0.113	-	-	-
		Post-Closure	176	0.12	0.0742	0.104	0.1060	0.224	2.5	1.9	33%
	East Farley Lake	Construction	2	0.12	0.0728	0.106	0.0745	0.116	-	-	-
		Operation	5	0.12	0.0728	0.106	0.0915	0.140	1.3	1.2	8%
		Closure	12	0.12	0.0728	0.106	0.0757	0.115	-	-	-
		Post-Closure	176	0.12	0.0728	0.106	0.0977	0.197	2.2	1.6	23%
Upper Case	West Farley Lake	Construction	2	0.12	0.0753	0.105	0.0787	0.117	-	-	-
		Operation	5	0.12	0.0753	0.105	0.1000	0.137	1.4	1.1	13%
		Closure	12	0.12	0.0753	0.105	0.0797	0.115		-	-
		Post-Closure	176	0.12	0.0753	0.105	0.1330	0.470	5.2	3.9	51%
	East Farley Lake	Construction	2	0.12	0.0736	0.107	0.0757	0.119	-	-	-
		Operation	5	0.12	0.0736	0.107	0.0932	0.142	1.3	1.2	10%
		Closure	12	0.12	0.0736	0.107	0.0765	0.117	-	-	-
		Post-Closure	176	0.12	0.0736	0.107	0.1190	0.394	4.5	3.3	40%

Notes:
CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded baseline by at least 20% and the applicable guideline
Maximum fold exceedance of applicable guidelines based on predicted phase maximum concentration
- = not applicable; values not provided for phases not associated with an identification of the POPC
Max Fold Change Project vs Baseline: the maxima presented is the maximum magnitude difference of prediction versus baseline across all model time steps (i.e. modelled months).

Table 3.28 Predicted Total Iron Concentrations, by Phase, at the Gordon Site Model Nodes Associated with Exceedances of Screening Criteria for the Expected and Upper-Case Scenarios

Model Scenario	Node	Phase	Number of Years in Phase	Long-term FEQG (mg/L)	Modelled Baseline		Project Predictions		Max fold Change: Project vs. Baseline	Magnitude of Exceedance of POPC Screening Criteria	Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)		Max fold Exceedance of Long-term FEQG	
Expected Case	Gordon Lake	Construction	2	0.79 - 0.8	0.674	1.18	0.670	1.18	-	-	-
		Operation	5	0.79 - 0.8	0.674	1.18	0.531	1.18	-	-	-
		Closure	12	0.79 - 0.8	0.674	1.18	0.653	1.27	1.2	1.6	22%
		Post-Closure	176	0.79 - 0.8	0.674	1.18	0.800	1.28	1.2	1.6	33%
Upper Case	Gordon Lake	Construction	2	0.79 - 0.8	0.848	1.35	0.842	1.35	-	-	-
		Operation	5	0.79 - 0.8	0.848	1.35	0.653	1.34	-	-	-
		Closure	12	0.79 - 0.8	0.848	1.35	0.809	1.45	1.2	1.8	42%
		Post-Closure	176	0.79 - 0.8	0.848	1.35	1.000	1.46	1.2	1.8	92%

Notes:
FEQG = Federal Environmental Quality Guidelines
The FEQG long term guideline uses look-up table or calculator. See ECCC (2024)
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded baseline by at least 20% and the applicable guideline
Maximum fold exceedance of applicable guidelines based on predicted phase maximum concentration
- = not applicable; values not provided for phases not associated with the identification of the POPC
Max Fold Change Project vs Baseline: the maxima presented is the maximum magnitude difference of prediction versus baseline across all model time steps (i.e. modelled months).

Table 3.29 Predicted Nitrite Concentrations, by Phase, at the Gordon Site Model Nodes Associated with Exceedances of Screening Criteria for the Expected and Upper-Case Scenarios

Model Scenario	Node	Phase	Number of Years in Phase	Long-term CWQG-FAL (mg/L)	Long-term MWQSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Max fold Change: Project vs. Baseline	Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
						Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)		Long-term CWQG-FAL (mg/L)	Long-term MWQSOG-FAL (mg/L)	
Expected Case	West Farley Lake	Construction	2	0.06	0.06	0.0199	0.0451	0.0206	0.0476	-	-	-	-
		Operation	5	0.06	0.06	0.0199	0.0451	0.0383	0.0883	2.4	1.5	1.5	12%
		Closure	12	0.06	0.06	0.0199	0.0451	0.0210	0.0479	-	-	-	-
		Post-Closure	176	0.06	0.06	0.0199	0.0451	0.0327	0.0551	-	-	-	-
Upper Case	West Farley Lake	Construction	2	0.06	0.06	0.0217	0.0468	0.0229	0.0506	-	-	-	-
		Operation	5	0.06	0.06	0.0217	0.0468	0.0493	0.1120	9.0	1.9	1.9	32%
		Closure	12	0.06	0.06	0.0217	0.0468	0.0223	0.0494	-	-		
		Post-Closure	176	0.06	0.06	0.0217	0.0468	0.0447	0.0631	1.4	1.1	1.1	8%

Notes:
MWQSOG-FAL = Manitoba Standards, Objectives, and Guidelines - Freshwater Aquatic Life; CWQG-FAL = Canadian Water Quality Guideline - Freshwater Aquatic Life
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded baseline by at least 20% and the applicable guideline
Maximum fold exceedance of applicable guidelines based on predicted phase maximum concentration
- = not applicable; values not provided for phases not associated with the identification of the POPC
Max Fold Change Project vs Baseline: the maxima presented is the maximum magnitude difference of prediction versus baseline across all model time steps (i.e. modelled months).

Table 3.30 Predicted Total Phosphorus Concentrations, by Phase, at the Gordon Site Model Nodes Associated with Exceedances of Screening Criteria for the Expected and Upper-Case Scenarios

Model Scenario	Node	Phase	Number of Years in Phase	Long-term MWQSOG-FAL (mg/L)	Modelled Baseline		Project Predictions		Magnitude of Exceedance of POPC Screening Criteria		Percent of Months in Exceedance of Guideline
					Phase Mean (mg/L)	Phase Max (mg/L)	Phase Mean (mg/L)	Phase Max (mg/L)	Max fold Change: Project vs. Baseline	Max fold Exceedance of Long-term MWQSOG-FAL	
Expected Case	East Farley Lake	Construction	2	0.025	0.0198	0.0279	0.0196	0.0282	-	-	-
		Operation	5	0.025	0.0198	0.0279	0.0172	0.0264	-	-	-
		Closure	12	0.025	0.0198	0.0279	0.0202	0.0293	1.2	1.2	24%
		Post-Closure	176	0.025	0.0198	0.0279	0.0160	0.0263	-	-	-
Upper Case	East Farley Lake	Construction	2	0.025	0.0203	0.0283	0.0202	0.0286	-	-	-
		Operation	5	0.025	0.0203	0.0283	0.0177	0.0271	-	-	-
		Closure	12	0.025	0.0203	0.0283	0.0207	0.0297	1.2	1.2	24%
		Post-Closure	176	0.025	0.0203	0.0283	0.0165	0.0266	-	-	-

Notes:
MWQSOG-FAL = Manitoba Standards, Objectives, and Guidelines - Freshwater Aquatic Life.
Maximum magnitudes and frequencies of exceedances only shown for nodes and phases in which at least a single month exceeded baseline by at least 20% and the applicable guideline.
Maximum fold exceedance of applicable guidelines based on predicted phase maximum concentration
- = not applicable; values not provided for phases not associated with the identification of the POPC
Max Fold Change Project vs Baseline: the maxima presented is the maximum magnitude difference of prediction versus baseline across all model time steps (i.e. modelled months).

Fluoride

Fluoride is identified as a POPC in West Farley Lake and East Farley Lake during operation and post-closure for the Expected Case scenario (Table 3.27). Project-related changes to fluoride concentrations in West Farley Lake and East Farley Lake during operation are associated with discharge of contact water effluent from the collection pond. Project-related changes to fluoride concentrations in West Farley Lake and East Farley Lake in post-closure are due to overflow from the open pit.

For the Expected Case scenario, the maximum predicted fluoride concentrations in West Farley Lake and East Farley Lake in the updated NOA/NOC water quality model are:

- 0.14 mg/L in West Farley Lake during operation, which is approximately 1.1 times the long-term CWQG-FAL (0.12 mg/L) and 1.3 times the modelled baseline concentration (Table 3.27; Figure H-1, Appendix G).
- 0.22 mg/L in West Farley Lake during post-closure, which is approximately 1.9 times the long-term CWQG-FAL (0.12 mg/L) and 2.5 times the modelled baseline concentration (Table 3.27; Figure H-1, Appendix G).
- 0.14 mg/L in East Farley Lake during operation, which is approximately 1.2 times the long-term CWQG-FAL (0.12 mg/L) and 1.3 times the modelled baseline concentration (Table 3.27; Figure H-3, Appendix G).
- 0.20 mg/L in East Farley Lake during post-closure, which is approximately 1.6 times the long-term CWQG-FAL (0.12 mg/L) and 2.2 times the modelled baseline concentration (Table 3.27; Figure H-3, Appendix G).

For the Expected Case, fluoride concentrations in West Farley Lake and East Farley Lake were predicted to exceed the CWQG-FAL in 8% of months during operation. Fluoride concentrations in West Farley Lake and East Farley Lake were predicted to exceed the CWQG-FAL in 33% and 22% of the modelled months during post-closure, respectively (Table 3.27, Figures H-1 and H-3, respectively), but were predicted to exceed the CWQG-FAL seasonally until the end of the modelled post-closure phase.

For the Upper-Case scenario, the maximum predicted fluoride concentrations in West Farley Lake and East Farley Lake in the updated NOA/NOC water quality model are:

- 0.14 mg/L in West Farley Lake during operation, which is approximately 1.1 times the long-term CWQG-FAL (0.12 mg/L) and 1.4 times the modelled baseline concentration (Table 3.27; Figure H-2, Appendix G).
- 0.47 mg/L in West Farley Lake during post-closure, which is approximately 3.9 times the long-term CWQG-FAL (0.12 mg/L) and 5.2 times the modelled baseline concentration (Table 3.27; Figure H-2, Appendix G).

- 0.14 mg/L in East Farley Lake during operation, which is approximately 1.2 times the long-term CWQG-FAL (0.12 mg/L) and 1.3 times the modelled baseline concentration (Table 3.27; Figure H-4, Appendix G).
- 0.39 mg/L in East Farley Lake during post-closure, which is approximately 3.3 times the long-term CWQG-FAL (0.12 mg/L) and 4.5 times the modelled baseline concentration (Table 3.27; Figure H-4, Appendix G).

Seasonal Trends for Fluoride

Seasonal trends in predicted fluoride concentrations in West Farley Lake and East Farley Lake compared with Swede Lake, Ellystan Lake, and the Hughes River downstream of the LAA are provided for the construction, operation, closure, and post-closure phases in Figure H-5 (Appendix G).

Predicted mean monthly fluoride concentrations for the Expected Case scenario and the Upper-case scenario followed similar seasonal trends to monthly baseline fluoride concentrations in West Farley Lake, East Farley Lake, Swede Lake, and Ellystan Lake during construction, operation, and closure phases; fluoride concentrations were low during summer (i.e., June to September), increased in October, remained elevated during the winter (i.e., November to April) and then decreased during the spring freshet (i.e., May). Similar seasonal trends for fluoride were predicted to occur in West Farley Lake, East Farley Lake, and Swede Lake during construction, operation, and closure phases in the EIS.

Seasonal trends in predicted mean monthly fluoride concentrations in West Farley Lake, East Farley Lake, Swede Lake, and Ellystan Lake follow the same pattern during post-closure as in construction, operation, and closure phases but deviate more from average monthly baseline fluoride concentrations than during the earlier phases, particularly during the fall and winter months.

Total Iron

Total iron is identified as a POPC in Gordon Lake during closure and post-closure for the Expected Case scenario (Table 3.26). This is predicted to occur for two reasons. First, total iron concentrations are predicted to decrease at the beginning of operation due to a greater mass load of total iron seeping via groundwater from Gordon Lake to the open pit than the mass load of total iron pumped from the interceptor wells to Gordon Lake (due to the time lag between water in Gordon Lake moving toward the open pit and groundwater pumped by the interceptor wells to Gordon Lake). In closure, the seepage rate from Gordon Lake will decrease as the open pit fills and the mass load of iron discharged from the interceptor wells to Gordon Lake will be greater than the mass load of iron seeping from Gordon Lake to the open pit. Therefore, the concentration of total iron in Gordon Lake is predicted to increase in closure and post-closure phases compared with baseline conditions. Second, the catchment area of Gordon Lake will be reduced during closure and post-closure which is predicted to increase total iron concentrations in Gordon Lake above the 20% difference criterion between baseline and predicted concentrations for identification of POPCs and above the dissolved organic carbon (DOC) and pH dependent FEQG for total iron (not used for the EIS).

Total iron concentrations were predicted to exceed the FEQG during all Project phases. However, unlike closure and post-closure phases, total iron was not identified as a POPC during construction and operation because the difference between modelled baseline total iron concentrations and predicted total iron concentrations during construction and operation were not greater than 20%. Unlike the EIS, seepage from the historical north and south MRSAs will no longer report to Gordon Lake after construction begins, meaning that the total iron load reporting to Gordon Lake during construction and operation will be smaller.

For the Expected Case scenario, the maximum predicted total iron concentrations in Gordon Lake in the updated NOA/NOC water quality model are:

- 1.27 mg/L during closure, which is approximately 1.6 times the long-term FEQG and 1.2 times the modelled baseline concentration in closure (Table 3.28; Figure H-6, Appendix G).
- 1.28 mg/L during post-closure, which is approximately 1.6 times the long-term FEQG and 1.2 times the modelled baseline concentration in closure (Table 3.28; Figure H-6, Appendix G).

For the Expected Case scenario, maximum total iron concentrations in Gordon Lake are predicted to exceed the FEQG in 22% of all months during closure and in 33% of all months during post-closure. However, maximum total iron concentrations in Gordon Lake are predicted to exceed the FEQG until the end of the modelled post-closure period (Figure H-6, Appendix G).

For the Upper-Case scenario, maximum predicted total iron concentrations in Gordon Lake in the updated NOA/NOC water quality model are:

- 1.45 mg/L during closure, which is approximately 1.8 times the long-term FEQG and 1.2 times the modelled baseline concentration in closure (Table 3.28; Figure H-7, Appendix G).
- 1.46 mg/L during post-closure, which is approximately 1.8 times the long-term FEQG and 1.2 times the modelled baseline concentration in closure (Table 3.28; Figure H-7, Appendix G).

Seasonal Trends for Total Iron

Seasonal trends in predicted total iron concentrations in Gordon Lake compared with Swede Lake, Ellystan Lake, and the Hughes River downstream of the LAA are provided for the construction, operation, closure, and post-closure phases in Figure H-8 (Appendix G).

In Gordon Lake, seasonal trends in average monthly total iron concentration are similar for all mine phases for the Expected Case and Upper-Case scenarios. For each mine phase, lower average monthly total iron concentrations are predicted to occur in Gordon Lake in winter (i.e., November to April), followed by a peak total iron concentration in May which is consistent with seasonal changes in baseline total iron concentrations (Figure H-8. Appendix G). Average monthly total iron concentrations in Gordon Lake are predicted to decrease over the summer and fall.

In Swede Lake and Ellystan Lake, average monthly total iron concentrations for the Expected Case and Upper-Case scenarios are predicted to follow the same seasonal patterns as baseline average monthly total iron concentrations (Figure H-8, Appendix G), indicating that natural seasonal variation in total iron concentrations will continue to be the largest influence on total iron concentrations in both lakes during all mine phases. The lower total iron concentrations predicted in Swede Lake for the Expected and Upper-case scenarios compared with baseline total iron concentrations is due to the difference in inflow volumes from Farley Lake and Simpson Lake into Swede Lake.

Nitrite

Nitrite is identified as a POPC in West Farley Lake during operation for the Expected Case scenario (Table 3.29). Project-related changes to nitrite concentrations in West Farley Lake are associated with discharge of contact water effluent from the collection pond during operation. Nitrite was not identified as a POPC in any lake during any Project phase for the EIS. Nitrite was identified as a POPC in West Farley Lake for this NOA/NOC but not in the EIS because the percentage of total nitrogen loss during blasting in the open pit used for the Expected Case source terms was increased to 0.5% for the updated model compared with 0.2% applied in the EIS model (Appendix F).

For the Expected Case scenario, the maximum predicted nitrite concentration in West Farley Lake in the updated NOA/NOC water quality model is:

- 0.088 mg/L during operation, which is approximately 1.5 times the long-term CWQG-FAL and MWQSOG-FAL (0.060 mg/L) and 2.4 times the modelled baseline concentration (Table 3.29; Figure H-9, Appendix G).

For the Expected Case scenario, nitrite concentrations in West Farley Lake were predicted to increase above the CWQG-FAL and MWQSOG-FAL in summer during operation when the collection pond is discharging to West Farley Lake and all other inflows to West Farley Lake are low (Figure H-9, Appendix G). Nitrite concentrations in West Farley Lake were predicted to exceed the CWQG-FAL and MWQSOG-FAL for 12% of all months during operation (Table 3.29).

For the Upper-Case scenario, the maximum predicted nitrite concentrations in West Farley Lake in the updated NOA/NOC water quality model are:

- 0.112 mg/L during operation, which is approximately 1.9 times the long-term CWQG-FAL and MWQSOG-FAL (0.060 mg/L) and 9 times the modelled baseline concentration (Table 3.29; Figure H-10, Appendix G).
- 0.063 mg/L during post-closure, which is approximately 1.1 times the long-term CWQG-FAL and MWQSOG-FAL (0.060 mg/L) and 1.4 times the modelled baseline concentration (Table 3.29; Figure H-10, Appendix G).

Seasonal Trends for Nitrite

Seasonal trends in predicted average monthly nitrite concentrations in West Farley Lake, Swede Lake, Ellystan Lake, and the Hughes River downstream of the LAA are provided for construction, operation, closure, and post-closure phases in Figure H-11 (Appendix G).

In West Farley Lake, seasonal trends in average monthly nitrite concentrations are predicted to be similar during construction, operation, and closure phases for the Expected Case and Upper-case scenarios. For both scenarios, average monthly nitrite concentrations during construction, operation, and closure phases are predicted to decrease in May during the spring freshet, increase in summer to a peak in August, and decrease from late summer, through fall and into winter (Figure H-11, Appendix G). Average monthly nitrite concentrations during post-closure are predicted to increase during the winter, decrease during the spring freshet, increase during the summer to a peak in August and gradually decrease over the fall and winter for the Expected Case and Upper-case scenarios.

Seasonal trends in average monthly nitrite concentrations in Swede and Ellystan lakes were opposite from the season trends in average monthly nitrite concentrations predicted in West Farley Lake (Figure H-11, Appendix G). In Swede and Ellystan lakes, average monthly nitrite concentrations are predicted to be high in the winter, decrease in May during the spring freshet and remain low during summer before increasing over the fall for the Expected Case and Upper-Case scenarios.

Total Phosphorus

Total phosphorus is identified as a POPC in East Farley Lake during closure for the Expected Case scenario (Table 3.30). This is because the total phosphorus load entering East Farley Lake from West Farley Lake during closure is predicted to be greater than 20% of baseline total phosphorus concentrations in East Farley Lake during June and November while also being greater than the MWQSOG-FAL (0.025 mg/L) in these months.

Total phosphorus is not identified as a POPC in East Farley Lake during construction, operation, and post-closure because the total phosphorus load entering East Farley Lake from West Farley Lake is lower in total during these phases compared with closure.

Total phosphorus is not identified as a POPC in West Farley Lake during closure (or any other Project phase) because the total phosphorus load entering West Farley Lake from the collection pond (construction and operation), groundwater interceptor wells and Gordon Lake (closure) and pit lake overflow (post-closure) is insufficient to raise predicted total phosphorus concentrations in this larger basin of Farley Lake more than 20% higher than modelled baseline total phosphorus concentrations. The total phosphorus concentrations in these discharges are lower than the total phosphorus in West Farley Lake.

For the Expected Case scenario, the maximum predicted total phosphorus concentration in East Farley Lake in the updated NOA/NOC water quality model is:

- 0.029 mg/L during closure, which is approximately 1.2 times the long-term MWQSOG-FAL (0.025 mg/L) and 1.2 times modelled baseline (Table 3.30; Figure H-12, Appendix G).

For the Expected Case scenario, maximum total phosphorus concentrations in East Farley Lake are predicted to exceed the long-term MWQSOG-FAL (0.025 mg/L) at least once per year during closure (Figure H-12, Appendix G). Total phosphorus concentrations are predicted to exceed the MWQSOG-FAL in 24% of months in East Farley Lake during closure for the Expected Case scenario (Table 3.30).

For the Upper-Case scenario, the maximum predicted total phosphorus concentrations in East Farley Lake in the updated NOA/NOC water quality model were:

- 0.030 mg/L during closure, which is 1.2 times the long-term MWQSOG-FAL (0.025 mg/L) and 1.2 times modelled baseline (Table 3.30; Figure H-13, Appendix G).

Seasonal Trends for Total Phosphorus

Seasonal trends in average monthly total phosphorus concentrations predicted in East Farley Lake, Swede Lake, Ellystan Lake, and the Hughes River downstream of the LAA during construction, operation, closure, and post-closure phases are presented in Figure H-14 (Appendix G).

Seasonal trends in average monthly total phosphorus concentration predicted in East Farley Lake, Swede Lake, and Ellystan Lake during construction were similar for the Expected Case, Upper Case, and baseline scenarios (Figure H-14, Appendix G). This is because water in the existing pit lakes at the Gordon site (Wendy and East pits) will no longer be pumped to Farley Lake and, therefore, will not be a source of total phosphorus to the downstream receiving environment.

Seasonal trends in average total phosphorus concentrations in East Farley Lake during operation and post-closure phases are similar for the Expected and Upper-case scenarios (Figure H-14, Appendix G). This trend is characterized by a decrease in average monthly total phosphorus during the winter, an increase in total phosphorus concentrations in May and June, a decrease in total phosphorus concentrations through the summer, and an increase in total phosphorus concentrations in fall. Lower total phosphorus concentrations in winter during operation is attributable to dilution from lower total phosphorus content groundwater being discharged to Farley Lake from the interceptor wells.

During closure, when contact water is diverted to the open pit, average monthly total phosphorus concentrations are predicted to gradually increase in East Farley Lake during the winter and spring, followed by a decrease in total phosphorus concentration in summer and an increase in total phosphorus concentrations in fall, like what is predicted during operation and post-closure phases.

In Swede Lake, seasonal trends in predicted total phosphorus concentrations are similar for all mine phases for the Expected Case and the Upper-Case scenarios; total phosphorus concentrations are predicted to be highest in winter and lowest in summer. In Ellystan Lake, total phosphorus concentrations are predicted to be lowest in winter and highest in summer. These seasonal trends are consistent with seasonal trends observed at baseline in both lakes, suggesting that seasonal trends in total phosphorus concentrations in Swede Lake and Ellystan Lake will be driven more by natural processes than by effects of the Project.

3.3.4.3 Summary of Mitigation Measures

The only mitigation measure for eliminating or reducing potential effects to surface water quantity and quality that was not included in the EIS that is included in this NOA/NOC is the change from dewatering the existing pit lakes (Wendy and East pits) to the Hughes River instead of to Farley Lake. This change was approved separately in summer 2025. All other mitigation measures for surface water quantity and quality are identical to the mitigation measures in the EIS (Stantec 2020a) and described in the Surface Water Management and Monitoring Plan (SWMMP; Version 0, January 2025). Alamos is committed to the follow-up monitoring and adaptive management actions (if and as required) that are described in the SWMMP.

3.3.4.4 Residual Effects

3.3.4.4.1 Surface Water Quantity

The Project will result in changes to surface water quantity within the LAA. The magnitude of these changes vary at different locations and between Project phases as follows:

- Within the headwater sub-catchments, i.e., Gordon Lake inflow sub-catchments (QF01 and QF02), moderate-magnitude (i.e., between 10% and 30%) reductions in annual streamflow compared with existing conditions are predicted during operation, and high-magnitude (i.e., greater than 30%) reductions are predicted during closure and post-closure (Table 3.7 and Table 3.8). These streamflow reductions are consistent with those predicted by the EIS model.
- At Gordon Lake outflow (QF03), moderate-magnitude reductions in annual streamflow are simulated during operation, closure, and post-closure. The EIS model had also predicted streamflow reductions during closure and post-closure compared with existing conditions, but it had predicted increases in streamflow during operation, primarily due to unoptimized interceptors well placement and pump rates.
- At Farley Lake outflow (QF05), while high-magnitude increases in annual streamflow are predicted during operation and post-closure, moderate-magnitude reductions in annual streamflow are predicted during closure (Table 3.10). These streamflow changes are consistent with those predicted by the EIS model, except during post-closure where the EIS model had predicted low magnitude increases in streamflow.
- At the downstream end of the LAA, i.e., Ellystan Lake outflow (QF08), low-magnitude (i.e., less than 10%) increases in annual streamflow are simulated during operation, low-magnitude reductions during closure, and moderate-magnitude increases during post-closure (Table 3.13). These streamflow changes are consistent with those predicted by the EIS model, except during post-closure where the EIS model had predicted low magnitude increases in streamflow.
- Outside the LAA (i.e., in the Hughes River [Hughes-ds]), the magnitude of changes in surface water quantity compared with existing conditions is predicted to be negligible (i.e., less than 1% difference, Table 3.17). Therefore, like the EIS, the effects are expected to be contained within the LAA.

As described above, as presented in the EIS, the surface water quantity changes will continue through post-closure and the timing of changes are predicted to occur continuously throughout the year.

In summary, as presented in the EIS, residual effects of the Project on surface water quantity during the construction, operation, closure, and post-closure phases are characterized as adverse in direction and moderate magnitude at the downstream end of the LAA, continuous, long-term, and irreversible.

3.3.4.4.2 Surface Water Quality

The proposed alterations to the approved Gordon site are predicted to result in large enough changes to surface water quality in Gordon Lake, West Farley Lake, and East Farley Lake within the LAA to exceed provincial or federal water quality guidelines for the protection of freshwater aquatic life during at least one Project phase. Updates to the groundwater and surface water quality models that address the proposed alterations to the Gordon site for this NOA/NOC and the use of more stringent FEQGs (total iron only) resulted in changes to the magnitude and frequency of guideline exceedances, the location and timing of guideline exceedances, and two new POPCs compared with the EIS. These changes to surface water quality results in the NOA/NOC are:

- Exclusion of fluoride as a POPC in Gordon Lake during all Project phases and in West Farley Lake and East Farley Lake during the construction and closure phases compared with the EIS
- Approximately 26% decrease and 49% increase in maximum predicted fluoride concentrations in West Farley Lake during operation and post-closure, respectively, compared with the EIS.
- Approximately 25% decrease and 28% increase in maximum predicted fluoride concentration in East Farley Lake during operation and post-closure, respectively, compared with the EIS.
- Inclusion of total iron as a POPC in Gordon Lake during closure and post-closure compared with the EIS
- Inclusion of nitrite as a POPC in West Farley Lake during operation compared with the EIS
- Inclusion of phosphorus as a POPC in East Farley Lake during closure, but elimination of total phosphorus as a POPC in West Farley Lake during all mine phases compared with the EIS.

For these reasons, characterization of residual effects to surface water quality are different than the characterization of residual effects to surface water quality in the EIS. An updated characterization of residual effects to surface water quality at the Gordon site due to the combination of updated groundwater and surface water model predictions that address the proposed alterations to the Gordon site are as follows:

- Construction: Adverse in direction, negligible in magnitude, confined to the LAA, short term, and reversible.
- Operation: Adverse in direction, moderate in magnitude, confined to the LAA, medium term, and reversible.
- Closure/Decommissioning: Adverse in direction, moderate in magnitude, confined to the LAA, long term, and irreversible.

Characterization of residual effects to surface water quality were separated by Project phase because of the differences in the number, timing, duration, and magnitude of POPCs that were predicted to occur during construction, operation, closure, and post-closure phases. Negligible magnitude residual effects to surface water quality are predicted to occur in Gordon Lake, West Farley Lake, and East Farley Lake during construction in consideration of the proposed alterations. This is because, with the change to pump water from the existing pit lakes (East and Wendy pits) to the Hughes River instead of Farley Lake, there are no parameters predicted to exceed baseline concentrations by more than 20% and any provincial or federal water quality guideline in Gordon Lake, West Farley Lake, or East Farley Lake during construction. By comparison, moderate magnitude residual effects to surface water quality were predicted at the Gordon site during construction for the EIS because fluoride and total phosphorus concentrations were identified as POPCs in Gordon Lake and West Farley Lake during construction, but concentrations were expected to be high enough to have an adverse effect on fish or other aquatic biota in either lake.

Moderate magnitude residual effects to surface water quality are predicted to occur during operation in consideration of the proposed alterations. This is because maximum nitrite concentrations are predicted to exceed baseline concentrations by more than 20% and the CWQG-FAL in West Farley Lake during operation, but adverse effects to fish and other aquatic biota in West Farley Lake are not expected to occur because the assumptions used to predict nitrite concentrations in West Farley Lake are conservative and because the predicted nitrite concentrations are below the sub-lethal effect concentrations for the most abundant fish and benthic invertebrate species present in West Farley Lake (see Section 3.3.5.4.2 for details).

Moderate magnitude residual effects to surface water quality are predicted to occur during the decommissioning/closure phase in consideration of the proposed alterations. This is because total iron concentrations are predicted to exceed baseline concentrations by more than 20% and the FEQG for total iron in Gordon Lake during closure, but adverse effects to fish and other aquatic biota in Gordon Lake are not expected to occur because the surface water quality model did not account for any reduction in total iron concentrations resulting from aeration of groundwater prior to pumping to Gordon Lake and because high DOC concentrations in Gordon Lake are expected to attenuate sub-lethal toxicological affects to fish and other aquatic biota (see Section 3.3.5.4.2 for details). The duration of the residual effect to surface water quality during decommissioning/closure is long-term because total iron concentrations are predicted to remain elevated in perpetuity in Gordon Lake post-closure.

Besides the above differences, the characterization of residual effects to surface water quality for this NOA/NOC are the same as the EIS (i.e., direction, geographic extent, timing, frequency, reversibility, and ecological context).

As stated in the EIS, Alamos is committed to monitoring and adaptively managing potential residual effects of the Project on surface water quality. To do this, Alamos has developed a SWMMP that includes monitoring water quality in Gordon Lake, West Farley Lake, East Farley Lake, Swede Lake, and suitable reference lakes during all Project phases. If surface water quality monitoring data shows that fluoride, total iron, nitrite, total phosphorus or any other monitored parameter is exceeding, or trending toward exceeding, a provincial and/or federal water quality guidelines for the protection of freshwater aquatic life, Alamos will initiate the adaptive management plan outlined in the SWMMP. This adaptive management

plan includes a hierarchical process of determining if the elevated water quality concentration(s) observed in the monitoring data are due to the Project and, if so, the measures that will be taken to reduce the effect. Mitigation measures that could be implemented at the Gordon site to reduce elevated water quality parameters include but are not limited to: 1) collect and treat (as required) contact water in the collection pond(s) prior to discharge; 2) increasing aeration of groundwater from the interceptor wells to encourage precipitation of elements that form oxides (e.g. iron oxide) prior to discharge to Gordon Lake; 3) discharging effluent to wetlands, the Hughes River, or lakes with larger assimilative capacity.

3.3.5 Fish and Fish Habitat

Fish and fish habitat are valued by Indigenous Nations, the public, and other stakeholders and are protected in Canada by the *Fisheries Act*. Fish and fish habitat provide cultural, economic, recreational, and aesthetic values to local communities, contribute to biodiversity, and are indicators of aquatic ecosystem health.

Alterations to the open pit, MRSA, ore and overburden stockpiles, facility area, and water management infrastructure at the Gordon site have the potential to alter water quantity, water quality, and groundwater contributions in streams, lakes, and fish-bearing wetlands downstream and adjacent to the Gordon site. These changes could affect fish community composition, population abundance and individual fish health. They may also affect fish indirectly due to changes in lower trophic communities that form the basis of the aquatic food web.

3.3.5.1 Regulatory and Guideline Setting

3.3.5.1.1 Federal Guideline Criteria

The assessment of potential effects of the proposed alterations on fish and fish habitat at the Gordon site included consideration of the federal legislation, regulations, and guidelines described below.

Fisheries Act

The *Fisheries Act* provides a framework for the “proper management and control of fisheries and the conservation and protection of fish and fish habitat, including by preventing pollution”. To do so, the *Fisheries Act* includes the following prohibitions:

- Sections 34(2) provides provisions for maintaining adequate flow and passage of fish.
- Section 34.4(1) prohibits any work, undertaking or activity, other than fishing, that results in the death of fish.
- Section 35(1) prohibits the carrying on of a work, undertaking or activity that results in the harmful alteration, disruption, or destruction (HADD) of fish habitat.
- Section 36(3) prohibits the deposit of deleterious substances of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance may enter such water.

Metal and Diamond Mining Effluent Regulation

The MDMER, promulgated under the *Fisheries Act*, regulates the deposit of deleterious mine effluents, tailings, and mine rock into waters frequented by fish and is administered by ECCC. The MDMER defines mine effluent as:

- (a) hydrometallurgical facility effluent, milling facility effluent, mine water effluent, tailings impoundment area effluent, treatment pond effluent or treatment facility effluent other than effluent from a sewage treatment facility.
- (b) any seepage or surface runoff containing any deleterious substance that flows over, through or out of the site of a mine.

The MDMER applies to metal and diamond mines with an effluent flow rate of greater than 50 m^3/d based on effluent deposited from all final discharge points of the MacLellan Gold Mine. For these mines, the MDMER allows the discharge of mine effluent containing deleterious substances if the effluent is:

- not acutely lethal
- the pH is equal to or greater than 6.0, but not greater than 9.5
- the concentrations of deleterious substances do not exceed concentration limits identified in Schedule 4 of the MDMER at the final discharge point(s).

Under the MDMER, all mines and recognized closed mines are required to conduct acute lethality testing of final effluent, effluent characterization, and EEM in the downstream receiving environment in three-year cycles.

Species at Risk Act

The *Species at Risk Act* (SARA) provides protection and mandates recovery strategies and action plans for extirpated, endangered, or threatened species in Canada, while managing species of special concern to prevent further declines. DFO administers SARA for aquatic species listed on SARA Schedule 1. Species at risk are added to Schedule 1, the official list of species at risk, through a federal government process after receiving scientific information and recommendations from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Each species is classified as extirpated, endangered, threatened, or special concern. Species listed on Schedule 1 are subject to protection and recovery measures.

The upper Churchill River populations of lake sturgeon are part of the western Hudson Bay populations of lake sturgeon that are classified as “endangered” by COSEWIC. However, they are not currently included under SARA Schedule 1 (Government of Canada 2025) or listed by the Manitoba Conservation Data Centre [MB CDC 2015]).

DFO's Ecological Flow Requirements

"The Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada" (DFO 2013) provides guidance on the management of flows required to maintain the ecological functions that sustain fisheries in streams and rivers potentially affected by flow withdrawals. The guidance promotes the maintenance of natural flow regimes to sustain riverine ecosystems, with the understanding that the probability of degrading riverine ecosystems increases with increasing alteration of the natural flow regime. To manage this risk, the Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada (DFO 2013) recommends that assessment of alterations to the natural flow regime be considered in a cumulative sense, not just on a project-by-project basis, and that:

- Cumulative flow alterations less than 10% in amplitude of the actual "instantaneous" flow in the river relative to a "natural flow regime" have a low probability of detectable effects to ecosystems that support commercial, recreational, or Aboriginal fisheries.
- Cumulative flow alterations that result in instantaneous flows less than 30% of the mean annual discharge (MAD) have a heightened risk of impacts to fisheries.
- Cumulative flow alterations greater than 10% of instantaneous discharge or that results in flows less than 30% of MAD, require a more rigorous level of assessment to evaluate potential impacts on ecosystem functions which support fisheries.

Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life

The CWQG-FAL are intended to protect all forms of freshwater aquatic life and all aspects of their aquatic life cycle, including the most sensitive life stage of the most sensitive species over the long-term from anthropogenic stressors such as chemical inputs or changes to physical components. CWQG-FALs provide science-based benchmarks for a nationally consistent level of protection for aquatic life in Canada. CWQG-FALs are developed by the CCME, an inter-governmental forum comprised of federal and provincial ministries of the environment.

Federal Environmental Quality Guidelines

FEQGs are recommended chemical thresholds that identify the concentration below which there is a low likelihood of direct adverse effects from the chemical on aquatic life exposed via water or sediment, or where chemicals may bioaccumulate in wildlife that may consume aquatic life. Use of FEQGs is voluntary unless prescribed by regulation of binding agreements. FEQGs are not effluent limits nor are they "never-to-be-exceeded" values. FEQGs are developed by ECCC to support federal environmental quality monitoring, risk assessment and risk management activities on substances for which CCME guidelines do not yet exist or are not reasonably expected to be updated in the near future.

3.3.5.1.2 Provincial Guideline Criteria

The assessment of potential effects of the proposed alterations on fish and fish habitat at the MacLellan site included consideration of the provincial legislation, regulations, and guidelines described below.

The Environment Act

Alterations to stream channels that affect fish mobility and/or fish habitat and works resulting in modification to lake or river levels for a water surface area greater than 2 square kilometres (km^2) are considered Class 2 developments under section 3(9) of the Classes of Development Regulations pursuant to *The Environment Act* of Manitoba (Chapter 1). Consequently, any proposed alteration to streams in Manitoba is subject to provincial assessment and licensing requirements.

The Water Rights Act

The Water Rights Act, administered by MECC, regulates the use or diversion of water in Manitoba. Section 9 requires consideration of flows required to protect and maintain aquatic ecosystems during water licensing and allows the Minister to suspend or restrict water rights under a licence if the available flow is insufficient to protect aquatic ecosystems, based on scientific information. Section 14.1 allows the Minister to undertake investigations into groundwater and instream flows to determine whether insufficient flows are negatively affecting aquatic ecosystems.

The Water Protection Act

The Water Protection Act, administered by MECC, provides for the protection of freshwater biota and human and wildlife consumers of fish. The MWQSOG lists water quality and tissue residue guidelines, which are set out in the *Water Quality Standards, Objectives, and Guidelines Regulation*.

The Mine and Minerals Act

Under *The Mines and Minerals Act,* water that is removed from the workings under a mine lease must be disposed of safely and securely. Regulation 67/99 of *The Mines and Minerals Act* stipulates requirements for restoration of watercourses during mine closure.

The Water Resources Conservation Act

The Water Resources Conservation Act requires that the removal of water from Manitoba's water basins is not done in quantities that could, individually or collectively, have significant adverse effects on the ecological integrity of Manitoba's water resources or their associated ecosystems.

3.3.5.1.3 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to fish and fish habitat:

> *3.1 The Proponent shall develop, prior to construction and to the satisfaction of Fisheries and Oceans Canada and in consultation with Indigenous groups, and implement an offsetting plan to mitigate residual effects to fish and fish habitat associated with carrying out of the Designated Project. The Proponent shall share the proposed plan with Indigenous groups at least 30 days prior to formal submission to Fisheries and Oceans Canada, and submit the approved plan to the Agency prior to implementation*
>
> *3.2 The Proponent shall, for any fish habitat offsetting measure proposed in any offsetting plan referred to in condition 3.1 that may cause adverse environmental effects not considered in the environmental assessment, develop and implement, following consultation with Indigenous groups and relevant authorities, measures to mitigate those effects. The Proponent shall submit these measures to the Agency before implementing them.*
>
> *3.3 The Proponent shall install exclusion screens on intake pipes prior to their operation, taking into account Fisheries and Oceans Canada's "Freshwater Intake End-of-Pipe Fish Screen Guideline", and in a manner consistent with the Fisheries Act and its regulations.*
>
> *3.4 The Proponent shall develop, prior to construction and in consultation with relevant authorities, and implement and maintain, during all phases of the Designated Project, measures to mitigate any potential effects to water levels in Farley Lake and Gordon Lake due to groundwater drawdown resulting from Designated Project activities. In doing so, the Proponent shall intercept and/or redirect groundwater flowing towards the open pit with wells and/or other mitigation measures, as applicable, before it enters the open pit. The Proponent shall submit these measures to the Agency before implementing them.*
>
> *3.5 The Proponent shall, when releasing any collected water into Farley Lake and Gordon Lake, including groundwater intercepted pursuant to condition 3.4 and water from dewatering the East and Wendy pit lakes:*
>
> > *3.5.1 aerate, or treat by other means, water collected from the East and Wendy pit lakes, prior to release into Farley Lake and Gordon Lake, in accordance with condition 3.7, to precipitate oxides, increase dissolved oxygen concentrations, and prevent chemical stratification; and*
> >
> > *3.5.2 release collected water into Farley Lake and Gordon Lake in a manner that maintains the lake temperature at the point of release within baseline temperature variations to protect fish and fish habitat, unless otherwise authorized by Fisheries and Oceans Canada*

3.6 The Proponent shall adjust, during construction, the rate of release of water into Farley Lake and Gordon Lake from dewatering the East and Wendy pit lakes and from groundwater intercepted pursuant to condition 3.4 in order to maintain lake levels within the range of natural variability predicted in Volume 2 Chapter 10 of the Environmental Impact Statement and Appendix A Attachment IAAC-48 of the Proponent's Information Request Responses Round 1, Package 1 (Canadian Impact Assessment Registry Reference Number 80140, document #54)

3.7 The Proponent shall collect contact water and seepage from the Project development areas, including seepage and recharge from the tailings management facility, mine rock storage areas, overburden and ore stockpiles, and seepage input to groundwater that flows into the open pits, and treat it, as necessary, before releasing it into the receiving environment during all phase of the Designated Project to ensure that any deposits are made in accordance with the Metal and Diamond Mining Effluent Regulation and the pollution prevention provisions of the Fisheries Act. When treating contact water and seepage, the Proponent shall take into account Manitoba's "Water Quality Standards, Objectives, and Guidelines", the Canadian Council of Ministers of the Environment's "Canadian Water Quality Guidelines for the Protection of Aquatic Life", and Environment and Climate Change Canada's "Federal Environmental Quality Guidelines".

3.8 the Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, measures to protect fish and fish habitat when undertaking activities in or near fish-bearing water bodies, in a manner that complies with any authorization issued under the Fisheries Act for the Designated Project. The Proponent shall implement these measures during all phases of the Designated Project. In doing so, the Proponent shall:

> *3.8.1 Salvage and relocated fish prior to conducting any Designated Project activity requiring the removal of fish habitat, including dewatering*
>
> *3.8.2 Conduct activities in or near fish-bearing water bodies in accordance with Fisheries and Oceans Canada's "Manitoba Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat" and "Measures to Protect Fish and Fish Habitat", unless otherwise authorized by relevant authorities*
>
> *3.8.3 Maintain, during all phases of the Designated Project, a buffer of undisturbed vegetation of at least 30 metres from the high-water mark, as follows:*
>
> *3.8.3.1 around fish-bearing water bodies, including wetlands, within and adjacent to the Project development areas that are not required to be removed for construction of the Designated Project, in a manner that complies with any authorization issued under the Fisheries Act*

3.8.3.2 around wetlands, within and adjacent to the project development areas that are not required to be removed for construction of the designated Project, unless not technically or economically feasible. If work within 30 metres of wetlands is required, the Proponent shall use weight-distributing materials under heavy machinery to limit soil compaction and give preference to using existing access roads to access areas near wetlands

3.9 The Proponent shall identify in consultation with Indigenous groups, prior to conducting the salvage and relocation of fish referred to in condition 3.8.1, opportunities for Indigenous groups to take part in, and determine their interest to take part in, the salvage and relocation of fish

3.11 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, and implement and maintain during all phases of the Designated Project, measures to control erosion and sedimentation within the Project development areas in a manner consistent with the Fisheries Act and its regulations, and taking into account Environment and Climate Change Canada's "Environmental Code of Practice for Metal Mines", and Fisheries and Oceans Canada's "Measures to Protect Fish and Fish Habitat". The Proponent shall submit these measures to the Agency before implementing them. As part of these measures, the Proponent shall:

3.11.1 install intake pipes point upward and away from sediment

3.11.2 equipment contact water discharge pipes with diffusers

3.12 the Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada, and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quality, taking into account Environment and Climate Change Canada's "Metal Mine Technical Guidance for Environmental Effects Monitoring". The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

3.12.1 determine, in consultation with Indigenous groups, Environment and Climate Change Canada, and any other relevant authorities, the location and extent of mixing zones in water bodies that may be affected by the Designated Project.

3.12.2 monitor water quality in the East and Wendy pit lakes, newly formed pit lakes, tailings management facility, mine rock storage areas, contact water collection ponds, and receiving water bodies and watercourses upstream and downstream of the Project development areas, including at the edge and downstream of the edge of mixing zones identified pursuant to condition 3.12.1, Arbor Lake, Burge Lake, Cockeram Lake, Ellystan Lake, Farley Creek, Farley Lake, Gordon Lake, the Hughes River, the Keewatin River, the unnamed tributary of the Keewatin River, Minton Lake, Payne Lake, Susan Lake, and Swede Lake, for all contaminant that may have adverse effects on fish and fish habitat, including aluminum, antimony, arsenic, calcium, copper, cyanide, fluoride, hexavalent chromium, iron, magnesium, methylmercury, phosphorus, selenium, and total and dissolved cadmium. Monitoring shall be conducted as follows:

3.12.2.1 beginning during construction and continuing through decommissioning, except in the East and Wendy pit lakes, and the newly formed pit lakes; and

3.12.2.2 beginning during construction in the East and Wendy pit lakes, and beginning during decommissioning and continuing through post-closure in the newly formed pit lakes, until water quality is stable and improving and any contact water or seepage potentially released meets the Canadian Council of Ministers of the Environment's "Canadian Water Quality Guidelines for the Protection of Aquatic Life" and Manitoba's "Water Quality Standards, Objectives, and Guidelines" pursuant to condition 3.7

3.12.4 monitor, during construction and operation, total suspended solids and turbidity in fish-bearing water bodies where Designated Project activities are undertaken in or near waters frequented by fish

3.12.5 develop, in consultation with relevant authorities, and implement modified or additional mitigation measures, if the results of monitoring conducted pursuant to condition 3.12.2, 3.12.3, and 3.12.4 demonstrate any unanticipated effects attributable to the Designated Project, taking into account the Canadian Council of the Ministers of the Environment's "Canadian Water Quality Guidelines for the Protection of Aquatic Life" or Manitoba's "Water Quality Standards, Objectives, and Guidelines", whichever is most protective of fish and fish habitat, and predicted concentrations identified in Volume 1, Chapter 9 of the environment Impact Statement

3.13 the Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quantity. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

3.13.1 monitor, during all phases of the Designated Project, surface water instantaneous flows, lake levels and pH levels in Arbor Lake, Burge Lake, Cockeram Lake, Ellystan Lake, Farley Creek, Farley Lake, Gordon Lake, the Keewatin River, the unnamed tributary of the Keewatin River, Minton Lake, Payne Lake, Susan Lake, fish-bearing wetlands within the local assessment areas, the East and Wendy pit lakes, newly formed pit lakes, the tailings management facility, and contact water collection ponds to verify the environmental assessment predictions identified in Volume 2 Chapter 10 of the Environmental Impact Assessment and Appendix A Attachment IAAC-48 of the Proponent's IR Responses Round 1, Package 1 (Canadian Impact Assessment Registry Reference Number 80140, document #54

3.13.2 monitor, during all phases of the Designated Project, groundwater levels, gradients and hydraulic conductivity of all hydrogeological units, as identified in the groundwater model in Volume 5 Appendix E and G of the Environment Impact Statement, with well depths ranging from near surface to a minimum of 115 metres below ground to characterize contaminant transport via groundwater at the depth of the groundwater model for the Designated Project. Monitoring wells shall be installed near the open pits, the tailings management facility, mine rock storage areas, ore and overburden stockpiles, and fish-bearing wetlands within the local assessment areas that intersect with the Project development areas; and

3.13.3 develop, in consultation with relevant authorities, and implement modified or additional mitigation measures, if the results of monitoring conducted pursuant to condition 3.13.1 and 3.13.2 demonstrate unanticipated effects attributable to the Designated Project

3.14 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to determine the effectiveness of the mitigation measures and verify the accuracy of the environmental assessment predictions identified in Volume 2 Chapter 10 of the Environmental Impact Statement as they pertain to adverse environmental effects of the Designated Project on fish and fish habitat, taking into account Environment and Climate Change Canada's Metal Mine Technical Guidance for Environmental Effects Monitoring. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

3.14.1 monitor, during all phases of the Designated Project, water temperature in Farley Creek, Farley Lake, Gordon Lake, the Hughes River, the Keewatin River, Minton Lake, the new diversion channel, and any additional locations identified in consultation with relevant authorities, taking into account predictions in Volume 2 Chapter 10 of the Environmental Impact Statement

3.14.2 monitoring total invertebrate density, taxon richness, Simpson's Evenness Index, Bray-Curtis Index, and chlorophyll a to characterize benthic invertebrate, plankton and periphyton communities in Farley Creek, Farley Lake, Gordon Lake, the Hughes River, the Keewatin River, Minton Lake, the new diversion channel, and any additional locations identified in consultation with Indigenous groups and relevant authorities, for the detection of project-related changes I nutrient and contaminant levels, taking into account predictions in Volume 2 Chapter 10 of the Environment Impact Statement

3.14.3 identify, in consultation with Indigenous groups, Fisheries and Oceans Canada and any other relevant authorities, fish species to monitor, including species used for traditional purposes by Indigenous groups. Species shall include northern pike (Esox lucius), lake whitefish (Coregonus clupeaformis), and white sucker (Catostomus commersoni)

3.14.4 monitor, starting prior to construction and during all phases of the Designated Project, fish habitat quality and quantity ends points for all species identified pursuant to condition 3.14.3, in Farley Creek, Farley Lake, Gordon Lake, the Keewatin River, Minton Lake, the new diversion channel, fish-bearing wetlands within and downstream of the Project development areas, and any additional locations identified in consultation with Indigenous groups and relevant authorities

3.3.5.2 Environmental Effects

The proposed alterations to the approved Gordon site may adversely affect the fish and fish habitat VC due to changes in fish habitat and/or changes in fish health, growth, or survival. The potential for the proposed alterations to adversely affect fish habitat and/or fish health, growth, or survival is described in the sections below.

3.3.5.2.1 Change in Fish Habitat

The proposed alterations to the approved Gordon site may affect fish habitat in the following ways:

1. Alteration of flows in Farley Creek downstream of the PDA due to diversion or capture of run-off from their upstream catchment areas during all Project phases
2. Alteration of flows in Farley Creek downstream of the PDA due to discharge of groundwater intercepted by the interceptor wells installed between the open pit and Gordon Lake and Farley Lake during all Project phases
3. Alteration of water levels in Gordon Lake, Farley Lake, and fish-bearing wetlands due to changes to the groundwater table during all Project phases

Overall, the proposed alterations to the approved Gordon site will make the footprint and PDA larger than the footprint and PDA proposed in the EIS (Table 2.2). However, none of the proposed alterations to the Gordon site footprint will result in any new HADD of fish habitat that has not already been accounted for in Alamos' fish habitat offset plan and will not trigger designation of any "waters frequented by fish" as a Tailings Impoundment Areas (TIA) under Schedule 2 of the MDMER. Additionally, maintaining the existing diversion channel between Gordon and Farley lakes will not result in any change to utilization of, or movements in, this channel by fish.

Construction

During construction, the Gordon site will be cleared of trees, topsoil will be removed and stockpiled, overburden will be removed and stockpiled, foundations will be prepared for the buildings in the facilities area, MRSA, and topsoil, overburden, and ore storage areas. Contact water collection ditches, sumps, and collection ponds will be built around the eastern perimeter of the MRSA, and around the perimeters of the ore, overburden, and topsoil storage areas, facilities area, and open pit. Non-contact water diversion ditches and sumps will be built around the southern perimeter of the MRSA. A freshwater intake pipe will be installed in Farley Lake and effluent diffusers will be installed in Gordon and Farley lakes. Interceptor wells will be installed between Gordon Lake and the western side of the open pit and between Farley Lake and the eastern side of the open pit.

Collectively, construction of these mine infrastructure and water management components will alter the upstream catchment areas, alter infiltration and evapotranspiration rates, and alter run-off reporting to Gordon Lake, Farley Lake, and Farley Creek. This has the potential to alter the magnitude, timing, and frequency of flows in streams and water levels in lakes, effects that have the potential to affect the quantity and quality of fish habitat used by different fish species and life stages at different times of the year.

Alamos no longer proposes to dewater Wendy and East pits to Farley Lake. Instead, Alamos will pump water from Wendy and East pits to the Hughes River via an approximately 8-km long flexible pipeline laid within the existing Gordon site access road right-of-way. This alteration, and its potential effects on the Hughes River, was submitted to IAAC, the Province of Manitoba, and the EAC, in a previous NOA/NOC. This alteration eliminates potential effects on fish habitat in Farley Lake and Farley Creek due to pit dewatering during construction of the Gordon site.

Operation

During operation, mining will progressively increase the size and depth of the open pit and, consequently, increase the size and height of the MRSA, and topsoil, overburden, and ore storage areas. Non-contact water will be diverted around the Gordon site while contact water will be collected and conveyed to the collection pond. Freshwater will be withdrawn from Farley Lake only fire suppression, safety showers and truck washes.

As the open pit gets larger and deeper, the hydraulic gradient between the pit and Gordon and Farley Lakes and between the pit and the local groundwater table will increase (i.e., water will want to move toward the pit via gravity). To maintain water levels in Farley Lake, Gordon Lake, and fish-bearing wetlands near the Gordon site, groundwater and surface water moving toward the open pit will be captured by interceptor wells installed between the open pit and Gordon and Farley lakes and pumped back to Gordon and Farley lakes.

Collectively, alteration of the upstream catchment areas, changes to the evapotranspiration and ground infiltration rates, and pumping of groundwater have the potential to alter water levels in Gordon Lake, Farley Lake, and in fish-bearing wetlands near the Gordon site and to alter stream flows in Farley Creek. Change in water levels or stream flows have the potential to alter fish habitat and its use by the fish in Gordon and Farley lakes and in Farley Creek.

Decommissioning/Closure

During decommissioning/closure, buildings and equipment will be removed, disturbed areas will be recontoured, collection ditches, sumps, and ponds will be recontoured or backfilled, the water intake will be removed from Farley Lake, and roads and the MRSA will be reclaimed. Prior to their decommissioning, contact water in the collection ditches, sumps and ponds will be diverted to the open pit and groundwater pumping rates in the interceptor wells will be gradually reduced. Together with direct precipitation and run-off from the surrounding catchment area, these actions are expected to fill the open pit with water in approximately 11 years.

Once the open pit is filled with water, the interceptor wells around the pit lake will be decommissioned and an inlet channel and outlet channel will be constructed in the southeastern and northwestern corners of the pit, respectively, to allow run-off from Gordon Lake to drain into the pit lake and run-off from the pit lake to drain into the northern basin of Farley Lake. Construction of these inlet and outlet channels connecting the pit lake to Gordon and Farley lakes will require isolation and dewatering of the existing diversion channel between Gordon and Farley lakes.

Decommissioning/closure of the Gordon site, particularly, reclamation of the water management infrastructure and establishment of final site drainage will result in permanent alteration of the catchment areas of Gordon Lake, Farley Lake, and Farley Creek compared with their pre-mine condition. This has the potential to alter the magnitude, timing, and frequency of flows in Farley Creek and water levels in Gordon and Farley lakes compared with pre-mine conditions. However, filling of the open pit with water will restore the groundwater table elevation and eliminate the hydraulic gradient between Gordon Lake, Farley Lake and fish-bearing wetlands and the open pit.

3.3.5.2.2 Change in Fish Health, Growth, or Survival

The proposed alterations to the approved Gordon site may affect fish health, growth, or survival in the following ways:

1. Change in water quality in Gordon Lake due to discharge of groundwater from the interceptor wells during operation
2. Change in water quality in Farley Lake due to the combined discharge of site contact water and groundwater from the interceptor wells during operation
3. Change in water quality in Susan Lake due to groundwater seepage from the MRSA during operation, decommissioning/closure, and post-closure phases

Construction

During construction, the main activities that could affect fish health, growth, or survival are clearing of trees, and grubbing and grading of the areas where mine infrastructure will be built. These activities have the potential to increase sediment loading to the streams, ponds, and lakes downstream and downslope of the mine infrastructure. Similarly, construction of the water management infrastructure has the potential to increase sediment loading to streams, ponds, and lakes. Increases in sediment to streams, ponds, and lakes can affect fish health, growth, and survival by covering fish eggs, irritating gills, and increasing turbidity of the water, a change that can reduce periphyton and phytoplankton production and reduce the ability of fish to detect prey and predators.

Operation

As mining progresses, the volume of mine rock added to the MRSA, the volume of ore added to the ore storage area and the volume of topsoil and overburden added to the topsoil and overburden storage areas will increase. These increases have the potential to increase the volume of contact water run-off and/or seepage reporting to streams, ponds, or lakes downstream or downslope of these facilities and to the surrounding groundwater table. Sources of contamination include metal leachate from the ore storage area, MRSA, and open pit, and blasting residues from the open pit.

Contact water and seepage from the MRSA, open pit, ore storage area, overburden storage area, topsoil storage area stockpile, and facilities area will be collected in collection ditches and sumps and conveyed to a collection pond near Farley Lake. Contact water in the collection pond will be combined with groundwater pumped from the interceptor wells on the eastern side of the open pit and discharged into the western basin of Farley Lake if it meets effluent limits identified in Schedule 4 of the MDMER. Groundwater pumped from the interceptor wells on the western side of the open pit will be discharged into Gordon Lake if it meets effluent limits identified in Schedule 4 of the MDMER.

Discharge of groundwater into Gordon Lake, discharge of the combined contact water and groundwater into Farley Lake and any seepage that is not captured in collection ditches around the perimeters of the MRSA, or ore, topsoil and overburden storage areas has the potential to affect fish health, growth, and survival be altering water quality in streams, ponds, or lakes downstream or downslope of these facilities. This can result in acute or chronic toxicological effects on fish health, growth, or survival depending on the magnitude, frequency, and duration of the exposure to the contaminant(s) in the receiving environment, the sensitivity of organisms to the contaminant(s), and whether there are other water quality parameters in the effluent or receiving environment that may exacerbate or reduce the toxicity of the contaminant (e.g., hardness, pH).

Decommissioning/Closure

During decommissioning/closure, buildings and equipment will be removed, disturbed areas will be recontoured, collection ditches, sumps, and ponds will be recontoured or backfilled, roads will be reclaimed, the water intake and effluent pipes will be removed, and the MRSA and ore, topsoil, and overburden storage areas will be reclaimed. These activities have the potential to increase sediment loading in streams, ponds, and lakes downstream and downslope of these facilities. The potential effects of increased sediment loading on fish were described previously (see construction, above).

Prior to their decommissioning, contact water in the collection ditches, sumps and ponds will be diverted to the open pit. Together with direct precipitation and run-off from its surrounding catchment area, contact water is expected to fill the open pit with water in approximately 11 years. Once filled, run-off from the open pit will drain to Farley Lake through a constructed outlet channel. If the concentration of metals, nutrients, or other contaminants are elevated in the pit water, acute or chronic toxicological effects to fish, fish eggs, periphyton, or benthic invertebrates in Farley Lake may occur depending on the magnitude, frequency, and duration of exposure to the contaminant(s) before the pit lake stratifies and water quality in the outflow improves.

3.3.5.3 Summary of Mitigation Measures

The principal mitigation measure for reducing or eliminating potential effects to fish and fish habitat due to the proposed alterations to the Gordon site continues to be avoid placing any new or expanded mine infrastructure on top of any fish-bearing stream, lake, or wetland. This was true for the EIS and remains so for this NOA/NOC.

Groundwater interceptor wells between the open pit and Gordon Lake and Farley Lake continues to be an important mitigation measure for reducing potential effects to fish and fish habitat at the Gordon site. The purpose of these wells is to intercept groundwater flowing toward the open pit prior to daylighting at the pit wall and to return this water to Gordon and Farley lakes. These wells will be installed during construction, operated throughout the operation phase, and gradually diminished during decommissioning/closure to help fill the open pit with water while still maintaining water levels in Gordon and Farley lakes. The groundwater interceptor wells will be decommissioned only once the open pit has filled with water and the groundwater table elevation has been restored to near pre-mine levels.

Another mitigation measure for reducing potential effects to fish and fish habitat at the Gordon site will be pumping water in the existing two open pits (Wendy and East pits) to the Hughes River instead of to Farley Lake. This change was submitted to IAAC in a previous NOA/NOC and, if approved, would reduce the dewatering period from several years to two or three months and would eliminate the following potential effects to fish and fish habitat during construction:

1. Increases in water levels in Farley Lake and stream flows in Farley Creek
2. Change in water quality in Farley Lake and Farley Creek
3. Change in water temperature in Farley Lake and Farley Creek

Other mitigation measures for reducing or eliminating potential effects to fish and fish habitat due to the proposed alterations at Gordon site were described in Chapter 10.0 of the EIS (Stantec 2020a), were included as conditions of the federal Decision Statement, and were included in the GMMP and SWMMP (Versions 0, January 2025). They include mitigation measures designed to reduce or eliminate potential changes in groundwater seepage and groundwater table drawdown and potential changes in stream flows and lake levels.

Mitigation measures specific to avoiding or reducing potential effects to fish health, growth and survival at the Gordon site were described in Chapter 10.0 of the EIS (Stantec 2020a), were included as conditions of the federal Decision Statement, and were discussed in the Aquatic Effects Monitoring Plan (AEMP; Version 0, January 2025). An important mitigation measure from the EIS that continues to be part of the Gordon NOA/NOC is aeration of groundwater pumped from the interceptor wells. The purpose of aeration is to encourage iron precipitation and to increase dissolved oxygen concentrations prior to discharge to Gordon and Farley lakes. These mitigation measures, and the adaptive management framework described in the AEMP, continue to apply to the alterations discussed in this NOA/NOC.

3.3.5.4 Residual Effects

3.3.5.4.1 Change in Fish Habitat

Potential changes in fish habitat due to changes in stream flows or water levels in ponds, lakes, or fish-bearing wetlands caused by changes in upstream catchment areas, water withdrawals from Farley Lake, and/or changes in the groundwater table were predicted using a GoldSim™ water balance model. Details of this model are described in a technical modelling report appended to this NOA/NOC (Appendix F). In brief, the water balance model incorporated baseline hydrology data collected in tributaries of Gordon and Farley lakes and in Farley Creek since 2015, climate data (e.g., precipitation, humidity) obtained from the Lynn Lake airport and the meteorological station installed by Alamos at the MacLellan site since 2015, and predicted changes in groundwater quantities based on the results of groundwater modelling (see Appendix E for details) to predict monthly changes in stream flows and water levels in lakes during each Project phase.

Diversion Channel

Elimination of the need for a new diversion channel between Gordon and Farley lakes will allow fish to continue to use habitat in the existing diversion channel. The existing channel is approximately 1.1 km long and 8 m wide with a <1% gradient and a V-shaped cross-section that is lined with >25 kg riprap. Fish passage between Gordon and Farley lakes will continue to be impeded by the numerous beaver dams present, if Alamos does not implement a beaver management plan during the construction, operation, and closure phases of the Project.

Change in Lake Levels

Results from the updated water balance model predicted less than 0.10 m change in average monthly water levels in Gordon Lake and Farley Lake during all Project phases. These results are the same as the predicted water level changes presented in the EIS. For this reason, potential effects to fish habitat in Gordon and Farley lakes are the same as those predicted in the EIS. The updated water balance model predicted changes of less than 0.01 m in average monthly water levels in Simpson Lake. While the EIS did not previously assess water levels in Simpson Lake, water level changes this small are not expected to have an adverse effect on fish habitat in Simpson Lake during any Project phase.

Change in Stream Flows

A comparison of the predicted changes in flow in Farley Creek, by Project phase, between the EIS and the NOA/NOC is provided in Table 3.31. On an annual and monthly basis, the updated water balance model for the NOA/NOC predicted flow changes in Farley Creek that result in:

- Smaller flow increases during construction and operation phases than predicted for the EIS
- Larger flow decreases during the decommissioning/closure phase when the pit is filling with water than predicted for the EIS
- Larger flow increases during post-closure than predicted for the EIS

Table 3.31 Comparison of Percentage Monthly and Annual Flow Changes in Farley Creek Between the Environmental Impact Statement and the Notice of Alteration/Notice of Change

Month	Existing Condition (m^3/s)	Construction		Operation		Decommissioning/Closure (Pit Filling)		Post-Closure	
		Change from Existing (EIS)	Change from Existing (NOA/NOC)	Change from Existing (EIS)	Change from Existing (NOA/NOC)	Change from Existing (EIS)	Change from Existing (NOA/NOC)	Change from Existing (EIS)	Change from Existing (NOA/NOC)
Jan	0.038	+141%	0%	+191%	+39%	+11	-23%	+11	+50%
Feb	0.025	+248%	0%	+325%	+60%	+7	-30%	+17	+79%
Mar	0.013	+329%	+11%	+335%	+120%	+5	-43%	+23	+159%
Apr	0.024	+375%	+11%	+313%	+99%	+2	-30%	+27	+139%
May	0.232	+74%	+1%	+60%	+7%	-8	-11%	+8	+7%
Jun	0.239	+46%	+1%	+24%	+2%	-7	-11%	-2	0%
Jul	0.135	+46%	+1%	+16%	+9%	-7	-13%	-3	+8%
Aug	0.111	+43%	+3%	+11%	+11%	-7	-13%	-3	+10%
Sep	0.126	+43%	+3%	+11%	+11%	-7	-13%	-1	+12%
Oct	0.131	+34%	+4%	+10%	+10%	-7	-13%	+1	+12%
Nov	0.119	+44%	+5%	+12%	+10%	-5	-13%	+3	+11%
Dec	0.074	+82%	+11%	+29%	+18%	-3	-15%	+7	+21%
Annual	**0.106**	**+66%**	**+4%**	+43%	**+33%**	**-6**	**-19%**	**+2**	**+42%**

Note:
flow predictions are based on “average” climate scenario

The smaller annual and monthly flow increases in Farley Creek during construction are due to the previously proposed alternation to dewater the existing two open pits to the Hughes River instead of to Farley Lake. The smaller annual and monthly flow increases in Farley Creek during operation are due to refined groundwater interception well pumping patterns.

During decommissioning/closure when the pit is filling with water, the updated water balance model predicts flow reductions of up to 43% in winter and up to 13% during the open water season in Farley Creek. Flow reductions were predicted in Farley Creek in winter for the NOA/NOC, but not for the EIS, because of differences between surface water and groundwater inputs used in the two models as discussed below.

During post-closure when the pit is filled with water and discharging to Farley Lake, the updated water balance model predicts flow increases up to 159% during the winter months and up to 12% during the open water season. The larger predicted flow increases in Farley Creek for the NOA/NOC compared with the EIS are again due to differences between surface water and groundwater inputs used in the two models.

The updated changes in flows in Farley Creek are not expected to result in adverse effects on fish and fish habitat in Farley Creek because:

- Flows in Farley Creek are predicted to increase during construction, operation, and post-closure and not decrease; while flow increases can negatively affect fish and fish habitat in streams if they are high enough to alter the channel morphology, channel geometry, and sediment transport, flow decreases are generally more detrimental to fish and fish habitat than flow increases
- The low gradient (<0.5%), wide wetted channel width (up to 75 m on both sides of the central channel), dense peat hummocks within the wetted channel, and the abundance of beaver dams that characterize habitat conditions the majority (>95%) of habitat in Farley Creek substantially reduce the magnitude of water depth and water velocity changes that would occur due to the predicted increases and decreases during all phases of the Project
- The largest predicted changes in average monthly flow in winter (i.e., November to April) during decommissioning/closure (43% flow reduction) and post-closure (159% flow increase) only represent a 0.006 m^3/s (6 litres per second [L/s]) decrease and a 0.020 m^3/s (20 L/s) increase in average monthly discharge compared with baseline, respectively.
- The largest predicted changes in average monthly flow during the spring freshet (i.e., May and June) during decommissioning/closure (11% flow reduction) and operation and post-closure (7% flow increase) represent a 0.026 m^3/s (26 L/s) decrease and a 0.016 m^3/s (16 L/s) increase in average monthly discharge, respectively
- The largest predicted changes in average monthly flow during the summer (i.e., July to September) during decommissioning/closure (13% flow reduction) and post-closure (12% flow increase) represent a 0.016 m^3/s (16 L/s) decrease and increase in average monthly discharge.

Farley Creek is known to be used by white suckers and northern pike in Swede Lake for spawning in spring and potentially by burbot in Swede Lake for spawning in winter. It is also used by brook sticklebacks year-round for spawning, rearing, foraging, and overwintering. Habitat for these life stages of these fish species is not expected to be negatively affected by the predicted changes in flow for the reasons stated above. However, as part of the AEMP, Alamos will monitor potential changes in fish habitat in Farley Creek during all Project phases by:

- Monitoring changes in the number of beaver dams present in Reach 1 of Farley Creek over time as determined from high resolution aerial imagery collected during pre-construction and at regular intervals during operation, decommissioning/closure and post-closure periods
- Monitoring changes in the average width of the central channel in Reach 1 of Farley Creek over time as determined from high resolution aerial imagery (verified with field-measured widths collected at transects established in Reach 1 of Farley Creek) collected during pre-construction and at regular intervals (e.g., every 5 m or at identifiable changes in channel geometry) during operation, decommissioning/closure and post-closure periods.
- Monitoring changes in average meander radius of the central channel in Reach 1 of Farley Creek over time as determined from high resolution aerial imagery collected during pre-construction and at regular intervals during operation, decommissioning/closure and post-closure periods.

If monitoring shows that habitat in Farley Creek is being negatively affected by changes to the flow regime, the following adaptive management actions may be triggered:

- Reducing pumping rates in the groundwater interceptor wells during operation to the extent possible without increasing inflows to the open pit or allowing water levels in Gordon and Farley Lake to decrease below trigger thresholds
- Increasing the number of discharge locations that groundwater from the interceptor wells is pumped to (e.g., Susan Lake, Pump Lake) or changing the discharge location to a larger waterbody (e.g., Swede Lake, Ellystan Lake) or stream (e.g., Hughes River) further downstream
- Adjusting pumping rates in the groundwater interceptor wells during decommissioning/closure to decrease inflows to the open pit and increase flows in Farley Creek, as required.
- Decreasing water withdrawals from Farley Lake during construction, operation, or decommissioning/closure, as required.

Comparison with the EIS

In the EIS, the magnitude of residual effects to fish habitat at the Gordon site was characterized as high, due exclusively to the predicted increase in discharge of up to 375% in Farley Creek during construction and operation. However, this residual effect was not expected to extend beyond the local assessment area, not extend beyond operation (i.e., medium-term), and be reversible because flows in Farley Creek were predicted to return to near baseline flows in post-closure.

Because of the smaller changes in flow predicted in Farley Creek during construction and operation for this NOA/NOC compared with the EIS, and because the flow reductions now predicted to occur in Farley Creek during decommissioning/closure are relatively small compared with the volume of water within the

wetted channel of Farley Creek at any time, the magnitude of residual effects to fish habitat at the Gordon site is expected to be moderate (i.e., a measurable change in habitat area, monthly flows or lake surface area that is greater than the range of natural variability, but that does not affect the ability of fish to use the habitat to carry out one or more of their life processes).

No change in the characterization of residual effects to fish habitat at the Gordon site is required for the predicted changes to lake levels because average monthly water level predictions for Gordon Lake, Farley Lake, Swede Lake, and Ellystan Lake are unchanged from the EIS and average monthly water level predictions for Simpson Lake are <0.01 m, which is within the range of natural variability. Similarly, no change in the characterization of residual effects to fish habitat at the Gordon site is required for fish habitat affected by the mine footprint or zone of groundwater table draw-down. This is because the updated mine footprint will not overprint additional fish habitat that hasn't already been accounted for in the fish habitat offset plan and because the zone of groundwater table draw-down around the open pit has decreased compared with the EIS.

3.3.5.4.2 Change in Fish Health, Growth, or Survival

Potential effects on fish health, growth, or survival due to predicted changes in water quality in the downstream receiving environment were assessed using the surface water quality model predictions for the Expected Case scenario (see Section 3.3.4.2). A summary of model nodes used in the surface water quality model at the Gordon site are shown in Figure 3.1. Assessment of potential effects on fish health, growth, and survival of each POPC identified by screening the predicted water quality concentrations against baseline water quality and the available provincial and federal water quality guidelines for the protection of freshwater aquatic biota is provided in the sections below. A comparison of the POPCs identified for the EIS and for the NOA/NOC, by location and Project phase, is provided in Table 3.26.

Potential Effects due to Fluoride

Fluoride concentrations are predicted to exceed baseline concentrations by at least 20% and the long-term CWQG-FAL for fluoride (0.12 mg/L; CCME 2002) in Farley Lake (east and west basins) during operation and post-closure. Fluoride concentrations are predicted to reach a maximum of 0.14 mg/L in Farley Lake (east and west basins) during operation, and maximums of 0.20 mg/L and 0.22 mg/L in Farley Lake (east and west basins) during post-closure. Exceedances of the fluoride CWQG-FAL are predicted to occur until the end of the modelled post-closure phase in Farley Lake (east and west basins) (Figures H-1 and H-3, Appendix G).

Despite these exceedances, predicted fluoride concentrations in Farley Lake (east and west basins) during operation and/or post-closure are not expected to result in adverse effects to fish health, growth, or survival for the following reasons:

- The CWQG-FAL for fluoride is an interim guideline that applies a safety factor of 100 to results of a study using caddisflies, where adverse effects (mortality after 144 hours of exposure) were reported at fluoride concentrations of 11.5 mg/L (CCME 2002). The safety factor was used because this study was based on acute lethality instead of sublethal effects on growth or reproduction after chronic exposure.

- The CWQG-FAL for fluoride is not dependent on other water chemistry parameters; however, the CCME (2002) notes that fluoride toxicity is affected by water hardness (i.e., decreasing toxicity with increasing hardness), which is consistent with the hardness-dependent fluoride guidelines derived by other jurisdictions such as British Columbia (British Columbia Ministry of Environment [BC MOE] 1990).
- Most studies have found that adverse effects of fluoride to fish and other aquatic biota, including secondary producers such as benthic invertebrates, begin at concentrations greater than 1 mg/L (BC MOE 1990, CCME 2002, Camargo 2003). While there are limited data on fluoride toxicity to aquatic organisms following long-term exposures, studies summarized by BC MOE (1990), CCME (2002), and Camargo (2003) suggest that adverse effects from long-term exposure to fluoride are unlikely to occur at concentrations below 0.5 mg/L in soft water, with the toxicity threshold for adverse effects likely to be higher in harder waters.

Potential Effects due to Total Iron

Alterations to the approved Gordon site are not predicted to increase total iron concentrations above those predicted in the EIS. The reasons that total iron was identified as a POPC for this NOA/NOC, and not for the EIS, is because baseline total iron concentrations used in the NOA/NOC model were lower than those used in the EIS model due to changes in the predicted seepage from the historical north and south MRSAs and because total iron concentration predicted by the NOA/NOC model were compared with the more stringent FEQG that was issued by ECCC in 2024 (ECCC 2024) and not to the CWQG-FAL of 0.3 mg/L (CCME 2011) used for the EIS; the FEQG was not available for the EIS which was submitted in 2020.

Total iron concentrations predicted for the NOA/NOC exceed baseline concentrations by at least 20% and the pH and DOC dependent FEQG in Gordon Lake during closure and post-closure. Total iron concentrations are predicted to reach maximums of 1.27 mg/L and 1.28 mg/L in Gordon Lake during closure and post-closure, which exceed the pH and DOC dependent FEQG that ranges from 0.79 to 0.80 mg/L (ECCC 2024). Exceedances of the total iron FEQG are predicted to occur until the end of the modelled post-closure phase in Gordon Lake (Figure H-6, Appendix G).

Although higher than the FEQG, predicted total iron concentrations in Gordon Lake during closure may be over-estimated. This is because the model did not include any iron removal that is expected to occur due to aeration of the pumped groundwater prior to its discharge to Gordon Lake; aeration of the groundwater is expected to form iron oxides that will fall out of suspension in the collection pond prior to discharge. This is also true for construction and operation phases in Gordon Lake and for total iron concentrations predicted for all phases in Farley Lake (even though total iron was not identified as a POPC in Gordon Lake or Farley Lake during these phases).

The risks to the health, growth, and survival of fish and other aquatic biota (invertebrates are generally more sensitive to the effects of total iron than fish; ECCC 2024) from elevated total iron concentrations in Gordon Lake during post-closure may be lower than suggested by the guideline exceedances because:

- The guideline is for total iron, but dissolved iron is the more bioavailable fraction of iron (ECCC 2024). Dissolved iron concentrations represented, on average, only 37% of the predicted total iron concentrations in Gordon Lake during post-closure
- As required by the FEQG guidance document (ECCC 2024), DOC concentrations were capped at 10.9 mg/L when calculating the FEQG for total iron in Gordon Lake. However, baseline DOC concentrations in Gordon Lake ranged between 11.3 mg/L and 18.0 mg/L in 2015 and 2017 (Stantec 2020c); Gordon Lake is a shallow (<1.5 m) headwater lake with tannin-stained water and fine organic substrates throughout. Toxicity of iron decreases with increasing DOC so it is likely that the high DOC concentrations in Gordon Lake will lower the toxicity of total iron in Gordon Lake during closure and post-closure phases.
- Based on the Species Sensitivity Distribution (SSD) used in the FEQG (ECCC 2024), salmonid fish species (e.g., trout, salmon, whitefish) are more sensitive to iron than non-salmonid fish species (e.g., fathead minnows). Brook sticklebacks are the only fish species present in Gordon Lake, and although there are no iron toxicity data for brook sticklebacks, it is likely that brook sticklebacks would have a normalized effect concentration more like that of fathead minnow (1.5 mg/L) than the most sensitive salmonid species, Mountain Whitefish (0.2 mg/L)

Despite the above, chironomids (*Tanytarsini* sp.and Orthocladiinae) represented two of the seven most sensitive organism to iron in the SSD used to develop the FEQG (ECCC 2024) and chironomids represent one of three most abundant families of benthic invertebrates (the others being oligochaetes [round worms] and bivalves [freshwater clams]) found in Gordon Lake in 2015 and 2016 (Stantec 2020d). These midges provide an important food source for the brook stickleback population in Gordon Lake and any reduction in their number, distribution, or reproduction may adversely affect brook sticklebacks.

Because of potential effects on the benthic invertebrate community in Gordon Lake post-closure and the uncertainties associated with the toxicity of total iron compared with dissolved iron and the ameliorating effects of DOC concentrations on iron toxicity, Alamos will monitor total and dissolved iron concentrations in the groundwater collection pond and in Gordon Lake during all Project phases, will include a trigger response threshold and adaptive management plan for total iron in the SWMMP and a trigger response threshold for benthic invertebrates in Gordon Lake in the AEMP tied to the same adaptive management plan as in the SWMMP.

The principal mitigation measure for reducing effects of total iron in Gordon Lake will be to aerate the groundwater pumped from the interceptor wells during construction, operation, and closure phases. Currently, groundwater will be aerated as it flows over rocky riffles installed in the open collection channels constructed between the interceptor wells and the collection pond near the southeastern corner of Gordon Lake. If monitoring shows higher total or dissolved iron concentrations than expected in the collection pond or in Gordon Lake, aeration would be increased by lengthening the collection channel, adding more rocks to the collection channel, or added an air-line or aerator to the collection pond itself.

Potential Effects due to Nitrite

Nitrite (as N) concentrations are predicted to exceed baseline concentrations by at least 20% and the long-term CWQG-FAL in West Farley Lake during operation. This is predicted to occur due to the accumulation of blast residues from the open pit in the contact water discharged to West Farley Lake from the collection pond. Nitrite (as N) concentrations are predicted to reach a maximum of 0.088 mg/L in West Farley Lake during operation, which exceeds the long-term (30-day average) CWQG-FAL for nitrite (as N) of 0.060 mg/L (CCREM 1987) by 1.5 times.

The long-term CWQG-FAL for nitrite (as N) was developed in 1987 (CCREM 1987). More recently, the British Columbia Ministry of Environment published maximum and long-term (30-day average) water quality guidelines for the protection of freshwater aquatic life for nitrite (as N) of 0.060 mg/L and 0.020 mg/L (as N), respectively, for waters with chloride concentrations <2 mg/L (BC MOE 2009); the maximum and long-term average nitrite water quality guidelines increase with increasing chloride concentrations because nitrite toxicity has been shown to decrease with increasing chloride concentration (BC MOE 2009). More recently however, Baker et al. (2022) calculated 5th percentile hazard concentrations (HC_5) for sub-lethal (IC_5) and lowest effect concentrations (LEC_5) using an SSD based on nine freshwater species (three invertebrates, four fish, and two algae) to be 0.052 mg/L and 0.064 mg/L nitrite (as N) in waters with <5 mg/L chloride. This suggests that the long-term CWQG-FAL of 0.060 mg/L nitrite (as N) remains appropriate for comparison with predicted nitrite concentrations in West Farley Lake; chloride concentrations in West Farley Lake are predicted to be <2 mg/L during all phases. Other water quality parameters that may influence nitrite toxicity include bromide and calcium (Kroupova et al. 2005), but these modifying factors have not been included in any available guideline.

Risks to the health, growth, or survival of fish and other aquatic biota in West Farley Lake due to predicted nitrite concentrations above the CWQG-FAL during operation may be lowered by the following lines of evidence:

- Maximum nitrite concentrations are predicted to be only 1.5 times higher than the guideline during operation and guideline exceedances are predicted to occur in only 12% of all months during operation (Table 3.29 and Figure H-9, Appendix G).
- It was assumed that ammonium-nitrate fuel oil (ANFO) will be used as the explosive in the open pit in the surface water quality model, instead of the emulsion blend blasting product that Alamos intends to use as its first-choice explosive at the Gordon site; unlike ANFO which is highly water soluble, emulsions are water-resistant and, therefore, produce lower nitrogen residues after blasting, particularly in wet conditions.
- No attenuation or removal or nitrite was included in the updated water quality model, either in the collection pond or West Farley Lake. This is a conservative assumption since nitrite is readily oxidized into less toxic nitrate under aerobic conditions such as those likely to be present in the collection pond and known to be present in West Farley Lake

- Sublethal toxicological effects to fish in West Farley Lake (i.e., northern pike, yellow perch, white suckers, and brook stickleback) are not expected to occur below 0.100 mg/L nitrite (as N) based on the SSD developed by Baker et al. (2022) which is above the maximum predicted nitrite concentration of 0.088 mg/L
- the most sensitive species to nitrite in the SSD developed by Baker et al. (2022) was a mayfly (*Neocloeon triangulifer*), a species in the family of invertebrates comprising <5% of the benthic invertebrate community of Farley Lake in 2016 (Stantec 2020d)

Although adverse effects from elevated nitrite concentrations in West Farley Lake are not expected to occur, Alamos will monitor water quality in West Farley Lake as part of the SWMMP to determine if nitrite concentrations are exceeding the long-term CWQG-FAL, by how much and how often, and if adaptive management actions are required. Mitigation measures that Alamos could implement should monitoring show that nitrite concentrations are elevated and having an adverse effect on fish and aquatic biota in West Farley Lake include:

- Altering blasting plans to increase combustion rates, reduce misfires, and reduce nitrogenous wastes in the open pit (e.g., using compressed air to dewater drill holes prior to loading with explosive, using electronic detonators and blast hole liners, and using blasthole covers or stopping blasting during rain events)
- Re-evaluating the blasting quality assurance/quality control plan to optimize blast patterns and to improve accounting of explosive materials used in the pit.
- Evaluating passive and active treatment options for managing nitrogenous wastes including, but not limited to, increasing dissolved organic carbon concentrations and reducing conditions in the collection pond, pumping collection pond water to wetland areas for passive treatment, modular water treatment

Potential Effects due to Total Phosphorus

Phosphorus concentrations are predicted to exceed baseline concentrations by at least 20% and the long-term MWQSOG-FAL in East Farley Lake during closure; no other exceedances of baseline phosphorus concentrations are expected. Phosphorus concentrations in East Farley Lake are predicted to reach a maximum of 0.0293 mg/L during closure, which exceeds the long-term MWQSOG-FAL of 0.025 mg/L (Manitoba Water Stewardship 2011).

The increased total phosphorus concentrations predicted to occur in East Farley Lake during closure are due to a lower basin volume during low flow months (i.e., June and November) coupled elevated total phosphorus concentration loading from West Farley Lake, which is predicted to have higher concentrations during the closure phase compared with operation and post-closure.

The MWQSOG for total phosphorus was set to protect freshwater aquatic biota, including fish and benthic invertebrates, from potential effects of eutrophication (i.e., a shift in trophic status due to increased production of photosynthetic algae). A moderate increase in trophic status can be beneficial in nutrient-poor systems. However, decomposition of phytoplankton and periphyton associated with increases in nutrients (such as phosphorus, nitrogen, or dissolved carbon) can lead to decreased oxygen concentrations in winter, which can affect the survival of fish (CCME 2004).

Although the maximum concentration of phosphorus in East Farley Lake during closure is predicted to exceed the long-term MWQSOG-FAL guideline, the maximum predicted concentration (0.029 mg/L), the long-term MWQSOG-FAL (0.025 mg/L) and the baseline maximum concentration (0.028 mg/L) are within the meso-eutrophic range of 0.020 to 0.035 mg/L, as defined for lakes in the Canadian Guidance Framework for the Management of Freshwater Ecosystems (CCME 2004). In addition, the average concentration of 0.020 mg/L during closure is predicted to be below the MWQSOG-FAL guideline of 0.025 mg/L. For these reasons, potential adverse effects on fish health, growth, or survival of fish in East Farley Lake due to predicted increases in phosphorus concentrations during closure are not expected to occur.

Comparison with the EIS

In the EIS, fluoride was identified as a POPC in Gordon Lake, Farley Lake (east and west basins), and in Swede Lake during construction, operation, and decommissioning/closure phases while total phosphorus was identified as a POPC only in West Farley Lake and only during construction. These POPCs were expected to have a negligible effect on fish health, growth, or survival in the LAA because the predicted concentrations were lower than the toxicity benchmark considered more appropriate than the CWQG-FAL which included a 100 times safety factor (fluoride) and were not expected to be high enough to alter the trophic status of any lake (phosphorus). The effects on fish health, growth, and survival were characterized as long-term and irreversible because fluoride concentrations in West Farley Lake were predicted to remain above the CWQG-FAL in perpetuity but the ecological context of the residual effect was characterized as resilient because the fish and other aquatic biota in the potentially effects lakes have been previously exposed to changes in water quality caused by previous mining at the Gordon site and because fish populations are generally adaptable to water quality that is below toxicity thresholds.

Fluoride and total phosphorus are also predicted to be POPCs in Gordon and Farley lakes for this NOA/NOC, but it is the identification of total iron as a POPC in Gordon Lake during closure and post-closure and nitrite as a POPC in Farley Lake during operation that has resulted in a change in the characterization of residual effects to fish health, growth, or survival for this NOA/NOC. If modelled water quality predictions in Gordon and Farley lakes are proven accurate by the SWMMP and no other mitigation measures are implemented, the magnitude of residual effects on fish health, growth, or survival would be expected to be moderate (i.e., a measurable change in the abundance, structure, or health metrics in focal fish populations that is greater than the range of natural variability but not large enough to affect the productivity of the focal fish populations). The geographic extent, duration, timing, frequency, reversibility, and ecological context of the residual effects on fish health, growth, or survival would be expected to remain unchanged from the EIS (i.e., local, long-term, applicable, multiple regular events, irreversible, and resilient, respectively).

3.3.6 Vegetation and Wetlands

The vegetation and wetlands VC includes native plant communities, wetlands, plant species and communities of conservation concern, and traditional use plant species (Stantec 2020a). The proposed alterations that may interact with the vegetation and wetlands VC and were therefore assessed as part of this NOA/NOC, include but are not limited to the changes in the PDA layout outlined in Table 2.1.

3.3.6.1 Spatial Boundaries

PDA – As outlined in Section 2.3, the PDA encompasses the immediate area in which Project activities and components occur plus a buffer and is the anticipated area of direct physical disturbance associated with the construction and operation of the Project. The PDA has changed from what was presented in the EIS and is now increased by 21.8 ha.

LAA – The LAA (4,141.2 ha) has changed from what was presented in the EIS because of groundwater drawdown and changes in the PDA. The LAA is based on a 100 m buffer around the furthest expected groundwater drawdown contour, a 1 km buffer around the updated NOA/NOC PDA extent, and a 1 km buffer around the PR 391 highway. These changes decrease the LAA by 123.5 ha from that presented in the EIS.

3.3.6.2 Regulatory and Guideline Setting

3.3.6.2.1 Guideline Criteria

The assessment of potential Project-related environmental effects on vegetation and wetlands includes the consideration of the federal *Species at Risk Act.*

Provincial legislation considered in the assessment of potential Project-related environmental effects on vegetation and wetlands includes the following:

- *The Water Rights Act*
- *The Conservation Agreements Act*
- *The Ecological Reserves Act*
- *The Endangered Species and Ecosystems Act*
- *The Environment Act*
- *The Forest Act*
- *The Forest Health Protection Act*
- *The Wildfires Act*
- *The Mines and Minerals Act*
- *The Noxious Weeds Act*

3.3.6.2.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to vegetation and wetlands:

> *3.8.3 maintain, during all phases of the Designated Project, a buffer of undisturbed vegetation of at least 30 meters from the high-water mark, as follows:*
>
> > *3.8.3.1 around fish-bearing water bodies, including wetlands, within and adjacent to the Project development areas that are not required to be removed for construction of the Designated Project, in a manner that complies with any authorization issued under the Fisheries Act; and*
> >
> > *3.8.3.2 around wetlands, within and adjacent to the Project development areas that are not required to be removed for construction of the Designated Project, unless not technically or economically feasible. If work within 30 meters of wetlands is required, the Proponent shall use weight-distributing materials under machinery to limit soil compaction and give preference to using existing access roads to access areas near wetlands.*
>
> *3.13 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Fisheries and Oceans Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as they pertain to adverse environmental effects of the Designated Project on water quantity. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:*
>
> > *3.13.1 monitor, during all phases of the Designated Project, surface water instantaneous flows, lake levels and pH levels within Arbor Lake, Burge Lake, Cockeram Lake, Ellystan Lake, Farley Creek, Farley lake, Gordon Lake; the Keewatin River, the unnamed tributary of the Keewatin River, Minton lake, Payne lake, Susan lake, Swede lake, fish-bearing wetlands within the local assessment areas, the East and Wendy pit lakes, newly formed pit lakes, the tailings management facility, and contact water collection ponds to verify the environmental assessment predictions identified in Volume 2 Chapter 10 of the Environmental Impact Statement and Appendix A Attachment IAAC-48 of the Proponent's IR Responses Round 1, Package 1 (Canadian Impact Assessment Registry Reference Number 80140, document 11S4);*
> >
> > *3.13.2 monitor, during all phases of the Designated Project, groundwater levels, gradients and hydraulic conductivity of all hydrogeological units, as identified in the groundwater model in Volume 5 Appendix E and G of the Environmental Impact Statement, with well depths ranging from near surface to a minimum of 115 meters below ground to characterize contaminant transport via groundwater at the depth of the groundwater model for the Designated Project. Monitoring wells shall be installed near the open pits, the tailings management facility, mine rock storage areas, ore and*

overburden stockpiles, and fish-bearing wetlands within the local assessment areas that intersect with the Project development areas;

3.14.4 monitor, starting prior to construction and during all phases of the Designated Project, fish habitat quality and quantity end points for all species identified pursuant to condition 3.14,3, in Farley Creek, Farley lake, Gordon lake, the Keewatin River, Minton lake, the new diversion channel, fish-bearing wetlands within and downstream of the Project development areas, and any additional locations identified in consultation with Indigenous groups and relevant authorities.

5.2.2 provide opportunities to Indigenous groups, prior to construction and at times determined in consultation with each Indigenous group, to:

5.2.2.1 harvest and transplant, during seasons where plants can be Identified and harvested, plant species used for traditional purposes from areas that will be cleared of vegetation

5.4 The Proponent shall develop, prior to construction, and implement, during all phases of the Designated Project, a protocol for inspecting and cleaning vehicles, machinery and equipment associated with the Designated Project that have come from other worksites in order to limit the introduction and spread of weed species within the Project development areas.

5.6 The Proponent shall, when Implementing measures to limit the introduction and spread of weed species within the Project development areas, use measures other than broadcast spraying when applying herbicides to mitigate effects to plant species used for traditional purposes by Indigenous groups, unless the Proponent determines that these measures are ineffective at controlling the introduction and spread of weed species.

5.7 The Proponent shall undertake, in consultation with Indigenous groups and relevant authorities, progressive reclamation of areas disturbed by the Designated Project, in doing so, the Proponent shall:

5.7.1 identify, in consultation with Indigenous groups, plant species native to the local assessment areas and plant species used for traditional purposes, to use for revegetation

6.3 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Health Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects from the Designated Project on air quality and country foods as it relates to the health of Indigenous peoples, taking into account available Indigenous knowledge provided by Indigenous groups related to current use of lands and resources for traditional purposes. The Proponent shall Implement the follow-up program during all phases of the Designated Project. As part of the implementation of the follow-up program, the Proponent shall:

6.3.1 identify, in consultation with Indigenous groups, the species of fish, vegetation and wildlife consumed as country foods that may be adversely affected by the Designated Project and the locations where these species shall be monitored

3.3.6.3 Environmental Effects

3.3.6.3.1 Construction

Consistent with the EIS, vegetation clearing during construction will result in portions of native plant communities being lost or altered. As described in Section 11.4 of the EIS, it was assumed that all vegetation within the PDA would be removed during construction. Overall, the revised Gordon PDA is larger than what was assessed in the EIS, with the addition of several new Project components, including the proposed borrow source and collection pond effluent diffuser. The land cover within the PDA remains similar with shrubby fen dominating 16.2% of the PDA, followed by dense mixedwood forest (13.9%), sparse conifer forest (9.9%), and open and dense conifer forest (7.6% and 7.2%, respectively) (Table 3.32). The relative proportions of these cover classes have not changed from the EIS.

Both construction and operation may indirectly alter the native plant communities due to the introduction or establishment of invasive species. This effect has not changed from the EIS.

Indirect effects on wetlands from groundwater drawdown may include a change in wetland class, change in plant species composition, and a change in decomposition rate for those wetlands influenced by groundwater such as fens and swamps.

Construction and operation at the Gordon site will require dewatering of the open pit and will result in groundwater drawdown of at least 1 m over an area extending approximately 500 m to the north and 1,000 m to the southwest of the open pit. Groundwater drawdown during construction and operation may alter the class, plant species composition, and decomposition rates of 27.3 ha of fen, and 5.9 ha of swamp wetlands in the LAA (Table 3.33). The area of wetlands affected has increased by 10.8 ha from the EIS, however, the relative proportions of wetlands have not changed.

Construction will directly affect three known occurrence of plant species of conservation concern (SOCC): boreal locoweed (*Oxytropis borealis),* which was observed on a reclaimed mine rock stockpile near the proposed open pit area; eyed foam lichen (*Stereocaulon tomentosum*), which was observed within the proposed open pit and the potential mine rock storage areas; and northern ground cedar (*Diphasiastrum complanatum*), which was observed within the planned MRSA. Boreal locoweed is an S1S2 listed species (critically imperiled to imperiled). Eyed foam lichen is an SU listed species (unrankable due to the lack of information), and northern ground cedar is an S3S4 listed species (vulnerable to apparently secure) (NatureServe 2025).

Boreal locoweed was identified during preliminary site surveys. A summer rare plant and weed survey completed in 2022 could not confirm the occurrence of boreal locoweed, but did document the occurrences of eyed foam lichen and northern ground cedar (Stantec 2022; Appendix A Map 4).

Table 3.32 Land Cover Classes in the Gordon PDA and LAA

Cover Type	Land Cover Class	EIS Results				Updated NOA/NOC Results			
		PDA		LAA		PDA		LAA	
		Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
Anthropogenic	Development	72.0	26.7	119.5	2.8	84.0	28.9	121.5	2.9
	Anthropogenic Subtotal	***72.0***	***26.7***	***119.5***	***2.8***	***84.0***	***28.9***	***121.5***	***2.9***
Native Upland	Conifer Dense	22.2	8.2	1,094.5	25.7	21.1	7.2	1,080.9	26.1
	Conifer Open	20.4	7.6	463.8	10.9	22.3	7.6	447.3	10.8
	Conifer Sparse	28.4	10.5	355.8	8.3	28.8	9.9	306.7	7.4
	Mixedwood Dense	40.0	14.9	272.7	6.4	40.6	13.9	264.0	6.4
	Mixedwood Open	2.48	0.9	96.2	2.3	2.4	0.8	78.9	1.9
	Shrubland	5.9	2.2	141.6	3.3	6.1	2.1	136.8	3.3
	Native Upland Subtotal	***119.4***	***44.3***	***2,437.9***	***57.2***	***121.2***	***41.6***	***2,314.6***	***55.9***
Water	Water	13.2	4.9	430.3	10.1	12.5	4.3	429.2	10.4
	Water Subtotal	***13.2***	***4.9***	**430.3**	**10.1**	***12.5***	***4.3***	***429.2***	***10.4***
Wetland	Bog Shrubby	10.7	4.0	194.6	4.6	12.5	4.3	193.9	4.7
	Bog Treed	7.9	2.9	435.8	10.2	8.4	2.9	435.3	10.5
	Fen Shrubby	41.6	15.4	383.9	9.0	47.3	16.2	379.7	9.2
	Fen Treed	0.5	0.2	28.1	0.7	0.5	0.2	22.3	0.5
	Marsh	0.0	0.0	10.2	0.2	0.0	0.0	10.2	0.2
	Swamp Shrubby	1.8	0.7	42.2	1.0	2.4	0.8	42.2	1.0
	Swamp Treed	2.3	0.9	195.6	4.6	2.4	0.8	192.3	4.6
	Wetland Subtotal	***64.8***	***24.0***	***1,290.4***	**30.3**	***75.6***	***25.3***	***1,275.9***	***30.8***
Total		**269.4**	**100.0**	**4,264.7**	**100.0**	**291.2**	**100.0**	**4,141.2**	**100.0**

Table 3.33 Wetlands Potentially Affected by Groundwater Drawdown during Construction and Operation in the LAA

Wetland Class	Area (ha)[1]	Proportion of the LAA (%)
Fen Shrubby	24.2	0.6
Fen Treed	3.1	0.1
Swamp Shrubby	3.5	0.1
Swamp Treed	2.4	0.1
TOTAL	**33.1**	0.8

Note:
[1] Area excludes the PDA.

Effects to undocumented SOCCs are unknown. Undocumented SOCCs occurrences may be present because for many species, the number of plants fluctuate in response to climatic conditions (e.g., annuals may not germinate in dry years) and occur in low numbers. This effect is consistent with what was presented in the EIS.

3.3.6.3.2 Operation

Consistent with the EIS, road use, drilling, blasting and rock removal from open pit mines during operation will generate dust and likely result in dust deposition on surrounding native plant communities. The AQMMP was developed for Project construction and operation to monitor and manage the ambient air quality near the Project. Dust from the haul road is the largest source of particulate emissions and therefore more frequent road watering will be implemented. In addition, to mitigate effects due to dust, automatic alerts will be sent to notify environmental representatives of high winds (i.e., wind speed greater than 5 metres per second [m/s] or 18 kilometres per hour [km/h] or Beaufort 3 gentle breeze) and dry conditions (less than 2 millimetres [mm] of precipitation has occurred in the previous 24 hours and the temperature is greater than 15°C), which will trigger the implementation of additional dust mitigation measures.

Operation at the Gordon site may affect two known plant SOCC occurrences in the LAA, shrubby willow (*Salix arbusculoides*) and hairy butterwort (*Pinguicula villosa),* both found in a lakeside riparian shrubland north of the PDA. These occurrences may be indirectly affected by drawdown from dewatering of the open pit that will likely last through post-closure until the open pit fills. This effect may be reversible for shrubby willow if there are propagules available for reestablishment of this species. Shrubby willow produces a high abundance of seed and there are a variety of habitats the species can grow in (United States Department of Agriculture 2020). However, it is assumed that the loss of hairy butterwort is irreversible. The characterization of this residual effect differs from what was presented in the EIS, as hairy butterwort was not included in the EIS as its presence was not identified until the rare plant survey completed in 2022. Potential introduction or establishment of invasive species during operation may also indirectly alter native plant communities. The baseline conditions reported in the EIS and supporting

documents note the presence of one Tier 3 weed species, common dandelion (*Taraxacum officinale*), within the Gordon PDA. Since the Project is in a remote northern area of Manitoba surrounded by native plant communities, weed species are less likely to be encountered (United Stated Department of Agriculture 2007). In accordance with the Vegetation and Weed Management Plan (VWMP) the following mitigation measures (in order of priority) will be used to reduce the introduction and spread of weed species during Project construction, operation, and decommissioning/closure:

1. Keeping equipment free of soil and debris as equipment can spread propagules (e.g., seeds, rhizomes). Equipment and personnel (e.g., boots and clothing) will arrive at the 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 within the construction footprint until it has been cleaned, re-inspected, and deemed suitable for use. Random inspections of equipment and personnel may also be completed. Cleaning stations will be established at the construction site. Cleaning stations will be lined by an impermeable liner to isolate the cleaning station from the surrounding area so that the water can be easily removed by hydrovac.
2. Monitoring topsoil and subsoil piles for regulated weed species establishment.
3. Monitoring newly disturbed areas for encroachment of weed species.
4. Controlling infestations of regulated weed species.
    a. Tier 2 species infestations under five acres (two hectares) must be eradicated; whereas infestations larger than five acres must be controlled and kept from spreading.
5. Revegetating disturbed land with native vegetation.
6. Using certified clean seed.
7. Applying corrective measures to avoid the growth of regulated weed infestations.

3.3.6.3.3 Decommissioning / Closure

Consistent with the EIS, areas disturbed by the Project will be reclaimed during decommissioning/closure, 13 years post-construction. Areas of Project disturbance, other than the open pit and the existing access road, will be reclaimed to native plant cover. Reclaimed native upland will be revegetated by seeding with native plant species, including commercially available plant species of interest to Indigenous Nations. The goals of revegetation are to control erosion, improve aesthetics, and assist in returning the PDA to a self-sustaining community dominated by native plant species that are in similar dominant plant abundance to the surrounding upland and representative of early successional development as outlined in the EIS (Stantec 2020a). The VWMP does not specifically target the restoration of existing conditions in the PDA. The VWMP targets the establishment of native plants; however, the abundance and distribution are expected to differ from existing conditions. With mitigation and reclamation, the Project will result in an increase in 254.5 ha of reclaimed native upland (MRSA and areas of the PDA), which replaces a portion of the 121.2 ha of native upland vegetation cover classes lost in the LAA. The Project will result in an increase in 36.7 ha of water as the open pit fills over the course of 40 years. As these pits fill,

groundwater levels will slowly recover. The existing access road into the Gordon site will remain in place and not be reclaimed.

3.3.6.3.4 Comparison with the EIS

Updated Project effects on vegetation and wetlands to those outlined in Chapter 11.0 of the EIS include the addition of three plant SOCC occurrences that will be directly affected by construction or potentially affected by operation; no additional adverse effects on vegetation and wetlands are anticipated because of the footprint alteration.

3.3.6.4 Summary of Mitigation Measures

Proposed mitigation measures incorporated as part of this NOA/NOC include those standard practices and procedures identified in the EIS (Stantec 2020a) and associated technical review, as well as other general mitigation measures that are typically applied during construction and operation; all of which are discussed in the VWMP (Version 0, January 2025).

3.3.6.5 Residual Effects

During construction, alterations to the approved Gordon site will affect more land (an additional 21.8 ha) than predicted in the EIS. Effects from groundwater drawdown near the open pit during construction and operation is similar in comparison with the EIS with effects extending to at least 1 m depth within 500 m to the north and 1,000 m to the southwest of the open pit. Like the EIS, 27.2 ha of fen and 5.9 ha of swamp may be potentially affected by groundwater drawdown in the LAA.

During decommissioning/closure, upland and wetland areas disturbed by the Project will be revegetated to establish reclaimed native upland. The open pit will be allowed to fill naturally over 50 years and is predicted to be reclaimed to water. The existing access road into the Gordon site will remain in place and not be reclaimed. The MRSA will also be capped and seeded with a native seed mix. Additional details on the plant selection for revegetation is included in the VWMP. Loss of entire plant communities from the LAA is not expected. With mitigation and reclamation, the Project will result in an increase in 254.5 ha of reclaimed native upland, which replaces a portion of the 121.2 ha of lost native upland plant communities in the LAA. The Project will also result in the permanent loss of 75.6 ha of wetlands. Groundwater drawdown during construction and operation may alter the class, plant species composition and decomposition rates of 59.5 ha of fen and 8.4 ha of swamp wetland area.

The proposed alterations will not result in additional adverse effects on vegetation and wetlands at the Gordon site and there is no change to the EIS conclusions (Stantec 2020a).

3.3.7 Wildlife and Wildlife Habitat

Wildlife and wildlife habitat is a VC because it provides ecological, aesthetic, recreational, economic, and cultural value to stakeholders, the public, Indigenous Nations, local businesses, and government agencies (Stantec 2020a). The proposed alterations that may interact with the wildlife and wildlife habitat VC and were therefore assessed as part of this NOA/NOC include but are not limited to the changes in the PDA layout outlined in Table 2.1.

3.3.7.1 Regulatory and Guideline Setting

3.3.7.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on wildlife and wildlife habitat includes the consideration of the following federal legislation:

- The *Species at Risk Act* (SARA) provides protection for species at risk (SAR) in Canada. The legislation provides a framework to facilitate recovery of species listed as threatened, endangered, or extirpated and to prevent species listed as special concern from becoming threatened or endangered. SAR and their habitats are protected under SARA, which prohibits: 1) the killing, harming, or harassing of endangered or threatened SAR; and 2) the destruction of critical habitat of an endangered or threatened SAR.
- The *Migratory Birds Convention Act* provides protection for migratory birds, nests, and eggs. Protection is afforded to most native bird species with some exceptions, all of which are protected under provincial legislation. The updated Migratory Birds Regulations, 2022 (Government of Canada 2022) protect the nests of migratory birds only when they contain a live bird or viable eggs, with year-round protection for 18 species whose nests are commonly re-used by migratory birds.

The assessment of potential Project-related environmental effects on wildlife and wildlife habitat includes the consideration of the following provincial legislation:

- *The Endangered Species and Ecosystems Act* (ESEA) provides protection to threatened and endangered ecosystems and plant and animal SAR in Manitoba. The ESEA facilitates the management and development of recovery strategies for threatened, endangered, and extirpated or extinct species to prevent further declines and promote recovery.
- *The Wildlife Act* provides general provisions for regulating the activities relating to the take and trade of wild animals in Manitoba, which are defined as “an animal or bird of a species or type listed in Schedule A or declared by the regulations to be a wild animal.” Select amphibian, reptile, and mammal species and most bird species (including those not protected under the *Migratory Birds Convention Act*) known to exist in Manitoba are included.

3.3.7.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to wildlife and wildlife habitat:

> *4.1 The Proponent shall carry out the Designated Project in a manner that protects migratory birds and avoids injuring, killing or harassing migratory birds or destroying, taking or disturbing their eggs, or damaging, destroying, removing or disturbing their nests, taking into account Environment and Climate Change Canada's Guidelines to avoid harm to migratory birds.*

3.3.7.2 Environmental Effects

As described in Section 12.4.2.4 of the EIS, the complete loss of wildlife habitat in the Gordon site PDA (269.4 ha) was assumed. Overall, the revised Gordon site PDA (291.2 ha) has increased by 21.8 ha from EIS predictions and some Project components changed in size or have been added, such as a new 7.3 ha stockpile borrow source (Table 2.1). Development of these areas is not expected to affect sensitive wildlife features (e.g., raptor nests) because none were observed near the proposed footprint layout area. The revised Gordon site PDA will result in additional direct habitat loss and potential sensory disturbance to wildlife and wildlife habitat. However, the additional amount of native upland landcover directly affected is relatively small (1.8 ha more than predicted in the EIS) (Table 3.31). The revised PDA will also directly affect 10.8 more ha of wetlands than predicted in the EIS (Table 3.31), which will result in a slight reduction in habitat availability for amphibians as well as birds and mammals associated with wetlands.

Project effects on SAR are the same as described in Chapter 12.0 of the EIS. Bank swallow (*Riparia riparia*), a SAR listed as threatened under SARA, was not assessed because it was not known to regularly occupy the RAA and was unlikely to be affected because of a lack of suitable habitat. However, bank swallow breeding range overlaps the RAA (Garrison and Turner 2020), and breeding has been confirmed near Lynn Lake (Taylor 2018). The topsoil storage area and the excavated stockpile borrow source area (Map 2, Appendix A) could provide habitat for nesting bank swallows, which typically dig burrows in near-vertical sand and gravel pits and stockpiles of soil that are more than 2 m high and with slopes of at least 70 degrees (Environment and Climate Change Canada [ECCC] 2022). Topsoil deposition and borrow source excavation during the general mid-April to late August breeding season could result in nests being damaged, destroyed, disturbed, or removed, which is prohibited under the Migratory Bird Regulations, 2022 if they contain a live bird or viable egg; (ECCC 2023). Section 33 of SARA prohibits damaging or destroying the residence of a SAR, which for bank swallow is defined as the occupied burrow (Government of Canada 2019).

The borrow source area could also attract common nighthawk (*Chordeiles minor*), a SAR listed as special concern under SARA and threatened under ESEA, and other migratory bird species that nest on the ground in disturbed areas (e.g., killdeer [*Charadrius vociferus*]). Excavation during the general mid-April to late August breeding season could result in nests being damaged, destroyed, disturbed, or removed, which is prohibited under the Migratory Bird Regulations, 2022 if they contain a live bird or viable egg (Section 3.3.7.1; ECCC 2023).

After decommissioning, the topsoil deposition and borrow source areas could provide nesting habitat for bank swallow, common nighthawk, and other migratory bird species that nest in disturbed areas, depending on the state in which they are left.

3.3.7.3 Summary of Mitigation Measures

Proposed mitigation measures incorporated as part of this NOA/NOC include those standard practices and procedures identified in the EIS (Stantec 2020a) as well as other general mitigation measures that are typically applied during construction and operation.

Additional proposed mitigation measures include:

- Contouring aggregate piles in the topsoil deposition and borrow source areas to have a slope of less than 70 degrees before and throughout the breeding season to avoid attracting nesting bank swallows (ECCC 2022).
- Maintaining a minimum buffer zone of 50 m (ECCC 2022) around an active bank swallow colony to protect it from disturbance from the date when adults are first seen entering or exiting the burrow to the date when an individual is last seen at the burrow (Government of Canada 2019).
- Searching the topsoil deposition and borrow source areas if they become active after a period of inactivity during the general mid-April to late August breeding bird period and maintaining the recommended buffer zone of 300 m around an active nest prescribed for common nighthawk (MB CDC 2021) to protect it from high disturbance level activities.

3.3.7.4 Residual Effects

Alterations to the approved Gordon site are adverse for wildlife and wildlife habitat as an additional 21.8 ha of land will be affected than predicted in the EIS. Mitigation applied to the topsoil deposition and borrow source areas will reduce potential for areas to attract and support migratory birds including SAR. Project residual effects on wildlife and wildlife habitat at the Gordon site during construction and operation were characterized in the EIS as adverse, low magnitude, extending to the RAA, single event or continuous, short-term or medium-term, reversible, and disturbed ecological context. Project residual effects on mortality risk during construction and operation were characterized in the EIS as adverse, low, extending to the LAA, multiple irregular, short-term or medium term, reversible, and disturbed ecological context. Project residual effects on wildlife health during construction and operation were characterized in the EIS as adverse, negligible to low, extending to the LAA, continuous, long-term, reversible, and disturbed ecological context. Project effects on wildlife and wildlife habitat, mortality risk, and health during decommissioning were characterized in the EIS as adverse and/or positive, low or negligible to low, extending to the PDA or LAA, continuous or multiple irregular, long-term, reversible, and disturbed ecological context. The proposed alterations at the Gordon site will not change the characterization of Project residual effects on change in habitat and there is no change to EIS conclusions (Stantec 2020a).

3.3.8 Labour and Economy

Labour and economy is a VC because employment and business support the economic livelihoods of residents, and provide associated social benefits related to employment and income (Stantec 2020a). The proposed alterations that may interact with the labour and economy VC and were therefore assessed as part of this NOA/NOC, include but are not limited to changes to the footprints of Project components, and mine production (mined tonnage) capacity.

3.3.8.1 Regulatory and Guideline Setting

3.3.8.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on labour and economy includes the consideration of the following federal and provincial legislation:

- The Canadian Environmental Assessment Agency (CEA Agency; now IAAC) Final Guidelines for the Preparation of an EIS (CEA Agency 2017) issued for the Project, which require assessment of effects on the human environment, including socio-economic conditions (encompassing a broad range of matters that affect communities in the study area in a way that recognizes interrelationships, system functions and vulnerabilities).
- The MECC *Environment Act* Proposal Report Guidelines (MECC 2023), which require consideration of Project effects on humans and socio-economic implications resulting from environmental effects.

3.3.8.1.2 IAAC Decision Statement

There are no conditions with respect to labour and economy as per the IAAC Decision Statement for Alamos to consider.

3.3.8.2 Environmental Effects

As described in Sections 13.4.2, 13.4.3, and 13.4.4, of the federal EIS and Section 6.8.2.1 of the provincial EAP Report, the assessment of potential environmental effects of the Project considered changes in the local and regional labour force, regional business, and 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 construction, operation, and decommissioning/closure. Adverse effects primarily relate to decreased demand for labour as the Project transitions from operation into, through and after 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, with the potential to support capital investment and hiring, resulting in increased capacity and capabilities for local and regional businesses. 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., Gross Domestic Product [GDP]) in the LAA and RAA. The Project will also pay property taxes, or provide grants in lieu, to the Town of Lynn Lake and contribute to provincial and federal government revenues through taxation on labour, goods and services. The alterations, including change in mine production (mining tonnage) capacity, are not expected to affect labour and economy.

3.3.8.3 Summary of Mitigation Measures

Proposed mitigation measures incorporated as part of this NOA/NOC include those standard practices and procedures identified in the EIS (Stantec 2020a) as well as other general mitigation measures that are typically applied during construction and operation.

3.3.8.4 Residual Effects

Overall, the Project is expected to result in both positive and adverse effects. The residual effects on labour and economy were characterized in the EIS as low magnitude and moderate magnitude positive residual effects. Low magnitude positive residual effects are associated with increased direct, indirect, and induced employment and contributions to municipal government revenues (through taxation). Project expenditures within the LAA and RAA represent economic potential for local and regional businesses, not limited to supply and service contracts to the Project and goods and services provision to direct and indirect workers. Project expenditures on goods and services are likely to occur with a greater percentage in the RAA compared with LAA, due to the larger labour force of the RAA. Moderate magnitude positive residual effects are associated with anticipated Project contributions to GDP. Local and regional labour forces and businesses were characterized in the EIS as having positive residual effects and occurring within a non-resilient socio-economic context in the LAA and a resilient context in the RAA. Effects on the local and regional economy were characterized in the EIS as occurring within a resilient context (LAA and RAA). Effects occur continuously over the short-term during construction and medium-term during operation. Positive effects are reversible following the completion of each Project phase. There are no seasonal timing considerations to positive effects on labour and economy.

Adverse effects occur within the LAA and RAA. Adverse effects on local and regional business (i.e., increased competition for labour and contributions to wage inflation) were characterized in the EIS as occurring continuously over the short-term during construction and medium-term during operation. Adverse effects associated with losses in employment and contributions to GDP were characterized in the EIS as occurring continuously over the short-term during decommissioning/closure. Adverse effects on local and regional labour forces and businesses were characterized in the EIS as occurring within a non-resilient socio-economic context in the LAA and a resilient context in the RAA. Effects on the local and regional economy were characterized in the EIS as occurring within a resilient context (LAA and RAA). Construction and operational adverse effects on local and regional businesses (i.e., contributions to increased competition for labour and wage inflation) are reversible following the completion of each Project phase. Other adverse effects are irreversible (i.e., they only occur finitely within the context of the Project and end when the Project ends). There are no seasonal timing considerations to adverse effects on labour and economy.

The proposed alterations will not result in additional positive or adverse effects on labour and economy at the Gordon site from those described in Chapter 13.0 of the EIS and there is no change to EIS conclusions (Stantec 2020a).

3.3.9 Community Services, Infrastructure, and Wellbeing

Community services, infrastructure, and wellbeing is a VC because construction, operation, and decommissioning/closure of the Project could increase demand for community services and infrastructure and affect (beneficially or adversely) community wellbeing (Stantec 2020a). The proposed alterations that may interact with the community services, infrastructure, and wellbeing VC and were therefore assessed as part of this NOA/NOC, include but are not limited to changes to the PDA layout, general infrastructure, and mine production (mining tonnage) capacity.

3.3.9.1 Regulatory and Guideline Setting

3.3.9.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on community services, infrastructure, and wellbeing includes the consideration of the following federal and provincial legislation:

- The CEA Agency (now IAAC) Final Guidelines for the Preparation of an EIS (CEA Agency 2017) issued for the Project, which require assessment of effects on the human environment, including socio-economic conditions (encompassing a broad range of matters that affect communities in the study area in a way that recognizes interrelationships, system functions and vulnerabilities).
- MECC 2023 *Environment Act* Proposal Report Guidelines, which require consideration of Project effects on humans and socio-economic implications resulting from environmental effects.
- Manitoba Health Seniors and Active Living's (MHSAL, formerly Manitoba Health and Healthy Living) 'Community Health Assessment Guidelines' (MHHL 2009a, 2009b), which provide a framework from which provincial health authorities develop region-specific Community Health Assessments

3.3.9.1.2 IAAC Decision Statement

There are no conditions with respect to community services, infrastructure, and wellbeing as per the IAAC Decision Statement for Alamos to consider.

3.3.9.2 Environmental Effects

As described in Sections 14.4.2, 14.4.3, 14.4.4, and 14.4.5 of the federal EIS and Section 6.9.2 of the provincial EAP Report, the assessment of potential environmental effects of the Project considered changes in housing and temporary accommodations, local and community services, infrastructure, and wellbeing. Potential changes to community services and infrastructure will result from an in-migration of Project workers to the LAA because of the Project, therefore increasing demand on existing services and infrastructure, including but not limited to 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.

During construction and operation, a temporary increase in population in the LAA is expected because of the Project, which has potential to place additional demands on local availability of housing and accommodations. However, implementation of a Project accommodation strategy, with workers primarily accommodated at a work camp at the Gordon site, will satisfy requirements for worker accommodation resulting in a negligible effect on housing and temporary accommodation. Most of the physical Project activities will not affect community services and infrastructure, except for wastes and emissions, movement of trucks, equipment, supplies, and personnel within the LAA. Camp utilities will be independent from the Town, with power being supplied by Manitoba Hydro, on-site wastewater treatment, and potable water treated on-site from the Keewatin River. However, Town infrastructure and utilities may experience increased strain from visiting on-site workers (e.g., to purchase supplies before returning home). An increased 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 these phases. 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 effects on community services and infrastructure as on-site workers move away due to diminishing employment. Traffic in the Town and along Provincial Road (PR) 391 between Thompson and Lynn Lake, utility use from on-site workers visiting the Town, and demand on local medical services and policing is expected to reduce. 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. The alterations, including change in mine production (mining tonnage) capacity, are not expected to affect community services, infrastructure, and well-being.

3.3.9.3 Summary of Mitigation Measures

Proposed mitigation measures incorporated as part of this NOA/NOC include those standard practices and procedures identified in the EIS (Stantec 2020a) as well as other general mitigation measures that are typically applied during construction and operation.

3.3.9.4 Residual Effects

With the implementation of Project mitigation and management measures, residual effects on community services and infrastructure were characterized in the EIS as being negligible to low magnitude, occurring in the LAA, continuous for the medium-term, and reversible. They will generally occur in a socio-economic context that was characterized in the EIS as resilient, except for housing and temporary accommodations, which has a socio-economic context that is not resilient. Residual effects on local services and infrastructure were characterized in the EIS as low due to the independent nature of works related to power, camp water, and wastewater systems. The Project will not place additional demands on that local infrastructure within the Town of Lynn Lake.

With the implementation of Project mitigation and management measures, positive effects on community wellbeing were characterized in the EIS as being low in magnitude during construction and operation, occurring within the LAA on a continual basis over the medium-term and reversible following the completion of decommissioning/closure. Positive residual effects of Project-related employment and income are likely to be inequitably distributed across the LAA population with vulnerable population less likely to realize benefits. Positive residual effects were characterized in the EIS as occurring within a non-resilient socio-economic context. Adverse residual effects were characterized in the EIS as being moderate in magnitude during construction and operation, occurring within the LAA on a continual basis over the long-term, and reversible following the completion of decommissioning/closure. Residual effects were characterized in the EIS as occurring within a non-resilient socio-economic context. Residual effects on community wellbeing were characterized in the EIS as negligible in magnitude during Project decommissioning/closure.

The proposed alterations will not result in additional positive or adverse effects on community services, infrastructure, and wellbeing at the Gordon from those described in Chapter 14.0 of the EIS, and there is no change to EIS conclusions.

3.3.10 Land and Resource Use

Land and resource use includes activities and associated infrastructure related to the use of land and resources, including waterways for recreational, commercial, and navigational purposes within and adjacent to the PDA (Stantec 2020a). The proposed alterations that may interact with land and resource use and were therefore assessed as part of this NOA/NOC, include but are not limited to the changes in the PDA layout outlined in Table 2.1.

3.3.10.1 Regulatory and Guideline Setting

3.3.10.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on land and resource use includes the consideration of the following federal legislation:

- *The Explosives Act* requires that anyone working with explosives have a licence, certificate or permit issued by the federal Minister of Natural Resources.

The assessment of potential Project-related environmental effects on land and resource use includes the consideration of the following provincial legislation:

- *The Crown Lands Act* requires works permits for work conducted on provincial Crown lands. A lease or permit may also be required for the use or occupation of Crown lands. An easement or right-of-way would also be required for any works upon, over, under, or in respect of Crown lands.
- *The Forest Act* requires a permit for the cutting or removing of timber from Crown land in support of the Project.

- *The Water Rights Act* requires a licence for use of surface water or groundwater for industrial or other purposes.
- *The Wildfires Act* requires a Burn Permit for open burning activities in a Burning Permit Area during the wildfire season (April 1 to November 15).

3.3.10.1.2 IAAC Decision Statement

There are no conditions with respect to land and resource use as per the IAAC Decision Statement for Alamos to consider.

3.3.10.2 Environmental Effects

As described in Sections 15.4.2.1, 15.4.3.1 and 15.4.4.1 of the federal EIS and Section 6.10.2.3 of the provincial EAP Report, clearing and construction activities within the Gordon PDA will result in the loss or alteration of area and the restriction of access to provincial Crown lands. As indicated in 2.2, the proposed changes to the revised Gordon site PDA (291.2 ha) will be small, 21.8 ha (less than 10%) greater than anticipated in the EIS. Some Project component footprints have changed in size or have been added, such as the new 7.3 ha stockpile borrow source and an increase in the footprint of the collection pond discharge pipeline (2.3 ha), topsoil storage area (4.1 ha), and the overburden storage area (17.8 ha).

The operation of the stockpile borrow source and collection pond discharge pipeline will result in additional ground disturbance and have the potential to degrade land use within the PDA. The presence of the stockpile borrow source may result in visual disturbance effects (e.g., recreational user's quality of experience due to operation activities at the site) and restricted access to recreational use areas. During operation, noise emitted from Project activities at the stockpile borrow source and mobile vehicle and equipment use will result in a change in noise levels due to use of internal access roads (e.g., haul trucks).

Land clearing for the stockpile borrow area will remove a small portion of timber from the commercial forest area in Forest Management Unit 72 for the life of the Project. The removal of productive forest land from the commercial forest area could affect the determination of allowable annual cut levels. The loss of productive forest land resulting from the Project will contribute to the reduction in allowable annual cut. Sensory disturbance (e.g., noise, visual) from access to the area can affect the presence of wildlife. This could result in the reduction of harvesting success due to disruption of animals and furbearers, which could lead to greater pressure on game resources. Worker presence could increase the competition for species harvested by local hunters and trappers. The stockpile borrow source and collection pond discharge pipeline at the Gordon site could be visible to resource users operating in the area.

3.3.10.3 Summary of Mitigation Measures

Proposed mitigation measures incorporated as part of this NOA/NOC include those standard practices and procedures identified in the EIS (Stantec 2020a) as well as other general mitigation measures that are typically applied during construction and operation.

3.3.10.4 Residual Effects

Given the small area of provincial Crown land affected by the PDA, Project disturbance was predicted in the EIS to be of low magnitude. There is at least one remote cabin within the Gordon site LAA (occupancy unknown). During construction, low frequency noise and vibration effects are not expected at sensitive receptors because predicted levels are below applicable targets (Section 3.3.2). Overall, the residual effects for the Gordon site are anticipated to remain low (low to moderate for noise).

During construction, residual effects on recreation will primarily occur in the altered PDA where access to the location of the stockpile borrow source will be restricted, potentially resulting in a shift of recreational users to other areas of the LAA. The land within the altered PDA is not considered “prime” recreational land, given the former mine site in proximity, and there are alternative lands within the LAA available for recreational use. Residual effects described for the construction phase will continue throughout operation consisting of ongoing noise, and restriction in use of access roads at and to the site. The addition and presence of the stockpile borrow source and change to the collection pond discharge pipeline, topsoil storage area, and overburden storage area may result in some visual disturbance to recreational users. However, the stockpile borrow source would barely be visible or marginally so to recreational users.

The Project alteration 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 because of altered Project activities. The stockpile borrow source may be barely or marginally visible from certain vantage points.

With the implementation of mitigation measures, the residual effects on land and resource use for the approved Gordon site were characterized in the EIS to be adverse, low to moderate in magnitude, limited to the Gordon site PDA/LAA, short- to long-term in duration, single, irregular to continuous in frequency, and reversible upon Project decommissioning/closure. Overall, the proposed alterations will not result in additional adverse effects on land and resource use at the Gordon from those described in Chapter 15.0 of the EIS, and there is no change to EIS conclusions (Stantec 2020a).

3.3.11 Heritage Resources

Heritage resources, including archaeological sites and objects, are a VC based on legislated requirements; scientific relevance and interest; Indigenous and public concern; and because archaeological sites and objects provide people from the past the opportunity to be heard in the present (Stantec 2020a). The proposed alterations may interact with the heritage resources VC and were therefore assessed as part of this NOA/NOC, are limited to the changes in the PDA layout outlined in Table 2.1.

3.3.11.1 Regulatory and Guideline Setting

3.3.11.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on land and resource use includes the consideration of the following provincial legislation:

- Under Section 12(2) of *The Heritage Resources Act*, if the Minister of Sport, Culture and Heritage has reason to believe that heritage resources or human remains are known, or thought likely to be present, on lands that are to be developed, then the owner/developer is required to conduct at his/her own expense, a heritage resource impact assessment (HRIA) and mitigation, if necessary, prior to the project's start.

3.3.11.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to heritage resources:

> *7.1 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, and implement, during all phases of the Designated Project, an archaeological and heritage resource management plan for any structures, sites or things of historical, archaeological, paleontological or architectural significance discovered within the Project development areas. As part of the archaeological and heritage resource management plan, the Proponent shall:*
>
> > *7.1.1 immediately halt work at the location of the discovery, except for actions required to be undertaken to protect the integrity of the discovery;*
> >
> > *7.1.2 delineate an area of at least 50 metres around the discovery as a no-work zone;*
> >
> > *7.1.3 inform the Agency and Indigenous groups in writing within 24 hours of the discovery, and allow Indigenous groups to monitor and participate in archaeological works;*

7.1.4 have a qualified individual, whose expertise pertains to the requirements of Manitoba's Heritage Resources Act, conduct an assessment at the location of the discovery, including sampling and construction monitoring on landforms of similar historic potential to the discovery site(s) within the Project development areas that are planned for development, prior to development in these areas; and

7.1.5 consult with Indigenous groups and relevant authorities on the manner by which to comply with all applicable legislative or legal requirements and protocols respecting the discovery, recording, transferring and safekeeping of previously unidentified structures, sites or things of historical, archaeological, paleontological or architectural significance.

3.3.11.2 Environmental Effects

In 2015-2016, Stantec competed a HRIA of the Gordon site on behalf of Alamos for the Project under Heritage Permit A37-15. The results of this HRIA were used to inform the assessment of effects on the heritage resources VC as described in Chapter 16.0 of the EIS.

The HRIA included a review of previous archaeological studies, provincial and federal databases, satellite imagery, and peer-reviewed literature. Gaps and limitations with respect to general heritage resources and EA requirements were identified and recommendations were made to both satisfy these requirements and obtain a strong understanding of heritage resources in the Project area. Stantec's 2015 field program focused on relocating previously recorded archaeological sites and completing survey transects within each of the Project components and along the recently cleared access roads.

A permit report was submitted to Historic Resources Branch, Manitoba Culture, Sport and Heritage (HRB) in May 2016 (Stantec Consulting Ltd., 2016). The 2015 field program surveyed all components of the Project that were determined to have a medium to high heritage resource potential. The HRB approved the permit report in 2017 and provided clearance for the Project to proceed as planned.

3.3.11.3 Summary of Mitigation Measures

No further assessment of the Project was recommended. No mitigation measures were required. A Heritage and Cultural Resource Protection Plan (HCRPP) has been developed according to Condition 7.1 by Alamos and will be applied during construction, operation, and decommissioning. The revised PDA was communicated to the HRB with the sharing of the HCRPP (Version 0, January 2025). The HCRPP was approved by HRB.

3.3.11.4 Residual Effects

There are no residual effects on heritage resources. Review of the NOA/NOC plans indicate that no areas of heritage potential have been added to the Project footprint. The proposed alterations will not result in adverse effects on heritage resources at the Gordon site and there is no change to EIS conclusions (Stantec 2020a).

3.3.12 Current Use of Lands and Resources for Traditional Purposes by Indigenous Peoples

Current use of lands and resources for traditional purposes by Indigenous peoples (current use) is a VC because of the potential for the Project to affect traditional activities, sites and resources identified by Indigenous Nations (Stantec 2020a). The proposed alterations that may interact with current use and were therefore assessed as part of this NOA/NOC, include but are not limited to the changes in the PDA layout outlined in Table 2.1.

3.3.12.1 Regulatory and Guideline Setting

3.3.12.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on current use includes the consideration of the following federal and provincial legislation:

Canadian Environmental Assessment Act (CEAA 2012). The EIS (Stantec 2020a) was prepared under the, CEAA 2012 which required consideration of:

> "*an effect occurring in Canada of any change that may be caused to the environment on the current use of lands and resources for traditional purposes*" (section 5(1)(c)(iii)).

Technical guidance for assessing effects on current use of lands and resources for traditional purposes (current use in this document) where the CEA Agency (now IAAC) is the responsible authority was provided in *Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under CEAA 2012* (CEA Agency 2015).

The Final EIS Guidelines (Appendix 4A of the EIS) also identified requirements for engagement with twelve Indigenous Nations (Chapter 17.0, Section 17.1.3), integrating TK in the assessment of environmental effects, provision of information regarding existing conditions to support the analysis of predicted effects on current use, and documenting specific suggestions raised by Indigenous Nations for mitigating effects of changes to the environment. These are:

- IAAC 'Most Affected' Indigenous Nations:
    - Treaty 5 First Nations
        - Barren Lands First Nation
        - Nisichawayasihk Cree Nation
        - O-Pipon-Na-Piwin Cree Nation
    - Treaty 6 First Nations
        - Marcel Colomb First Nation
        - Mathias Colomb Cree Nation
        - Peter Ballantyne Cree Nation

    - Manitoba Métis Federation
- IAAC Indigenous Nations 'Affected to a Lesser Degree':
    - Treaty 5 First Nations
        - Northlands Denesuline First Nation
        - Sayisi Dene First Nation
    - Treaty 10 First Nation
        - Hatchet Lake First Nation
    - Métis Nation – Saskatchewan
        - Northern Region 1
        - Eastern Region 1
    - Chemawawin Cree Nation was added in May 2020.

MSD (now MECC) provides guidance in Information Bulletin – Environment Act Proposal Guidelines (MSD 2017). In the Description of Environmental and Human Health Effects of the Proposed Development, the guidelines require a description of potential effects of the development on Indigenous Nations, including, but not necessarily limited to:

- Direct effects on Indigenous Nations in the Project area.
- Resource use, such as hunting, fishing, trapping, and gathering.
- Cultural or traditional activities in the Project area.

3.3.12.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to current use:

> *5.1 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, measures to mitigate adverse impacts from the Designated Project on access to lands and resources used for traditional purposes, including the implementation of safe access point(s) and/or routes within the local assessment areas. The Proponent shall submit these measures to the Agency prior to construction.*
>
> *5.2 The Proponent shall avoid disturbing sites of traditional or cultural importance within or near the Project development areas, except for the construction of Designated Project components. In doing so, the Proponent shall:*
>
> > *5.2.1 identify, in consultation with Indigenous groups, the location of sites of traditional or cultural importance within or near the Project development areas.*
> >
> > *5.2.2 provide opportunities to Indigenous groups, prior to construction and at times determined in consultation with each Indigenous group, to:*

5.2.2.1 harvest and transplant, during seasons where plants can be identified and harvested, plant species used for traditional purposes from areas that will be cleared of vegetation; an

5.2.2.2 conduct ceremonies for any sites of traditional or cultural importance that will be disturbed by any Designated Project activities.

5.3 The Proponent shall prohibit, during all phases of the Designated Project, Designated Project employees and contractors from fishing and hunting within the Project development areas or using the Project development areas to access surrounding areas with the intent to fish or hunt, unless an employee or contractor is provided access by the Proponent for exercising Aboriginal rights.

5.4 The Proponent shall develop, prior to construction, and implement, during all phases of the Designated Project, a protocol for inspecting and cleaning vehicles, machinery and equipment associated with the Designated Project that have come from other worksites in order to limit the introduction and spread of weed species within the Project development areas.

5.5 The Proponent shall identify days of traditional or cultural importance in consultation with Indigenous groups and modify the blasting schedule for the Designated Project to minimize or avoid disturbance to current use of lands and resources by Indigenous groups, unless not technically or economically feasible.

5.6 The Proponent shall, when implementing measures to limit the introduction and spread of weed species within the Project development areas, use measures other than broadcast spraying when applying herbicides to mitigate effects to plant species used for traditional purposes by Indigenous groups, unless the Proponent determines that these measures are ineffective at controlling the introduction and spread of weed species.

5.7 The Proponent shall undertake, in consultation with Indigenous groups and relevant authorities, progressive reclamation of areas disturbed by the Designated Project. In doing so, the Proponent shall:

5.7.1 identify, in consultation with Indigenous groups, plant species native to the local assessment areas and plant species used for traditional purposes, to use for revegetation.

5.7.2 establish performance standards for reclaimed areas, including that the areas be self-sustaining, reduce establishment of weed species, restore native species assemblages, and reduce erosion of exposed soils; and

5.7.3 monitor reclaimed areas for a minimum of five years during post-closure or until performance standards established pursuant to condition 5.7.2 are met.

3.3.12.2 Environmental Effects

As described in Sections 15.4.2.1, 15.4.3.1 and 15.4.4.1 of the federal EIS and Section 6.10.2.3 of the provincial EAP Report, clearing and construction activities within the Gordon PDA will result in the loss or alteration of area and the restriction of access to provincial Crown lands. As indicated in Table 2.2, the proposed changes to the revised Gordon site PDA (291.23 ha) will be small, 21.84 ha greater than anticipated in the EIS. Chapter 17.0, Section 17.1.4 of the EIS identifies the potential environmental effects on current use measured by:

Change to availability of resources (physical presence, abundance, and distribution of lands and resources) through:

- 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; and

Change to ability to access lands and resources or alteration of lands and resources for current use activities through:

- Loss, alteration, or restriction of access (including trails and travelways) to current lands and resources

Change to the integrity of cultural and spiritual sites and areas that detract from use of the area or lead to avoidance of the area due to real and perceived disturbance of the environment through:

- 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

Effects on current use may incorporate both tangible values (e.g., biophysical or socio-economic resources and sites) and intangible values (e.g., spiritual, cultural, artistic, aesthetic, and educational elements).

Two elements of Section 6.3.4 of the Final EIS Guidelines (Appendix 4A of the EIS) required information about intangible values:

- Cultural value or importance associated with physical and cultural heritage.
- Cultural value or importance associated with traditional uses or areas.

Change to the environment that affects cultural value or importance associated with current use through:

- 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 operation has the potential to affect cultural transmission through the experience of traditional practices.

Intangible values relate to beliefs, perceptions, values, and qualitative experience. Given the subjective and conditional nature of intangible values, these potential effects were considered only when an Indigenous Nation identified a related concern. Potential effects on experiential values often include changes to cultural transmission, language retention, governance systems, patterns of cultural behaviour, and the sensorial experience of traditional practices. Intangible effects can only be meaningfully evaluated by individuals and communities experiencing these values in their cultural context; however, such effects are difficult to mitigate or quantitatively assess by an external party. These effects are not amenable to conventional residual effects characterizations that were developed for the assessment of objective, measurable phenomena from a Western scientific perspective. In addition, intangible effects might not realistically be mitigated in the context of an EA. Therefore, potential effects on intangible values were not subject to a full effects assessment (e.g., that includes residual effects characterization). Rather, when an Indigenous Nation identified a related concern, the subjective and experiential components of current use that could not be measured were considered narratively. Both tangible and identified intangible values contributed to the conclusion for the current use assessment.

The potential interactions between Project activities and the environment were considered for the construction, operation, and decommissioning/closure phases of the Project. The identification of Project activities and their potential interactions were based on engagement with interested parties, the professional judgment of technical specialists involved in the assessment, and a review of existing conditions. The selection of interactions is also informed by the potential effects and effects pathways for each VC as described in Section 17.1.3.

3.3.12.3 Summary of Mitigation Measures

Mitigation measures that are relevant to availability of traditionally harvested resources are identical to the mitigation measures recommended in the EIS (Stantec 2020a) and described in the Country Foods Plan (Version 0, January 2025). No additional mitigation measures are required in relation to this NOA/NOC. Alamos is committed to the follow-up and monitoring, and adaptive management (if and as required) that is described in the Country Foods Plan.

3.3.12.4 Residual Effects

Project residual environmental effects on current use are assessed in Chapter 17.0 (Section 17.4) of the EIS. In summary, with the application of mitigation, Project residual effects on current use will be adverse through construction, operation, and decommissioning/closure. Because the PDA is within the disturbed context of existing mine sites and the current use LAA includes an existing road, magnitude is anticipated to be low with indirect effects, especially sensory disturbance, extending into the current use LAA. The effects will be long term, extending beyond the Project life until the PDA returns to its pre-Project state, except for the open pits and mine rock, which will be permanent features. While the timing of construction, operation, and decommissioning/closure may affect current use dependent on seasonal resources and access, effects on land-based cultural sites and areas are not conditioned by season. Effects on current use will be reversible with decommissioning/closure, except for the open pits and mine rock, which will be permanent features.

The IAAC's IR IAAC-R2-57 for the Project directed Alamos to describe baseline conditions for each Indigenous Nation participating in the Project. Citing the *Guidelines for the Preparation of an Environmental Impact Statement Pursuant to the Canadian Environmental Assessment Act, 2012* (CEAA 2012; Federal EIS Guidelines), IAAC required baseline information for each Indigenous Nation to inform the assessment of potential Project effects to Indigenous peoples. In response to IAAC-R2-57, Alamos provided a review and summary of the record of engagement with Indigenous Nations in one document. The intention of the review and summary was to report on engagement with each Indigenous Nation, describe baseline conditions, and demonstrate how Alamos has responded to the concerns and issues raised by each Indigenous Nation. Section 10 of the response presented Indigenous Nation-specific sections that consolidated available baseline information for each Indigenous Nation engaged on the Project with respect to the current use of lands and resources for traditional purposes, Indigenous health and socioeconomic conditions, Indigenous or Treaty Rights, including intangible aspects of rights such as governance rights, and physical and cultural heritage. The intention for each Indigenous Nation-specific section was to provide a stand-alone summary of information obtained by Alamos for each Indigenous Nation and review of how it has been considered in the assessment of potential effects of the Project. The response to IAAC-R2-57 supported the original conclusions of the EIS.

The proposed alteration of 21.84 ha of the PDA described in this report is small and will not materially change the amount of habitat lost, direct or indirect effects on traditional resources or result in measurable changes to access or effects on cultural or spiritual sites and areas within the current use LAA as addressed above at the Gordon site and there is no change to EIS conclusions (Stantec 2020a).

3.3.13 Human Health

The assessment of potential changes in human health encompasses consideration of potential exposures for Indigenous and non-Indigenous people including sensitive members of the population (e.g., toddlers, women of child-bearing age). The proposed alterations that may interact with the human health VC and were therefore assessed as part of this NOA/NOC, include but are not limited to changes to the PDA layout, major infrastructure, and mine production capacity that could affect releases to the atmospheric environment and surface water.

3.3.13.1 Regulatory and Guideline Setting

3.3.13.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on human health includes the consideration of Health Canada guidance for evaluating human health effects in impact assessment, namely:

- Guidance for Evaluating Human Health Effects in Impact Assessment: Human Health Risk Assessment (Health Canada 2023b)
- Guidance for Evaluating Human Health Effects in Impact Assessment: Air Quality (Health Canada 2023c)
- Guidance for Evaluation Human Health Effects in Impact Assessment: Drinking and Recreational Water Quality (Health Canada 2023d)
- Guidance for Evaluating Human Health Effects in Impact Assessment: Country Foods (Health Canada 2023e)

3.3.13.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to human health:

> *6.1 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, measures to mitigate emissions of dust and fugitive particulates within the Project development areas, taking into account the standards and criteria set out in the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards and Manitoba's Ambient Air Quality Criteria. The Proponent shall implement these measures from construction through decommissioning. In doing so, the Proponent shall:*
>
> > *6.1.1 apply dust suppressants, including water, that do not contain chemicals and have the least potential for adverse environmental effects, on haul and access roads during periods when dust generation is expected or occurring, including periods of drought and high winds;*

6.1.2 locate all stationary machinery and equipment used for processing ore indoors, where technically and economically feasible, including the crushing plant and conveyors feeding into the ore milling and processing plant;

6.1.3 ensure all equipment and vehicles used, including equipment and vehicles operated by third-party contractors, are serviced and maintained in accordance with the manufacturer's maintenance guidelines to meet or exceed applicable emission standards, including Tier 4 emission standards for off-road equipment with off-road diesel engines, pursuant to the Off-Road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission Regulations and Off-Road Compression-Ignition Engine Emission Regulations;

6.1.4 develop and implement policies to reduce the fuel consumption of equipment and vehicles operating in the Project development areas, including no idling and limited cold start policies; and

6.1.5 establish speed limits on the roads located in the Project development areas, taking into account the recommended speed limits in Environment and Climate Change Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities and by requiring and ensuring that speed limits are respected, including by installing signs indicating speed limits.

6.2 The Proponent shall implement measures, during all phases of the Designated Project, to avoid exceedances of the thresholds for noise and vibration, identified in Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise at sensitive receptors identified in the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement. In doing so, the Proponent shall:

6.2.1 develop, prior to construction, a protocol for receiving and addressing feedback related to the exposure to noise and vibration generated by the Designated Project. The Proponent shall provide the protocol to the Agency and Indigenous groups prior to construction and make the protocol publicly available online. As part of the protocol, the Proponent shall:

6.2.1.1 identify how a person may provide feedback, how the Proponent will handle the feedback received, including ranking and responding to feedback received according to the anticipated level of impacts, and how the Proponent may implement modified or additional mitigation measures(s) and/or follow-up requirement(s) in response to the feedback received;

6.2.1.2 record any feedback received as soon as feasible, no later than 48 hours after receiving the feedback; and

6.2.1.3 implement, as soon as technically feasible, any modified or additional mitigation measure and/or follow-up requirement that the Proponent deems necessary to respond to the feedback received.

6.3 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Health Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects from the Designated Project on air quality and country foods as it relates to the health of Indigenous peoples, taking into account available Indigenous knowledge provided by Indigenous groups related to current use of lands and resources for traditional purposes. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the implementation of the follow-up program, the Proponent shall:

6.3.1 identify, in consultation with Indigenous groups, the species of fish, vegetation and wildlife consumed as country foods that may be adversely affected by the Designated Project and the locations where these species shall be monitored;

6.3.2 monitor, beginning prior to construction and continuing through post-closure, contaminants of potential concern, including arsenic, copper, mercury, methylmercury and selenium, in the species and at the locations identified pursuant to condition 6.3.1;

6.3.3 monitor, throughout construction and operation, ambient air concentrations of total suspended particulates, PM_{10} and $PM_{2.5}$ at locations identified in consultation with Indigenous groups, and upwind and downwind from the Project development areas, taking into account 24-hour and 1-hour thresholds in the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards;

6.3.4 monitor, during all phases of the Designated Project, dust fall at locations identified in consultation with Indigenous groups, and upwind and downwind from the Project development areas;

6.3.5 monitor ambient air concentrations of nitrogen dioxide (NO_2) at locations identified in consultation with Indigenous groups and relevant authorities, for at least two consecutive months during year 2 of operation, and continue to monitor during all phases of the Designated Project if the monitoring results exceed predicted levels in the atmospheric dispersion model in Volume 1 Chapter 6 of the Environmental Impact Statement;

6.3.6 monitor meteorological conditions (including wind speed, wind direction, temperature and relative humidity) upwind and downwind of the Project development areas, during construction and operation; and

6.3.7 if the monitoring results referred to in conditions 6.3.2 to 6.3.5 exceed predicted levels in the atmospheric dispersion model in Volume 1 Chapter 6 of the Environmental Impact Statement, taking into account the results of monitoring meteorological conditions pursuant to condition 6.3.6, the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement, or thresholds of the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards, modify or implement additional mitigation measures pursuant to condition 2.8, and update the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement. The Proponent shall submit any updates to the human health and ecological risk assessment to the Agency and relevant authorities.

6.5 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures as it pertains to noise and vibration from the Designated Project on the health of Indigenous peoples. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

6.5.1 monitor noise and vibration levels at receptors identified in Volume 1 Chapter 7 Tables 7-7 to 7-10 of the Environmental Impact Statement, and at any other human receptors identified in consultation with Indigenous groups.

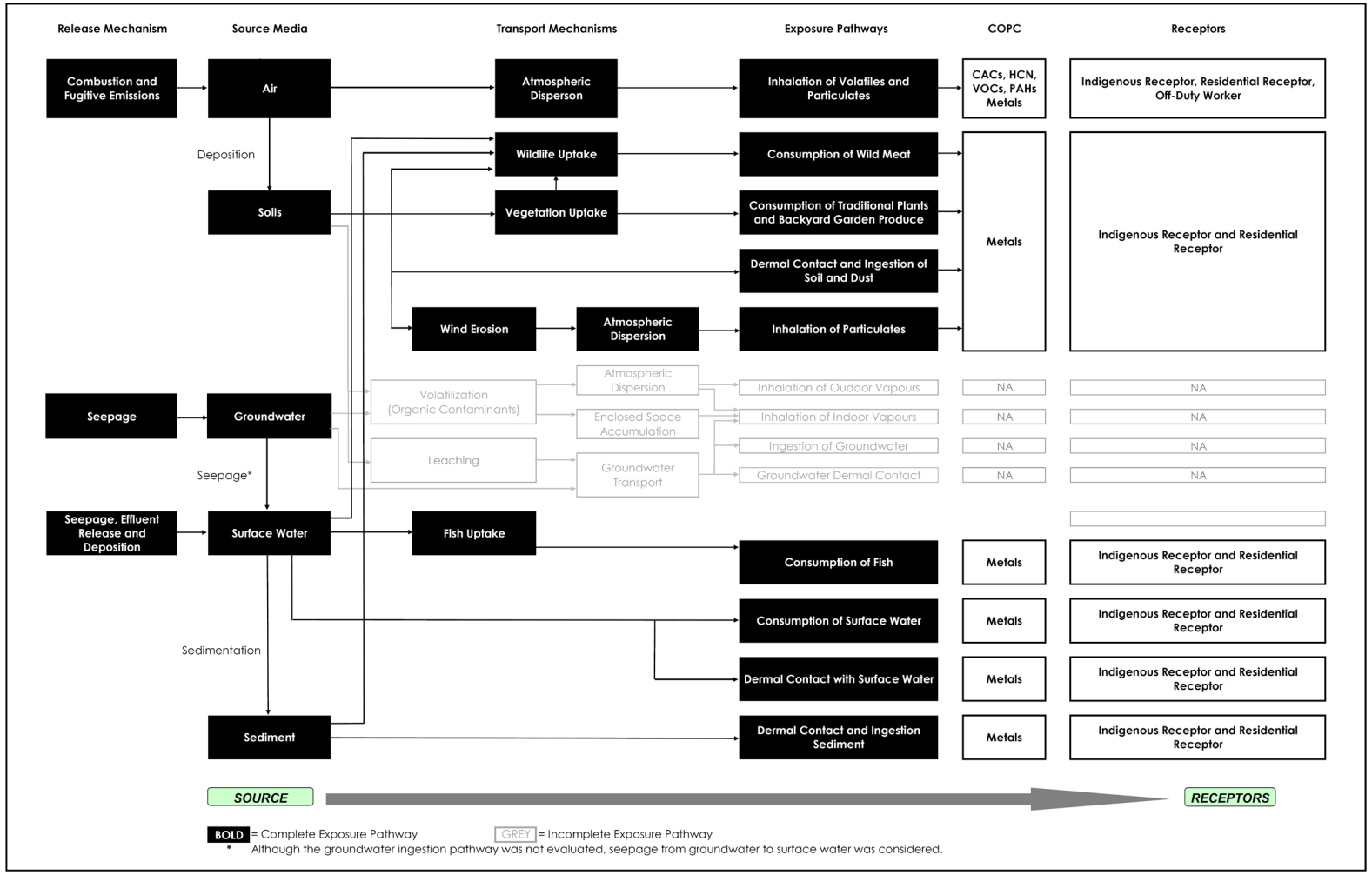
3.3.13.2 Environmental Effects

The construction, operation, and decommissioning/closure of the Project may affect the concentrations of chemicals in the air, soil, water, and biota near the Project. The EIS (Stantec 2020a) included a human health risk assessment (HHRA) to evaluate the potential effects to human health from modelled changes in environmental quality due to Project activities (EIS HHRA). The key components of the conceptual site model (CSM) for human health remain unchanged and are depicted in Figure 3.2.

Individuals most likely to be affected by changes in environmental quality include Indigenous people residing in or frequently visiting the area for food harvesting and non-Indigenous residents who may also engage in food harvesting. Chemicals of potential concern (COPCs) related to Project activities include criteria air contaminants (NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$), diesel particulate matter (DPM), HCN, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and metals.

To assess the potential Project-related effects on human health due to the proposed alterations, the revised air and water model results were examined to understand how these new estimates of possible environmental quality changes might influence the original human health risk conclusions.

Figure 3.2 Conceptual Site Model for the Human Health Risk Assessment



3.3.13.2.1 Changes to Air Quality

The updated assessment of Project-related effects on air quality is presented in Section 3.3.1. The update focuses on potential changes in the Project's air quality effects resulting from the 2023 design updates during the operation phase. Changes in the Project design that might affect air quality include updates to the PDA, Project layouts, mining production quantities, major mine equipment, and operation blast parameters. The air quality model for the operation phase was revised using the same approach as the EIS (Stantec 2020a) and was used to estimate concentrations of key COPCs in air at 45 locations in the Gordon region. These receptor locations were identified as part of the EIS HHRA, and represent places where receptors are likely to be present and could be exposed to emissions from the Project. The selection of receptor locations was based on considerations of land use and on input from local communities. Locations included residential developments, hunting and/or fishing camps, and potential Indigenous use locations.

The air quality effects were assessed for key COPCs (NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, and HCN) and dustfall. The maximum modelled concentrations of these key COPCs and dustfall for the Gordon site are detailed in the Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design memo (Appendix C) and summarized in Section 3.3.1. The other COPCs (VOCs, PAHs, metals) were not remodelled because the concentrations reported in the EIS HHRA were low (generally less than 1 µg/m³ for annual average concentrations) and were typically orders of magnitude less than the health-based exposure limits. Based on these findings, it is reasonable to conclude that these other COPCs represent a negligible risk to human health via inhalation.

The COPCs NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ are air pollutants. Some of these COPCs are non-threshold contaminants, for which it is acknowledged that any increase in exposure may result in adverse health effects. However, the severity of effects increases incrementally with exposure concentration and exposure duration. The absence of clearly defined toxicological reference values (TRVs) for these air pollutants presents a technical challenge for health regulatory agencies and health risk practitioners on how to assess the incremental increase in health risk resulting from modelled or measured exposure concentrations. The EIS HHRA used comparisons to CAAQS to assess potential human health risks. Following updated guidance from Health Canada (2023b), inhalation exposure limits have been established based on data reviews that examine health effects from different levels of these parameters in ambient air, as summarized by Health Canada (2023b) and WHO (2021).

Based on this updated guidance, WHO ambient air quality guidelines (WHO 2021) have been adopted for this assessment as exposure limits for most of these parameters (Table 3.34). According to WHO (2021), these guidelines represent the lowest level of exposure for which there is evidence of adverse health effects. It is assumed that adverse health effects either do not occur or are minimal below this concentration level (WHO 2021).

For SO_2, Health Canada (2016b) concluded that there is inadequate evidence to infer a causal relationship between long-term SO_2 exposure and cardiovascular effects, reproductive and development effects, total mortality, or cancer. As such, evaluation of the effects of chronic exposure to SO_2 was not conducted as part the EIS (Stantec 2020a) or this assessment.

Table 3.34 Modelled Maximum Ground-level Concentrations from Gordon Site Operation

COPC	Averaging Period	Maximum Concentration – Indigenous Receptor and Residential Receptor Locations (µg/m³)	Exposure Limit or TRV (µg/m³)	Reference
NO_2	1-hour [a]	**287**	200	(WHO 2021)
NO_2	24-hour [b]	20	25	(WHO 2021)
NO_2	Annual [c]	3.4	10	(WHO 2021)
CO	1-hour [a]	8,643	35,000	(WHO 2021)
CO	8-hour [d]	1,669	10,000	(WHO 2021)
SO_2	24-hour [b]	8	40	(WHO 2021)
PM_{10}	24-hour [b]	**60**	45	(WHO 2021)
PM_{10}	Annual [c]	10	15	(WHO 2021)
$PM_{2.5}$	24-hour [b]	13	15	(WHO 2021)
$PM_{2.5}$	Annual [c]	3.7	5	(WHO 2021)
HCN	1-hour [a]	0.5	340	(OEHHA 2008)
HCN	Annual [c]	0.01	2.5	(US EPA 2010 as modified by OMECP 2015, 2022)
DPM	2-hour [e]	3.6	10	(Health Canada 2016a)
DPM	Annual [c]	0.023	5	(Health Canada 2016a)

Notes:
µg/m³: micrograms per cubic metre; NO_2: nitrogen dioxide; CO: carbon monoxide; SO_2: sulphur dioxide; PM_{10}: particulate matter <10 microns; $PM_{2.5}$: particulate matter <2.5 microns; HCN: hydrogen cyanide; DPM: diesel particulate matter; TRV: toxicological reference value
Values in **BOLD** are higher than the exposure limit or TRV

a. The maximum 1-hour concentration after eliminating 8 highest meteorological hours in each year
b. The 99th percentile (4th highest) of 24-hour concentrations
c. The maximum arithmetic average concentrations over a single calendar year of all 1-hour average concentrations
d. The maximum 8-hour average concentrations after eliminating the 1st highest meteorological hour in each year
e. The maximum 2-hour average concentrations after eliminating the 1st highest meteorological hour in each year

The TRVs for HCN and DPM remain the same as the EIS HHRA (Table 3.34). The toxicologically relevant averaging periods for HCN are 1-hour (for short-term exposures) and average annual (for long-term exposures) while DPM are 2-hour (for short-term exposures) and average annual (for long-term exposures).

A summary of the maximum modelled concentrations for the human receptor locations (defined as the locations where Indigenous and non-Indigenous receptors are most likely to be exposed) is provided in Table 3.34.

In the EIS HHRA, the assessment of human health risks from non-carcinogenic chemicals was conducted using concentration ratios (CRs) for the inhalation pathway. The CRs were calculated by dividing the appropriate statistical interpretation of the chemical concentrations in air by the exposure limit and comparing that result with a CR of 1.0. As noted in the EIS HHRA, if the CR is less than or equal to the target benchmark (CR ≤ 1.0), human health risks related to the Project are considered to be negligible. Concentration ratios greater than one do not necessarily indicate that adverse health effects are expected to occur, or that the health risks are considered unacceptable, but it does require further evaluation of the implication of the estimated risks, including assumptions built into the toxicity and exposure assessments.

The maximum human health risks associated with inhalation exposures to the key COPCs for Indigenous Receptor and the Residential Receptor (i.e., the maximum CR values of the 45 special human receptor locations in the Gordon region) are provided in Table 3.35.

Table 3.35 Maximum Human Health Risks Associated with Inhalation Exposures from Gordon Site Operation

COPC	Averaging Period	Maximum Concentration Ratio (CR) – Indigenous Receptor and Residential Receptor
NO_2	1-hour	**1.4**
	24-hour	0.8
	Annual	0.3
CO	1-hour	0.2
	8-hour	0.2
SO_2	24-hour	0.2
PM_{10}	24-hour	**1.3**
	Annual	0.7
$PM_{2.5}$	24-hour	0.9
	Annual	0.7
HCN	1-hour	0.00
	Annual	0.0
DPM	2-hour	0.4
	Annual	0.005

Notes:
NO_2: nitrogen dioxide; CO: carbon monoxide; SO_2: sulphur dioxide; PM_{10}: particulate matter <10 microns; $PM_{2.5}$: particulate matter <2.5 microns; HCN: hydrogen cyanide; DPM: diesel particulate matter; CR: Concentration Ratio
Values in **BOLD** are higher than the benchmark of 1.0

Nitrogen Dioxide (NO_2)

As shown in Table 3.35, the CRs associated with annual average concentrations of NO_2 meet the benchmark of 1.0; however, the CRs associated with 1-hour concentrations are greater than the benchmark at one or more locations. Of the 45 special receptor locations, only one location (Trapping Area 2) has a concentration ratio greater than 1, as shown in Table 3.36. At this location, consideration is given to the magnitude, frequency and likelihood of exposure in the evaluation of potential human health risks.

Table 3.36 Receptor Locations where Concentration Ratios of NO_2 Are Greater than Benchmark (CR > 1.0)

	Concentration Ratio (CR)
NO_2 (1-hour)	
Trapping Area 2	1.4

Trapping Area 2 represents a location that people could reasonably be expected to be present; however, the frequency of exceedances is expected to be low since the maximum 98th percentile of NO_2 daily maximum 1-hour average concentrations at a human health location of 91.1 µg/m^3 (see Table 8, Appendix C) is well below the exposure level of 200 µg/m³.

As reported by the WHO (2006), in experiments, researchers found that breathing in NO_2 at 560 µg/m³ can directly affect the lungs of people with asthma. Other studies show that people with asthma become more sensitive to NO_2 at levels starting from 200 µg/m³ (WHO 2006). Based on these studies, if people with asthma are present at Trapping Area 2 when concentrations are greater than the exposure limit of 200 µg/m^3, they may experience respiratory effects. Although the maximum 1-hour concentration at this location is greater than the exposure limit, maximum modelled concentrations for 24-hour and annual average exposures meet the exposure limits. The WHO notes that when the air quality meets the long-term exposure limits, the health burden related to a few incidents above the short-term exposure limit corresponds to a very small fraction of the total air pollution-related burden (WHO 2021).

Based on the results, it is reasonable to conclude that occasional exceedances above the 1-hour NO_2 exposure limits do not represent an unacceptable human health risk for people who may be in the area. These findings are consistent with the EIS HHRA.

Isopleths of the 1-hour (98th percentile), frequency of exceedance of the 1-hour (98th percentile) concentrations relative to the CAAQS, 24-hour (98th percentile) and annual concentrations of NO_2 are provided on Map 2, Map 3, Map 4 and Map 5, respectively, in Appendix C.

Carbon Monoxide (CO)

As shown in Table 3.35, the concentration ratios associated with 1-hour CO concentrations meet the benchmark of 1.0 at the human health receptor locations. Because adverse health effects are not expected to occur or are minimal below the exposure limit, there are no unacceptable risks to human receptors expected from inhalation of CO.

Isopleths of the 1-hour (9th highest) concentrations of CO are provided on Map 6, Appendix C.

Sulphur Dioxide (SO_2)

As shown in Table 3.35, the concentration ratios associated with 24-hour SO_2 concentrations meet the benchmark of 1.0 at the human health receptor locations. Because adverse health effects are not expected to occur or are minimal below the exposure limit, there are no unacceptable risks to human receptors expected from inhalation of SO_2.

Isopleths of the 24-hour (98th percentile) concentrations of SO_2 are provided on Map 11, Appendix C.

Particulate Matter (PM_{10}, $PM_{2.5}$)

As shown in Table 3.35, the CRs associated with annual exposures to particulate matter (PM_{10} and $PM_{2.5}$) and 24-hour exposure to $PM_{2.5}$ meet the benchmark of 1.0; however, the maximum CR associated with 24-hour concentrations of PM_{10} is greater than the benchmark of 1.0 at one or more locations. These locations are limited to two human receptor locations, as shown in Table 3.37. At these locations, consideration is given to the magnitude, frequency and likelihood of exposure in the evaluation of potential human health risks.

Table 3.37 Receptor Locations where Concentration Ratios of Particulate Matter Are Greater than Benchmark (CR > 1.0)

	Concentration Ratio (CR)
PM_{10} (24-hour)	
Trapping Area 2	1.3
Trapping Area 3	1.1

The two trapping areas represent locations that people could reasonably be expected to be present. The WHO (2006) suggests that when evaluating particulate matter, the WHO guidelines for annual average takes precedence over the 24-hour average since, at low levels, there is less concern about remaining episodic excursions. As the annual average concentration of PM_{10} at these locations meet the exposure limit, and concentrations of both 24-hour and annual average $PM_{2.5}$ meet the exposure limit at the 45 human health receptor locations evaluated, there are no unacceptable risks to Indigenous Receptors or Residential Receptors from inhalation of particulate matter.

Isopleths of the 24-hour (98th percentile) concentrations of PM_{10} are provided on Map 19, Appendix C while isopleths of the 24-hour (98th percentile) and annual concentrations of $PM_{2.5}$ are provided on Map 21 and Map 22, respectively, in Appendix C.

Hydrogen Cyanide (HCN)

As shown in Table 3.35, the concentration ratios associated with both short-term and long-term HCN concentrations meet the benchmark of 1.0 at the human receptor locations. These results indicate a negligible risk to human health from inhalation of HCN.

Isopleths of the 1-hour and annual concentrations of HCN are provided on Map 13 and Map 15, respectively, in Appendix C.

Diesel Particulate Matter (DPM)

As shown in Table 3.35, the concentration ratios associated with both short-term and long-term DPM concentrations meet the benchmark at the human receptor locations. These results indicate a negligible risk to Indigenous Receptors and Residential Receptors from inhalation of DPM.

Dustfall

Although dustfall itself is not considered a COPC, it serves as an indicator of possible deposition from air to soil. As depicted in Figure 3.2, this deposition can affect soil quality and result in human exposure through direct dermal contact and ingestion of soil and dust. Additionally, exposure can occur indirectly via wind erosion and subsequent inhalation of particulates from soil, and uptake by vegetation and wildlife, subsequently leading to the consumption of traditional plants, backyard garden produce, and wild meat.

The maximum predicted dustfall values are 33% to 36% higher than those reported in the EIS; however, the maximum predicted annual rates of dustfall at human health receptor locations are anticipated to increase by 13% (refer to Table 8, Appendix C). Isopleths of maximum modelled annual average dustfall depositions are provided on Map 24, Appendix C.

The EIS HHRA concluded that project-related changes to these media posed a negligible risk to human health. Specifically:

- The calculated non-cancer risks from direct exposure to COPCs in soil were well below the threshold of 0.2, with the maximum estimated risk for arsenic showing a minimal increase from 0.018 (Baseline) to 0.019 (Future Case).
- The estimated cancer risk from arsenic in soil was 7.4E-08, substantially below the threshold of 1E-05.
- Project-related health risks from ingestion of traditional plants, garden produce, and wild meat were also negligible, with no substantive difference between Baseline and Future Cases.

Even if the 13% increase in dustfall were to proportionally increase COPC concentrations in soil and biota, the resulting Project-related health risks would remain negligible. Therefore, the updated design is not expected to materially alter the original HHRA conclusions that Project-related changes to soil, terrestrial vegetation, and terrestrial wildlife represent a negligible risk to human health.

3.3.13.2.2 Changes to Surface Water Quality

The updated assessment of Project-related effects to surface water quality are presented in Section 3.3.4. The updated NOA/NOC water quality model (the updated model) used the same assessment nodes and approach as the EIS surface water quality model (EIS model) with some slight modifications, as described in Section 3.3.4. Within the EIS HHRA, potential pathways related to surface water included direct pathways (consumption of surface water, direct contact with surface water) and indirect pathways (consumption of fish).

Although the CSM (Figure 3.2) identifies that humans could come in direct contact with sediment, the EIS HHRA concluded that risks related to sediment contact are considered minor. No public beaches or areas of shoreline where high intensity activities occur were identified in the Gordon region. Locations where humans could be exposed to sediment are considered remote and exposure would be infrequent. Consistent with the EIS HHRA, exposures associated with direct contact with sediment are not assessed further.

The following provides an assessment of the human health risks associated with the surface water-related pathways based on the updated model results.

Ingestion and Dermal Contact with Surface Water

In certain instances, individuals might consume water directly from local lakes. However, information collected through various engagements suggest that such occurrences are rare, as people generally do not source their drinking water directly from these lakes. Consistent with the EIS HHRA, the updated modelled concentrations of metals in lakes in the Gordon region were based on the maximum 12-month running average surface water concentrations for the Expected case for waterbodies in the surface water LAA for the Gordon site. These concentrations were compared with Canadian drinking water quality guidelines (Table 3.38). Preference was given to guidelines from Health Canada (2025); in the absence of Health Canada guidelines, guidelines from other jurisdictions (e.g., Ontario) were selected. Modelled concentrations of metals in the applicable lakes in the Gordon region were less than the applicable guidelines, except for manganese. The updated Baseline and Project Case concentrations of manganese is higher than the maximum acceptable concentration of 0.12 mg/L for potable water supplies.

Table 3.38 Comparison of Surface Water Concentration to Drinking Water Guidelines

COPC	Units	Updated Concentrations – Gordon Region		Drinking Water Quality Guideline	Source
		Baseline Case	Project Case		
Antimony	mg/L	0.000095	0.00030	0.006	Health Canada (2025)
Arsenic	mg/L	0.00050	0.00105	0.01	Health Canada (2025)
Barium	mg/L	0.015	0.020	2	Health Canada (2025)
Beryllium	mg/L	0.00009	0.00011	0.004	OMECP (2011)
Cadmium	mg/L	4.4E-06	5.9E-06	0.007	Health Canada (2025)
Chromium	mg/L	0.00015	0.00016	0.05	Health Canada (2025)
Cobalt	mg/L	0.00012	0.00015	0.003	OMECP (2011)
Copper	mg/L	0.00038	0.00059	2	Health Canada (2025)
Lead	mg/L	6.4E-05	7.5E-05	0.005	Health Canada (2025)
Manganese	mg/L	**0.17**	**0.29**	0.12	Health Canada (2025)
Mercury	mg/L	1.4E-06	1.7E-06	0.001	Health Canada (2025)
Molybdenum	mg/L	0.0005	0.0014	0.07	OMECP (2011)
Nickel	mg/L	0.00032	0.00044	0.1	OMECP (2011)
Selenium	mg/L	0.00006	0.00011	0.05	Health Canada (2025)
Silver	mg/L	6.5E-06	7.8E-06	0.01	OMECP (2011)
Strontium	mg/L	0.054	0.078	7	Health Canada (2025)
Thallium	mg/L	4.0E-05	5.1E-05	0.002	OMECP (2011)
Uranium	mg/L	0.00010	0.00066	0.02	Health Canada (2025)
Vanadium	mg/L	0.00020	0.00022	0.0062	OMECP (2011)
Zinc	mg/L	0.0014	0.0019	5	Health Canada (2025)

Notes:
Values in **BOLD** are higher than the drinking water quality guideline

As noted by Health Canada (2019), manganese occurs naturally in the environment and is an essential element for human health; however, studies suggest an association between exposure to manganese in drinking water and neurological effects in children. The drinking water guideline of 0.12 mg/L was derived by Health Canada to be protective of bottle-fed infants (0 to 6 months of age) consuming 0.75 litres of water a day. As noted in the EIS HHRA, the lakes in the Gordon region are not used as a potable water supply and, based on information gathered through engagement, people do not obtain drinking water directly from the lakes within the surface water LAA. As a result, consumption of water from the lakes is expected to be rare and use for infant formula very unlikely. Based on these findings, it is reasonable to conclude that the presence of manganese in the lake water, under existing (baseline) conditions and for the 2023 Project design, do not represent an unacceptable human health risk for people who might consume water directly from local lakes.

Consumption of Fish

The EIS HHRA assumed that people in the Gordon region obtain a portion of their local fish from Swede Lake. Baseline metal concentrations in fish were based on 33 muscle tissue samples collected from Swede Lake in 2015 and 2016 and 95% upper confidence limit of the mean (UCLM) concentrations were adopted as the baseline concentration for each metal. Project-related changes in fish tissue concentrations were estimated using the predictive concentrations from surface water modelling, specifically, the maximum 12-month running average surface water concentrations in Swede Lake for the Expected case.

The EIS HHRA determined that the calculated non-cancer health risk for methyl mercury in fish for the Project Case (hazard quotient [HQ] of 0.38) was greater than the target benchmark of 0.2 but was not substantially different than the Baseline Case (HQ of 0.38). The non-cancer health risks for all other COPCs via consumption of fish were less than the target benchmark of 0.2 (ranging from 0.000011 for chromium to 0.067 for thallium). Arsenic was the only COPC in fish that is considered a carcinogen. The EIS HHRA determined that the calculated carcinogenic risk associated with ingestion of fish was 8.5E-06 (or 0.85 in 100,000), which is below the target threshold of 1E-05 (or 1 in 100,000). As a result, the EIS HHRA concluded that the modelled Project-related changes represent a negligible change in health risk.

Because uptake to fish tissues is modelled as being directly proportional to modelled changes in surface water concentrations, it is reasonable to assume that:

- If the updated model concentrations (for the maximum 12-month running average surface water concentrations in Swede Lake for the Expected case) are like or less than those in the EIS HHRA, there would be no changes to the HHRA conclusions.
- The percent difference between the modelled concentrations used in the EIS HHRA and the updated model concentrations are an indication of the potential increase in risk to human health via ingestion of fish.

As indicated in Table 3.39, the updated model concentration of barium, chromium, vanadium, and zinc in surface water are less than the concentrations assessed in the EIS HHRA, indicating that there would be no change to the EIS HHRA conclusions. The updated model concentrations for other COPCs ranged from a 1% increase (strontium) to a 228% increase (manganese). However, even if health risks for these other COPCs were to increase by 228%, the non-cancer health risks from the consumption of fish would remain less than the target of 0.2, except for methyl mercury.

The EIS HHRA found that the Project would not substantially affect the methyl mercury risk from fish consumption, with mercury surface water concentrations of 9.9E-07 mg/L for both baseline and EIS model cases. The updated baseline and updated modelled mercury concentration for Swede Lake are both 1.19E-06 mg/L, suggesting that exposure may be higher from the updated results but the conclusion that the risk from the Project is not substantially different from the Baseline Case remains unchanged.

Table 3.39 Changes in Model Concentrations at Swede Lake – Project Case

COPC	Units	EIS Model Concentrations	Updated Model Concentration	Increase in Concentration (%)
Antimony	mg/L	2.18E-04	3.28E-04	50%
Arsenic	mg/L	7.07E-04	9.37E-04	33%
Barium	mg/L	1.68E-02	1.64E-02	-2%
Beryllium	mg/L	9.28E-05	1.01E-04	8%
Cadmium	mg/L	4.91E-06	5.47E-06	11%
Chromium	mg/L	1.68E-04	1.58E-04	-6%
Cobalt	mg/L	8.77E-05	1.04E-04	19%
Copper	mg/L	5.78E-04	7.25E-04	25%
Lead	mg/L	6.07E-05	6.57E-05	8%
Manganese	mg/L	3.26E-02	1.07E-01	228%
Mercury	mg/L	9.92E-07	1.19E-06	20%
Molybdenum	mg/L	1.18E-03	1.49E-03	26%
Nickel	mg/L	2.74E-04	3.63E-04	33%
Selenium	mg/L	7.22E-05	1.13E-04	56%
Silver	mg/L	6.24E-06	7.67E-06	23%
Strontium	mg/L	7.34E-02	7.42E-02	1%
Thallium	mg/L	3.89E-05	4.75E-05	22%
Uranium	mg/L	1.95E-04	4.41E-04	126%
Vanadium	mg/L	2.45E-04	2.26E-04	-8%
Zinc	mg/L	3.53E-03	3.23E-03	-8%

As noted, arsenic was the only COPC in fish that is considered a carcinogen. A 33% increase in surface water concentrations of arsenic could result in a cancer risk of 1.1E-05, which is slightly above the target of 1E-05. When estimating exposure to arsenic in fish tissue, it was assumed that the arsenic was present only in its inorganic form, which is more toxic to humans. This assumption was made even though fish tissues typically contain organic arsenic compounds (e.g., arsenocholine and arsenobetaine), which have been determined to be relatively non-toxic (Health Canada 2006). In a study conducted by the Canadian Food Inspection Agency in 2018/2019 (CFIA 2019), total and inorganic arsenic concentrations were measured in 92 domestic fish samples from local and regional retail locations from six cities across Canada. The study found that inorganic arsenic made up a small portion (approximately 0.1%) of the arsenic analyzed in fish (the remaining being organic arsenic). As a result, the slightly higher estimated cancer risk (1.1E-05 versus the previous 0.85E-05 estimated in the EIS HHRA) does not affect the conclusion that consumption of fish from Swede Lake represents a negligible risk to human health but does highlight the importance of the fish tissue monitoring program.

3.3.13.3 Summary of Mitigation Measures

The mitigation measures to reduce environmental effects of the Project (e.g., as described in Sections 3.3.1 and 3.3.4) also serve to address potential human health effects through the potential exposure pathways previously described. Considering the current wind conditions and measured ambient concentration levels, suitable and effective mitigation options will be implemented to reduce Project emissions to air. This approach to managing emissions is referred to as “adaptive management”. Since emissions of NO_2 and PM_{10} are dependent on the types of vehicles and equipment used, as well as how and when they are used, adaptive management is considered an effective means to mitigate exposures for people who may be present at Trapping Area 2 and Trapping Area 3. Additionally, monitoring of surface water quality and country foods will be conducted to provide an understanding of Project-related effects to environmental media of importance of human health and to identify if additional mitigation measured are needed.

3.3.13.4 Residual Effects

In comparison with the EIS results, the air quality effects from the Project activities slightly increased at some receptor locations. These changes were evaluated in the context of newer guidance and health-based targets (Health Canada 2023b and 2023c; WHO 2021). In instances where the updated modelled concentrations are above the current guidelines, the associated risks were generally limited to short-term exposures (1-hour, 24-hour), with a low frequency of exposures to concentrations above the guidelines.

Based on the 2023 design, dustfall levels at some human receptor locations are expected to be higher than assessed in the EIS; however, even if the predicted 13% increase in dustfall were to proportionally increase the COPCs concentrations in soil and biota, the resulting Project-related health risks would remain negligible.

The updated assessment of Project-related effects to surface water quality resulted in higher modelled concentrations of some metals within the Gordon region, for both baseline and modelled cases. Concentrations are expected to meet drinking water guidelines except for manganese for both Baseline and modelled Project Case. However, as the lakes are not used as a potable water supply, the occasional consumption of the lake water does not represent an unacceptable human health risk.

Similarly, in comparison with the EIS results, surface water quality resulted in higher modelled concentrations of some metals in Swede Lake, where people may fish. The 2023 Project design is not expected to affect the conclusion that consumption of fish from Swede Lake represents a negligible risk to human health, but the modelling does highlight the importance of the fish tissue monitoring program.

After applying the mitigation measures, including adaptive management for air emissions, the proposed alterations at the Gordon site will not change the characterization of Project residual effects on human health and there is no change to the EIS conclusions (Stantec 2020a).

3.3.14 Indigenous Peoples

The section provides further consideration of effects to Indigenous or Treaty Rights (Stantec 2020a). The proposed alterations that may interact with the Indigenous peoples VC and were therefore assessed as part of this NOA/NOC, include but are not limited to the PDA layout.

3.3.14.1 Regulatory and Guideline Setting

3.3.14.1.1 Guideline Criteria

The assessment of potential Project-related environmental effects on Indigenous health conditions, Indigenous socio-economic conditions, and Indigenous physical and cultural heritage, current use of lands and resources for traditional purposes (current use) and Indigenous or Treaty Rights includes the consideration of the following federal and provincial legislation:

Section 6.1.9 of the Final EIS Guidelines) (Appendix 4A of the EIS) required assessment of Project effects to health, social conditions, and physical and cultural heritage of Indigenous peoples as required by CEAA 2012 Paragraph 5(1)(c).

The Government of Manitoba *Northern Affairs Act* (1966 most recent revision in 2006) coordinates interprovincial and interjurisdictional initiatives, policies, and strategies affecting northern Manitoba.

Manitoba's Department of Indigenous and Northern Relations (MINR) interim provincial policy for Crown consultation (MINR 2019) recognizes Manitoba's duty to consult with First Nations, Métis Nations, and other Indigenous Nations when any proposed action has the potential to adversely affect the exercise of Indigenous or Treaty Rights.

In Manitoba, public health is the responsibility of the Manitoba Ministry of Health, Seniors and Active Living, in accordance with *The Public Health Act*. Health Canada's mandate includes the protection of human health from exposure to chemicals in the environment.

3.3.14.1.2 IAAC Decision Statement

As per the IAAC Decision Statement, Alamos is required to adhere to the following conditions with respect to health and Socio-economic conditions of Indigenous peoples:

> *6.1 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, measures to mitigate emissions of dust and fugitive particulates within the Project development areas, taking into account the standards and criteria set out in the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards and Manitoba's Ambient Air Quality Criteria. The Proponent shall implement these measures from construction through decommissioning. In doing so, the Proponent shall:*

6.1.1 apply dust suppressants, including water, that do not contain chemicals and have the least potential for adverse environmental effects, on haul and access roads during periods when dust generation is expected or occurring, including periods of drought and high winds;

6.1.2 locate all stationary machinery and equipment used for processing ore indoors, where technically and economically feasible, including the crushing plant and conveyors feeding into the ore milling and processing plant;

6.1.3 ensure all equipment and vehicles used, including equipment and vehicles operated by third-party contractors, are serviced and maintained in accordance with the manufacturer's maintenance guidelines to meet or exceed applicable emission standards, including Tier 4 emission standards for off-road equipment with off-road diesel engines, pursuant to the Off-Road Compression-Ignition (Mobile and Stationary) and Large Spark-Ignition Engine Emission Regulations and Off-Road Compression-Ignition Engine Emission Regulations;

6.1.4 develop and implement policies to reduce the fuel consumption of equipment and vehicles operating in the Project development areas, including no idling and limited cold start policies; and

6.1.5 establish speed limits on the roads located in the Project development areas, taking into account the recommended speed limits in Environment and Climate Change Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities and by requiring and ensuring that speed limits are respected, including by installing signs indicating speed limits.

6.2 The Proponent shall implement measures, during all phases of the Designated Project, to avoid exceedances of the thresholds for noise and vibration, identified in Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise at sensitive receptors identified in the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement. In doing so, the Proponent shall:

6.2.1 develop, prior to construction, a protocol for receiving and addressing feedback related to the exposure to noise and vibration generated by the Designated Project. The Proponent shall provide the protocol to the Agency and Indigenous groups prior to construction and make the protocol publicly available online. As part of the protocol, the Proponent shall:

6.2.1.1 identify how a person may provide feedback, how the Proponent will handle the feedback received, including ranking and responding to feedback received according to the anticipated level of impacts, and how the Proponent may implement modified or additional mitigation measures(s) and/or follow-up requirement(s) in response to the feedback received;

6.2.1.2 record any feedback received as soon as feasible, no later than 48 hours after receiving the feedback; and

6.2.1.3 implement, as soon as technically feasible, any modified or additional mitigation measure and/or follow-up requirement that the Proponent deems necessary to respond to the feedback received.

6.3 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, Health Canada, Environment and Climate Change Canada and any other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects from the Designated Project on air quality and country foods as it relates to the health of Indigenous peoples, taking into account available Indigenous knowledge provided by Indigenous groups related to current use of lands and resources for traditional purposes. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the implementation of the follow-up program, the Proponent shall:

6.3.1 identify, in consultation with Indigenous groups, the species of fish, vegetation and wildlife consumed as country foods that may be adversely affected by the Designated Project and the locations where these species shall be monitored;

6.3.2 monitor, beginning prior to construction and continuing through post-closure, contaminants of potential concern, including arsenic, copper, mercury, methylmercury and selenium, in the species and at the locations identified pursuant to condition 6.3.1;

6.3.3 monitor, throughout construction and operation, ambient air concentrations of total suspended particulates, PM_{10} and $PM_{2.5}$ at locations identified in consultation with Indigenous groups, and upwind and downwind from the Project development areas, taking into account 24-hour and 1-hour thresholds in the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards;

6.3.4 monitor, during all phases of the Designated Project, dust fall at locations identified in consultation with Indigenous groups, and upwind and downwind from the Project development areas;

6.3.5 monitor ambient air concentrations of nitrogen dioxide (NO_2) at locations identified in consultation with Indigenous groups and relevant authorities, for at least two consecutive months during year 2 of operation, and continue to monitor during all phases of the Designated Project if the monitoring results exceed predicted levels in the atmospheric dispersion model in Volume 1 Chapter 6 of the Environmental Impact Statement;

6.3.6 monitor meteorological conditions (including wind speed, wind direction, temperature and relative humidity) upwind and downwind of the Project development areas, during construction and operation; and

6.3.7 if the monitoring results referred to in conditions 6.3.2 to 6.3.5 exceed predicted levels in the atmospheric dispersion model in Volume 1 Chapter 6 of the Environmental Impact Statement, taking into account the results of monitoring meteorological conditions pursuant to condition 6.3.6, the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement, or thresholds of the Canadian Council of Ministers of the Environment's Canadian Ambient Air Quality Standards, modify or implement additional mitigation measures pursuant to condition 2.8, and update the human health and ecological risk assessment in Volume 5 of the Environmental Impact Statement. The Proponent shall submit any updates to the human health and ecological risk assessment to the Agency and relevant authorities.

6.4 The Proponent shall develop, in consultation with Indigenous groups, and implement a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as it pertains to adverse effects on the socio-economic conditions of Indigenous peoples from changes to the environment caused by the Designated Project. The Proponent shall solicit and incorporate additional information provided by Indigenous groups when monitoring these effects. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

6.4.1 monitor, based on the information provided by Indigenous groups that are trapping, harvesting, fishing or hunting within the local assessment areas, including Marcel Colomb First Nation and holders of registered trap lines:

6.4.1.1 the ability of trappers, harvesters, fishers and hunters to relocate, if required to do so, to new trapping, harvesting, fishing and hunting sites used for traditional purposes, including registered trap lines;

6.4.1.2 the quantity and quality of resources obtained through trapping, harvesting, fishing and hunting activities; and

6.4.1.3 the changes in socio-economic conditions of Indigenous groups, including any additional financial costs incurred by Marcel Colomb First Nation and holders of registered trap lines, as they relate to the relocation of trapping, harvesting, fishing and hunting activities.

6.5 The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures as it pertains to noise and vibration from the Designated Project on the health of Indigenous peoples. The Proponent shall implement the follow-up program during all phases of the Designated Project. As part of the follow-up program, the Proponent shall:

6.5.1 monitor noise and vibration levels at receptors identified in Volume 1 Chapter 7 Tables 7-7 to 7-10 of the Environmental Impact Statement, and at any other human receptors identified in consultation with Indigenous groups.

Condition 7.1 regarding Physical and Cultural Heritage is described above in Section 3.3.11 heritage resources.

7.2 The Proponent shall develop, prior to construction and in consultation with Indigenous groups, nation-specific measures to address the effects described in the Environmental Assessment Report caused by the Designated Project on cultural heritage, including tangible and intangible losses to culture. The Proponent shall implement the measures during all phases of the Designated Project and submit these measures to the Agency prior to implementing them, while ensuring that confidential information is protected. The Proponent shall report its discussions with Indigenous groups as part of the annual report referred to in condition 2.10, including the level of satisfaction of Indigenous groups with the implementation of the measures. As part of the measures, the Proponent shall:

7.2.1 develop and/or contribute to Indigenous-led program(s) and/or initiative(s) to preserve and enhance cultural heritage, including the transfer of intergenerational knowledge; and

7.2.2 develop, in collaboration with Indigenous groups, cultural awareness training for all employees associated with the Designated Project, including the cultural setting and providing an understanding of cultural practices, protocols and considerations.

Condition 5, current use of lands and resources for traditional purposes is described in Section 3.3.12 above.

3.3.14.2 Environmental Effects

3.3.14.2.1 Change to Indigenous Health Conditions

The effect pathways carried forward for Indigenous health conditions were addressed in the current use (Chapter 17.0) and human health (Chapter 18.0) assessments of the EIS. These are tabulated below with reference to relevant section of the EIS, the potential effect, and the effect pathways.

Table 3.40 Indigenous Health Conditions Effect Pathways

Valued Component	Potential effect assessed in related VC	Effect pathways carried forward for Indigenous health conditions
Current Use (Chapter 17.0, Sections 17.4.2-17.4.4)	Change in availability of lands and resources currently used for traditional purposes	Project construction and operation have the potential to affect Indigenous health conditions through a reduction in the quantity of country foods to harvest.
	Change in access and resources currently used for traditional purposes	Project construction and operation have the potential to affect Indigenous health conditions through a change in access to country foods to harvest.
	Change to traditional cultural and spiritual sites and areas	Construction and operation activities have the potential to affect Indigenous health conditions through a reduction in the value and perceived quality of country foods.
Human Health (Chapter 18.0, Section 18.4.2)	Change to human health	Construction and operation of the Project may affect Indigenous health conditions through changes in air quality, changes in noise, changes in water quality, and country foods.

3.3.14.2.2 Change to Indigenous Socio-Economic Conditions

The effect pathways carried forward for Indigenous socio-economic conditions were addressed in the assessments of labour and economy (Chapter 13.0), community services, infrastructure, and wellbeing (Chapter 14.0), and land and resource use (Chapter 15.0) assessments of the EIS. These are tabulated below with reference to relevant section of the EIS, the potential effect, and the effect pathways.

Table 3.41 Indigenous Socio-Economic Conditions Effect Pathways

Valued Component	Potential effect assessed in Related VC	Effect pathways carried forward for Indigenous Socio-Economic conditions
Land and Resource Use (Chapter 15.0, Sections 15.5.2-15.5.4)	Change in land use	Project construction and operation activities have the potential to affect Indigenous socio-economic conditions through disturbance and nuisance effects (noise, dust, visuals).
	Change in recreation	Project construction and operation activities may change Indigenous socio-economic conditions by resulting in loss of area available for recreational use, access to or quality of recreational use.
	Change in resource use	Project construction and operation activities may change Indigenous socio-economic conditions by affecting commercial activities that Indigenous peoples engage in, such as fishing, hunting, trapping, gathering.
Community Services, Infrastructure, and Wellbeing (Chapter 14.0, Sections 14.5.2-14.5.5)	Change in housing and temporary accommodations	Construction activities for the Project may result in increased workforce demand for temporary housing and accommodations, affecting off-reserve members of Indigenous Nations.
	Change in local services and infrastructure	The workforce required for construction and operation of the Project may increase demand for services that Indigenous peoples use, such as fire and police, roads and medical.
	Change in transportation services and infrastructure	Project-related construction and operation will increase traffic on roadways, including PR 391, which is used by Indigenous Nations.
	Change in community wellbeing	The Project-related employment may increase disposable income, reduce financial barriers to beneficial health practices, change the demographics of nearby communities and result in changes of sense of place, alter participation in recreational, subsistence, and family-related activities.
Labour and Economy (Chapter 13.0, Sections 13.4.2,13.4.3)	Change in regional labour force	An increased workforce associated with the Project could lead fewer workers available for local positions and an increase in wages.
	Change in regional business	Project spending could affect local and regional businesses, including those owned or operated by Indigenous Nations.

3.3.14.2.3 Change in Current Use

Please refer to Section 3.3.12 for a description of the potential effects of the Project on current use.

3.3.14.2.4 Change to Indigenous Physical and Cultural Heritage

The effect pathways carried forward for Indigenous physical and cultural heritage were addressed in the heritage resources (Chapter 16.0) and current use (Chapter 17.0) assessments of the EIS. Effects to Indigenous physical and cultural heritage can include indirect changes, as would occur through increases in noise, light, dust (and other emissions) and sensory changes, and direct changes, such as could occur through physical loss of, or loss of access to, resources due to Project activities. These are tabulated below with reference to relevant section of the EIS, the potential effect, and the effect pathways.

Table 3.42 Indigenous Physical and Cultural Heritage Effects Pathways

Valued Component	Potential Effect assessed in Related VC	Effect pathways carried forward for Indigenous Physical and Cultural Heritage
Heritage Resources (Chapter 16.0, Section 16.4.2)	Change to the number of heritage sites	Project construction and operation could affect or reduce the number of heritage sites important to Indigenous Nations.
Current Use (Chapter 17.0, Sections 17.4.2,17.4.4)	Change in access to resources currently used for traditional purposes	Project construction and operation has the potential to affect Indigenous physical and cultural heritage through changing access to plant and animal species of value to Indigenous Nations, as well as areas and sites of cultural value.
	Change to traditional cultural and spiritual sites and areas	Project construction and operation has the potential to affect cultural and spiritual sites, such that their value to Indigenous peoples is compromised or reduced.

3.3.14.3 Summary of Mitigation Measures

Mitigation measures proposed to avoid or reduce potential adverse effects on Indigenous health conditions include those identified in the current use (Chapter 17.0) and human health (Chapter 18.0) assessments of the EIS and are discussed in the Management and Monitoring Plans (Version 0, January 2025).

Mitigation measures proposed to avoid or reduce potential adverse effects on Indigenous socio-economic conditions include those identified in the land and resource use (Chapter 15.0), community services, infrastructure, and wellbeing (Chapter 14.0), and labour and economy (Chapter 13.0) assessments of the EIS and are discussed in the Management and Monitoring Plans (Version 0, January 2025).

Mitigation measures proposed to avoid or reduce potential adverse effects on Indigenous physical and cultural heritage include those identified in the current use (Chapter 17.0, Sections 17.4.2.2, 17.4.3.2, and 17.4.4.2) and heritage resources chapters (Chapter 16.0, Section 16.4.2.2) assessments of the EIS and are discussed in the Management and Monitoring Plans (Version 0, January 2025).

3.3.14.4 Residual Effects

Residual effects will act upon Indigenous peoples harvesting and consuming country foods within the Indigenous health conditions LAA and RAA. It is anticipated that residual effects will primarily be experienced by Marcel Colomb First Nation, whose reserve is within the Indigenous health conditions LAA and RAA. Nevertheless, other Indigenous Nations may also experience residual effects of the Project, through members traveling to the Lynn Lake area to harvest and consume country foods. Indigenous health conditions may be affected by changes in the availability of country foods and value or perceived quality of country foods, as assessed in current use (Chapter 17.0 of the EIS). The availability of country foods within the PDA is currently limited by the former mine sites. The Project is anticipated to increase wildlife mortality and habitat loss for wildlife, fish, and plants within the PDA during construction and operation (Chapters 9.0, 10.0, and 12.0 of the EIS), but the residual effects are not anticipated to cause population-level effects to plant, animal, or fish species, including those harvested as country foods within the Indigenous health conditions RAA.

Residual effects to Indigenous socio-economic conditions are anticipated for Indigenous peoples living and working within the Indigenous socio-economic conditions LAA and RAA. Effects are anticipated to include change to the use of and access to road infrastructure, medical, and other public services, as well as effects to economic and financial conditions through changes to commercial trapline harvest and employment with the Project. These effects are anticipated to be positive and adverse, and to primarily affect Marcel Colomb First Nation with its reserve within the Indigenous socio-economic conditions LAA. Effects may extend to other Indigenous Nations through members who live, work, or harvest in the Lynn Lake area. Project construction may affect, restrict, or change the land base available for recreational activities, including hunting and fishing.

Residual effects to traditional cultural and spiritual sites are anticipated. These effects will be on Indigenous peoples that undertake traditional practices and visit cultural or spiritual sites in the Indigenous physical and cultural heritage LAA. Effects are anticipated to primarily affect Indigenous Nations within the Indigenous physical and cultural heritage LAA (i.e., Marcel Colomb First Nation), but other Indigenous Nations engaged on the Project may also experience residual effects to cultural and spiritual sites.

Project residual environmental effects on current use are assessed in Chapter 17.0 (Section 17.4) of the EIS. With the application of mitigation, Project residual effects on current use will be adverse through construction, operation, and decommissioning/closure. Because the PDA is within the disturbed context of an existing mine and the current use LAA includes an existing road, magnitude is anticipated to be low with indirect effects, especially sensory disturbance, extending into the current use LAA. The effects will be long term, extending beyond the Project life until the PDA returns to its pre-Project state, except for the open pits and mine rock, which will be permanent features. While the timing of construction, operation,

and decommissioning/closure may affect current use dependent on seasonal resources and access, effects on land-based cultural sites and areas are not seasonal. Effects on current use will be reversible with decommissioning/closure, except for the open pits and mine rock, which will be permanent features.

The IAAC's Information Request (IR) IAAC-R2-57 for the Project directed Alamos to describe baseline conditions for each Indigenous Nation participating in the Project. Citing the Federal EIS Guidelines, IAAC required baseline information for each Indigenous Nation to inform the assessment of potential Project effects to Indigenous peoples. In response to IAAC-R2-57, Alamos provided a review and summary of the record of engagement with Indigenous Nations in one document. The intention of the review and summary was to report on engagement with each Indigenous Nation, describe baseline conditions, and demonstrate how Alamos has responded to the concerns and issues raised by each Indigenous Nation. Section 10 of the response presented Indigenous Nation-specific sections that consolidated available baseline information for each Indigenous Nation engaged on the Project with respect to the current use of lands and resources for traditional purposes, Indigenous health and socioeconomic conditions, Indigenous or Treaty Rights, including intangible aspects of rights such as governance rights, and physical and cultural heritage. The intention for each Indigenous Nation-specific section was to provide a stand-alone summary of information obtained by Alamos for each Indigenous Nation and review of how it has been considered in the assessment of potential effects of the Project. The response to IAAC-R2-57 supported the original conclusions of the EIS.

The proposed alterations totaling a 21.84 ha expansion of the PDA described in this report will not result in additional adverse effects within the current use LAA as addressed above at the Gordon site and there is no change to EIS conclusions (Stantec 2020a).

4 Conclusion

Stantec has prepared this report on behalf of Alamos in support of the NOA/NOC application for alterations to the approved Gordon site (Licence No. 3390) and the federal Decision Statement for the Lynn Lake Gold Project. The NOA/NOC application is filed in accordance with Section 14(1) of *The Environment Act* (which requires a proponent to notify the Director [for Class 1 and 2 developments] if the proponent intends to alter a licensed development [MECP 2022]) and filed in accordance with conditions 2.16 and 2.17 of the federal Decision Statement (which require notification of IAAC if the proponent is proposing to carry out the Designated Project in a manner other than described in the Decision Statement).

The proposed alterations encompass an increase to the mine tonnage and modifications to the approved Gordon site, inclusive of the adjustment of footprints of several of the Project components, the removal of the development of the planned diversion ditch (no longer required) and the addition of one new Project component. Those components that have been modified through engineering detailed design include the MRSA, facility area (including buildings), ore and overburden stockpiles, and water management structures (sumps, collections ponds, discharge pipeline). The new Project component is use of the non-acid generating historical MRSA to the north of the open pit as a source of construction borrow material (borrow source).

Potential interactions of the proposed alterations and the environment were evaluated with likely interactions examined to assess residual effects on the assumption of typical mitigation measures representative of best practices and previous construction methods employed at the Gordon site. Based on information available to date and as presented in this NOA/NOC, residual effects of the proposed alterations are characterized following the same approach and criteria as presented in the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) for the following VCs:

- Atmospheric Environment
- Noise and Vibration
- Groundwater
- 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 by Indigenous Peoples

- Human Health
- Indigenous Peoples

**The proposed alterations will not result in additional adverse effects on vegetation and wetlands at the Gordon site and there is no change to the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) conclusions for vegetation and wetlands, however, the vegetation and wetlands LAA has changed from what was presented in the EIS and EAP Report because of groundwater drawdown and changes in the PDA. The vegetation and wetlands LAA is based on a 100 m buffer around the furthest expected groundwater drawdown contour, a 1 km buffer around the updated NOA/NOC PDA extent, and also a 1 km buffer around the PR 391 highway. The changes decrease the vegetation and wetlands LAA by 123.5 ha from that presented in the EIS and EAP Report.*

Based on information available to date and as presented in this NOA/NOC, residual effects characterizations in this NOA/NOC differ from the residual effects characterizations presented in the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) for the following VCs:

- Surface Water
- Fish and Fish Habitat

Results of the updated surface water balance model do not change the characterization of residual effects to surface water quantity (i.e., stream flows and lake levels) from those presented in the EIS. However, results of the updated surface water quality model do change the characterization of residual effects to surface water quality from those presented in the EIS. This is because of updates to the groundwater and surface water quality models that address the proposed alterations to the Gordon site for this NOA/NOC and the use of more stringent FEQGs (total iron only) resulted in changes to the magnitude and frequency of guideline exceedances, the location and timing of guideline exceedances, and two new POPCs compared with the EIS. With the exception of the following differences, the characterization of residual effects to surface water quality for this NOA/NOC are the same as the EIS.

- Negligible magnitude residual effects to surface water quality are predicted to occur in Gordon Lake, West Farley Lake, and East Farley Lake during construction in consideration of the proposed alterations. This is because, with the change to pump water from the existing pit lakes (East and Wendy pits) to the Hughes River instead of Farley Lake, there are no parameters predicted to exceed baseline concentrations by more than 20% and any provincial or federal water quality guideline in Gordon Lake, West Farley Lake, or East Farley Lake during construction.

- Moderate magnitude residual effects to surface water quality are predicted to occur during operation in consideration of the proposed alterations. This is because maximum nitrite concentrations are predicted to exceed baseline concentrations by more than 20% and the CWQG-FAL in West Farley Lake during operation, but adverse effects to fish and other aquatic biota in West Farley Lake are not expected to occur because the assumptions used to predict nitrite concentrations in West Farley Lake are conservative and because the predicted nitrite concentrations are below the sub-lethal effect concentrations for the most abundant fish and benthic invertebrate species present in West Farley Lake.
- Moderate magnitude residual effects to surface water quality are predicted to occur during the decommissioning/closure phase in consideration of the proposed alterations. This is because total iron concentrations are predicted to exceed baseline concentrations by more than 20% and the FEQG for total iron in Gordon Lake during closure, but adverse effects to fish and other aquatic biota in Gordon Lake are not expected to occur because the surface water quality model did not account for any reduction in total iron concentrations resulting from aeration of groundwater prior to pumping to Gordon Lake and because high DOC concentrations in Gordon Lake are expected to attenuate sub-lethal toxicological affects to fish and other aquatic biota. The duration of the residual effect to surface water quality during decommissioning/closure is long-term because total iron concentrations are predicted to remain elevated in perpetuity in Gordon Lake post-closure.

Changes to the approved Gordon site and changes to the updated surface water quality model change the characterization of residual effects to fish habitat at the Gordon site. Due to the smaller changes in flow predicted in Farley Creek during construction and operation for this NOA/NOC, and because the flow reductions now predicted to occur in Farley Creek during decommissioning/closure are relatively small compared with the volume of water within the wetted channel of Farley Creek at any time, the magnitude of residual effects to fish habitat at the Gordon site is expected to be moderate (i.e., a measurable change in habitat area, monthly flows or lake surface area that is greater than the range of natural variability, but that does not affect the ability of fish to use the habitat to carry out one or more of their life processes).

Changes to the approved Gordon site and changes to the updated surface water quality model change the characterization of residual effects to fish health, growth, or survival at the Gordon site. Like in the EIS, fluoride and total phosphorus are also predicted to be POPCs in Gordon and Farley lakes for this NOA/NOC, but it is the identification of total iron as a POPC in Gordon Lake during closure and post-closure and nitrite as a POPC in Farley Lake during operation that has resulted in a change in the characterization of residual effects to fish health, growth, or survival for this NOA/NOC. If modelled water quality predictions in Gordon and Farley lakes are proven accurate by the SWMMP and no other mitigation measures are implemented, the magnitude of residual effects on fish health, growth, or survival would be expected to be moderate (i.e., a measurable change in the abundance, structure, or health metrics in focal fish populations that is greater than the range of natural variability but not large enough to affect the productivity of the focal fish populations). The geographic extent, duration, timing, frequency, reversibility, and ecological context of the residual effects on fish health, growth, or survival would be expected to remain unchanged from the EIS (i.e., local, long-term, applicable, multiple regular event, irreversible, and resilient, respectively).

Overall, the proposed alterations described in this NOA/NOC are not significant, and changes to the characterization of residual effects are limited. All changes are either fully captured and mitigated under the existing management and monitoring plans or reflect removals (i.e., such as the elimination of the diversion channel) rather than additions. As such, while these changes may warrant administrative updates to the federal Decision Statement and the provincial Environment Act Licence No. 3390, they do not result in new or unmitigated impacts and therefore would not require additional conditions or changes to existing conditions requiring additional requirements.

Alamos remains committed to developing and operating the Project inclusive of the proposed alterations in a manner that provides environmental protection for VCs and long-term benefits for the region. The additional mitigation measures identified in Section 3.3, which are beyond those identified in the EIS (Stantec 2020a) and the EAP Report (Stantec 2020b) will be incorporated (change from Version 0 to Version 1) into the applicable Management and Monitoring Plans, which are living documents following approval of this NOA/NOC.

A draft of this NOA/NOC was shared with all Indigenous Nations involved in the Project. No feedback has been received to date. If any feedback is received, Alamos will address it with the respective Indigenous Nation(s) and share this information with the Province and IAAC.

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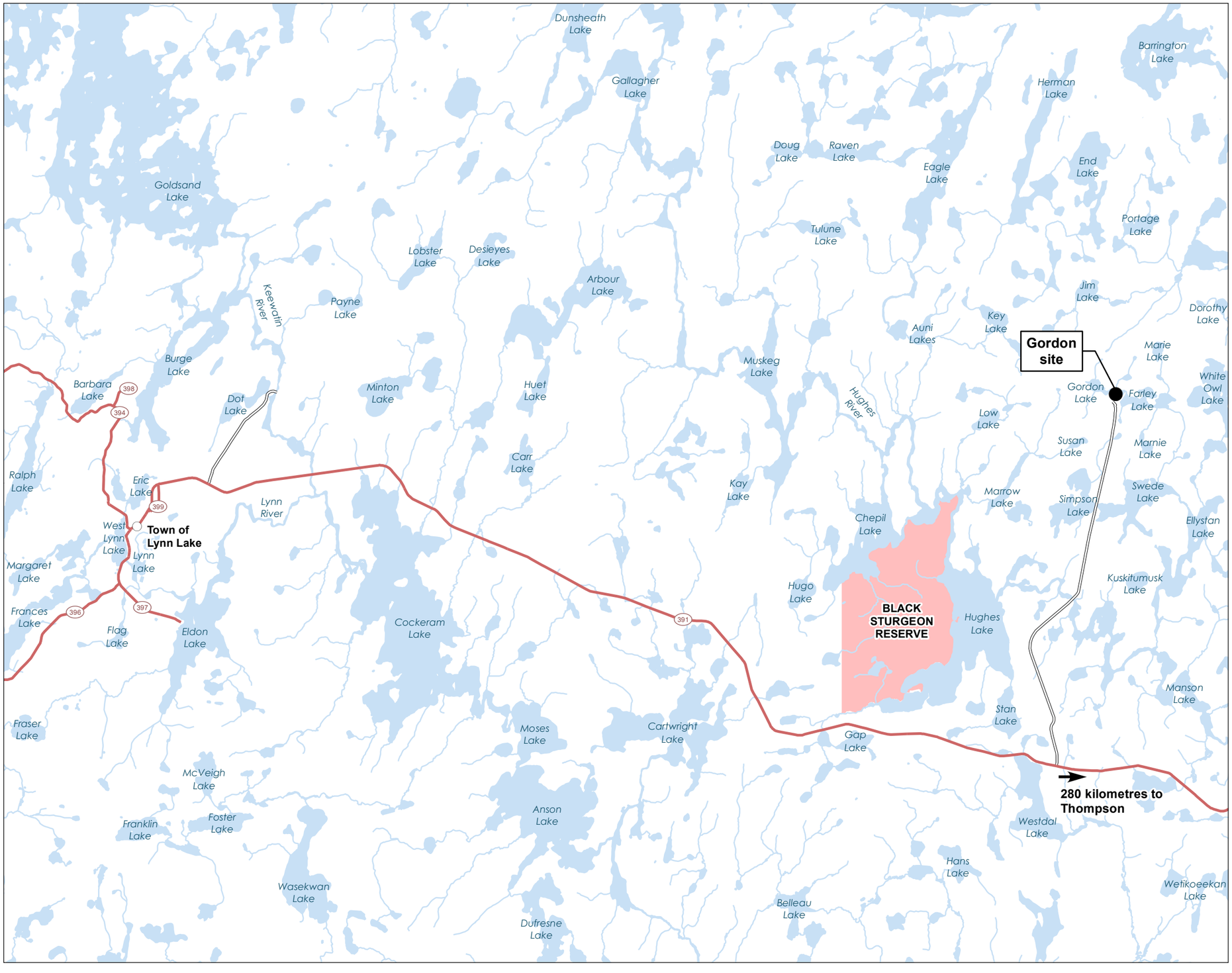
Appendices

Appendix A Maps



Stantec

Landbase

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

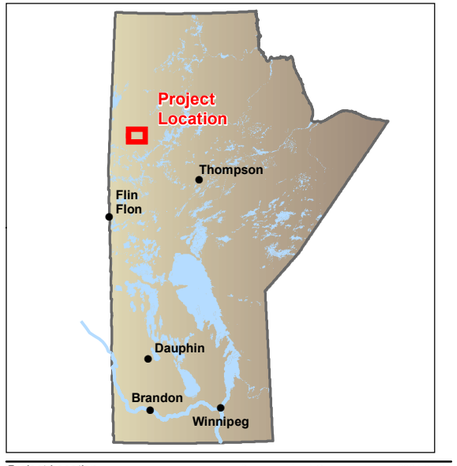
N

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 2024-01-31
Technical Review by BKrawchuk on 2024-01-31

Client/Project 111473054

ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
1

Title
General Location of Gordon Site

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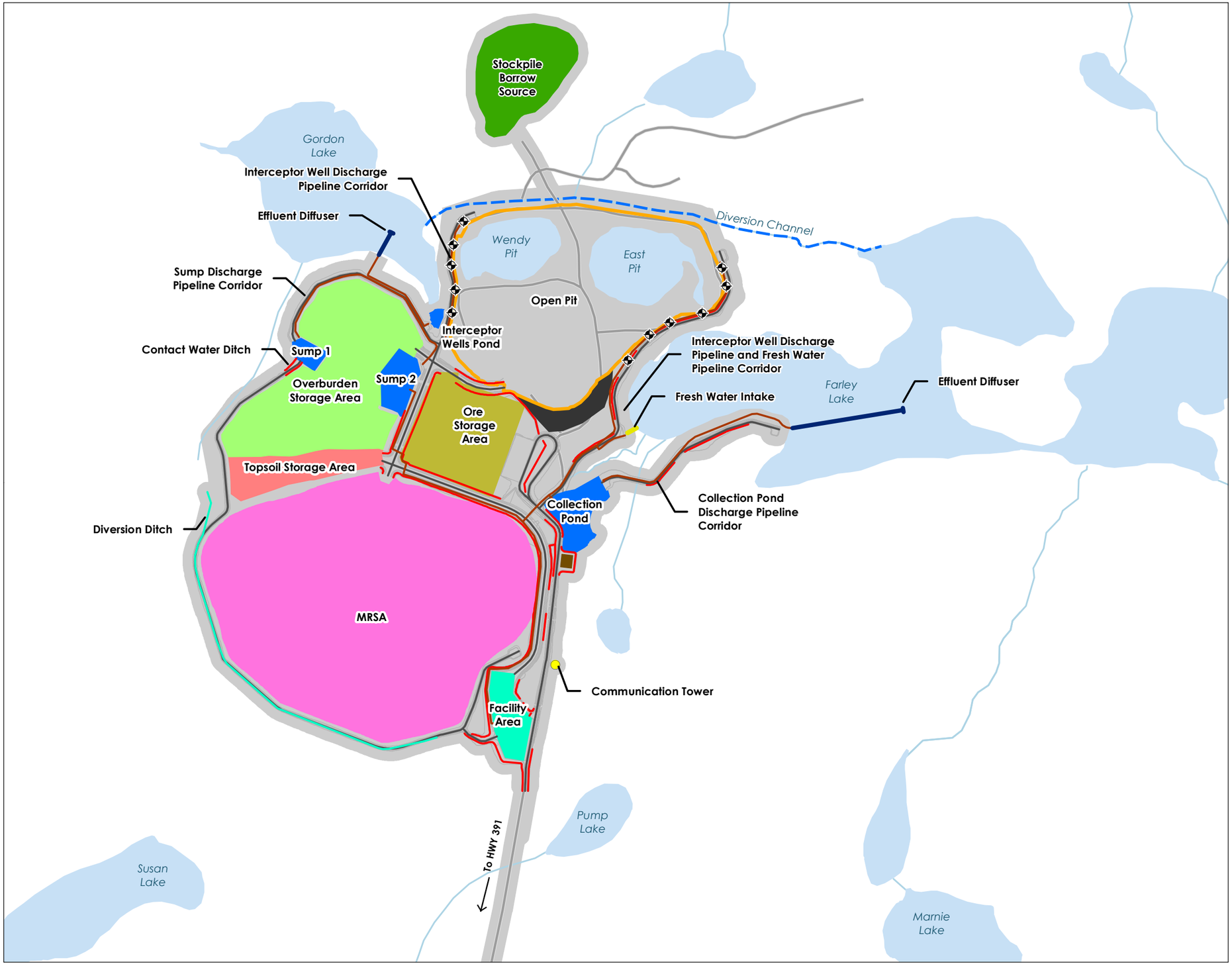


Stantec

Project Infrastructure (NOA)

- Interceptor Well
- Communication Tower
- Contact Water Ditch
- Mine Site Road
- Diversion Ditch
- Discharge Pipeline
- Fresh Water Intake
- Effluent Diffuser
- Collection Pond/Sumps
- Facility
- Gen Set
- Mine Rock Storage Area
- Open Pit
- Ore Storage
- Overburden Storage
- Topsoil Storage
- Stockpile Borrow Source
- NOA Project Development Area (PDA)

Landbase

- Existing Access
- Existing Diversion Channel
- Watercourse
- Waterbody
- Remnant Historical Mine Rock Pile

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. NOA Project Infrastructure features provided by Worley via Alamos.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2025-04-02
Technical Review by KMathers on 2025-04-02

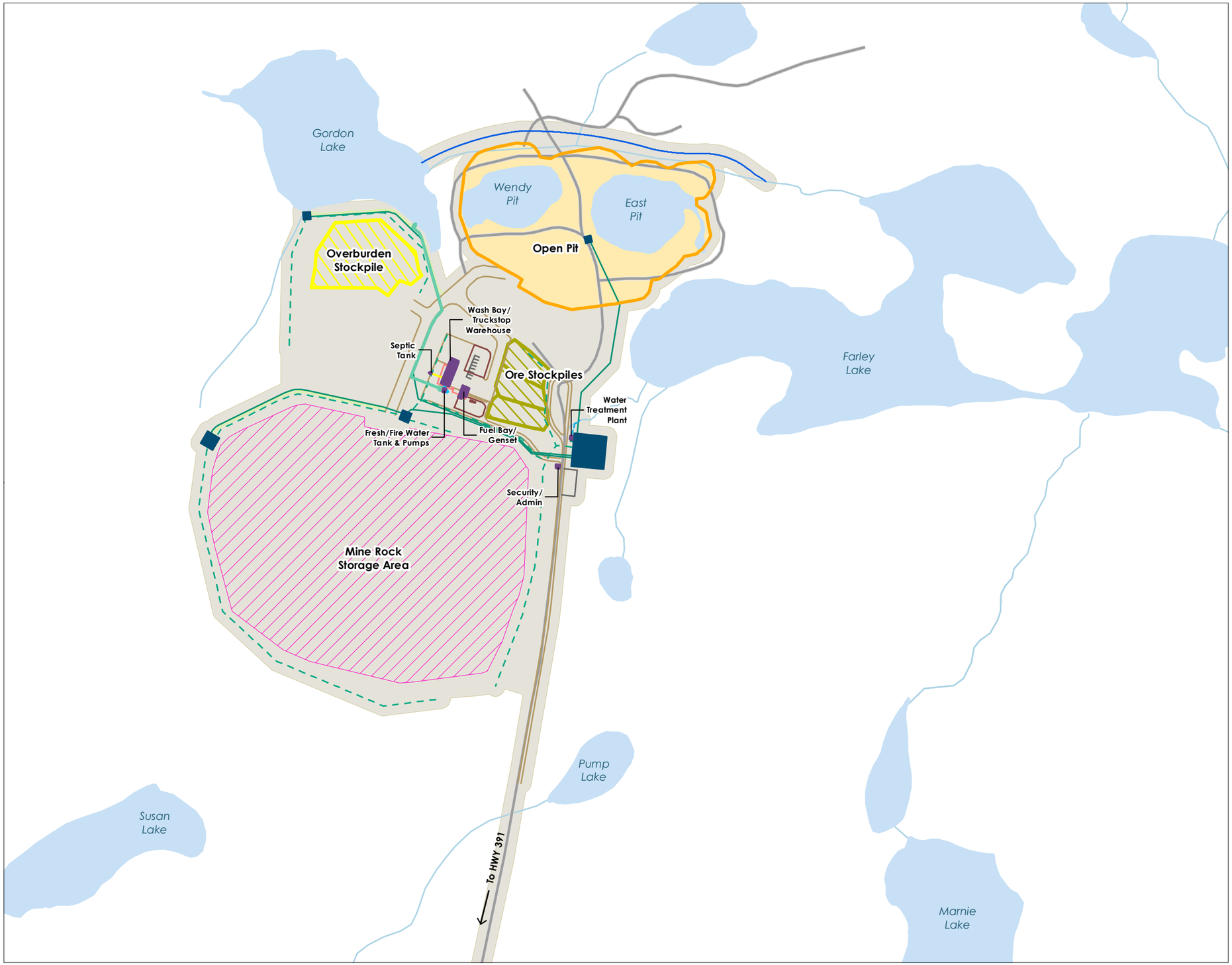
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
2

Title
NOA Footprint Files - Gordon site

G:\...GIS Project Folder\111473008 LLGP EA\admin\data_out\STANTEC\20250224 Catchments for AIA\111473084_LLGP_Gordon Updated Layout with NOA_PDA_20250512.mxd Revised: 2025-05-22 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

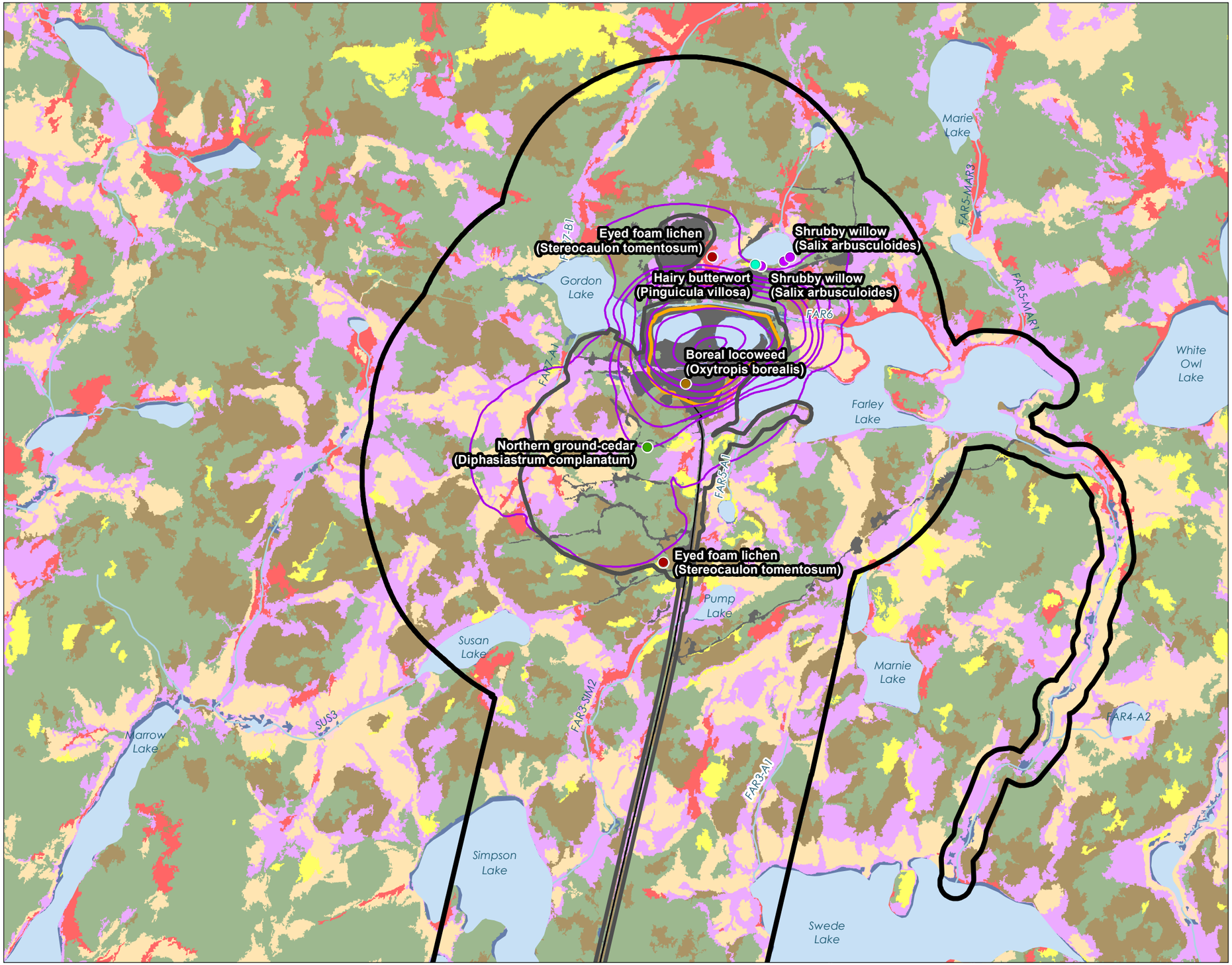
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473008

Map No.
3

Title
EIS Footprint (PDA)
- Gordon site

G:_GIS Project Folders\111473008 LGP EA Maps\Ch2 Project Description\For ReviewWsp21_PD_GordonDevelopment 20201117.mxd — Revised: 2020-05-11 By: ACampigotto



Stantec

Project Infrastructure

- Open Pit
- Project Development Area

Study Area

- Vegetation and Wetlands Local Assessment Area (LAA)

Survey Locations

- Predicted Water Table Drawdown Contours

SOCC Locations

- Shrubby Willow *(Salix arbusculoides)*
- Boreal locoweed (Oxytropis borealis)
- Eyed foam lichen *(Stereocaulon tomentosum)*
- Hairy butterwort *(Pinguicula villosa)*
- Northern ground-cedar *(Diphasiastrum complanatum)*

Land Use/Land Cover

- Barren
- Coniferous
- Deciduous
- Mixedwood
- Shrubland
- Water
- Bog
- Fen
- Marsh
- Swamp
- Development

Landbase

- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2025-05-15
Technical Review by NKearns on 2025-05-15

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
4

Title
Area of Potential Indirect Wetland Affects from Groundwater Drawdown - Gordon Site

Revised: 2025-05-15 By: ACampigotto

G:_GIS_Project Folder\111473008 LLGP EA\IRs\IR #2_109 UUC_GW drawdown\NOA Update\UUC Vegetation LAA with updated Mos_GW_drawdown_Gordon_20250508.mxd

Appendix B Summary of Light Modelling Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Stantec

Memo

To:	Alamos Gold Inc.	From:	Stantec Consulting Ltd.
Project/File:	111473076.301.104	Date:	June 19, 2025

Reference: Summary of Light Modelling Results for the Lynn Lake Gold Project Revised 2023 Mine Design

The Lynn Lake Gold Project (LLGP; the Project) consists of two primary deposit sites, the MacLellan site and Gordon site, which are both located near the Town of Lynn Lake, Manitoba. Alamos Gold Inc. (Alamos) will construct (redevelop), operate and eventually close/reclaim open-pit gold mines at both historical mine sites. The Project will be built as two open pit mines with a centralized processing plant facility and a tailings management facility (TMF). The processing plant, located at the MacLellan site has an expected nominal processing throughput of 8,000 tonnes/day with an estimated 17-year production life.

Stantec Consulting Ltd. (Stantec) completed an Environmental Impact Statement (EIS) for the Project that included Light as a Valued Component (Stantec 2020). The EIS was completed to fulfill a requirement of the "Guidelines for the Preparation of an Environmental Impact Statement" (2017) pursuant to the *Canada Environmental Assessment Act* (2012) for the Project. The assessment provides an overview of the existing conditions in the Project area and identifies the changes in ambient light at key receptor locations for the Project to determine potential residual and cumulative changes to lighting in support of the EIS.

The Project was approved under the *Canadian Environmental Assessment Act* (2012) with a federal Decision Statement issued March 5, 2023 (subsequently revised July 28, 2024). It was approved under *The Environment Act* of Manitoba with two provincial licences issued March 6, 2023 (Licence No. 3390 relating to the Gordon site and Licence No. 3391 relating to the MacLellan site).

Since Project approval, Alamos has completed a 2023 Feasibility Study Update (FSU) NI 43-101 Technical Report (Alamos 2023) that includes design updates. The design updates include, but are not necessarily limited to the following:

- The processing plant and TMF at the MacLellan site
- General infrastructure at both sites; and
- Major development area layouts.

Stantec has been engaged by Alamos to prepare an update of the light assessment for the Project based on the 2023 Feasibility Study Update or FSU. This update includes a review of the changes to the Project design, and changes/updates to the light model to assess how these Project design changes may affect the conclusions of the light assessment completed back in 2020. This memo summarizes the findings and results of the light assessment updates for the Project.

1 Summary of Major Changes to Project Design

Stantec reviewed and compared the Project design parameters for 2019, and the update published in 2023. Mine design changes, relevant to lighting, are based on the following design information provided by Alamos for the Project:

- Feasibility Study Update, NI 43-101 Technical Report for the Lynn Lake Project. Issue date: August 22, 2023 (Alamos 2023).
- Updated lighting plan design documents (Worley 2024; pers comm 2024).

The lighting design at the Gordon site has not been updated. Since the lighting design used for the original assessment for Gordon was based on conservative assumptions that are likely to overestimate the lighting required for mining, the initial lighting assessment at Gordon is still considered representative of the final design.

The lighting design at the MacLellan site includes refined designs for the parking area, process area, and primary crushing area. Marked up drawings of the luminaires for these areas as provided by Worley are provided in Appendix A. The exterior lighting design is still being finalized at the MacLellan site, and therefore lighting designs have not been updated for the administrative building, warehouse, assay lab, truck shop, and truck wash area. In these cases, the previous lighting design was also based on conservative assumptions for the anticipated lighting requirements for the activities occurring in those areas, and so the previous lighting design for those areas was still considered representative of the final design (pers comm 2024).

A summary of the relevant changes to the lighting design at MacLellan is listed as follows:

- The parking lot to the north of the process area required a re-alignment of the parking spaces and resulted in a relocation of the luminaires.
- The updated design of the process area shifted a conveyor system and refined the lighting plan for the Fine Ore Bin, Leach Tanks, Oxygen Plant, Thickener, and Primary Crushing. The updated lighting plan resulted in changes in the location and type of some luminaires in those areas.

2 Lighting Modelling Update Results

The light modelling methodology used to assess the potential effects of the 2023 design changes on lighting noted above is identical to the methodology used in the EIS (Stantec 2020). Light modelling focused on changes in illuminance and glare for nearby receptors. The changes in illuminance and glare were assessed using criteria established by the Commission Internationale de l'Éclairage (CIE 2017). A summary of the guideline levels for light trespass and glare are provided in Table 1. The threshold for glare is based on distance between the source and receptor and so the glare threshold in Table 1 is related to the nearest receptor location (Receptor 87).

Table 1 Guideline Threshold Criteria for Lighting Assessment (Based on CIE 2017)

Threshold	Value
Light Trespass	1 lux
Glare *	754 cd

Note:

* The threshold for glare is related to the distance between the source and receptor and so the value shown is based on the distance between the nearest luminaire and Receptor 87

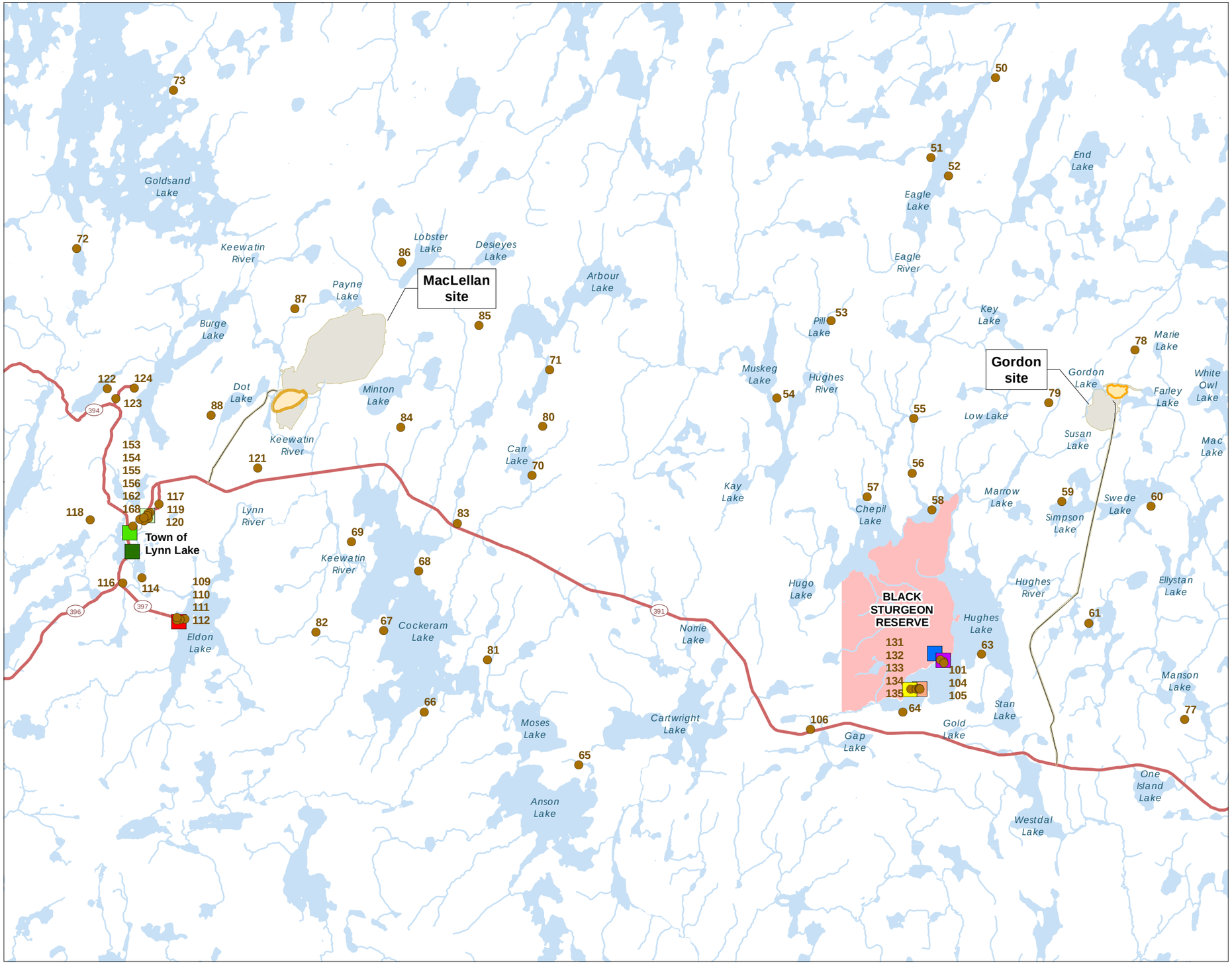
Nearby receptors are shown in Figure 1 and are the same as those considered in the EIS (Stantec 2020). Figure 1 includes receptors that are nearby but that do not have a direct line of sight to project components. Only receptors with a direct line of sight to project components were included in the light modelling update.

A summary of the modelling results for light trespass and glare is provided in Table 2. Light levels were still predicted to be low at nearby receptors. Receptor 87 was predicted to have some glare; however the glare value was still well below the CIE threshold.

The updated lighting design is therefore predicted to comply with the guideline levels for trespass and glare established by the CIE.

Table 2 Predicted Levels of Light Trespass and Glare at nearby Receptors

Receptor ID	Light Trespass (lux)	Glare (cd)
84	<0.0001	<0.001
85	<0.0001	<0.001
86	<0.0001	<0.001
87	0.0002	12
88	0.0001	<0.001
121	0.0005	<0.001
Cluster 1	<0.0001	<0.001
Cluster 2	0.0002	<0.001
Cluster 3	<0.0001	<0.001
Cluster 4	0.0001	<0.001
Cluster 5	0.0001	<0.001
Lynn Lake Cluster North	<0.0001	<0.001
Lynn Lake Cluster Central	<0.0001	<0.001
Lynn Lake Cluster South	<0.0001	<0.001



Project Infrastructure
- Proposed Open Pit
- Project Development Area

Receptors
- Individual Receptor

Receptor Groups
- Cluster 1
- Cluster 2
- Cluster 3
- Cluster 4
- Cluster 5
- Lynn Lake Cluster North
- Lynn Lake Cluster Central
- Lynn Lake Cluster South

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 2019-11-27
Technical Review by GHatcher on 2019-11-27
Senior GIS Review by XXxxxxxx on XXXX-xx-xx

Client/Project 111473073
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
1

Title
Receptor Locations Considered for Predictive Modelling

G:_GIS_Project Folder\111473908 - LGP EA\Figures\Chp_Atmospheric_Environment\TDR Report\ph1\Mxd\2-3 LGP_Rec appx locations_20191127.mxd Revised: 2019-12-04 By: ACampigotto

3 Conclusion

This update of the lighting assessment focused on the potential changes of the Project lighting effects due to the updated Project 2023 design during the operation phase. Changes to the Project design include updates to the parking and road access, along with the location and size of the main process area, the truck wash and truck shop, and the administration building. The lighting model for the operation phase of the Project was updated using the same approach and receptor locations as the previous Stantec 2020 assessment.

The predicted lighting levels from the updated project activities are not expected to change significantly from the previous assessment completed in 2020. Further, the estimated illuminance and glare are not predicted to exceed the guideline levels recommended by the Commission International de l'Éclairage. **In conclusion, the results of the updated lighting assessment do not change the characterization of residual effects, or the significance ratings summarized as presented in the EIS (Stantec 2020).**

4 Limitations and Sign-off

This document entitled was prepared by *Stantec Consulting Ltd.* ("Stantec") for the account of *Alamos Gold Inc.* (the "Client") to support the permitting process for its Lynn Lake Gold Project (the "Project"). In connection therewith, this document may be reviewed and used by the *Impact Assessment Agency of Canada* and *Manitoba Conservation and Climate* participating in the review process in the normal course of its duties. Except as set forth in the previous sentence, any reliance on this document by any other party or use of it for any other purpose is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The information and conclusions in the document are based on the conditions existing at the time the document was published and does not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by the Client or others, unless expressly stated otherwise in the document. Any use which another party makes of this document is the responsibility and risk of such party. Such party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other party as a result of decisions made or actions taken based on this document.

Reference: **Summary of Light Modelling Results for the Lynn Lake Gold Project Revised 2023 Mine Design**

If you have any questions or require additional information, please do not hesitate to contact us

Regards,

Stantec Consulting Ltd.

Prepared by: Digitally signed by Bylhouwer, Brian Date: 2025.06.20 08:55:12 -03'00'

Signature

Brian Bylhouwer

Printed Name

Reviewed by: Digitally signed by Murphy, Mike (Charlottetown) Date: 2025.06.20 09:13:28 -03'00'

Signature

Michael Murphy, Ph.D., P.Eng.

Printed Name

Approved to transmit by: Digitally signed by Mathers, Karen Date: 2025.06.20 09:24:53 -05'00'

Signature

Karen Mathers

Printed Name

5 References

Alamos. 2023. Feasibility Study Update (FSU). NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada. August 22, 2023.

Pers comm. 2024. November 1 and November 11, 2024 email correspondence from Robert Halas, (Alamos Gold Inc. Sr. Project Engineer, Lynn Lake, Projects) to Karen Mathers (Stantec Senior Principal - Environmental Services).

Stantec (Stantec Consulting Inc.). 2020. Lynn Lake Gold Project Environmental Impact Statement, May 2020.

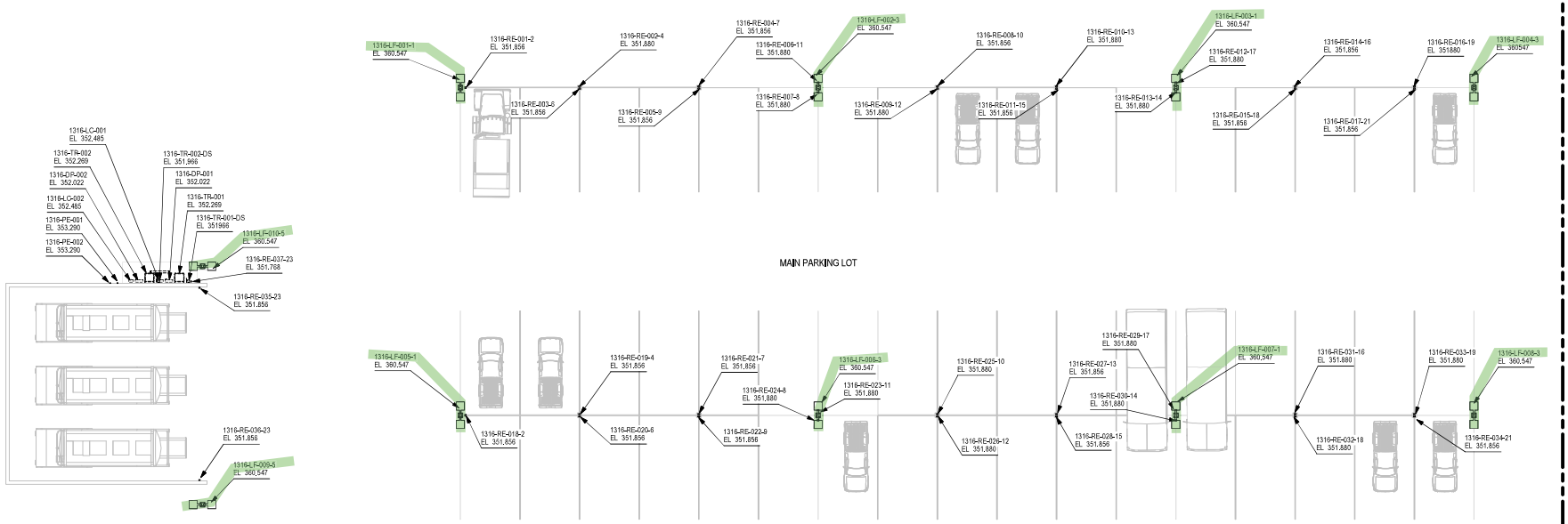
Worley 2024. AGL Design Review Navisworks Drawing.

Reference: Summary of Light Modelling Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Appendix A Updated Light Plans from Worley

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DD-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER PART NUMBERS SPECIFIED ON DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.



EQUIPMENT BILL OF MATERIALS

ITEM	DESCRIPTION	QTY.
1	LIGHTING CONTROL PANEL, 30A, 120V, 60Hz, GE #CR463L60AJA20A0	2
	1316-LC-001	1
	1316-LC-002	1
2	LIGHTING PANEL, 30CCTs, 208Y/120V, 60Hz	2
	1316-DP-001	1
	1316-DP-002	1
3	LIGHTING TRANSFORMER, 45kVA, 600/208Y-120V, DRY TYPE, 3Ph, 6-Hz	2
	1316-TR-001	1
	1316-TR-002	1
4	SAFETY SWITCH, 60A, 600V, 3Ph, EATON #DH362UWKW	2
	1316-TR-001-DS	1
	1316-TR-002-DS	1

LIGHTING AND RECEPTACLE BILL OF MATERIALS

Item	TAG NUMBER	QTY.	UNIT	Tag Number
1	1316-RE-001-2, 1316-RE-002-4, 1316-RE-003-6, 1316-RE-004-7, 1316-RE-005-9, 1316-RE-006-11, 1316-RE-007-8, 1316-RE-008-10, 1316-RE-009-12, 1316-RE-010-13, 1316-RE-011-15, 1316-RE-013-14, 1316-RE-014-16, 1316-RE-015-18, 1316-RE-016-19, 1316-RE-017-21, 1316-RE-018-2, 1316-RE-019-4, 1316-RE-020-6, 1316-RE-21-07, 1316-RE-022-9, 1316-RE-023-11, 1316-RE-024-8, 1316-RE-025-10, 1316-RE-026-12, 1316-RE-027-13, 1316-RE-028-15, 1316-RE-029-17, 1316-RE-030-14, 1316-RE-031-16, 1316-RE-032-18, 1316-RE-033-19, 1316-RE-034-21, 1316-RE-035-23, 1316-RE-036-23, 1316-RE-037-23	37	ea.	2-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX6200
2	1316-LF-001-1, 1316-LF-002-3, 1316-LF-003-1, 1316-LF-004-3, 1316-LF-005-1, 1316-LF-006-3, 1316-LF-007-1, 1316-LF-008-3, 1316-LF-009-5, 1316-LF-010-5	10	ea.	LED STREET LIGHT, 2x(58W, 120V, 400K, 3967lLUM). COOPER #GLEON-SA6C-740-U-T-QM-ISK, w/ POLE #R556M30SY22X
3	1316-PE-001, 1316-PE-002	2	ea.	PHOTOCELL, 3.3A, 120V, 60Hz, CROUSE-HINDS #D2520

DRAFT

REV	DATE (DD/MMM/YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
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A1 SHEET SCALE 1:150

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
MAIN PARKING LOT
LIGHTING, RECEPTACLE AND EQUIPMENT PLAN

DRG No LLGP-1316-EL-DAL-0031 REV A

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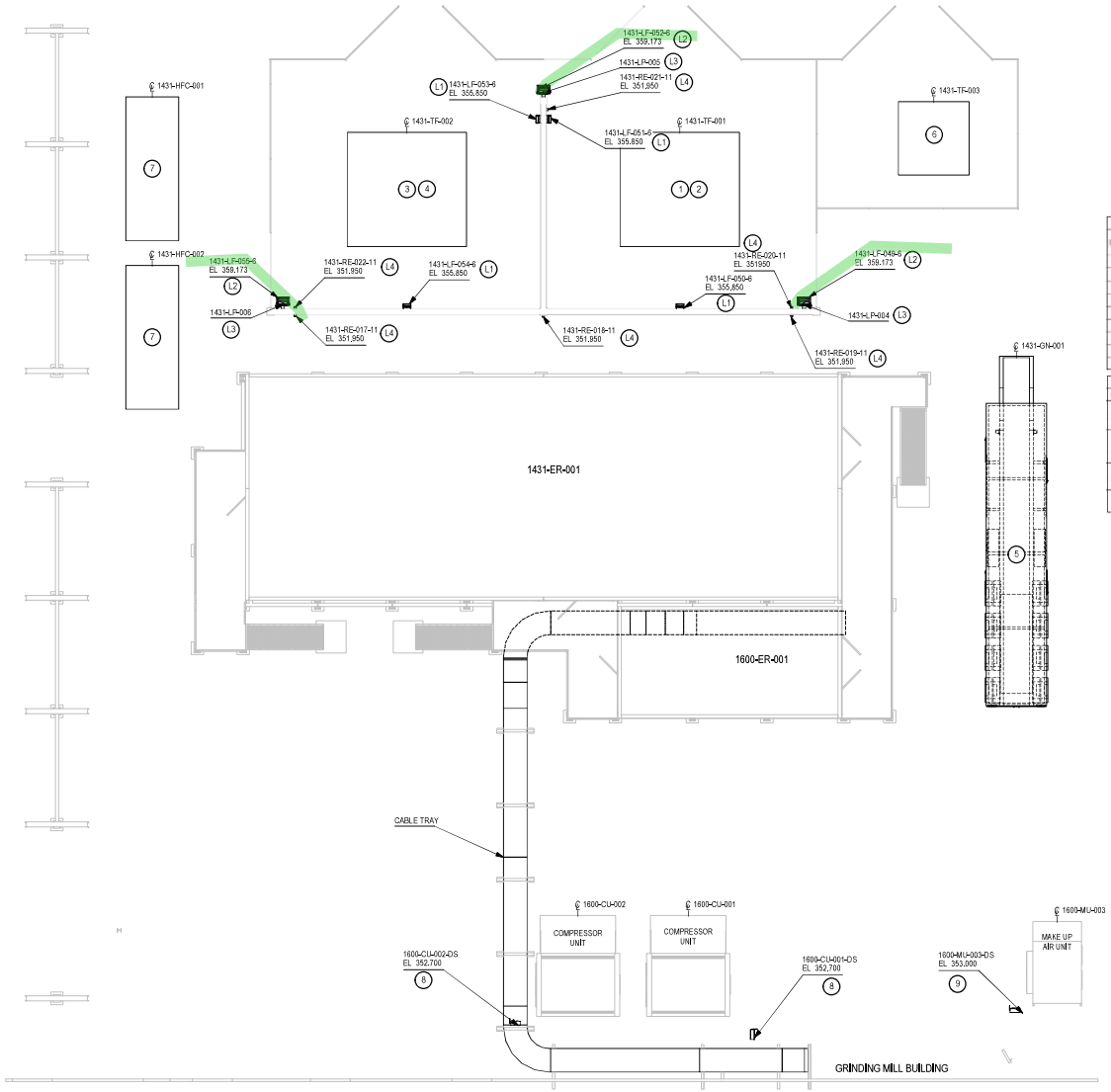
SAVE DATE & TIME: 9 Jul 2024 08:31:34



NOTES:

1. FOR STANDARD ELECTRICAL NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. FOR STANDARD EQUIPMENT NOTES SEE DRAWING LLGP-0000-EL-DAL-0001 THRU 0006
3. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
4. ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
5. CONTRACTOR MAY USE MANUFACTURER PART NUMBERS SPECIFIED ON THE DRAWING OR APPROVED EQUAL.
6. ALL MATERIALS FOR OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENTS AND 316L STAINLESS STEEL OR FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
8. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.

EQUIPMENT LIST

ITEM	TAG NUMBER	QTY	DESCRIPTION	WEIGHT (kg)	HEAT DISSIPATION (kw)	DIMENSIONS (mm, WxDxH)
1	1431-TF-001	1	LIQUID IMMERSED POWER TRANSFORMER, 25/33MVA, ONAN/ONAF, 34.5/13.8kV, 3Ph, 60Hz	2600	4.25	2400x1400x2350
2	1431-NGR-001	1	NEUTRAL GROUNDING RESISTOR, 25A FOR 10 SECONDS, 15kV, BIL 95kV	44950	TBD	4800x4000x4500
3	1431-TF-002	1	LIQUID IMMERSED POWER TRANSFORMER, 25/33MVA, ONAN/ONAF, 34.5/13.8kV, 3Ph, 60Hz	TBD	TBD	TBD
4	1431-NGR-002	1	NEUTRAL GROUNDING RESISTOR, 25A FOR 10 SECONDS, 15kV, BIL 95kV	44950	TBD	4800x4000x4500
5	1431-GN-001	1	STANDBY DIESEL GENERATOR SET, 2MW, 600Vac GENERATOR, c/w 1200A CIRCUIT BREAKER.	TBD	TBD	TBD
6	1431-TF-003	1	DRY TYPE STEP-UP TRANSFORMER, 2.5MVA, 600V/13.8kV, 3Ph, 60Hz, OUTDOOR TYPE	7264	TBD	TBD
7	1431-HFC-001, 143-HFC-002	2	13.8kV HARMONIC FILTER & POWER FACTOR CORRECTION SET, 4.5MVA	TBD	TBD	TBD
8	1600-CU-001-DS, 1600-CU-002-DS	2	SAFETY SWITCH, 200A, 600V, 3Ph, EATON #DH364UWKW	TBD	TBD	TBD
9	1600-MU-003-DS	1	SAFETY SWITCH, 200A, 600V, 3Ph, EATON #DH364UWKW	TBD	TBD	TBD

LIGHTING BILL OF MATERIAL

ITEM	[illegible]	QTY	UNIT	DESCRIPTION
L1	1431-LF-053-6, 1431-LF-051-6, 1431-LF-053-6, 1431-LF-054-6	4		IWP WALL PACK LED, 6200 LUMEN, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED13
L2	1431-LF-049-6, 1431-LF-052-6, 1431-LF-055-6	3		FLOODLIGHT, 25500 lm LED, 239W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CRUISE HINES #FMM2SLC1-UNV176
L3	1431-LF-004, 1431-LF-005, 1431-LF-006	3		9' SPRING LIGHT POLE, C-R #WSH-6, #WHK-WG, & #LMB-FL-40
L4	1431-RE-017-11, 1431-RE-018-11, 1431-19-11, 1431-RE-020-11, 1431-RE-022-11	5		2-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200

DRAFT

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A1 SHEET SCALE 1:75

Worley

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
MAIN PLANT SUBSTATION (1431-ER-001)
& MAU ELECTICAL ROOM (1600-ER-001)
YARD EQUIPMENT & LIGHTING LAYOUTS

DRG No LLGP-1431-EL-DAL-0001 REV A

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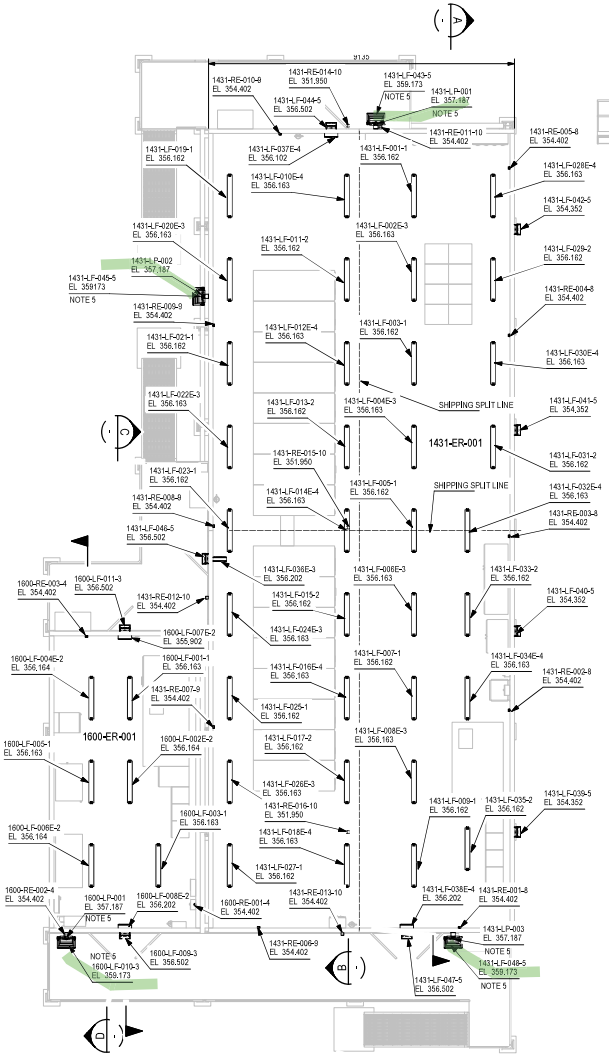
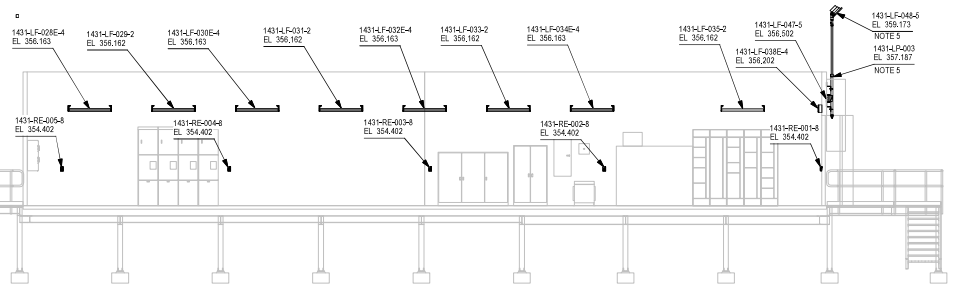


1431-ER-001 & 1600-ER-001 PLAN - LAYOUT

1:75



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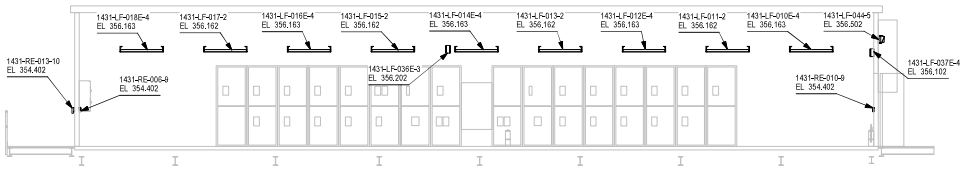
1431-ER-001



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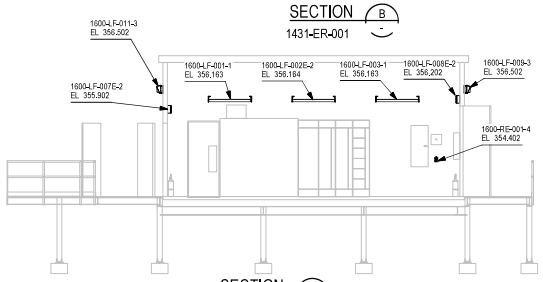

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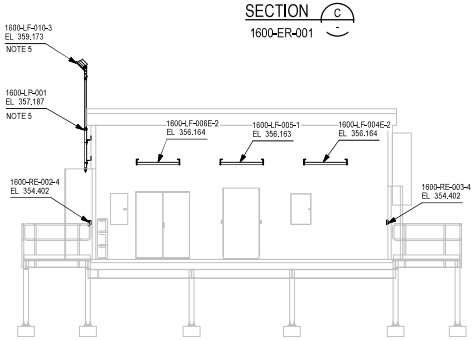


SECTION D
1600-ER-001

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING ARE PRILIMINARY ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.
3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL
4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVANENT.
5. LIGHT FIXTURES ARE NOT PART OF E-ROOM VENDOR PACKAGE AND WILL BE SUPPLIED AND INSTALLED AT SITE BY ELECTRICAL CONTRACTOR.

LIGHTING BILL OF MATERIAL

ITE	1600-ER-001 TAG NUMBERS	QT	UN	DESCRIPTION
1	1600-LF-001-1, 1600-LF-003-1, 1600-LF-005-1	3	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-5903-TF-EM1
2	1600-LF-002E-2, 1600-LF-004E-2, 1600LF-006E-2	3	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
3	1600-LF-009-3, 1600-LF-011-3	2	ea.	WP WALL PACK LED, 6200 lm, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED11
4	1600-RE-002-4	1	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
5	16000-RE-001-4, 1600-RE-003-4,	2	ea.	1-GANG RECEPTACLE, 20A, 120V, 60HZ
6	1600-LF-007E-2, 1600-LF-008E-2	2	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #LUX715D
7	1600-LF-010-3	1	ea.	FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PFMA25LCY-UNV176
8	1600-LP-001	1	ea.	V-SPRING LIGHT POLE, C-H #V65H-G, #MHK-WG, & #LMB-FL-40

1	[illegible]	[illegible]	ea.	[illegible] 3MTK & 90 MIN [illegible]
2	[illegible] 4, 1431-LF-020E-3, 1431-LF-022E-3, 1431-LF-024E-3, 1431-LF-026E-3, 1431-LF-028E-4, 1431-LF-030E-4, 1431-LF-032E-4, 1431-LF-034E-4	[illegible]	[illegible]	[illegible] w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
3	1431-LF-039-5, 1431-LF-040-5, 1431-LF-041-5, 1431-LF-042-5, 1431-LF-044-5, 1431-LF-046-5, 1431-047-5	7	ea.	WP WALL PACK LED, 6200 lm, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED15
4	1431-RE-011-10, 1431-RE-012-10, 1431-RE-013-10, 1431-RE-014-10	4	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
5	1431-RE-001-8, 1431-RE-002-8, 1431-RE-003-8, 1431-RE-004-8, 1431-RE-005-8, 1431-RE-006-9, 1431-RE-007-9, 1431-RE-008-9, 1431-RE-009-9, 1431-RE-010-9, 1431-RE-015-10	11	ea.	1-GANG RECEPTACLE, 20A, 120V, 60HZ
6	1431-LF-036E-3, 1431-LF-037E-4, 1431-LF-038E-4	3	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #LUX715D
7	1431-LF-043-5, 1431-LF-045-5, 1431-LF-048-5	3	ea.	FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PFMA25LCY-UNV176
8	1431-LP-001, 1431-LP-002, 1431-LP-003	3	ea.	V-SPRING LIGHT POLE, C-H #V65H-G, #MHK-WG, & #LMB-FL-40

DRAFT

1:75 0 750 1500 3000 4500 6000 7500mm

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1431-EL-DAL-0250	MAIN PLANT SUBSTATION & MAU ELECTICAL ROOM GROUNDING LAYOUT
B	10/04/24	REISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1431-EL-DAL-0200	MAIN PLANT SUBSTATION & MAU ELECTICAL ROOM EQUIPMENT LAYOUTS
A	23/02/24	ISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1431-EL-DAL-0210	MAIN PLANT SUBSTATION & ELETRICAL ROOM CABLE TRAY LAYOUTS

A1 SHEET SCALE 1:75

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

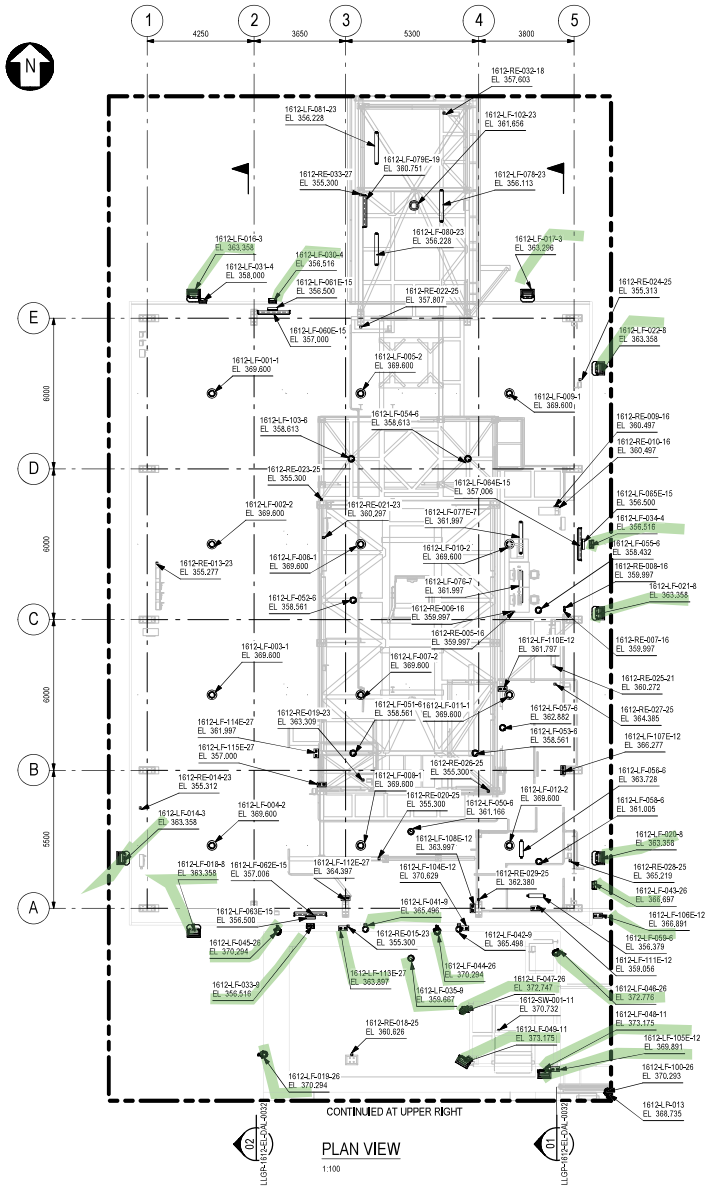
"This drawing is prepared solely for the use of the contracted customer of Worley Canada Services Ltd. (Worley) and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
MAIN PLANT SUBSTATION (1431-ER-001)
& MAU ELECTICAL ROOM (1600-ER-001)
LIGHTING LAYOUT & ELEVATIONS

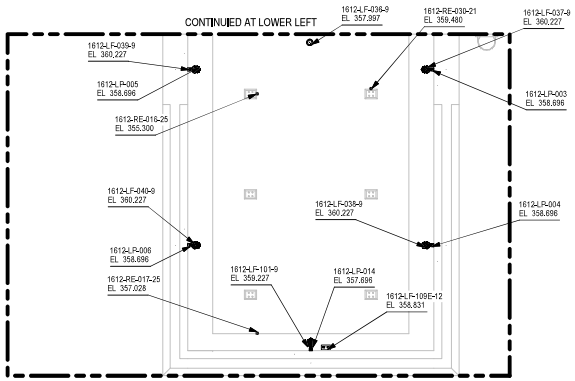
DRG No LLGP-1431-EL-DAL-0220 REV B

USER NAME: alexanderson
PLOT DATE & TIME: 29 Apr 2024 10:30:00
SAVE DATE & TIME: 19 Apr 2024 10:28:09



PLAN VIEW

1:100



DRAFT

0 1000 2000 4000 6000 8000 10000mm

1:100

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DIC-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVINIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.

ITEM	TAG NUMBER	QTY.	UNIT	DESCRIPTION
1	[illegible]	122	ea.	29000 lm LED, 208W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, PENDANT MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-15-2A-UNV1
2	[illegible]	71	ea.	1-GANG GFCI RECEPTACLE, 20A, 120V, 60HI
3	[illegible]	200	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MK3200
4	[illegible]	5	ea.	5250 lm LED, 28W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-3-UNV1
5	1612-LF-056-6, 1612-LF-059-6	2	ea.	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 33W, 120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL2-UNV1-5903-TF
6	1612-LP-001, 1612-LP-002, 1612-LP-003, 1612-LP-004, 1612-LP-005, 1612-LP-006, 1612-LP-008, 1612-LP-009, 1612-LP-010, 1612-LP-011, 1612-LP-012, 1612-LP-013, 1612-LP-014	13	ea.	V-SPRING LIGHT POLE, C-H #V65H-G, #MHK-RTG & JM5
7	1612-LF-103-6,1612-LF-051-6, 1612-LF-052-6, 1612-LF-053-6, 1612-LF-054-6, 1612-LF-055-6, 1612-LF-057-6, 1612-LF-058-6	7	ea.	5537 lm LED, 45W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-5-2C-UNV1
8	1612-LF-041-9, 1612-LF-042-9	2	ea.	5537 lm LED, 45W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, WALL MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-5-2STW-UNV1
9	1612-LF-060E-15, 1612-LF-062E-15, 1612-LF-064E-15	3	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W, 120V, 60Hi, c/w DP1052MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-5903-TF-EM1
10	1612-LF-077E-7, 1612-LF-079E-19	2	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W, 120V, 60Hi, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-5903-TF-EM1
11	1612-LF-076-7, 1612-LF-078-23, 1612-LF-080-23, 1612-LF-081-23,	4	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 84W, 120V, 60Hi, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
12	1612-LF-035-9, 1612-LF-036-9, 1612-LF-050-6, 1612-LF-037-9, 1612-LF-038-9, 1612-LF-039-9, 1612-LF-040-9, 1612-LF-047-26, 1612-LF-101-9,	9	ea.	9254 lm LED, 76W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-9-2C-UNV1
13	1612-LF-014-3, 1612-LF-016-3, 1612-LF-017-3, 1612-LF-018-8, 1612-LF-020-8, 1612-LF-021-8, 1612-LF-022-8, 1612-LF-048-11, 1612-LF-049-11,	9	ea.	FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, PURE MOUNTING, NEMA 4X, CROUSE-HINDS #PFM216LCV-UNV178
14	1612-LF-061E-15, 1612-LF-063E-15, 1612-LF-065E-15,	3	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX7150
15	1612-LF-104E-12, 1612-LF-105E-12, 1612-LF-106E, 1612-LF-107E-12, 1612-LF-108E-12,1612-LF-109E-12,1612-LF-110E-12,1612-LF-111E-12, 1612-LF-112E-27, 1612-LF-113E-27, 1612-LF-114E-27, 612-LF-115E-27	12	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x8W LED LAMP, 90 MINUTES BATTERY, CROUSE-HINDS #N2LPS12222 SS
16	1612-LF-102-23	1	ea.	13100 lm LED, 95W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSEHINDS #PVML-13-2C-UNV1
17	1612-LF-030-4, 1612-LF-031-4, 1612-LF-033-9,1612-LF-034-4, 1612-LF-043-26	5	ea.	WP WALL PACK LED, 6200 lm, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED15
18	1612-SW-001-11	1	ea.	LIGHT SWITCH, 1 POLES, 15A

REV	DATE (D.MMM.Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
C	29 Apr 24	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1612-EL-LST-0001	LIGHTING PANEL SCHEDULE AND WIRING DIA
B	3 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1612-EL-DAL-0051	PRIMARY CRUSHER GROUNDING LAYOUT
A	26 Jul 2023	ISSUED FOR INTERNAL REVIEW	AW	FO	SH	ES	YM		LLGP-1612-EL-DAL-0032	PRIMARY CRUSHER LIGHTING SECTIONS

A1 SHEET SCALE 1:100

Worley

WORLEY PROJECT No.
317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
PRIMARY CRUSHER
LIGHTING
LAYOUT

DRG No LLGP-1612-EL-DAL-0031

REV C

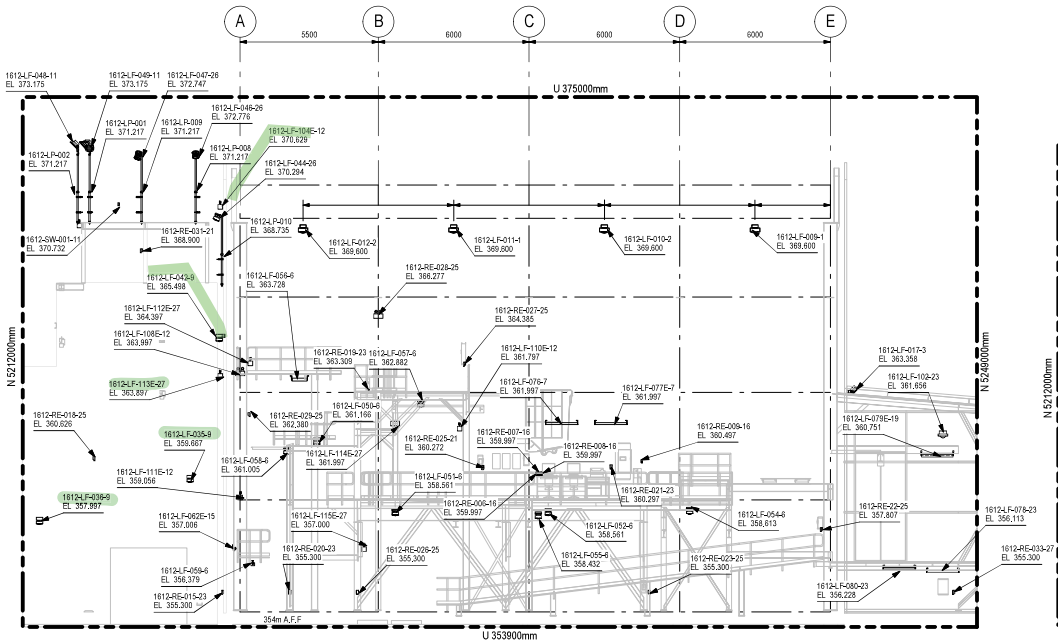
USER NAME: alexanderm

PLOT DATE & TIME: 3 May 2024 10:42:26

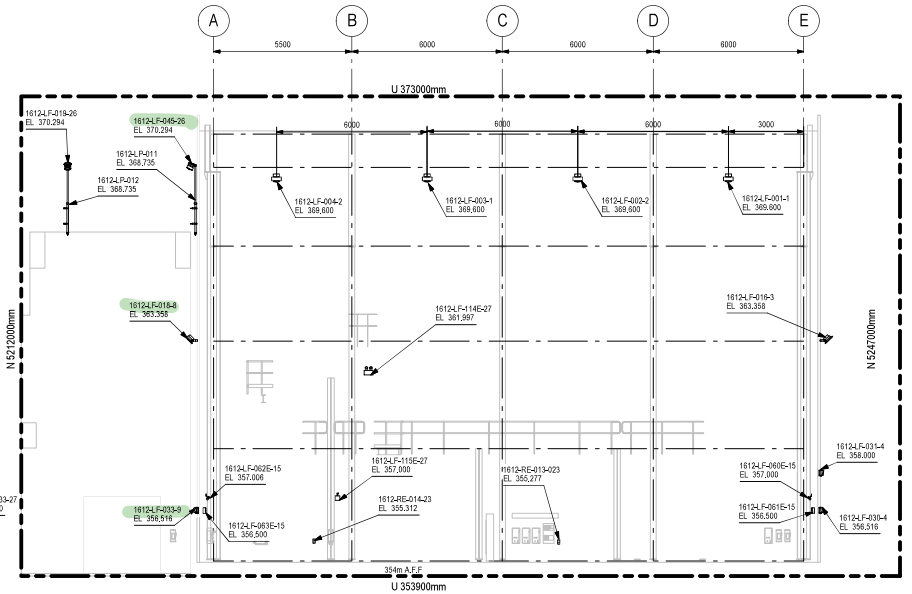
SAVE DATE & TIME: 3 May 2024 10:43:31

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVINIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.



SECTION 01
LLGP-1612-EL-DAL-0031



SECTION 02
LLGP-1612-EL-DAL-0031

DRAFT

1:100 0 1000 2000 4000 6000 8000 10000mm

REV	DATE (DD/MMM/YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
C	29 Apr 24	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1612-EL-LST-0001	LIGHTING PANEL SCHEDUKE AND WIRING DIA.
B	6 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1612-EL-DAL-0051	PRIMARY CHRUSHER GROUNDING LAYOUT
A	26 Jul 2023	ISSUED FOR INTERNAL REVIEW	AW	FO	SH	ES	YM		LLGP-1612-EL-DAL-0031	PRIMARY CRUSHER LIGHTING LAYOUT

A1 SHEET SCALE 1:100

Worley

WORLEY PROJECT No.
317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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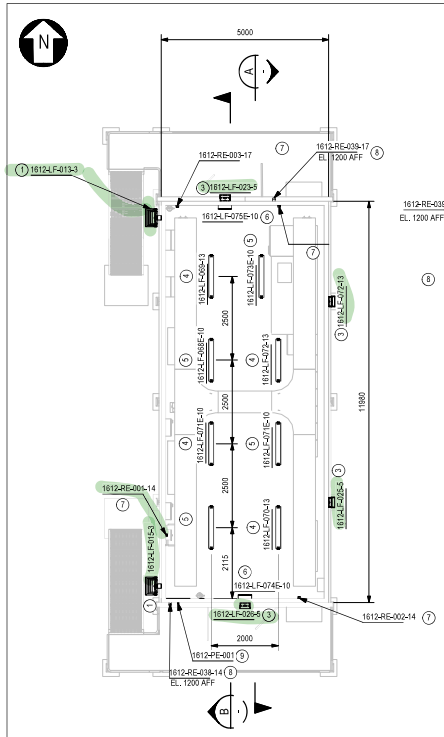
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
PRIMARY CRUSHER
LIGHTING
SECTIONS

DRG No LLGP-1612-EL-DAL-0032

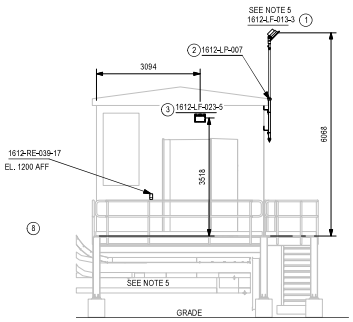
REV C

USER NAME: alexwatson
PLOT DATE & TIME: 3 May 2024 10:31:09
SAVE DATE & TIME: 3 May 2024 10:31:09



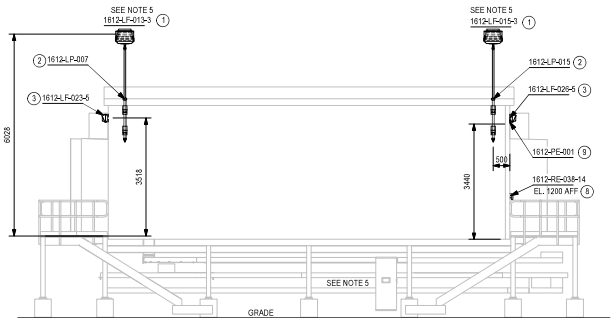
LIGHTING LAYOUT INSIDE E-ROOM - PLAN

1:75



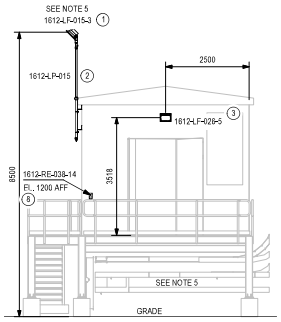
ELEVATION - NORTH VIEW

1:75



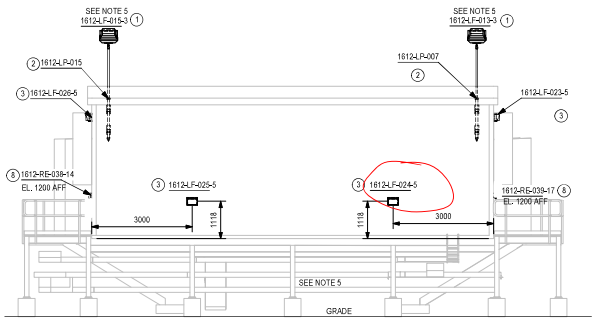
ELEVATION - WEST VIEW

1:75



ELEVATION - SOUTH VIEW

1:75



ELEVATION - EAST VIEW

1:75

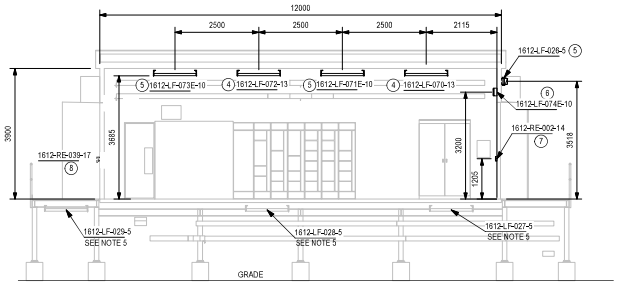
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING IS INDICATIVE ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.
3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL
4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVALENT.
5. LIGHT FIXTURES AND RECEPTACLE ARE NOT PART OF E-ROOM VENDOR PACAKAGE AND WILL BE SHIPPED LOOSE TO BE INSTALLED ON SITE BY ELECTRICAL CONTRACTOR.

LIGHTING BILL OF MATERIAL

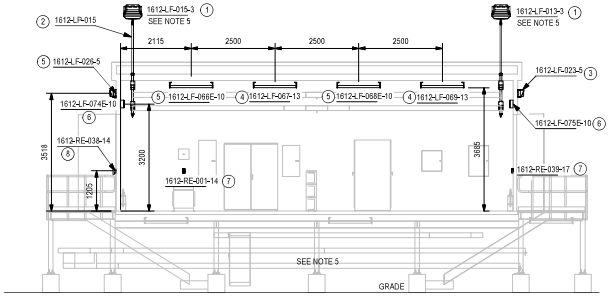
ITEM	TAG NUMBER	QTY	DESCRIPTION
1	1612-LF-013, 1612-LF-015	2	FLOODLIGHT, 26600 lm LED, 218W, 120V, 60Hz, 5000K CCRI, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #FFMA25LY UNV1 F5
2	1612-LP-007, 1612-LP-015	2	V-SPRING LIGHT POLE, C.H. #WSH-G, #MHK-INT, & (6) MH F1-4)
3	1612-LF-023, 1612-LF-023, 1612-LF-024, 1612-LF-025, 1612-LF-026	4	IMP WALL PACK LED, 5280 LUMEN, 50W, 120V, 60Hz, 5000K CCRI, NEMA 4X, COOPER #IPMLED15
4	1612-LF-027, 1612-LF-028, 1612-LF-029, 1612-LF-067, 1612-LF-068, 1612-LF-070, 1612-LF-072,	4	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 60W, 120V, 60Hz, UW DP1S52MTK KIT, CROUSE-HINDS #PLL4-UNV1-5963 TF
5	1612-LF-068E, 1612-LF-068E, 1612-LF-07IE, 1612-LF-073E	4	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W, 120V, 60Hz, UW DP1R58MTK & (8) MINUTE BATTERY MODULE, CROUSE-HINDS #PLL4 UNV1 5963 TF EM1
6	1612-LF-074E, 1612-LF-074E	2	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, UW NICKEL CADMIUM BATTERY, CROUSE-HINGS #LEX7SD
7	1612-RE-001, 1612-RE-002, 1612-RE-003, 1612-RE-004	4	1-GANG RECEPTACLE, 20A, 120V, 60Hz
8	1612-RE-038, 1612-RE-039	2	1-GANG WATERPROOF GFCI RECEPTACLE, 125V, 20A, HEAVY DUTY DIE-CAST AL IRON & CONFER, HUBBELL TAYMAC MX2200
9	1612-PE-001	1	PHOTOCELL, 3.3A, 120V, 60Hz, CROUSE-HINDS #DSH

DRAFT



SECTION A

1:75



SECTION A

1:75

0 750 1500 3000 4500 6000 7500mm

1:75

REV	DATE (YYYY/MM/DD)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
B	7/04/23	RE-ISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1612-EL-DAL-0210	PRIMARY CRUSHER AREA ELEC, RM, 16120ER-001 CABLE TRAY LAYOUT
A	20/12/23	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM	GD	LLGP-1612-EL-DAL-0200	PRIMARY CRUSHER AREA ELEC, RM, 16120ER-001 EQUIPMENT LAYOUT

A1 SHEET SCALE 1:75

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
PRIMARY CRUSHER AREA
ELECTRICAL ROOM 1612-ER-001
LIGHTING LAYOUT

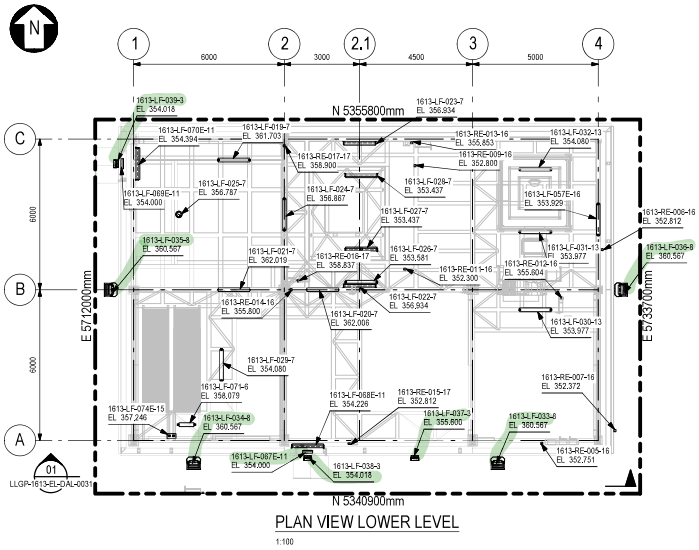
DRG No LLGP-1612-EL-DAL-0220

REV B

USER NAME: sbarnes3ck
PLOT DATE & TIME: 29 Apr 2024 09:37:11
SAVE DATE & TIME: 11 Apr 2024 09:27:11

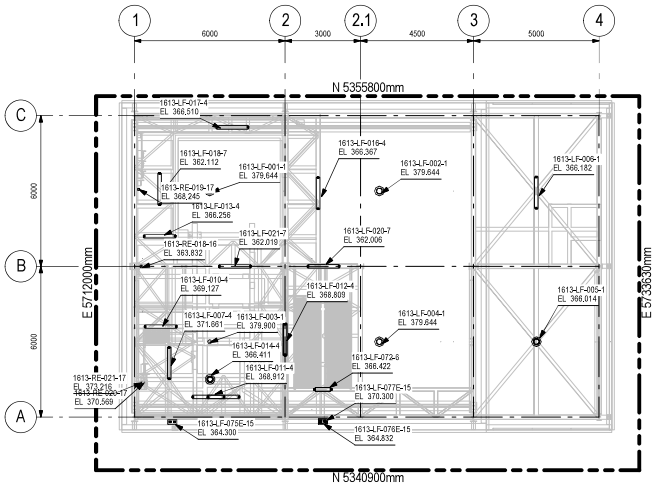
NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVINIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.



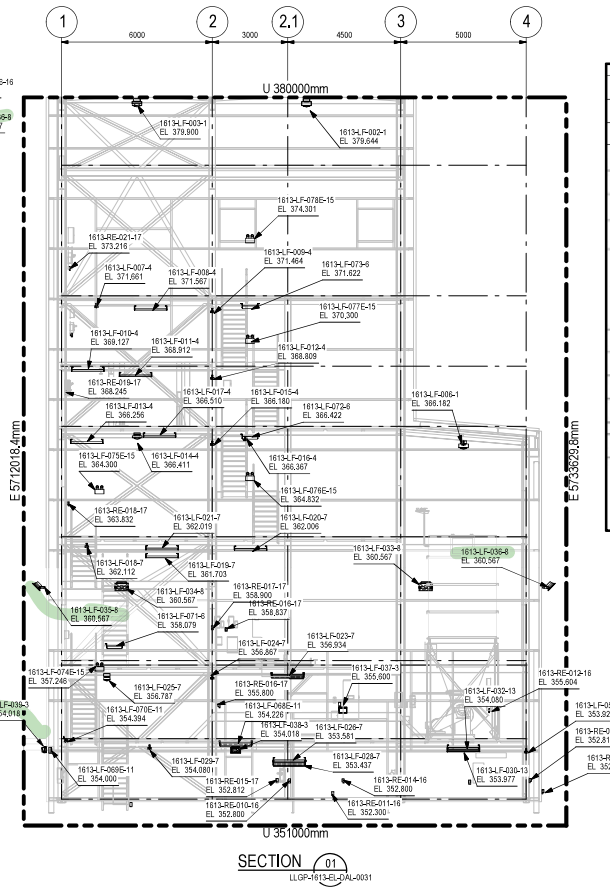
PLAN VIEW LOWER LEVEL

1:100



PLAN VIEW UPPER LEVEL

1:100



SECTION 01 LLGP-1613-EL-DAL-0031

ITEM	TAG NUMBER	QTY.	UNIT	DESCRIPTION
1	1613-LF-003-1	1	ea.	13100 lm LED, 95W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PMWL 23 2C UNV3
2	1613-LF-014-2	1	ea.	17800 lm LED, 147W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PMWL 27 2C UNV3
3	1613-LF-001-1, 1613-LF-002-1, 1613-LF-004-1, 1613-LF-005-1	4	ea.	25000 lm LED, 206W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PMWL 35 2C UNV3
4	1613-LF-071-14, 1613-LF-072-14, 1613-LF-073-14	3	ea.	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 52W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL2-UNV1-5903-TF
5	1613-LF-068E-13, 1613-LF-070E-13	2	ea.	6730 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1052MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-5903-TF-EM1
6	1613-LF-057E-12	1	ea.	6730 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-5903-TF-EM1
7	1613-LF-022-3, 1613-LF-023-3, 1613-LF-027-3, 1613-LF-028-3	4	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1052MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
8	1613-LF-006-1, 1613-LF-007-2, 1613-LF-008-2, 1613-LF-009-2, 1613-LF-010-2, 1613-LF-011-2, 1613-LF-012-2, 1613-LF-013-2, 1613-LF-015-2, 1613-LF-016-2, 1613-LF-017-2, 1613-LF-018-3, 1613-LF-019-3, 1613-LF-020-3, 1613-LF-021-3, 1613-LF-024-3, 1613-LF-026-3, 1613-LF-029-3, 1613-LF-030-11, 1613-LF-031-11, 1613-LF-032-11	21	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
9	1613-LF-035-3	1	ea.	9234 lm LED, 76W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PMWL 35 2C UNV3
10	1613-LF-074E-15, 1613-LF-075E-15, 1613-LF-076E-15, 1613-LF-077E-15, 1613-LF-078E-15	5	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x3W LED LAMP, 90 MIN BATTERY MODULE, CROUSE-HINDS #NZLPS12222 SS
11	1613-LF-033-4, 1613-LF-034-4, 1613-LF-035-4, 1613-LF-036-4	4	ea.	FLOODLIGHT,25500 lm LED, 210W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PFMA25LCY-UNV176
12	1613-LF-067L-13, 1613-LF-069L-13	2	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX715D
13	1613-LF-001, 1613-LF-032	2	ea.	V-SPRING LIGHT POLE, C-H #V6SH-G, #BMHK-WG, & #LMB-FL-40
14	1613-LF-037-5, 1613-LF-038-5, 1613-LF-039-5	3	ea.	WP WALL PACK LED, 6200 lm, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED15
15	1613-RE-005-16, 1613-RE-006-16, 1613-RE-007-16, 1613-RE-009-16, 1613-RE-010-16, 1613-RE-011-16, 1613-RE-012-16, 1613-RE-013-16, 1613-RE-014-16, 1613-RE-015-17, 1613-RE-016-17, 1613-RE-017-17, 1613-RE-018-17, 1613-RE-019-17, 1613-RE-020-17, 1613-RE-021-17	16	ea.	1-GANG GFCI RECEPTACLE, 20A, 120V, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MK8200

DRAFT

0 1000 2000 4000 6000 8000 10000mm

1:100

REV	DATE (DD/MM/YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
C	20 May 24	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1613-EL-LST-0001	SECONDARY CRUSHER LIGHTING PANEL SCHEDULE & WIRING DIAGRAM
B	6 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1613-EL-DAL-0051	SECONDARY CRUSHER GROUNDING LAYOUT
A	26 Jul 2023	ISSUED FOR INTERNAL REVIW	AW	FO	SH	ES	YM		LLGP-1613-EL-DAL-0011	SECONDARY CRUSHER CABLE TRAY LAYOUT

A1 SHEET SCALE 1:100

Worley energy | chemicals | resources

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
SECONDARY CRUSHER & ELECTRICAL RM
LIGHTING
LAYOUTS AND SECTION

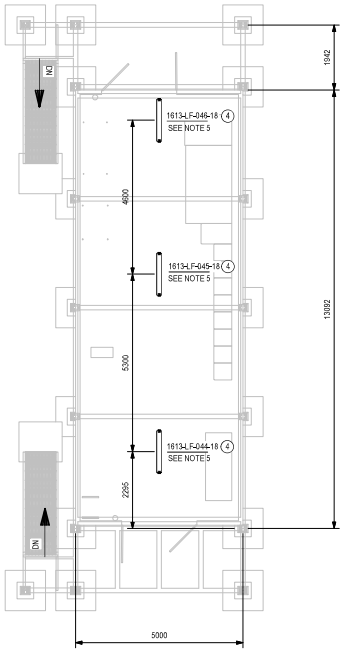
DRG No LLGP-1613-EL-DAL-0031 REV C

USER NAME: allevanson

PLOT DATE & TIME: 16 May 2024 08:18:13

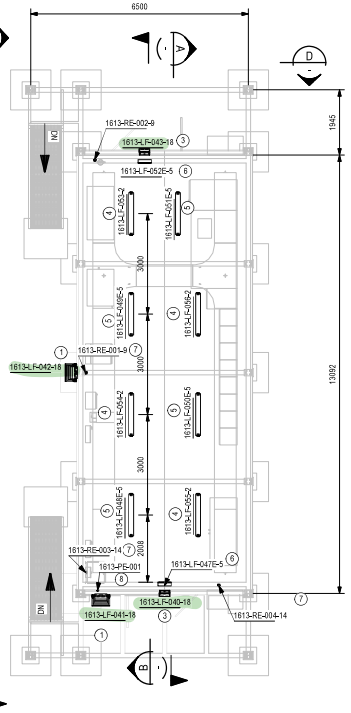
SAVE DATE & TIME: 16 May 2024 08:18:13

Worley_A1



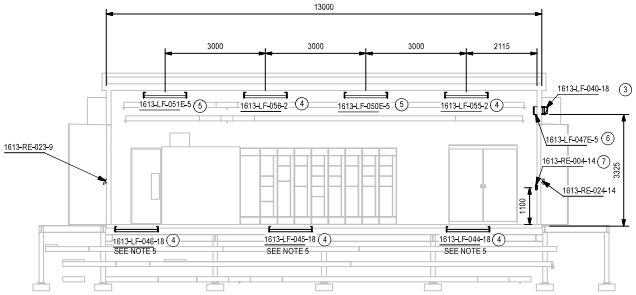
PLAN VIEW UNDER E-ROOM

1:75



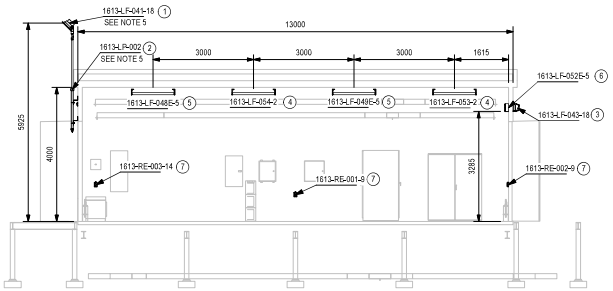
PLAN VIEW E-ROOM

1:75



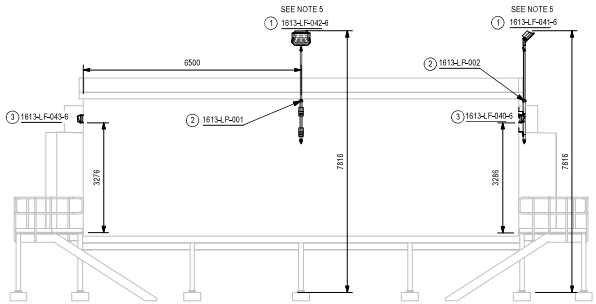
SECTION A

1:75



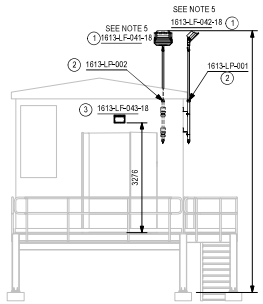
SECTION B

1:75



SECTION C

1:75



SECTION D

1:75

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING ARE PRELIMINARY ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.
3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL
4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVALENT.
5. LIGHT FIXTURES ARE PART OF E-ROOM VENDOR PACKAGE AND WILL BE SHIPPED LOOSE TO BE INSTALEED ON SITE BY ELECTRICAL AT SITE BY ELECTRICAL CONTRACTOR.

LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY.	DESCRIPTION
1	1613-LF-041,1613-LF-042	2	FLOODLIGHT, 25500 LUMEN LED, 216W, 120Vac, 60Hz, [illegible] White LIGHT, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS CHAMP FRO #PFMA25LCY-UNV1-76
2	1613-LP-001,1613-LP-002	2	V-SPRING LIGHT POLE, C-H #V65H-G, #M-K-WG, 6-ft, MH FI, 40
3	1613-LF-040-6,1613-LF-043-6	2	WP WALL PACK LED, 5250 LUMENS, 50W, 120V, 60Hz, [illegible] COOL, NEMA 4X COOPER #PWLED15
4	1613-LF-053,1613-LF-054,1613-LF-055,1613-LF-056	4	7500 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W, [illegible] #P1553MTK-KIT, CROUSE-HINDS #PLL4-UNV1-5965
5	1613-LF-044-6,1613-LF-045-6,1613-LF-046-6,1613-LF-053-6, 1613-LF-054-6,1613-LF-055-6,1613-LF-056-6	4	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W, 120V, 60Hz, [illegible] #P1553MTK-4 W MIN BATTERY MODULE, CROUSE-HINDS #PLL4-UNV1-5965 IF EM
6	1613-LF-049E,1613-LF-052E	2	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FAIL, 5W NICKEL CADMIUM BATTERY, CROUSE HINDS #UX71SD
7	1613-RE-001,1613-RE-002, 1613-RE-003, 1613-RE-004	4	2-GANG GFCI RECEPTACLE, 20A, 120V, 60Hz
8	1613-PE-001	1	PHOTOCELL, 3.3A, 120V 60Hz, CROUSE-HINDS #CD69

DRAFT

0 750 1500 3000 4500 6000 7500mm

1:75

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1613-EL-LST-0001	SECONDARY CRUSHER LIGHTING PANEL SCHEDULE & WIRING DIAGRAM
									LLGP-1613-EL-DAL-0051	SECONDARY CRUSHER E-ROOM 1613-ER-001 GROUNDING LAYOUT
B	09.04.24	RE-ISSUED FOR IIFMCR	AW	FO	SH	ES	YM		LLGP-1613-EL-DAL-0210	SECONDARY CRUSHER E-ROOM 1613-ER-001 TRAY LAYOUT
A	10.11.2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1613-EL-DAL-0200	SECONDARY CRUSHER E-ROOM 1613-ER-001 EQUIPMENT LAYOUT

A1 SHEET SCALE 1:75

Worley

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
SECONDARY CRUSHER AREA
ELECTRICAL ROOM 1613-ER-001
LIGHTING LAYOUT AND SECTIONS

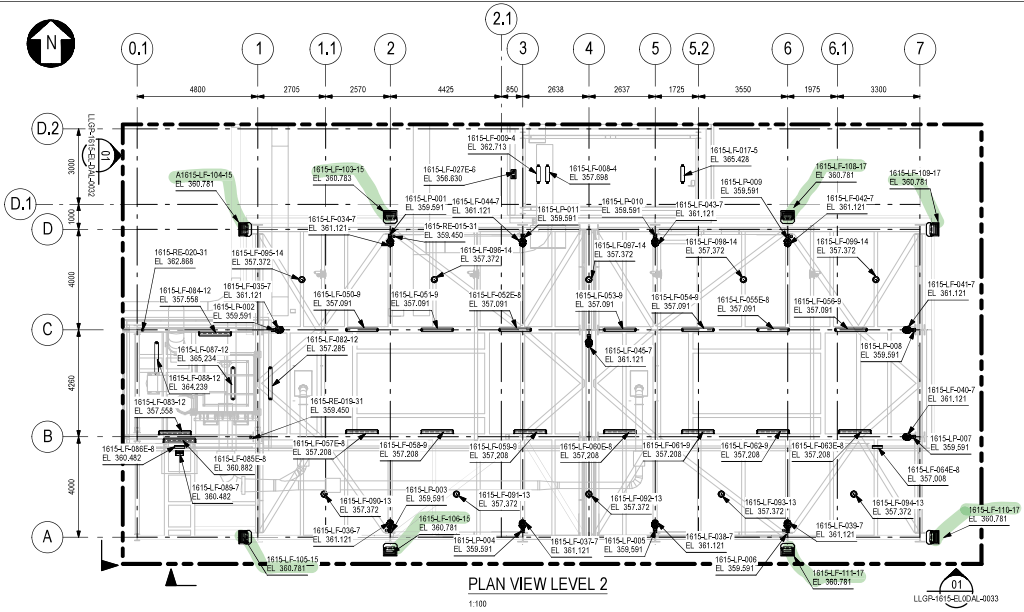
DRG No LLGP-1613-EL-DAL-0220

REV B

USER NAME: alexanderson

PLOT DATE & TIME: 29 Apr 2024 09:53:12

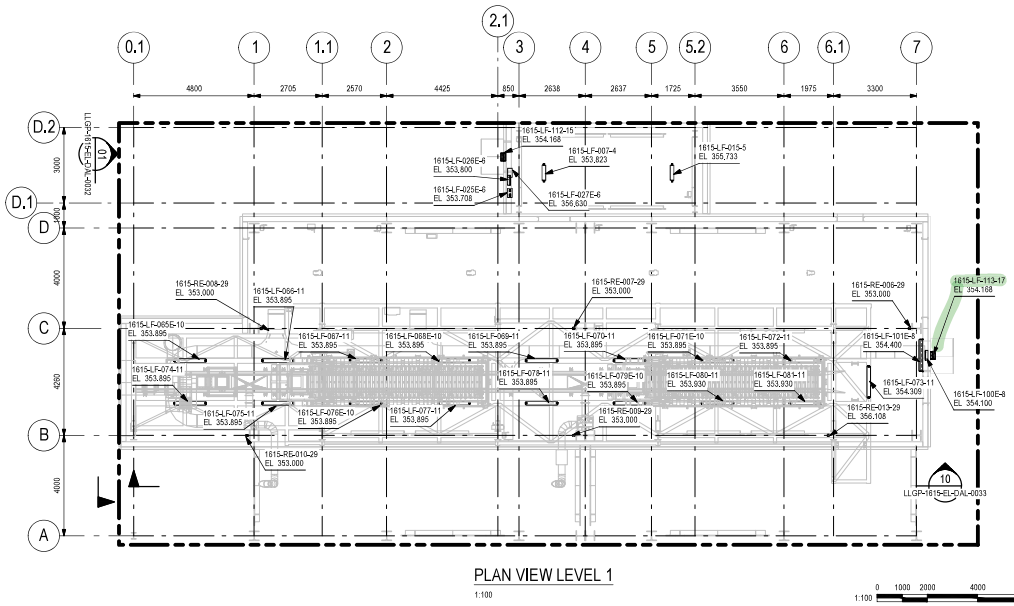
SAVE DATE & TIME: 11 Apr 2024 09:53:12

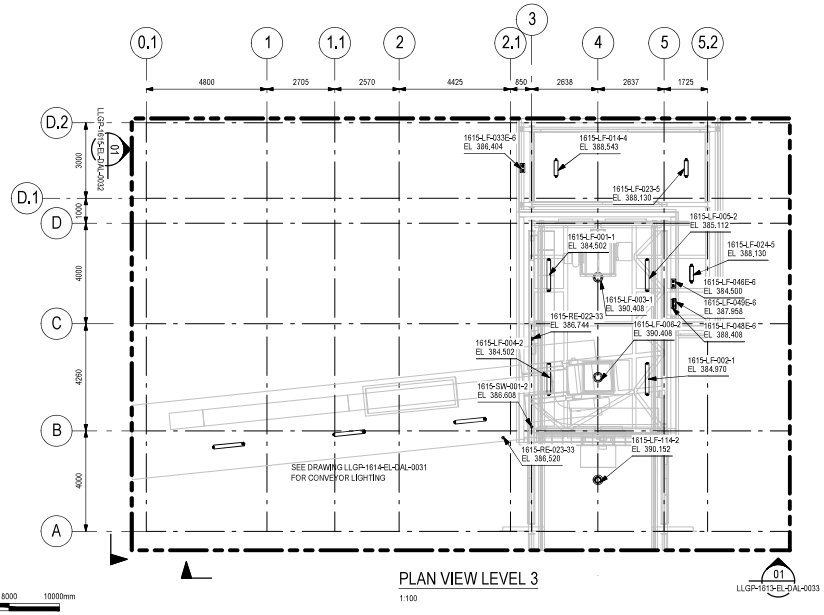


NOTE:
THIS TABLE ONLY REFLECTS LIGHT FIXTURES AND RECEPTICLES SHOWN ON THIS DRAWINGS
FOR FULL FINE ORE BIN AREA BILL OF MATERIALS REFER TO DRAWING LLGP-1615-EL-DAL-0034.
DUPLICATION OF FIXTURE TAGS MAY BE REFERED TO ON MULTIPULE DRAWINGS

NOTES:
1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0001 THRU 0006.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHEWRWISE.

1	[illegible]	2	ea.
2	[illegible]	1	ea.
3	[illegible]	18	ea.
4	[illegible]	4	ea.
5	[illegible]	21	ea.
6	1615-LF-058-9, 1615-LF-059-9, 1615-LF-061-9, 1615-LF-062-9, 1615-LF-083-12, 1615-LF-084-12	7	ea.
7	1615-LF-001-1, 1615-LF-002-1, 1615-LF-004-2, 1615-LF-005-2, 1615-LF-050-9, 1615-LF-051-9, 1615-LF-053-9, 1615-LF-054-9, 1615-LF-056-9, 1615-LF-066-11, 1615-LF-067-11, 1615-LF-069-11, 1615-LF-070-11, 1615-LF-072-11, 1615-LF-073-11, 1615-LF-074-11, 1615-LF-075-11, 1615-LF-077-11, 1615-LF-078-11, 1615-LF-080-11, 1615-LF-081-11, 1615-LF-082-12, 1615-LF-087-12, 1615-LF-088-12	24	ea.
8	1615-LF-090-13, 1615-LF-091-13, 1615-LF-092-13, 1615-LF-093-13, 1615-LF-094-13, 1615-LF-095-14, 1615-LF-096-14, 1615-LF-097-14, 1615-LF-098-14, 1615-LF-099-14	10	ea.
9	1615-LF-034-7, 1615-LF-035-7, 1615-LF-036-7, 1615-LF-037-7, 1615-LF-038-7, 1615-LF-039-7, 1615-LF-040-7, 1615-LF-041-7, 1615-LF-042-7, 1615-LF-043-7, 1615-LF-044-7, 1615-LF-045-7	12	ea.
10	1615-LF-025E-6, 1615-LF-027E-6, 1615-LF-033E-6, 1615-LF-046E-6, 1615-LF-048E-6	5	ea.
11	1615-LF-103-15, 1615-LF-104-15, 1615-LF-105-15, 1615-LF-106-15, 1615-LF-108-17, 1615-LF-109-17, 1615-LF-110-17, 1615-LF-111-17	8	ea.
12	1615-LF-026E-6,1615-LF-049E-6, 1615-LF-064E-8, 1615-LF-086E-8, 1615-LF-100E-8	6	ea.
13	1615-SW-001-2	1	ea.
14	1615-PL-001, 1615-PL-002, 1615-PL-003 1615-PL-004, 1615-PL-005, 1615-PL-006, 1615-PL-007, 1615-PL-008, 1615-PL-009	11	ea.
15	1615-LF-089-7, 1615-LF-112-15, 1615-LF-113-17,	3	ea.
16	1615-RE-006-29, 1615-RE-007-29, 1615-RE-008-29, 1615-RE-009-29, 1615-RE-010-29, 1615-RE-013-29, 1615-RE-015-31, 1615-RE-019-31, 1615-RE-020-31, 1615-RE-022-33, 1615-RE-023-33	11	ea.





0 1000 2000 4000 6000 8000 10000mm
1:100

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER
C	20.05.2024	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM	
B	8 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM	
A	16.10.2023	ISSUED FOR INTERNAL REVIEW	AW	FO	SH	ES	YM	

REF DRAWING No	REFERENCE DRAWING TITLE
LLGP-1615-EL-DAL-0220	ELECTRICAL ROOM 1615-ER-001 LIGHTING LAYOUT & SECTIONS
LLGP-1615-EL-LST-0002	FINE ORE BIN LIGHTING WIRING DIAGRAM
LLGP-1615-EL-LST-0001	FINE ORE BIN LIGHTING PANEL SCHEDULE & SCHMATIC DIAGRAM
LLGP-1615-EL-DAL-0034	FINE ORE BIN COMPLETE BILL OF MATERILS
LLGP-1615-EL-DAL-0033	FINE ORE BIN LIGHTING SECTION AND BILL OF MATERIAL
LLGP-1615-EL-DAL-0032	FINE ORE BIN LIGHTING SECTION AND BILL OF MATERIAL
LLGP-1615-EL-DAL-0051	FINE ORE BIN GROUNDING LAYOUT
LLGP-1615-EL-DAL-0011	FINE ORE BIN CABLE TRAY LAYOUTS

A1 SHEET SCALE 1:100

WORLEY PROJECT No.
317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER
ALAMOS GOLD INC.

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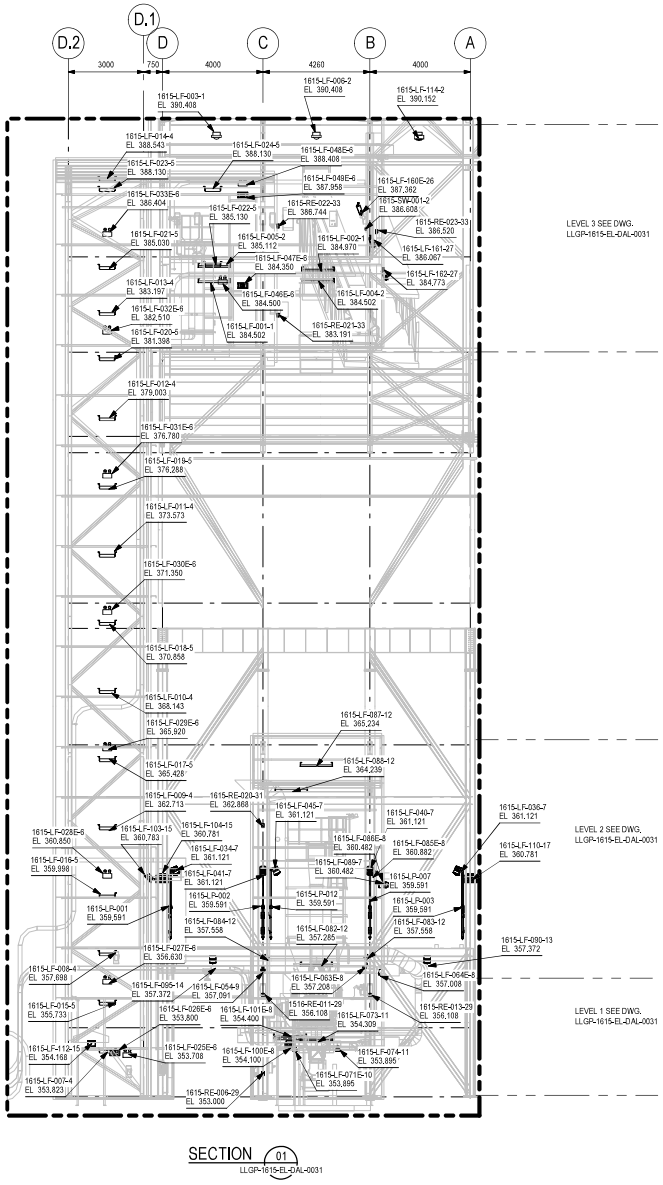
DRG TITLE
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN
LIGHTING
LAYOUTS AND BILL OF MATERIL

DRG No LLGP-1615-EL-DAL-0031 REV C

USER NAME: allexanderson
PLOT DATE & TIME: 15 May 2024 13:40:20
SAVE DATE & TIME: 15 May 2024 13:40:20



SECTION 01
LLGP-1615-EL-DAL-0031

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-D[illegible]-0001 THRU 0008.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.

NOTE:
THIS TABLE ONLY REFLECTS LIGHT FIXTURES SHOWN ON DRAWINGS LLGP-1615-EL-DAL-0031, 32 AND 33.
FOR FULL FINE ORE BIN AREA BILL OF MATERIALS REFER TO DRAWING LLGP-1615-EL-DAL-0034.
DUPLICATION OF FIXTURE TAGS MAY BE REFERED TO ON MULTIPULE DRAWINGS

ITE	TAG NUMBER	CTY	UNT	DESCRIPTION
1	1615-LF-003-1, 1615-LF-006-2	2	ea.	13100 m LED, 95W, 120V, 60Hz 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-13-2C-UNV1
2	1615-LF-114-2	1	ea.	25900 m LED, 206W, 120V, 60Hz, 5000K COOL, TYPEV OPTICAL, CEILING MOUNTING, NEMA 1X, CROUSE-HINDS #PVML-25-2C-UNV1
3	1615-LF-027-4, 1615-LF-008-4,1615-LF-009-4, 1615-LF-010-4, 1615-LF-011-4, 1615-LF-012-4, 1615 LF-#13-4, 1615-LF-014-4, 1615-LF-015-5 1615-LF-015-5,1615-LF 017-5, 1615-LF-018-5, 1615-LF-019-5,1615-LF-020-5, 1615-LF-021-5, 1615 LF-022-5, 1615-LF-023-5, 1615-LF-024-5	18	ea.	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 32W.120V, 60Hz,c/w DP1053MTP KIT. CROUSE-HINDS #PLL2-UNVI-S903-TF
4	1615-LF-033E-8, 1315-LF-301E-8	2	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 38W.120V, 60Hz,c/w DP1052MTP & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-S903-TF-EM1
5	1615-LF-071E-10, 1615-LF-160E-26, 1615-LF-161E-27, 1615 LF-162-2,	4	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 38W.120V, 60Hz,c/w DP1053MTP & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-S903-TF-EM1
6	1615-LF-083-12, 1315-LF-084-12, 1615 LF-085E-8	3	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W.120V, 60Hz,c/w DP1053MTP KIT. CROUSE-HINDS #PLL4-UNVI-S903-TF
7	1615-LF-031-1, 1615-LF-0C2-1,1615-LF-004-2, 1615-LF-005-2, 1615-LF-054-9, 1615-LF-073-11,1615-LF-074-11,1615-LF-082-12 1615-LF-087-12 1615-LF-088-12	10	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W.120V, 60Hz,c/w DP1053MTP KIT. CROUSE-HINDS #PLL4-UNVI-S903-TF
8	1615-LF-030-13, 1315-LF-095-14	2	ea.	9234 lm LED, 76W, 120V, 60Hz, 5000K COOL TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X CROUSE-HINDS#PVML-9-2C-UNV1
9	1615-LF-034-7, 1615-LF-036-7,1615-LF-040-7, 1615-LF-041-7, 1615-LF-043-7	5	ea.	9234 lm LED, 76W, 120V, 60Hz, 5000K COOL TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-9-UNV1
10	1615-LF-025E-6, 1315-LF-027E-6, 1615-LF-028E-6, 1615-LF-329E-6, 1615-LF-030C-6, 1315-LF-031E-6, 1615-LF-032E-6, 1615-LF-333(-6, 1615-LF-046E-6, 1315-LF-048E-6	10	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x3W LED LAMP, 30 MIN BATTERY MODULE, CROUSE-HINDS #N2LPS12222SS
11	1615-LF-133-15, 1315-LF-304-15, 1615-LF-310-17	3	ea.	FLOODLIGHT, 2550 lm LED, 216W,120V, 60Hz, 5000K COOL YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PSMA25LCY-UNV176
12	1615-LF-026E-6, 1315-LF-047E-6, 1615 LF-049E-6, 1615 LF-364E-8, 1615-LF-086E-8, 1315-LF-300E-8	6	ea.	LED EXT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX/15D
13	1615-SW-301-2	1	ea.	unset
16	1615-PL-001, 1615-PL-002 1615-PL-003, 1615-PL-007, 1615-PL-012	5	ea.	V-SPRING LIGHT POLE, 5-H #V65H-GC, #MHE-W5, &#IN5
17	1615-LF-089-7, 1615-LF-112-15	2	ea.	WP WALL FACE LED, 6200 lm, 58W, 120V, 60Hz, 5000K COOL NEMA 4X, COOPER WPMLED15
18	1615-RE-006-29, 1615-RE-011-29, 1615-RE-013-29, 1615-RE-023-3[illegible], 1615-RE-021-33, 1615-RE-022-33, 1615-RE-023-33	7	ea.	1-GANG GFCI RECEPTACLE,20A120V, HEAVY DUTY DIE CAST ALBOX & COVER, HUBBELL TAYMAC MX320

DRAFT

1:100 0 1000 2000 4000 6000 8000 10000mm

REV	DATE (D.M.M.A.Y.)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER
C	20.05.2024	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM	
B	8 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM	
A	16.10.2023	ISSUED FOR INTERNAL REVIEW	AW	FO	SH	ES	YM	

REF DRAWING No	REFERENCE DRAWING TITLE
LLGP-1615-EL-DAL-0034	FINE ORE BIN COMPLETE BILL OF MATERILS
LLGP-1615-EL-DAL-0033	FINE ORE BIN SECTION AND BILL OF MATERILS
LLGP-1615-EL-DAL-0031	FINE ORE BIN LIGHTING LAYOUTS
LLGP-1615-EL-DAL-0051	FINE ORE BIN GROUNDING LAYOUT
LLGP-1615-EL-DAL-0011	FINE ORE BIN CABLE TRAY LAYOUTS

A1 SHEET SCALE 1:100

Worley energy | chemicals | resources

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

"This drawing is prepared solely for the use of the contracted customer of Worley Canada Services Ltd. (Worley) and Worley assumes no liability to any other party for any representations contained in the drawing."

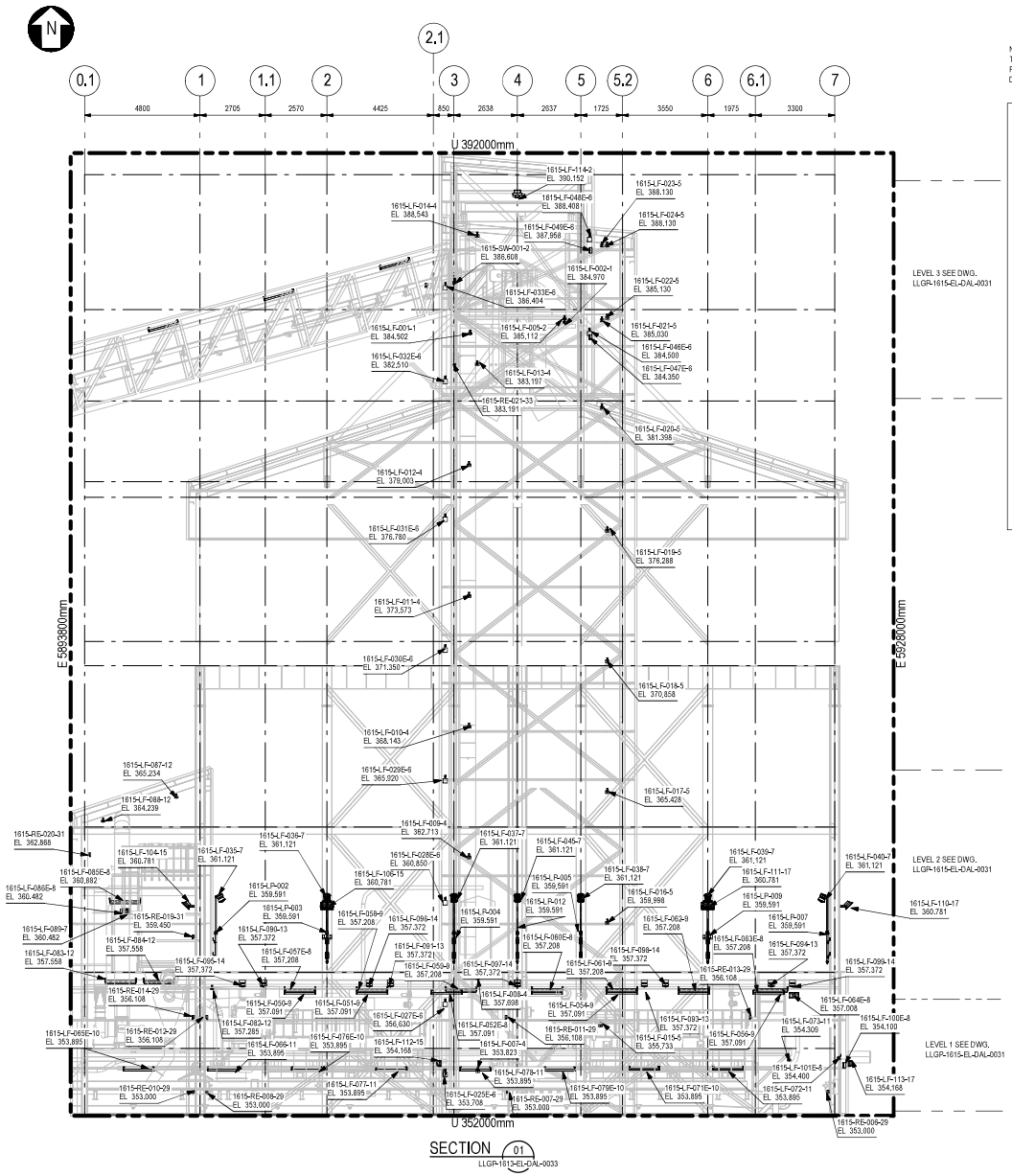
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN
LIGHTING
SECTION AND BILL OF MATERIAL

DRG No LLGP-1615-EL-DAL-0032 REV C

Worley_A1

USER NAME: alexanderson
PLOT DATE & TIME: 15 May 2024 16:23:19
SAVE DATE & TIME: 15 May 2024 16:23:19



SECTION 01
LLGP-1615-EL-DAL-0033

NOTE:
THIS TABLE ONLY REFLECTS LIGHT FIXTURES AS RECEPTICLES SHOWN ON THIS DRAWINGS.
FOR FULL FINE ORE BIN AREA BILL OF MATERIALS REFER TO DRAWING LLGP-1615-EL-DAL-0034.
DUPLICATION OF FIXTURE TAGS MAY BE REFERED TO ON MULTIPULE DRAWINGS

NOTES:
1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0001 THRU 0006.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHEWRWISE.

DRAFT

0 1000 2000 4000 6000 8000 10000mm
1:100

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER
C	20.05.2024	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM	
B	8 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM	
A	10.16.2023	ISSUED FOR INTERNAL REVIEW	AW	FO	SH	ES	YM	

REF DRAWING No	REFERENCE DRAWING TITLE
LLGP-1615-EL-LST-0002	FINE ORE BIN LIGHTING WIRING DIAGRAM
LLGP-1615-EL-LST-0001	FINE ORE BIN LIGHTING PANEL SCHEDULE & SCHEMATIC DIAGRAM
LLGP-1615-EL-DAL-0034	FINE ORE BIN LIGHTING COMPLETE BILL OF MATERILS
LLGP-1615-EL-DAL-0032	FINE ORE BIN LIGHTING SECTION AND BILL OF MATERIAL
LLGP-1615-EL-DAL-0031	FINE ORE BIN LIGHTING LAYOUTS AND BILL OF MATERIAL
LLGP-1615-EL-DAL-0051	FINE ORE BIN GROUNDING LAYOUT
LLGP-1615-EL-DAL-0011	FINE ORE BIN CABLE TRAY LAYOUTS

A1 SHEET SCALE 1:100

WORLEY PROJECT No.
317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER
ALAMOS GOLD INC.

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DRG TITLE
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN
LIGHTING
SECTION AND BILL OF MATERIAL

DRG No LLGP-1615-EL-DAL-0033 REV C

USER NAME: alexandrosm
PLOT DATE & TIME: 10 May 2024 15:07:19
SAVE DATE & TIME: 10 May 2024 13:07:09

NOTES:
1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0001 THRU 0006.

ITE	TAG NUMBER	QT	UN	DESCRIPTION
1	1615-LF-003-1, 1615-LF-006-2	2	ea.	13100 lm LED, 95W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-13-2C-UNV1
2	1615-LF-124-2	1	ea.	25300 lm LED, 206W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-25-2C-UNV1
3	1615-LF-007-4, 1615-LF-008-4, 1615-LF-009-4, 1615-LF-010-4, 1615-LF-011-4, 1615-LF-012-4, 1615-LF-013-4, 1615-LF-014-4, 1615-LF-015-5, 1615-LF-016-5, 1615-LF-017-5, 1615-LF-018-5, 1615-LF-019-5, 1615-LF-020-5, 1615-LF-021-5, 1615-LF-022-5, 1615-LF-023-5, 1615-LF-024-5	18	ea.	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 32W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL2-UNV1-S903-TF
4	1615-LF-057E-8, 1615-LF-060E-8, 1615-LF-063E-8, 1615-LF-101E-8	4	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1052MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-S903-TF-EM1
5	1615-LF-052E-8, 1615-LF-055E-8, 1615-LF-065E-10, 1615-LF-068E-10, 1615-LF-071E-10, 1615-LF-076E-10, 1615-LF-079E-10	7	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-S903-TF-EM1
6	1615-LF-058-9, 1615-LF-059-9, 1615-LF-061-9, 1615-LF-062-9, 1615-LF-083-12, 1615-LF-084-12, 1615-LF-085E-8	7	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1052MTK KIT, CROUSE-HINDS #PLL4-UNV1-S903-TF
7	1615-LF-001-1, 1615-LF-002-1, 1615-LF-004-2, 1615-LF-005-2, 1615-LF-050-9, 1615-LF-051-9, 1615-LF-053-9, 1615-LF-054-9, 1615-LF-056-9, 1615-LF-066-11, 1615-LF-067-11, 1615-LF-069-11, 1615-LF-070-11, 1615-LF-072-11, 1615-LF-073-11, 1615-LF-074-11, 1615-LF-075-11, 1615-LF-077-11, 1615-LF-078-11, 1615-LF-080-11, 1615-LF-081-11, 1615-LF-082-12, 1615-LF-087-12, 1615-LF-088-12	24	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-S903-TF
8	1615-LF-090-13, 1615-LF-091-13, 1615-LF-092-13, 1615-LF-093-13, 1615-LF-094-13, 1615-LF-095-14, 1615-LF-096-14, 1615-LF-097-14, 1615-LF-098-14, 1615-LF-099-14	10	ea.	9234 lm LED, 76W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-9-2C-UNV1
9	1615-LF-034-7, 1615-LF-035-7, 1615-LF-036-7, 1615-LF-037-7, 1615-LF-038-7, 1615-LF-039-7, 1615-LF-040-7, 1615-LF-041-7, 1615-LF-042-7, 1615-LF-043-7, 1615-LF-044-7, 1615-LF-045-7	12	ea.	9234 lm LED, 76W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-9-UNV1
10	1615-LF-025E-6, 1615-LF-027E-6, 1615-LF-028E-6, 1615-LF-029E-6, 1615-LF-030E-6, 1615-LF-031E-6, 1615-LF-032E-6, 1615-LF-033E-5, 1615-LF-046E-6, 1615-LF-048E-6	10	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x3W LED LAMP, 90 MIN BATTERY MODULE, CROUSE-HINDS #N2LPS12222 SS
11	1615-LF-102-15, 1615-LF-103-15, 1615-LF-104-15, 1615-LF-105-15, 1615-LF-106-15, 1615-LF-107-17, 1615-LF-108-17, 1615-LF-109-17, 1615-LF-110-17, 1615-LF-111-17, 1615-LF-187-28	11	ea.	FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PFMA25LCY-UNV176
12	1615-LF-026E-6, 1615-LF-047E-6, 1615-LF-049E-6, 1615-LF-054E-8, 1615-LF-085E-8, 1615-LF-100E-8	6	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX71SD
13	1615-SW-001-2	1	ea.	unset
16	1615-PL-001, 1615-PL-002, 1615-PL-003, 1615-PL-004, 1615-PL-005, 1615-PL-006, 1615-PL-007, 1615-PL-008, 1615-PL-009, 1615-PL-010, 1615-PL-011, 1615-PL-012, 1615-FL-015	13	ea.	V-SPRING LIGHT POLE, C-H #V65H-GC, #MHK-WG, & #JM5
17	1615-LF-089-7, 1615-LF-112-15, 1615-LF-113-17,	3	ea.	WP WALL PACK LED, 6200 lm, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED15
18	1615-RE-006-29, 1615-RE-007-29, 1615-RE-008-29, 1615-RE-009-29, 1615-RE-010-29, 1615-RE-011-29, 1615-RE-012-29, 1615-RE-013-29, 1615-RE-014-29, 1615-RE-015-31, 1615-RE-019-31, 1615-RE-020-31, 1615-RE-021-33, 1615-RE-022-33, 1615-RE-023-33	15	ea.	1-GANG GFCI RECEPTACLE, 20A, 120V, HEAVEY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200

DRAFT

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1615-EL-DAL-0031	FINE ORE BIN LIGHTING LAYOUTS AND BILL OF MATERILS
									LLGP-1615-EL-DAL-0033	FINE ORE BIN LIGHTING SECTION AND BILL OF MATERIAL
C	16 May 24	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1615-EL-DAL-0032	FINE ORE BIN LIGHTING SECTION AND BILL OF MATERIAL
B	8 Nov 2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1615-EL-DAL-0051	FINE ORE BIN GROUNDING LAYOUT
A	16.10.2023	ISSUED FOR INTERNAL REVIEW	AW	FO	SH	ES	YM		LLGP-1615-EL-DAL-0011	FINE ORE BIN CABLE TRAY LAYOUTS

A1 SHEET SCALE 1:100

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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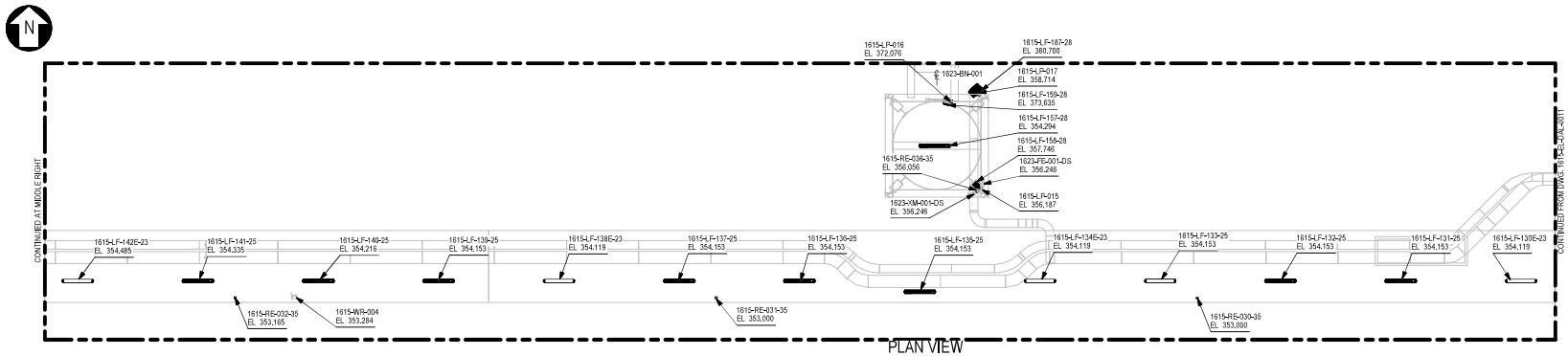
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN
LIGHTING
COMPLETE BILL OF MATERILS

DRG No LLGP-1615-EL-DAL-0034

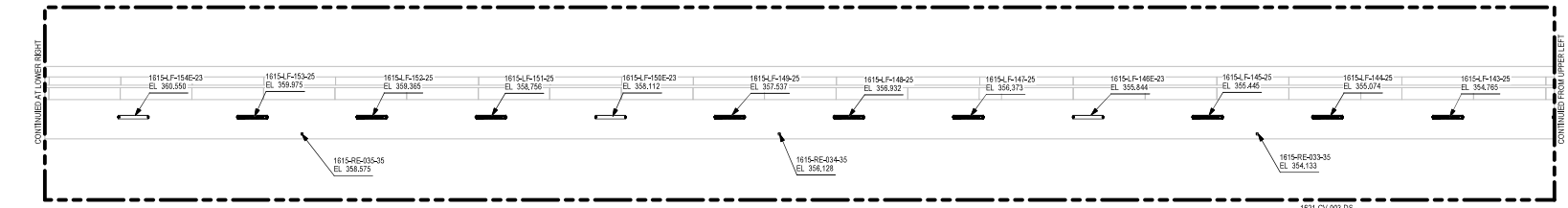
REV C

USER NAME: allexanderson
PLOT DATE & TIME: 16 May 2024 16:07:40
SAVE DATE & TIME: 16 May 2024 16:07:40



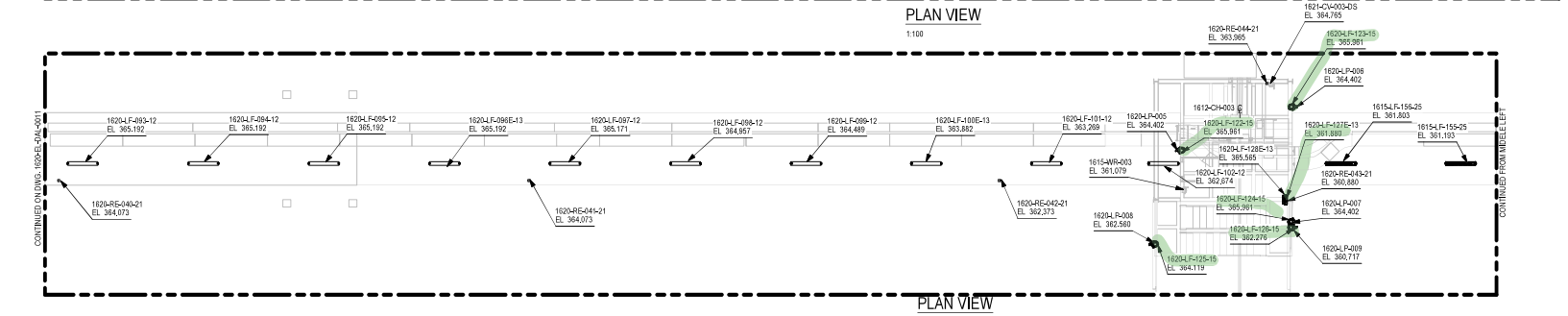
PLAN VIEW

1:100



PLAN VIEW

1:100



PLAN VIEW

1:100

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER PART NUMBERS SPECIFIED ON THE DRAWING OR APPROVED EQUAL.
5. ALL MATERIALS FOR OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENTS AND 316L STAINLESS STEEL OR FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.

ITE	TAG NUMBER	QT	UN	DESCRIPTION
1	1615-LF-130E-23, 1615-LF-134E-23, 1615-LF-138E-23, 1615-LF-142E-23, 1615-LF-146E-23, 1615-LF-150E-23, 1615-LF-154E-23, 1620-100E-13, 1620-LF-096E-13,	9	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-S903-TF-EM1
2	1615-LF-131-25, 1615-LF-132-25, 1615-133-25, 1615-LF-135-25, 1615-LF-136-25, 1615-137-25, 1615-LF-139-2, 1615-LF-140-25, 1615-LF-141-25, 1615-LF-143-25, 1615-LF-144-25, 1615-LF-145-25, 1615-LF-147-25, 1615-LF-148-25, 1615-LF-149-25, 1615-LF-151-25, 1615-LF-152-25, 1615-LF-153-25, 1615-LF-155-25, 1615-LF-156-25, 1615-LF-157-28, 1620-LF-102-12, 1620-LF-101-12, 1620-LF-099-12, 1620-LF-098-12, 1620-LF-097-12, 1620-LF-095-12, 1620-094-12, 1620-LF-093-12	29	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-S903-TF
3	1615-LF-158-28, 1615-LF-159-28	2	ea.	9234 lm LED, 76W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-9-UNV1
4	1620-LF-122-15, 1620-LF-123-15, 1620-LF124-15, 1620-LF-125-15, 1620-LF-126-15	5	ea.	3250 lm LED, 28W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-3-UNV1
5	1615-LP-017	1		V-SPRING LIGHT POLE, C-H #V65H-GC, #MHK-WG, & #LMB-FL-40
6	1615-LP-015, 1615-LP-016, 1620-LP-005,1620-LP-006, 1620-LP-007, 1620-LP-008, 1620-LP-009	7	ea.	V-SPRING LIGHT POLE, C-H #V65H-GC, #MHK-WG, & #LM5
7	1615-LF-187-28	1		FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, GROUSE-HINDS #PFMA25LCY-UNV176
8	1615-RE-030-35, 1615-RE-031-35, 1615-RE-032-35, 1615-RE-033-35, 1615-RE-034-35, 1615-RE-035-35, 1620-RE-040-21, 1620-RE-041-21, 1620-RE-042-21, 1620-043-21, 1620-RE-044-21,	11	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
9	1620-LF-127E-13, 1620-LF-128E-13	2	ea.	EMERGENCY LIGHT LED, 28W, 12V, 60Hz, 2x3W LED LAMP, 90 MIN. BATTERY MODULE, CROUSE-HINDS #IN2LPS122225S

ITEM	DESCRIPTION	QTY.
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	[illegible]	1
2	[illegible]	
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0 1000 2000 4000 6000 8000 10000mm

1:100

REV	DATE (DD/MM/YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
A	09.01.24	ISSUED FOR IR/ACR	AW	FO	SH	ES	YM		LLGP-1613-EL-DAL-0012	FINE ORE BIN & 1615 ELECTRICAL RM CABLE TRAY SECTIONS

A1 SHEET SCALE 1:100

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN 1615 CONVEYOR
LIGHTING AND EQUIPMENT
LAYOUTS

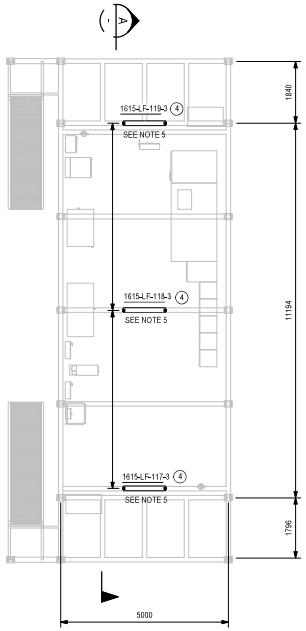
DRG No LLGP-1615-EL-DAL-0035

REV A

USER NAME: allevatson

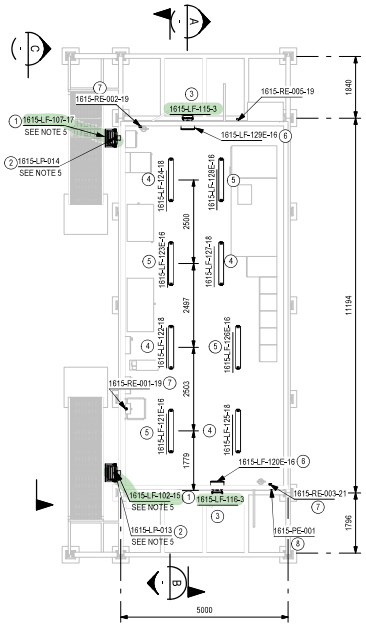
PLOT DATE & TIME: 26 Jan 2024 10:24:48

SAVE DATE & TIME: 18 Jan 2024 10:24:48



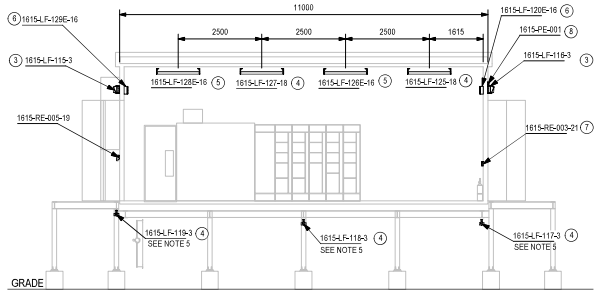
PLAN VIEW UNDER E-ROOM

1:75



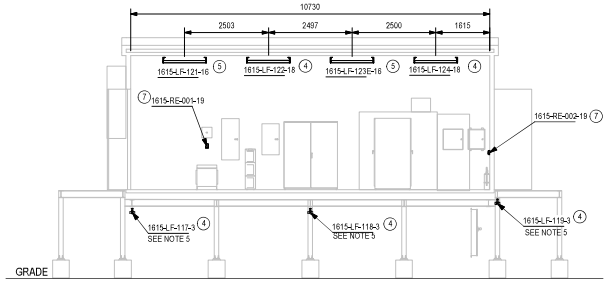
PLAN VIEW E-ROOM

1:75



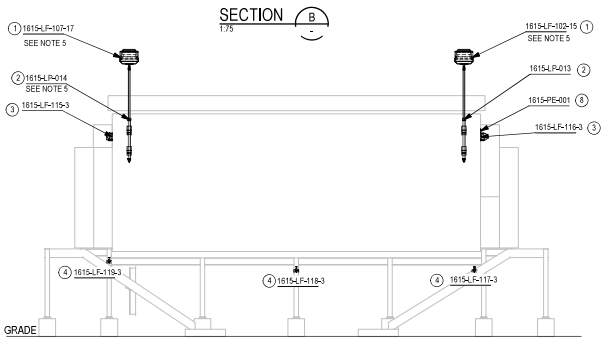
SECTION A

1:75



SECTION B

1:75



SECTION C

1:75

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING ARE PRILIMINARY ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.
3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL
4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVANENT.
5. LIGHT FIXTURES ARE NOT PART OF E-ROOM VENDOR PACKAGE AND WILL BE SUPPLIED AND INSTALLED AT SITE BY ELECTRICAL CONTRACTOR.

LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY.	DESCRIPTION
1	1615-LF-102-15, 1615-LF-107-17	2	FLOODLIGHT, 26500 LUMEN LED, 216W, 120Vac, 60Hz, 5000K CCOL WHITE LIGHT, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS CHAMP PRO #PFMA25LCY-UNV1-76
2	1615-LF-013, 1615-LF-014	2	Y-SPRING LIGHT POLE, C-H #V66H-G, #MHK-6KG, & #LMB-FL-40
3	1615-LF-115-3, 1615-LF-116-3	2	WF WALL PACK LED, 6200 LUMEN, 50W, 120V, 60Hz, 5000K CCOL, NEMA 4X, COOPER WPMLED15
4	1615-LF-117-3, 1615-LF-118-3, 1615-LF-119-3, 1615-LF-122-18, 1615-LF-124-18, 1615-LF-125-18, 1615-LF-127-18	7	7040 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W, 120V, 60Hz, c/w DP1053MTK KIT, CROUSE HINDS #PLL4-UNV1-5903-TF
5	1615-LF-121-16, 1615-LF-123-16, 1615-LF-125-16, 1615-LF-126-16	4	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W, 120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, CROUSE-HINDS #PLL4-UNV1-5903-TF-EM1
6	1615-LF-120E-16, 1615-129E-16	2	(E) EXIT SIGNS, 1.4W, 120V, 60Hz, SELF POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX71SD
7	1615-RE-001-19, 1615-RE-002-19, 1615-RE-003-21	4	3-GANG RECEPTACLE, 20A, 120V, 60Hz
8	1615-PE-001	1	PHOTOCELL, 3.3A,120V,60Hz, CROUSE-HINDS #D2S20

DRAFT

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1615-EL-DAL-0210	FINE ORE BIN AREA E-ROOM 1615-ER-001 CABLE TRAY LAYOUT
									LLGP-1615-EL-DAL-0200	FINE ORE BIN AREA E-ROOM 1615-ER-001 EQUIPMENT LAYOUT
									LLGP-1615-EL-LST-0001	FINE ORE BIN PANEL SCHEDULE & WIRING DIAGARM
									LLGP-1615-EL-DAL-0051	FINE ORE BIN GROUNDING LAYOUT
B	14.3.24	RE-ISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1615-EL-DAL-0012	FINE ORE BIN CABLE TRAY SECTIONS
A	16.11.23	ISSUED FOR IR AND ICR	AW	FO	SH	ES	YM		LLGP-1615-EL-DAL-0011	FINE ORE BIN CABLE TRAY LAYOUT

A1 SHEET SCALE 1:75

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER: ALAMOS GOLD INC.

"This drawing is prepared solely for the use of the contracted customer of Worley Canada Services Ltd. (Worley) and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN AREA
ELECTRICAL ROOM 1615-ER-001
LIGHTING LAYOUT

DRG No LLGP-1615-EL-DAL-0220 REV B

USER NAME: alexanderson

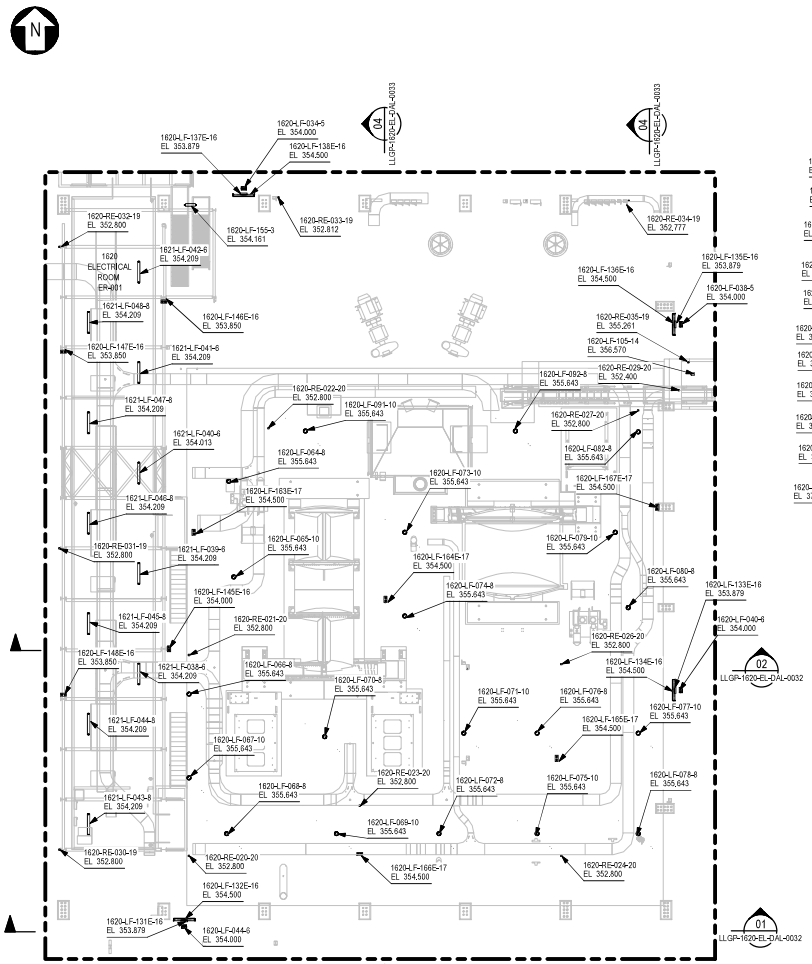
PLOT DATE & TIME: 29 Apr 2024 09:59:24

SAVE DATE & TIME: 19 Apr 2024 09:09:34

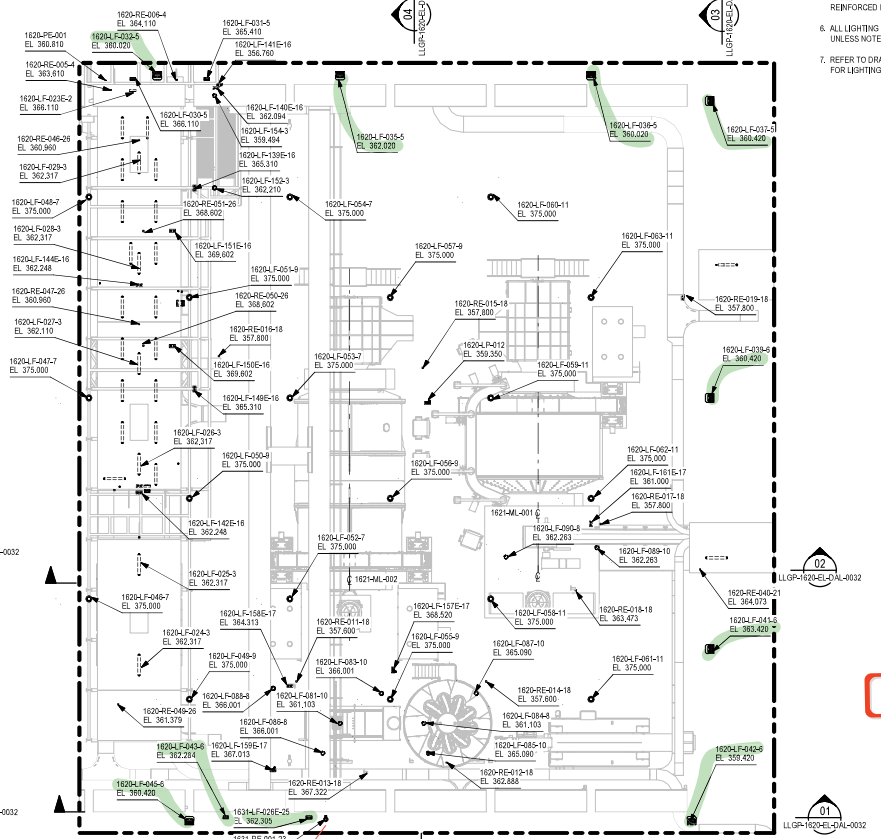
Worley_A1

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER PART NUMBERS SPECIFIED ON THE DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVINIZED STEEL FOR NON AGGRESSIVE ENVIRONMENTS AND 316L STAINLESS STEEL OR FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.
7. REFER TO DRAWING LLGP-EL-DAL-0032, GRINDING MILL AREA LIGHTING SECTIONS FOR LIGHTING BILL OF MATERIAL.



PLAN VIEW LOWER LEVEL
1:150



PLAN VIEW UPPER LEVEL
1:150

DRAFT

1:150 0 1500 3000 6000 9000 12000 15000mm

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1620-EL-DAL-0033	GRINDING MILL LIGHTING SECTIONS
B	23 May 24	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1620-EL-DAL-0032	GRINDING MILL LIGHTING SECTIONS
A	20.11.2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1600-ME-DKP-0001	PROCESS PLANT & SERVICES - KEY PLAN & DRAWING INDEX

A1 SHEET SCALE 1:150

Worley

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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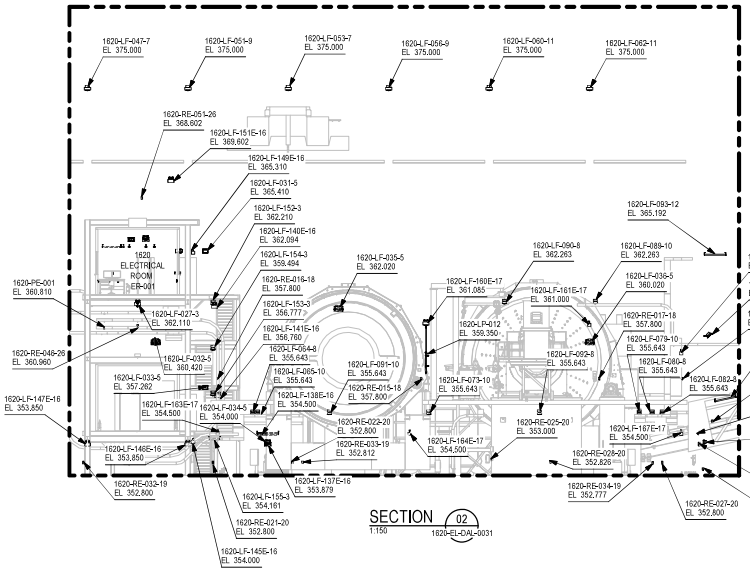
DRG TITLE

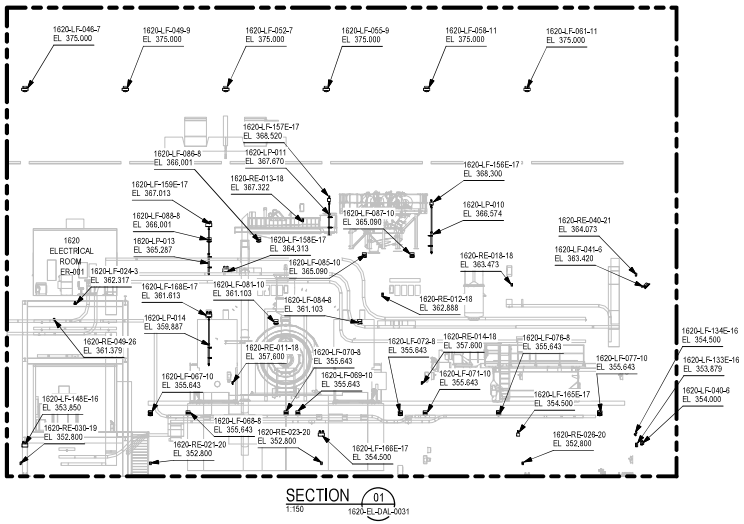
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
GRINDING MILL AREA
LIGHTING
LAYOUT

DRG No LLGP-1620-EL-DAL-0031

REV B

USER NAME: allevalenzo
PLOT DATE & TIME: 29 May 2024 11:44:22
SAVE DATE & TIME: 27 May 2024 11:44:22





NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVINIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.

Item	TAG NUMBER	QTY.	UNIT	Tag Number
1	1620-RE-005-4, 1620-RE-006-4,1620-RE-011-18, 1620-RE-012-18,1620-RE-013-18, 1620-RE-014-18, 1620-RE-015-18, 1620-RE-016-18, 1620-RE-017-18, 1620-RE-018-18, 1620-RE-019-18, 1620-RE-020-20, 1620-RE-021-20, 1620-RE-022-20, 1620-RE-023-20, 1620-RE-024-20, 1620-RE-025-20, 1620-RE-026-20, 1620-RE-027-20, 1620-RE-028-20, 1620-RE-029-20, 1620-RE-030-19, 1620-RE-031-19, 1620-RE-032-19, 1620-RE-033-19, 1620-RE-034-19, 1620-RE-035-19, 1620-RE-040-21, 1620-RE-046-26, 1620-RE-047-26, 1620-RE-048-26, 1620-RE-049-26, 1620-RE-050-26, 1620-RE-051-26, 1631-RE-001-23	35	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
2	1620-LF-046-7, 1620-LF-047-7, 1620-LF-048-7, 1620-LF-049-9, 1620-LF-050-9, 1620-LF-051-9, 1620-LF-052-7, 1620-LF-053-7, 1620-LF-054-7, 1620-LF-055-9, 1620-LF-056-9, 1620-LF-057-9, 1620-LF-058-11, 1620-LF-059-11, 1620-LF-060-11,1620-LF-061-11, 1620-LF-062-11, 1620-LF-063-11	18	ea.	25000 lm LED, 206W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, PENDANT MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-25-2A-UNV1
3	1620-LF-155-3	1	ea.	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 32W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL2-UNV1-5903-TF
4	1631-LF-001-22	1	ea.	5537 lm LED, 45W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, WALL MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-5-25TW-UNV1
5	1620-LF-132E-16, 1620-LF-134E-16, 1620-LF-136E-16, 1620-LF-131E-16	4	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-5903-TF-EM1
6	1620-LF-064-8, 1620-LF-065-10, 1620-LF-066-8, 1620-LF-067-10, 1620-LF-068-8, 1620-LF-069-10, 1620-LF-070-8,1620-LF-071-10, 1620-LF-072-8, 1620-LF-073-10, 1620-LF-074-8, 1620-LF-075-10,1620-LF-076-8, 1620-LF-077-10, 1620-LF-078-8, 1620-LF-079-10, 152C-LF-080-8, 1620-LF-081-10, 1620-LF-082-8, 1620-LF-083-10, 1620-LF-084-8, 1620-LF-085-10, 1620-LF-086-8, 1620-LF-388-8,1620-LF-089-10, 1620-LF-090-8, 1620-LF-091-10, 1620-LF-092-8,1620-LF-152-3 1620-LF-153-3, 1620-LF-154-3	31	ea.	7442 lm LED, 61W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, CEILING MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-7-2C-UNV1
7	1620-LF-024-3, 1620-LF-025-3, 1620-LF-026-3, 1620-LF-027-3, 1620-LF-028-3, 1620-LF-029-3, 1620-LF-087-10,1620-LF-088-8, 1620-LF-093-12, 1620-LF-105-14, 1621-LF-027-6, 1620-LF-038-5, 1621-LF-039-6, 1621-LF-040-6, 1521-LF-041-5, 3621-LF-042-6, 1621-LF-043-8, 1621-LF-044-8, 1621-LF-045-8, 1621-LF-046-8, 1621-LF-347-8, 1621-LF-048-8	22	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
8	1620-LF-139E-16, 1620-LF-140E-16, 1620-LF-141E-16, 1620-LF-142E-16, 1620-LF-141E-16, 152C-LF-144E-16, 1620-LF-145E-16, 1620-LF-146E-16, 1620-LF-147E-16, 1620-LF-148E 16, 1620-LF-149E-16, 1620-LF-150E 16 1620-LF-151E-16 1620-LF-156E-17, 1620-LF-157E 17, 1620-LF-158E 17, 1620-LF-159E-17, 1620-LF-160E-17 1620-LF-161E-17, 1620-LF-162E-17, 1620-LF-163E-17, 1620-LF-164E-17, 1620-LF-165E-17, 1620-LF-166E-17, 152C-LF-167E-17, 1631-LF-026E-25, 1620-LF-168E-17	27	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x3W LED LAMP, 90 MIN BATTERY MODULE, CROUSE-HINDS #N2LPS12222 SS
9	1620-LF-032-5, 1620-LF-035-5, 1620-LF-036-5, 1620-LF-037-5, 1620-LF-039-6, 1620-LF-041-6, 1520-LF-042-6, 1623-LF-045-6	8	ea.	FLOOD LIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #FFMA25LCY-UNV176
10	1620-LF-023E-2, 1620-LF-131E-16, 1620-LF-133E-16, 1620-LF-135E-16, 1620-LF-137E-16	5	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX71SD
11	1620-PE-001	1	ea.	PHOTOCELL, 3.3A, 120V, 60Hz, CROUSE-HINDS #D2520
12	1620-LP-010, 1620-LP-011, 1620-LP-012,1620-LP-013, 1620-LF-014	5	ea.	V-SPRING LIGHT POLE, C-H #V65H-G, #MHK-RTG, & #LMB-FL40
13	1620-LF-030-5, 1620-LF-031-5, 1620-LF-033-5, 1620-LF-034-5, 1620-LF-038-5, 1620-LF-040-6, 1520-LF-043-6, 1623-LF-044-6	8	ea.	WP WALL PACK LED, 6200 lm, 59W, 120V, 60Hz, 5000K COOL, NEMA4X, COOPER WPMLED15

DRAFT

1:150 0 1500 3000 6000 9000 12000 15000mm

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1620-EL-DAL-0033	GRINDING MILL AREA LIGHTING SECTIONS
B	24 May 24	REISSUED FOR IIR/CIR	AW	FO	SH	ES	YM		LLGP-1620-EL-DAL-0031	GRINDING MILL AREA LIGHTING LAYOUTS
A	20.11.2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1600-ME-DKP-0001	PROCESS PLANT & SERVICES - KEY PLAN & DRAWING INDEX

A1 SHEET SCALE 1:100

Worley energy | chemicals | resources

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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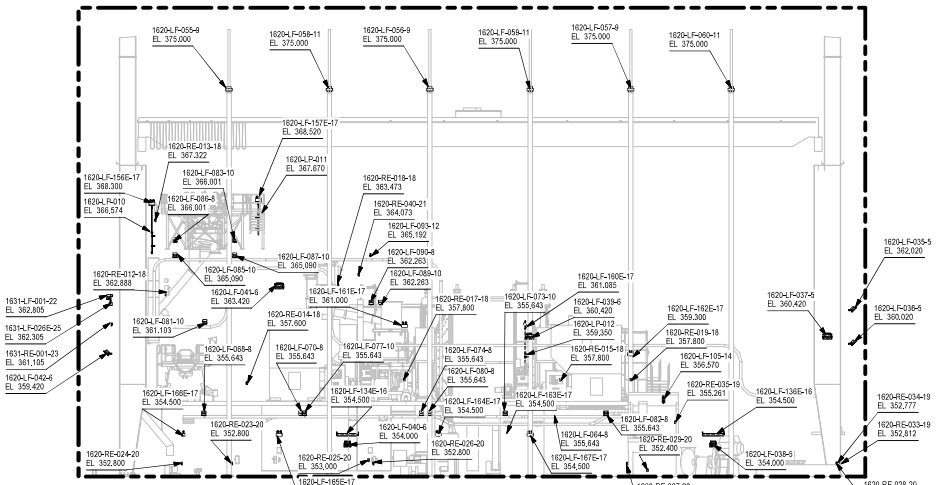
DRG TITLE

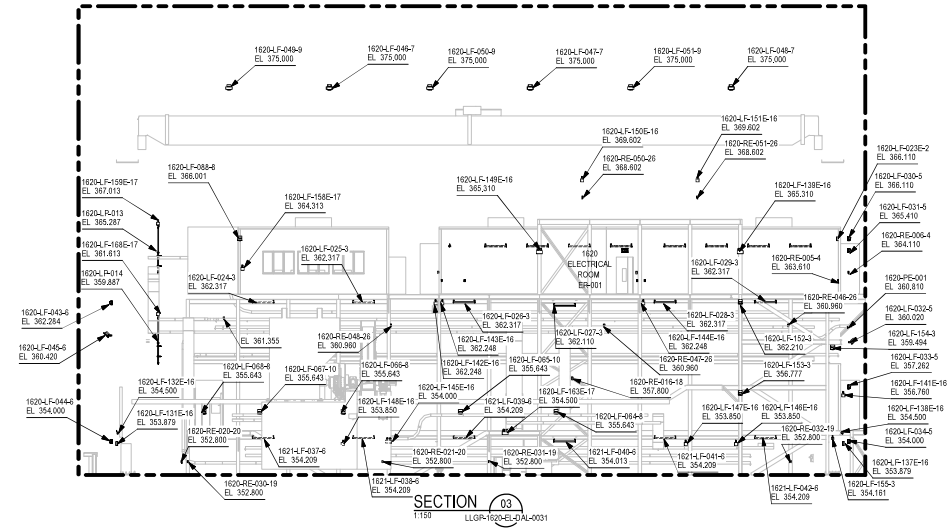
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
GRINDING MILL AREA
LIGHTING
SECTIONS

DRG No LLGP-1620-EL-DAL-0032 REV B

USER NAME: alexanderm
PLOT DATE & TIME: 29 May 2024 11:48:53
SAVE DATE & TIME: 27 May 2024 11:48:53



SECTION 04
1:150 LLGP-1620-EL-DAL-0031



SECTION 03
1:150 LLGP-1620-EL-DAL-0031

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWING OR APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.
7. REFER TO DRAWING LLGP-EL-DAL-0032, GRINDING MILL AREA LIGHTING SECTIONS FOR LIGHTING BILL OF MATERIAL.

DRAFT

0 1500 3000 6000 9000 12000 15000mm
1:150

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1620-EL-DAL-0031	GRINDING MILL LIGHTING LAYOUTS
B	24.05.2024	REISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1620-EL-DAL-0032	GRINDING MILL LIGHTING SECTIONS
A	20.11.2023	ISSUED FOR IIR AND ICR	AW	FO	SH	ES	YM		LLGP-1600-ME-DKP-0001	PROCESS PLANT & SERVICES - KEY PLAN & DRAWING INDEX

A1 SHEET SCALE 1:150

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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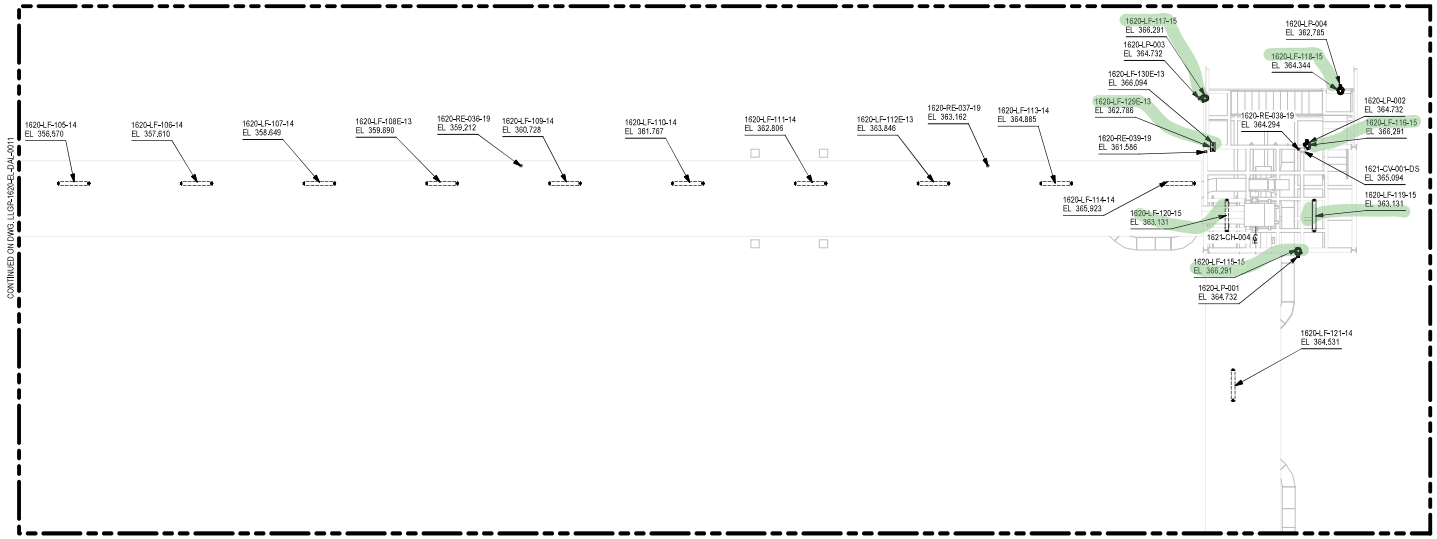
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
GRINDING MILL AREA
LIGHTING
SECTIONS

DRG No LLGP-1620-EL-DAL-0033 REV B

USER NAME: allevadson
PLOT DATE & TIME: 27 May 2024 11:39:44
SAVE DATE & TIME: 24 May 2024 11:39:48



NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-0000-EL-DID-0010 THRU 0013.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
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6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.

DRAFT

EQUIPMENT LIST		
ITEM	DESCRIPTION	QTY.
1	SAFETY SWITCH, 30A, 600V, 3Ph, EATON #DH361UWKW	
	1621-CV-001-DS	1

ITEM	TAG NUMBER	QTY	UN	DESCRIPTION
1	1620-LF-108E-13, 1620-LF-112E-13	2	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, C-H #P114-UNVS-9903-TF-EM1
2	1620-LF-105-14, 1620-LF-106-14, 1620-LF-107-14, 1620-LF-109-14, 1620-110-14, 1620-111-14, 1620-LF-113-14, 1620-LF-114-14, 1620-LF-119-15, 1620-LF-120-15, 1620-LF-121-14	15	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 67W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #P114-UNVT-9909-TF
3	1620-RE-036-19, 1620-RE-037-19, 1620-RE-38-19, 1620-RE-039-19,	4	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MK3200
4	1620-LF-125-15, 1620-LF-126-15, 1620-LF-117-15, 1620-LF-118-15,	4	ea.	3250 lm LED, 28W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PWML-3-UNV1
5	1620-LF-129E-13, 1620-LF-130E-13	2	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x28W LED LAMP, 90 MINUTES BATTERY, CROUSE-HINDS #NZLPS12222 SS
6	1620-LF-001, 1620-LF-002, 1620-LF-003, 1620-LF-004	4	ea.	V-SPRING LIGHT POLE, C-H #V45H-G, #MHK-RTG, & JM5

0 1000 2000 4000 6000 8000 10000mm
1:100

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1620-EL-DAL-0031	GRINDING MILL LIGHTING LAYOUT
A	09.01.24	ISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1615-EL-DAL-0035	FINE ORE BIN 1615/1620 CONVEYOR LIGHTING AND EQUIPMENT LAYOUT

A1 SHEET SCALE 1:100
WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER
ALAMOS GOLD INC.

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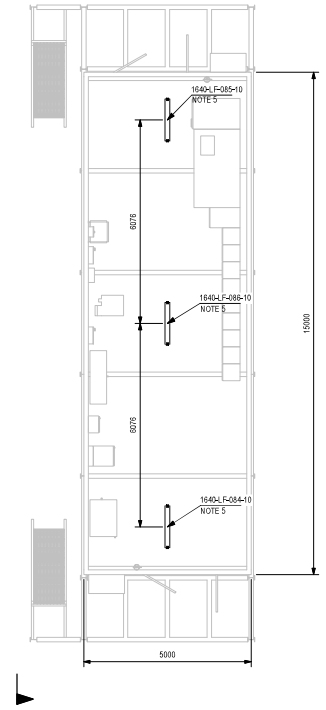
DRG TITLE
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
FINE ORE BIN 1615/1620 CONVEYOR
LIGHTING AND EQUIPMENT
LAYOUTS

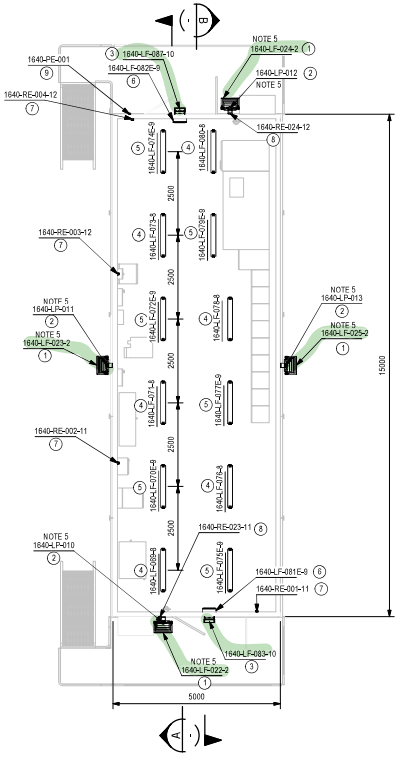
DRG No LLGP-1621-EL-DAL-0031 REV A

USER NAME: allevalsson
PLOT DATE & TIME: 17-Jan-2024 10:10:42
SAVE DATE & TIME: 17-Jan-2024 10:10:42



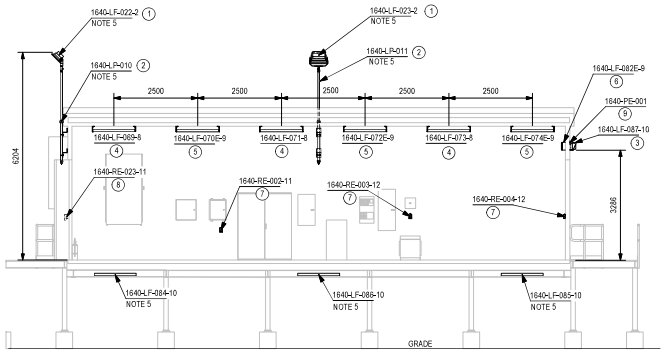
PLAN VIEW UNDER E-ROOM

1:75

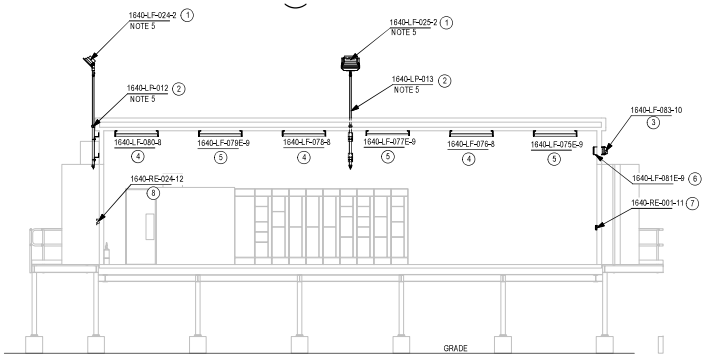


1640-ER-001 LAYOUT - PLAN

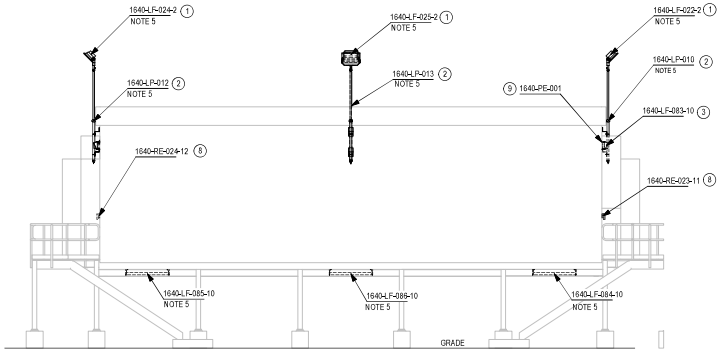
1:75



SECTION A



SECTION B



SECTION C

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.

2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING ARE PRELIMINARY ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.

3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL

4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVANENT.

5. LIGHT FIXTURES ARE PART OF E-ROOM VENDOR PACKAGE AND WILL BE SUPPLIED AND INSTALLED ON SITE BY ELECTICAL CONTRACTOR.

LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY	DESCRIPTION
1	1640-LF-022-2, 1640-LF-025-2, 1640-LF-024-2, 1640-LF-025-2	4	FLOODLIGHT, 25500 LUMEN LED, 216W, 120Vac, 60Hz, 5000K COOL WHITE LIGHT, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS CHAMP PRO XPTMA25 (UNV) (T)
2	1640-LF-010, 1640-LF-011, 1640-LF-012, 1640-LF-013	4	X-SPOKE LIGHT POLE, CXP1/BH1-0, BHBK WG, & RLMB FL 40
3	1640-LF-083-10, 1640-LF-087-10	2	WP WALL PACK LED 6200 LUMEN, 58W, 120V, 60Hz, 5000K COOL NEMA 4X, COOPER WPMLED(-)
4	1640-LF-089-8, 1640-LF-071-8, 1640-LF-073-8, 1640-076-8, 1640-078-8, 1640-LF-080-8, 1640-LF-064-10, 1640-LF-085-10, 1640-LF-086-10	9	7500 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 58W 120V 60Hz c/w DP1053MTK KIT, CROUSE-HINDS #FLLA-UNV1-5903-TF
5	1640-LF-070E-9, 1640-LF-072E-9, 1640-LF-074E-9, 1640-LF-075E-9, 1640-LF-077E-9, 1640-LF-079E-9	6	5720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W 120V 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, CROUSE-HINDS #FLLA-UNV1-5903-TF-EM1
6	1640-LF-081E-9, 1640-LF-082E-9,	2	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #LWTRP
7	1640-RE-001-11, 1640-RE-002-11, 1640-RE-003-12, 1640-RE-004-12	4	2-GANG RECEPTACLE, 20A, 125V, 60Hz
8	1640-RE-023-11, 1640-RE-024-11	2	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
9	1640-PE-001	1	PHOTOCELL, 3.3A, 120V,60Hz, CROUSE-HINDS #DX20

DRAFT

1:75 0 750 1500 3000 4500 6000 7500mm

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
B	10/04/24	RE-ISSUED FOR IIR_ICR	AW	FO	SH	ES	YM		LLGP-1640-EL-DAL-200	LEACH AREA ELECTRICAL ROOM 1640-ER-001 EQUIPMENT LAYOUT
A	01/03/24	ISSUED FOR IIR/ICR	AW	FO	SH	ES	YM		LLGP-1640-EL-DAL-210	LEACH AREA ELECTRICAL ROOM 1640-ER-001 CABLE TRAY LAYOUT

A1 SHEET SCALE 1:75

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

"This drawing is prepared solely for the use of the contracted customer of Worley Canada Services Ltd. (Worley) and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

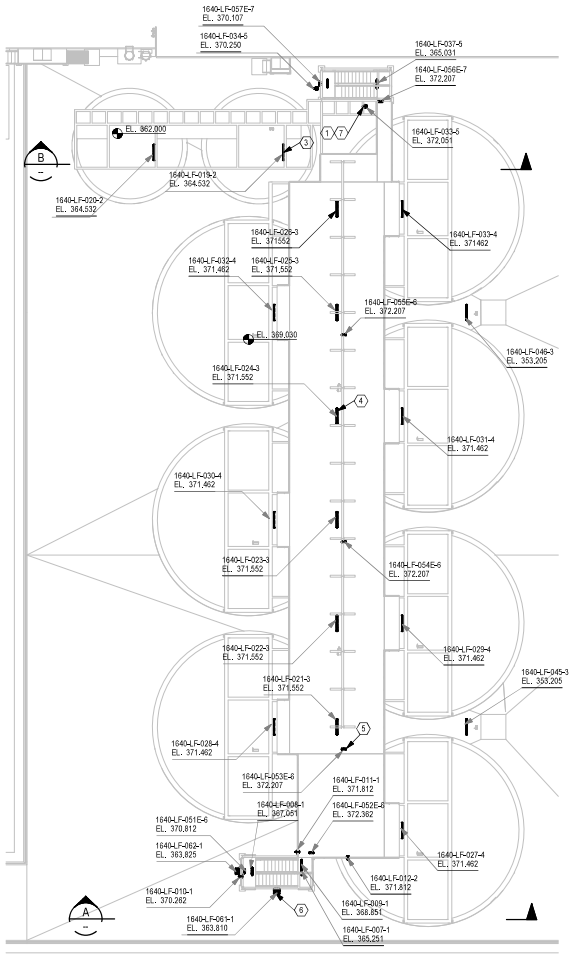
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
LEACH AREA
ELECTRICAL ROOM 1640-ER-001
LIGHTING LAYOUT

DRG No LLGP-1640-EL-DAL-0220 REV B

USER NAME: sbenedict

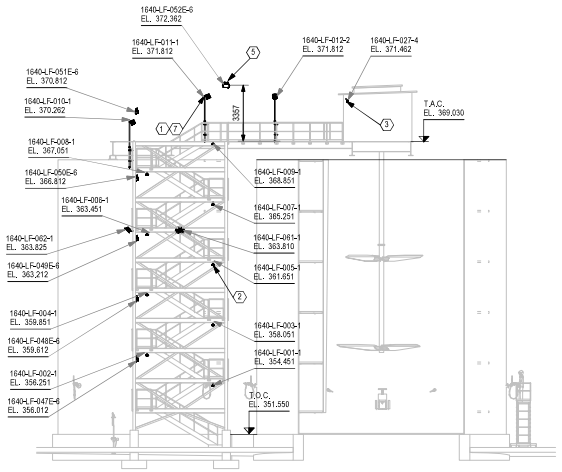
PLOT DATE & TIME: 29 Apr 2024 10:22:22

SAVE DATE & TIME: 19 Apr 2024 10:22:22



LIGHTING LAYOUT PLAN VIEW

SCALE 1:200



SECTION A
1:150

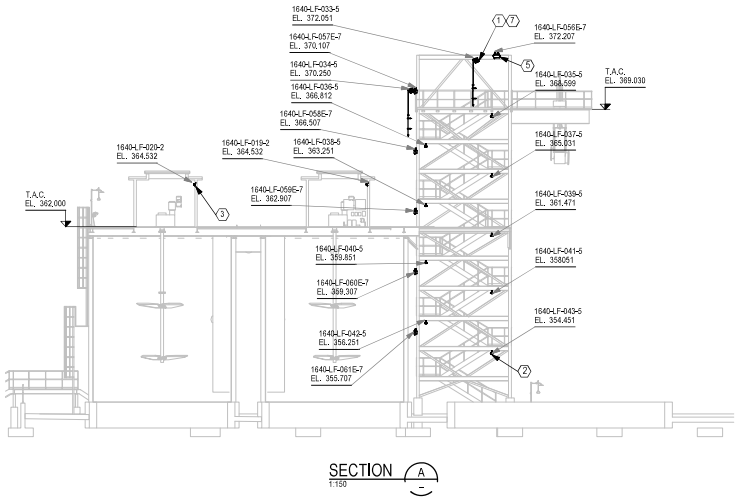
NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-1600-EL-DID-0001 & 0002.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNO.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2021 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWINGS OR AN APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER-REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCE, REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.
7. FOR LIGHTING CONTROL PANEL SEE DRAWING LLGP-1641-EL-LST-0001.

LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY.	DESCRIPTION	NOTES
1	1640-LF-010-1; 1640-JF-011-1 1640-LF-012-2; 1640-JF-033-5 1640-LF-034-5	5	3250 lm LED, 28W, 120V, 60Hz, 5000K COOL, TYPE 'V' OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-3-UNV1	
2	1640-LF-001-1; 1640-JF-002-1 1640-LF-003-1; 1640-JF-004-1 1640-LF-005-1; 1640-JF-006-1 1640-LF-007-1; 1640-JF-008-1 1640-LF-009-1; 1640-JF-035-5 1640-LF-036-5; 1640-JF-037-5 1640-LF-038-5; 1640-JF-039-5 1640-LF-040-5; 1640-JF-041-5 1640-LF-042-5;	18	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 110° 32W,120V, 60Hz, c/w DP1033MTK KIT, CROUSE-HINDS #"PLL2-UNV1-S903-TF	
3	1640-LF-019-2; 1640-JF-020-2 1640-LF-027-4; 1640-JF-028-4 1640-LF-029-4; 1640-JF-030-4 1640-LF-031-4; 1640-JF-032-4 1640-LF-033-4	9	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DF1052MTK & 90 MIN BATTERY MODULE, CH #PLL4-UNV1-S903-TF-EM1	
4	1640-LF-021-3; 1640-JF-022-3 1640-LF-023-3; 1640-JF-024-3 1640-LF-025-3; 1640-JF-026-3 1640-LF-045-3; 1640-JF-046-3	8	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 110° 52W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #"PLL4-UNV1-S903-TF	
5	1640-LF-047E-6; 1640-LF-048E-6; 1640-LF-049E-6; 1640-LF-050E-6; 1640-LF-051E-6; 1640-LF-052E-6; 1640-LF-053E-6; 1640-LF-054E-6; 1640-LF-055E-6; 1640-LF-056E-7; 1640-LF-057E-7; 1640-LF-058E-7; 1640-LF-059E-7; 1640-LF-060E-7; 1640-LF-061E-7	15	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 1x3W LED LAMP, 9) MIN BATTERY MODULE, CROUSE-HINDS #N2LFS12222 SS	
6	1640-LF-061-1; 1640-JF-062-1	2	FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PFMA25LCY-UNV176	
7	1640-LF-001; 1640-LF-002; 1640-LP-003; 1640-LP-010; 1640-LP-011;	5	V-SPRING LIGHT POLE, C-H #V65H-G, #MHK-RTG, 8 #JM5	

DRAFT



SECTION A
1:150

1:100 0 1000 2000 4000 6000 8000 10000mm

REV	DATE	REVISION DESCRIPTION	DRAWN	CHECK	DESIGN	ENG CHK	APPROVE	CUSTMR	REF DRAWING No	REFERENCE DRAWING TITLE
A	28.Sep.2023	ISSUED FOR INTERNAL REVIEW	RM	FO	SH	ES				

A1 SHT SCALE INDICATED

Worley

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

"This drawing is prepared solely for the use of the contracted customer of Worley Canada Services Ltd. (Worley) and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
LEACHING
LEACHING TANKS
LIGHTING LAYOUT

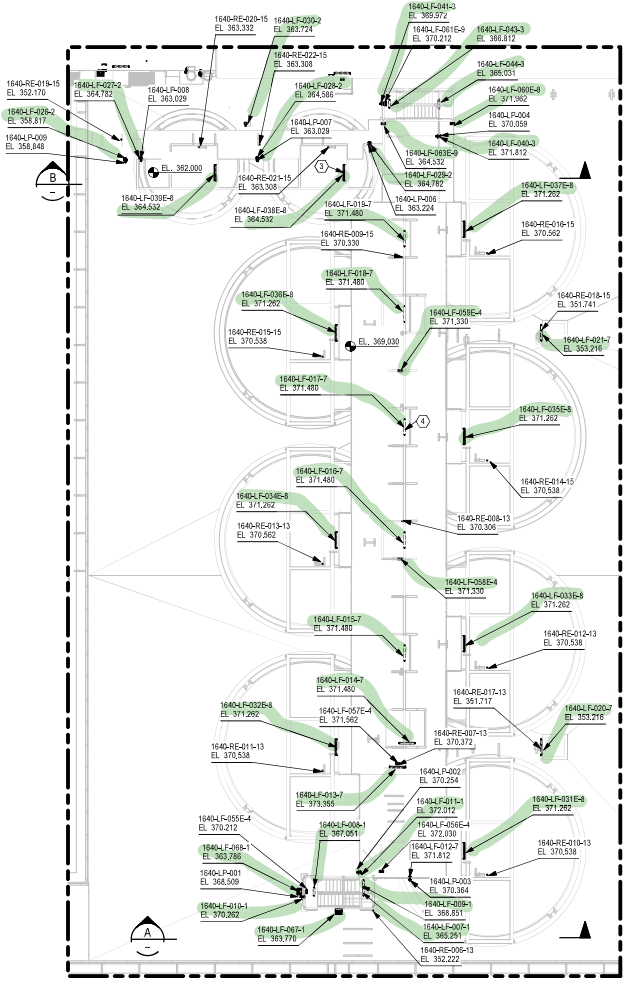
DRG No LLGP-1642-EL-DAL-0031

REV A

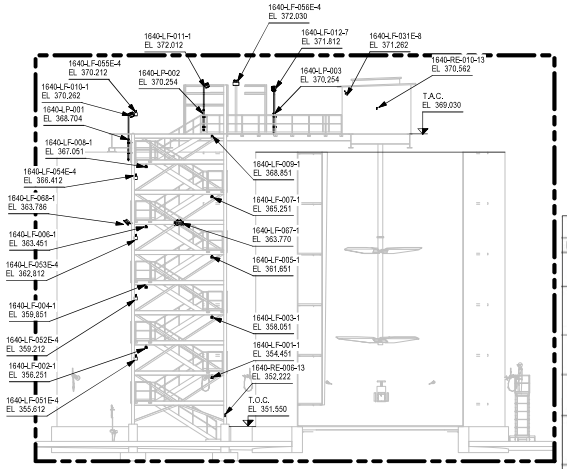
USER NAME: rclarke.j.mc/mac

PLOT DATE & TIME: 28 Sep 2023 11:07:54

SAVE DATE & TIME: 27 Sep 2023 11:07:54



LIGHTING LAYOUT PLAN VIEW
1:200



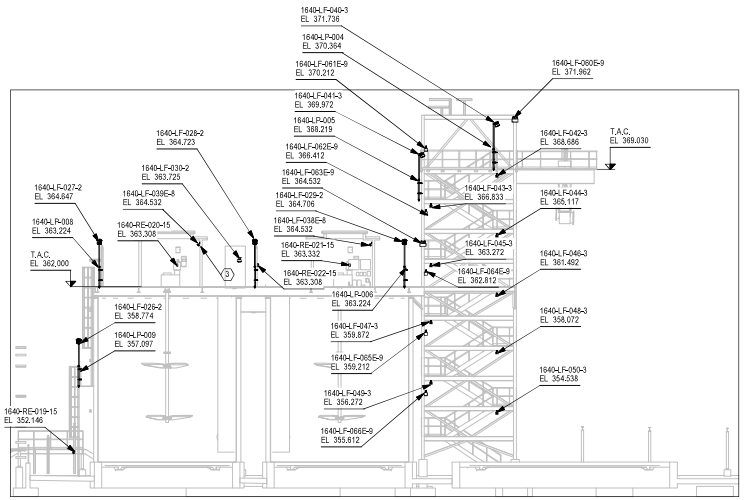
SECTION A
1:150

NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-1600-EL-DID-0001 & 0002.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBERS SPECIFIED ON DRAWINGS OR AN APPROVED EQUAL.
5. ALL MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER-REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCE, REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.
7. FOR LIGHTING CONTROL PANEL SEE DRAWING LLGP-1641-EL-LST-0001.

LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY	DESCRIPTION
1	1640-LF-010-1, 1640-LF-011-1, 1640-LF-015-7, 1640-LF-028-2, 1640-LF-029-2, 1640-LF-040-3, 1640-LF-041-3, 1640-LF-042-3, 1640-LF-043-3, 1640-LF-044-3	10	3250 lm LED, 28W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVMI-3-UNV1
2	1640-LF-001-1, 1640-LF-002-1, 1640-LF-003-1, 1640-LF-004-1, 1640-LF-005-1, 1640-LF-006-1, 1640-LF-007-1, 1640-LF-008-1, 1640-LF-009-1, 1640-LF-340-3, 1640-LF-041-3, 1640-LF-042-3, 1640-LF-043-3, 1640-LF-048-3, 1640-LF-045-3, 1640-LF-046-3, 1640-LF-047-3, 1640-LF-048-3, 1640-LF-049-3, 1640-LF-050-3	20	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 32W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL2-UNV1-S903-TF
3	1640-LF-019-2, 1640-LF-020-2, 1640-LF-027-2, 1640-LF-028-4, 1640-LF-029-4, 1640-LF-030-2, 1640-LF-031E-8, 1640-LF-032E-8, 1640-LF-033E-8, 1640-LF-034E-8, 1640-LF-035E-8, 1640-LF-036E-8, 1640-LF-037E-8, 1640-LF-038E-8, 1640-LF-039E-8,	15	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1052MTK & 90 MIN BATTERY MODULE, C-H #PLL4-UNV1-S903-TF-EM1
4	1640-LF-013, 1640-LF-014-7, 1640-LF-015-7, 1640-LF-016-7, 1640-LF-017-7, 1640-LF-018-7, 1640-LF-019-7, 1640-LF-020-7, 1640-LF-021-7, 1640-LF-022-1, 1640-LF-023-1, 1640-LF-024-3, 1640-LF-025-3, 1640-LF-026-3, 1640-LF-045-3, 1640-LF-046-3	16	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-S903-TF
5	1640-LF-051E-4, 1640-LF-052E-4, 1640-LF-053E-4, 1640-LF-054E-4, 1640-LF-055E-4, 1640-LF-056E-4, 1640-LF-057E-4, 1640-LF-058E-4, 1640-LF-059E-4, 1640-LF-060E-9, 1640-LF-061E-9, 1640-LF-062E-9 ; 1640-LF-062E-9 ; 1640-LF-063E-9 ; 1640-LF-064E-9, 1640-LF-065E-9 ; 1640-LF-066E-9	17	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x3W LED LAMP, 90 MIN BATTERY MODULE, CROUSE-HINDS #N2LPS12222 SS
6	1640-LF-067-1, 1640-LF-068-1	2	FLOODLIGHT, 26500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #FFMA25LCY-UNV176
7	1640-LP-001, 1640-LP-002, 1640-LP-003, 1640-LP-005, 1640-LP-006, 1640-LP-007, 1640-LP-008, 1640-LP-009	8	V-SPRING LIGHT POLE, C-H #V65H-G, #M6K-RTG, & #JM5
8	1640-RE-006-13, 1640-RE-007-13, 1640-RE-008-13, 1640-RE-009-15, 1640-RE-010-13, 1640-RE-011-13, 1640-RE-012-13, 1640-RE-013-13, 1640-RE-014-15, 1640-RE-015-15, 1640-RE-016-15, 1640-RE-017-13, 1640-RE-018-15, 1640-RE-019-15, 1640-RE-020-15, 1640-RE-021-15, 1640-RE-022-15	17	1-GANG WATERPROOF GFCI RECEPTACLE 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200



SECTION B
1:150

DRAFT

REV	DATE (D-MMM-Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1642-EL-DAL-0051	LEACHING TANKS GROUNDING LAYOUT
B	27 Jun 24	REISSUED FOR IBR/CR	AW	FO	SH	ES	YM		LLGP-1642-EL-DAL-0011	LEACHING TANK CABLE TRAY PLAN & SECTION
A	26,Sep,2023	ISSUED FOR INTERNAL REVIEW	RM	FO	SH	ES			LLGP-1642-EL-DAL-0001	LEACHING TANK EQUIPMENT LAYOUT

A1 SHEET SCALE AS SHOWN

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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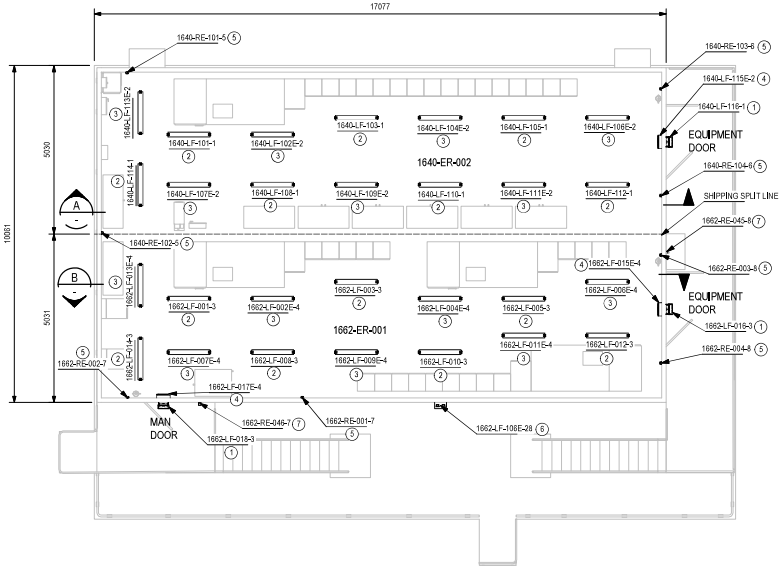
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
LEACHING
LEACHING TANKS
LIGHTING LAYOUT

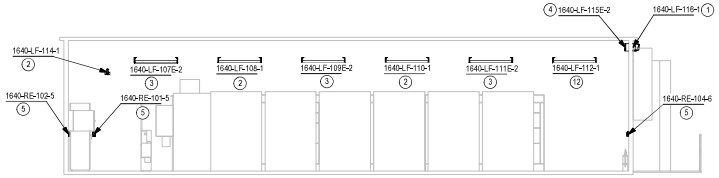
DRG No LLGP-1642-EL-DAL-0031 REV B

USER NAME: rsevilla.martinez
PLOT DATE & TIME: 27 Jun 2024 14:19:05
SAVE DATE & TIME: 27 Jun 2024 14:19:05

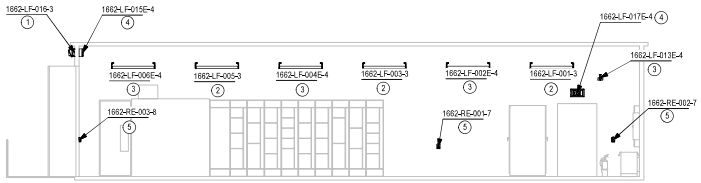


ELECTRICAL ROOM 1640-ER-002 & 1662-ER-001 LAYOUT - PLAN

1:75



SECTION A
1640-ER-002



SECTION B
1662-ER-001

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING ARE PRELIMINARY ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.
3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL
4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVANENT.
5. LIGHT FIXTURES ARE NOT PART OF E-ROOM VENDOR PACKAGE AND WILL BE INSTALLED AT THE E-ROOM FABRICATION SHOP.

E-ROOM 1640-ER-002 LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY.	DESCRIPTION
1	1640-LF-116-1	1	WP WALL PACK LED, 6200 LUMEN, 50W, 120V, 60Hz,5000K CCOL, NEMA 4X, COOPER WFMLED15
2	1640-LF-101-1, 1640-LF-103-1, 1640-LF-105-1, 1640-LF-108-1, 1640-LF-110-1, 1640-112-1, 1640-LF-114-1	7	7990 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W/120V, 60Hz, c/w DP1063MTK KIT, CROUSE-HINDS iPLL4-UNV1-5903-TF
3	1640-102E-2, 1640-104E-2, 1640-106E-2, 1640-LF-107E-2, 1640-LF-109E-2, 1640-LF-111E-2, 1640-LF-113-2	7	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, CROUSE-HINDS iPLL4-UNV1-5903-TF-EM1
4	1640-LF-115E-2	1	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #LX71SD
5	1640-RE-101-5, 1640-RE-102-5, 1640-RE-103-6, 1640-RE-104-6	4	2-GANG RECEPTACLE, 20A, 120V, 60Hz

E-ROOM 1662-ER-001 LIGHTING BILL OF MATERIAL

ITEM		QTY.	DESCRIPTION
1	1662-LF-016-3, 1662-LF-018-3	2	WP WALL PACK LED, 6200 LUMEN, 50W, 120V, 60Hz, 5000K CCOL, NEMA 4X, COOPER WFMLED15
2	1662-LF-001-3, 1662-LF-003-3, 1662-LF-005-3, 1662-LF-0008-3, 1662-LF-010-3, 1662-LF-012-3, 1662-LF-014-3	7	7990 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1063MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
3	1662-LF-002E-4, 1662-LF-004E-4, 1662-LF-006E-4, 1662-LF-007E-4, 1662-LF-009E-4,1662-LF-011E-4, 1662-LF-013-3	7	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1053MTK & 90 MIN BATTERY MODULE, CROUSE-HINDS #PLL4-UNV1-5903-TF-EM1
4	1662-LF-015E-4, 1662-LF-017E-4	2	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #LX71SD
5	1662-RE-001-7, 1662-RE-002-7, 1662-RE-003-8, 1662-RE-004-8	4	2-GANG RECEPTACLE, 20A, 120V, 60Hz
6	1662-LF-108E-28	1	EMERGENCY LIGHT LED, 28W, 120V, 60Hz 2x3W LED LAMP, 90 MINUTES BATTERY, CROUSE-HINDS #NZLPS12222 SS
7	1662-RE-045-8, 1662-RE-046-7	2	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC VSX200

DRAFT

1:75 0 750 1500 3000 4500 6000 7500mm

REV	DATE (D/M/M/A)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1662-EL-DAL-0230	ELECTRWINNING AREA 1640-ER-002 & 1662-ER-001 GROUNDING LAYOUT
B	16/04/24	REISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1662-EL-DAL-0200	ELECTRWINNING AREA 1640-ER-002 & 1662-ER-001 EQUIPMENT LAYOUT
A	11/03/24	ISSUED FOR IFR/CR	AW	FO	SH	ES	YM		LLGP-1662-EL-DAL-0210	ELECTROWINNING AREA 1640-ER-002 & 1662-ER-001 CABLE TRAY LAYOUT

A1 SHEET SCALE 1:75

Worley

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

"This drawing is prepared solely for the use of the contracted customer of Worley Canada Services Ltd. (Worley) and Worley assumes no liability to any other party for any representations contained in the drawing."

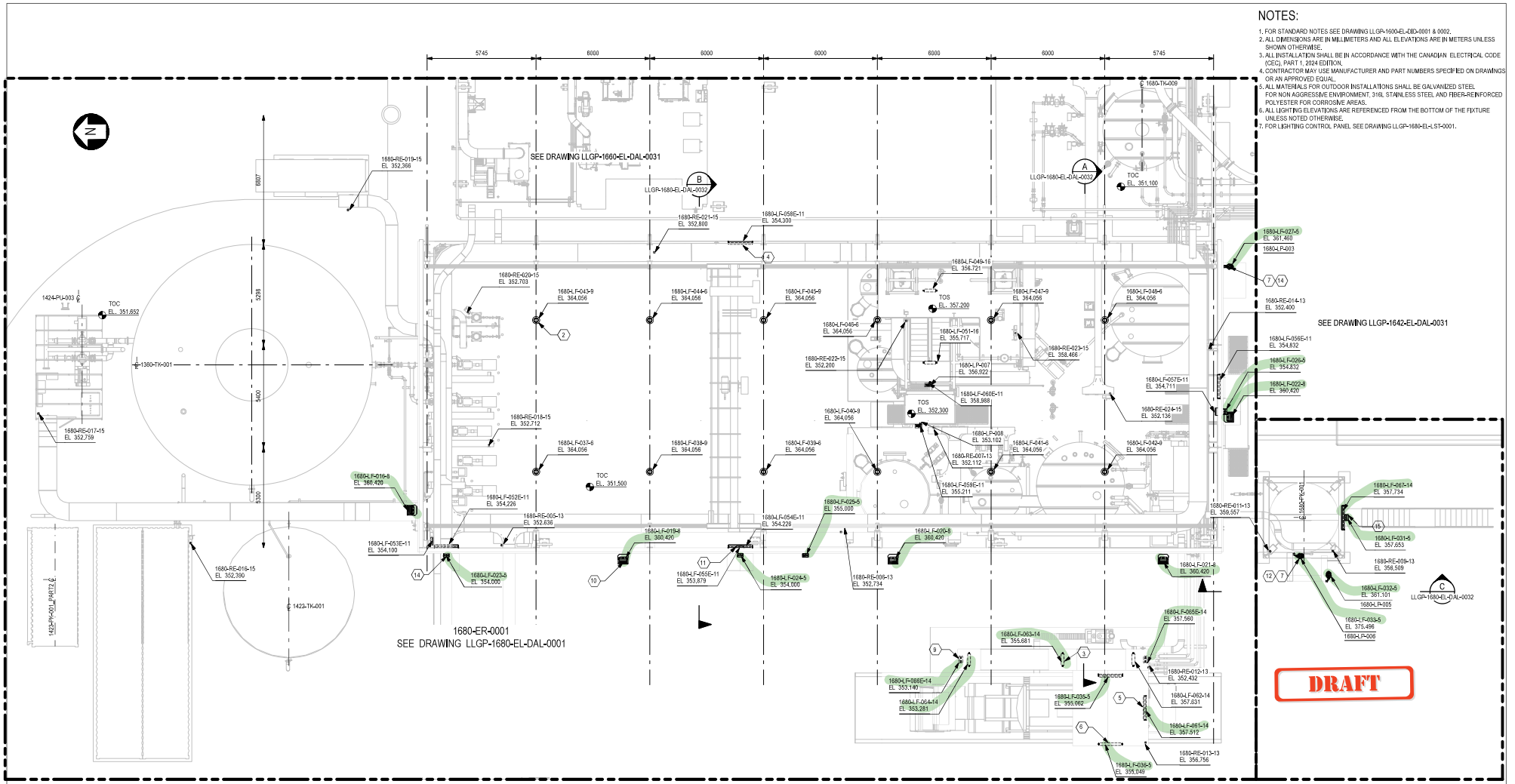
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
CIP / ADSORPTION / ELECTROWINDING AREA
ELEC. ROOM 1640-ER-002 & 1662-ER-001
LIGHTING LAYOUT

DRG No LLGP-1662-EL-DAL-0220 REV B

USER NAME: allevatson
PLOT DATE & TIME: 29 Apr 2024 10:25:51
SAVE DATE & TIME: 19 Apr 2024 10:25:51

Worley_A1



NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-1600-EL-DID-0001 & 0002.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
3. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2024 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBERS SPECIFIED ON DRAWINGS OR AN APPROVED EQUAL.
5. ALL MATERIALS FOR OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER-REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.
7. FOR LIGHTING CONTROL PANEL SEE DRAWING LLGP-1680-EL-LST-0001.

LIGHTING LAYOUT REAGENTS & SERVICES PLAN

1:100

0 1000 2000 4000 6000 8000 10000mm
1:100

REV	DATE (DD-MMM-YY)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
B	24 Jun 24	REISSUED FOR IIR/CR	AW	FO	SH	ES	YM		LLGP-1680-EL-DAL-0032	REAGENTS & SERVICES PLAN-LIGHTING
A	23 Nov 2023	ISSUED FOR IIR/CR	RM	FO	SH	ES	YM		LLGP-1600-ME-DKP-0001	PROCESS PLANT & SERVICES-KEY PLAN & DRAWING INDEX

A1 SHEET SCALE 1:100

Worley

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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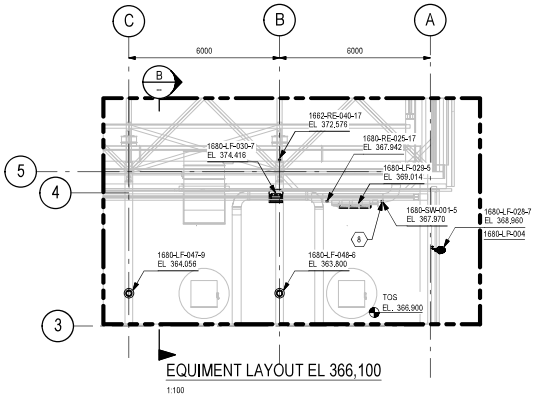
DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
REAGENTS & SERVICES PLANT
LIGHTING LAYOUT

DRG No LLGP-1680-EL-DAL-0031

REV B

USER NAME: rezekiu.umefenc
PLOT DATE & TIME: 27 Jun 2024 15:08:18
SAVE DATE & TIME: 27 Jun 2024 15:08:18



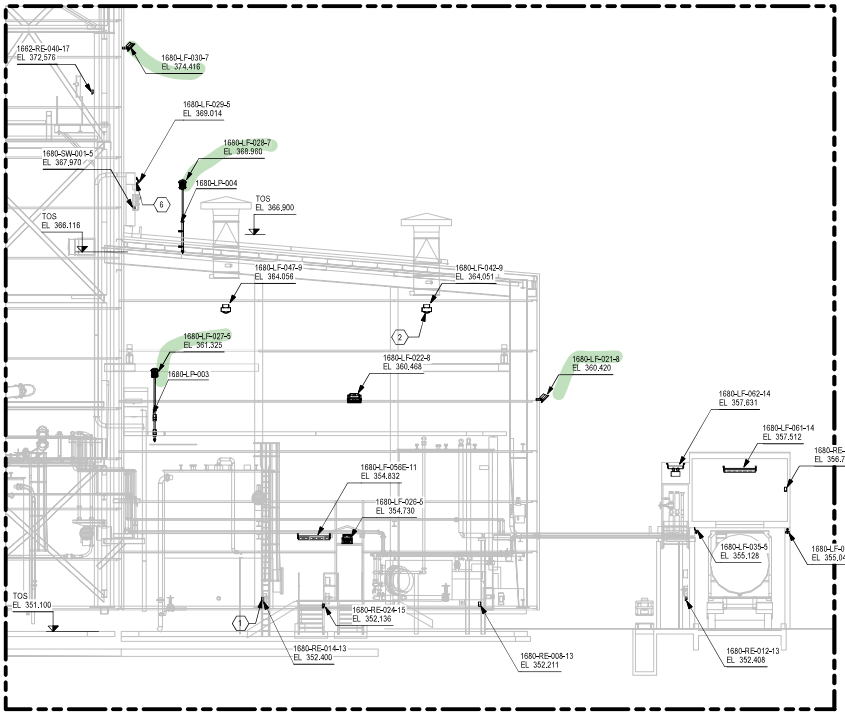
EQUIMENT LAYOUT EL 366,100

1:100

Item	TAG NUMBER	QTY.	UNIT	Tag Number
1	1680-RE-005-13, 1680-RE-006-13,1680-RE-007-13, 1680-RE-008-13, 1680-RE-009-13, 1680-RE-010-13, 1680-RE-011-13, 1680-RE-013-13, 1 1680-RE-014-13, 1680-RE-016-15, 1680-RE-017-15, 1680-RE-018-15, 1680-RE-019-15, 1680-RE-020-15. 1680-RE-021-15, 1680-RE-022-15, 1680-RE-023-15, 1680-RE-024-15, 1680-RE-025-17, 1680-RE-040-17	20	ea.	1-GANG WATERPROOF GFCI RECEPTACLE, 120V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
2	1680-LF-037-6, 1680-LF-038-9, 1680-LF-039-6, 1680-LF-040-9, 1680-LF-041-6, 1680-LF-042-9, 1680-LF-043-9, 1680-LF-044-6, 1680-LF-045-9, 1680-LF-046-6, 1680-LF-047-9, 1680-LF-048-14	12	ea.	25000 lm LED, 206W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, PENDANT MOUNTING, NEMA 4X, CROUSE-HINDS #PVML-25-2A-UNV1
3	1680-LF-049-10, 1680-LF-050-10, 1680-LF-051-16, 1680-LF-062-14, 1680-LF-063-14, 1680-LF-064-14	6	ea.	3958 lm LINEAR LED, 2 ft LENGTH, OPTICS 120° 32W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL2-UNV1-5903-TF
4	1680-LF-052E-11, 1680-LF-054E-11, 1680-LF-056E-11, 1680-LF-058E-11	4	ea.	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1052MTK & 90 MIN BATTERY MODULE, C H #PLL4-UNV1-5903-TF-EM1
5	1680-LF-027-5, 1680-LF-028-7, 1680-032-5, 1680-LF-033-5	4	ea.	9234 lm LINEAR LED, 76W, 120V, 60Hz, 5000K COOL, TYPE V OPTICAL, NEMA 4X, CROUSE-HINDS #PVML-7-2C-UNV1
6	1680-LF-029-5, 1680-LF-035-5, 1680-LF-036-5, 1680-LF-061-14, 1680-LF-067-14, 1680-LF-068-12	6	ea.	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60Hz, c/w DP1053MTK KIT, CROUSE-HINDS #PLL4-UNV1-5903-TF
7	1680-LF-059E-11, 1680-LF-060E-11,	2	ea.	EMERGENCY LIGHT LED, 28W, 120V, 60Hz, 2x3W LED LAMP, 90 MIN BATTERY MODULE, CROUSE-HINDS #NZLPS12222 SS
8	1680-LF-016-8, 1680-LF-019-8, 1680-LF-020-8, 1680-LF-021-8, 1680-LF-022-8, 1680-LF-030-7	6	ea.	FLOODLIGHT, 25500 lm LED, 216W, 120V, 60Hz, 5000K COOL, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS #PFMA25LCY-UNV176
9	1680-LF-053E-11, 1680-LF-055E-11, 1680-LF-057E-11, 1680-LF-065E-14, 1680-LF-066E-14	5	ea.	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWED, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX715D
10	1680-SW-001-5	1	ea.	DOUBLE TOGGLE SWITCH FLUSH MOUNTED
11	1680-LP-003	1	ea.	V-SPRING LIGHT POLE, C H #V65H-G, #MHK-WG, & #IM5
12	1680-LP-004, 1680-LP-005, 1680-LP-006	3	ea.	V-SPRING LIGHT POLE, C H #V85H-G, #MHK-RTG, & #IM5
13	1680-LP-007, 1680-LP-008	2	ea.	V-SPRING LIGHT POLE, C H #V65H-G, #MHK-RTG, & #LMB-FL40
14	1680-LF-023-5, 1680-LF-024-5, 1680-LF-025, 1680-LF-026-5, 1680-LF-031-5, 1680-LF-034-7	6	ea.	WP WALL PACK LED, 6200 lm, 50W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED15

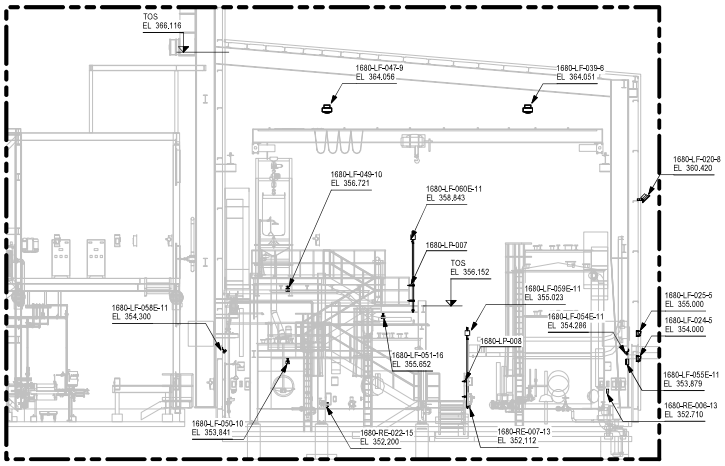
NOTES:

1. FOR STANDARD NOTES SEE DRAWING LLGP-1680-EL-DID-0001 & 0002.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNO.
3. UNLESS INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC), PART 1, 2021 EDITION.
4. CONTRACTOR MAY USE MANUFACTURER AND PART NUMBER SPECIFIED ON DRAWINGS OR AN APPROVED EQUAL.
5. ALL THE MATERIALS FOR THE OUTDOOR INSTALLATIONS SHALL BE GALVANIZED STEEL FOR NON AGGRESSIVE ENVIRONMENT, 316L STAINLESS STEEL AND FIBER-REINFORCED POLYESTER FOR CORROSIVE AREAS.
6. ALL LIGHTING ELEVATIONS ARE REFERENCED FROM THE BOTTOM OF THE FIXTURE UNLESS NOTED OTHERWISE.
7. FOR LIGHTING CONTROL PANEL SEE DRAWING LLGP-1680-EL-LST-0001.

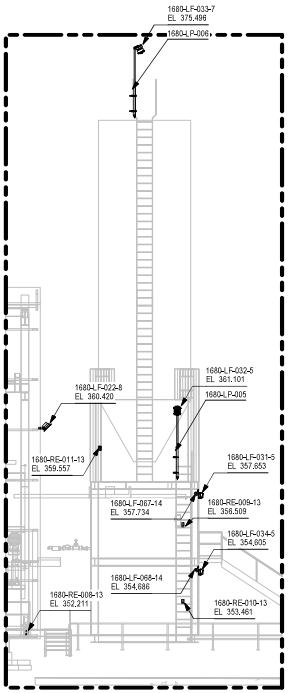


SECTION A 1:100

DRAFT



SECTION B 1:100



SECTION C 1:100

1:100 0 1000 2000 4000 6000 8000 10000mm

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
B	25 Jun 24	REISSUED FOR IIR/CR	AW	FO	SH	ES	YM			
A	23 Nov 2023	ISSUED FOR IIR/CR	RM	FO	SH	ES	YM		LLGP-1680-EL-DAL-0031	REAGENTS & SERVICES PLAN LIGHTING LAYOUT

A1 SHEET SCALE 1:100

WORLEY PROJECT No. 317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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DRG TITLE

LYNN LAKE GOLD PROJECT
MACLELLAN SITE
REAGENTS & SERVICES PLAN
LIGHTING LAYOUT
PLAN AND SECTIONS

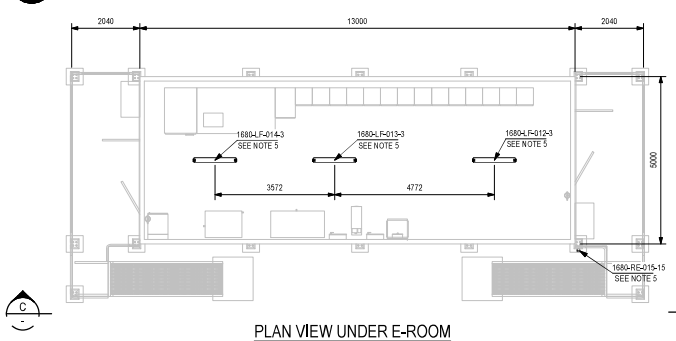
DRG No LLGP-1680-EL-DAL-0032

REV B

USER NAME: rsevilla.martinez

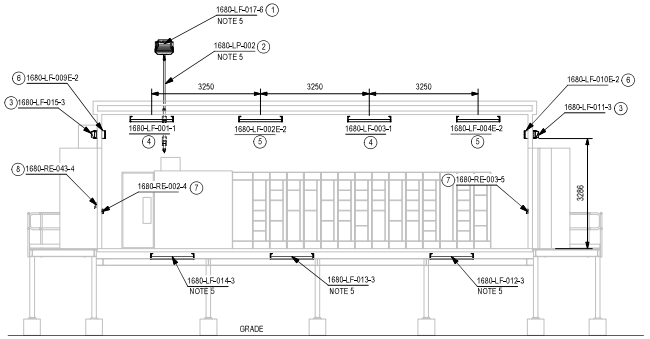
PLOT DATE & TIME: 27 Jun 2024 15:13:47

SAVE DATE & TIME: 27 Jun 2024 15:13:47



PLAN VIEW UNDER E-ROOM

1:75



SECTION A

1:75

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND ALL ELEVATIONS ARE IN METERS UNLESS SHOWN OTHERWISE.

2. THE LOCATION OF LIGHT FIXTURES AND RECEPTACLES IN THIS DRAWING ARE PRILIMINARY ONLY. THE ACTUAL LOCATION DEPENDS ON THE E-ROOM VENDOR AND SHALL BE DETERMINED AT THE TIME OF INSTALLATION.

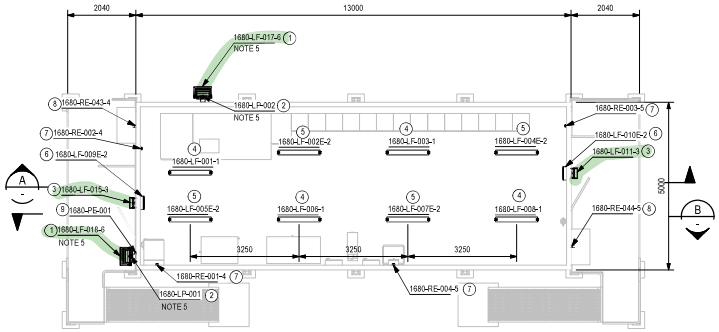
3. THE LIGHTING FIXTURE & RECEPTACLE TAG NUMBER: AAAA-BB-CCCX-Y
   AAAA: AREA NUMBER
   BB: LF - LIGHTING FIXTURE
   LP - LIGHTING POLE
   RE - RECEPTACLE
   PE - PHOTOCELL
   CCCX: CCC - SEQUENCE NUMBER (001-999)
   X - BLANK: STANDARD LIGHTING FIXTURE
   E: INTEGRATED EMERGENCY BATTERY BACK-UP
   Y: CIRCUIT NUMBER OF LIGHTING PANEL.

4. ALL MATERIAL PART NUMBERS CAN BE SUBSTITUTED WITH APPROVED EQUIVANENT.

5. LIGHT FIXTURES AND RECEPTACLE ARE NOT PART OF E-ROOM VENDOR PACKAGE AND WILL BE SUPPLIED AND INSTALLED INSTALLED ON SITE BY ELECTRICAL CONTRACTOR.

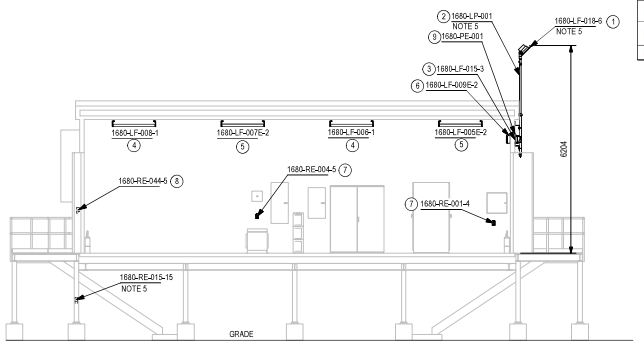
LIGHTING BILL OF MATERIAL

ITEM	TAG NUMBER	QTY.	DESCRIPTION
1	1680-LF-017-6, 1680-LF-018-6	2	FLOODLIGHT, 25500 LUMEN LED, 216W, 120Vac, 60Hz, 5000K COOL WHITE LIGHT, YOKE MOUNTING, NEMA 4X, CROUSE-HINDS CHAMP PRO #PFMA25LCY-UNV1-76
2	1680-LP-001, 1680-LP-002	2	6" SPIGOT LIGHT POLE, C-11-P0503-0, PAINT WG & #8 MB-FL-40
3	1680-LF-011-3, 1680-LF-015-3	2	WP WALL PACK LED, 6260 LUMEN, 53W, 120V, 60Hz, 5000K COOL, NEMA 4X, COOPER WPMLED15
4	1680-LF-001-1, 1680-LF-003-1, 1680-LF-006-1, 1680-LF-008-1, 1680-LF-012-3, 1680-LF-013-3, 1680-LF-014-3	7	7900 lm LINEAR LED, 4 ft LENGTH, OPTICS 120° 62W,120V, 60 Hz, c/w DP1863MTK KIT, CROUSE-HINDS #PLL4-UNV1-5963-TF
5	1680-LF-002E-2, 1680-LF-004E-2, 1680-LF-005E-2, 1680-LF-007E-2	4	6720 lm LINEAR LED, 4 ft, OPTICS 120°, 58W,120V, 60Hz, c/w DP1863MTK & 90 MIN BATTERY MODULE, CROUSE-HINDS #PLL4-UNV1-5963-TF-EM1
6	1680-LF-009E-2, 1680-LF-010E-2	2	LED EXIT SIGNS, 1.4W, 120V, 60Hz, SELF-POWER, SIGNAL FACE, c/w NICKEL CADMIUM BATTERY, CROUSE-HINDS #UX71SD
7	1680-RE-001-4, 1680-RE-002-4, 1680-RE-003-5, 1680-RE-004-5	4	2-GANG RECEPTACLE, 20A, 120V, 60Hz
8	1680-RE-015-15, 1680-RE-043-4, 1680-RE-044-5	3	1-GANG WATERPROOF GFCI RECEPTACLE, 125V, 20A, HEAVY DUTY DIE-CAST AL BOX & COVER, HUBBELL TAYMAC MX3200
9	1680-PE-001	1	PHOTOCELL, 3.3A,120V,60 Hz, CROUSE-HINDS #02520



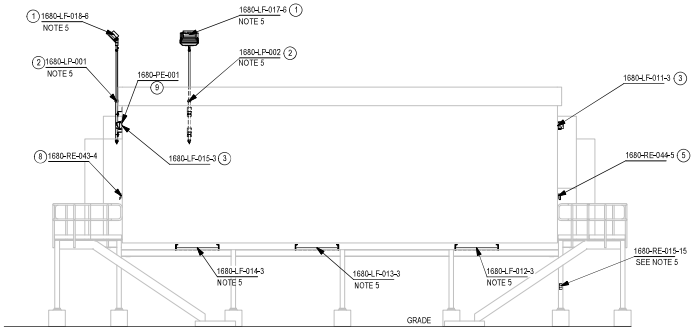
1680-ER-001 LAYOUT - PLAN

1:75



SECTION B

1:75



SECTION C

1:75

DRAFT

REV	DATE (D/M/Y)	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
									LLGP-1680-EL-DAL-251	REAGENTS & WATER SYS. AREA ELEC. RM. 1680-ER-001 GROUND'G LAYOUT
B	10/04/24	REISSUED FOR IIR/CR	AW	FO	SH	ES	YM		LLGP-1680-EL-DAL-200	REAGENTS & WATER SYS. AREA ELEC. RM 1680-ER-001 EQUIPMENT LAYOUT
A	7/03/24	ISSUED FOR IIR/CR	AW	FO	SH	ES	YM		LLGP-1680-EL-DAL-210	REAGENTS & WATER SYS. AREA ELEC. RM 1680-ER-001 TRAY LAYOUT

A1 SHEET SCALE 1:75

Worley

WORLEY PROJECT No.
317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

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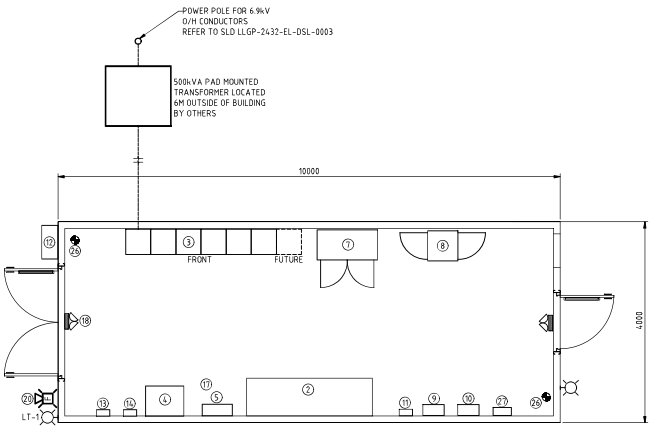
DRG TITLE

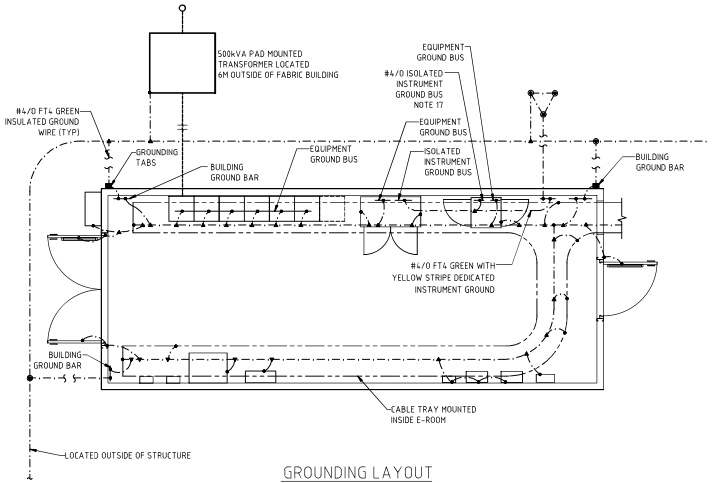
LYNN LAKE GOLD PROJECT
MACLELLAN SITE
REAGENTS & WATER MANAGEMENT SYS. AREA
ELECTRICAL ROOM 1680-ER-001
LIGHTING LAYOUT

DRG No LLGP-1680-EL-DAL-0220 REV B

USER NAME: rclarck.j.mc/mac
PLOT DATE & TIME: 24 Apr 2024 11:19:48
SAVE DATE & TIME: 19 Apr 2024 11:19:48

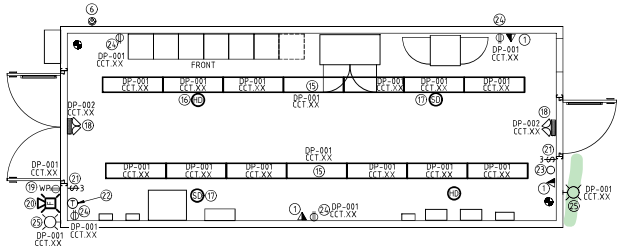


TRUCK MAINTENANCE SHOP ELECTRICAL ROOM 2322-ER-001 - PLAN



GROUNDING LAYOUT

DRAFT



POWER AND LIGHTING LAYOUT

ITEM	QTY.		DESCRIPTION
1	3	2322-TDO-001	COMBINATION TELEPHONE/DATA OUTLET
2	1	2322-LT-001	LAYOUT TABLE
3	1	2322-MCC-001	MOTOR CONTROL CENTER, 600V, 1600A BUS, 3PHASE, 5 SECTIONS, SIZE 42kAIC, NEMA 1 ENCLOSURE (TBD)
4	1	2322-TR-001	30kVA 600/120-280V TRANSFORMER
5	1	2322-DP-001	208-120V, 60Hz, DISTRIBUTION PANEL (42 CCT.)
6	1	2322-PC-001	PHOTOCELL LOCATION (TBD)
7	1	2322-PLC-001	PLC CABINET, 1600mm (W) x 800mm (D) 2100 (H), FRONT ACCESS (TBD).
8	1	2322-CC-001	COMMUNICATIONS CABINET, 800mm (W) x 1100mm (D) x 2100 (H). FRONT AND BACK ACCESS (TBD)
9	1	2322-UPS-001	UPS SYSTEM
10	1	2322-BR-001	BATTERY RACK
11	1	2322-UPS-002	UPS PANEL (30CCT.)
12	1	2322-HVAC-001	HVAC UNIT (HVAC UNIT MAY NOT BE REQUIRED IF BUILDING A/C SUPPLIES THE THE ELECTRICAL ROOM)
13	1	2322-EWS-001	EYE WASH STATION
14	1	2322-FAS-001	FIRST AID STATION
15	14	2322-LL-001	LED LIGHTS
16	2	2322-HD-001	HEAT DETECTOR
17	2	2322-SD-001	SMOKE DETECTOR
18	2	2322-EEL-001	EMERGENCY EXIT LIGHT
19	1	2322-WP-001	WEATHERPROOF RECEPTACLE
20	1	2322-FAS-001	FIRE ALARM SYSTEM HORN AND STROBE
21	2	2322-LS-001	LIGHT SWITCH 3 WAY
22	1	2322-CP-001	THERMOSTAT CONTROL PANEL FOR HVAC UNIT
23	1	2322-TEL-001	TELEPHONE
24	4	2322-IDR-001	INTERIOR DUPLEX RECEPTACLE
25	2	2322-ELF-001	EXTERIOR LIGHT FIXTURE
26	2	2322-FE-001	FIRE EXTINGUISHER
27	1	2322-FAP-001	FIRE ALARM PANEL

CONSTRUCTION NOTES:

1. THE E-ROOM SUPPLIER SHALL DESIGN & SUPPLY A COMPLETE BUILDING WITH INTERNAL EQUIPMENT AS SHOWN IN THE BILL OF MATERIALS. THE E-ROOM WILL BE LOCATED WITHIN THE MAINTENANCE SHOP FABRIC STRUCTURE PREFERABLY IN THE SOUTH WEST AREA OF THE BUILDING TO FACILITATE INCOMING POWER. VENDOR TO VERIFY. THE E-ROOM IS TO BE PLACED ON PILES AT AN ELEVATION OF 2M OR 6 FEET ABOVE GRADE. OUTGOING CABLES TO ALL POWER LOADS INTERNAL AND EXTERNAL OF THE MAINTENANCE SHOP WILL BE RUN IN TRAYS UNDER THE BUILDING. THIS BUILDING IS TO SUPPLY POWER FOR THE MAINTENANCE SHOP, TRUCK WASH, FUEL BAY FIELD LIGHTING AND OTHER ASSOCIATED LOADS (TBD)
2. THE E-ROOM SHALL BE COMPLETED TESTED & ONLY REQUIRE THE CONNECTION OF EXTERNAL CABLES TO MAKE IT OPERABLE.
3. EQUIPMENT SHOWN IN THE BILL OF MATERIALS WILL BE ISSUED TO THE E-ROOM SUPPLIER FOR INSTALLATION & WIRING.
4. THE E-ROOM VENDOR SHALL SUPPLY ALL NECESSARY HVAC EQUIPMENT. LOCATION OF HVAC EQUIPMENT SHOWN FOR REFERENCE ONLY.
5. THE ELECTRICAL EQUIPMENT SHALL BE BONDED WITH #4/0 AWG INSULATED CU. GROUND WIRE TO THE OUTDOOR BARE CU. PERIMETER GROUND GRID.
6. THE E-ROOM ILLUMINATION LEVEL SHALL BE 500 LUX MINIMUM. INTERNAL LIGHTS SHALL ALWAYS BE ON.
7. THE E-ROOM SUPPLIER SHALL VERIFY THE DIMENSIONS FOR ALL OWNER SUPPLIED EQUIPMENT WITH VENDOR DRAWINGS NOT YET RECEIVED.
8. FIRE PANEL AND FIRE DEVICES TO BE DESIGNED, SUPPLIED AND INSTALLED AT SITE BY OTHERS.
9. ALL DOORS SHALL BE BONDED TO THE ROOM PERIMETER GROUND BUS.
10. CONTRACTOR SHALL SUPPLY AND INSTALL #4/0 FT4 RATED INSULATED GROUNDING CABLE IN THE FULL LENGTH OF THE CABLE TRAY. BOND EVERY SECTION AND FITTING OF THE CABLE TRAY.
11. THE MAIN BUILDING GROUND GRID SHALL BE #4/0 BARE STRANDED COPPER BUILDING GROUND BURIED TO A DEPTH OF NOT LESS THAN 460mm BELOW LEVEL GRADE. THIS DOES NOT INCLUDE THE SURFACE LEVEL OF GRAVEL OR CRUSHED ROCK,.
12. USE #2/0 FT-4 GREEN INSULATED CONDUCTOR FOR TAPS TO 600V EQUIPMENT AND STRUCTURAL STEEL INCLUDING ALL JUNCTION BOXES, TERMINAL BOXES, DISCONNECT SWITCHES, ETC. RELIANCE ON THE TECK CABLE GROUND CORE ALONE SHALL NOT BE ACCEPTABLE.
13. USE #4 FT-4 GREEN INSULATED CONDUCTOR FOR BONDING TO ELECTRICAL EQUIPMENT LESS THAN 600V INCLUDING ALL P.B. STATION, LIGHTING EQUIPMENT, INSTRUMENT STANDS AND ASSOCIATED EQUIPMENT. RELIANCE ON THE TECK CABLE GROUND CORE ALONE SHALL NOT BE ACCEPTABLE.
14. EXPOSED COPPER PORTION ON ALL BURIED CONNECTIONS OF JACKETED CONDUCTORS SHALL BE COATED WITH GLYTAL AND TAPED WITH A 25mm LAP OF ELECTRICAL TAPE. APPLY GLYTAL TO ALL ABOVE GROUND CONNECTIONS.
15. ALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC) PART 1, 2024 EDITION.
16. ISOLATED INSTRUMENT GROUND CONDUCTOR SHALL BE GREEN INSULATED CABLE WITH YELLOW STRIPE TO DIFFERENTIATE IT FROM COMMON GROUND.

LEGEND:

- CABLE TRAY MOUNTED INSIDE E-ROOM
- GROUND CONDUCTOR COPPER CU.
- BOLTED CONNECTION
- BRANCH COMPRESSION CONNECTION BURNDY 'YG' SERIES
- GROUNDING WELL
- GROUNDING ROD

HOLD NOTES:

1. HOLD FOR TRUCK SHOP AND WAREHOUSE BUILDING INFORMATION FROM STRUCTURAL AND MECHANICAL.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
B	08.04.24	RE-ISSUED FOR CLIENT REVIEW	AW	EY	FO	ES	YM		LLGP-2432-EL-DSL-0003	GORDON SITE 6.9kV O/H DISTRIBUTION & 600V FACILITIES POWER SUPPLY SINGLE LINE DIA.
A	23.05.23	ISSUED FOR CLIENT IIR AND ICR	AW	FO	FO	JD	YM	DG	LLGP-2000-CI-DWG-1001	GORDON SITE OVERALL SITE PLAN

A1 SHEET SCALE 1:50

Worley

WORLEY PROJECT No.
317045-00108

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

ALAMOS GOLD INC.

"This drawing is prepared solely for the use of the contractual customer of Worley and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

LYNN LAKE GOLD PROJECT
GORDON SITE
TRUCK SHOP AND WAREHOUSE
ELECTRICAL ROOM 2322-ER-001
POWER, LIGHTING AND GROUNDING LAYOUT

DRG No LLGP-2322-EL-DAL-0001

REV B

Worley_A1

LOCATION: C:\USERS\ALLAN.WATSON\WORLEY\LYNN LAKE GOLD PROJECT - DOCUMENTS\10_ENG\05_ELEC - DETAIL DESIGN\04_LAYOUTS\01 - E-ROOM & CONTROL ROOM LAYOUTS\01_WORKING FILES\LLGP-2322-EL-DAL-0001.DWG

USER NAME: allan.watson

PLOT DATE & TIME: 16/4/2024, 12:12:31 PM

SAVE DATE & TIME: 16/4/2024, 12:10:17 PM

Appendix C Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Stantec

Memo

To:	Alamos Gold Inc.	From:	Stantec Consulting Ltd.
Project/File:	Lynn Lake Gold Project 111473076 task 301.104a	Date:	November 18, 2024

Reference: Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

The Lynn Lake Gold Project (LLGP; the Project) consists of two primary deposit sites, the MacLellan site and Gordon site, which are both located near the Town of Lynn Lake, Manitoba. Alamos Gold Inc. (Alamos) will construct (redevelop), operate and eventually close/reclaim open-pit gold mines at both historical mine sites. The Project will be built as two open pit mines with a centralized processing plant facility and a tailings management facility (TMF). The processing plant, located at the MacLellan site has an expected nominal processing throughput of 8,000 tonnes/day with an estimated 17-year production life.

Stantec Consulting Ltd. (Stantec) completed an Environmental Impact Statement (EIS) for the Project (Stantec 2020). The corresponding Air Quality Valued Component section included Chapter 6, Volume 1 of the EIS and a Technical Modelling Report (TMR) in Appendix A, Volume 5 of the EIS. Stantec 2020 was completed to fulfill a requirement of the "Guidelines for the Preparation of an Environmental Impact Statement" (2017) pursuant to the *Canada Environmental Assessment Act* (2012) for the Project. The assessment provides an overview of the existing conditions in the Project area and identifies the changes in ambient air quality at key receptor locations for the Project to determine potential residual and cumulative changes to air quality in support of the EIS.

The Project was approved under the *Canadian Environmental Assessment Act* (2012) with a federal Decision Statement issued March 5, 2023 (subsequently revised July 28, 2024). It was approved under *The Environment Act* of Manitoba with two provincial licences issued March 6, 2023 (Licence No. 3390 relating to the Gordon site and Licence No. 3391 relating to the MacLellan site).

Since Project approval, Alamos has completed a 2023 Feasibility Study Update (FSU) NI 43-101 Technical Report (Alamos 2023) that includes design updates. The design updates include, but are not necessarily limited to the following:

- The processing plant and TMF at the MacLellan site
- General infrastructure at both sites;
- Major development area layouts;
- Major equipment lists
- Mine production capacities.

Reference: Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Stantec has been engaged by Alamos to conduct an update of the air quality assessment for the Project based on the 2023 FSU. The assessment update focused on the Project design changes, updating the air quality model for the operation phase of the Project, and predicting the potential air quality effects on the receptors. As an amendment to Stantec 2020, this memo summarizes the findings and results of the air quality assessment updates for the Project.

1 Summary of Major Changes to Project Design

The air quality modelling updates focused on the Project operation phase and considered air emissions from the mobile and stationary equipment during operation activities at the MacLellan site and Gordon site. The mobile equipment included the trucks and equipment moving around the Project area (e.g., haul trucks, loaders, excavators). The stationary equipment included the processing equipment (e.g.., crushers, mills, pumps, compressors). The air dispersion model update also considered air emissions from the open pit production blast.

Stantec reviewed and compared the Project design parameters for 2019 and 2023. The design changes that may affect the air quality assessment are summarized in the subsections below.

Mine design changes, relevant to air emissions, are based on the following design information provided by Alamos for the Project:

- Feasibility Study Update, NI 43-101 Technical Report for the Lynn Lake Project. Issue date: August 22, 2023 (Alamos 2023).
- Capital and Operating Cost Estimate – MacLellan 13Apr2023 V1.9 update 13Aug2023 (Excel Spreadsheet, pers comm 2024).
- Capital and Operating Cost Estimate – Gordon 13Apr2023 V1.9 update 13Aug2023 (Excel Spreadsheet, pers comm 2024).
- Gordon Highway Haul Calculator 26Apr2023 Plan V1.9 (Excel Spreadsheet, pers comm 2024).
- Schedule MacLellan 13Apr2023 V1.9 (Excel Spreadsheet, pers comm 2024).
- Schedule Gordon 13Apr2023 V1.9 (Excel Spreadsheet, pers comm 2024).
- Process Design Criteria – Process Plant (Worley document issued 12-April-2023), Process Plant Plot Plan and Elevation Drawings showing the building heights (pers comm 2024).

Table 1 summarizes the changes in total years of mine operations between the 2019 and 2023 designs. These changes were determined to possibly alter the air quality effects at the receptors, necessitating the re-assessment.

Table 1 Comparison of Years of Mine Operations between 2019 Design and 2023 Design

Parameter	Unit	AQ Model 2019	Feasibility Study 2023
Gordon Operation	year	5 (mining)	5 (mining) + 2 (stockpile reclaim)
MacLellan Operation	year	13 (mining)	11 (mining) + 6 (stockpile reclaim)

1.1 Project Development Area and Project Layouts

Comparison of the updated drawings of the Project Development Area (PDA) at the MacLellan site and the Gordon site for the 2019 and 2023 designs shows that there are some changes to the Project footprint and the detailed layouts of the Project components, including access road and haul road, the open pit, mine rock storage areas (MRSA), overburden stockpiles, and ore stockpiles at both sites. Additionally, there are changes to the TMF and ore milling and processing plant at the MacLellan site. Although there are changes to the Project components within the PDA, the air quality local assessment area (LAA) does not change from what was included for the 2020 Air Quality Valued Component section and TMR (Stantec 2020).

Table 2 summarizes the major changes to the Project layouts between the 2019 and 2023 designs. These changes will alter the Project equipment layouts and the spatial distribution of the air emission sources and will therefore have potential effects on the maximum model predicted air quality concentrations.

Table 2 Comparison of Project Layouts between the 2019 Design and 2023 Design

Mine Site	Project Major Components	2019 Design	2023 Design
MacLellan	PDA	-[1]	Changes
	LAA	-	No Changes
	Open Pit	-	Changes
	Satellite Pit	N/A[2]	Located at south of Open Pit, new component
	TMF and MRSA	-	Changes – changes to the extents of the MRSA, TMF pond, and TMF bank area
	Overburden Stockpile	-	Changes – the new area is larger
	Topsoil Storage Area	-	Changes – the location is moved from south to north of the Overburden Stockpile

Reference: Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Mine Site	Project Major Components	2019 Design	2023 Design
MacLellan (cont'd.)	Process Plant	-	Plant building and equipment layouts are different
	Haul Road	-	Road routes change with change to location or extents of stockpiles and pits
	Access Road	-	No significant changes
Gordon	PDA	-	Changes
	LAA	-	No changes
	Open Pit	-	Changes – new area is larger
	MRSA	-	Changes
	Overburden Stockpile	-	Changes – new area is larger
	Topsoil Storage Area	N/A	Added to site
	Ore Storage Area	-	Changes – location is moved
	Diesel Generators	-	Location of diesel generator changed
	Disel Generator (Power output)	300 kW (Tier 2)	1 MW (Tier 4)
	Facility Area	-	Changes – location is moved from center to southeast of the MRSA
	Stockpile Borrow Source	N/A	Added to site but not relevant to air quality assessment
	Haul Road	-	Road routes change with change to location or extents of the stockpiles and pit
	Access Road	-	No significant changes

Notes:

"-": as a comparison base

"N/A": not included or not shown on design drawings of the 2019 design

1.2 Mining Production

Based on the review of the Project mine production data during the operation phase, the years with the highest production rates are different from the 2019 design at both sites. Table 3 compares the highest production rate year for the 2019 design with the 2023 design.

Table 3 Comparison of Mining Production between 2019 Design and 2023 Design

Mine Site	Unit	2019 Design		2023 Design	
		Total Material Mined	Highest Year	Total Material Mined	Highest Year
MacLellan	kt/y[1]	28,000	7	33,941	5
Gordon	kt/y[1]	16,000	2	16,001	3

Notes:

[1] kt/y: thousands of tonnes per year

In the air quality dispersion model, the production years with the highest production rates are considered representative of the worst-cases for air emissions. Therefore, in the assessment update, Year 5 of the MacLellan site operation and Year 3 of the Gordon site operation are selected. These years differ from the 2019 design, which used Year 7 for the MacLellan site and Year 2 for the Gordon site.

1.3 Ore Transport from Gordon to the Mill

Table 4 compares the 2019 design for ore transportation from the Gordon site along Provincial Road (PR) 391 to the Mill at the MacLellan site with the 2023 design. The maximum tonnage of ore transported from the Gordon site to the Mill in a year of operation has changed. In the 2019 design, the maximum tonnage of ore transported from the Gordon site to the Mill was 1,500 kt/y in Year 2. In the 2023 design, a maximum of 1,696 kt of ore will be transported from the Gordon site to the Mill in Year 4.

Table 4 Comparison of Ore Transport from the Gordon Site to the Mill – 2019 Design to 2023 Design

Mine Site	Unit	2019 Design		2023 Design	
		Total Material Mined	Highest Year	Total Material Mined	Highest Year
Ore	kt/y[1]	1,500	2	1,696	4

Notes:

[1] kt/y: thousands of tonnes per year

1.4 Mining Equipment

The number of pieces of mining equipment and make/model have changed from the 2019 design. Table 5 summarizes the mining equipment and quantities associated with the 2023 design in the years with the highest production rates for the MacLellan and Gordon sites.

Table 5 Mining Equipment of 2023 Design

Equipment	Number of Units		
	MacLellan Site (Year 5)	Gordon Site (Year 3)	PR 391 (Year 4)
Open Pit Mining			
Hydraulic Electric Shovel (PC4000 shovel)	2	-	-
Hydraulic Excavator (PC1250LC-8)	-	4	-
Ore Haul Truck (HD1500-7)	16	-	-
Ore Haul Truck (HD605-8)	-	15	-
Crawler Dozer (D375-6)	5	4	-
Small Water Truck (15,000 L)	2	2	-
Waste Rock Removal	-	-	-
Hydraulic Excavator (PC1250LC-8)	1	1	-
Hydraulic Excavator (PC490LC-11)	1	1	-
Dump Truck - 20 ton	3	2	-
Drilling and Blasting	-	-	-
Production HP Electric Drill (PV275)	4		-
Drill (Epiroc SmartRoc D65)	1	3	-
Forklift/Telehandler (Blasting Loader)	1	1	-
Stockpile Rehandle	-	-	-
Transfer Loader	2		-
Transfer Loader (WA600)	-	1	-
Articulated Dump Truck (ADT) 40 tonne (t)	2	-	-
General Equipment	-	-	-
Lube/Fuel Truck (20,000 litres (L))	1	1	-
Welding Service Truck	1	1	-
Explosives Delivery Truck (20 t) (Blaster Truck)	1	1	-
Mechanic Truck	1	1	-
Super B Train Fuel Truck (40,000 L)	1	1	-

Reference: Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Equipment	Number of Units		
	MacLellan Site (Year 5)	Gordon Site (Year 3)	PR 391 (Year 4)
Grinding Media Delivery Truck (40 t)	1	0	-
Reagents Delivery Truck (20 t)	1	0	-
Crew Change Vehicle	2	2	-
Pickup Trucks	14	10	-
Small Water Truck (15,000 L)	1	1	-
Pump Truck	1	1	-
Maintenance and Other Supporting Equipment			-
Crane 50 t	1	-	-
Crane 30 t	1	1	-
Integrated Tool Carrier WA200-7	1	1	-
Grader (GD655-6)	2	2	-
Loader (Tire Manipulator (WA500-8))	1	1	-
Loader (Road maintenance) WA500-8	1	1	-
Compactor (BW211)	1	1	-
Lighting Plant	8	6	-
ADT 40 t	-	1	-
Provincial Road			
Highway Haul Truck (122SD)	-	-	15
Explosives Delivery Truck (14 t)	-	-	1
Super B Train Fuel Truck (40,000 L)	-	-	1
Grinding Media Delivery Truck (40 t)	-	-	1
Reagents Delivery Truck (20 t)	-	-	1
Tow Truck/Flatbed (55 t)	-	-	1
Pickup Trucks	-	-	10
Intercity Bus	-	-	1

1.5 Processing Plant

The 2023 FSU provided new design and layouts for the processing plant at the MacLellan site. The processing plant consists of several buildings housing the mine processing equipment, including:

- Main Process Building
- Reagent Storage Building
- Primary Crushing Facility
- Secondary Crushing Building
- Fine Ore Storage Facility
- Oxygen Plant

The processing plant also includes other auxiliary buildings, such as warehouse and workshop, truck shop and truck wash, assay laboratory and administration building.

There are some changes to the buildings layout when compared to the 2019 design. The number of leach tanks increased from five in the 2019 design to seven in the 2023 design. The layout of the fine ore storage building has changed.

Section 7.3.3 in Stantec (2020) summarized the buildings and equipment in the processing plant. Map 7 in Appendix A in Stantec (2020) shows the processing plant layout. Compared with the 2019 design, the buildings in the 2023 design have different layouts, sizes, and equipment setups. Maps 1 and 2 show the plant layout based on 2023 design for the Gordon site and the MacLellan site, respectively. The gold room was a separate building in the 2019 design but is housed inside the main building in the 2023 design. The locations of the reagent building, and oxygen plant have also changed.

The capacity of the crushing plant and processing plant has changed from the 2019 design. Table 6 compares the crushing plant and processing plant capacity between the 2019 and 2023 designs.

Table 6 Comparison of Processing Plant Buildings between2019 and 2023 Designs at the MacLellan Site

Parameter	Unit	2019 Design	2023 Design
Crushing Plant Capacity	kt/y	2,738	2,920
	t/d	7,500	8,000
	t/h	474	481
Processing Plant Capacity	kt/y	2,738	2,920
	t/d	7,500	8,000
	t/h	474	362

kt/y: thousands of tonnes per year; t/d: tonnes per day; t/h: tonnes per hour

1.6 Blasting Parameters

During the operation phase, there are air emissions due to blasting activities within the open pit at the Gordon site and the MacLellan site. The primary factors affecting the air emissions due to blasting are the mass of explosives used for each hole, number of holes per blast, and the frequency of blasts.

Table 7 summarizes the differences for the blasting parameters between the 2019 design and the 2023 design.

Table 7 Comparison of Blasting Parameters in 2019 Design and 2023 Design

Blasting Parameter	2019 Design		2023 Design	
	MacLellan Site	Gordon Site	MacLellan Site	Gordon Site
Highest Explosive Charge	208 kg/hole	208 kg/hole	230 kg/hole	230 kg/hole
Holes per Blast	213	154	241	119
Frequency	Every third day	Every third day	3-4 times a week	3-4 times a week

kg: kilograms

2 Air Quality Modeling Update Results

The dispersion modelling methodology used to assess the potential effects of the 2023 design changes on air quality is identical to the methodology used in the EIS (Stantec 2020). The details of CALPUFF model setup, CALMET meteorological data, receptor grid, nitric oxide (NO) to nitrogen dioxide (NO_2) conversion, and particulate matter deposition can be found in the Air Quality TMR, Volume 5 Attachment A in the EIS (Stantec 2020).

The model predicted 1-hour and 8-hour average concentrations are based on the maximum hourly emission rates. The model predicted 24-hour, monthly and average concentrations are based on the daily average emission rates that consider the actual operating hours per day for each mining activity. Baseline concentrations are added to the model predicted maximum concentrations to account for other existing emission sources (natural and anthropogenic) that are not directly included in the model simulation. The model predicted maximum concentrations with the baseline contribution are compared to the Manitoba Ambient Air Quality Criteria (AAQC) and the Canadian Ambient Air Quality Standards (CAAQS). The CAAQS are reference values for regional air quality management and are applicable to measured ambient concentrations at human receptor locations away from the industrial facility boundaries. The maximum predicted concentrations in the LAA are compared to the CAAQS in this context and do not imply compliance with the AAQC at the Project Boundary. The maximum predicted concentrations are based on areas along and outside the Project Boundary (i.e., locations where public access is not restricted). The predicted maximum concentrations and dustfall are discussed separately for the Gordon site and MacLellan site in the following sections. The corresponding concentration contour maps are presented in Attachment A.

2.1 Gordon Site Operations

The model predicted maximum ground-level concentrations and dustfall from operation of the Gordon site are summarized in Table 8 and are compared with maximum predicted concentrations presented in the EIS TMR (Stantec 2020). The associated concentration and dustfall contours in the LAA are presented in Map 1 to Map 24 in Attachment A.

2.1.1 Maximum NO_2 Concentrations

The maximum predicted 1-hour NO_2 concentration, 415 micrograms per cubic metre (µg/m³), is greater than the Manitoba AAQC (400 µg/m³). The maximum predicted 24-hour and annual NO_2 concentrations are 74.2 and 10.4 µg/m³, respectively and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average NO_2 concentration in the metric of the CAAQS (284 µg/m³) is greater than the 1-hour CAAQS (79 µg/m³). The maximum predicted NO_2 concentrations at human health (HH) receptors for all averaging periods are less than the Manitoba AAQC. The maximum predicted NO_2 concentrations are greater than the 1-hour CAAQS at three HH receptors (receptor ID 73, 76 and 77 in TMR Appendix E Table E-2 (Stantec 2020)).

The maximum predicted 1-hour NO_2 concentration, 415 µg/m³, is 10% less than the maximum predicted value in the EIS TMR (Stantec 2020) and the maximum frequency of exceedance changed from 2 hours per year (h/y) to 1 h/y. The maximum predicted 1-hour CAAQS NO_2 concentration is 27% greater than the maximum predicted value in the EIS TMR and the maximum frequency of exceedance increases from 99 d/y to 101 d/y.

2.1.2 Maximum CO Concentrations

The maximum predicted 1-hour, and 8-hour carbon monoxide (CO) concentrations are 14,832 and 4,345 µg/m³, respectively and are less than the Manitoba AAQC. The predicted concentrations are 8 to 12% lower than the than maximum predicted values in EIS TMR (Stantec 2020).

2.1.3 Maximum SO_2 Concentrations

The maximum predicted 1-hour, 24-hour, and annual sulphur dioxide (SO_2) concentration are 422, 42.6, and 2.60 µg/m³, respectively, and are less than the Manitoba AAQC and annual CAAQS. The maximum predicted 1-hour average SO_2 concentration in the metric of the CAAQS (382 µg/m³) is greater than the 1-hour CAAQS (170 µg/m³). The maximum predicted SO_2 concentrations at HH receptors for all averaging periods are less than the Manitoba AAQC and CAAQS.

The maximum predicted 1-hour SO_2 CAAQS concentration, 415 µg/m³, is 12% greater than the maximum predicted value in the EIS TMR (Stantec 2020) and the maximum frequency of exceedance increases from 5 days per year (d/y) to 12 d/y.

2.1.4 Maximum Total Suspended Particulate (TSP) Concentrations

The maximum predicted 24-hour TSP concentration, 734 µg/m³, is greater than the Manitoba AAQC (120 µg/m³). The maximum predicted annual TSP concentration,15.8 µg/m³, is less than the Manitoba AAQC. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC at three HH receptors (receptors ID 73, 76, and 77 in TMR Appendix E Table E-2 (Stantec 2020)).

The maximum predicted TSP concentrations are 7% to 21% greater than the maximum predicted TSP concentrations in the EIS TMR (Stantec 2020). The maximum frequency of exceedance increases from 73 d/y to 94 d/y.

2.1.5 Maximum PM_{10} Concentrations

The maximum predicted 24-hour particulate matter <10 microns (PM_{10}) concentration, 406 µg/m³, is greater than the Manitoba AAQC (50 µg/m³). The maximum predicted PM_{10} concentrations are greater than the Manitoba 24-hour AAQC at four HH receptors (receptors ID 72, 73, 76, and 77 in TMR Appendix E Table E-2 (Stantec 2020)).

The maximum predicted PM_{10} concentration is 12% greater than the maximum predicted PM_{10} concentrations in the EIS TMR (Stantec 2020). The maximum frequency of exceedance increases from 110 d/y to 119 d/y.

2.1.6 Maximum $PM_{2.5}$ Concentrations

The maximum predicted 24-hour and annual particulate matter less than 2.5 microns ($PM_{2.5}$) concentrations are 25.7 µg/m³ and 7.40 µg/m³, respectively, and are less than the CAAQS. The maximum predicted $PM_{2.5}$ concentrations at HH receptors for all averaging periods are less than the CAAQS.

The maximum predicted $PM_{2.5}$ concentrations are 8% to 9% greater than the maximum predicted $PM_{2.5}$ concentrations in the EIS TMR (Stantec 2020).

2.1.7 Maximum Dustfall

The maximum predicted 30-day and annual average dustfall are 6.50 grams per square metre per 30-day period (g/m²/30-day) and 4.51 g/m²/30-day, respectively, and are less than the Ontario AAQC.
The maximum predicted 30-day and annual average dustfall at HH receptors are less than the dustfall criteria.

The maximum predicted dustfall values are 33% to 36% greater than the maximum predicted dustfall concentrations in the EIS TMR (Stantec 2020).

Reference:Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Table 8 Predicted Maximum Ground-Level Concentrations from Gordon Site Operation (EIS vs 2023 Design)

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)											Ambient Air Quality Criteria [a] (µg/m³)
			Max. Value in LAA (EIS)	Max. Value in LAA (2023 Design)	% Change in Max Value in LAA from EIS	Max. Value at Human Receptors (EIS)	Max. Value at Human Receptors (2023 Design)	% Change in Max. Value at Human Receptors from EIS	Max. No. of Exceedances per Year (EIS)	Max. No. of Exceedances per Year (2023 Design)	% Change Max No. of Exceedances from EIS	% Max. Value of AAQC (EIS)	% Max. Value of AAQC (2023 Design)	
Gaseous CAC														
NO_2	1-hour [b]	7.5	**459**	**415**	-10%	180	287	59%	2 h/y	1 h/y	-50%	**115%**	**104%**	400
	1-hour [c]	7.5	**224**	**284**	27%	**95.5**	**91.1**	-5%	99 d/y	101 d/y	2%	**283%**	**360%**	79 [c,d]
	24-hour [e]	5.6	74.1	74.2	0.1%	34	36.2	6%	0	0	—	37%	37%	200
	Annual	1.9	11.2	10.4	-7%	3.61	3.42	-5%	0	0	—	19%	17%	60
									0	0	—	49%	45%	23 [d,f]
CO	1-hour [b]	406	**16,096**	14,832	-8%	6,040	8,643	43%	1 h/y	0	-100%	**107%**	99%	15,000
	8-hour	406	4,952	4,345	-12%	1,192	1,669	40%	0	0	—	83%	72%	6,000
SO_2	1-hour [b]	6	**460**	422	-8%	168	240	43%	1 h/y	0	-100%	**102%**	94%	450
	1-hour [g]	6	**342**	**382**	12%	44.7	44.9	0%	5 d/y	12 d/y	140%	**201%**	**224%**	170 [d,g]
	24-hour [e]	6	48.7	42.6	-13%	13.5	17.4	29%	0	0	—	32%	28%	150
	Annual	1.5	2.45	2.60	6%	1.60	1.63	2%	0	0	—	8%	9%	30
									0	0	—	25%	26%	10 [d,h]
Other Gaseous Species														
HCN	1-hour [b]	—	—	—	—	—	—	—	—	—	—	—	—	40
	24-hour [d]	—	—	—	—	—	—	—	—	—	—	—	—	8 [i]
	Annual	—	—	—	—	—	—	—	—	—	—	—	—	3
Particulate CAC														
TSP	24-hour [e]	10.5	**606**	**734**	21%	**162**	**228**	41%	73 d/y	94 d/y	29%	**505%**	**611%**	120
	Annual [j]	10.5	14.8	15.8	7%	11.9	12.0	1%	0	0	—	25%	26%	60 [j]
PM_{10}	24-hour [e]	4.6	**361**	**406**	12%	**100**	**129**	29%	110 d/y	119 d/y	8%	**721%**	**811%**	50
$PM_{2.5}$	24-hour [k]	2.9	23.5	25.7	9%	8.45	9.79	16%	0	0	—	87%	95%	27 [d,k]
	Annual [l]	2.9	6.87	7.40	8%	3.54	3.67	4%	0	0	—	78%	84%	8.8 [d,l]
Dustfall	30-day	0.99	4.90	6.50	33%	1.72	2.00	16%	0	0	—	61%	93%	7
(g/m²/30-day)	Annual [j]	0.99	3.32	4.51	36%	1.34	1.52	13%	0	0	—	26%	98%	4.6 [j]

Reference:Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Notes:

µg/m³: micrograms per cubic metre; EIS: Environmental Impact Statement; LAA: Local Assessment Area; AAQC: ambient air quality criteria; NO_2: nitrogen dioxide; CO: carbon monoxide; SO_2: sulphur dioxide; HCN: hydrogen cyanide; TSP: total suspended particulate; PM_{10}: particulate matter <10 microns; $PM_{2.5}$: particulate matter <2.5 microns; g/m^2/30-day: grams per square metre per 30 days.

a. Manitoba Ambient Air Quality Criteria (MSD 2005) unless otherwise noted

b. The maximum 1-hour concentration after eliminating 8 highest meteorological hours in each year

c. The 1-hour CAAQS for NO_2 is referenced to the three-year average of the annual 98th percentile of the NO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).

d. CAAQS (CCME 2017)

e. The maximum 24-hour concentration after eliminating the 1st highest meteorological day in each year

f. The annual CAAQS for NO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average NO_2 concentrations (effective 2025) (CCME 2017).

g. The 1-hour CAAQS for SO_2 is referenced to the three-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).

h. The annual CAAQS for SO_2 is referenced to the arithmetic average over a single calendar year of all 1-hour average SO_2 concentrations (effective 2025) (CCME 2017).

i. Ontario AAQC (MOECC 2012)

j. Annual geometric mean

k. The CAAQS for 24-hour $PM_{2.5}$ is referenced to the annual 98th percentile of daily 24-hour average concentrations, averaged over three years (effective 2020) (CCME 2017).

l. The CAAQS for annual $PM_{2.5}$ is referenced to the three-year mean of annual average concentrations (effective 2020) (CCME, 2017).

Predicted maximum 1-hour and 8-hour average concentrations are based on maximum hourly emission rates.

Predicted maximum 24-hour, 30-day and annual average concentrations are based on daily average emission rates.

"—" not applicable

Values in **BOLD** exceed the ambient air quality criteria

2.2 MacLellan Site Operations

The model predicted maximum ground-level concentrations and dustfall from operation of the MacLellan site are summarized in Table 9 and are compared with maximum predicted concentrations in the EIS TMR (Stantec 2020). The associated concentration and dustfall contours in the LAA are presented in Map 1 to Map 24 in Attachment A.

2.2.1 Maximum NO_2 Concentrations

The maximum predicted 1-hour NO_2 concentration, 435 µg/m³, is greater than the Manitoba AAQC (400 µg/m³). The maximum predicted 24-hour and annual NO_2 concentrations are 72.9 and 7.91 µg/m³, respectively and are less than the Manitoba AAQC and the annual CAAQS. The maximum predicted 1-hour average NO_2 concentration in the metric of the CAAQS (186 µg/m³) is greater than the 1-hour CAAQS (79 µg/m³). The maximum predicted NO_2 concentrations at HH receptors for all averaging periods are less than the Manitoba AAQC. The maximum predicted NO_2 concentrations are greater than the 1-hour CAAQS at six HH receptors (receptors ID 82, 85, 86, 117, 123, and 156 in TMR Appendix E Table E-2 (Stantec 2020)).

The maximum predicted 1-hour NO_2 concentration, 435 µg/m³, is 8% greater than maximum predicted value in the EIS TMR (Stantec 2020) and the maximum frequency of exceedance stays the same at 1 h/y. The maximum predicted 1-hour CAAQS NO_2 concentration is 27% greater than maximum predicted value in the EIS TMR (Stantec 2020) and the maximum frequency of exceedance decreases from 79 d/y to 70 d/y.

2.2.2 Maximum CO Concentrations

The maximum predicted 1-hour CO concentration is 15,406 µg/m³ and is 3% greater than the Manitoba AAQC. The maximum predicted 8-hour CO concentration is 4,567. The predicted concentrations are 10 to 16% higher than the than maximum predicted values in EIS TMR (Stantec 2020).

2.2.3 Maximum SO_2 Concentrations

The maximum predicted 1-hour, 24-hour, and annual SO_2 concentration are 437, 44.6, and 2.18 µg/m³, respectively, and are less than the Manitoba AAQC and annual CAAQS. The maximum predicted 1-hour average SO_2 concentration in the metric of the CAAQS (256 µg/m³) is greater than the 1-hour CAAQS (170 µg/m³). The maximum predicted SO_2 concentrations at HH receptors for all averaging periods are less than the Manitoba AAQC and CAAQS.

The maximum predicted 1-hour SO_2 CAAQS concentration, 256 µg/m³, is 74% greater than maximum predicted value in the EIS TMR (Stantec 2020) and the maximum frequency of exceedance increases from 0 d/y to 3 d/y. The increase is attributable to an increase in the blasting frequency and the amount of explosives used per blast associated with the 2023 design.

2.2.4 Maximum HCN Concentrations

The maximum predicted 1-hour, 24-hour and annual hydrogen cyanide (HCN) concentrations are 17.6, 6.79, and 0.553 µg/m³, respectively, and are less than the Manitoba AAQC and the 24-hour Ontario AAQC. The maximum predicted HCN concentrations at HH receptors for all averaging periods are less than the ambient criteria.

2.2.5 Maximum TSP Concentrations

The maximum predicted 24-hour TSP concentration, 437 µg/m³, is greater than the Manitoba AAQC (120 µg/m³). The maximum predicted annual TSP concentration, 14.1 µg/m³, is less than the Manitoba AAQC. The maximum predicted TSP concentrations are greater than the Manitoba 24-hour AAQC at three HH receptors (receptors ID 85, 86, and 117 in TMR Appendix E Table E-2 (Stantec 2020)).

The maximum predicted TSP concentrations are 1% to 15% less than the maximum predicted TSP concentrations EIS TMR (Stantec 2020). The maximum frequency of exceedance decreases from 64 d/y to 50 d/y.

2.2.6 Maximum PM_{10} Concentrations

The maximum predicted 24-hour PM_{10} concentration, 247 µg/m³, is greater than the Manitoba AAQC (50 µg/m³). The maximum predicted PM_{10} concentrations are greater than the Manitoba 24-hour AAQC at six HH receptors (receptors ID 82, 85, 86, 117, 123, and 156 in TMR Appendix E Table E-2 (Stantec 2020)).

The maximum predicted PM_{10} concentration is 21% less than the maximum predicted PM_{10} concentrations in the EIS TMR (Stantec 2020). The maximum frequency of exceedance decreases from 89 d/y to 70 d/y.

2.2.7 Maximum $PM_{2.5}$ Concentrations

The maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are 18.6 µg/m³ and 5.57 µg/m³, respectively, and are less than the CAAQS. The maximum predicted $PM_{2.5}$ concentrations at HH receptors for all averaging periods are less than the CAAQS.

The maximum predicted $PM_{2.5}$ concentrations are 11% to 23% less than the maximum predicted $PM_{2.5}$ concentrations in the EIS TMR (Stantec 2020).

2.2.8 Maximum Dustfall

The maximum predicted 30-day and annual average dustfall are 5.57 g/m²/30-day and 3.95 g/m²/30-day and are less than the Ontario AAQC. The maximum predicted 30-day and annual average dustfall at HH receptors are less than the dustfall criteria.

The maximum predicted dustfall values are 1% to 3% greater than the maximum predicted dustfall concentrations in the EIS TMR (Stantec 2020).

Reference:Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Table 9 Predicted Maximum Ground-Level Concentrations from MacLellan Site Operation (EIS vs 2023 Design)

Substance	Averaging Period	Existing/ Baseline Conditions (µg/m³)	Maximum Ground-level Concentration (µg/m³) (includes Baseline Conditions)											Ambient Air Quality Criteria a (µg/m³)
			Max. Value in LAA (EIS)	Max. Value in LAA (2023 Design)	% Change in Max Value in LAA from EIS	Max. Value at Human Receptors (EIS)	Max. Value at Human Receptors (2023 Design)	% Change in Max. Value at Human Receptors from EIS	Max. No. of Exceedances per Year (EIS)	Max. No. of Exceedances per Year (2023 Design)	% Change Max No. of Exceedances from EIS	% Max. Value of AAQC (EIS)	% Max. Value of AAQC (2023 Design)	
NO2	1-hour [b]	7.5	**404**	**435**	8%	223	241	8%	1 h/y	1 h/y	0%	**101%**	**109%**	400
	1-hour [c]	7.5	**146**	**186**	27%	**91.5**	**96.9**	6%	79 d/y	70 d/y	-11%	**185%**	**236%**	79 [c,d]
	24-hour [e]	5.6	84.5	72.9	-14%	48.5	45.4	-6%	0	0	—	42%	36%	200
	Annual	1.9	9.03	7.91	8%	3.96	3.63	-8%	0	0	—	15%	13%	60
									0	0	—	39%	34%	23 [d,f]
CO	1-hour [b]	406	13,328	**15,406**	16%	6,282	7,284	16%	0	1 h/y	—	89%	**103%**	15,000
	8-hour	406	4,144	4,567	10%	1,445	1,686	17%	0	0	—	69%	76%	6,000
SO2	1-hour [b]	6	370	437	18%	173	205	18%	0	0	—	82%	97%	450
	1-hour [g]	6	147	**256**	74%	36.2	54.1	49%	0	3 d/y	—	86%	**150%**	170 [d,g]
	24-hour [e]	6	39.0	44.6	14%	15.7	17.9	14%	0	0	—	26%	30%	150
	Annual	1.5	1.95	2.18	12%	1.60	1.67	5%	0	0	—	7%	7%	30
									0	0	—	20%	22%	10 [d,h]
Other Gaseous Species														
HCN	1-hour [b]	0	14.4	17.6	22%	7.15	9.20	29%	0	0	—	36%	44%	40
	24-hour [d]	0	6.5	6.79	4%	2.92	3.11	7%	0	0	—	81%	85%	8 [i]
	Annual	0	0.55	0.553	0.5%	0.22	0.233	6%	0	0	—	18%	18%	3
Particulate CAC														
TSP	24-hour [e]	10.5	**513**	**437**	-15%	**205**	**194**	-6%	64 d/y	50 d/y	-22%	**428%**	**364%**	120
	Annual [j]	10.5	14.2	14.1	-1%	12.0	12.0	0%	0	0	—	24%	23%	60 [j]
PM10	24-hour [e]	4.6	**315**	**247**	-21%	**132**	**112**	-15%	89 d/y	70 d/y	-21%	**630%**	**495%**	50
PM2.5	24-hour [k]	2.9	24.1	18.6	-23%	8.4	8.20	-2%	0	0	—	89%	69%	27 [d,k]
	Annual [l]	2.9	6.23	5.57	-11%	3.74	3.71	-1%	0	0	—	71%	63%	8.8 [d,l]
Dustfall	30-day	0.99	5.51	5.57	1%	2.02	1.82	-10%	0	0	—	69%	80%	7
(g/m²/30-day)	Annual [j]	0.99	3.84	3.95	3%	1.52	1.46	-4%	0	0	—	28%	86%	4.6 [j]

Reference:Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

Notes:

µg/m³: micrograms per cubic metre; EIS: Environmental Impact Statement; LAA: Local Assessment Area; AAQC: ambient air quality criteria; NO2: nitrogen dioxide; CO: carbon monoxide; SO2: sulphur dioxide; HCN: hydrogen cyanide; TSP: total suspended particulate; PM10: particulate matter <10 microns; PM2.5: particulate matter <2.5 microns; g/m2/30-day: grams per square metre per 30 days.

a. Manitoba Ambient Air Quality Criteria (MSD 2005) unless otherwise noted

b. The maximum 1-hour concentration after eliminating 8 highest meteorological hours in each year

c. The 1-hour CAAQS for NO2 is referenced to the three-year average of the annual 98th percentile of the NO2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).

d. CAAQS (CCME 2017)

e. The maximum 24-hour concentration after eliminating the 1st highest meteorological day in each year

f. The annual CAAQS for NO2 is referenced to the arithmetic average over a single calendar year of all 1-hour average NO2 concentrations (effective 2025) (CCME 2017).

g. The 1-hour CAAQS for SO2 is referenced to the three-year average of the annual 99th percentile of the SO2 daily maximum 1-hour average concentrations (effective 2025) (CCME 2017).

h. The annual CAAQS for SO2 is referenced to the arithmetic average over a single calendar year of all 1-hour average SO2 concentrations (effective 2025) (CCME 2017).

i. Ontario AAQC (MOECC 2012)

j. Annual geometric mean

k. The CAAQS for 24-hour PM2.5 is referenced to the annual 98th percentile of daily 24-hour average concentrations, averaged over three years (effective 2020) (CCME 2017).

l. The CAAQS for annual PM2.5 is referenced to the three-year mean of annual average concentrations (effective 2020) (CCME, 2017).

Predicted maximum 1-hour and 8-hour average concentrations are based on maximum hourly emission rates.

Predicted maximum 24-hour, 30-day and annual average concentrations are based on daily average emission rates.

“—” not applicable

Values in **BOLD** exceed the ambient air quality criteria

3 Conclusion

This update of the air quality assessment focused on the potential changes of the Project air quality effects due to the updated Project 2023 design during the operation phase. Changes to the Project design include updates to the PDA, Project layouts, mining production quantities, major mine equipment, and operation blast parameters. The air quality model for the operation phase of the Project was updated, based on the same approach (i.e., receptor locations, regulatory framework, baseline conditions, and modelling method) as to the previous Stantec 2020 assessment.

For the 2023 mine design the air quality effects were assessed for NO_2, CO, SO_2, HCN, TSP, PM_{10}, $PM_{2.5}$ and dustfall. The predicted air quality during the operation phase on the air quality receptors were presented and summarized in isopleth maps and in summary tables with comparison to the ambient air quality criteria.

Compared with the results in Stantec 2020, the air quality effects from the Project activities marginally increased at some receptors. When there was an increase in the model predicted concentrations, the associated increase in the frequency of exceedance was low. In conclusion, the results of the updated air quality assessment do not change the characterization of residual effects, or the significance ratings summarized as presented in the EIS (Stantec 2020).

4 Limitations and Sign-off

This document entitled was prepared by *Stantec Consulting Ltd.* (“Stantec”) for the account of *Alamos Gold Inc.* (the “Client”) to support the permitting process for its Lynn Lake Gold Project (the “Project”). In connection therewith, this document may be reviewed and used by the *Impact Assessment Agency of Canada* and *Manitoba Conservation and Climate* participating in the review process in the normal course of its duties. Except as set forth in the previous sentence, any reliance on this document by any other party or use of it for any other purpose is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The information and conclusions in the document are based on the conditions existing at the time the document was published and does not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by the Client or others, unless expressly stated otherwise in the document. Any use which another party makes of this document is the responsibility and risk of such party. Such party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other party as a result of decisions made or actions taken based on this document.

Reference:Summary of Air Dispersion Model Results for the Lynn Lake Gold Project Revised 2023 Mine Design

If you have any questions or require additional information, please do not hesitate to contact us

Regards,

Stantec Consulting Ltd.

Prepared by: _____
Signature

Kanwardeep Bajwa
Printed Name

Reviewed by: _____
Signature

Dan Jarratt
Printed Name

Approved to transmit by: _____
Signature

Karen Mathers
Printed Name

5 References

Alamos. 2023. Feasibility Study Update (FSU). NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada. August 22, 2023.

CCME (Canadian Council of Ministers of the Environment). 2017. Canada's Air: Canadian Ambient Air Quality Standards (CAAQS). Available at: https://ccme.ca/en/air-quality-report. Last accessed on September 9, 2024.

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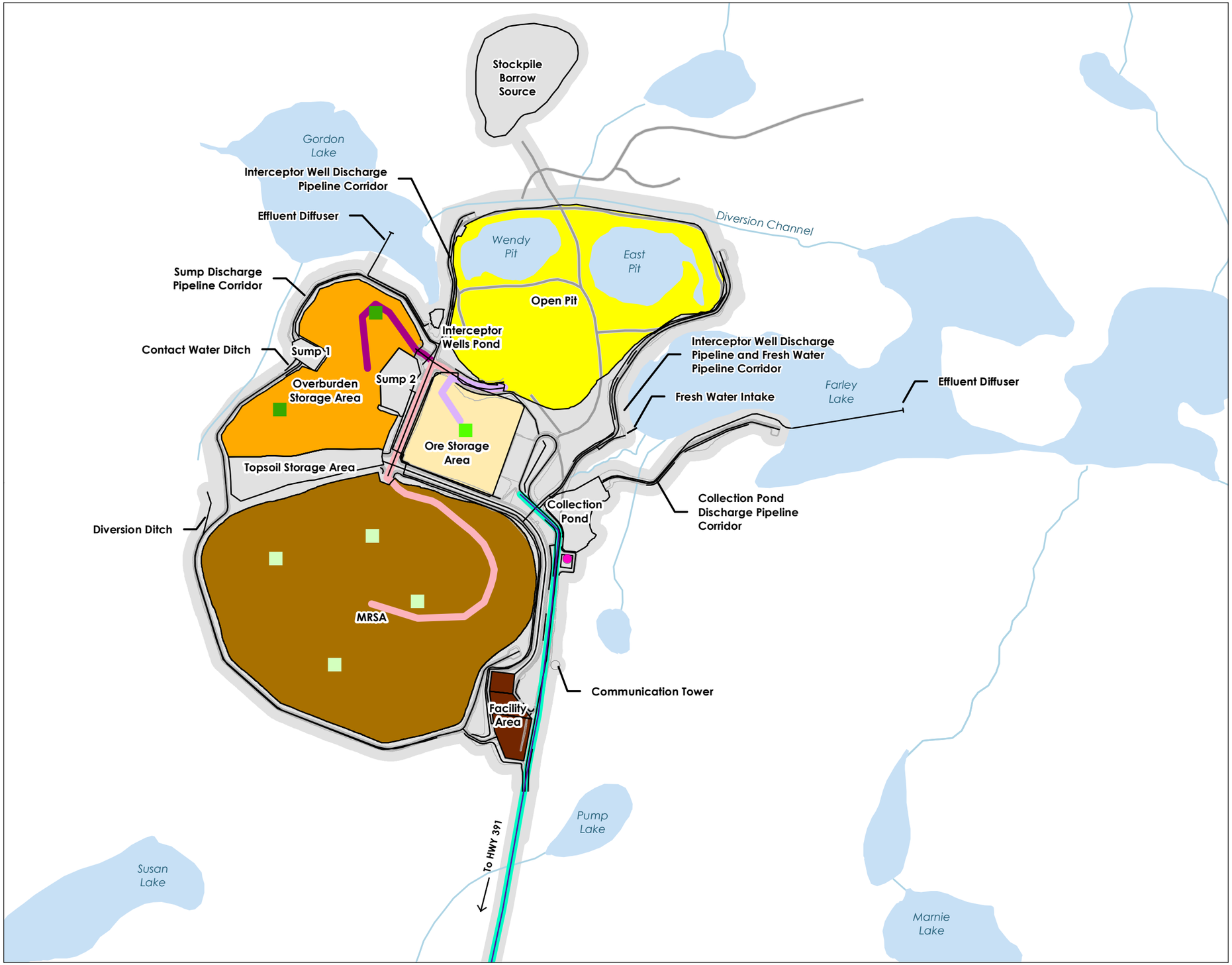
Pers comm. 2024. February 27 and April 10 and 11, 2024 email correspondence from Robert Halas, (Alamos Gold Inc. Sr. Project Engineer, Lynn Lake, Projects) to Karen Mathers (Stantec Senior Principal - Environmental Services).

Stantec (Stantec Consulting Inc.). 2020. Lynn Lake Gold Project Environmental Impact Statement, May 2020.

Attachment A Isopleths 2024



Stantec

Project Infrastructure

- Infrastructure Features
- Project Development Area (PDA)

Emission Source Type

Point Source
- Diesel Generator

Volume Source
- Material Handling at MRSA
- Material Handling at Ore Stockpile
- Material Handling at Overburden Stockpile

Haul Road Source
- Haul Road from the Open Pit to the MRSA
- Haul Road from the Open Pit to the Ore Stockpile
- Haul Road from the Open Pit to the Overburden Stockpile

Access Road Source
- Access Road to Gordon Site

Open Pit Source
- Open Pit at Gordon Site

Area Source
- Ore Stockpile Wind Erosion
- Overburden Wind Erosion
- MRSA Wind Erosion
- General Area

Landbase
- Existing Access
- Waterbody
- Watercourse

N

0 250 500 Metres

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Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.
3. NOA Project Infrastructure features provided by Worley via Alamos.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2025-05-14
Technical Review by DJarratt on 2025-05-14

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
A

Title
Modelled Emission Sources for Gordon Site Operation

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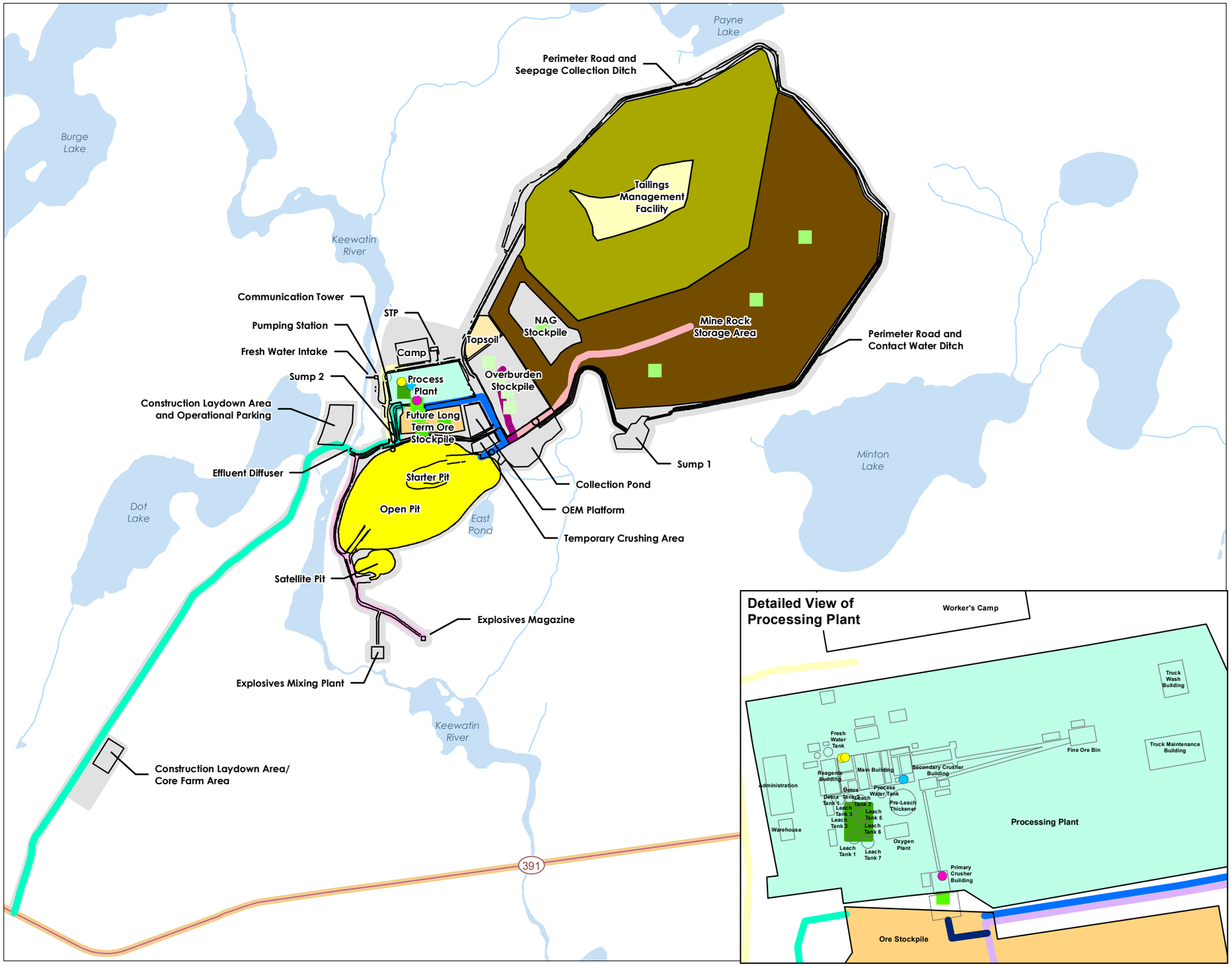

Stantec

Project Infrastructure

- Infrastructure Features
- Project Development Area (PDA)

Emission Source Type

Point Source
- Gold Room Drying Oven Stack/Gold Room Dust Collector
- Primary Crusher Dust Collector
- Secondary Crusher Wet Scrubber

Volume Source
- Material handling at overburden stockpile
- Material handling at MRSA
- Material handling at primary crusher
- Material handling at Ore Stockpile
- Processing plant HCN fugitive emission

Haul Road Source
- Haul Road from Open Pit to MRSA
- Haul Road from Open Pit to Ore Stockpile
- Haul Road from Open Pit to Overburden Stockpile
- Haul Road from Open Pit to the Primary Crusher
- Haul Road from Ore Stockpile to the ROM Stockpile

Access Road Source
- Access Road to Mill at MacLellan Site
- Access Road to Explosives Facilities
- Access Road to Worker's Camp

PR 391 Source
- Provincial Road 391

Open Pit Source
- Open Pit and Satellite Pit

Area Source
- Topsoil Stockpile/ROM Wind Erosion
- TMF Pond and HCN Fugitive Emissions
- TMF Dry Banks Wind Erosion
- MRSA Wind Erosion
- Ore Stockpile Wind Erosion
- General Area

N

0 0.5 1 Kilometres

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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 2025-02-26
Technical Review by IYankova on 2025-02-26

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
B

Title
Modelled Emission Sources for MacLellan Site Operation

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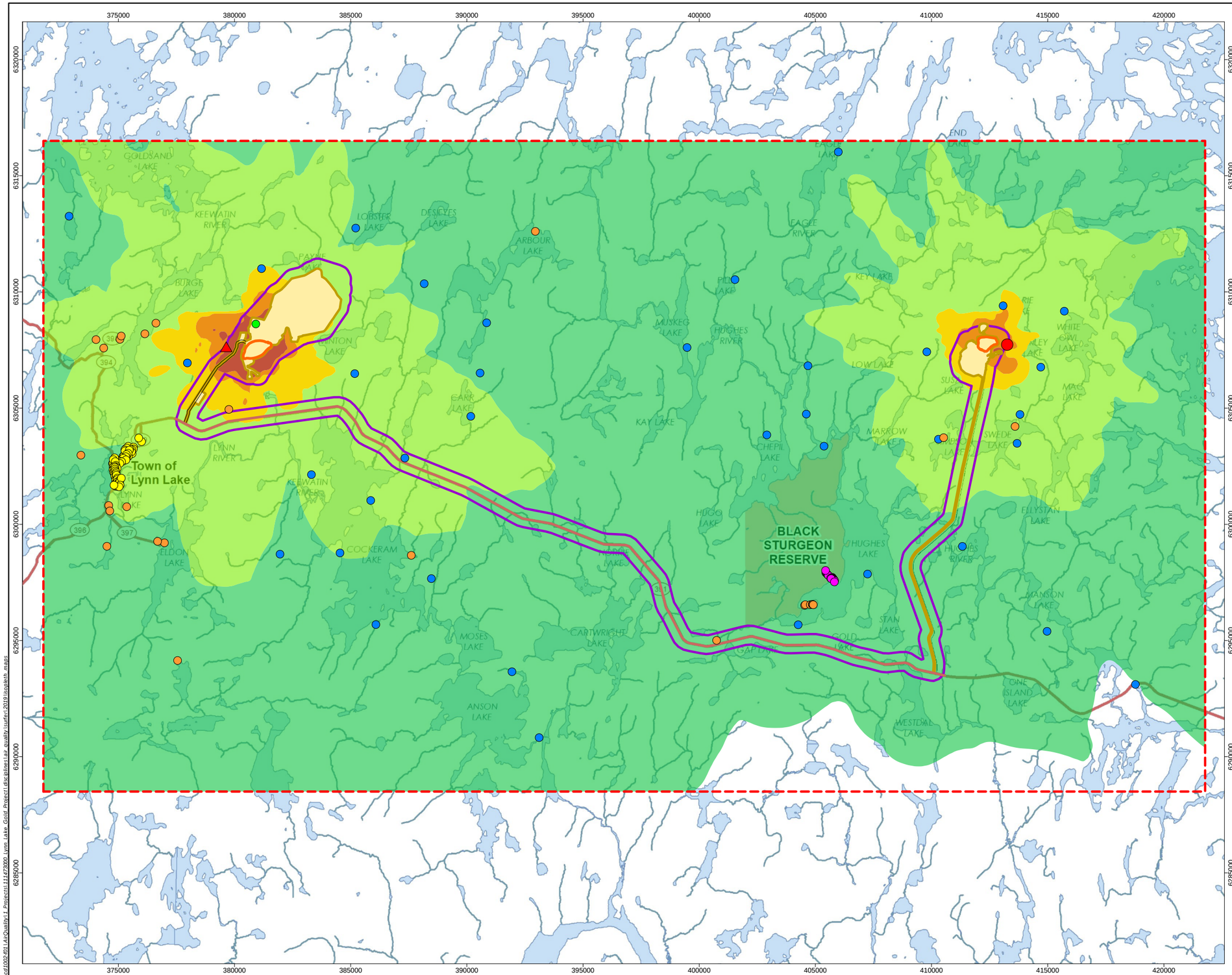

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 415 µg/m³
- Maximum Concentration (MacLellan Site): 435 µg/m³
- Background Concentration: 7.5 µg/m³
- 1-hour NO_2 MAAQC: 400 µg/m³

40 100 200 300 400

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
1

Title
Maximum Predicted 1-hour Average NO_2 Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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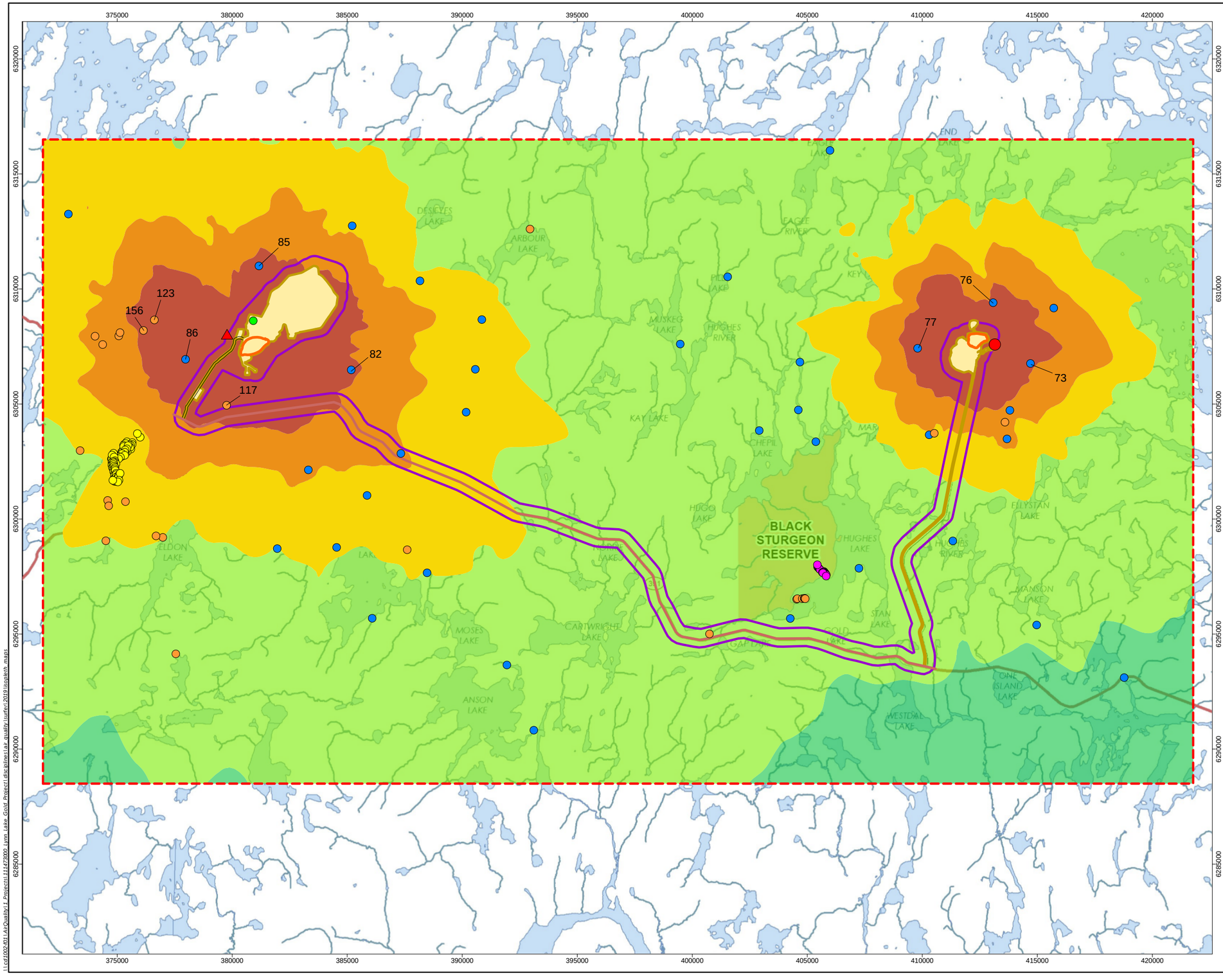

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 284 µg/m³
- Maximum Concentration (MacLellan Site): 186 µg/m³

Background Concentration: 7.5 µg/m³

1-hour NO_2 CAAQS: 79 µg/m³

7.9 | 19.8 | 39.5 | 59.3 | 79

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
2

Title

Maximum Predicted 98% Daily 1-hour Average NO_2 Concentrations (Project Operation + Baseline Conditions)

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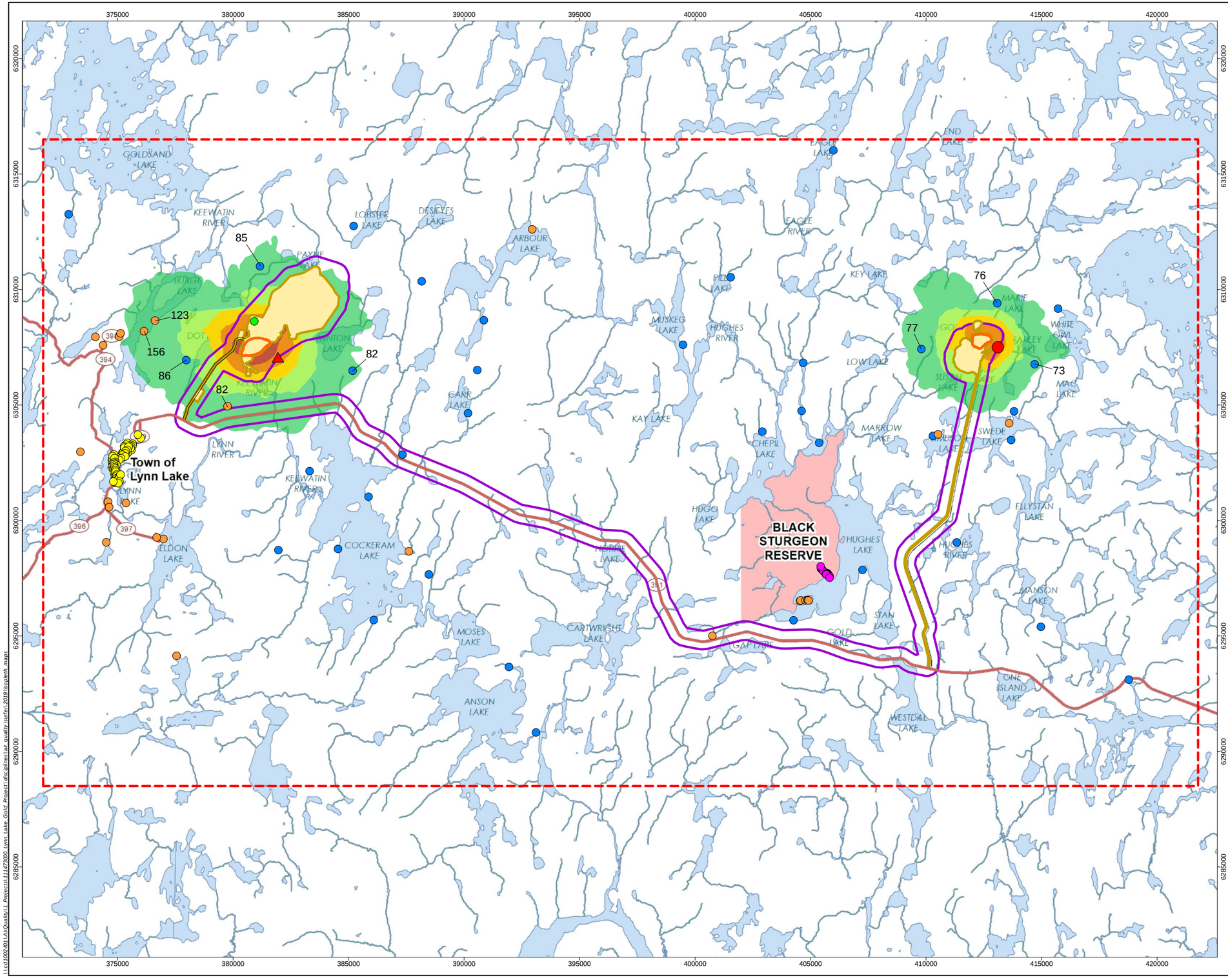

Stantec

Alamos Gold Inc.

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
3

Title

Maximum Frequency Exceedance of 98% Daily 1-hour Average NO_2 Concentrations (Project Operation + Baseline Conditions)

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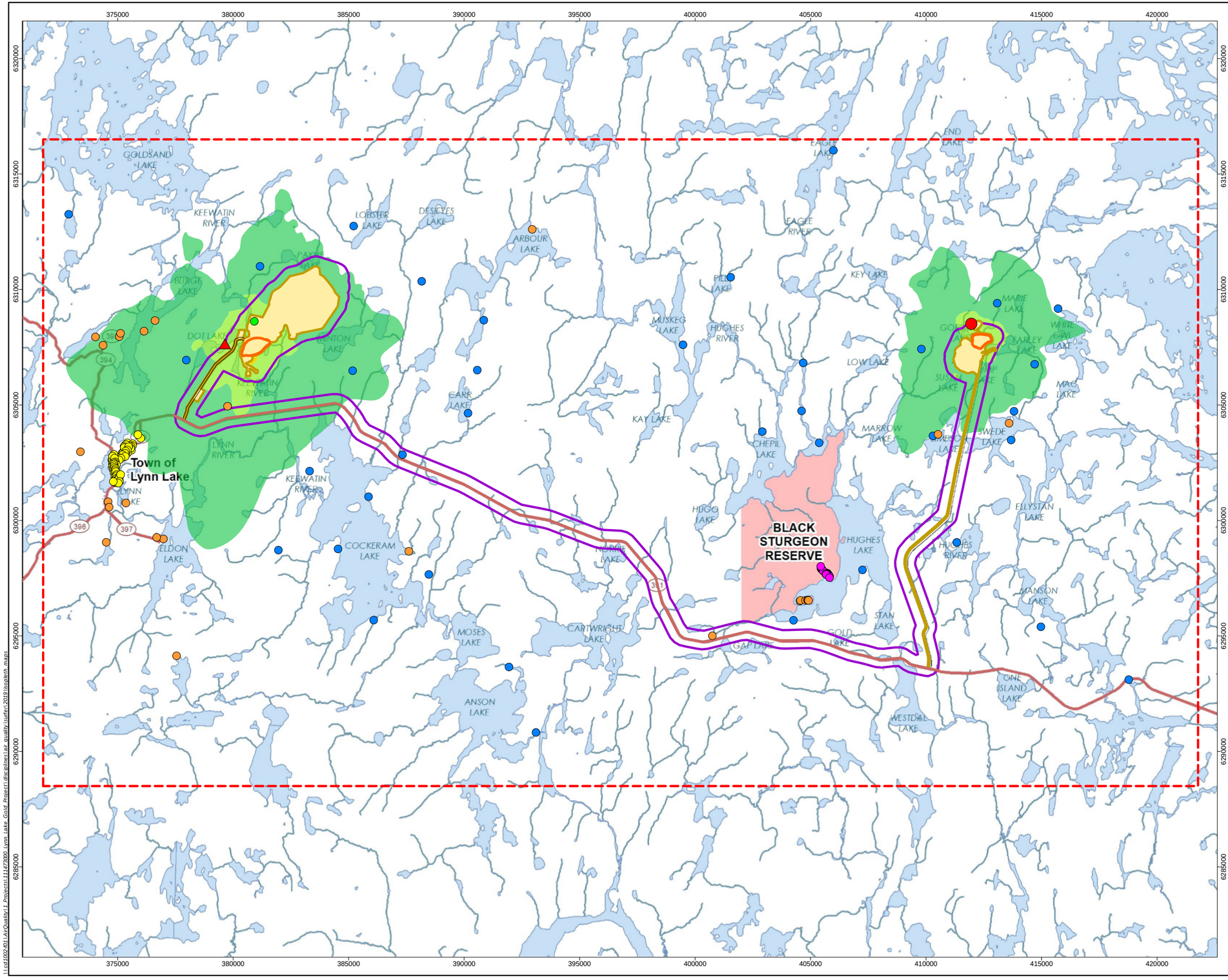

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 74.2 µg/m³
- Maximum Concentration (MacLellan Site): 72.9 µg/m³
- Background Concentration: 5.6 µg/m³
- 24-hour NO_2 MAAQC: 200 µg/m³

20 50 100 150 200

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
4

Title

Maximum Predicted 24-hour Average NO_2 Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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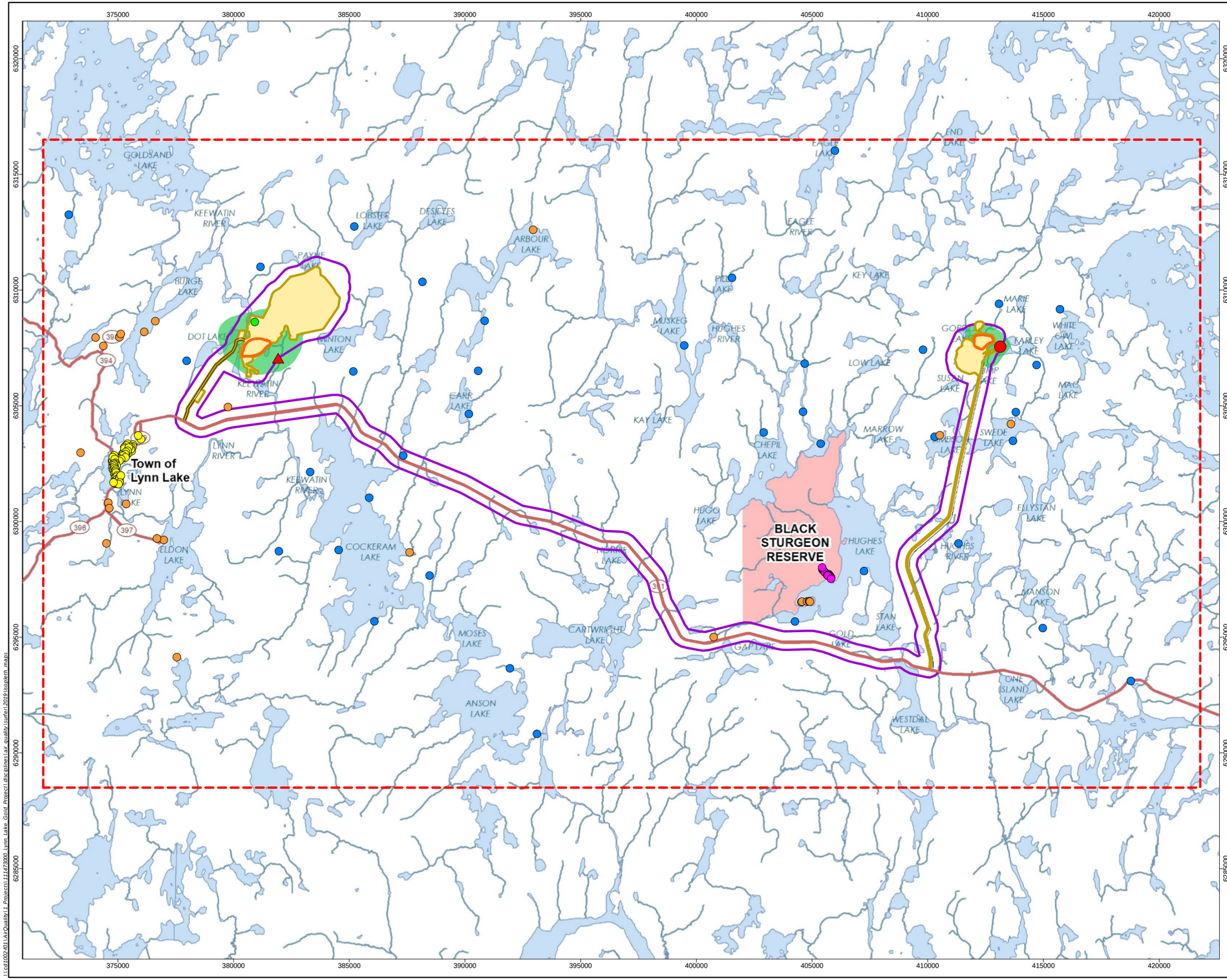

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 10.4 µg/m³
- Maximum Concentration (MacLellan Site): 7.91 µg/m³
- Background Concentration: 1.9 µg/m³
- Annual NO_2 MAAQC: 60 µg/m³

6 15 30 45 60

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5

Title

Maximum Predicted Annual Average NO_2 Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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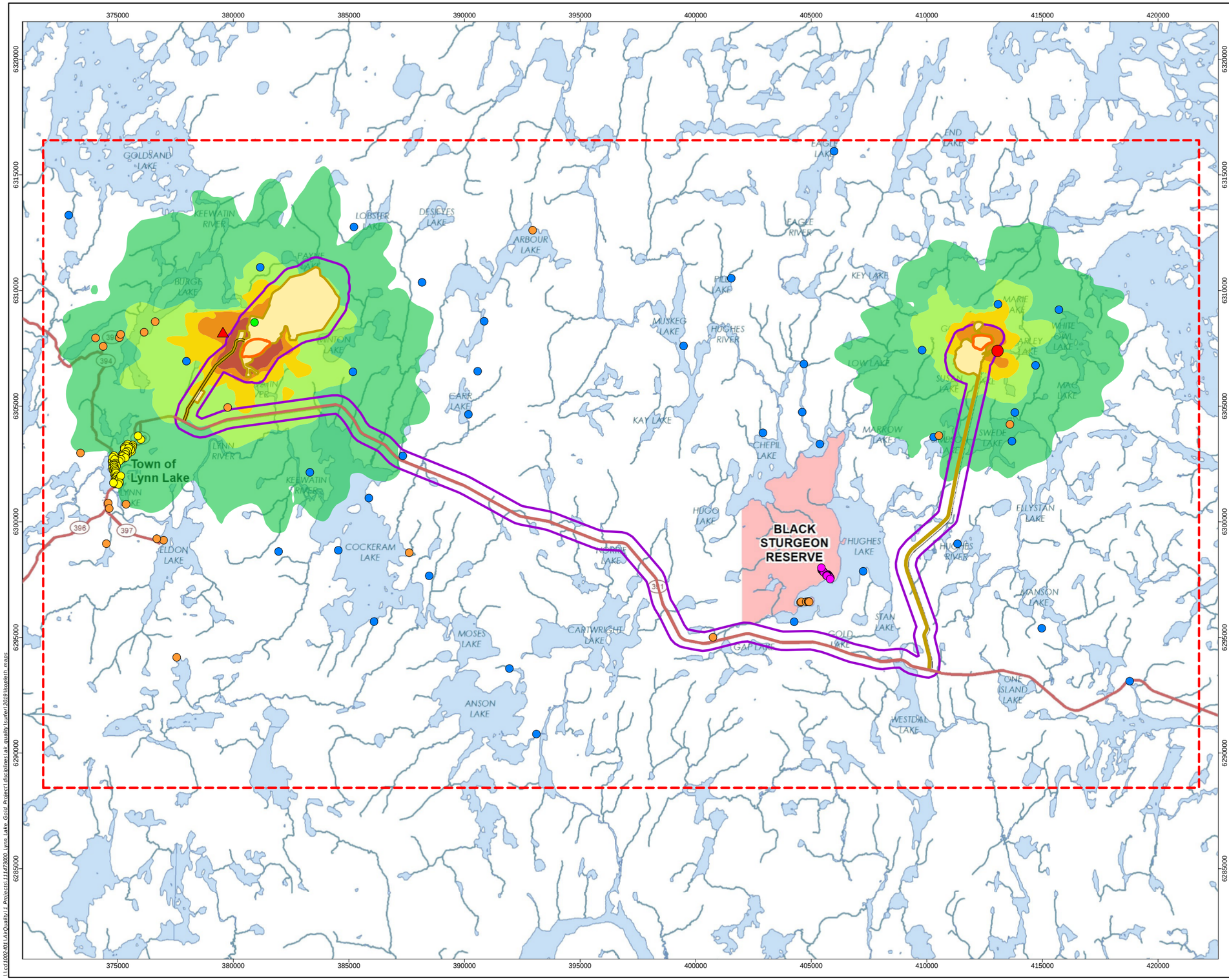

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 14832 µg/m³
- Maximum Concentration (MacLellan Site): 15406 µg/m³
- Background Concentration: 406 µg/m³
- 1-hour CO MAAQC: 15000 µg/m³

1500 3750 7500 11250 15000

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
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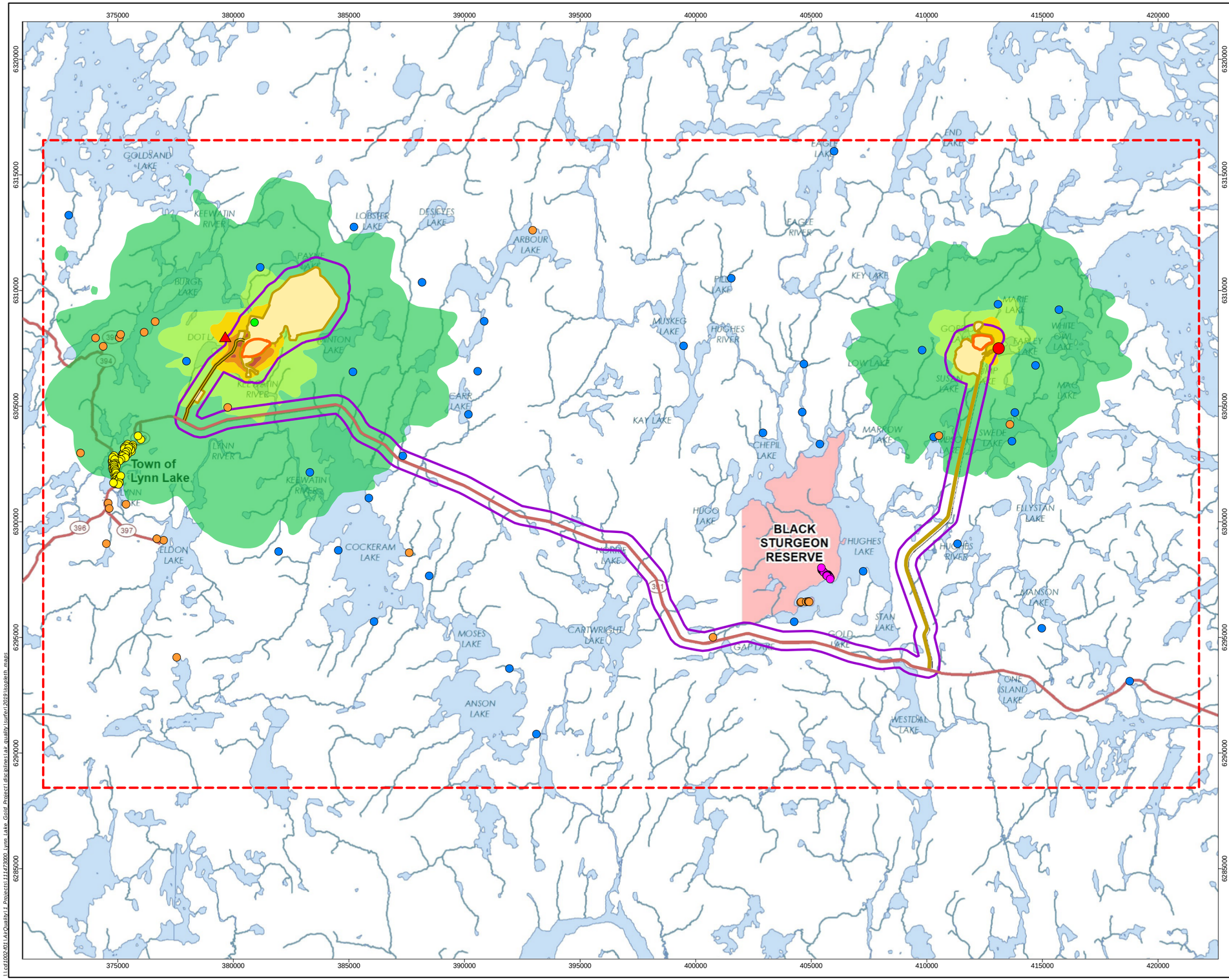
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
6

Title

Maximum Predicted 1-hour Average CO Concentrations (µg/m³) (Project Operation + Baseline Conditions)



Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 4345 µg/m³
- Maximum Concentration (MacLellan Site): 4567 µg/m³

Background Concentration: 406 µg/m³

8-hour CO MAAQC: 6000 µg/m³

600 1500 3000 4500 6000

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

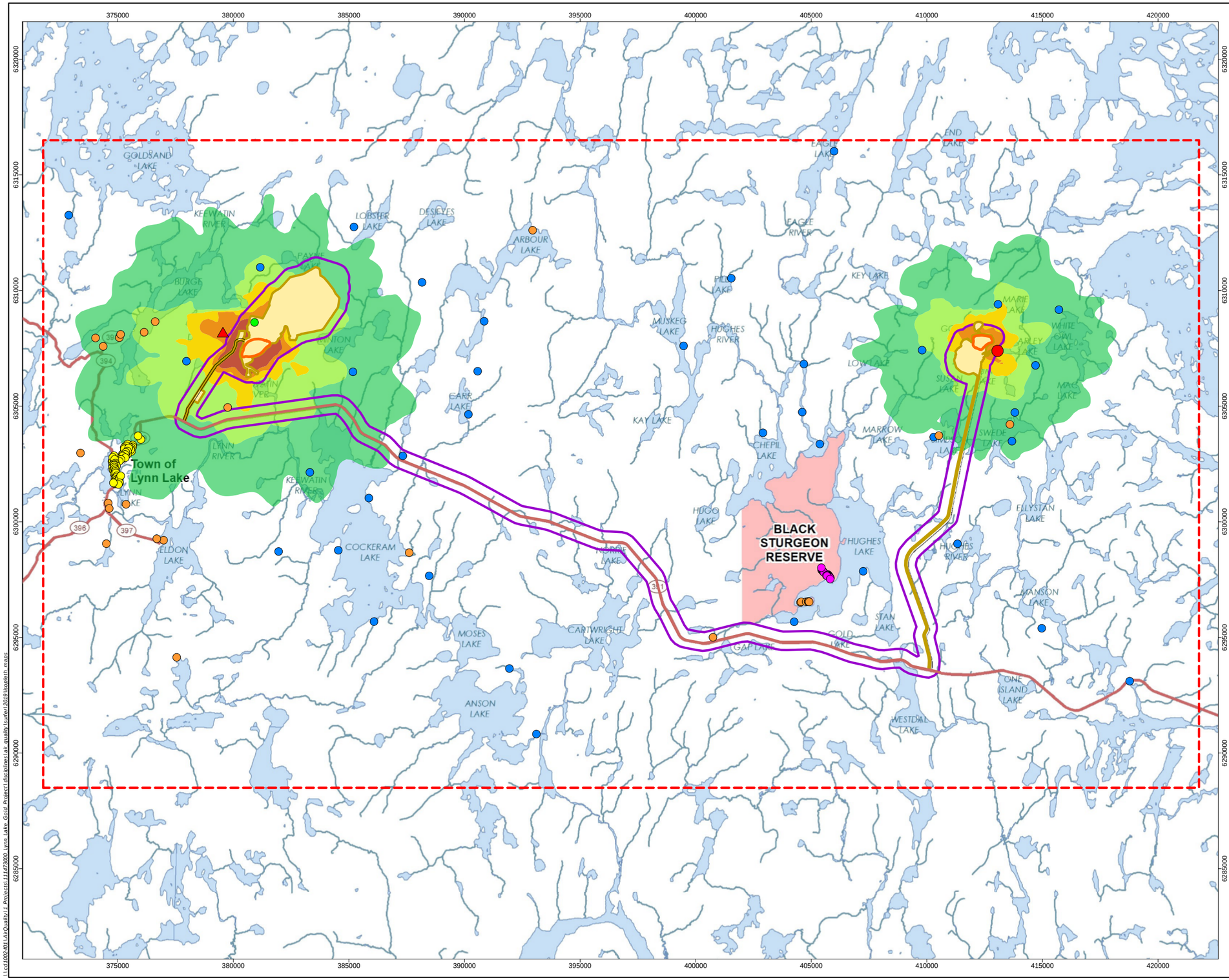
Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
7

Title

Maximum Predicted 8-hour Average CO Concentrations (µg/m³) (Project Operation + Baseline Conditions)



Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 422 µg/m³
- Maximum Concentration (MacLellan Site): 437 µg/m³

Background Concentration: 6 µg/m³

1-hour SO_2 MAAQC: 450 µg/m³

45 | 113 | 225 | 338 | 450

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
8

Title

Maximum Predicted 1-hour Average SO_2 Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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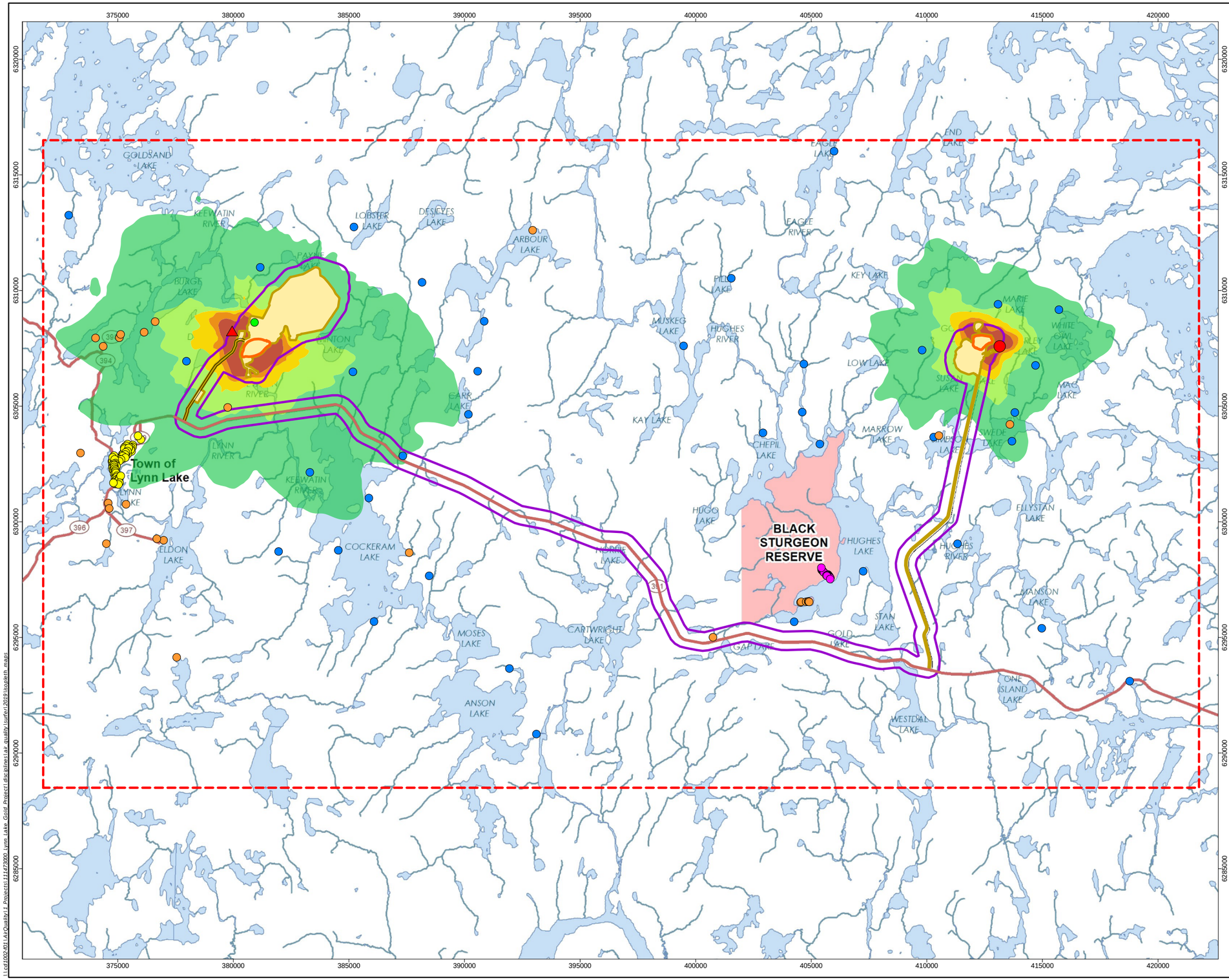

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 382 µg/m³
- Maximum Concentration (MacLellan Site): 256 µg/m³
- Background Concentration: 6 µg/m³
- 1-hour SO_2 CAAQS: 170 µg/m³

17 | 42.5 | 85 | 128 | 170

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
9

Title

Maximum Predicted 99% Daily 1-hour Average SO_2 Concentrations (Project Operation + Baseline Conditions)

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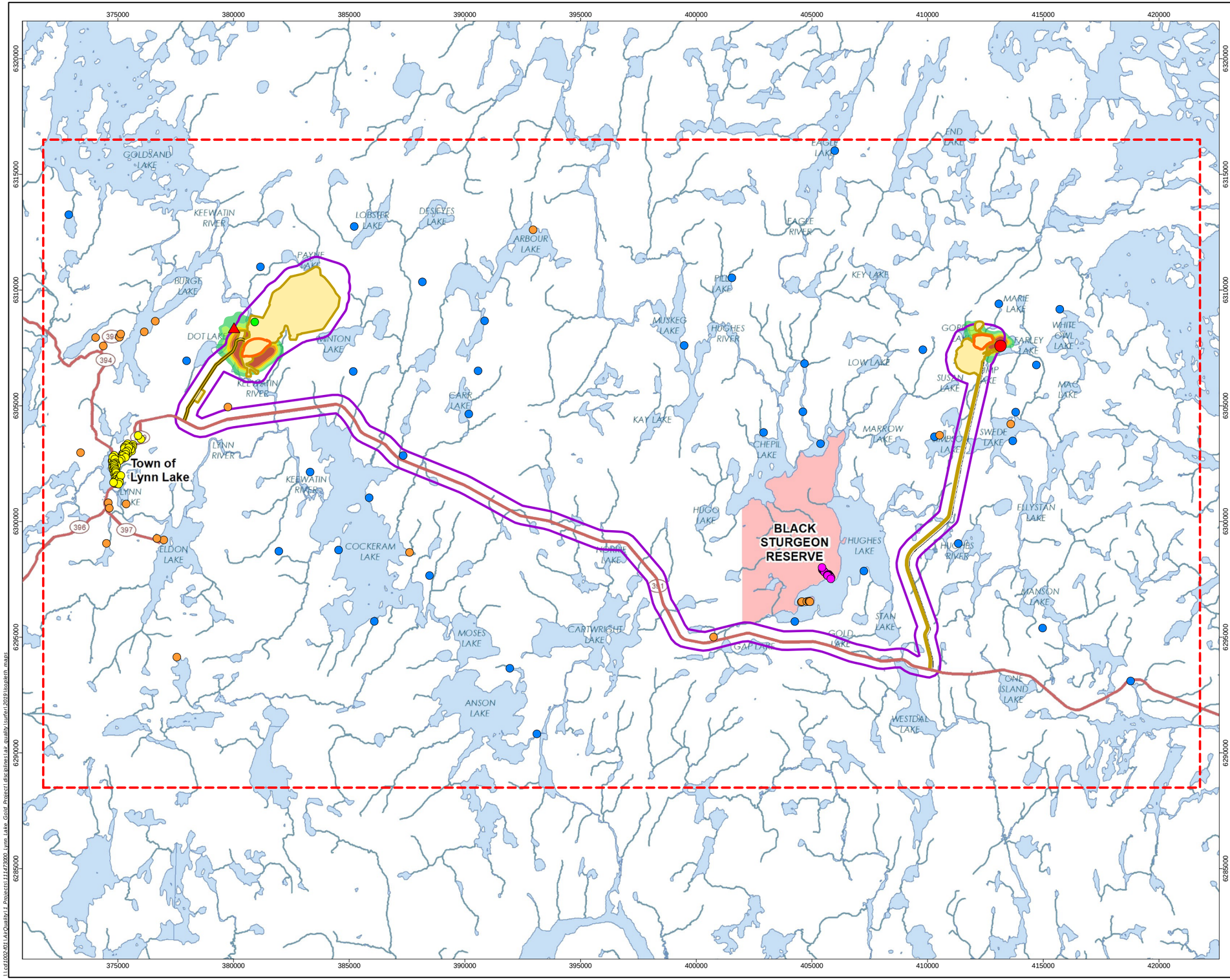

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Exceedances (Gordon Site): 12 days/year
- Maximum Exceedances (MacLellan Site): 3 days/year
- Background Concentration: 6 µg/m³
- 1-hour SO_2 CAAQS: 170 µg/m³

1 2 3 4 5

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
10

Title

Maximum Frequency Exceedance of 99% Daily 1-hour Average SO_2 Concentrations (Project Operation + Baseline Conditions)

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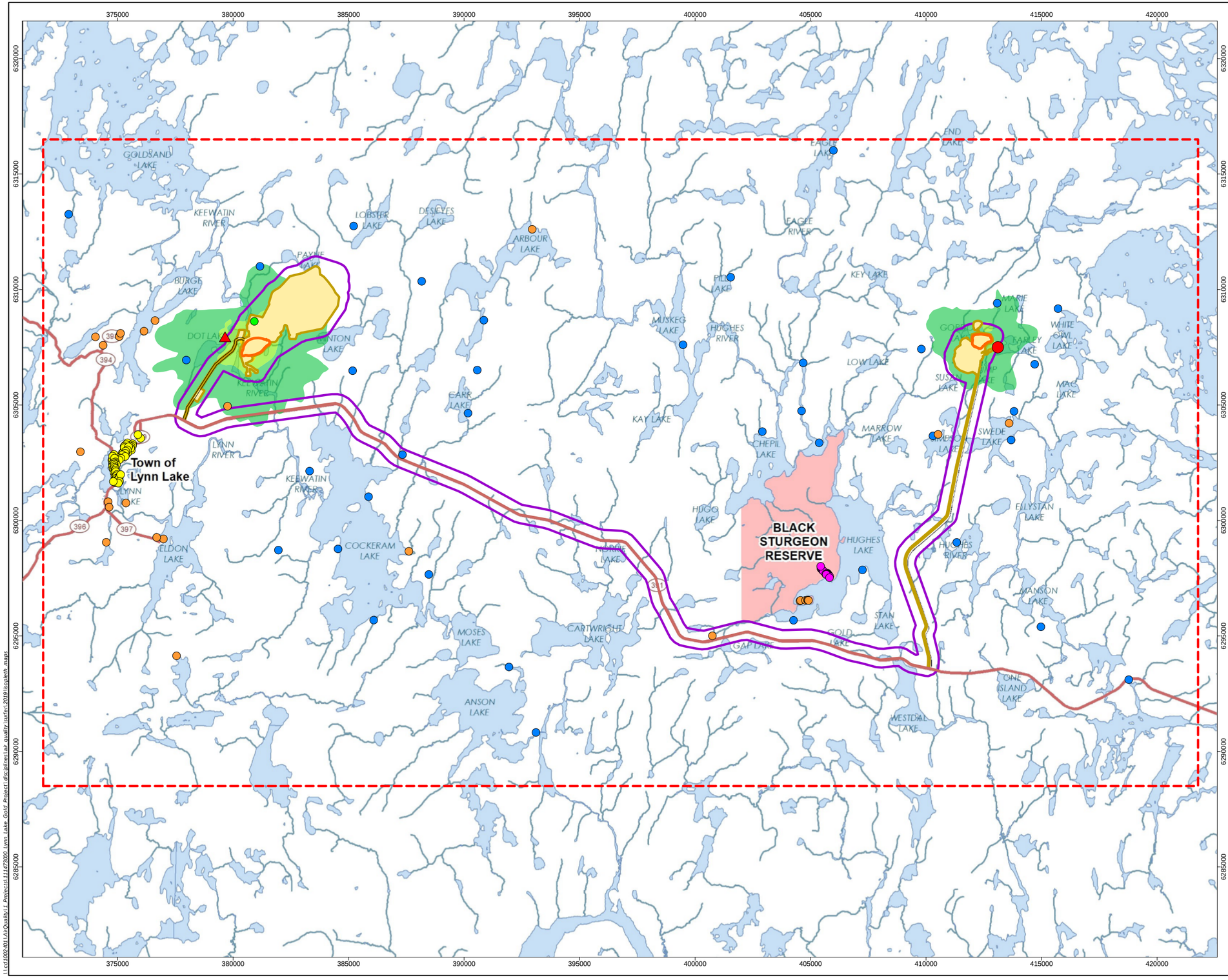

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 42.6 µg/m³
- Maximum Concentration (MacLellan Site): 44.6 µg/m³
- Background Concentration: 6 µg/m³
- 24-hour SO_2 MAAQC: 150 µg/m³

15 37.5 75 113 150

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
11

Title

Maximum Predicted 24-hour Average SO_2 Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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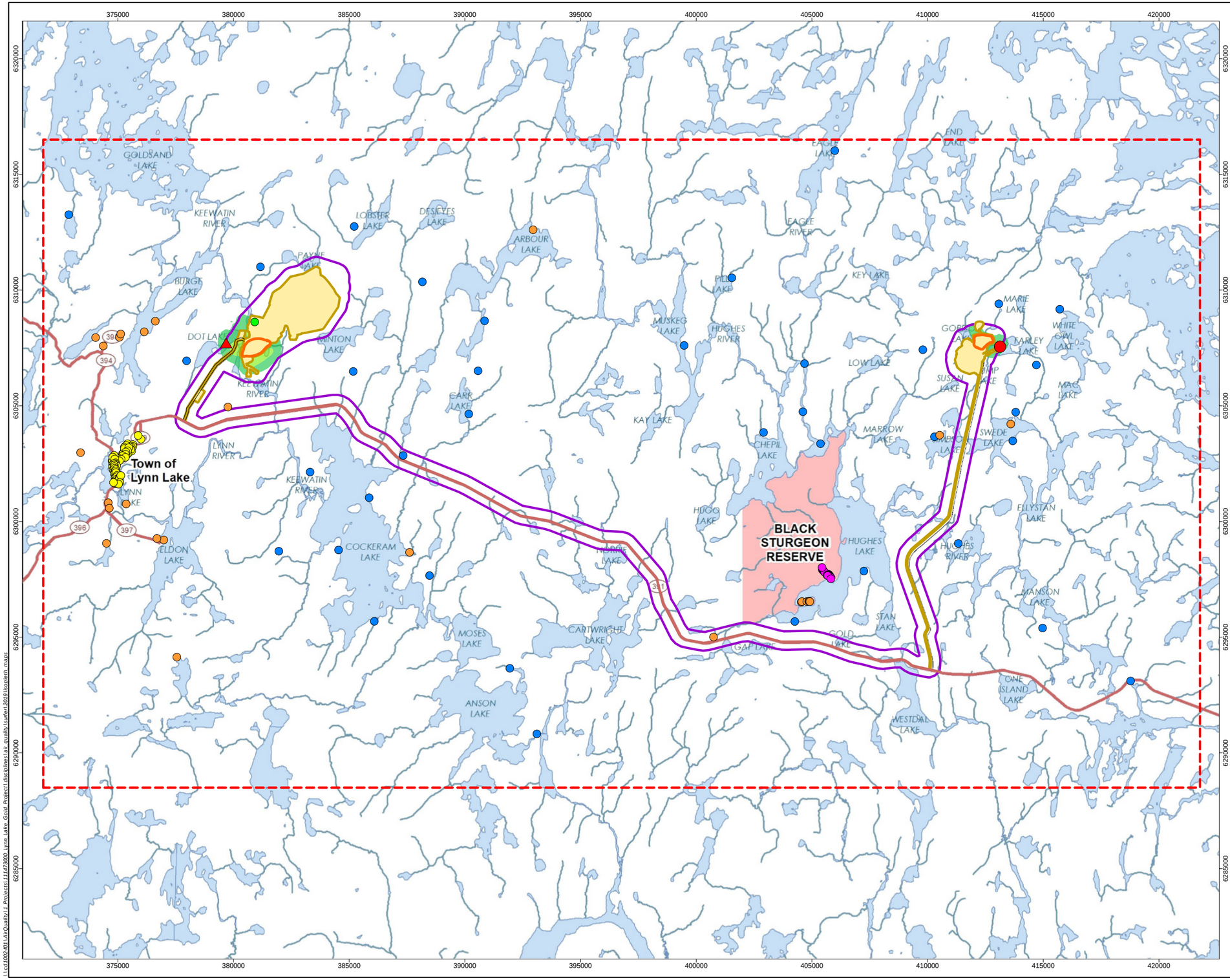

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 2.60 µg/m³
- Maximum Concentration (MacLellan Site): 2.18 µg/m³
- Background Concentration: 1.5 µg/m³
- Annual SO_2 CAAQS: 10 µg/m³

2 2.5 5 7.5 10

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
12

Title

Maximum Predicted Annual Average SO_2 Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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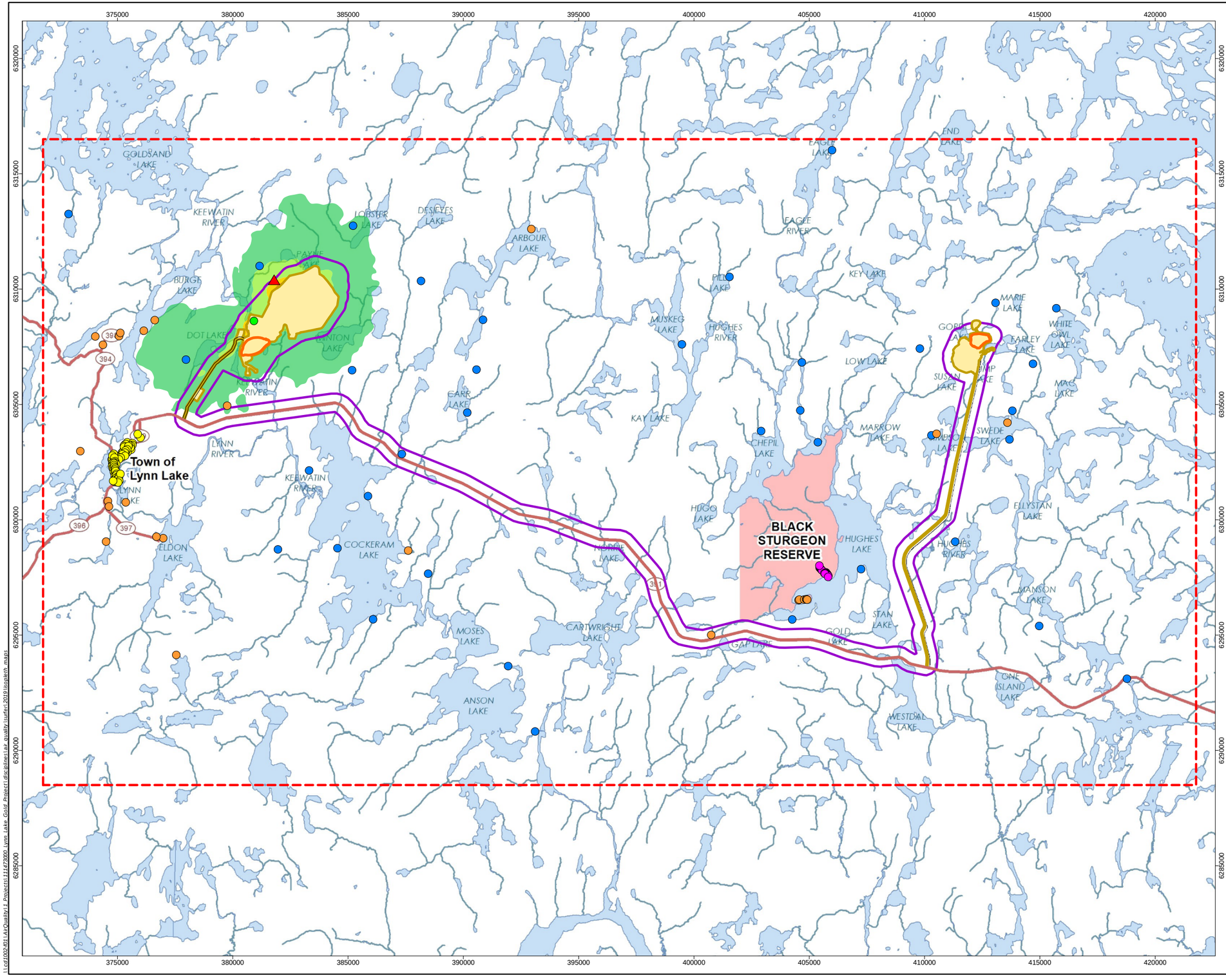

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 0 µg/m³
- Maximum Concentration (MacLellan Site): 17.6 µg/m³
- Background Concentration: 0 µg/m³
- 1-hour HCN MAAQC: 40 µg/m³

4 10 20 30 40

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
13

Title

Maximum Predicted 1-hour Average HCN Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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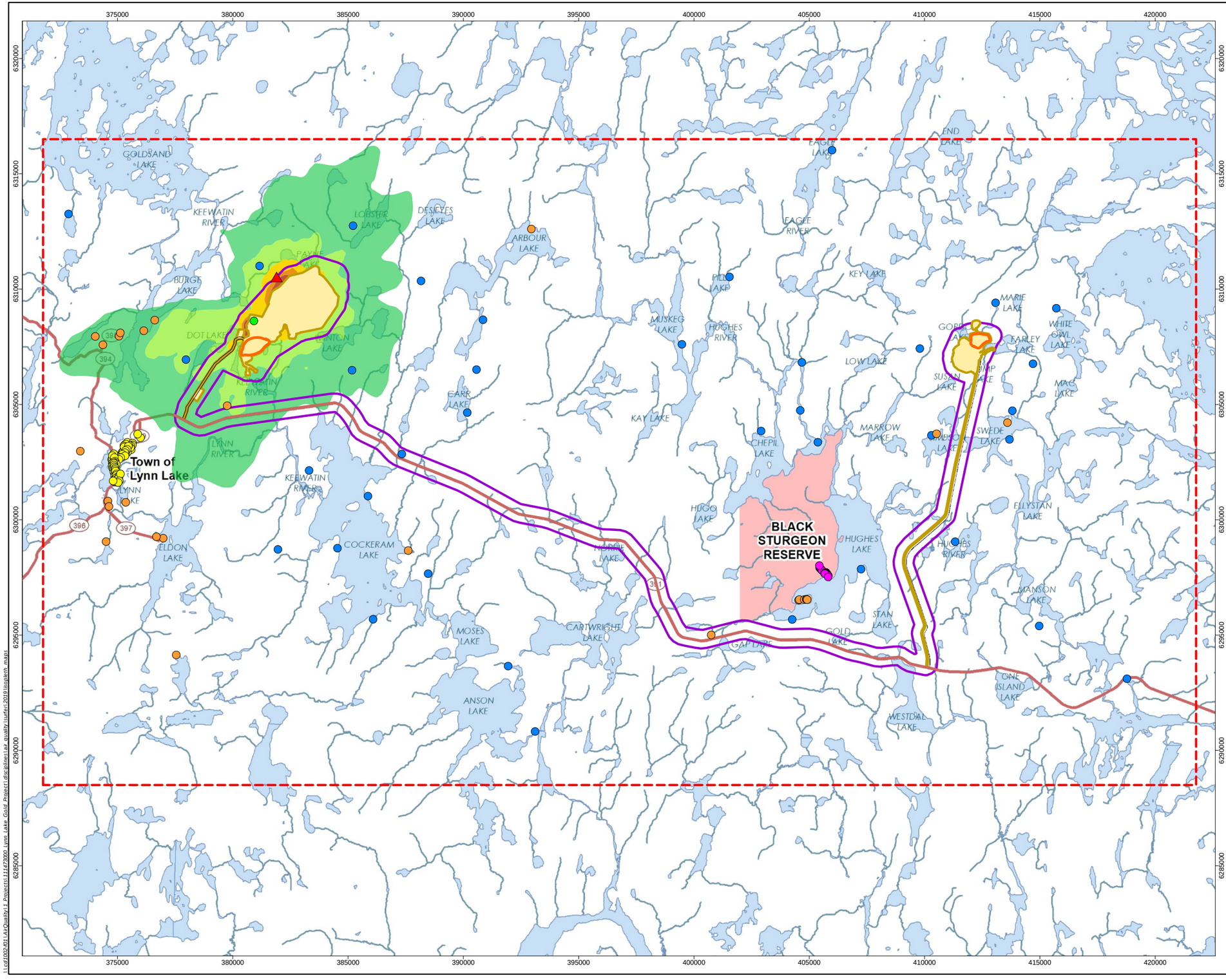

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 0 µg/m³
- Maximum Concentration (MacLellan Site): 6.79 µg/m³
- Background Concentration: 0 µg/m³
- 24-hour HCN OAAQC: 8 µg/m³

0.8 2 4 6 8

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
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Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
14

Title

Maximum Predicted 24-hour Average HCN Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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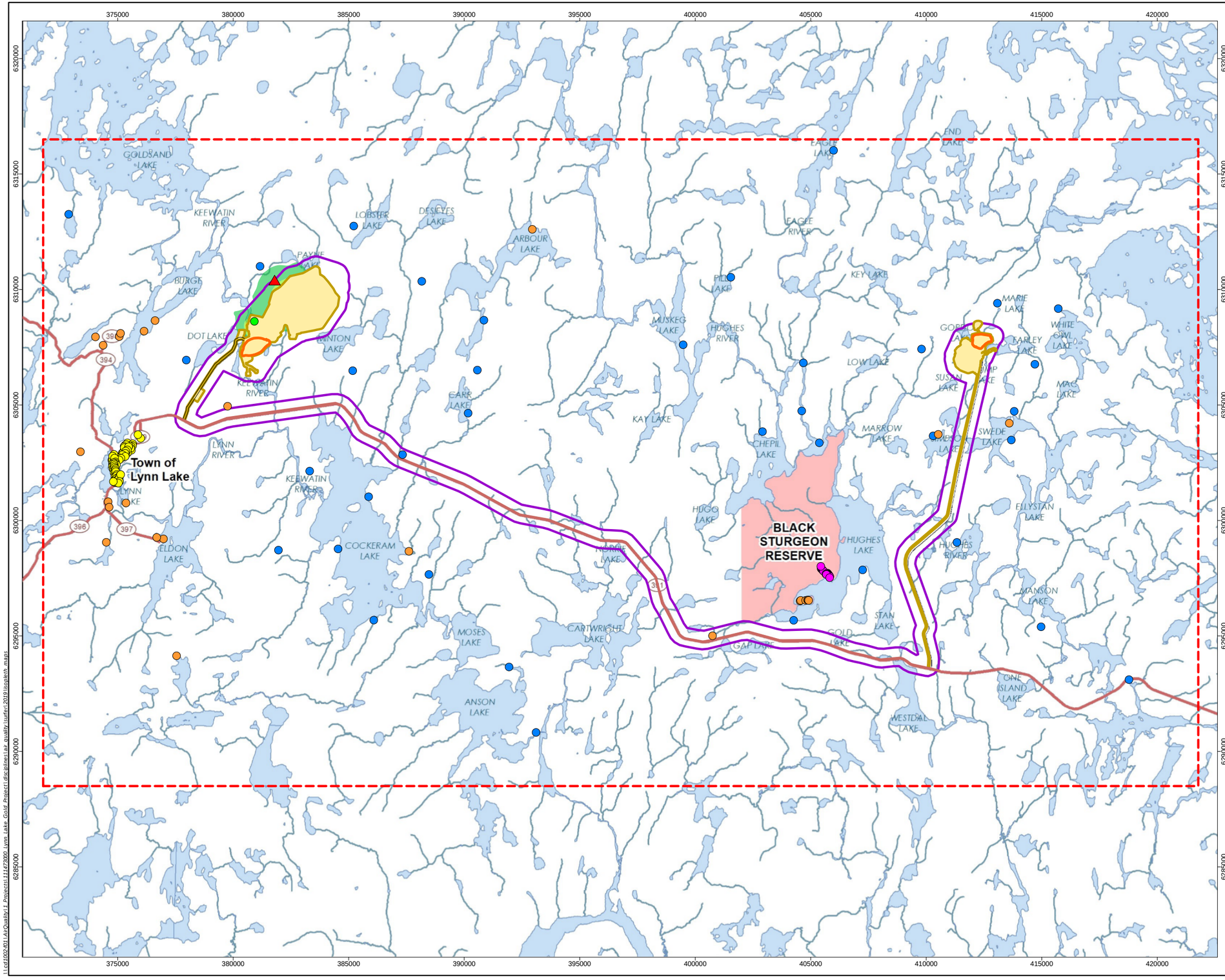

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 0 µg/m³
- Maximum Concentration (MacLellan Site): 0.553 µg/m³
- Background Concentration: 0 µg/m³
- Annual HCN MAAQC: 3 µg/m³

0.3 0.75 1.2 2.25 3

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
15

Title

Maximum Predicted Annual Average HCN Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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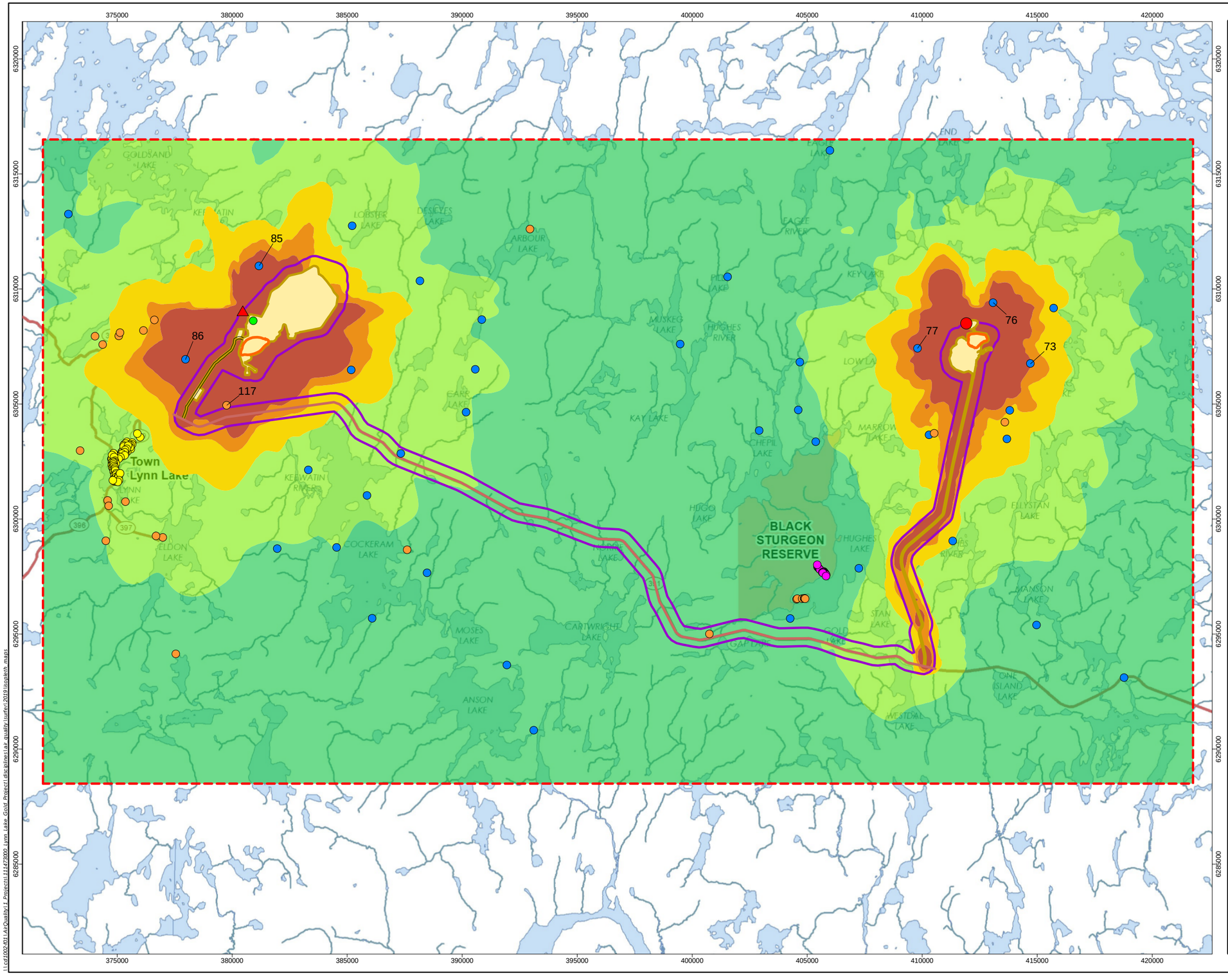

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 734 µg/m³
- Maximum Concentration (MacLellan Site): 437 µg/m³
- Background Concentration: 10.5 µg/m³
- 24-hour TSP MAAQC: 120 µg/m³

12 30 60 90 120

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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

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Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
16

Title
Maximum Predicted 24-hour Average TSP Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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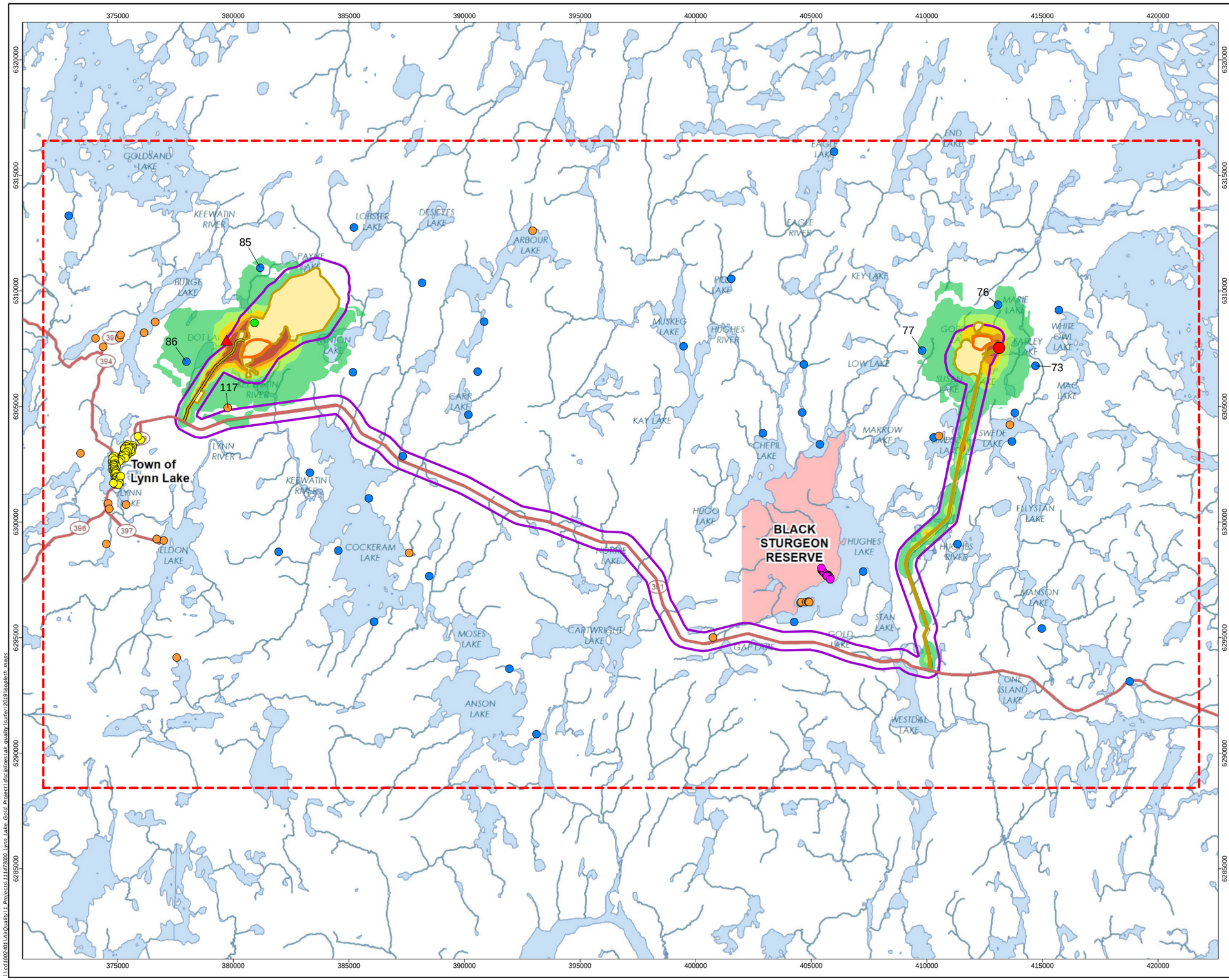

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Exceedances (Gordon Site): 94 days/year
- Maximum Exceedances (MacLellan Site): 50 days/year
- Background Concentration: 10.5 µg/m³
- 24-hour TSP MAAQC: 120 µg/m³

1 — 15 — 30 — 45 — 60

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
17

Title
Maximum Frequency Exceedance of 24-hour Average Level TSP Concentrations (Project Operation + Baseline Conditions)

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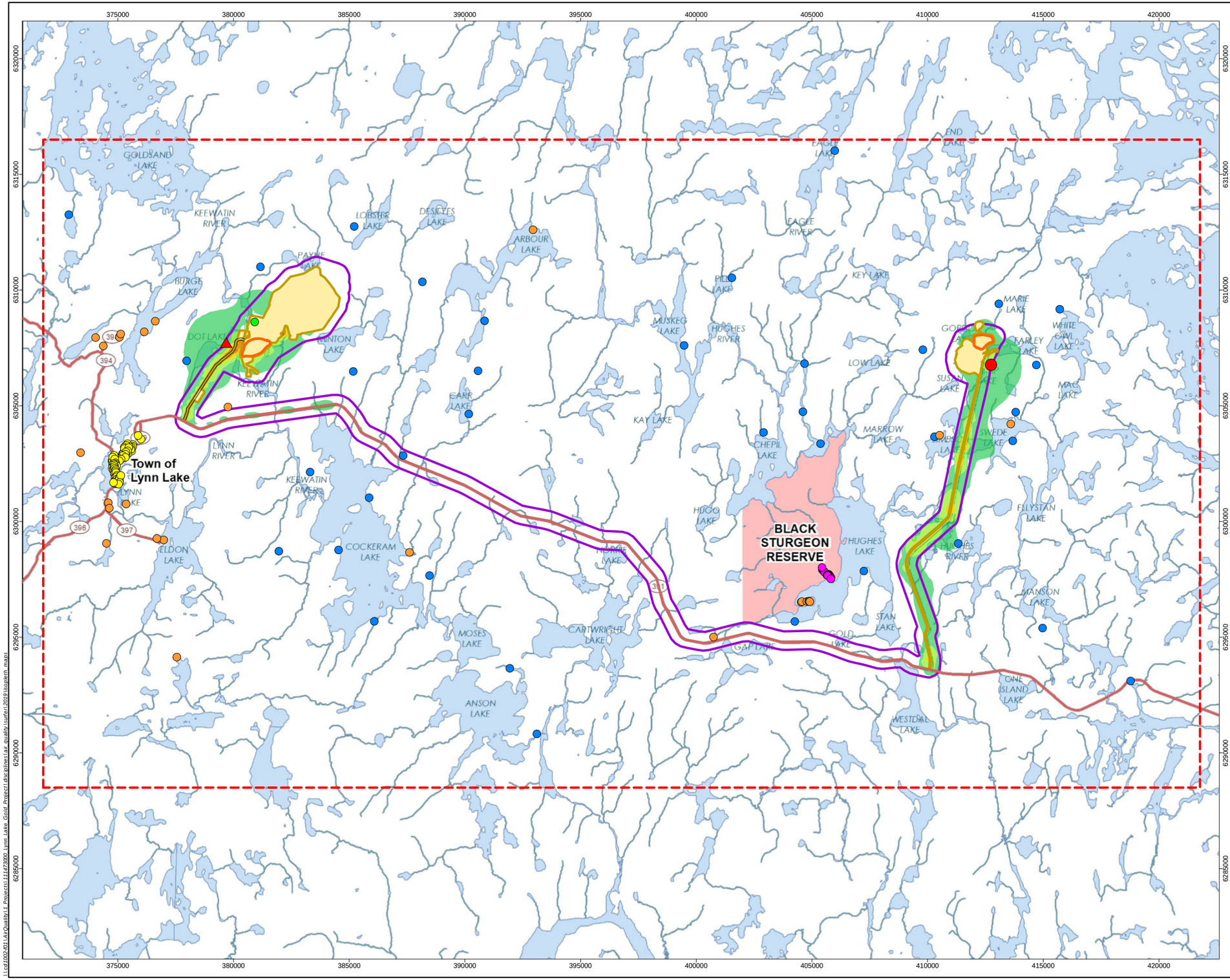

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 15.8 µg/m³
- Maximum Concentration (MacLellan Site): 14.1 µg/m³
- Background Concentration: 10.5 µg/m³
- Annual TSP MAAQC: 60 µg/m³

12 15 30 45 60

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
18

Title

Maximum Predicted Annual Average TSP Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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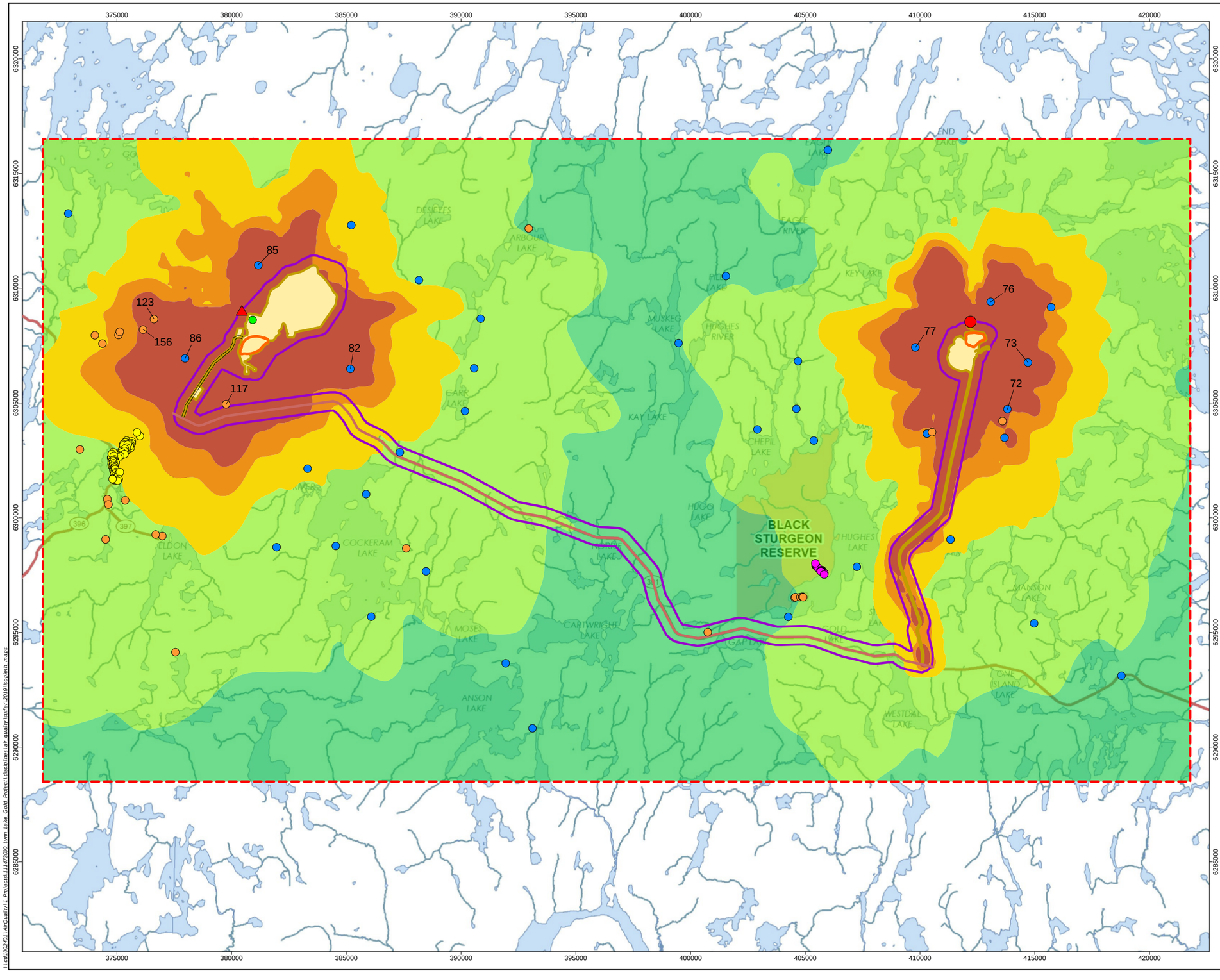

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 406 µg/m³
- Maximum Concentration (MacLellan Site): 247 µg/m³
- Background Concentration: 4.6 µg/m³
- 24-hour PM_{10} MAAQC: 50 µg/m³

5 12.5 25 37.5 50

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
19

Title
Maximum Predicted 24-hour Average PM_{10} Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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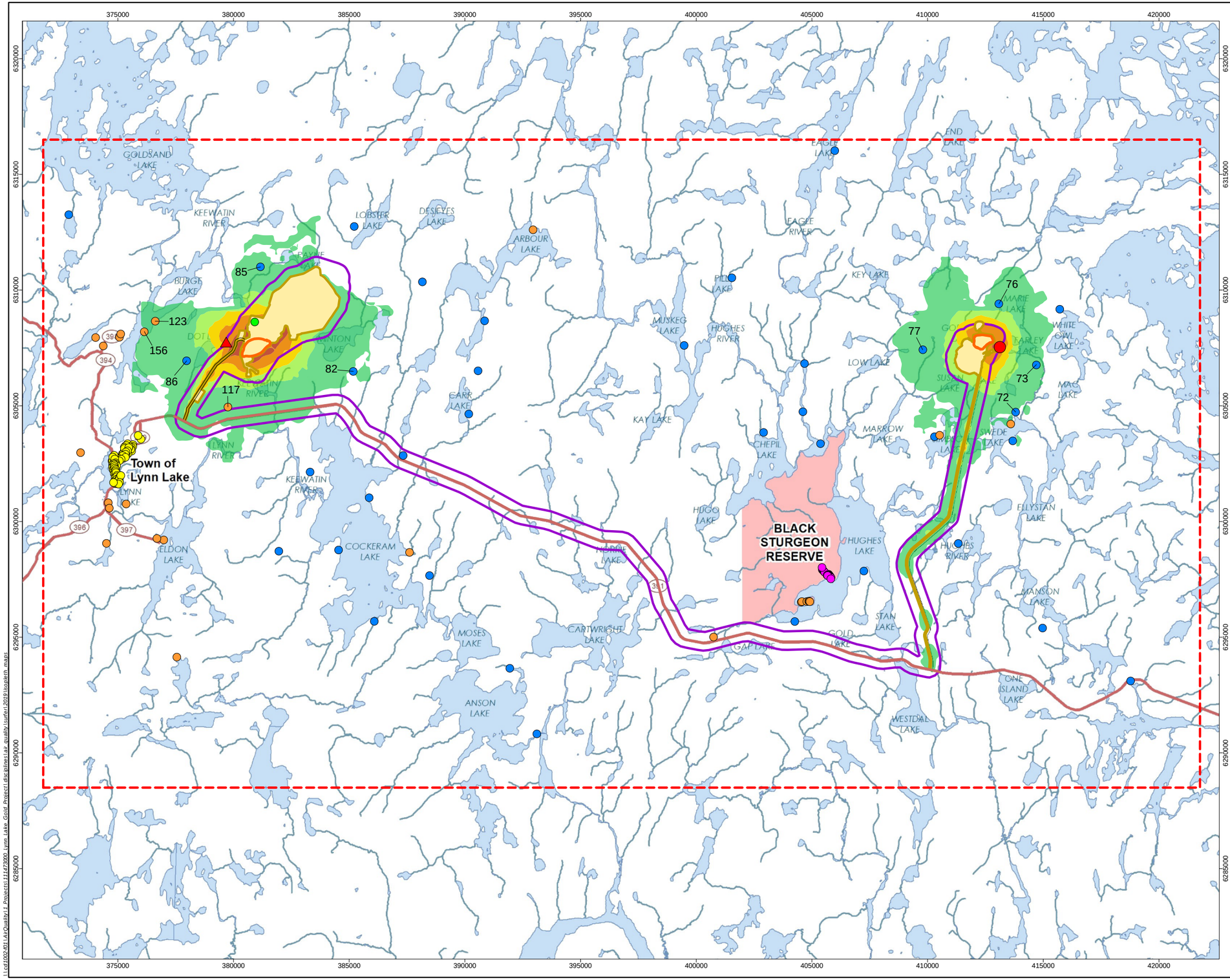

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Exceedances (Gordon Site): 119 days/year
- Maximum Exceedances (MacLellan Site): 70 days/year
- Background Concentration: 4.6 µg/m³
- 24-hour PM_{10} MAAQC: 50 µg/m³

1 | 15 | 30 | 50 | 100

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
20

Title

Maximum Frequency Exceedance of 24-hour Average Level PM_{10}Concentrations (Project Operation + Baseline Conditions)

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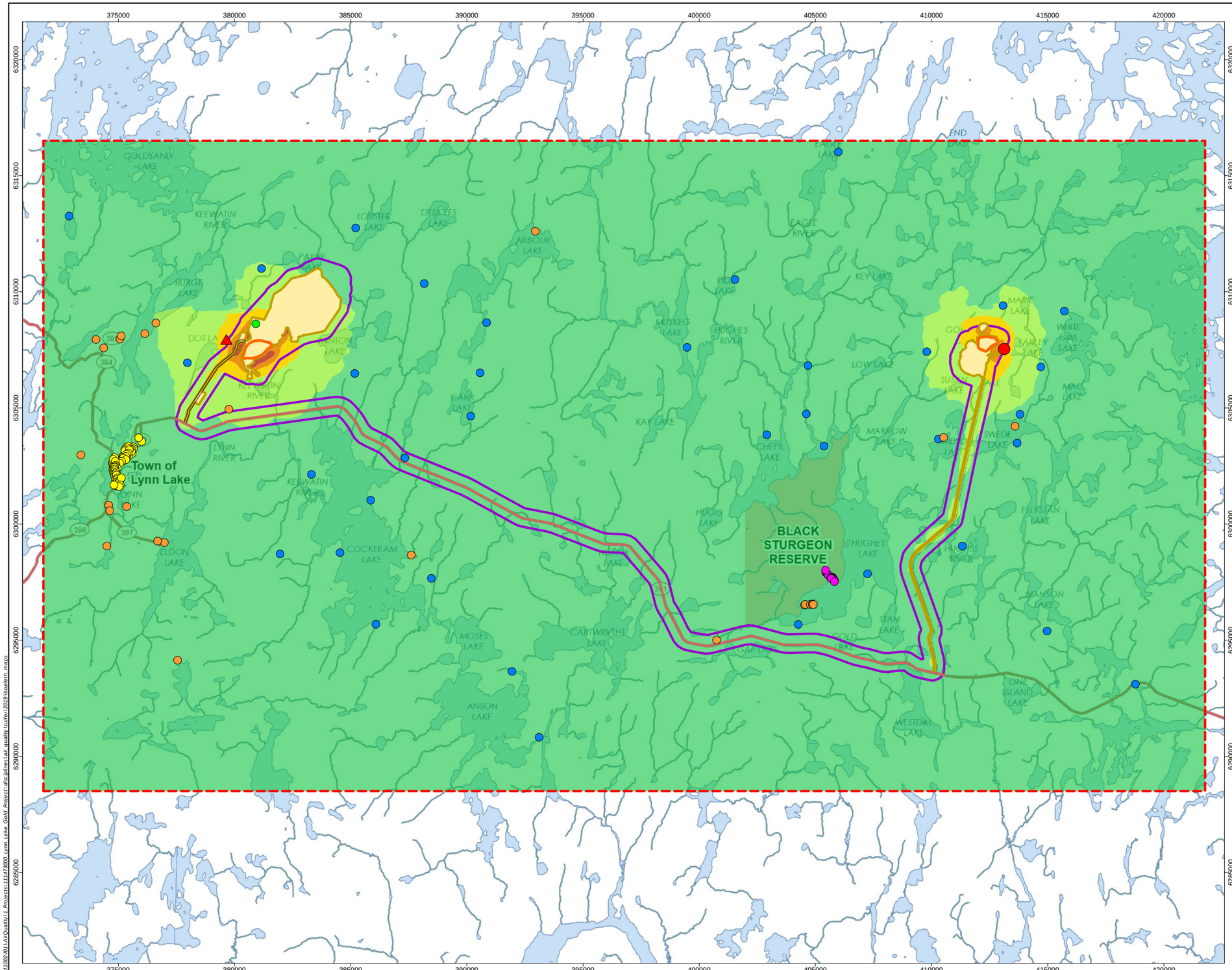

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 25.7 µg/m³
- Maximum Concentration (MacLellan Site): 18.6 µg/m³
- Background Concentration: 2.9 µg/m³
- 24-hour $PM_{2.5}$ CAAQS: 27 µg/m³

3 | 6.75 | 13.5 | 20.3 | 27

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
21

Title

Maximum Predicted 98% 24-hour Average $PM_{2.5}$ Concentrations (Project Operation + Baseline Conditions)

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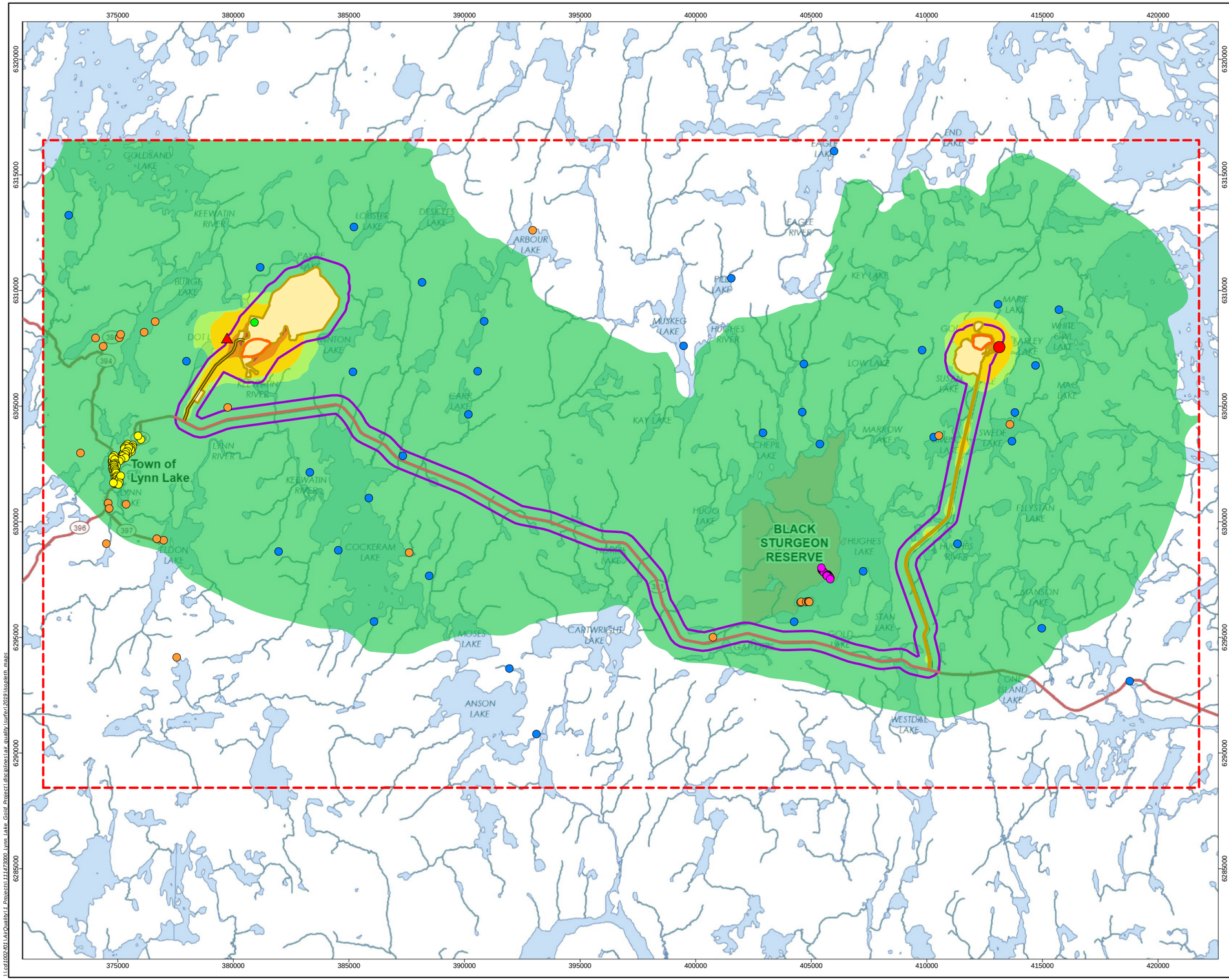

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Concentration (Gordon Site): 7.40 µg/m³
- Maximum Concentration (MacLellan Site): 5.57 µg/m³
- Background Concentration: 2.9 µg/m³
- Annual $PM_{2.5}$ CAAQS: 8.8 µg/m³

3 | 4 | 4.4 | 6.6 | 8.8

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
22

Title

Maximum Predicted Annual Average $PM_{2.5}$ Concentrations (µg/m³) (Project Operation + Baseline Conditions)

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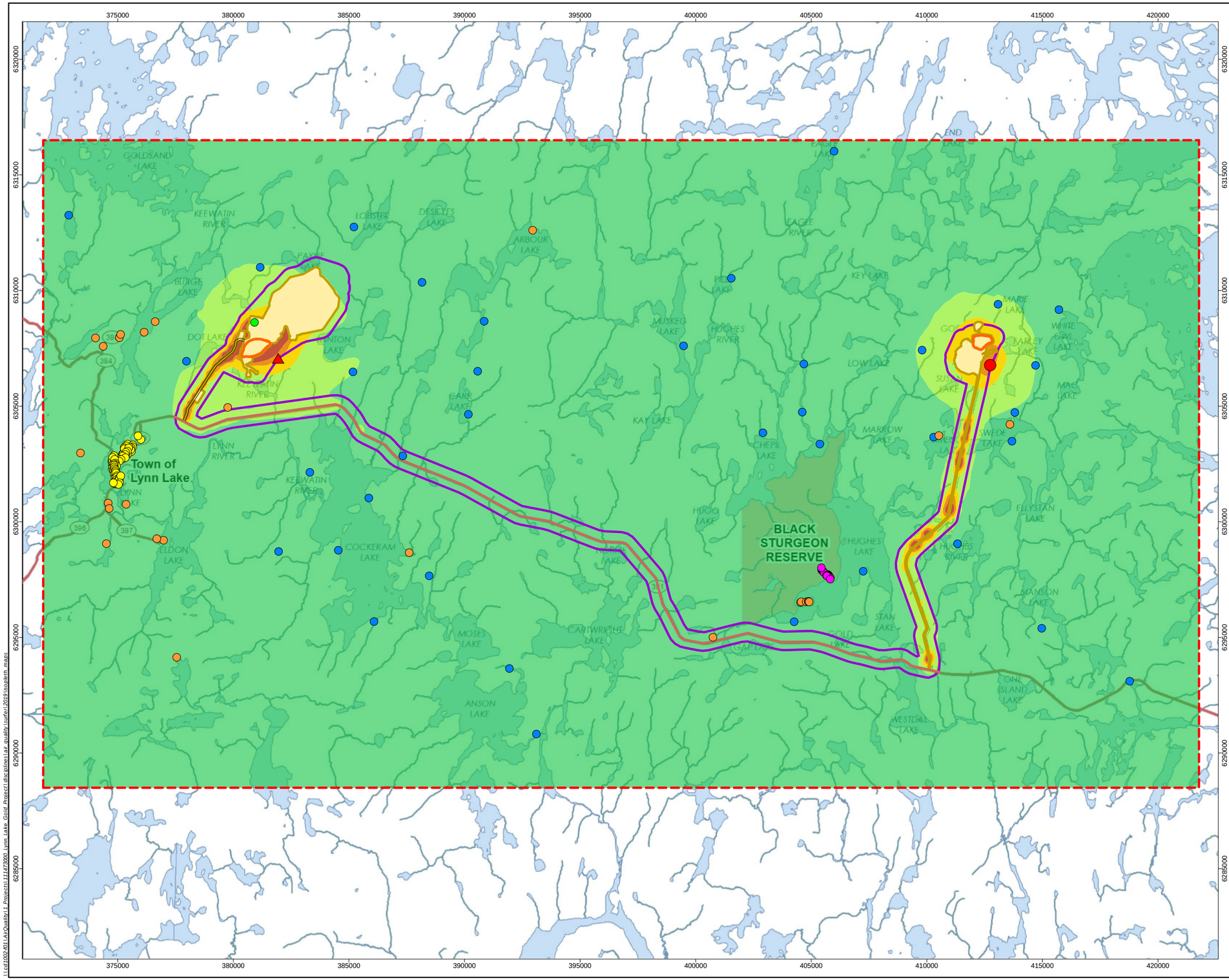

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Deposition (Gordon Site): 6.50 g/m²/30-day
- Maximum Deposition (MacLellan Site): 5.57 g/m²/30-day
- Background Concentration: 0.99 g/m²/30-day
- 30-day Dustfall OAAQC: 7 g/m²/30-day

1 | 1.75 | 3.5 | 5.25 | 7

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
23

Title
Maximum Predicted 30-day Average Dustfall Depositions (g/m²/30-day) (Project Operation + Baseline Conditions)

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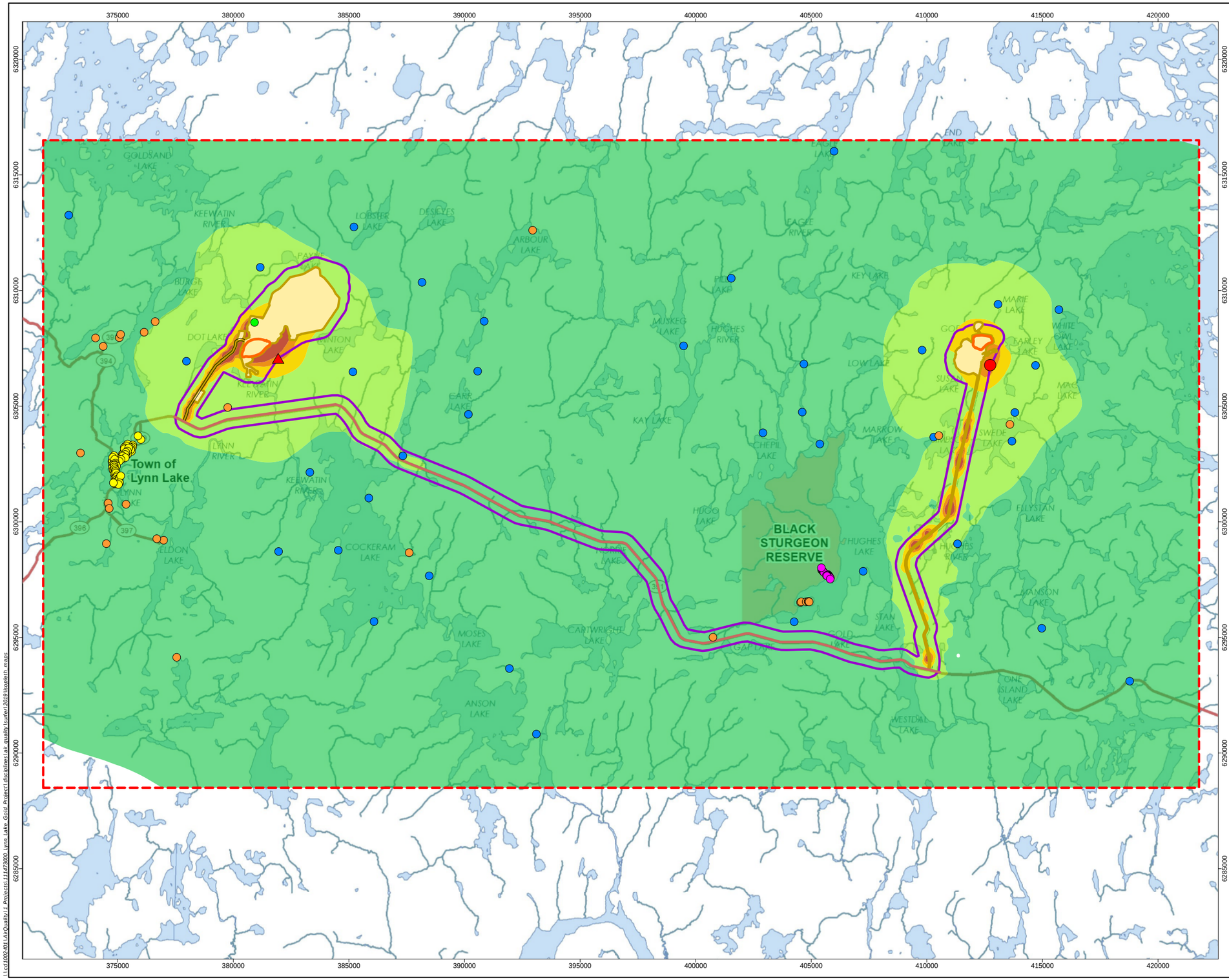

Stantec

Alamos Gold Inc.

Study Area

- Proposed Open Pit
- Project Development Area
- Project Boundary
- Air Quality Local Assessment Area

Human Receptors

- Lynn Lake Receptors
- Black Sturgeon Reserve Receptors
- Human Receptors
- Potential Indigenous Receptor
- Worker Camp

Landbase

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

Maximum Concentrations

- Maximum Deposition (Gordon Site): 4.51 g/m²/30-day
- Maximum Deposition (MacLellan Site): 3.95 g/m²/30-day
- Background Concentration: 0.99 g/m²/30-day
- Annual Dustfall OAAQC: 4.6 g/m²/30-day

1 1.15 2.3 3.45 4.6

N

0 1500 3000 4500 6000 Metres

(At original document size of 11x17)

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 KBajwa on 2024-07-11
Technical Review by IYankova on 2024-07-12
Senior Review by DJarratt on 2024-07-11

Client/Project 111473076
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
24

Title

Maximum Predicted Annual Average Dustfall Depositions (g/m²/30-day) (Project Operation + Baseline Conditions)

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Appendix D Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Stantec

Memo

To:	Alamos Gold Inc., Micheal Raess, Manager, Environment & Community Relations, Development Lynn Lake, Manitoba	From:	Yong Ma, P.Eng. Stantec Consulting Ltd. Calgary, AB
Project/File:	Lynn Lake Gold Project/111473076	Date:	May 13, 2025

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

The Lynn Lake Gold Project (LLGP; the Project) consists of two primary deposit sites, the MacLellan site and Gordon site, which are both located near the Town of Lynn Lake, Manitoba. Alamos Gold Inc. (Alamos) will construct (redevelop), operate and eventually close/reclaim open-pit gold mines at both of these historical mine sites. The Project will be built as two open pit mines with a centralized processing plant and a tailings management facility (TMF). The processing plant, located at the MacLellan site has an expected nominal processing throughput of 8,000 tonnes/day with an estimated 17-year production life.

Stantec Consulting Ltd. (Stantec) completed an Environmental Impact Statement (EIS) for the Project (Stantec 2020). The corresponding Noise and Vibration Valued Component sections include Chapter 7, Volume 1 of the EIS and a Technical Modelling Report in Appendix C, Volume 5 of the EIS. The assessment provides an overview of the existing conditions in the Project area and identifies the changes in noise and vibration levels at key receptor locations to determine potential residual and cumulative changes to noise and vibration as a result of the Project.

Since the submission of the EIS in 2020, Alamos has completed a 2023 Feasibility Study Update (2023 FSU) for the Project. The 2023 FSU includes design updates to the 2019 design. The design updates include, but are not limited to the following:

- Project Development Area (PDA) layouts
- Processing plant (MacLellan site)
- TMF (MacLellan site)
- General infrastructures
- Major equipment lists
- Mine production capacities

Stantec has been engaged to update the noise and vibration impact assessment based on the design updates. This assessment updated the noise and vibration models for the construction and operation phases of the Project, and predicted the noise and vibration effects at selected noise receptors. As an amendment to the EIS (Stantec 2020), this memo summarizes the results of the Noise and Vibration Impact Assessment Update for the Project.

This memo update is based on the 2023 design of the Project, including the 2023 Feasibility Study Update technical report, and also integrates additional detailed engineering changes in 2024.

1 Summary of Key Changes to Project Design

The Noise and Vibration Impact Assessment Update focused on two Project phases: construction and operation. The noise model considered noise emissions from the mobile and stationery equipment during construction and operation activities at both the Gordon site and MacLellan site. Mobile equipment included the trucks travelling around the Project area (e.g., haul trucks, loaders, excavators). Stationery equipment included the processing equipment (e.g.., crushers, mills, pumps, compressors). The vibration model considered open pit production blast-induced ground vibration and air blast overpressure effects on human habitats during the operation phase.

This Noise and Vibration Impact Assessment update is based on the following design information (e.g., excel spreadsheet provided by Alamos for the Project:

- Feasibility Study Update, NI 43-101 Technical Report for the Lynn Lake Project. Issue date: August 22, 2023 (Alamos 2023).
- Capital and Operating Cost Estimate – Gordon 13Aug2023 V1.9 update (Excel Spreadsheet, pers. comm. 2024a).
- Capital and Operating Cost Estimate – MacLellan 13Aug2023 V1.9 update (Excel Spreadsheet, pers. comm. 2024b).
- Gordon Highway Haul Calculator 26Apr2023 Plan V1.9 (Excel Spreadsheet, pers. comm. 2024c).
- Schedule MacLellan 13Apr2023 V1.9 (Excel Spreadsheet, pers. comm. 2024d).
- Schedule Gordon 13Apr2023 V1.9 (Excel Spreadsheet, pers. comm. 2024e).
- LLGP Process Plant Noise Sources Summary_2023 (Excel Spreadsheet, pers. comm. 2024f).

Stantec reviewed and compared the Project design parameters for 2019 and 2023. Changes that may affect the results of the Noise and Vibration Impact Assessment as presented in the EIS are described in the following sections.

1.1 Project Development Area and Project Layouts

Comparison of the updated PDA drawings for both Gordon site and MacLellan site with the 2019 designs indicates changes to the overall Project footprint and Project components (i.e., access road, haul road, open pit area, mine rock storage areas [MRSA], overburden stockpiles, ore stockpiles, TMF, and ore milling and processing plant). The corresponding Local Assessment Area (LAA) and Regional Assessment Area (RAA) for noise and vibration as presented in the EIS are affected by these changes.

Table 1 summarizes the key changes to major Project components based on the 2023 design. These changes may alter the noise and vibration effects at the receptors.

Table 1 Key Changes of Project Major Components in 2023 Design

Mine Site	Project Major Components	2023 Design
Gordon	PDA	Changes
	LAA and RAA	Changes associated with PDA
	Open Pit	Increased area
	MRSA	Changes – new area is larger
	Overburden Stockpile	Increased area
	Topsoil Storage Area	Added to site
	Ore Storage Area	Relocated
	Fresh Water System	New collection pond and discharge pipeline corridor
	Facility Area	Relocated from center to southeast of MRSA
	Stockpile Borrow Source	Added to site for construction borrow materials
	Access Road and Haul Road	New road alignment – haul road routes change with change to location or extents of the stockpiles and pit; access road has no significant changes
MacLellan	PDA	Changes
	LAA and RAA	Changes associated with PDA
	Open Pit	Increased area
	Satellite Pit	New pit located at south of Open Pit
	TMF and MRSA	Changes – changes to the extents of the MRSA, TMF pond, and TMF bank area
	Mine Rock Storage	Changes – new area is larger
	Overburden Stockpile	Increased area
	Topsoil Storage Area	Relocated from south to north of Overburden Stockpile
	Collection Pond and Sump Pond	New
	Construction Laydown Area	New
	Processing Plant	Building and equipment layouts are different
	Access Road and Haul Road	New road alignment – haul road routes change with change to location or extents of the stockpiles and pit; access road has no significant changes

Notes:

PDA = Project Development Area; LAA = Local Assessment Area; RAA = Regional Assessment Area

1.2 Mining Production

Based on the review of the Project mine production data during the operation phase, the years with the highest production rates have changed. Table 2 compares the highest production rate year for the 2019 design with the 2023 design.

Table 2 Comparison of Mining Production between 2019 Design and 2023 Design

Mine Site	2019 Design		2023 Design	
	Total Material Mined (kt/y[1])	Highest Year	Total Material Mined (kt/y[1])	Highest Year
Gordon	16,000	2	16,000	3
MacLellan	28,000	7	33,000	5

Note:

[1] kt/y: thousands of tonnes per year

In the noise model, production year with the highest production rates represents the worst-case noise emission scenario due to higher equipment quantity and activity level. In this assessment update, Gordon site operation Year 3 and MacLellan site operation Year 5 were selected for the noise model.

1.3 Mining Equipment

The 2023 design data sheets “Schedule MacLellan13Apr2023 V1.9.xlsx” and “Schedule Gordon 13Apr2023 V1.9.xlsx” provide the Project mining equipment summary during the operation phase. The summary includes equipment associated with mine general equipment, mine support equipment, drills, loading equipment and hauling equipment for different operation years.

Table 3 summarizes the mining equipment and quantities for the 2023 design in the years with the highest production rates for the MacLellan and Gordon sites. The 2023 design mining equipment type and quantity are different from the 2019 design. Section 5.1.3.2 of Stantec 2020 summarized the mining equipment for the operation phase of the 2019 design.

Table 3 Mining Equipment Included in 2023 Design

Equipment	Gordon Site Quantity (Year 3)	MacLellan Site Quantity (Year 5)
Mine General Equipment		
Lube/Fuel Truck	1	1
Mechanic's Truck	1	1
Welding Truck	1	1
Blasting Loader	1	1
Blasters Truck	1	1
Integrated Tool Carrier WA200-7	1	1
Compactor (BW 211)	1	1
Lighting Plants	6	8
Tire Manipulator (980) (WA500-8)	1	1
Man Bus	2	2
Pickup Trucks	10	16
Crane - 50T	1	1
Crane - 35T	1	1
Pump Truck	1	1
ADT 40 tonne (t)	1	2
Lowboy and tractor (75-100 ton)	1	1
Mine Support Equipment		
Track Dozer - D375A-6	-[1]	5
Grader - GD655-6 - 14'	-	2
Transfer Loader - WA900-3	-	1
Snow Plow/Water Truck	-	3
PC1250LC-8 (6.7 cubic metre (m^3))	-	1
PC490LC-11 (w/hammer)	1	1
Dump Truck - 20 ton	2	3
Road Maintenance Loader - WA500-8	1	1
Drills		
Drill – 178 millimetre (mm) SmartROC D65	3	1
PV275 - 178 mm	-	4

Equipment	Gordon Site Quantity (Year 3)	MacLellan Site Quantity (Year 5)
Loading Equipment		
PC4000 shovel - 22 m^3 (150/200 t)	-	2
PC1250LC-8 (6.7 m^3)	4	-
WA900 loader - 11.5 m^3 (100/150 t)	-	1
Hauling Equipment		
HD1500-7 150t	-	17[2]
HD605-8	15	-

Notes:

[1] "-": not applicable

[2] Year 8 has the most quantity of 17. Year 5 has 14, however, 17 is used in the mode conservatively

1.4 Processing Plant

The 2023 FSU provides new design and layouts for the processing plant at the MacLellan site. The equipment list for each building in the 2023 design is provided in the spreadsheet "LLGP Process Plant Noise Sources Summary_2023.xlsx". The processing plant consists of multiple buildings housing different mine processing equipment, including:

- Main Process Building
- Reagent Storage Building
- Primary Crushing Facility
- Secondary Crushing Building
- Fine Ore Storage Facility
- Oxygen Plant

The processing plant also includes other auxiliary buildings, such as warehouse and workshop, truck maintenance building and truck wash building, laboratory building and administration building. These buildings are not considered as noise sources in the acoustic model.

Section 5.1.3.2 in Stantec 2020 summarized the buildings and equipment in the processing plant associated with the 2019 design. In comparison to the 2019 design, buildings in the 2023 design have different location, sizes, and equipment layout.

Table 4 compares the major buildings associated with the processing plant for the 2019 design with those of the 2023 design.

Table 4 Comparison of Processing Plant Buildings between 2019 and 2023 Designs at MacLellan Site

Building/Equipment	2019 Design	2023 Design
Primary Crusher Building	-[1]	Different building size and equipment setup
Secondary Crusher Building	-[1]	Different building size and equipment setup
Fine Ore Storage Facility	Ore Stockpile, no building	New building with equipment
Main Process Building	Mill Building	Different building size and equipment setup
Reagent Storage Building	Located at northwest of Mill Building	Relocated adjacent to Main Process Building; different building size and equipment setup
Gold Room	Detached building	Relocated inside Main Process Building
Oxygen Plant	Southwest of Mill Building	Relocated south of Main Process Building; different building size and equipment setup
Service Equipment	Not listed	Different locations and equipment setup

Note:
"-": as a comparison base

Table 5 summarizes the processing plant mobile equipment list associated with the 2023 design. A mobile equipment list was not available for the 2019 design.

Table 5 Processing Plant Mobile Equipment List for 2023 Design at MacLellan Site

Equipment	Capacity	Quantity
Single Cab 4WD Pickup	-[1]	6
Twin Cab 4WD Hiab Truck	8 t	1
Bus	22-seat	1
Fire Trailer	5 m^3	1
All Terrain Crane	40/50 t	1
Crane	150 t	-
Plant Forklift	4 t	2
Warehouse Forklift	4 t	1
Front-End Loader	10 t	1
Skid-Steer Loader (Bobcat)	1 t	1
Tip Truck	3 t	2
Telescopic Handler	3 t	1
Boom/Scissor Lift	-	2

Equipment	Capacity	Quantity
Fusion Butt Welder	90/315	1
Portable Compressor	-	1
Diesel Welder	-	2
Portable Pumps Generator	200 kilovolt amperes	1
Gravel truck	10 m^3	2
Water Truck	15,000 litres (L)	1
Potable water Trailers	5,000 L	4
Franna Crane	15 t	1
Yard Crane – Hydraulic	20 t	1
Pick-n Carry Mobile Crane	-	1
Backhoe	11 t	1
Forklift/Telescopic Handler	20 t	1

Note:

"-": data is unavailable

1.5 Pre-production Equipment

The 2023 design data sheets "Schedule MacLellan13Apr2023 V1.9.xlsx" and "Schedule Gordon 13Apr2023 V1.9.xlsx" summarize the mining equipment during the pre-production, including Mine General Equipment, Mine Support Equipment, Drills, Loading Equipment and Hauling Equipment. Table 6 summarizes the 2023 design equipment and quantities associated with the pre-production phase at the MacLellan and Gordon sites.

Section 5.1.2.3 of the Stantec 2020 summarized the mining equipment during the pre-production phase for the 2019 design.

Table 6 Pre-Production Mining Equipment of 2023 Design

Equipment	Gordon Site Quantity (Year -1)	MacLellan Site Quantity (Year -1)
Mine General Equipment		
Lube/Fuel Truck	1	1
Mechanic's Truck	1	1
Welding Truck	1	1
Blasting Loader	1	1

Equipment	Gordon Site Quantity (Year -1)	MacLellan Site Quantity (Year -1)
Blasters Truck	1	1
Integrated Tool Carrier WA200-7	1	1
Compactor (BW 211)	1	1
Lighting Plants	6	8
Tire Manipulator (980) (WA500-8)	1	1
Man Bus	2	2
Pickup Trucks	10	16
Crane - 50T	1	1
Crane - 35T	1	1
Pump Truck	1	1
ADT 40t	1	2
Lowboy and tractor (75-100 ton)	1	1
Mine Support Equipment		
Track Dozer - D375A-6	-	5
Grader - GD655-6 - 14'	-	2
Transfer Loader - WA900-3	-	1
Snow Plow/Water Truck	-	3
PC1250LC-8 (6.7 m^3)	-	1
PC490LC-11 (w/hammer)	1	1
Dump Truck - 20 ton	2	3
Road Maintenance Loader - WA500-8	1	1
Drills		
Drill - 178mm SmartROC D65	1	1
PV275 - 178 mm	-	1
Loading Equipment		
PC4000 shovel - 22 m^3 (150/200 t)	1	1
PC1250LC-8 (6.7 m^3)	2	-
WA900 loader - 11.5 m^3 (100/150 t)	1	1
Hauling Equipment		
HD1500-7 150t	-	4
HD605-8	3	-

1.6 Blasting Parameters

During the operation phase, the primary vibration effects associated with the Project are ground vibration and air overpressure due to blasting activities within the open pit at the Gordon site and the MacLellan site. The primary factors affecting vibration due to blasting are the highest explosive charge per delay and the distance from a blast to the receptor. Table 7 compares the blasting parameters between the 2019 and 2023 designs.

Table 7 Comparison of Blasting Parameters in 2019 Design and 2023 Design

Blasting Parameter	2019 Design (Gordon Site and MacLellan Site)	2023 Design (Gordon Site and MacLellan Site)
Highest Explosive Charge	208 kilogram (kg)/hole	230 kg/hole
Closest distances from blast to receptors (Open Pit Boundary to Receptor)	-[1]	Marginal changes in distances due to different open pit layout. The distance decreases for the closest receptors (ID 73 and ID 76) at the Gordon site and decreases for the closest receptor at the permanent work camp.

Note:
[1] "-": as a comparison base

1.7 Access Road and PR391 Traffic

Table 8 compares the Project-related operation phase access road and Provincial Road (PR)391 road traffic between the 2019 and 2023 design. As a conservative approach, the 2023 design road traffic volume is based on the highest mine production year (1,696 kilotonnes per year (kt/yr) in Year 4) from the Gordon site stockpile to MacLellan site mill. Low traffic volume associate with Gordon Mine Year 3 was not used.

Table 8 Project-Related Operation Access Roads and PR391 Road Traffic

Item	Description	2019 Design Volume (Trucks/hr)	2023 Design Volume (Trucks/hr)
1	Access Road Traffic for Gordon and MacLellan	12	13
2	PR391 Road Traffic	12	13

2 Assessment Approach

The Noise and Vibration Impact Assessment Update was based on an identical approach (i.e., receptor locations, regulatory framework, baseline conditions, and modelling method) to that applied for the Stantec 2020 assessment. Some assessment parameters remain the same as the 2019 design. For example, Project construction phase equipment listings for the processing plant, open pit area and TMF area remain the same as in the 2019 design. Table 9 summarizes the assessment approach for Noise and Vibration Impact Assessment Update; the approach is identical to the approach applied in Stantec 2020. The corresponding sections for Stantec 2020 are provided as references in the table.

Table 9 Assessment Approach

Assessment Method or Parameter	Descriptions	Reference in Stantec 2020
Noise and Vibration Receptors	Selected noise receptors near Gordon site and MacLellan site remain the same, including Receptor ID, Description and Location UTM Coordinates	Table 2-1 – Gordon Site Table 2-2 – MacLellan Site
Regulatory Framework Noise Criteria	Manitoba noise guideline Health Canada Change in percent highly annoyed (%HA) Health Canada Low Frequency Noise	Section 3.1 Section 6.1.4
Regulatory Framework Vibration Criteria	MECP Guidance vibration targets for blasting Health Canada blast overpressure target FTA 2018 structural damage threshold	Section 3.2 Section 6.2.1 Section 6.2.2
Baseline Conditions	Same baseline conditions for all receptors	Section 4.0
Noise Modelling Parameters	Same noise modelling software parameters	Section 5.1.1
Vibration Modelling	Same vibration modelling/calculation methods	Section 5.2.1
Decommissioning/Closure	Quantitative noise modelling of decommissioning/closure phase was not conducted	Section 5.1.4 Section 5.2.4
Construction Equipment List	Remains the same as Stantec 2020 for processing plant and TMF area at MacLellan site	Section 5.1.2
Pile Driving Activity	Activity remains the same as Stantec 2020 for Gordon site and MacLellan site	Table 6-2 Table 6-3
Construction Phase Access Road Traffic Volume	Remain the same as Stantec 2020 for Gordon site and MacLellan site: 2 Trucks/hour – Gordon Site 6 Trucks/hour – MacLellan Site	Table 5-8 Table 5-9
Construction Phase PR391 Road Traffic Volume	Remain the same as Stantec 2020 between Gordon site and MacLellan site: 2 Trucks/hour	Table 5-10

Table 10 summarizes the assessment assumptions; the assumptions for this update are identical to those applied in Stantec 2020. The corresponding sections for the assumptions in Stantec 2020 are provided as references in the table.

Table 10 Assessment Assumptions (Stantec 2020)

Assessment Parameter	Assessment Assumptions (Gordon Site and MacLellan)	Reference in Stantec 2020
Construction Phase		
Processing Plant (MacLellan Site)	• Worst case scenario is based on the period of Year -2 and Year -1 • Mobile equipment operates 10 hours (6 hours daytime and 4 hours nighttime) during a 24-hour period • Stationery equipment operates at 100% capacity • Piling activities were assumed to be less than 12 months • Active piling is assumed to be 30% of the equipment operating time, with a 12 decibel (dB) tonality penalty added to noise emissions • Back-up alarms are assumed to be 20% of the equipment operating time, with a 5 dB tonality penalty added to noise emissions	Section 5.1.2.1
TMF (MacLellan Site)	• Equipment operates 10 hours (6 hours daytime and 4 hours nighttime) during a 24-hour period • Equipment operates at 100% capacity • Back-up alarms are assumed to be 20% of the equipment operating time, with a 5 dB tonality penalty added to noise emissions	Section 5.1.2.2
Pre-Production (MacLellan and Gordon Sites)	• Equipment operates 20 hours (12.5 hours daytime and 7.5 hours nighttime) during a 24-hour period • Equipment operates at 100% capacity • Stationery equipment operates at 100% capacity continuously during 24-hour period • Back-up alarms are assumed to be 20% of the equipment operating time, with a 5 dB tonality penalty added to noise emissions	Section 5.1.2.3
Haul Road Traffic Access Road Traffic PR391 Road Traffic	• Equipment operates 24 hours continuously in 365 days • Equipment operates at 100% capacity • Highest road traffic volumes were used	Section 5.1.2.4 Section 5.1.2.5 Section 5.1.2.6
Operation Phase		
Processing Plant and Primary Mining Equipment Support Equipment	• Stationery equipment (i.e., processing plant) operates at 100% capacity continuously during 24-hour period • Equipment operates at 100% capacity • Mobile equipment operates 20 hours (12.5 hours daytime and 7.5 hours nighttime) during a 24-hour period • Back-up alarms are assumed to be 20% of the equipment operating time, with a 5 dB tonality penalty added to noise emissions	Section 5.1.3.2

Assessment Parameter	Assessment Assumptions (Gordon Site and MacLellan)	Reference in Stantec 2020
Vibration		
Blast-related Vibration	• Vibration prediction used a conservative method with the highest explosive charge weight. The actual blast charges could be lower • Blast-related vibration prediction was based on the shortest distance between receptor and the pit boundary	Section 5.2.1

3 Noise Emissions

3.1 Mine Equipment Noise Sources

As described in the previous sections, this Noise and Vibration Impact Assessment Update will only present the differences between the 2019 design and 2023 design for the Project. Therefore, only noise emissions for the Project equipment that are different with those listed in Stantec 2020 are summarized herein. Updated noise emission sound power levels are summarized and included in Attachment A.

Updated noise emission data for the pre-production and operation phase equipment is presented in Table A-1 to Table A-4 in Attachment A. Construction phase equipment for the processing plant and TMF, and construction haul road traffic noise remains unchanged from the Stantec 2020 assessment, therefore this noise emission information is not included in Attachment A.

3.2 Mine Haul Road Traffic

Based on the highest annual production year of the 2023 design, the operation haul road traffic for the Gordon site and MacLellan site were updated. Table 11 and Table 12 summarize the operation haul road traffic volumes and associated noise emission (e.g., sound power level per equipment unit) at the Gordon site and MacLellan site, respectively.

Table 11 Haul Road Traffic Summary at Gordon Site

Item	Description	Equipment	Year 3 Volume (Trucks/hr)	Sound Power Level [1] (a-weighted decibel sound level [dBA])
1	Open Pit	Haul Truck (69 Ton)	66	116
2	Open Pit to Waste Rock Stockpile	Haul Truck (69 Ton)	54	116
3	Open Pit to Ore Stockpile	Haul Truck (69 Ton)	6	116
4	Open Pit to Overburden Stockpile	Dump Truck (20 Ton)	21	113

Note:

[1] Represent sound power level per unit of mobile equipment

Table 12 Haul Road Traffic Summary at MacLellan Site

Item	Description	Equipment	Year 5 Volume (Trucks/hr)	Sound Power Level [1] (a-weighted decibel sound level [dBA])
1	Within Open Pit	Haul Truck (150 Ton)	64	120
2	Ore Stockpile to Processing Plant	Dump Truck (20 Ton)	11	113
3	Open Pit to Waste Rock Stockpile	Haul Truck (150 Ton)	59	120
4	Open Pit to Low Grade Ore Stockpile	Haul Truck (150 Ton)	2	120
5	Open Pit to Overburden Stockpile	Dump Truck (20 Ton)	11	113
6	Open Pit to Mill	Haul Truck (150 Ton)	1	120

Note:

[1] Represent sound power level per unit of mobile equipment

The operation haul road traffic noise emissions are based on the same assumption or condition as 2019 Desing except equipment operates 350/365 yearly instead of 365/365 in 2019 Design).

4 Noise Model Results

4.1 Construction

Table 13 and Table 14 summarize the Project only daytime, nighttime, and day-night average sound level results at the receptors for the Gordon site and MacLellan site during the construction phase, respectively. Figure 1 and Figure 2 in Attachment B illustrate the construction phase only noise contour maps for the Gordon site and MacLellan site, respectively.

Table 13 Constructon Phase Sound Level at Gordon Site

Receptor ID	Description	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)
59	Potential Indigenous Receptor	22.9	22.9	29.3
61	Potential Indigenous Receptor	16.7	16.7	23.1
62	Potential Indigenous Receptor	12.8	12.8	19.2
72	Potential Indigenous Receptor	29.1	29.1	35.5
73	Potential Indigenous Receptor	29.7	29.7	36.1
74	Potential Indigenous Receptor	24.2	24.2	30.6
76	Potential Indigenous Receptor	34.7	34.7	41.1
77	Potential Indigenous Receptor	34.2	34.2	40.6
93	Black Sturgeon Reserve Residence	14.3	14.3	20.7
101	Black Sturgeon Reserve Residence	16.2	16.2	22.6
104	Remote Cottage	4.5	4.5	10.9
126	Recreation Lot	13.7	13.7	20.1
130	Remote Cottage	13.8	13.8	20.2
131	Remote Cottage	28.2	28.2	34.6
132	Trapper Cabin	28.4	28.4	34.8
139	Park Vacation Home	13.9	13.9	20.3

Notes:

L_d = daytime equivalent sound level; L_{dn} day-night average sound level; dBA = A-weighted decibel sound level

Table 14 Construction Phase Sound Level at MacLellan Site

Receptor ID	Description	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)
66	Potential Indigenous Receptor	21.8	21.8	28.2
67	Potential Indigenous Receptor	23.2	23.2	29.6
68	Potential Indigenous Receptor	26.1	26.1	32.5
69	Potential Indigenous Receptor	21.0	21.0	27.4
78	Potential Indigenous Receptor	20.9	20.9	27.3
79	Potential Indigenous Receptor	16.8	16.8	23.2
81	Potential Indigenous Receptor	22.8	22.8	29.2
82	Potential Indigenous Receptor	31.0	31.0	37.4
83	Potential Indigenous Receptor	25.0	25.0	31.4
84	Potential Indigenous Receptor	28.2	28.2	34.6
85	Potential Indigenous Receptor	37.7	37.7	44.1
86	Potential Indigenous Receptor	35.1	35.1	41.5
105	Remote Cottage	19.4	19.4	25.8
115	Museum Site	23.0	23.0	29.4
116	Communication Site	25.1	25.1	31.5
121	Recreation Lot	26.5	26.5	32.9
123	Potential Indigenous Receptor	28.4	28.4	34.8
135	Park Vacation Home	26.3	26.3	32.7
163	Lynn Lake Friendship Center	23.6	23.6	30.0
166	Lynn Lake Gospel Church	23.4	23.4	29.8
169	Lynn Lake Library	23.1	23.1	29.5
172	West Lynn Lake High School	22.3	22.3	28.7
173	Lynn Lake Hospital	24.6	24.6	31.0
177	Lynn Lake Residence	23.9	23.9	30.3
178	Lynn Lake Residence	24.4	24.4	30.8
225	Lynn Lake Residence	22.2	22.2	28.6
--	Temporary Work Camp (outdoor)	57.1	57.1	63.5

Notes:

L_d = daytime equivalent sound level; L_{dn} day-night average sound level; dBA = A-weighted decibel sound level

4.2 Operation

Table 15 and Table 16 and summarize the Project only daytime, nighttime, and day-night average sound level results at the receptors for the Gordon site and MacLellan site during the operation phase, respectively. Figure 3 and Figure 4 in Attachment B illustrate the operation phase only noise contour maps for the Gordon site and MacLellan site, respectively.

Table 15 Operation Phase Sound Level at Gordon Site

Receptor ID	Description	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)
59	Potential Indigenous Receptor	30.4	30.4	36.8
61	Potential Indigenous Receptor	22	22	28.4
62	Potential Indigenous Receptor	18.6	18.6	25
72	Potential Indigenous Receptor	32	32	24.8
73	Potential Indigenous Receptor	31.4	31.4	38.5
74	Potential Indigenous Receptor	27.6	27.6	37.8
76	Potential Indigenous Receptor	39.9	39.9	34
77	Potential Indigenous Receptor	38.7	38.7	46.3
93	Black Sturgeon Reserve Residence	19.6	19.6	45.2
101	Black Sturgeon Reserve Residence	21.7	21.7	26
104	Remote Cottage	7	7	28.1
126	Recreation Lot	18.6	18.6	13.4
130	Remote Cottage	18.9	18.9	25
131	Remote Cottage	33.7	33.7	25.3
132	Trapper Cabin	32.2	32.2	40.1
139	Park Vacation Home	19	19	25.4

Notes:

L_d = daytime equivalent sound level; L_{dn} day-night average sound level; dBA = A-weighted decibel sound level

Table 16 Operation Phase Sound Level at MacLellan Site

Receptor ID	Description	Project Daytime Sound Level, L_d (dBA)	Project Nighttime Sound Level, L_n (dBA)	Project Day-Night Sound Level, L_{dn} (dBA)
66	Potential Indigenous Receptor	25.8	25.8	32.2
67	Potential Indigenous Receptor	27.4	27.4	33.8
68	Potential Indigenous Receptor	29.6	29.6	36
69	Potential Indigenous Receptor	25.2	25.2	31.6
78	Potential Indigenous Receptor	24.7	24.7	31.1
79	Potential Indigenous Receptor	20.5	20.5	26.9
81	Potential Indigenous Receptor	26.5	26.5	33
82	Potential Indigenous Receptor	34.7	34.7	41.2
83	Potential Indigenous Receptor	28.7	28.7	35.1
84	Potential Indigenous Receptor	30.5	30.5	36.9
85	Potential Indigenous Receptor	38.4	38.4	44.8
86	Potential Indigenous Receptor	38.8	38.8	45.2
105	Remote Cottage	23.8	23.8	30.2
115	Museum Site	27	27	33.4
116	Communication Site	29.2	29.2	35.6
121	Recreation Lot	30.4	30.4	36.8
123	Potential Indigenous Receptor	31.5	31.5	37.9
135	Park Vacation Home	28.4	28.4	34.8
163	Lynn Lake Friendship Center	27.1	27.1	33.5
166	Lynn Lake Gospel Church	27.3	27.3	33.7
169	Lynn Lake Library	27.1	27.1	33.5
172	West Lynn Lake High School	26.1	26.1	32.5
173	Lynn Lake Hospital	29.2	29.2	35.6
177	Lynn Lake Residence	27.3	27.3	33.8
178	Lynn Lake Residence	27.4	27.4	33.8
225	Lynn Lake Residence	26.9	26.9	33.3
--	Temporary Work Camp (outdoor)	59.7	59.7	66.1

Note:

L_d = daytime equivalent sound level; L_{dn} day-night average sound level; dBA = A-weighted decibel sound level

4.3 Comparison to Regulatory Framework

4.3.1 Manitoba

During the construction phase the predicted Project L_d and L_n sound levels (see Table 13 and Table 14) at all residential receptors near both Gordon site and MacLellan site are below the Manitoba noise guideline (i.e., Manitoba Guidelines for Sound Pollution) target of 55 dBA daytime and 45 dBA nighttime. During the operation phase the predicted Project L_d and L_n sound levels (see Table 15 and Table 16) at all residential receptors are below the Manitoba noise guideline target of 55 dBA daytime and 45 dBA nighttime.

4.3.2 Health Canada Change in Percent Highly Annoyed Noise Level

For the construction and operation phases, change in percent highly annoyed (%HA) associated with the Project is compared with the threshold of 6.5% advised by Health Canada guidance (i.e., Guidance for Evaluating Human Health Effects in Impact Assessment: NOISE). The change is %HA at a receptor is based on the difference between the baseline %HA and total (Project and Baseline) %HA.

The changes in %HA associated with the Project construction phase at the Gordon site and the MacLellan site are summarized in Table 17 and Table 18, respectively. The changed in %HA results are compared to the target for change in %HA of 6.5% advised in the Health Canada noise guidance. The changes in %HA at all receptors are below the 6.5% target for the construction phase. The results indicate compliance with the Health Canada guidance.

The changes in %HA associated with the operation phase at the Gordon site and MacLellan site are summarized in Table 19 and Table 20, respectively. The changed in %HA results are compared to the target for change in %HA of 6.5% advised in the Health Canada noise guidance. The changes in %HA at all receptors are below the 6.5% target for the operation phase. The results indicate compliance with the Health Canada guidance.

Table 17 Construction Phase – Change in %HA at Gordon Site

Receptor ID	Description	Baseline			Project L_{dn} (dBA)	Total			Change in %HA (Between Total and Baseline)
		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA	
59	Potential Indigenous Receptor	40.0	50.0	2.17	29.3	40.3	50.3	2.28	0.1
61	Potential Indigenous Receptor	40.0	50.0	2.17	23.1	40.0	50.0	2.20	0.0
62	Potential Indigenous Receptor	40.0	50.0	2.17	19.2	40.0	50.0	2.18	0.0
72	Potential Indigenous Receptor	40.0	50.0	2.17	35.5	41.3	51.3	2.58	0.4
73	Potential Indigenous Receptor	40.0	50.0	2.17	36.1	41.5	51.5	2.64	0.5
74	Potential Indigenous Receptor	40.0	50.0	2.17	30.6	40.4	50.4	2.31	0.1
76	Potential Indigenous Receptor	40.0	50.0	2.17	41.1	43.6	53.6	3.46	1.3
77	Potential Indigenous Receptor	40.0	50.0	2.17	40.6	43.3	53.3	3.34	1.2
93	Black Sturgeon Reserve Residence	44.6	54.6	3.92	20.7	44.6	54.6	3.93	0.0
101	Black Sturgeon Reserve Residence	44.6	54.6	3.92	22.6	44.6	54.6	3.94	0.0
104	Remote Cottage	40.0	50.0	2.17	10.9	40.0	50.0	2.18	0.0
126	Recreation Lot	40.0	50.0	2.17	20.1	40.0	50.0	2.19	0.0
130	Remote Cottage	40.0	50.0	2.17	20.2	40.0	50.0	2.19	0.0
131	Remote Cottage	40.0	50.0	2.17	34.6	41.1	51.1	2.51	0.3
132	Trapper Cabin	40.0	50.0	2.17	34.8	41.1	51.1	2.52	0.4
139	Park Vacation Home	40.0	50.0	2.17	20.3	40.0	50.0	2.19	0.0

Notes:

[1] The + 10 dB “peace and quiet” adjustment is included

L_{dn} day-night average sound level; dBA = A-weighted decibel sound level; %HA = percent highly annoyed

Table 18 Construction Phase – Change in %HA at MacLellan Site

Receptor ID	Description	Baseline			Project L_{dn} (dBA)	Total			Change in %HA (Between Total and Baseline)
		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA	
66	Potential Indigenous Receptor	40.0	50.0	2.17	28.2	40.2	50.2	2.25	0.1
67	Potential Indigenous Receptor	40.0	50.0	2.17	29.6	40.3	50.3	2.28	0.1
68	Potential Indigenous Receptor	40.0	50.0	2.17	32.5	40.7	50.7	2.39	0.2
69	Potential Indigenous Receptor	40.0	50.0	2.17	27.4	40.2	50.2	2.24	0.1
78	Potential Indigenous Receptor	40.0	50.0	2.17	27.3	40.2	50.2	2.24	0.1
79	Potential Indigenous Receptor	40.0	50.0	2.17	23.2	40.0	50.0	2.20	0.0
81	Potential Indigenous Receptor	40.0	50.0	2.17	29.2	40.3	50.3	2.28	0.1
82	Potential Indigenous Receptor	40.0	50.0	2.17	37.4	41.9	51.9	2.78	0.6
83	Potential Indigenous Receptor	40.0	50.0	2.17	31.4	40.5	50.5	2.34	0.2
84	Potential Indigenous Receptor	40.0	50.0	2.17	34.6	41.1	51.1	2.51	0.3
85	Potential Indigenous Receptor	40.0	50.0	2.17	44.1	45.5	55.5	4.43	2.3
86	Potential Indigenous Receptor	40.0	50.0	2.17	41.5	43.8	53.8	3.57	1.4
105	Remote Cottage	40.0	50.0	2.17	25.8	40.1	50.1	2.22	0.0
115	Museum Site	45.0	55.0	4.15	29.4	45.1	55.1	4.21	0.1
116	Communication Site	45.0	55.0	4.15	31.5	45.2	55.2	4.25	0.1
121	Recreation Lot	42.9	52.9	3.18	32.9	43.3	53.3	3.36	0.2
123	Potential Indigenous Receptor	42.9	52.9	3.18	34.8	43.5	53.5	3.45	0.3
135	Park Vacation Home	42.9	52.9	3.18	32.7	43.3	53.3	3.35	0.2
163	Lynn Lake Friendship Center	45.0	55.0	4.15	30.0	45.1	55.1	4.22	0.1
166	Lynn Lake Gospel Church	45.0	55.0	4.15	29.8	45.1	55.1	4.22	0.1
169	Lynn Lake Library	45.0	55.0	4.15	29.5	45.1	55.1	4.21	0.1
172	West Lynn Lake High School	45.0	55.0	4.15	28.7	45.1	55.1	4.20	0.1
173	Lynn Lake Hospital	45.0	55.0	4.15	31.0	45.2	55.2	4.24	0.1
177	Lynn Lake Residence	45.0	55.0	4.15	30.3	45.1	55.1	4.23	0.1
178	Lynn Lake Residence	45.0	55.0	4.15	30.8	45.2	55.2	4.23	0.1
225	Lynn Lake Residence	45.0	55.0	4.15	28.6	45.1	55.1	4.20	0.1

Notes:

[1] The + 10 dB “peace and quiet” adjustment is included

L_{dn} day-night average sound level; dBA = A-weighted decibel sound level; %HA = percent highly annoyed

Table 19 Operation Phase – Change in %HA at Gordon Site

Receptor ID	Description	Baseline			Project L_{dn} (dBA)	Total			Change in %HA (Between Total and Baseline)
		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA	
59	Potential Indigenous Receptor	40.0	50.0	2.17	37.1	41.8	51.8	2.75	0.6
61	Potential Indigenous Receptor	40.0	50.0	2.17	28.7	40.3	50.3	2.26	0.1
62	Potential Indigenous Receptor	40.0	50.0	2.17	25	40.1	50.1	2.21	0.0
72	Potential Indigenous Receptor	40.0	50.0	2.17	38.5	42.3	52.3	2.94	0.8
73	Potential Indigenous Receptor	40.0	50.0	2.17	37.8	42.0	52.0	2.84	0.7
74	Potential Indigenous Receptor	40.0	50.0	2.17	34	40.9	50.9	2.47	0.3
76	Potential Indigenous Receptor	40.0	50.0	2.17	46.3	47.2	57.2	5.48	3.3
77	Potential Indigenous Receptor	40.0	50.0	2.17	45.2	46.3	56.3	4.87	2.7
93	Black Sturgeon Reserve Residence	44.6	54.6	3.92	26.2	44.6	54.6	3.95	0.0
101	Black Sturgeon Reserve Residence	44.6	54.6	3.92	28.3	44.7	54.7	3.97	0.1
104	Remote Cottage	40.0	50.0	2.17	13.4	40.0	50.0	2.18	0.0
126	Recreation Lot	40.0	50.0	2.17	25.3	40.1	50.1	2.21	0.0
130	Remote Cottage	40.0	50.0	2.17	25.5	40.1	50.1	2.22	0.0
131	Remote Cottage	40.0	50.0	2.17	40.4	43.2	53.2	3.30	1.1
132	Trapper Cabin	40.0	50.0	2.17	38.7	42.4	52.4	2.97	0.8
139	Park Vacation Home	40.0	50.0	2.17	25.7	40.1	50.1	2.22	0.0

Note:

[1] The + 10 dB “peace and quiet” adjustment is included

L_{dn} day-night average sound level; dBA = A-weighted decibel sound level; %HA = percent highly annoyed

Table 20 Operation Phase – Change in %HA at MacLellan Site

Receptor ID	Description	Baseline			Project L_{dn} (dBA)	Total			Change in %HA (Between Total and Baseline)
		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA		L_{dn} (dBA)	$L_{dn, adjusted}$ [1] (dBA)	%HA	
66	Potential Indigenous Receptor	40.0	50.0	2.17	32.2	40.6	50.6	2.37	0.2
67	Potential Indigenous Receptor	40.0	50.0	2.17	33.8	40.9	50.9	2.46	0.3
68	Potential Indigenous Receptor	40.0	50.0	2.17	36.0	41.4	51.4	2.63	0.5
69	Potential Indigenous Receptor	40.0	50.0	2.17	31.6	40.5	50.5	2.35	0.2
78	Potential Indigenous Receptor	40.0	50.0	2.17	31.1	40.5	50.5	2.33	0.2
79	Potential Indigenous Receptor	40.0	50.0	2.17	26.9	40.2	50.2	2.23	0.1
81	Potential Indigenous Receptor	40.0	50.0	2.17	32.9	40.7	50.7	2.41	0.2
82	Potential Indigenous Receptor	40.0	50.0	2.17	41.1	43.6	53.6	3.46	1.3
83	Potential Indigenous Receptor	40.0	50.0	2.17	35.1	41.2	51.2	2.55	0.4
84	Potential Indigenous Receptor	40.0	50.0	2.17	36.9	41.7	51.7	2.72	0.5
85	Potential Indigenous Receptor	40.0	50.0	2.17	44.8	46.0	56.0	4.73	2.6
86	Potential Indigenous Receptor	40.0	50.0	2.17	45.2	46.3	56.3	4.91	2.7
105	Remote Cottage	40.0	50.0	2.17	30.2	40.4	50	2.30	0.1
115	Museum Site	45.0	55.0	4.15	33.4	45.3	55.3	4.30	0.2
116	Communication Site	45.0	55.0	4.15	35.6	45.5	55.5	4.40	0.3
121	Recreation Lot	42.9	52.9	3.18	36.8	43.9	53.9	3.60	0.4
123	Potential Indigenous Receptor	42.9	52.9	3.18	37.9	44.1	54.1	3.71	0.5
135	Park Vacation Home	42.9	52.9	3.18	34.8	43.5	53.5	3.45	0.3
163	Lynn Lake Friendship Center	45.0	55.0	4.15	33.5	45.3	55.3	4.31	0.2
166	Lynn Lake Gospel Church	45.0	55.0	4.15	33.7	45.3	55.3	4.32	0.2
169	Lynn Lake Library	45.0	55.0	4.15	33.5	45.3	55.3	4.31	0.2
172	West Lynn Lake High School	45.0	55.0	4.15	32.5	45.2	55.2	4.28	0.1
173	Lynn Lake Hospital	45.0	55.0	4.15	35.6	45.5	55.5	4.40	0.3
177	Lynn Lake Residence	45.0	55.0	4.15	33.7	45.3	55.3	4.32	0.2
178	Lynn Lake Residence	45.0	55.0	4.15	33.8	45.3	55.3	4.32	0.2
225	Lynn Lake Residence	45.0	55.0	4.15	33.3	45.3	55.3	4.30	0.2

Notes:

[1] The + 10 dB “peace and quiet” adjustment is included

L_{dn} day-night average sound level; dBA = A-weighted decibel sound level; %HA = percent highly annoyed

4.3.3 Health Canada Low Frequency Noise

As a target for the low frequency noise (LFN) issue, Health Canada noise guidance recommends that the energy sum of the linear sound levels in the 16, 31.5 and 63-Hz octave bands at a receptor location not exceed 70 dBL.

Table 21 summarizes the predicted octave band sound level at 16 Hz, 31.5 Hz, and 63 Hz for the receptors near the Gordon sites during the construction and operation phases; and Table 22 summarizes the predicted octave band sound level at 16 Hz, 31.5 Hz, and 63 Hz for the receptors near the MacLellan sites during the construction and operation phases.

Assessment of the 16 Hz sound pressure level is not possible because no sound power data is available for the proposed equipment and this octave band is outside of the ISO 9613-2 calculation standard. However, Stantec's professional experience suggests that the 16 Hz octave band sound pressure level will be similar to that of the 31.5 Hz octave band. The sound levels at 16 Hz octave band were therefore assumed to be the same as the sound levels at 31.5 Hz octave band.

Potential for LFN noise effect is low at receptors near both the Gordon site and MacLellan site because the predicted sound level results are below the Health Canada target of 70 dBL.

Table 21 Sound Level at 16 Hz, 31.5 Hz and 63 Hz Octave Band Frequency at Gordon Site

Receptor ID	Description	Construction Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)				Operation Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)			
		16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz	16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz
59	Potential Indigenous Receptor	36.4	36.4	39.5	42.5	39.9	39.9	44.4	46.7
61	Potential Indigenous Receptor	34.6	34.6	36.9	40.3	38.3	38.3	41	44.2
62	Potential Indigenous Receptor	32	32	33.9	37.5	35.6	35.6	38	41.3
72	Potential Indigenous Receptor	44.4	44.4	47	50.2	47.1	47.1	49.6	52.9
73	Potential Indigenous Receptor	45	45	47.4	50.7	47.7	47.7	49.6	53.2
74	Potential Indigenous Receptor	41.1	41.1	43.2	46.7	44.8	44.8	46.8	50.3
76	Potential Indigenous Receptor	49	49	51.4	54.7	53	53	55.6	58.8
77	Potential Indigenous Receptor	48.9	48.9	51.5	54.7	52.3	52.3	55	58.2

Receptor ID	Description	Construction Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)				Operation Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)			
		16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz	16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz
93	Black Sturgeon Reserve Residence	32.6	32.6	34.6	38.1	35.7	35.7	38	41.4
101	Black Sturgeon Reserve Residence	34	34	36.3	39.7	37.7	37.7	40.4	43.6
104	Remote Cottage	27.1	27.1	28.6	32.4	29.2	29.2	30.5	34.4
126	Recreation Lot	32.5	32.5	34.5	38.0	36.1	36.1	38.4	41.8
130	Remote Cottage	32.6	32.6	34.6	38.1	36.2	36.2	38.5	41.9
131	Remote Cottage	42.7	42.7	45.5	48.6	46.1	46.1	49.3	52.2
132	Trapper Cabin	43.6	43.6	46.3	49.5	46.6	46.6	49.3	52.5
139	Park Vacation Home	32.6	32.6	34.6	38.1	36.2	36.2	38.5	41.9

Notes:

L_d = daytime equivalent sound level; L_n nighttime equivalent sound level; dBA = A-weighted decibel sound level; dB = decibel; Hz = Hertz

Table 22 Sound Level at 16 Hz, 31.5 Hz and 63 Hz Octave Band Frequency at MacLellan Site

Receptor ID	Description	Construction Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)				Operation Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)			
		16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz	16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz
66	Potential Indigenous Receptor	42.2	42.2	44.3	47.8	47.3	47.3	48.6	52.5
67	Potential Indigenous Receptor	42.7	42.7	44.9	48.3	48.4	48.4	49.8	53.7
68	Potential Indigenous Receptor	44.1	44.1	46.5	49.8	49.1	49.1	50.7	54.5
69	Potential Indigenous Receptor	40.9	40.9	43	46.5	46.4	46.4	47.8	51.7
78	Potential Indigenous Receptor	40.9	40.9	43	46.5	45.9	45.9	47.3	51.2
79	Potential Indigenous Receptor	37.7	37.7	39.5	43.2	42.5	42.5	43.7	47.7

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Receptor ID	Description	Construction Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)				Operation Phase Predicted Daytime or Nighttime Sound Level, L_d or L_n (dB)			
		16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz	16 Hz	31.5 Hz	63 Hz	Sum of 16 Hz to 63 Hz
81	Potential Indigenous Receptor	42.1	42.1	44.3	47.7	47	47	48.6	52.4
82	Potential Indigenous Receptor	47.7	47.7	50.2	53.5	52.8	52.8	54.8	58.3
83	Potential Indigenous Receptor	43.9	43.9	46.3	49.6	48.9	48.9	50.6	54.3
84	Potential Indigenous Receptor	46.7	46.7	49.3	52.5	50.1	50.1	51.9	55.6
85	Potential Indigenous Receptor	53.2	53.2	56	59.1	56.9	56.9	57.5	61.9
86	Potential Indigenous Receptor	49.7	49.7	52.4	55.6	56.2	56.2	57.7	61.5
105	Potential Indigenous Receptor	40	40	42	45.5	45.8	45.8	46.9	51.0
115	Museum Site	41.8	41.8	44.1	47.5	47.5	47.5	49	52.8
116	Communication Site	43.3	43.3	45.7	49.0	49.2	49.2	50.6	54.5
121	Recreation Lot	44.4	44.4	46.8	50.1	50.1	50.1	51.8	55.5
123	Potential Indigenous Receptor	46.1	46.1	48.4	51.8	50.9	50.9	52.2	56.1
135	Park Vacation Home	45	45	46.9	50.5	48.8	48.8	49.4	53.8
163	Lynn Lake Friendship Center	42.3	42.3	44.6	48.0	47.4	47.4	48.9	52.7
166	Lynn Lake Gospel Church	42	42	44.3	47.7	47.8	47.8	49.4	53.2
169	Lynn Lake Library	41.9	41.9	44.2	47.6	47.5	47.5	49.1	52.9
172	West Lynn Lake High School	41.5	41.5	43.7	47.1	46.8	46.8	48.2	52.1
173	Lynn Lake Hospital	42.7	42.7	45	48.4	49.5	49.5	50.9	41.3
177	Lynn Lake Residence	42.7	42.7	44.9	48.3	47.6	47.6	49	39.5
178	Lynn Lake Residence	42.6	42.6	45	48.3	47.6	47.6	49	39.5
225	Lynn Lake Residence	41.4	41.4	43.6	47.0	47.4	47.4	49	39.1

Notes:

L_d = daytime equivalent sound level; L_n nighttime equivalent sound level; DBA = a-weighted decibel sound level; Hz = Hertz

4.3.4 World Health Organization Sleep Disturbance

The outdoor nighttime annual sound level of 40 dBA was used as the sleep disturbance noise target for this assessment update, based on the World Health Organization Night Guidelines for Europe (WHO 2009). The L_n results in Table 14 and Table 15 indicate that the nighttime equivalent sound level from the Project is below 40 dBA at all residential receptors. No noise-related sleep disturbances of residential receptors are expected from the Project construction and operation during the nighttime period.

It is assumed that a minimum of 30-dB noise reduction is expected for the work camp building walls with the windows closed. Air conditioning units are recommended for the work camp building such that exterior windows and doors can be closed during summer season. The WHO (1999) recommends a target for sleep disturbance as being an indoor sound level of no more than 30 dBA. The predicted daytime or nighttime sound level at the temporary work camp is 57.1 dBA outdoor during the construction phase. The predicted daytime or nighttime sound level at the permanent work camp and 59.7 dBA outdoor during the operation phase. The construction phase noise level inside the temporary work camp is predicted to be 27.1 dBA. The operation phase noise level inside the temporary work camp is predicted to be 29.7 dBA. The indoor level predicted is based on a building transmission loss of 30 dB with the exterior windows and doors closed.

Therefore, the predicted results during both construction and operation phases are below the WHO 1999 indoor sound level target of 30 dBA. No noise-related sleep disturbances of workers are expected from the Project during the daytime and nighttime periods.

5 Vibration Model Results

5.1 Operation Phase

During the operation phase, as described in Section 1.6 due to the increase of the highest blasting charge per hole (i.e., increased from 208 kg in the 2019 design to 230 kg in the 2023 design), and changes to the shortest distances from the receptors to the open pit boundary, the predicted results of the ground-borne vibration and air overpressure levels marginally increase for some receptors in comparison to the Stantec 2020 assessment.

Table 23 and Table 24 present the predicted ground-borne vibration and air overpressure for receptors at the Gordon site and MacLellan site, respectively. To be conservative in the predictions, the distance to each receptor was taken from the final pit boundary, and blasts were assumed to be fired with 230 kg of explosives.

Table 23 Blast Related Vibration Levels for Receptors near Gordon Site

Receptor ID	Description	Distance to Open Pit (m)	Ground-borne Vibration (mm/s)	Air Overpressure with blast charge of 230 kg per hole per delay (dBL)	Air Overpressure with blast charge of 43 kg per hole per delay (dBL)
59	Potential Indigenous Receptor	8465	0.2	113	109
61	Potential Indigenous Receptor	10855	0.2	111	108
62	Potential Indigenous Receptor	10855	0.1	109	106
72	Potential Indigenous Receptor	3080	1.0	119	115
73	Potential Indigenous Receptor	2125	1.8	121[a]	118
74	Potential Indigenous Receptor	3135	1.0	119	115
76	Potential Indigenous Receptor	1420	3.4	124[a]	120
77	Potential Indigenous Receptor	2255	1.7	121[a]	117
93	Black Sturgeon Residence Reserve	11720	0.1	111	107
101	Black Sturgeon Residence Reserve	11655	0.1	111	107
104	Remote Cottage	17070	0.1	108	105
126	Recreation Lot	13345	0.1	110	106
130	Remote Cottage	13155	0.1	110	106
131	Remote Cottage	4135	0.7	117	113
132	Trapper Cabin	3470	0.9	118	115
139	Park Vacation Home	13140	0.1	110	106

Notes:

[a] exceeds the target of 120 dBL based on the blast charge of 230 kg per hole per delay. However, the reduced charge as recommended in the mitigation section will lower the air overpressure to 120 dBL at Receptor ID 73, ID 76 and ID 77.

m = metres; mm/s = millimetres per second; kg = kilograms; dBL = linear (unweighted) decibel sound level

Table 24 Blast Related Vibration Levels for Receptors near MacLellan Site

Receptor ID	Description	Distance to Open Pit (m)	Ground-borne Vibration (mm/s)	Air Overpressure with blast charge of 230 kg per hole per delay (dBL)	Air Overpressure with blast charge of 85 kg per hole per delay (dBL)
66	Potential Indigenous Receptor	9090	0.2	112	110
67	Potential Indigenous Receptor	7790	0.3	113	111
68	Potential Indigenous Receptor	5520	0.4	115	113
69	Potential Indigenous Receptor	9100	0.2	112	110
78	Potential Indigenous Receptor	9100	0.2	112	110
79	Potential Indigenous Receptor	12050	0.1	110	108
81	Potential Indigenous Receptor	7520	0.3	113	111
82	Potential Indigenous Receptor	3785	0.8	117	115
83	Potential Indigenous Receptor	7085	0.3	114	112
84	Potential Indigenous Receptor	6230	0.4	114	112
85	Potential Indigenous Receptor	3050	1.1	119	117
86	Potential Indigenous Receptor	2350	1.6	120	118
105	Remote Cottage	10730	0.2	111	109
115	Museum Site	6875	0.3	114	112
116	Communication Site	5585	0.4	115	113
121	Recreation Lot	5255	0.5	115	113
123	Potential Indigenous Receptor	3935	0.7	117	115
135	Park Vacation Home	3960	0.7	117	115
163	Lynn Lake Friendship Center	6350	0.3	114	112
166	Lynn Lake Gospel Church	6715	0.3	114	112
169	Lynn Lake Library	6765	0.3	114	112
172	West Lynn Lake High School	7125	0.3	114	112
173	Lynn Lake Hospital	6165	0.4	114	112
177	Lynn Lake Residence	6005	0.4	115	113
178	Lynn Lake Residence	6060	0.4	115	113
225	Lynn Lake Residence	7355	0.3	113	111
	Permanent Work Camp (outdoor)	750	8.9	127 [a]	125

Notes:

[a] exceeds the Health Canada target of 125 dBL based on the blast charge of 230 kg per hole per delay. However, the reduced charge of 85 kg per hole per delay will lower the air overpressure to 125 dBL at the permanent work camp.

m = metres; mm/s = millimetres per second; kg = kilograms; dBL = linear (unweighted) decibel sound level

The highest blast charge of 230 kg will result in ground-borne vibration below the vibration target of 10 mm/s at all receptors for the Gordon site. The predicted air overpressures are below the vibration target of 120 dBL at all receptors, with the exception of receptor ID 73, ID 76 and ID 77 near the Gordon site. The predicted air overpressure at receptor ID 73 and ID 77 is 121 dBL and ID 76 is 124 dBL, respectively. When the blast charge is reduced from 230 kg to 43 kg per hole per delay, the predicted overpressures at receptor ID 73, ID 76 and ID 77 meet the 120 dBL target.

The highest blast charge of 230 kg will result in ground-borne vibration below the vibration target of 10 mm/s at all receptors for the MacLellan site. The predicted air overpressures are below the vibration target of 120 dBL at all receptors, with the exception of the permanent work camp at the MacLellan Site. The predicted air overpressure at the permanent work camp is 127 dBL. This level is also above the Health Canada target of 125 dBL for one blast per day. In order to meet the Health Canada target of 125 dBL, the blast charge reduction to 85 kg per hole per delay is required. The reduced blast charge of 85 kg can be implemented initially to achieve the overpressure level of 125 dBL at the permanent work camp. The reduced blast charge of 85 kg can be increased if monitoring results indicate air overpressure level below 125 dBL at the permanent work camp.

5.2 Mitigation

The modelling results presented in Section 5.1 include a scenario with mitigation. In an adaptive management approach, mitigation measures presented in this section will be implemented as needed, and monitoring will help to confirm effectiveness. Mitigation will be achieved by blast design. The mitigation measures that apply to both the Gordon and MacLellan sites are summarized as follows:

- Highest blasting charge per hole that do not exceed 230 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 the permanent work cmp within the MacLellan site are as follows:
    - Reduced blast charge of 85 kg can be increased if the distance between the blast and the permanent work camp is more than 750 m.
    - The reduced blast charge of 85 kg can be increased if monitoring results indicate air overpressure level is below 125 dBL at the permanent work camp.
    - Blasting will be scheduled during shift change (e.g., less worker sleeping and more local activities) to reduce potential annoyance at the permanent work camp.

The specific mitigation measures for receptor ID 73, ID 76 and ID 77 near the Gordon site are as follows:

- The reduced blast charge of 43 kg can be increased if the distances between the blast and closest receptor ID 76, ID 73 and ID 77 are more than 1,420 m, 2125 m and 2,255 m, respectively (distance based on receptor location to pit boundary).

- The reduced blast charge of 43 kg can be increased if monitoring results indicate air overpressure level is below 120 dBL at ID 73, ID 76 and ID 77.
- 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 73, ID 76 and ID 77) is not expected.

6 Discussion

This Noise and Vibration Impact Assessment Update predicted the noise and vibration effects to the environment based on the Project 2023 design. Due to the design changes (see Section 1), the predicted results are different from the Stantec 2020 assessment results. Table 25 and Table 26 assessment update and the Stantec 2020 assessment for the construction and operation phase, respectively.

Table 25 Comparison of Predicted Results of Project Construction Phase

Mine Site	Receptor	L_d or L_d (dBA)			L_{dn} (dBA)			Change in %HA (%)		
		2020	Update	Changes	2020	Update	Change	2020	Update	Change
Gordon	ID77	30.7	33.8	+3.1	37.1	40.2	+3.1	2.2	3.3	1.1
MacLellan	ID85	35.5	37.7	+2.2	41.9	44.1	+2.2	3.7	4.4	0.7
	Work Camp	56.7	57.1	+0.4	63.1	63.5	+0.4	-[1]	-	-

Notes:

[1] "-": Not Applicable

dBA = A-weighted decibel sound level; %HA = percent highly annoyed

Table 26 Comparison of Predicted Results of Project Operation Phase

Mine Site	Receptor	L_d or L_d (dBA)			L_{dn} (dBA)			Change in %HA (%)		
		2020	Update	Changes	2020	Update	Change	2020	Update	Change
Gordon	ID76	38.5	39.9	+1.4	44.9	46.3	+1.4	4.8	5.5	+0.7
MacLellan	ID86	37.3	38.8	+1.5	43.7	45.2	+1.5	4.3	4.9	+0.6
	Work Camp	53.5	59.7	+6.2	59.9	66.1	+6.2	-[1]	-	-

Notes:

[1] "-": Not Applicable

dBA = A-weighted decibel sound level; %HA = percent highly annoyed

Table 27 compares that the highest vibration results between this assessment update and the Stantec 2020 assessment.

Table 27 Comparison of Vibration Results

Mine Site	Receptor	Ground-borne Vibration (mm/s)			Overpressure (dBL)		
		2020	Update	Changes	2020	Update	Changes
Gordon	ID76	3.1	3.4	+0.3	123	124	+1
MacLellan	ID86	1.4	1.6	+0.2	120	120	0
	Work Camp	7.4	8.9	+1.5	127	127	0

Notes:
mm/s = millimetres per second; dBL = linear (unweighted) decibel sound level

The Project 2023 design marginally increases both noise and vibration effects at some receptors in comparison to the Stantec 2020 assessment. This is because of the changes described in Section 1. However, the assessment update results indicate that the Project will remain compliant with the applicable noise and vibration thresholds (Section 4) at all receptors.

7 Conclusion

This Noise and Vibration Impact Assessment Update focused on the potential changes of the Project noise and vibration effects due to the updated Project 2023 design during the operation and construction phases. Key changes of the Project design include updates to the PDA, Project layouts, mining production quantities, major mine equipment, operation blast parameters. The noise and vibration models for the construction and operation phases of the Project were updated based on identical approach (i.e., receptor locations, regulatory framework, baseline conditions, and modelling method) to the Stantec 2020 assessment.

Noise effects such as community annoyance, sleep disturbance, and low frequency noise were assessed. The predicted noise level during the construction and operation phases on the selected 32 noise receptors were presented.

The operation phase vibration for the blast induced ground vibration and air blast overpressure effects were evaluated for same 32 noise receptors. Blast designs were recommended to avoid structural damage and reduce annoyance effects from blast induced ground vibrations and air blast overpressure.

Compared with the results in Stantec 2020, the noise and vibration effects of the Project activities marginally increased at some receptors. However, the updated results comply with the applicable noise and vibration thresholds during all Project phases. In conclusion, the Noise and Vibration Impact Assessment Update results do not change the characterization of residual effects, or the significance ratings as presented in the EIS (Stantec 2020).

8 Limitations and Sign-off

This document entitled Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Alamos Gold Inc. (the “Client”) for regulatory submission. Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Attachment A Noise Emission Sources

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Table A.1 Equipment Sound Power Level Summary – Pre-Construction at Gordon Site

Source	Quantity	Sound Power Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Loading Equipment											
Material Loader PC1250LC-8 (6.7 m3)	2	117	120	121	112	104	105	101	99	95	111
Mine Support Equipment											
Graders - GD655-6	1	108	111	110	106	102	107	101	97	88	109
Tracked Dozer - D375A-6	1	117	120	121	112	104	105	101	99	95	111
Transfer Loader (WA600)	1	113	116	121	112	112	111	109	107	97	116
Snow Plow/Water Truck	1	101	106	106	106	106	104	100	98	99	109
Material Handler PC1250LC-8 (6.7 m3)	1	117	120	121	112	104	105	101	99	95	111
Hydraulic Excavators (PC490LC-11 whammer)	1	113	116	121	112	112	111	109	107	97	116
Road Maint Loader - WA500-8	1	114	117	112	106	107	105	102	97	89	110
Drills											
Drill (178 mm SmartROC D65)	1	112	115	121	113	115	111	108	103	100	117
Hauling Equipment											
Dump Trucks (20 t)	2	111	114	112	114	111	107	104	100	95	113
Articulated Trucks (HD605-8 69 t)	3	118	121	118	113	112	111	109	105	97	116
Mine General Equipment											
Pump Truck	1	113	116	112	103	101	103	100	96	88	107
Lube/Fuel Truck	1	109	111	119	108	101	103	98	92	83	108
Man Bus	2	95	109	106	103	102	101	92	90	85	104
Pickup Trucks	10	106	109	100	96	96	94	92	88	83	99
Welding Truck	1	106	109	100	96	96	94	92	88	83	99
Blasting Truck	1	106	109	100	96	96	94	92	88	83	99
Blasting Loader	1	106	109	100	96	96	94	92	88	83	99
Mechanics Truck	1	106	109	100	96	96	94	92	88	83	99
Diesel Cranes - 35T	1	91	94	93	86	85	83	80	71	62	88

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Power Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Tire Manipulator (980 WA5000-8)	1	98	101	93	91	91	90	87	86	77	95
Integrated Tool Carrier WA200-7 (wheel loader)	1	107	110	109	105	101	106	100	96	87	108
Compactor (BW211)	1	102	105	109	107	107	104	101	95	87	109
Lowboy and Tractor (75-100t)	1	117	120	121	112	104	105	101	99	95	111
ADT 40t	1	101	104	107	103	103	104	101	98	93	108
Light Plants	6	98	101	96	88	84	83	81	78	66	89

Note:

dB – linear sound level; dBA- A-weighted sound level

Table A.2 Equipment Sound Power Level Summary – Pre-Construction at MacLellan Site

Source	Quantity	Sound Power Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Loading Equipment											
WA900 Loader (11.5 m3)	1	114	117	112	106	107	105	102	97	89	110
Shovel (PC4000 22 m3)	1	113	116	121	112	112	111	109	107	97	116
Mine Support Equipment											
Graders - GD655-6	2	108	111	110	106	102	107	101	97	88	109
Tracked Dozer - D375A-6	5	117	120	121	112	104	105	101	99	95	111
Transfer Loader (WA600)	1	113	116	121	112	112	111	109	107	97	116
Snow Plow/Water Truck	3	101	106	106	106	106	104	100	98	99	109
Material Handler PC1250LC-8 (6.7 m3)	1	117	120	121	112	104	105	101	99	95	111
Hydraulic Excavators (PC490LC-11 whammer)	1	113	116	121	112	112	111	109	107	97	116
Road Maint Loader - WA500-8	1	114	117	112	106	107	105	102	97	89	110
Drills											
Drill (178 mm SmartROC D65)	1	112	115	121	113	115	111	108	103	100	117
Drill Rigs (178 mm PV275)	1	110	113	121	106	107	108	107	104	102	114
Hauling Equipment											
Dump Trucks (20 t)	3	111	114	112	114	111	107	104	100	95	113
Articulated Trucks (HD1500-150 t)	4	122	125	123	119	119	114	112	107	103	120
Mine General Equipment											
Pump Truck	1	113	116	112	103	101	103	100	96	88	107
Lube/Fuel Truck	1	109	111	119	108	101	103	98	92	83	108
Man Bus	2	95	109	106	103	102	101	92	90	85	104

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Power Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Pickup Trucks	16	106	109	100	96	96	94	92	88	83	99
Welding Truck	1	106	109	100	96	96	94	92	88	83	99
Blasting Truck	1	106	109	100	96	96	94	92	88	83	99
Blasting Loader	1	106	109	100	96	96	94	92	88	83	99
Mechanics Truck	1	106	109	100	96	96	94	92	88	83	99
Diesel Cranes - 35T	1	91	94	93	86	85	83	80	71	62	88
Tire Manipulator (980 WA5000-8)	1	98	101	93	91	91	90	87	86	77	95
Integrated Tool Carrier WA200-7 (wheel loader)	1	107	110	109	105	101	106	100	96	87	108
Compactor (BW211)	1	102	105	109	107	107	104	101	95	87	109
Lowboy and Tractor (75-100t)	1	117	120	121	112	104	105	101	99	95	111
ADT 40t	2	101	104	107	103	103	104	101	98	93	108
Light Plants	8	98	101	96	88	84	83	81	78	66	89

Notes:

dB – linear sound level; dBA- A-weighted sound level

Table A.3 Equipment Sound Power Level Summary – Operation, Processing Plant

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Primary Crusher Building											
Primary & Secondary Crusher Overhead Crane	1	96	99	90	88	85	83	78	70	61	88
Primary Crusher	1	115	115	115	111	109	106	104	100	91	112
Primary Crusher Transfer Conveyor	1	90	90	93	95	98	98	97	92	84	103
Apron Feeder	1	113	113	113	111	109	108	106	100	93	112
Vibrating Grizzly Screen	2	107	110	108	105	105	100	100	97	90	107
Rock Breaker	1	113	116	116	114	117	111	111	108	104	118
Secondary Screen Feed Conveyor	1	90	90	93	95	98	98	97	92	84	103
Pre-leach Thickener mechanism	1	81	81	84	86	89	89	88	83	75	93
Secondary Crusher Building											
Secondary Crusher Overhead Crane	1	96	99	90	88	85	83	78	70	61	88
Secondary Crusher	1	118	118	118	114	112	109	107	103	94	115
Fine Ore Stockpile Feed Conveyor	1	91	91	94	96	99	99	98	93	85	104
Secondary Crusher Bag House	1	104	107	100	100	97	97	92	90	89	101
Secondary Crusher Belt Feeder	1	107	107	107	105	103	102	100	94	87	107
Secondary Screen	1	104	107	105	102	102	97	97	94	87	104
Mill Building											
Cyclone Feed Pump Box	1	78	79	81	83	84	86	83	79	72	90
Cyclone Feed Pump	2	100	101	103	104	104	106	104	100	94	110
Grinding Area Pump	2	100	100	103	105	107	108	106	101	94	112
CIP Tailings Pump	2	97	98	100	102	104	105	103	98	91	109
CIP Area Sump Pump	1	80	81	82	84	85	87	85	81	74	91
Pre-leach Thickener Area Sum Pump	2	85	86	88	90	91	93	91	86	79	97

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Pre-leach Thickener Underflow Pump	2	85	86	88	90	91	93	91	86	79	97
Flocculant Dosing Pump	1	86	87	89	91	92	94	92	87	80	98
Elution Area Sump Pump	2	89	90	92	94	95	97	95	90	83	101
Carbon Transfer Pump	2	82	83	84	86	87	89	87	83	76	93
Carbon Area Sump Pump	2	82	83	84	86	87	89	87	83	76	93
Process Building Overhead Crane	1	103	106	97	95	92	90	85	77	68	95
Cyclone Cluster	1	81	81	84	86	89	89	88	83	75	93
Pre-leach Sampler	2	81	81	84	86	89	89	88	83	75	93
Flocculant Mixing System	1	107	110	108	105	105	100	100	97	90	107
Carbon Safety Screen	1	104	107	105	102	102	97	97	94	87	104
Pebble Conveyor	2	75	75	78	80	83	83	82	77	69	88
Carbon Regen Exhaust Fan	1	85	85	91	92	91	89	88	82	80	94
Ball Mill	1	113	114	113	112	110	111	110	101	91	115
Sag Mill	1	110	111	110	109	107	108	108	99	89	113
Ball Hopper	2	107	110	103	103	100	100	95	93	92	104
Ball Kibble	2	107	110	103	103	100	100	95	93	92	104
Sag Mill Liner Handler	1	103	106	97	95	92	90	85	77	68	95
Carbon Regen Kilin Package	1	107	110	108	105	105	100	100	97	90	107
Trash Screen	1	99	102	100	97	97	92	92	89	82	99
Loaded Carbon Screen	1	99	102	100	97	97	92	92	89	82	99
Stripped Carbon Screen	1	107	110	108	105	105	100	100	97	90	107
CIP Intertank Screen	6	111	114	112	109	109	104	104	101	94	112
Carbon Fines Filter Press	1	107	110	108	105	105	100	100	97	90	107
Air Receiver	5	105	101	106	105	103	106	111	108	101	114
Air Dryer	2	100	96	101	100	98	101	106	103	96	109
Elution Circuit Package	1	94	94	97	99	102	102	101	96	88	107

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Reagent Building											
Lime Distribution Pump	2	87	88	89	91	93	94	92	88	81	99
Lime Slaking System	1	95	96	98	100	102	103	101	97	89	107
Sodium Cyanide Dissolution System	1	95	96	98	100	102	103	101	97	89	107
Sodium Cyanide Dosing Pump	4	90	91	93	95	96	98	95	91	84	102
Tailings Pump	2	84	85	87	88	90	88	84	77	94	96
Regent Area Overhead Crane	6	101	102	104	106	108	109	107	102	95	113
Sambs Exhaust Fan	1	93	96	87	85	82	80	75	67	58	85
Copper Sulphate Transfer Pump	1	81	81	82	74	71	71	66	64	63	76
Copper Sulphate Dosing Pump	1	94	94	96	98	100	101	99	95	88	105
Tailings Sampler	1	94	94	96	98	100	101	99	95	88	105
Tailings Sum Pump	1	81	81	84	86	89	89	88	83	75	93
Process Plan Air Compressor	1	97	98	100	101	101	103	101	97	91	107
Oxygen Plant											
Oxygen Plant	1	105	101	106	105	103	106	111	108	101	115
Fine Ore Bin Building											
Fine Ore Bin	2	115	115	115	113	111	110	108	102	95	115
Fine Ore Reclaim Feeder	2	115	115	115	113	111	110	108	102	95	115
Fine Ore Bin Ven Fan	1	92	92	90	84	78	73	73	68	65	81
Sag Mill Conveyor	1	88	88	91	93	96	96	95	90	82	101
Quick Lime Screw Feder	1	113	113	113	111	109	108	106	100	93	112
Reclaim Area Baghouse	2	115	115	115	113	111	110	108	102	95	115
Gold Room (inside Main Building)											
Electrowinning Cell	2	98	98	96	90	84	79	79	74	71	88
Electrowinning Hoist	1	93	96	87	85	82	80	75	67	58	85
Extraction Fan	2	99	99	97	91	85	80	80	75	72	89
Electrowinning Sludge Pump	1	82	83	84	86	86	89	86	82	76	93
Electrowinning Sludge Filer	1	77	78	79	81	81	84	81	77	71	88

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Electrowinning Cell Rectifier	2	98	98	96	90	84	79	79	74	71	88
Induction Furnace Dust Collector	1	104	107	100	100	97	97	92	90	89	101
Outdoor Service Equipment											
Diesel Feed Pump	2	84	85	86	88	90	91	89	85	78	96
Diesel Station	2	79	80	81	83	84	86	84	80	73	90
Gasoline Feed Pump	1	84	85	86	88	90	91	89	85	78	96
Gasoline Pump	1	84	85	86	88	90	91	89	85	78	96
Freshwater Pump	2	94	94	96	98	100	101	99	95	88	105
Potable Water Feed Pump	1	82	83	84	86	88	89	87	83	76	93
Potable Water Feed Plant (enclosed)	1	77	78	79	81	82	84	82	77	71	88
Firewater Pump (enclosed)	4	71	72	74	76	77	79	77	72	65	83
Quick Lime Vent	1	85	85	91	92	91	89	88	82	80	94
Air Compressor	1	82	78	83	82	80	83	88	85	78	91
Freshwater Pump (enclosed)	2	76	76	78	80	82	83	81	77	70	87
Freshwater Pump	1	94	94	96	98	100	101	99	95	88	105
Potable Water Pump	1	82	83	84	86	88	89	87	83	76	93
Air Compressor (inside truck shop)	1	82	78	83	82	80	83	88	85	78	91
Process Plan Mobile Equipment											
Single Cab 4WD Pickup	6	106	109	100	96	96	94	92	88	83	99
Twin Cab 4WD Hiab Truck	1	106	109	100	96	96	94	92	88	83	99
Bus	1	95	109	106	103	102	101	92	90	85	104
Fire Trailer	1	109	111	119	108	101	103	98	92	83	108
All Terrain Crane	1	103	106	97	95	92	90	85	77	68	95
Crane	1	105	108	107	101	102	101	101	92	83	106
Plant Forklift	2	100	103	94	92	89	87	82	74	65	92
Warehouse Forklift	1	100	103	94	92	89	87	82	74	65	92
Front-End Loader	1	113	116	121	112	112	111	109	107	97	116
Skid-Steer Loader (Bobcat)	1	114	117	112	107	108	103	100	94	87	109

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Tip Truck	2	109	111	119	108	101	103	98	92	83	108
Telescopic Handler	1	100	103	94	92	89	87	82	74	65	92
Boom/Scissor Lift	2	100	103	94	92	89	87	82	74	65	92
Fusion Butt Welder	1	92	95	96	97	96	97	94	89	84	101
Portable Compressor	1	106	109	110	95	100	99	102	101	94	107
Diesel Welder	2	92	95	96	97	96	97	94	89	84	101
Portable Pumps Generator	1	103	106	99	94	90	87	83	84	77	93
Gravel truck	2	109	111	119	108	101	103	98	92	83	108
Water Truck	1	101	106	106	106	106	104	100	98	99	109
Potable water Trailers	4	101	106	106	106	106	104	100	98	99	109
Franna Crane	1	102	105	96	94	91	89	84	76	67	94
Yard Crane – Hydraulic	1	102	105	96	94	91	89	84	76	67	94
Pick-n Carry Mobile Crane	1	102	105	96	94	91	89	84	76	67	94
Backhoe	1	114	117	112	106	107	105	102	97	89	110
Forklift/Telescopic Handler	1	102	105	96	94	91	89	84	76	67	94

Notes:

dB – linear sound level; dBA- A-weighted sound level

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Table A.4 Equipment Sound Power Level Summary – Operation

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Primary Equipment – Gordon Site											
Material Loader PC1250LC-8 (6.7 m^3)	4	117	120	121	112	104	105	101	99	95	111
Ore Haul Truck (HD605-8, 69 t)	15	118	121	118	113	112	111	109	105	97	116
Hydraulic Excavators (PC490LC-11 whammer)	1	113	116	121	112	112	111	109	107	97	116
Tracked Dozer D375A	2	117	120	121	112	104	105	101	99	95	111
Articulated Truck (69t)	2	118	121	118	113	112	111	109	105	97	116
Drill (178 mm SmartROC D65)	3	112	115	121	114	117	113	112	107	106	119
Blaster Loader	1	106	109	100	96	96	94	92	88	83	99
Blaster Truck	1	106	109	100	96	96	94	92	88	83	99
Dump Truck (20 t)	2	111	114	112	114	111	107	104	100	95	113
Maintenance and Other General Equipment – Gordon Site											
Pump Truck	1	113	116	112	103	101	103	100	96	88	107
Lube/Fuel Truck	1	109	111	119	108	101	103	98	92	83	108
Man Bus	2	95	109	106	103	102	101	92	90	85	104
Pickup Trucks	10	106	109	100	96	96	94	92	88	83	99
Welding Truck	1	106	109	100	96	96	94	92	88	83	99
Mechanics Truck	1	106	109	100	96	96	94	92	88	83	99
Snow Plow/Water Truck	2	101	106	106	106	106	104	100	98	99	109
Diesel Cranes - 35T	1	91	94	93	86	85	83	80	71	62	88
Tire Manipulator (980 WA5000-8)	1	98	101	93	91	91	90	87	86	77	95
Integrated Tool Carrier WA200-7 (wheel loader)	1	107	110	109	105	101	106	100	96	87	108
Compactor (BW211)	1	102	105	109	107	107	104	101	95	87	109
Lowboy and Tractor (75-100t)	1	117	120	121	112	104	105	101	99	95	111
Light Plants	8	98	101	96	88	84	83	81	78	66	89

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Road Maint Loader - WA500-8	1	114	117	112	106	107	105	102	97	89	110
ADT 40t	2	101	104	107	103	103	104	101	98	93	108
Primary Equipment – MacLellan Site											
Shovel (PC4000 22 m3)	2	113	116	121	112	112	111	109	107	97	116
Transfer Loader (WA900-3)	1	114	117	112	106	107	105	102	97	89	110
Ore Haul Truck (150 t)	17	122	125	123	119	119	114	112	107	103	120
Graders - GD655-6	2	108	111	110	106	102	107	101	97	88	109
Hydraulic Excavators (PC490LC-11 whammer)	1	113	116	121	112	112	111	109	107	97	116
Tracked Dozer D375A	5	117	120	121	112	104	105	101	99	95	111
WA900 Loader (11.5 m3	1	114	117	112	106	107	105	102	97	89	110
Drill Rigs (178 mm PV275)	4	113	116	122	115	118	114	113	108	107	120
Drill (178 mm SmartROC D65)	1	112	115	121	114	117	113	112	107	106	119
Blaster Loader	1	106	109	100	96	96	94	92	88	83	99
Blaster Truck	1	106	109	100	96	96	94	92	88	83	99
Maintenance and Other General Equipment – MacLellan Site											
Pump Truck	1	113	116	112	103	101	103	100	96	88	107
Lube/Fuel Truck	1	109	111	119	108	101	103	98	92	83	108
Man Bus	2	95	109	106	103	102	101	92	90	85	104
Pickup Trucks	16	106	109	100	96	96	94	92	88	83	99
Welding Truck	1	106	109	100	96	96	94	92	88	83	99
Mechanics Truck	1	106	109	100	96	96	94	92	88	83	99
Snow Plow/Water Truck	3	101	106	106	106	106	104	100	98	99	109
Diesel Cranes - 35T	1	91	94	93	86	85	83	80	71	62	88
Tire Manipulator (980 WA5000-8)	1	98	101	93	91	91	90	87	86	77	95
Integrated Tool Carrier WA200-7 (wheel loader)	1	107	110	109	105	101	106	100	96	87	108
Compactor (BW211)	1	102	105	109	107	107	104	101	95	87	109
Lowboy and Tractor (75-100t)	1	117	120	121	112	104	105	101	99	95	111

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

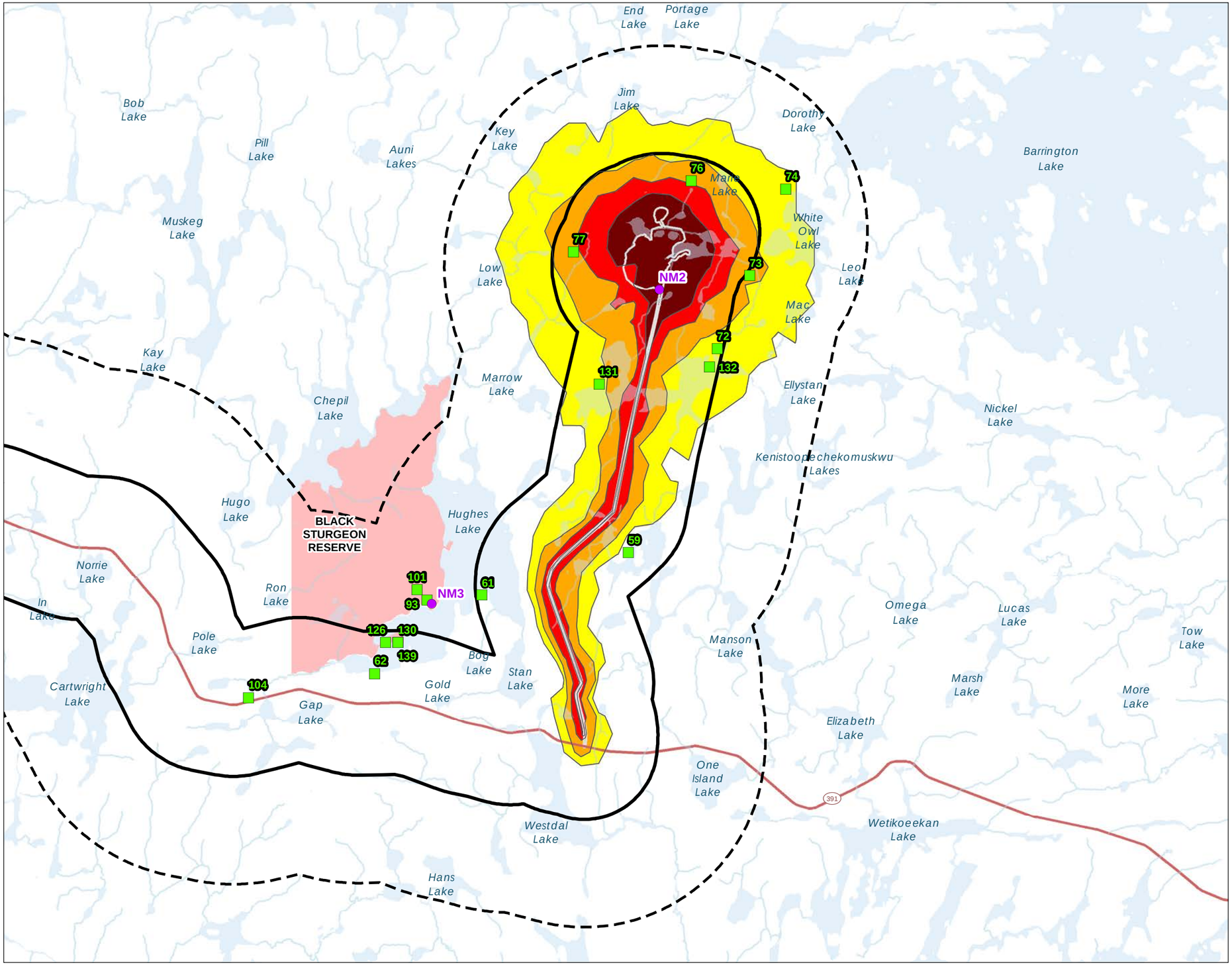
Source	Quantity	Sound Levels at Octave Band Center Frequencies for Each Unit (Hz) (dB re 1 pW)									Total dBA
		31.5	63	125	250	500	1000	2000	4000	8000	
Light Plants	8	98	101	96	88	84	83	81	78	66	89
Road Maint Loader - WA500-8	1	114	117	112	106	107	105	102	97	89	110
ADT 40t	2	101	104	107	103	103	104	101	98	93	108

Note:

dB – linear sound level; dBA- A-weighted sound level

Reference: Lynn Lake Gold Project – Noise and Vibration Impact Assessment Update

Attachment B Figures



Stantec

Study Area

- Project Development Area at Mine
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location

Noise Level (dBA)

- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

0 2 4 Kilometres

(At original document size of 11x17)
1:110,000

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 2025-05-06
Technical Review by YMa on 2025-05-06

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
1

Title
Construction Phase Noise Contours - Gordon Site

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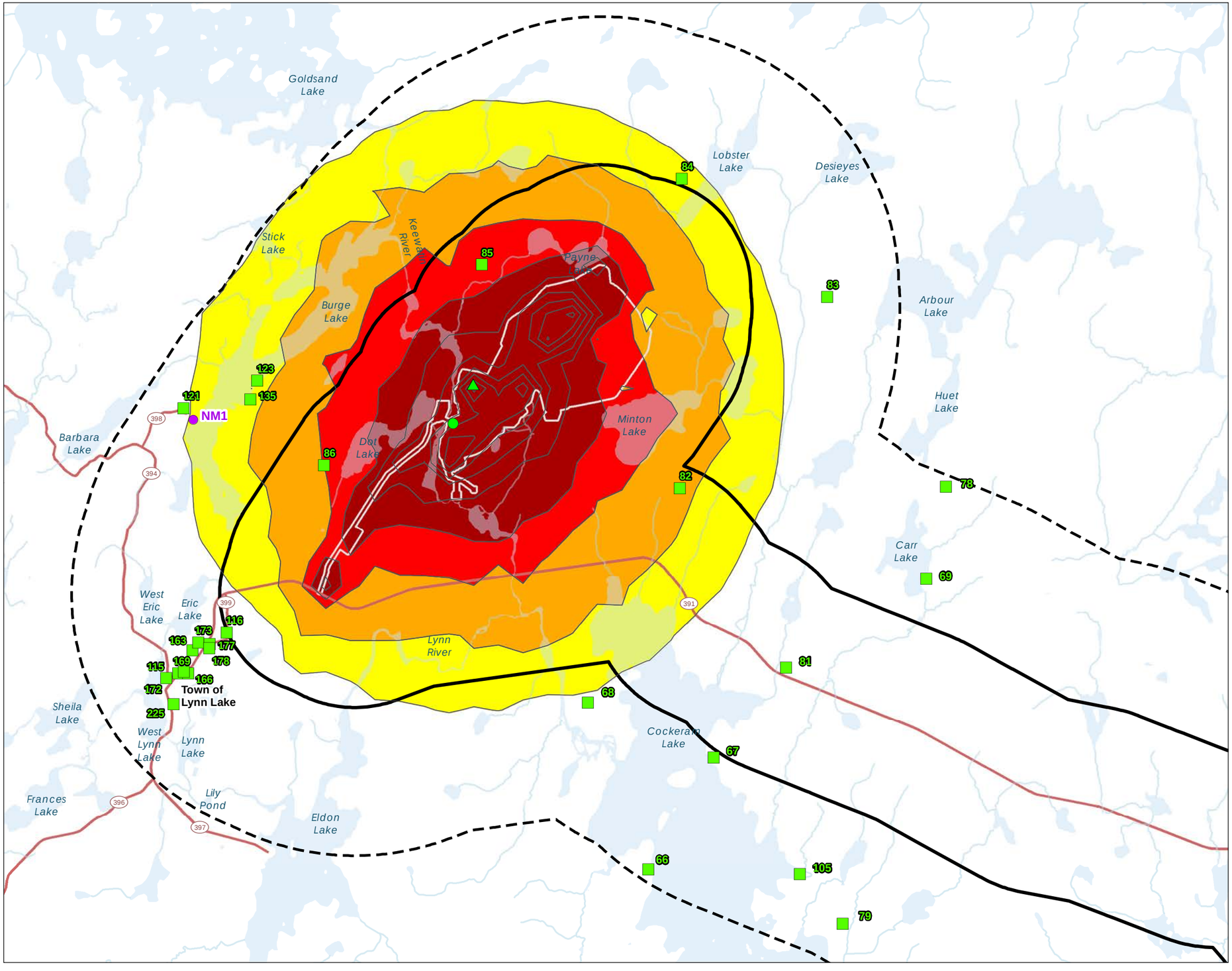

Stantec

Study Area

- Project Development Area at Mine
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location
- Future Worker Camp
- Temporary Worker Camp

Noise Level (dBA)

- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:80,000

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 2025-02-24
Technical Review by YMa on 2025-02-24

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
2

Title
Construction Phase Noise Contours - MacLellan Site

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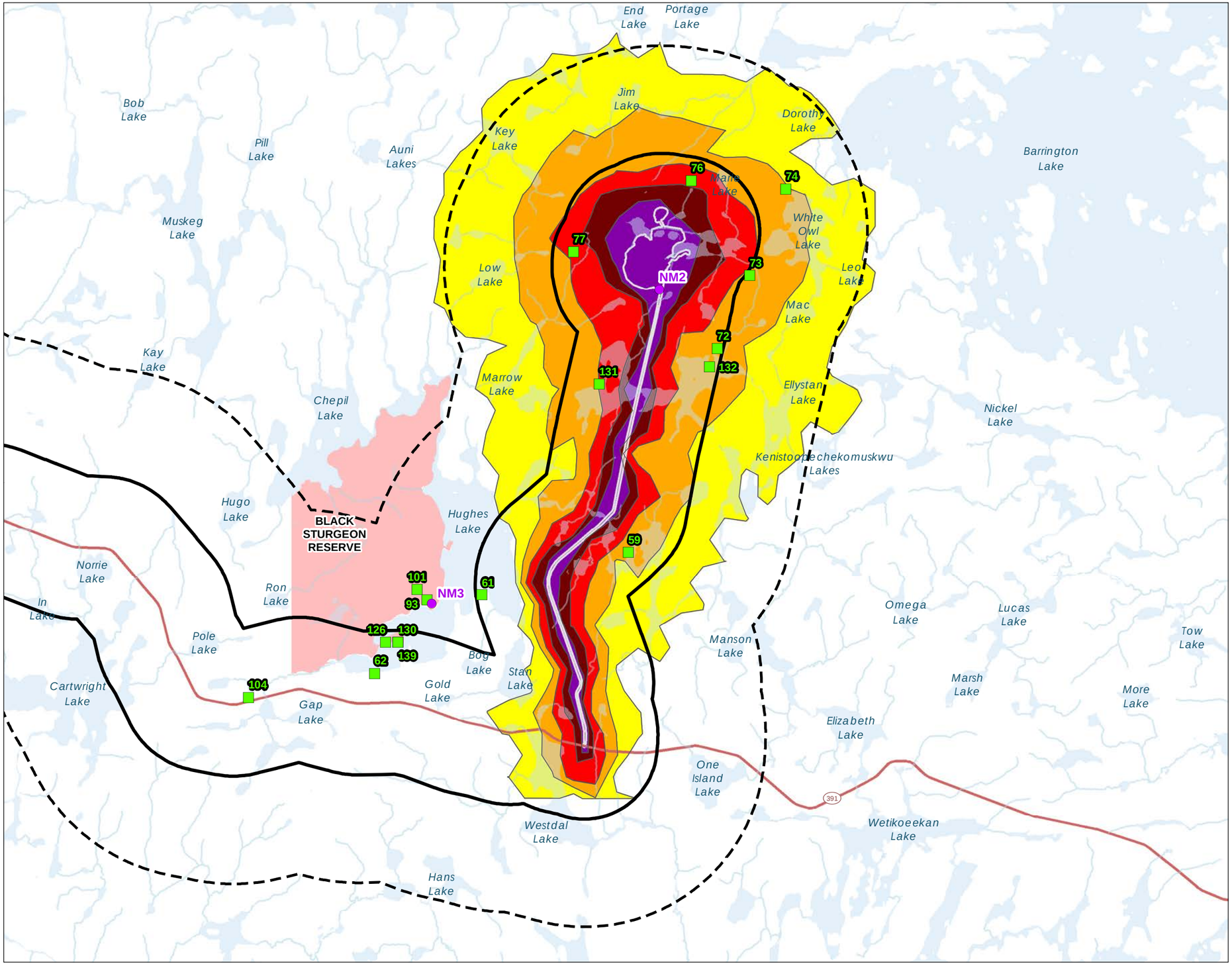

Stantec

Study Area

- Project Development Area at Mine
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location

Noise Level (dBA)

- >45 dBA
- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody
- First Nation Reserve

N

0 2 4 Kilometres

(At original document size of 11x17)
1:110,000

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 2025-05-06
Technical Review by YMa on 2025-05-06

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
3

Title
Operation Phase Noise Contours - Gordon Site

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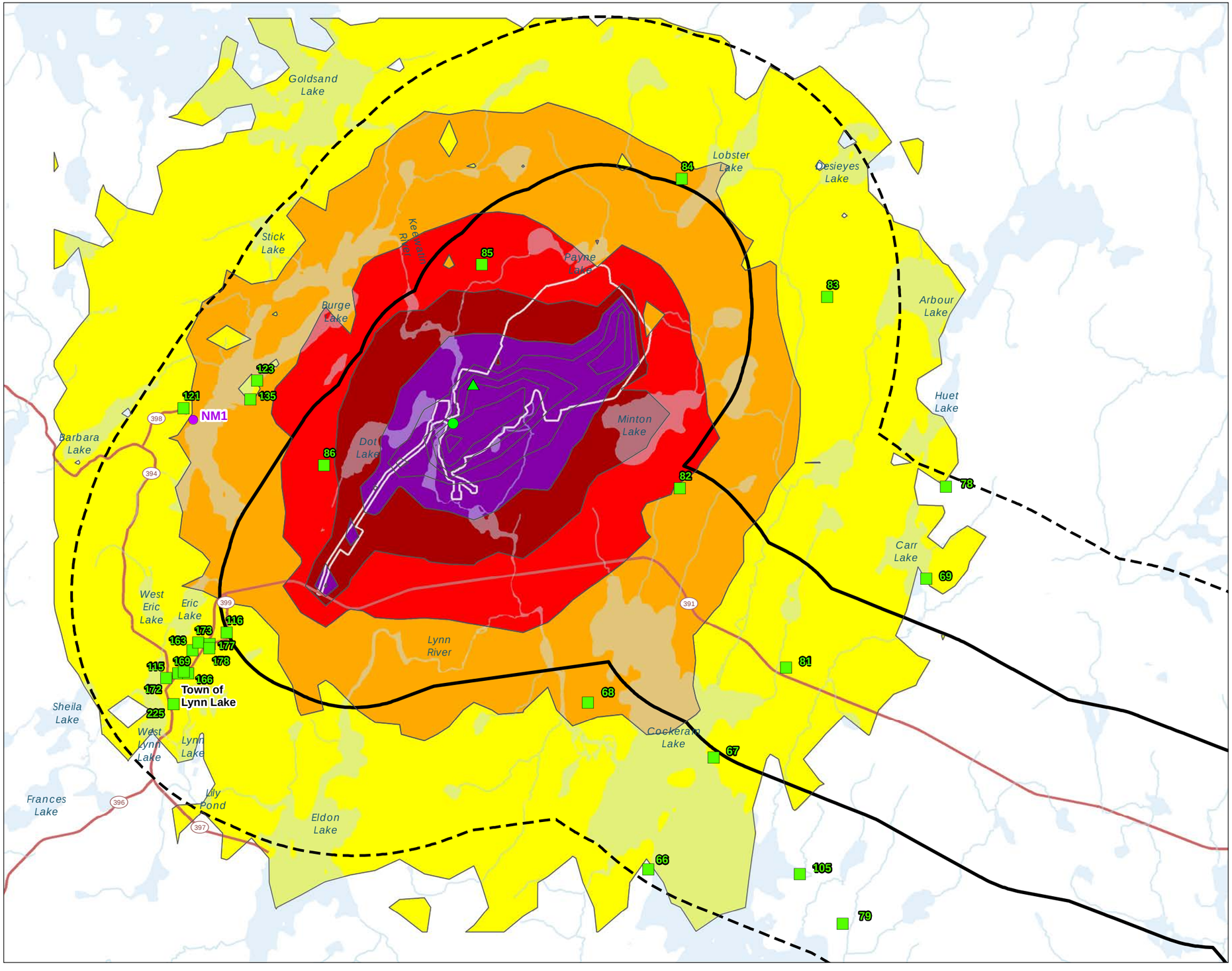

Stantec

Study Area

- Project Development Area at Mine
- Noise and Vibration Local Assessment Area (LAA)
- Noise and Vibration Regional Assessment Area (RAA)

Locations

- Noise Monitoring Location
- Receptor Location
- Future Worker Camp
- Temporary Worker Camp

Noise Level (dBA)

- >45 dBA
- >40 dBA
- >35 dBA
- >30 dBA
- >25 dBA

Landbase

- Highway
- Watercourse
- Waterbody

N

0 1.5 3 Kilometres

(At original document size of 11x17)
1:80,000

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 2025-02-24
Technical Review by YMa on 2025-02-24

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
4

Title
Operation Phase Noise Contours - MacLellan Site

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Appendix E Groundwater Gordon Site – Groundwater Model Report

Gordon Site – Groundwater Model Report

Lynn Lake Gold Project

Final Report

May 22, 2025

Prepared for:
Alamos Gold Inc

Prepared by:
Stantec Consulting Ltd.

Project Number:
111473076

Stantec

Limitations and Sign-off

The conclusions in the Report titled Gordon Site – Groundwater Model Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Alamos Gold Inc. (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Prepared by: Greaser, Kelly Digitally signed by Greaser, Kelly Date: 2025.05.28 11:58:17 -06'00'
Signature

Kelly Greaser, Ph.D.
Printed Name

Reviewed by: Okeson, Seth Digitally signed by Okeson, Seth Date: 2025.05.29 10:40:18 -06'00'
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Seth Okeson, M.E.
Printed Name

Approved by: PROVINCE OF MANITOBA M.J. FRASER Member 38498G REGISTERED PROFESSIONAL GEOSCIENTIST Digitally signed by Fraser, Michelle Date: 2025.05.27 04:48:12 -04'00'
Signature

Michelle Fraser, M.Sc., P.Geo
Printed Name

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Appendix C Transient Calibration Hydrographs

Acronyms/Abbreviations

Alamos	Alamos Gold Inc.
amsl	above mean sea level
bgs	below ground surface
EIS	environmental impact statement
EPM	equivalent porous media
GHB	general head boundary
GMR	Groundwater Model Report
IAAC	Impact Assessment Agency of Canada
MAE	mean absolute error
ME	mean error
the Project	Lynn Lake Gold Project
MRSA	mine rock storage area
OSA	ore storage area
PAG	potentially acid generating
RMS	root mean squared
RQD	rock quality designation

1 Introduction

As part of the Lynn Lake Gold Project (the Project), Alamos Gold Inc. (Alamos) plans to operate the Gordon Gold Mine (hereinafter referred to as the 'Gordon site') 55 kilometers (km) east of the Town of Lynn Lake in northern Manitoba (Map 1). Alamos is seeking approval to proceed with alterations to the Gordon site as approved under *Environment Act* License No. 3390 and the conditions stipulated therein (March 6, 2023) and a Decision Statement issued under the *Canadian Environmental Assessment Act, 2012* as documented by the Impact Assessment Agency of Canada (IAAC), dated March 5, 2023. The proposed alterations to the Gordon site include modifications to the mine rock storage area (MRSA), open pit, ore storage area (OSA), overburden storage area, and the collection pond. The proposed alterations also include the addition of a stockpile borrow source area, topsoil storage area, generator set area, facility area, interceptor wells and pond, ditches, sumps, and detailed freshwater intake lines and effluent locations. The proposed mine plan is documented in the Feasibility Study Update (Alamos 2023).

This updated Groundwater Model Report (GMR) for the Gordon site has been prepared to assess the potential effects of the construction, operation, and closure phases of the Project (including proposed alterations to the Gordon site) on groundwater resources and the consequent indirect effects on surface water resources at the Gordon site. The GMR considers the Gordon site components of the Project, baseline data collected for the Project since 2015, and comments received from agencies, Indigenous Nations, and other stakeholders.

To evaluate the effects of the Project (including proposed alterations to the Gordon site) on groundwater quality and quantity, a three-dimensional groundwater flow model has been developed for the Gordon site to provide estimates of:

- Changes in groundwater levels (drawdown), including changes to water table elevation and groundwater flow directions, due to dewatering of the historical East and Wendy pits and the proposed open pit.
- The groundwater flow rate to the open pit over time for use as an input to the water balance modelling conducted for the Project (including proposed alterations for the Gordon site).
- Groundwater flow and discharge to wetlands, creeks, and lakes during baseline, operation, and closure.
- Groundwater recharge and flow pathways during operations and closure from historical south and north MRSAs, OSA, and a new MRSA to be developed during operation.
- Evaluation of mitigation options to control groundwater inflow to the open pit.

The groundwater flow model encompasses the groundwater Local Assessment Area and Regional Assessment Area as defined in the Environmental Impact Statement (EIS) for the Project (2020) (Stantec 2020d), referred to herein as the study area.

This GMR forms part of the supporting documentation Gordon Mine Plan Amendment Notice of Alteration / Notice of Change completed for the Project.

2 Site Setting

This section provides an overview of the existing conditions that were used as background for development of the GMR. More detailed information is presented in the following reports:

- Hydrogeology Baseline Technical Data Report (Stantec 2017c).
- Hydrology Baseline Technical Data Report (Stantec 2017b).
- Hydrogeology Technical Data Report: Validation Report (Stantec 2020b).
- Hydrology Baseline Technical Data Report: Validation Report (Stantec 2020c).
- Hydrogeology Assessment – Gordon Site Technical Modelling Report (Stantec 2020a)

2.1 Historical Mining Operations

Historical mining operations at the Gordon site consisted of the development of two primary open pits, the Wendy Pit and East Pit (Map 2). The following is a summary of the historical mining operations described by KGS (2014).

The open pits were active between 1996 and 1999 and produced 214,800 oz of gold from 1.7 Mt of ore. The ore was transported to Lynn Lake for processing and smelting. Overburden was placed in two overburden storage areas, one north of the Wendy Pit and one north of the East Pit. Mine rock and low-grade ore not transported to Lynn Lake were placed in two MRSAs, one to the north of Wendy Pit and one to the south of Wendy and East pits. The north MRSA contained mine rock from the East Pit and was not considered potentially acid generating (PAG). Mine rock and low-grade ore from Wendy Pit was placed in the south MRSA. KGS (2014) characterized this material as containing about 10.5% PAG rock.

The historical open pits are located between Gordon and Farley Lakes (Map 3), which were historically connected via Gordon Creek. To allow the development of the open pits, a diversion channel was constructed so that discharge from Gordon Lake was directed through the diversion channel into Farley Lake. The water levels in Gordon and Farley lakes were reduced by 0.9 m because of the diversion channel (KGS 2014). Wendy Pit and East Pit were not connected to the diversion channel; however, KGS (2014) concluded that the East Pit and Farley Lake may be hydraulically connected via a historical buried stream channel.

Dewatering for the Wendy and East pits was conducted through a series of wells located between the open pits. Inflow to the open pits was collected and discharged with water from the dewatering wells to adjacent settling ponds, which were ultimately discharged to the southeast corner of Gordon Lake through a drainage channel.

Operation of the mine ceased in 1999 and a mine closure plan was submitted to the Manitoba Mines Branch and received conditional approval in August 1999. At closure, some of the PAG material was placed into Wendy Pit. The open pits were allowed to fill with water, which reduced the potential for oxidation and generation of acidic conditions from the PAG rock.

Reclamation work was completed in 2007 and consisted of ditching and drainage upgrades, berm repairs, and general fill placement. The mine rock storage areas were sloped to maximize runoff and were covered with 0.3 meters (m) of overburden from the overburden stockpiles and then hydroseeded to increase evapotranspiration and minimize infiltration.

Additional reclamation work was completed in 2012 and included installation of rock riffle control structures at the outlets of Gordon and Farley lakes to maintain water levels at pre-development elevations, repair berms around each of the open pits, removal of buildings, and general site cleanup (KGS 2014).

2.2 Climate

The climate and meteorology of the Gordon site are detailed in the Climate and Meteorology Baseline Technical Data Report (Stantec 2017a). The Lynn Lake area has a climate typical of northern Manitoba. The nearest permanent weather monitoring stations are Environment and Climate Change Canada stations 5061645 and 5061649, located at the Lynn Lake Airport. The climate normal (1981 to 2010) average temperature, precipitation, and snow on ground statistics for the Lynn Lake Airport are summarized in Table 2.1. The climate normals for the period 1991 to 2020 are similar to the values presented in Table 2.1.

Table 2.1 Climate Normal (1981 to 2010) Statistics at Lynn Lake Airport

Month	Average Temperature (°C)	Average Total Precipitation (mm)	Average Total Rainfall (mm)	Average Total Snowfall (cm)
January	-24	20	0.2	28
February	-20	16	0.1	24
March	-13	20	1.4	25
April	-3.1	24	4.5	24
May	5.6	37	27	10
June	13	62	61	1.3
July	16	85	85	0.1
August	15	69	69	0.1
September	7.7	61	57	3.5
October	-0.6	38	12	31
November	-13	27	0.8	36
December	-21	19	0.1	26
Annual	-3.2	478	318	208

The average monthly temperature is normally above freezing from May to September. The annual total precipitation for the region is 478 mm using the 1981 to 2010 climate normal. July typically receives the most monthly precipitation and February the least.

2.3 Physiography and Topography

The Gordon site is surrounded by vegetated land, forest cover, scattered lakes, watercourses, and wetlands and is located within areas of discontinuous permafrost cover.

Regional topography around the Gordon site slopes from a high of 350 m above mean sea level (amsl) in the west and northwest to a low of 320 m amsl in the southeast (Map 4). The ground surface is characterized as hummocky with steeply sloping rocky ridges that may extend 30 m to 60 m above lakes and peat-filled depressions.

2.4 Surface Water Features

The Site is located within the Churchill River watershed. Drainage is generally to the east and southeast via a system of irregular bedrock-controlled stream systems. The landscape is dominated by lakes and rivers. The lakes range in size from less than 100 m length to greater than 2 km length.

Surface water in the study area includes several streams, lakes, wetlands, and peat deposits which generally occupy the topographic lows. Farley Lake and Gordon Lake are fed from surrounding creeks and lakes (Map 4). The historical and proposed open pits are located between Gordon and Farley lakes. To allow the development of the historical East and Wendy open pits, a diversion channel (FAR6) was constructed so that discharge from Gordon was directed through the diversion channel into Farley Lake. Flow in the diversion channel as well as out of Farley Lake has been influenced by beaver activity.

The surface area of Gordon Lake is 190,292 m^2 and the corresponding volume is 260,370 m^3 (Stantec 2020a). The maximum depth of the lake has been measured as 2.8 m, with an average depth of 1.4 m. In 2016, the water level in the lake fluctuated from 315.00 to 315.45 m amsl. The littoral substrate is composed of organics and detritus.

Gordon Lake flows into Farley Lake via the diversion channel. The surface area of Farley Lake is 773,944 m^2 and the corresponding volume is 724,960 m^3 (Stantec 2020a). The maximum depth of the lake has been measured as 10.8 m in the southwest end of the lake adjacent to the historical East pit. The average depth is 0.9 m. In 2016, the water level in the lake fluctuated from 313.35 to 313.88 m amsl. The littoral substrate is composed of sand, silt, organics, detritus, and boulders.

In 2021, a beaver dam that controlled the outflow of Farley Lake broke. Subsequently, the water level of Gordon and Farley lakes decreased, and groundwater discharge was observed along a portion of the southwest shoreline of Farley Lake, adjacent to East Pit.

2.5 Regional Geology

A summary of the regional geology is provided below. Additional information on the regional and local geology is provided in the Hydrogeology Baseline Technical Data Report (Stantec 2017c) and subsequent validation report (Stantec 2020a).

2.5.1 Overburden Geology

The regional surficial geology has been mapped by the Geological Survey of Canada as shown in Map 5 (Kaszycki et al. 2008). During the Late Wisconsinan period, the advance of the Keewatin ice centre (part of the Laurentide Ice Sheet) deposited glacial diamicton (diamicton) derived from the crystalline bedrock of the Canadian Shield. Meltwaters, resulting from the retreat of glacial ice, eroded and cut through the various glacial deposits and resulted in deposition of glaciofluvial sediments that are typically stratified and sorted to varying degrees. As the ice retreated, glacial Lake Agassiz was formed and resulted in the deposition of glaciolacustrine laminated silt and clay.

2.5.2 Bedrock Geology

The bedrock geology of the area has been described in detail by the Manitoba Geological Survey. The Gordon and MacLellan sites are located within part of the Lynn Lake greenstone belt, which is located in the Churchill Structural Province of the Canadian Shield. Map 6 presents the regional bedrock geology. The Lynn Lake greenstone belt is comprised of metamorphosed volcanic rocks of the Wasekwan Group, metamorphosed sedimentary rocks of the Sickle Group, and plutonic intrusions. The Lynn Lake greenstone belt trends west to east and extends 130 km from the La Ronge greenstone belt in Saskatchewan (MEM 1986). Structural processes altered the Lynn Lake greenstone belt into two belts (north belt and south belt), that are separated by felsic intrusions (Beaumont-Smith and Böhm 2003). The north and south belts differ by stratigraphic sequences, chemistry, and structure (MEM 1986).

The Gordon and MacLellan sites are located within the north belt, which is characterized as a north-dipping homocline comprised of rhyolite, overlain by andesite and sedimentary rocks, and an upper unit of basaltic rocks (MEM 1986). The north belt includes the unique stratigraphic sequence known as the Agassiz Metallotect (also termed “Rainbow Trend”) (Map 6), which consists of picritic flows, iron formation, and felsic volcanic rocks. The metallotect hosts the gold deposits of the Gordon and MacLellan sites. South of the sites lies the south belt, which consists of volcanic and sedimentary rocks and the east-west trending structural feature identified as the Johnson Shear Zone (Map 6). In some areas, these weathered shear zones may have been preferentially eroded because of the orientation of the shear zone relative to the direction of ice movement and the competence of the weathered bedrock in the shear zone relative to the surrounding bedrock units (Machibroda Engineering 1988).

The Gordon site has four zones of mineralization including the Wendy, East, Southeast, and the South zone (KGS 2014). The Wendy and East zones have been mined during historical mining activities. Two northwest trending parallel faults extend across the former Gordon pit areas from Gordon Lake in the west to south of Farley Lake in the east and are called the East and Wendy Faults (Map 4) (KGS 2014).

2.6 Hydrostratigraphy

The following hydrostratigraphic units are interpreted within the study area and are incorporated into the conceptual model.

- Historical Mine Rock
- Organics and Fill
- Glaciolacustrine (nearshore and offshore deposits)
- Diamicton
- Bedrock

Cross-sections depicting the geologic interpretation of the hydrostratigraphic units across the study area are shown on Map 7 and Map 8. The cross-section locations are presented on Map 4. Additional description of the hydrostratigraphic units is presented below, including references to monitoring well locations (Map 4), where appropriate.

2.6.1 Historical Mine Rock

Two historical MRSAs are present at the Gordon site, identified on Map 2 as the north rock storage area and south rock storage area. Both historical MRSAs are covered with native soils and contain surplus mine rock from historical mining operations at the Gordon site. Hydraulic testing of the mine rock was not completed due to the expected high hydraulic conductivity values and because the mine rock is stored on original ground surface, above the water table. Typical testing methods are difficult to perform under these conditions. Based on the grain size and material descriptions, hydraulic conductivity values for historical mine rock were estimated to vary between 1×10^{-3} and 1×10^{-2} meters per second (m/s) (Fetter 2000).

2.6.2 Organics and Fill

Organic deposits in the form of fibric peat and topsoil were observed at ground surface throughout the study area. Fibric peat is the least decomposed type of peat and generally consists of greater than 30% organic material or greater than 17% organic carbon. Topsoil was observed in upland portions of the landscape and was characterized as mineral soil with minor enrichment of organic material. Typical thicknesses were less than 1 m, but accumulations of up to approximately 3 m were observed in low lying areas such as at monitoring well GBHF-06 (Map 4). Organic deposits were found underlying surficial fill in boreholes completed along the access road.

Hydraulic testing of the organic deposits was not completed due to their shallow nature and thickness. Hydraulic conductivity values from literature cover a wide range and are dependent on the texture of the sediments composing the organic deposit. Based on the geology and material descriptions, hydraulic conductivity values for organic deposits were assumed to vary between 1×10^{-8} and 1×10^{-5} m/s (Fetter 2000).

2.6.3 Glaciolacustrine Deposits

Glaciolacustrine deposits were observed across the study area at either ground surface or underlying organic deposits. The glaciolacustrine deposits were discontinuous (Map 5, Map 7, and Map 8). The glaciolacustrine deposits consisted of nearshore coarse-grained deposits and offshore fine-grained deposits. Nearshore and offshore deposits were generally observed to grade laterally between the two units; however, in some areas the units were interlayered (Map 7 and Map 8). The lateral variations in thickness are interpreted to reflect changes to the water level of former glacial Lake Agassiz.

Both nearshore and offshore deposits were observed in areas south of the open pit, including at monitoring wells GBHF-13 and MWF-04 (Map 4). When both deposits were present, the offshore deposits overlaid the nearshore deposits; when only one deposit was observed at a borehole, it was typically the nearshore deposits.

2.6.3.1 Glaciolacustrine Offshore

Offshore glaciolacustrine deposits are described as sandy clayey silt to clay and range in thickness from 0.8 m at monitoring well GBHF-13 to 6.2 m at monitoring well GBHF-05 when present. In the area of the proposed open pit, glaciolacustrine offshore deposits were predominant and range in thickness from 0.46 m at monitoring well GBHF-02 to 6.2 m at monitoring well GBHF-05.

Hydraulic conductivity estimates from slug tests conducted in the glaciolacustrine offshore deposits range from 6×10^{-7} to 1×10^{-6} m/s.

2.6.3.2 Glaciolacustrine Nearshore

The nearshore deposits are described as loose, fine to coarse grained sand to silty sand and gravel and range in thickness from 1.1 m at monitoring well MWF-06 to 9.6 m at monitoring well MWF-02 when present. Nearshore deposits of silty sand were observed in boreholes located along the eastern edge of the proposed open pit associated with monitoring wells GBHF-03, GBHF-04, GBHF-06, GPW-01, and GPW-02 ranging in thickness from 0.6 m to 4.5 m.

Hydraulic conductivity estimates from slug tests conducted in the glaciolacustrine deposits range from 3×10^{-7} to 1×10^{-4} m/s.

2.6.4 Sand Diamicton

Sand diamicton was frequently observed throughout the Gordon site. Despite the frequency of encountering the sand diamicton, the unit was interpreted as discontinuous, having been eroded by meltwaters associated with the retreat of glacial ice (Map 7 and Map 8). When present, sand diamicton overlaid bedrock and was overlain by glaciolacustrine or organic deposits. The sand diamicton was generally observed south and east of the proposed open pit but thinned in the topographic and bedrock high located south of the Wendy and East pits. Sand diamicton was comprised of very dense sand to silty sand with trace to some gravel and at times contained trace cobbles and boulders. The thickness of the sand diamicton generally ranged from less than 1 m to approximately 4 m.

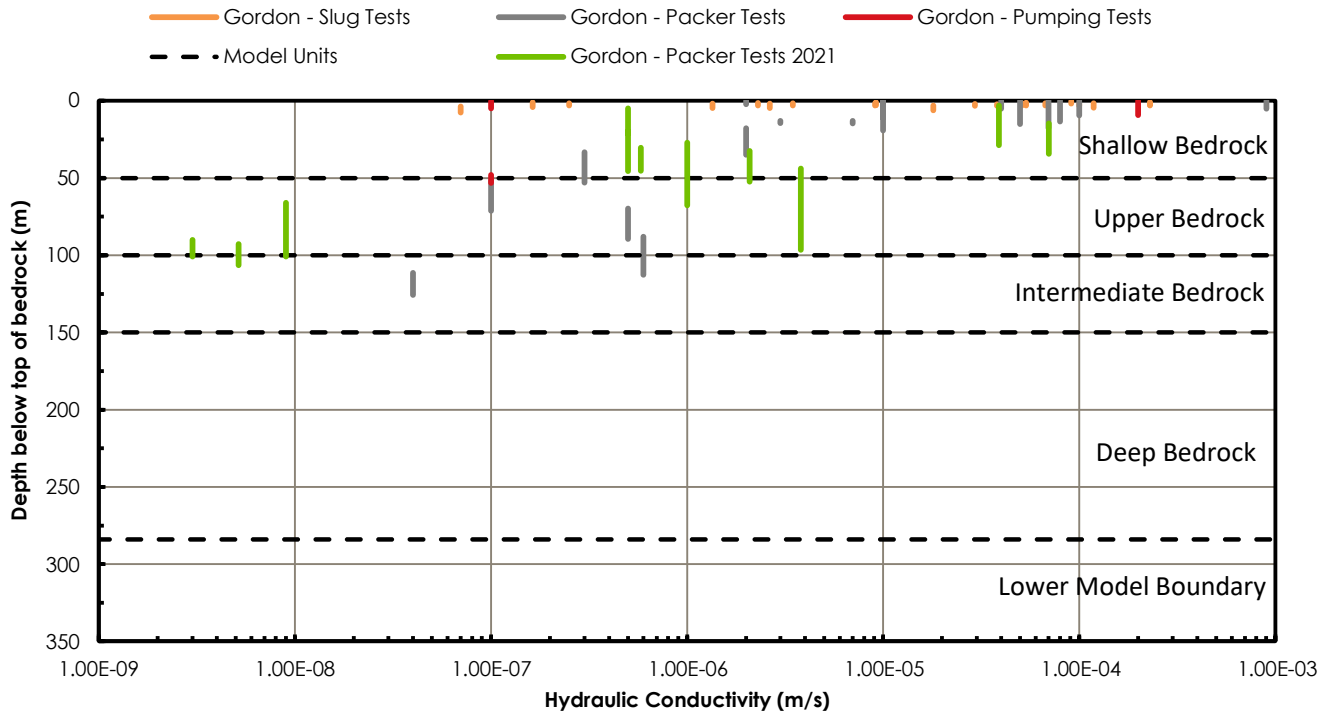
Hydraulic conductivity estimates from slug tests conducted in the sand diamicton deposits range from 2×10^{-7} to 3×10^{-5} m/s.

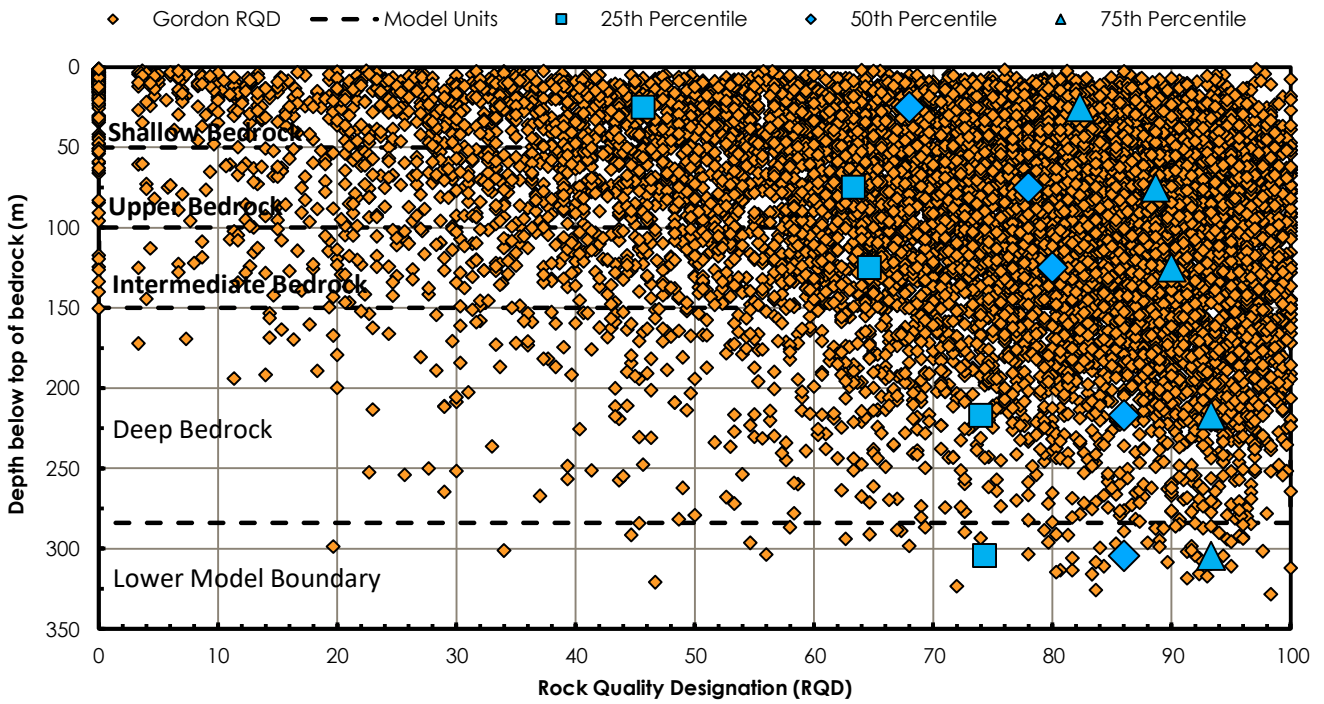
2.6.5 Bedrock

Bedrock was defined as a continuous unit throughout the study area. The top of bedrock surface described in Stantec (2017c) was interpreted from the boreholes and test pits installed at the Gordon site, including boreholes drilled for exploration and condemnation purposes. The bedrock topography was interpreted to follow a similar trend to ground surface topography, with a topographic high associated with the area south of the Wendy and East pits (monitoring well GBHF-13), which steeply slopes to the south towards Susan Lake (monitoring well MWF-04) and gradually slopes to the north toward the Wendy and East pits. Bedrock was observed near surface (less than 1 m below ground surface [bgs]) in areas associated with topographic highs and between 1 and 10 m bgs in areas associated with topographic lows. Local bedrock lows were observed at monitoring wells GBHF-12 and GBHF-09 (Map 4). These bedrock lows were interpreted to be local in extent. Across the Gordon site, the top of bedrock was encountered at elevations ranging from 298 m amsl at monitoring well GBHF-27 to 342 m amsl at monitoring well GBHF-13, with a relief of 44 m.

The hydraulic conductivity of the bedrock decreases with depth, with the upper portions being the most transmissive due to increased weathering and/or fracturing. Since Stantec (2017c) and Stantec (2020a), additional packer testing was completed in 2021 and two pumping tests were completed in 2022 (Stantec 2022). The results of the 2021 and 2022 hydraulic testing are incorporated into this description of bedrock hydrostratigraphy. The additional hydraulic conductivity estimates confirm the trend of decreasing hydraulic conductivity with depth below top of bedrock.

The bedrock was subdivided into four hydrostratigraphic units based on transmissivity data collected from hydraulic testing conducted in the study area (Stantec 2017c). These units include the shallow bedrock, upper bedrock, intermediate bedrock, and deep bedrock units. A comparison of the measured hydraulic conductivity in the bedrock for each of the hydrostratigraphic units is presented on Figure 2-1. The hydraulic conductivity was observed to be variable across each hydrostratigraphic unit, as described below.





Notes:

Pumping test represents fractured interval of borehole

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Title

Horizontal Hydraulic Conductivity and RQD with Depth

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2.6.5.1 Shallow Bedrock

The shallow bedrock unit consists of a zone of weathered and fractured bedrock underlying overburden deposits or exposed at ground surface. The shallow bedrock is estimated to be approximately 50 m thick, with hydraulic conductivity estimates ranging from 7×10^{-8} to 9×10^{-4} m/s (Figure 2-1).

Two northwest trending parallel faults, the East and Wendy fault, extend across the study area and intersect the historical East and Wendy open pits (Map 4). The hydraulic conductivity of shallow bedrock estimated from in situ hydraulic testing and pumping tests in the area of the East and Wendy Fault and historical East and Wendy open pits are assumed to be reflective of a zone of higher hydraulic conductivity associated with historical blasting and the presence of the fault zones. The interpreted faulted shallow bedrock zone relative to shallow bedrock is illustrated on Map 9.

Hydraulic conductivity estimates in the faulted shallow bedrock zone were estimated to be at the higher end of the estimates of hydraulic conductivity of the shallow bedrock. In 2021, two 72-hour pumping tests of the faulted shallow bedrock zone were completed. On the Farley Lake side of the East pit, the transmissivity of shallow bedrock was estimated at 125 m^2/d, with storativity of approximately $4x10^{-3}$ m/m. Assuming the active flow zone of bedrock is the upper 50 m, a hydraulic conductivity of $3x10^{-5}$ m/s was estimated. The radius of influence (drawdown > 1 m) resulting from 72 hours of pumping is estimated to be approximately 130 m. On the Gordon Lake side of the Wendy pit, the transmissivity of shallow bedrock was estimated at 60 m^2/d, with storativity of approximately $1x10^{-2}$ m/m. Assuming the active flow zone of bedrock is the upper 50 m, a hydraulic conductivity of $1x10^{-5}$ m/s was estimated. The radius of influence (drawdown > 1 m) resulting from 72 hours of pumping is estimated to be approximately 110 m.

In comparison, hydraulic conductivity of shallow bedrock outside the interpreted faulted bedrock zone ranged from $2x10^{-7}$ to $2x10^{-4}$ m/s with a geometric mean of $7x10^{-6}$ m/s. The hydraulic conductivity data with depth were consistent with the rock quality designation (RQD) data, which suggests the upper 50 m of bedrock had a lower RQD (i.e., less competent rock) and higher hydraulic conductivity than the RQD of bedrock greater than 50 m depth (Figure 2-1).

2.6.5.2 Upper Bedrock

The upper bedrock unit underlies the shallow bedrock unit and is estimated to be 50 m thick. The hydraulic conductivity for the upper bedrock is estimated to range from 3×10^{-9} to 4×10^{-6} m/s (Figure 2-1).

2.6.5.3 Intermediate Bedrock

The intermediate bedrock unit underlies the upper bedrock and is estimated to be 50 m thick. The hydraulic conductivity for the intermediate bedrock is estimated to range from 3×10^{-9} to 6×10^{-7} m/s (Figure 2-1)

2.6.5.4 Deep Bedrock

The deep bedrock unit is the deepest bedrock unit and is interpreted to be relatively impermeable, although discrete fractures may occur that locally increase the hydraulic conductivity. Figure 2-1 presents RQD with depth below top of bedrock and indicates that RQD increases with depth in the bedrock. RQD and hydraulic conductivity are generally correlated because competent rock with few fractures (i.e., a high RQD) is commonly associated with a lower hydraulic conductivity. The hydraulic conductivity of this unit is estimated to range from less than 3×10^{-9} m/s (based on the hydraulic conductivity of bedrock with limited to no interconnected fractures) to 6×10^{-7} m/s (where fractures are present).

2.7 Groundwater Levels and Flow

Groundwater level data across the study area and used for this GMR were measured from August 2015 to June 2021. As discussed in Section 2.4, a beaver dam which controlled the outflow from Farley Lake broke in 2021. Consequently, data measured after the dam break were not used for model calibration. This section presents a summary and interpretation of this dataset. Construction details for the monitoring wells and associated groundwater hydrographs are presented in Appendix B.

The average groundwater level in the area ranges from 313 m to 327 m amsl with generally lower water levels at lower topographic elevations and higher water levels at higher topographic elevations. The groundwater level in the vicinity of the pit is 313 m to 316 m amsl, whereas in the vicinity of the MRSA is 324 m to 327 m amsl. Groundwater generally flows from topographic highs and discharges to streams and lakes at lower elevations.

There is generally a water level response to precipitation events in wells completed in shallow bedrock and overburden. The similar water level responses at nested well pairs suggests that the overburden and shallow bedrock are hydraulically connected. The hydrographs also show that groundwater levels tend to peak in the summer or fall and decrease in the winter and spring. The magnitude of groundwater fluctuations from precipitation events and temporal trends ranges from approximately 0.5 to 2.5 m

In 2021, a beaver dam that controlled the outflow of Farley Lake broke. Subsequently, the water level of Gordon and Farley lakes decreased, and groundwater discharge was visually observed along a portion of the southwest shoreline of Farley Lake, adjacent to East Pit. Consequently, groundwater level data beyond December 2020 were not used for groundwater flow model calibration.

3 Description of Numerical Model

The numerical model code, domain, grid discretization, model boundaries, and simulation of hydrogeologic features are presented in this section.

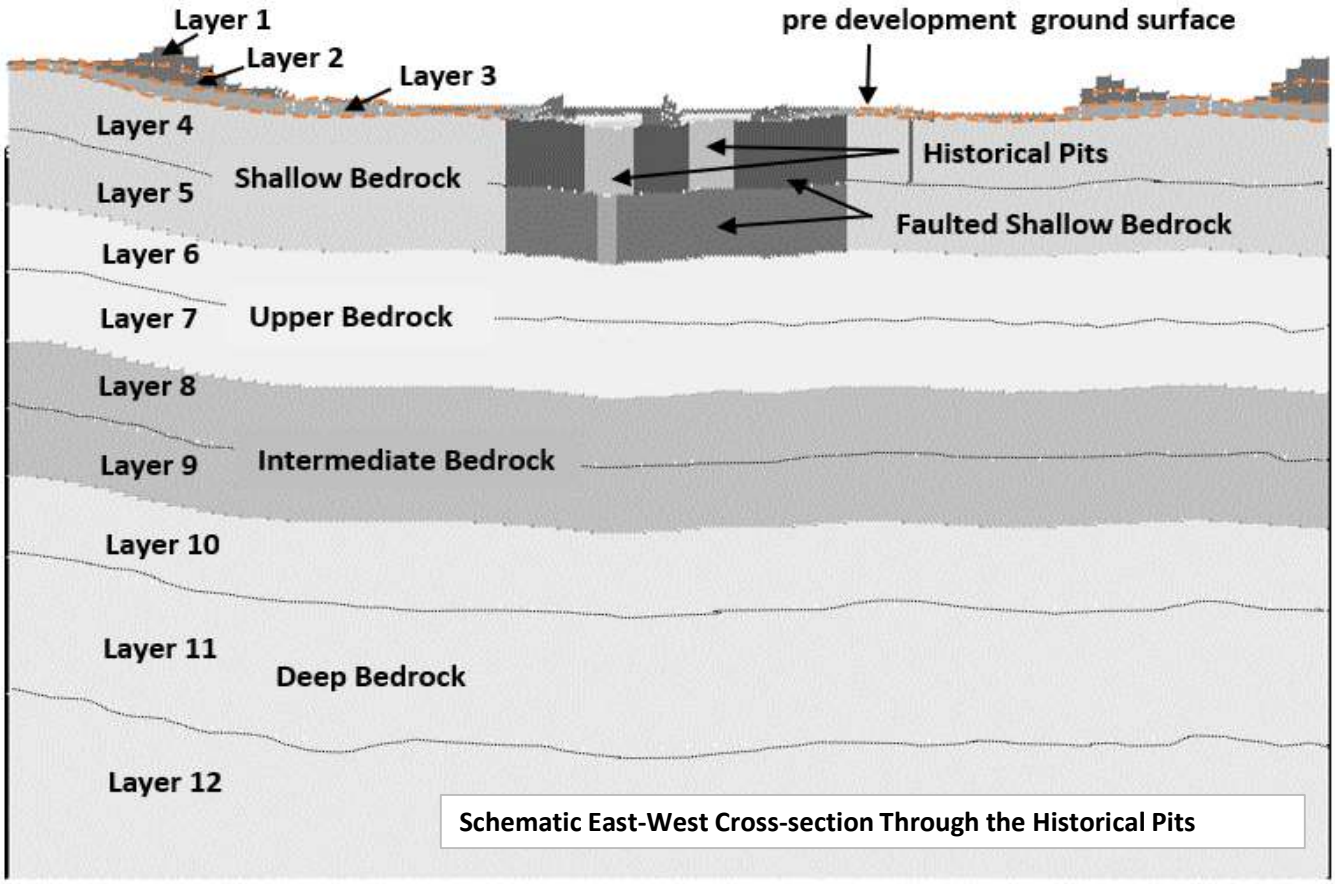
3.1 Model Code

The groundwater numerical models were developed using the three-dimensional finite difference groundwater flow computer code MODFLOW, MODFLOW-NWT, and MODFLOW-SURFACT in Groundwater Vistas Version 8 (Rumbaugh and Rumbaugh 2020). Groundwater Vistas is a pre-and post-processing software and was used to create standard format MODFLOW, MODFLOW-NWT, and MODFLOW-SURFACT files from graphical input data. The steady state and transient models used MODFLOW, the pumping test model used MODFLOW-SURFACT, while the predictive models used MODFLOW-SURFACT for models that simulate freezing of the open pit walls or MODFLOW-NWT for models that did not simulate freezing of the open pit walls. The packages used in the models include General Head Boundary (GHB), River, Recharge, Drain, Well, Multi-Node Well, Adaptive Time-Stepping and Output Control, and Time-Varying Material Property.

Model output was evaluated using Groundwater Vistas, ArcMap 10.6.1, and Microsoft Office programs.

3.2 Model Domain and Discretization

The same model domain used in the previous model (Stantec 2020a) was used in the current model. The model domain corresponds to natural hydrogeologic boundaries and beyond the area where potential effects from the model predictions may impact model boundaries. The model domain is approximately 33.14 km^2 in area (Map 10). The model was discretized into 12 model layers (Figure 3-1). The maximum elevation in the model is 360 m amsl, while the bottom of the model was assigned as 30 m amsl. As will be described in Section 5, the bottom of the open pit is expected to reach 116 m amsl. The thickness of layers 10 and 11 were assigned so the majority of the open pit is within layer 10 and above; a small portion of the open pit is within layer 11. The top of layer 11 at the deepest portion of the open pit ranges from 125 to 130 m amsl. Layer 11 is 50 m thick, consequently the bottom of layer 11 ranges from 75 to 80 m amsl while the bottom of the open pit is expected to reach 116 m amsl. Layer 12 is completely below the open pit and ranges from 35 to 40 m thick beneath the deepest portion of the pit. The approximate relationship of hydrostratigraphic units to model layers is presented in Figure 3-1.



Schematic East-West Cross-section Through the Historical Pits

Model Layer Hydrostratigraphic Unit Average Thickness (m)

1 2 3	Waste Rock Organics and Fill Glaciolacustrine Sand Diamicton	3.2 1.8 3.4
4 5	Shallow Bedrock	50
6 7	Upper Bedrock	50
8 9	Intermediate Bedrock	50
10 11 12	Deep Bedrock	30 50 54

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Title **Model Layers and Hydrostratigraphy**

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The model grid is coarser around the limits of the domain and grades to finer cells in the vicinity of the surface water features and the area of the proposed open pit (Map 10). The grid is composed of 570,228 active cells.

A geological model of hydrostratigraphic units described in Section 2.6 was constructed in Leapfrog Hydro ® software and the conceptual geological model grid was then saved in MODFLOW software format for direct transfer to the MODFLOW groundwater model. Where hydrostratigraphic units were observed to be discontinuous across the study area and “pinch out”, the model layer was assigned a minimum thickness of 1 m and the hydraulic properties of the underlying hydrostratigraphic unit were assigned.

An equivalent porous media (EPM) approach was selected to simulate the flow within the overburden and underlying bedrock. The EPM approach assumes that groundwater flow through fractured bedrock can be approximated by a porous medium with equivalent hydrogeologic properties of the bulk of the rock. The water level data within the shallow bedrock monitoring wells indicates a similar hydraulic response to the overburden system, indicating a high degree of connectivity. Cook (2003) demonstrates regional connectivity occurs within the shallow bedrock zone and decreases with depth due to a decrease in fracture frequency and permeability. Groundwater flow in the bedrock is therefore expected to occur dominantly through the upper portions of this shallow bedrock unit.

As shown in Section 2.6.5, the permeability and RQD of the bedrock decreases with increasing depth, due to more discrete fracturing of the bedrock. At the regional scale, the EPM approach remains appropriate for predicting the effective groundwater discharge rates from the deeper bedrock into the open pit but reduces the reliability of predicted travel times through discrete fractures (Wels et al. 2012). Travel times through the discrete fractures using the EPM approach could be under-predicted (due to lower effective fracture porosities in the bedrock) or over-predicted, if there is poor connectivity of fractures at depth. This is appropriate based on the regional scale of the modelling and considering that, based on measured hydraulic conductivity and RQD, flow was predicted to occur primarily through the shallow weathered bedrock.

3.3 Boundary Conditions

The model limits were assigned based on local watershed boundaries but were extended into neighboring watersheds based on anticipated effects from the presence of the open pit. In each case, the model was extended to natural hydrologic/hydrogeologic boundaries, including watershed boundaries (assumed to be coincident with groundwater flow divides) or surface water features (also assumed to be coincident with groundwater flow divides). The model domain and boundary conditions are presented on (Map 10).

3.3.1 No Flow Boundaries

No flow boundaries are used to simulate impermeable boundaries, groundwater divides, or streamlines. Along the model domain, no-flow boundaries occur by default when a boundary condition (e.g., a river or lake) is not defined. The no flow boundaries correspond with the model domain limits, except where a general head boundary or river boundary condition was assigned as presented in Map 10.

3.3.2 General Head Boundary

General head boundary (GHB) is a generic form of the head-dependent boundary condition (Rumbaugh and Rumbaugh 2020). Lakes were simulated as GHBs in the model. This type of boundary condition calculates the flow rate between the boundary condition and the aquifer based on the head assigned to the boundary condition. The depth of the lakes was estimated using available bathymetric data collected at the lakes and the reference head for each cell was estimated from the digital elevation model or measured water levels where available. The interaction between the surface water in the lakes and the groundwater in the underlying aquifers is defined by a “conductance” term. This term represents the presence of a layer of sediment on the lakebed that can affect the rate of water transferred between the lake and the underlying model layer. A review of sediment analyses from lakes and watercourses showed that the sediments are generally fine-grained (Stantec 2017b), and the initial conductance term was assigned to the model based on an assumed hydraulic conductivity of 1×10^{-7} m/s. The hydraulic conductivity of lakebed materials was used as a calibration parameter.

3.3.3 River Boundary

Watercourses were simulated as river boundaries. The river boundary is a head-dependent boundary condition which allows water to enter or exit the model cell based on the hydraulic head of the aquifer compared to the river stage (water level in the river). The river package requires inputs for the length, width, stage, and bottom of the river as well as the thickness and hydraulic conductivity of the riverbed to calculate the interaction between groundwater and surface water in the rivers. River widths were estimated to range from 0.46 m to 6 m based on field measurements and estimated from aerial photographs. Generally, rivers were wider in the lowlands with smaller widths estimated in the upper parts of the basins. River depths are based on field observations of stream depths during average summer conditions. The initial hydraulic conductivity of the riverbed material was assigned similar to lakebed material and was used as a calibration parameter. River stage was assigned based on water levels in the lakes to maintain water flow in the correct direction while river depths were estimated from field measurements. The rivers were divided into segments based on river width, stage, and depth.

3.3.4 Recharge

Precipitation is the primary source for groundwater recharge. Publicly available precipitation data from Environment and Climate Change Canada weather monitoring stations 5061645 and 5061649, located at the Lynn Lake Airport were used to assign recharge. A uniform recharge rate was applied to the uppermost active layer of the model domain in the steady state model. The groundwater recharge rate was adjusted during the model calibration process. Recharge applied represents average conditions based on recent measured precipitation (Section 2.2).

3.4 Hydrogeologic Properties

Hydrogeologic properties were assigned in the model based on the hydrostratigraphic units as described in Section 2.6. However, due to discontinuity in the glaciolacustrine offshore and nearshore deposits, the two units were combined in the groundwater model. This section describes the simulated aquifer properties including hydraulic conductivity, specific yield, and specific storage.

3.4.1 Hydraulic Conductivity

The initial hydraulic conductivity values assigned in the model were the geometric means from aquifer testing performed at the site (Stantec 2022) or standard values based on hydrostratigraphic unit as discussed in Section 2.6. The initial hydraulic conductivity values were adjusted during the calibration process for both steady-state and transient conditions (Sections 4.1 and 4.1.4).

The final horizontal hydraulic conductivity values are presented in Table 4.1 for each hydrostratigraphic unit. Anisotropy assigned for each hydrostratigraphic unit (based on literature values) is also presented in Table 4.1; anisotropy is presented as the ratio of horizontal hydraulic conductivity to vertical hydraulic conductivity.

3.4.2 Specific Storage and Specific Yield

Initial estimated specific yield for lithologic units ranged from 0.01 to 0.3 (dimensionless) for overburden units and 0.0001 to 0.001 for bedrock while specific storage for lithologic units in the study area ranged from $2x10^{-7}$ to $2x10^{-4}$ 1/m (Table 4.1). The specific storage and specific yield values initially assigned to the model were adjusted during the transient model calibration process (Section 4.1.4). The final storage values are presented in Table 4.1 for each hydrostratigraphic unit.

4 Model Calibration

The main objective of model calibration is to better simulate observed hydrogeologic conditions. The process of calibration involves adjusting aquifer properties and boundary conditions to improve simulation of observed conditions and reduce model error (difference between observed and simulated conditions). Model calibration was completed using an iterative approach for steady-state and transient conditions. This involved a process where a flow simulation was completed, the resulting groundwater levels and baseflow rates to watercourses were compared to measured values, and the model input parameters were adjusted to achieve better agreement with observed (field measured) conditions. A hybrid calibration approach was used that combined automated parameter estimation, facilitated using the Model-Independent Parameter Estimation and Uncertainty Analysis software package PEST (Doherty 2004) together with professional judgement and interpretation of the calibration results.

Generally, the transient calibrations using pumping test data were emphasized compared to the steady state calibration given the models will be used to assess impacts from pumping for mining operations. The calibrated model parameters are presented in Table 4.1 and a description of the steady-state and transient model calibration as well as sensitivity of the model calibration is presented in the following sections. The calibrated hydraulic conductivity and storage for the various hydrostratigraphic units are within the ranges expected for the materials based on measured and literature values (Fetter 2000; Schwartz and Zhang 2002), as the range was used to set upper and lower bounds as part of the calibration process.

Table 4.1 Calibrated Model Parameters

Hydrostratigraphic Unit	Horizontal Hydraulic Conductivity (m/s)	Anisotropy (-)	Specific Yield (-)	Specific Storage (1/m)
Mine Rock				n/a
Calibrated Value	1×10^{-3}	1	0.1	
Expected Range	1×10^{-3} to 1×10^{-2}	1 to 5	0.01 to 0.3	
Organics and Fill				n/a
Calibrated Value	1.4×10^{-6}	10	0.3	
Expected Range	1×10^{-8} to 1×10^{-5}	1 to 100	0.01 to 0.3	
Glaciolacustrine				n/a
Calibrated Value	4.4×10^{-5}	10	0.16	
Expected Range	3×10^{-7} to 1×10^{-4}	1 to 100	0.01 to 0.3	
Sand Diamicton				n/a
Calibrated Value	2.7×10^{-5}	1	0.015	
Expected Range	2×10^{-7} to 3×10^{-5}	1 to 50	0.01 to 0.3	

Hydrostratigraphic Unit	Horizontal Hydraulic Conductivity (m/s)	Anisotropy (-)	Specific Yield (-)	Specific Storage (1/m)
Shallow Bedrock				
Calibrated Value	1.5×10^{-7}	1.2	0.0003	6.8×10^{-4}
Expected Range	7×10^{-8} to 9×10^{-4}	1 to 100	0.0001 to 0.3	2×10^{-7} to 2×10^{-4}
Faulted Shallow BR				
Calibrated Value	2.3×10^{-5}	1.2	0.06	1.5×10^{-4} to 5.6×10^{-4}
Expected Range	7×10^{-8} to 9×10^{-4}	1 to 100	0.0001 to 0.3	2×10^{-7} to 2×10^{-4}
Upper Bedrock				
Calibrated Value	1×10^{-7}	10	0.0001	6.6×10^{-6}
Expected Range	3×10^{-9} to 4×10^{-6}	1 to 100	0.0001 to 0.001	2×10^{-7} to 2×10^{-5}
Intermediate Bedrock				
Calibrated Value	8.9×10^{-8}	10	0.0001	6.6×10^{-6}
Expected Range	3×10^{-9} to 6×10^{-7}	1 to 100	0.0001 to 0.001	2×10^{-7} to 2×10^{-5}
Deep bedrock				
Calibrated Value	7×10^{-8}	10	0.0001	6.6×10^{-6}
Expected Range	9×10^{-9} to 6×10^{-7}	1 to 100	0.0001 to 0.001	2×10^{-7} to 2×10^{-5}

4.1 Steady-State Model Calibration

Based on minimal changes to the hydrogeologic and hydrologic systems in the recent past, current conditions in the study area were assumed to generally represent steady-state conditions. Parameter values were adjusted across typical observed ranges to better simulate heads and flows in comparison with observed head and flow conditions throughout the steady-state calibration process

4.1.1 Steady-State Model Observation Targets

Groundwater elevation data measured from 31 observation wells were used as calibration targets for groundwater levels/pressure heads. Map 11 presents the location of calibration targets.

The average annual water level at each location was calculated as well as the average monthly water level for the period from 2015 through December 2020. Table 4.2 presents the average annual water level for each target as well as the simulated water level for the final calibrated model for steady state conditions.

Table 4.2 Steady State Model Hydraulic Head Calibration Targets and Residuals

Monitoring Location	Weighting Factor	Observed Head (m amsl)	Simulated Head (m amsl)	Weighted Residual (m)
MWF-02B	1	317.35	318.42	-1.07
GBHF-01B	1	314.81	314.98	-0.16
GBHF-04B	1	314.70	314.58	0.12
GBHF-16-02B	0.95	313.51	313.86	-0.34
MWF-03B	1	325.44	324.59	0.85
GBHF-05B	1	314.67	314.87	-0.20
GBHF-16-01B	0.95	312.52	314.98	-2.33
MWF-04B	1	313.72	312.12	1.60
GBHF-07B	1	317.88	319.29	-1.41
GBHF-09B	1	317.07	317.63	-0.55
GBHF-10B	0.1	326.70	323.57	0.31
GBHF-12B	1	323.98	324.36	-0.37
GBHF-01A	1	314.92	314.98	-0.06
GBHF-02A	1	315.58	314.13	1.45
GBHF-03	1	314.05	313.91	0.14
GBHF-04A	1	314.52	314.58	-0.06
GBHF-05A	1	314.71	314.87	-0.15
GBHF-07A	0.95	317.83	319.32	-1.41
GBHF-09A	1	317.24	317.68	-0.44
GBHF-10A	1	325.97	323.41	2.56
GBHF-12A	1	324.15	324.34	-0.19
GBHF-16-01A	1	312.50	314.98	-2.48
GBHF-16-02A	0.95	312.87	313.87	-0.95
MWF-01A	0.95	321.52	321.50	0.02
MWF-02A	1	317.65	318.46	-0.81
MWF-03A	1	325.44	324.63	0.81
MWF-04A	1	313.94	312.53	1.41
GPT21-02-50	0.5	315.59	314.84	0.37
GPT21-03-50	0.5	313.50	313.89	-0.20
GPT21-02-95	0.5	315.93	316.41	-0.24
GPT21-03-95	0.5	315.91	314.84	0.54

Weights were assigned based on the period of record at each location and the range in measurements. Assigned weights ranged from 0.1 to 1 and are listed in Table 4.2.

The water level calibration targets were assigned a weight of 1 except the following:

- The groundwater level target at GBHF-10B was assigned a weight of 0.1 because the groundwater levels were measured manually and consisted of only eight measurements.
- The groundwater level targets at GPT21-02-50, GPT21-03-50, GPT21-02-95, and GPT21-03-95 were assigned a weight of 0.5 because the periods of record were 14 to 15 months compared to 5 to 6 years for the remainder of the wells.
- The groundwater level targets at GBHF-07A, GBHF-16-01B, GBHF-16-02A, GBHF-16-02B, and MWF-01A were assigned a weight of 0.95 because the periods of record were less than 4 years compared to 5 to 6 years for the remainder of the wells.

The steady-state model calibration also included a baseflow target for a surface water monitoring location at the outlet of Farley Lake (QF05, Map 11). Streamflow was estimated from water level data and flow measurements completed between 2015 and 2016. The average annual streamflow rate at the outlet of Farley Lake is estimated to be approximately 0.06 cubic meters per second (m^3/s).

Baseflow to surface water features is provided primarily by groundwater discharge. However, a portion of the baseflow can also be attributed to the delayed drainage of precipitation storage in lakes and wetlands. This delayed release of surface water storage can be difficult to distinguish from groundwater contributions to baseflow. Therefore, the baseflow targets estimated from surface water hydrographs include both components. For calibration, baseflow to Farley Lake was estimated to range from 25 percent of the average annual streamflow rate to the minimum streamflow rate measured at QF05 when flow occurred (i.e., not frozen). Consequently, the range of baseflow is estimated from 0.008 to 0.015 m^3/s and was the range targeted for model calibration.

4.1.2 Statistical Methods to Evaluate the Steady-State Model Calibration

The purpose of the steady-state model is to establish baseline hydrogeologic conditions within the study area with an emphasis near the mine infrastructure. Parameter values such as recharge, lakebed and riverbed conductance, and hydraulic conductivity were adjusted to improve model calibration. The steady-state model was calibrated using a combination of manual and automated calibration methods. Automated calibration methods utilized the software package PEST, which adjusts model parameters using a weighted least square method (Doherty 2004). PEST utilizes the Gauss Levenberg Marquardt algorithm which optimizes the model parameters to improve the fit to observed targets and objectives (Doherty 2004).

$$\Phi = \sum_{i}^{m} (w_i r_i)^2$$

Where w_i is a weighting term applied to the measurement and r_i is the difference (residual) between the observation target and the model simulated outcome (Doherty 2004).

As a measure of calibration, plotting observed heads (average annual water level) versus simulated heads provides a visual assessment of how closely the model simulated observed conditions. Each point on a graph represents the observed head and the simulated (calculated) head at the same location. If there was no difference between observed heads and simulated heads, each point would align along a line with a 1:1 slope. The further away a point is from the line, the greater the residual at that location. Plotting measured groundwater levels versus the residual head is another visual method for understanding the behavior of the model. If there is no difference between observed and simulated water levels, the points would plot along the zero line. Points above the zero line indicate simulated heads were less than observed, while points below the zero line indicate simulated heads were greater than observed heads. In addition to these graphs, statistical methods of evaluating observed versus computed hydraulic heads were used to evaluate the quality of calibration. These analyses included mean error (ME), mean absolute error (MAE), and root mean square error (RMS). The ME was calculated as follows:

$$ME = \frac{1}{n}\sum_{i=1}^{n} w_i(h_m - h_s)_i$$

Where n equals the number of targets, h_m is the measured (observed) head, and h_s is the simulated head. The mean error calculation provides a comparison of measured and simulated heads by computing the difference. A limitation of this method is caused by sign cancellation. An example of sign cancellation would be when the difference between the measured and simulated value is a positive 30 m at one location and negative 30 m at another location. The average difference between these two wells is zero, which would be misleading, as there appears to be no error in the simulated heads.

The MAE calculation eliminates the problem of sign cancellation by using the average of the absolute value of the differences in heads:

$$MAE = \frac{\sum_{i=1}^{n} w_i|h_m - h_s|_i}{n}$$

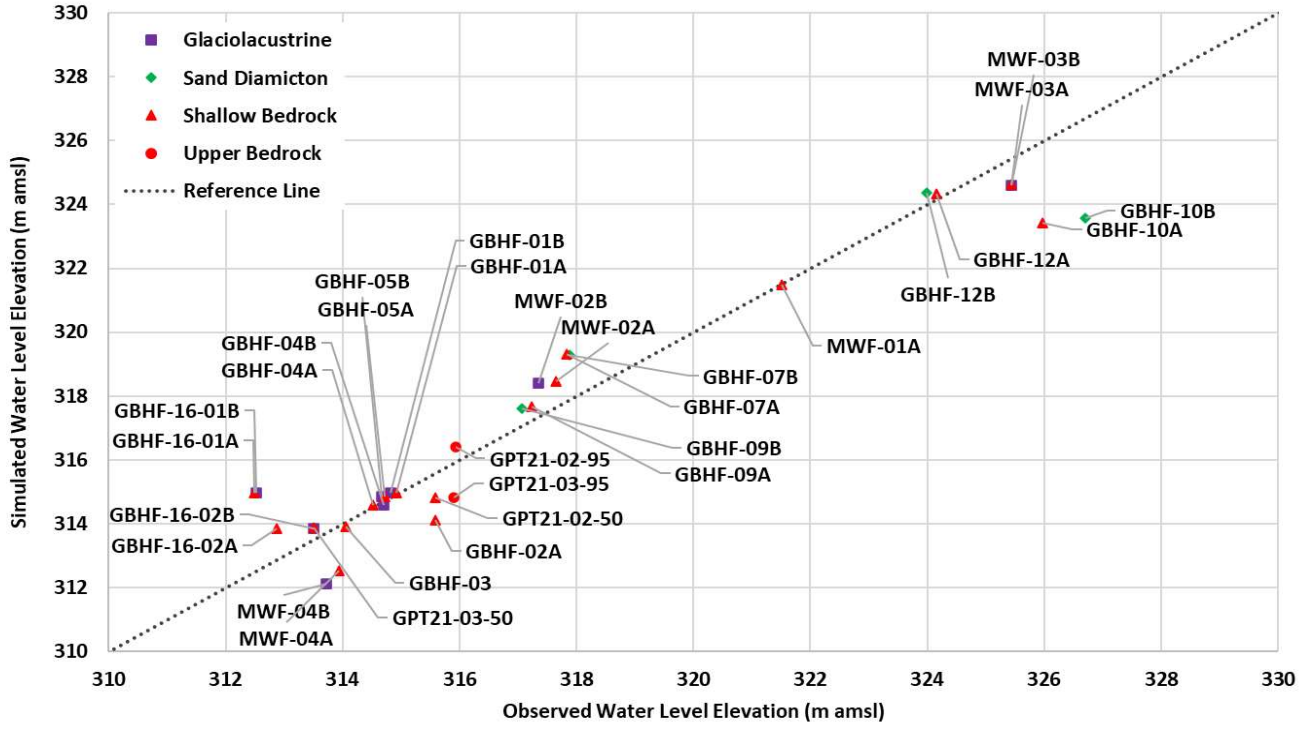
The RMS error, or the standard deviation, is the average of the squared differences in heads:

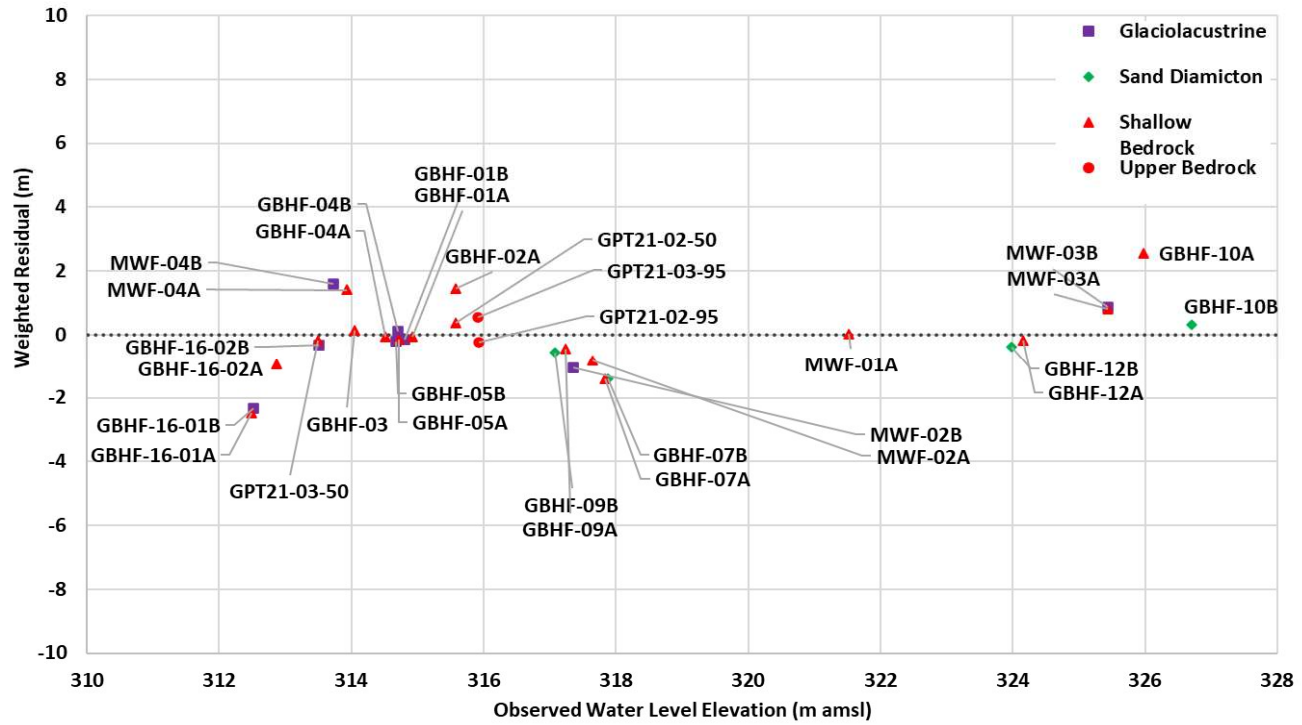
$$RMS = \sqrt{\frac{1}{n}\sum_{i=1}^{n}[w_i(h_m - h_s)_i]^2}$$

The RMS error tends to heavily weight the outlying points in the calculation. This occurs because of the squaring of the differences. When most of the differences are small, with few large differences, the error emphasizes the few rather than the many.

4.1.3 Results of Steady-State Calibration

The plot of observed head versus simulated head for the steady state model calibration and a graphical representation of residual errors are presented on Figure 4-1. The simulated water table contours and representative observed head values are presented on Map 12 and the weighted residual errors are presented on Map 13.





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Steady State Calibration Targets and Weighted Residuals

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The calibration statistics for the steady-state model are provided in Table 4.3. The steady-state model simulated an acceptable fit to observed heads with a scaled MAE of 5.4 percent and scaled RMS error of 7.4 percent.

In evaluating the fit between the observed and the simulated water levels, the RMS error is usually regarded as the best measure (Anderson and Woessner 1991). If the ratio of the RMS error to the total water level differential (i.e., the scaled RMS error) over the model area is small (e.g., less than 10%; Wels et al. 2012 and Spitz and Moreno 1996), then the errors are only a small part of the overall hydraulic response of the model. The British Columbia Ministry of Environment guidance for groundwater modelling (Wels et al. 2012) states, “Generally, NRMSE (aka scaled RMS error) under 10 percent is good in many models, and under 5% is very good in terms of average residual fit.” In this simulation, the ratio of the RMS error to the total water level differential (7.4%) is less than the recommended 10% threshold. No systematic bias was observed in the residuals considering hydrostratigraphic units or proximity to boundary conditions.

Map 12 shows the simulated potentiometric surface from the calibrated steady state model compared to a snapshot of measured groundwater levels in 2018. The model provides a good representation of groundwater flow conditions around the open pit and mimics the ground surface contours (Map 4). Groundwater flow converges locally on Gordon and Farley lakes in the central portion of the model domain.

The model simulated average annual (i.e., steady state) groundwater discharge to Farley Lake is 0.009 m^3/s. The simulated average annual baseflow is within the estimated range of baseflow of 0.008 to 0.015 m^3/s. The calibration of the model to baseflow is considered acceptable.

Table 4.3 Steady State Calibrated Model Statistical Summary for Water Level Targets

Statistic	Result
Number of Targets	31
Mean Error (m)	-0.10
Mean Absolute Error (m)	0.76
Root Mean Square Error (m)	1.05
Range of Measured Water Levels (m)	14.21
Scaled MAE (-)	0.054
Scaled RMS Error (-)	0.074

4.1.4 Calibrated Hydrogeologic Properties

The calibrated horizontal hydraulic conductivities and anisotropy are presented in Table 4.1 for each hydrostratigraphic unit; anisotropy is presented as the ratio of horizontal hydraulic conductivity to vertical hydraulic conductivity. The calibrated specific yield and specific storage for each hydrostratigraphic unit is also presented in Table 4.1; the transient calibration is discussed in Section 4.2. Due to the limited extent of the mine rock within the project area, the hydraulic conductivity of the mine rock generally does not influence simulated water levels or groundwater/surface water interactions. Consequently, the horizontal and vertical hydraulic conductivities assigned to the mine rock are relatively high but not so high to contribute to model instability.

4.1.5 Recharge

A uniform recharge rate of 40 mm/yr or 8.4% of the annual average precipitation (478 mm/yr) was applied to the uppermost active layer of the model domain in the steady state model, the pumping test model, and the predictive models. For the transient model, 8.4% of the monthly average precipitation was applied.

4.1.6 Calibrated Hydraulic Conductivity for Boundary Conditions

The calibrated lakebed and riverbed hydraulic conductivities are 1.2×10^{-7} m/s. This is consistent with sediment analyses which demonstrated the sediments are generally fine-grained (Section 3.3.2).

4.2 Transient Model Calibration

The purpose of transient calibration is to assess groundwater contribution to/from streams and lakes and pumping from the open pit over time. Transient calibration was conducted using observed water level hydrographs and stress responses recorded during the pumping tests completed at the Gordon site in 2021. The transient models were calibrated by varying the hydraulic conductivity, specific storage, specific yield, and lakebed and riverbed hydraulic conductivity until a close visual match between the observed and simulated water levels, drawdown, and recovery was achieved.

4.2.1 Farley Lake Pumping Test

4.2.1.1 Observation Targets for Farley Lake Pumping Test

In August 2021, two pumping tests were conducted by Friesen under the observation of Stantec personnel. The first pumping test was a 72-hour test between East pit and Farley Lake using two 150 mm diameter test wells, TW1-21 and TW2-21. The pumping test was completed in two stages with no recovery between stages. The details of the pumping stages are provided in Table 4.4.

Stage 1 involved pumping one of the two test wells for a period of 24 hours with a pumping rate of 1,186 m^3/day, immediately followed by Stage 2 during which both wells were operated for a period of 48 hours with a combined pumping rate of 2,062 m^3/day. Following Stage 2, both pumps were shut down and groundwater level recovery was monitored. During the pumping test, water levels were monitored in 10 monitoring wells: GBHG-17-01, GBHG-17-02, GBHF-03, GPW-01, GPW-02, GBHF-16-02A, GBHF-16-02B, GBHF-04A, GBHF-04B, and GBHF-02A (Map 4).

The measured drawdown and recovery at the pumping and observation wells were used as calibration targets. The transient model included a steady state stress period prior to simulating the pumping test to enable calibration in steady state and transient conditions within the same model. Groundwater withdrawal from well TW1-21 and TW2-21 were simulated using the WEL package.

Table 4.4 Summary of the Pumping Test at Farley Lake

Date (2021)	Pumping Test Details
August 23	Start of TW1-21 pumping at 6:00 pm. Pumping rate was approximately 13.7 L/s (1,186 m^3/day). Pumped groundwater discharged to the diversion (FAR 6) located to the north of TW1-21 and TW2-21 (Map 4).
August 24	Start of TW2-21 pumping at 6:00 pm. The pumping rate of TW1-21 decreased slightly when TW2-21 was turned on. Collective pumping rate from TW1-21 and TW2-21 was approximately 23.9 L/s (2,062 m^3/day). Pumped groundwater discharged to the diversion (FAR 6) located to the north of TW1-21 and TW2-21 (Map 4).
August 26	Pumping from both TW1-21 and TW2-21 simultaneously terminated at 6:00 pm.

4.2.1.2 Results of Model Calibration to Farley Lake Pumping Test

The measured and simulated drawdown and recovery are presented in Appendix C. In general, the observed drawdown trends in groundwater levels matched well in the Farley Lake area. At the pumping wells, TW1-21 and TW2-21, the trends in drawdown and recovery are matched well. The magnitude is under-predicted, which is expected given the groundwater model cells are 15 meters wide, which would dampen the response to pumping within the model cell compared to the response measured within the pumping well. The trends and magnitude of drawdown and recovery are matched well at GPW-01 and GBHF-16-02B. The trends are well matched at GBHF-03, GBHF-16-02A, GBHG-17-01, GBHG-17-02, and GPW-02 although the magnitudes are under-predicted. The measured drawdown at GBHF-04A and GBHF-04B was minimal (less than 0.05 m) while the model simulated essentially no response at these locations. At GBHF-02A, no response was measured, and the model simulated nearly no response.

Generally, larger drawdown was measured and simulated for wells located closer to the pumping wells such as GBHG-17-01, GBHG-17-02, and GBHF-03 with maximum measured drawdown of 2.8 m.

4.2.2 Gordon Lake Pumping Test

4.2.2.1 Observation Targets for Gordon Lake Pumping Test

In August 2021, Friesen, under the observation of Stantec personnel, conducted a 72-hour pumping test between the Wendy pit and Gordon Lake. The pumping test on the Gordon Lake side of the proposed open pit was completed using two 150 mm diameter test wells, GPW-03 and GPW-04. The pumping test was completed in two stages with no recovery between stages. The details of the pumping stages are provided in Table 4.5.

Stage 1 involved pumping one of the two test wells for a period of 24 hours with a pumping rate of 458 m^3/day, immediately followed by Stage 2 during which both wells operated for a period of 48 hours with a combined pumping rate of 743 m^3/day. Following Stage 2, both pumps were terminated, and groundwater level recovery was monitored. During the pumping test, water levels were monitored in eight monitoring wells: GBHF-16-01A, GBHF-01A, GBHF-16-01B, GBHF-01B, GBHF-05A, GBHF-05B, GBHF-07A, and GBHF-07B (Map 4).

The measured drawdown and recovery at the pumping and observation wells were used as calibration targets. Groundwater withdrawal from well GPW-03 and GPW-04 were simulated using the WEL package. pumping test completed near Gordon Lake was simulated following the pumping test near Farley Lake according to the details and times provided in Table 4.4 and Table 4.5. Consequently, one model facilitated calibrating steady state conditions as well as both pumping tests.

Table 4.5 Summary of the Pumping Test at Gordon Lake

Date (2021)	Pumping Test Details
August 27	Start of GPW-03 pumping at 1:00 pm. Pumping was approximately 5.3 L/s (458 m3/day). Pumped groundwater discharged to the diversion (FAR 6) located to the north of GPW-03 and GPW-04 (Map 4).
August 28	Start of GPW-04 pumping at 1:00 pm. The pumping rate of GPW-03 decreased slightly when GPW.04 was turned on. Collective pumping rate from GPW-03 and GPW-04 was approximately 8.6 L/s (743 m3/day). Pumped groundwater discharged to the diversion (FAR 6) located to the north of GPW-03 and GPW-04 (Map 4).
August 30	Pumping from both GPW-03 and GPW-04 simultaneously terminated at 12:00 pm.

4.2.2.2 Results of Model Calibration to Gordon Lake Pumping Test

The measured and simulated drawdown and recovery are presented in Appendix C. In general, the observed drawdown trends in groundwater levels matched well in the Gordon Lake area. At the pumping wells, GPW-03 and GPW-04, the trends in drawdown and recovery are matched well. The magnitude is under-predicted, which is expected given the groundwater model cells are 15 meters wide, which would dampen the response to pumping within the model cell compared to the response measured within the pumping well. The trends and magnitude of drawdown and recovery are matched well at GBHF-16-01A, GBHF-01A, GBHF-05A, and GBHF-05B. The measured drawdown at GBHF-16-01B and GBHF-01B were negligible during the pumping stages of the test while the model simulated more than 1 m drawdown at GBHF-16-01B and nearly 0.5 m drawdown at GBHF-01B. The measured drawdown at these two locations may have been influenced by the discharge of water during the pumping stages. Finally, measured drawdown at GBHF-07A and GBHF-07B was less than 0.1 m and was sporadic. It is uncertain if the response measured was due to the pumping test. The model simulated essentially no response at these locations.

Generally, larger drawdown was measured and simulated for wells located closer to the pumping wells such as GBHF-16-01A and GBHF-01A with maximum measured drawdown of 1.2 m.

4.2.3 Results of the Transient Model Calibration

To evaluate the calibrated model, the same statistical methods discussed in Section 4.1.2 were used for the pumping test model. The calibration statistics for the pumping test model are provided in Table 4.6. The transient model simulated an acceptable fit to observed drawdown with a scaled MAE of 3.5 percent and scaled RMS error of 8.4 percent. The RMS is less than the 10 percent threshold for model calibration as defined in Spits and Moreno (1996) and Wells et al. (2012).

Table 4.6 Transient Calibrated Model Statistical Summary

Statistic	Result
Number of Observation Wells	18
Mean Error (m)	0.05
Mean Absolute Error (m)	0.10
Root Mean Square Error (m)	0.24
Range of Measured Drawdown (m)	2.9
Scaled MAE (-)	0.035
Scaled RMS Error (-)	0.084

4.3 Assessment of Model Calibration

For the steady state model, the error of the model was acceptable with a scaled MAE of 5.4 percent and scaled RMS error of 7.4 percent. No systematic bias was observed in the residuals considering hydrostratigraphic units or proximity to boundary conditions. For the transient model, simulated water level changes in observation wells match well with measured water level changes. The transient model simulated an acceptable fit to observed drawdown with a scaled MAE of 3.5 percent and scaled RMS error of 8.4 percent. The scaled RMS for the steady state and transient models were below the 10 percent threshold for model calibration as defined in Spits and Moreno (1996) and Wells et al. (2012). The steady state and transient model calibrations are suitable for the purpose of assessing potential impacts from mining operations in the study area.

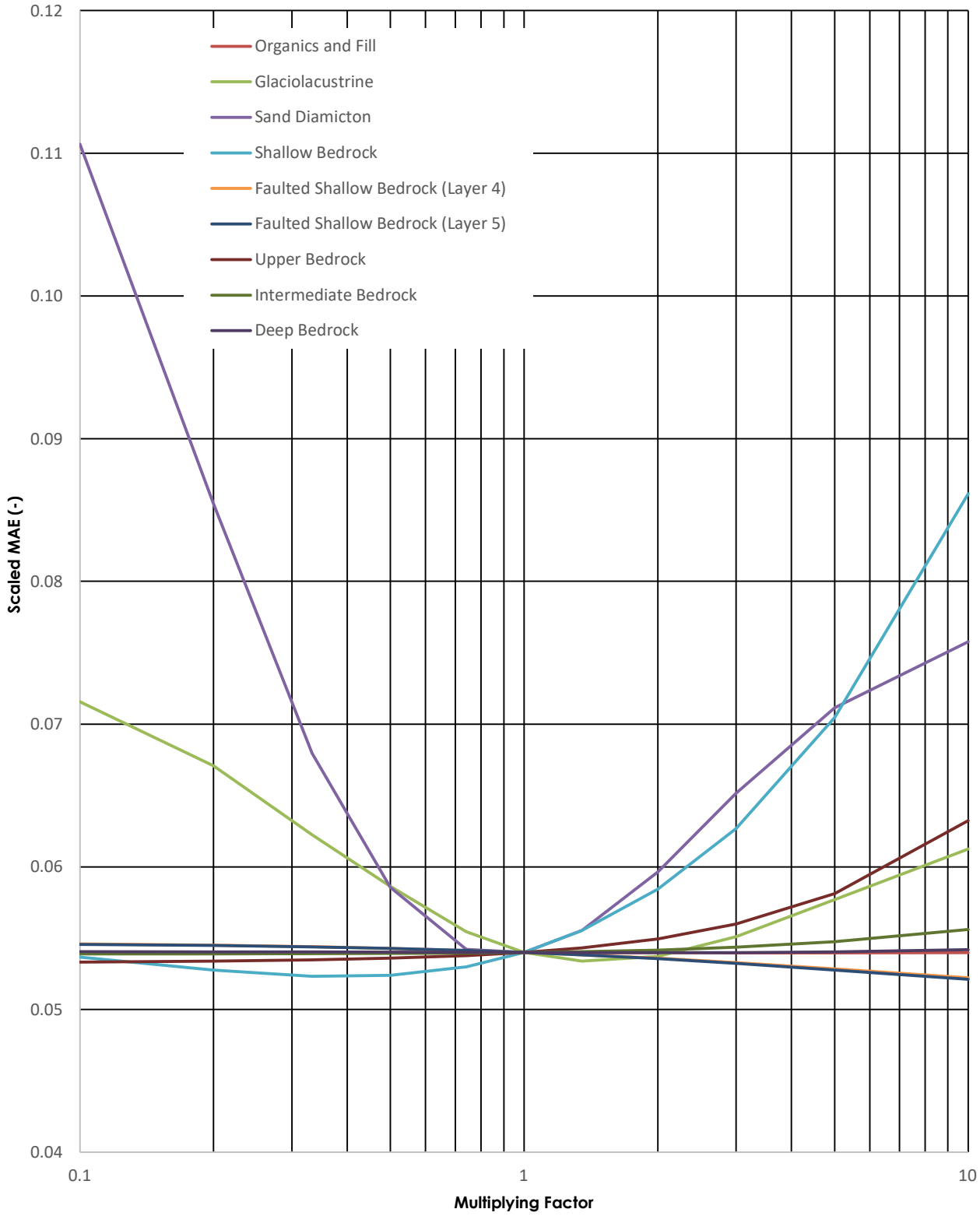
4.4 Calibrated Model Sensitivity Analyses

A sensitivity analysis was performed to assess the uncertainty in estimated parameters, hydraulic stresses, and boundary conditions used to develop the calibrated steady state groundwater flow model, consistent with the approach described in Anderson and Woessner (1991). For this sensitivity analysis, iterative changes were applied to the hydraulic conductivity of the hydrostratigraphic units, the hydraulic conductivity of lakebed and riverbed materials, and recharge. Modelled changes for each of these parameters were constrained to reasonable and foreseeable values for each parameter/condition; tests were not performed for parameters outside of expected ranges as described below.

4.4.1 Hydraulic Conductivity of Hydrostratigraphic Units

Multiple sensitivity simulations were performed for the hydraulic conductivity of the hydrostratigraphic units. The hydraulic conductivity of each hydrostratigraphic unit (except mine rock) was adjusted individually using factors between 0.1 and 10 to assess the sensitivity of the calibration to the hydraulic conductivity of each hydrostratigraphic unit

The scaled MAE for each sensitivity simulation is presented in Figure 4-2 which indicates the calibrated model is most sensitive to increases in the hydraulic conductivity of the sand diamicton, shallow bedrock, glaciolacustrine, and upper bedrock units and decreases in the hydraulic conductivity of the sand diamicton and glaciolacustrine units. The organics and fill, the faulted shallow bedrock, intermediate bedrock, and deep bedrock zones are fairly insensitive to an increase or decrease in hydraulic conductivity. Some of the sensitivity simulations as presented in Figure 4-2 show slight improvements in the scaled MAE. The sensitivity simulation with the lowest MAE was the 2-fold increase in hydraulic conductivity of the glaciolacustrine with a scaled MAE of 0.049 compared to 0.054 for the calibrated model, which is a small improvement. The results of the sensitivity analysis demonstrate the calibrated hydraulic conductivities simulate the measured water levels well and alternate values are not indicated.



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Title **Calibrated Model Sensitivity Analysis - Hydraulic Conductivity**

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The hydraulic conductivity of the hydrostratigraphic units also were adjusted simultaneously. Except for mine rock, each hydrostratigraphic unit was adjusted by an order of magnitude decrease and increase (factor of 10) from the calibrated baseline values. Table 4.7 presents the calibration statistics for the sensitivity scenarios and the baseline model for comparison.

Table 4.7 Calibration Statistics for the Sensitivity Analyses for Hydraulic Conductivity of Hydrostratigraphic Units

Statistic	Baseline	K / 10	K * 10
Mean Error (m)	-0.10	-4.93	1.34
Mean Absolute Error (m)	0.76	4.95	1.78
Root Mean Square Error (m)	1.05	7.91	2.77
Scaled MAE (-)	0.054	0.35	0.13
Scaled RMS Error (-)	0.074	0.56	0.20

Decreasing the hydraulic conductivity of the hydrostratigraphic units by an order of magnitude increases the error of the model significantly as indicated by the scaled RMS error of 56%. Increasing the hydraulic conductivity of the hydrostratigraphic units by an order of magnitude also increases the error of the model although to a lesser degree as the scaled RMS is 20%. Both scaled RMS errors are greater than the 10% threshold described in Section 4.1.3.

The effect of simultaneously varying the hydraulic conductivity for the hydrostratigraphic units on predicted baseflow to the rivers, lakes, and streams is discussed in Section 5.5.1

4.4.2 Hydraulic Conductivity of Lakebed and Riverbed Sediments

Two sensitivity simulations were performed whereby the hydraulic conductivity of riverbed material (as represented in the River boundary condition) and lake bed material (as represented in the General Head Boundary) was varied to evaluate model responsiveness. The hydraulic conductivity in both the River and General Head Boundaries was increased and decreased by a factor of ten. Table 4.8 presents the calibration statistics for the sensitivity scenarios and the baseline model.

Table 4.8 Calibration Statistics for the Sensitivity Analyses for Hydraulic Conductivity of Riverbed and Lakebed Sediments

Statistic	Baseline	Decreased K	Increased K
Mean Error (m)	-0.10	-1.31	0.06
Mean Absolute Error (m)	0.76	1.62	0.73
Root Mean Square Error (m)	1.05	1.87	1.05
Scaled MAE (-)	0.054	0.11	0.05
Scaled RMS Error (-)	0.074	0.13	0.074

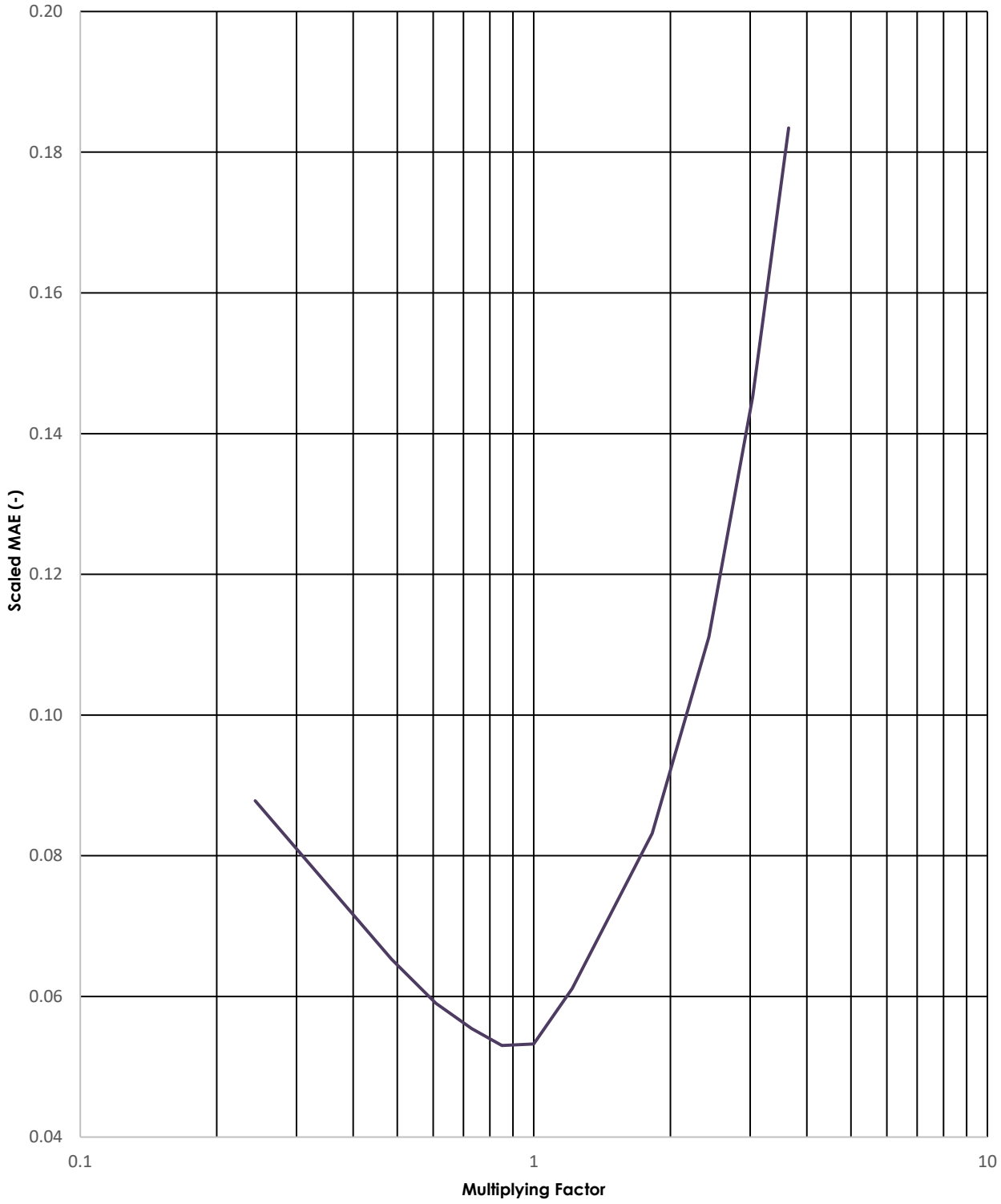
Decreasing river and lakebed hydraulic conductivity increases the error of the model as indicated by the scaled RMS error of 13%. Increasing the river and lakebed hydraulic conductivity has minimal effect on the error of the model as indicated by the scaled RMS error of 7.4%. This indicates the calibrated values for hydraulic conductivity of the river and lakebed materials simulate high hydraulic connection between surface water and groundwater and further increasing the hydraulic conductivity does not increase the hydraulic connection. This is conservative to assess impacts.

The effect of varying riverbed and lakebed hydraulic conductivity on predicted baseflow to the rivers, lakes, and streams is discussed in Section 5.5.4.

4.4.3 Recharge

Multiple sensitivity simulations were performed by adjusting the recharge rate using factors between 0.24 and 3.6 to assess the conceptual range of recharge which is assumed to be 4 to 146 mm/yr. The range in recharge rate used in this sensitivity scenario is considered conservative as climate change forecasts for Lynn Lake, Manitoba are in the range of 11% to 15% increase in precipitation for the next 20 to 50 years, respectively, under a high emissions scenario (ClimateData.ca 2024).

The scaled MAE for each sensitivity simulation is presented in Figure 4-3 which indicates that the model is generally equally sensitive to increases and decreases in the recharge rate. The results of the sensitivity analysis demonstrate water levels are highly sensitive to recharge rate, the calibrated recharge rate simulates the measured water levels well, and an alternate value is not indicated.



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4-3

Title **Calibrated Model Sensitivity Analysis - Recharge**

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Table 4.9 presents the calibration statistics for the sensitivity scenarios and the baseline model for comparison in which recharge was adjusted using a factor of 2.

Table 4.9 Calibration Statistics for the Sensitivity Analyses for Recharge

Statistic	Baseline	Recharge / 2	Recharge x 2
Mean Error (m)	-0.10	0.51	-1.06
Mean Absolute Error (m)	0.76	0.93	1.27
Root Mean Square Error (m)	1.05	1.48	1.85
Scaled MAE (-)	0.054	0.07	0.09
Scaled RMS Error (-)	0.074	0.10	0.13

Decreasing the recharge by a factor of two increases the error of the model as indicated by the scaled RMS error of 10%. Increasing the recharge by a factor of two also increases the error of the model as indicated by the scaled RMS error of 13%. The scaled RMS error for the simulation in which recharge was increased is greater than the 10% threshold described in Section 4.1.3.

The effect of varying recharge on predicted baseflow to the rivers, lakes, and streams is discussed in Section 5.5.3.

5 Model Applications

The calibrated groundwater flow model was used to quantify baseline groundwater levels and flow and groundwater discharge to the receiving environment under baseline conditions. The baseline model results were then used to compare to model predictions during construction, operation, and closure phases of the Project. Model modifications completed to allow simulation of the Project phases are as follows:

- Construction (Mine Years -1 to 0) – dewatering of the existing East and Wendy pits and initial dewatering of the starter pit.
- Operation (Mine Years 0 to 5) – dewatering of open pit and groundwater discharge and seepage collection associated with the historical and new MRSAs.
- Active reclamation/closure (after Mine Year 5) – filling the open pit and groundwater discharge associated with the MRSAs.

5.1 Baseline Conditions

5.1.1 Model Setup: Baseline

The calibrated groundwater flow model described in Section 4 was used to estimate the water table elevation (i.e., the top of the saturated water column) and groundwater flow under baseline conditions.

Recharge through the historical MRSAs (north and south) has the potential to affect groundwater quality and as a result the model was used to estimate the discharge location and flux of water recharging the groundwater flow system from beneath the MRSAs. A forward particle tracking approach was used, where a particle was released from each model node within the footprint of the historical MRSAs. The travel paths of the particles were simulated through the model domain until they arrived at a receptor, such as a lake or watercourse.

The groundwater flux associated with each particle track was then used to estimate the total discharge rate (Q) for the historical MRSAs to the environment. The groundwater discharge to a surface water feature that is contributed by the cell in the historical MRSA is conservatively assumed to be equal to the average annual recharge rate into that cell (e.g., $Q_{in} = Q_{out}$). It was assumed the groundwater recharge that enters a historical MRSA will ultimately discharge to receptors. As a result, the groundwater flow model may over-estimate groundwater discharge rates, as local seepage to intermittent surface water features or ditches that may be present in the area of a historical MRSA are not accounted for in the model.

The historical north MRSA and south MRSA received an average recharge rate of 40 mm/yr under baseline conditions.

5.1.2 Model Results: Baseline

The calibrated groundwater flow model was used to estimate the water table elevation, groundwater flow, and groundwater discharge to surface water under baseline conditions.

5.1.2.1 Groundwater Elevation

Map 14 shows the predicted average annual water table elevation contours under baseline conditions. The model provides a good representation of groundwater flow conditions in the area of the open pit and mimics the ground surface contours, with groundwater flowing regionally to the east in the southern portions of the model domain and to the north in the northern portion of the model domain. Groundwater flow converges locally on Gordon and Farley lakes in the central portion of the model domain.

5.1.2.2 Groundwater Discharge to Surface Water

Simulated groundwater discharge to the primary lakes and watercourses located in the model domain is presented in Table 5.1. The locations of surface water features are presented in Map 10. The baseline groundwater discharge rates were used to quantify changes to groundwater discharge during the construction, operation, and closure phases, as presented in subsequent sections.

In Table 5.1, a positive number for the net groundwater to receiver indicates groundwater discharge to the surface water feature (gaining river or lake) and a negative value indicates that the surface water feature is recharging the groundwater flow system (losing river or lake). Baseflow values presented in the table represent the groundwater contributions to the features, and do not include contributions from surface water storage.

Table 5.1 Estimated Groundwater Discharge to Surface Water Features for Baseline Conditions

Receiver	Net Groundwater Discharge to Receiver (m^3/s)[1]
Lakes	
Susan Lake	0.00236
Pump Lake	-0.00057
Marnie Lake	-0.00030
Marnie Lake North	0.00024
Gordon Lake	0.00340
Farley Lake	0.00893
Marie Lake	-0.00231
Lake 3	0.00050

Receiver	Net Groundwater Discharge to Receiver (m^3/s)[1]
Watercourses	
Watercourse connecting Susan and Marrow Lakes (SUS3)	0.00044
Tributary of Simpson Lake (FAR3-SIM2)	0.00115
Tributary of Swede Lake (FAR3-A1)	0.00059
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	0.00013
Tributary of Farley Lake (FAR5-A1)	0.00003
Southern Tributary of Gordon Lake (FAR7-A1)	0.00013
Diversion Channel (FAR6)	0.00006
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	0.00009
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	-0.00004
Northern Tributary of Gordon Lake (FAR7-B1)	-0.00001

Notes

[1] Positive value represents flow from groundwater to receiver

5.1.2.3 Seepage from Mine Rock Storage Areas

The particle tracks from the historical MRSAs under baseline conditions are presented on Map 15, and the estimated discharge rates and travel time statistics to the receiving environment is presented in Table 5.2. As shown on Map 15 and Table 5.2, Seepage originating from the historical north MRSA discharges to East Pit and Wendy Pit with mean travel times of 70 and 116 years, respectively. Seepage originating from the historical south MRSA discharges to East Pit and Farley Lake with mean travel times of 188 and 1,036 years, respectively. The flow paths are long as they flow into the bedrock unit prior to discharge in surface water.

Table 5.2 Predicted Seepage from Historical Mine Rock Storage Areas for Baseline Conditions

Source	Receptor	Discharge (m^3/s)	Travel Time (years)		
			Minimum	Mean	Maximum
Historical North MRSA	East Pit	4.6E-05	15	70	171
	Wendy Pit	4.5E-05	16	116	759
Historical South MRSA	East Pit	4.4E-05	61	188	500
	Farley Lake	1.1E-04	991	1,036	1,226

5.2 Construction

The primary activities that are anticipated to potentially influence groundwater levels and flow during construction include the initial dewatering of the historical East and Wendy pits and the starter pit, mitigation of pit inflows through the use of interceptor wells, the development of the MRSA, the removal of the historical North MRSA, and the alteration of the historical South MRSA. While these activities will continue into the initial operating years, they have been presented separately in the construction phase to document the potential changes to groundwater levels and flow in the early phases of Project development.

5.2.1 Model Setup: Construction

Starting with the calibrated groundwater flow model, the following modifications were completed to represent the dewatering of Wendy and East pits, the use of groundwater interception wells to mitigate pit inflow, and the fate of groundwater originating from the MRSA. The historical north MRSA was not simulated as the mine rock will be used in construction or relocated to the new MRSA. The size of the historical south MRSA was reduced to reflect development of the open pit. The modifications are discussed below for each Project component. The model was run in transient mode using four quarterly stress periods to simulate the one-year construction phase.

5.2.1.1 Dewatering East, Wendy, and Open Pits

To evaluate the effects of the dewatered historical East and Wendy pits on the groundwater level and groundwater discharge to surface water features, the calibrated groundwater flow model was modified to represent the extent and depth of each pit by removing the GHBs over the footprint of the historical pits and adding a well to remove water within each pit. The historical pits were simulated to be dewatered throughout the construction phase, although the pits may be dewatered faster to meet Project objectives. Wendy pit has a surface area of about 44,100 m^2, a volume of 573,930 m^3, and a depth of approximately 50 m. East pit has a surface area of about 58,460 m^2, a volume of 1,561,931 m^3, and a depth of approximately 80 m. The elevation of the ground surface in the area of the historical pits is 318 m amsl, meaning the elevation of the base of the Wendy pit and East pit is about 268 m amsl and 238 m amsl, respectively.

5.2.1.2 Groundwater Interceptor Wells

A high permeability zone was simulated in the shallow bedrock in the vicinity of the East and Wendy faults to reflect the results of pumping tests. Initial model runs identified that dewatering of the existing pits has a strong hydraulic connection between the pits and Gordon and Farley lakes due to this high permeability zone in shallow bedrock. Interceptor wells were simulated to capture seepage from Gordon and Farley lakes prior to entering the open pit and return the water to the lakes to mitigate potential for changes in lake level due to open pit dewatering. Capturing the water prior to entering the open pit is anticipated to limit effects of blasting residual and metal leaching on the chemistry of groundwater and therefore limit potential treatment prior to returning the water to the lakes.

Eleven (11) interceptor wells were simulated in the groundwater flow model between the pits and the lakes within the higher permeability zone. Six interceptor wells are located between Farley Lake and the open pit, and five interceptor wells are located between Gordon Lake and the open pit. Each interceptor well was assumed to extend from the top of rock to the base of the shallow bedrock layer (i.e., the top 50 m of bedrock). The number of pumping wells, and the pumping rate from each well was optimized to intercept groundwater originating from the lakes before it entered the open pit. The pumped water from the interceptor wells was assumed to be discharged to the nearest lake (Gordon or Farley). The interceptor wells were simulated using the MNW package. The pumping rate for each well assigned in the model was slightly higher than could be removed from the aquifer; the limiting function in the MNW package was used to reduce the pumping rate to prevent dry cells. Consequently, slight fluctuation in the pumping rate is possible in different models (e.g., sensitivity simulations).

5.2.1.3 Mine Rock Storage Areas

The Project includes an MRSA for the collection of surplus mine rock (Map 3). While there will be no rock mined in construction, rock from the historical north MRSA that is not used during construction will be relocated into the new MRSA and a portion of rock from the historical south MRSA will be removed or used in construction to allow development of the open pit. Therefore, for the construction phase groundwater model, the historical north MRSA was removed, the footprint of the historical south MRSA was reduced, and the new MRSA was added. Recharge through the MRSAs has the potential to affect groundwater quality and as a result the model was used to estimate the discharge locations and flux of water recharging the groundwater flow system from beneath the MRSA and historical south MRSA. The forward particle tracking approach presented in Section 5.1.1 was used to predict the fate of recharge from the MRSAs, where a particle was released from each model cell within the footprint of the MRSAs.

A portion of rock from the historical south MRSA needs to be relocated to the MRSA and/or used in construction to allow development of the open pit. The historical south MRSA footprint from baseline conditions was reduced by approximately 80%, from 129,499 m^2 to approximately 25,900 m^2 in construction. The recharge rate for the historical south MRSA from baseline conditions of 40 mm/year was applied through construction.

The MRSA was represented in the model by adjusting the groundwater recharge within the footprint of the MRSA. This footprint increases over time in the model to reflect the expansion of the MRSA over the construction phase. The groundwater recharge within the footprint of the MRSA was estimated using a MACRO model (Stantec 2020e). The average recharge rate to the groundwater flow system under the MRSA during the operations phase is predicted to be 8.4 mm/yr from the top surface of the MRSA and 39 mm/yr from the side slopes of the MRSA.

The footprint of the MRSA was added in the first model stress period and modified in subsequent stress periods to represent the expansion of the MRSA over time. In each stress period where a model cell first fell within the footprint of the expanding MRSA, a particle was added to the cell. The travel paths of the particles were evaluated for the 1-year construction period where they discharged to a receptor, such as a lake or watercourse, or the MRSA contact water collection ditch (which was represented by drain cells assigned 1 m bgs in cells where the collection ditch is present), or remained in groundwater.

The groundwater flux associated with each particle track was then used to estimate the total discharge rate (Q) for MRSAs to the environment using the method described in Section 5.1.1. The estimated groundwater flux represents the total discharge rate to the environment at the end of construction following one year of flow of the particles.

5.2.2 Model Results: Construction

5.2.2.1 Dewatering Volumes

The historical East and Wendy pits were dewatered throughout the construction period as a precursor to dewatering for the open pit. The dewatering rate in the model does not represent what will be the actual dewatering rate because the open pits will likely be dewatered over a short period of time within the construction period.

The time to dewater the historical open pits will be estimated as part of a separate scope of work based on a water balance that incorporates groundwater inflows, precipitation, surface water runoff, the volume of water already in the open pits as well as the capacity of the pumps that will be used to dewater the historical pits. For reference, the volumes of the East and Wendy pits are 1,561,931 m^3 and 573,930 m^3.

5.2.2.2 Groundwater Drawdown and Discharge

The predicted water table elevation and groundwater drawdown contours at the end of the construction period when the East and Wendy pits are fully dewatered are presented on Map 16 and Map 17, respectively. In the area of the East and Wendy pits, groundwater levels are lowered by 1 m or more within approximately 500 m of the pits, which includes the drawdown effect from the interceptor wells. An approximately 350 m wide area of drawdown that is 1 m or more is predicted at the north-western end of the MRSA due to the contact water collection ditch around the MRSA. The groundwater table is closest to ground surface in the northwestern portion of the MRSA which is why drawdown effects of the MRSA contact water collection ditch are predicted for the other portions of the ditch.

Table 5.3 presents the comparison of baseline groundwater discharge rates with effects of the dewatering at the end of the construction period. As shown in Table 5.3, the groundwater flow system responds to the dewatering of the existing pits at the end of the construction period. Gordon and Farley lakes are predicted to shift from gaining water from groundwater to losing water to groundwater, as is the diversion from Gordon to Farley Lake (FAR6). The water pumped from the interceptor wells (0.10 m^3/s) will be returned to Gordon and Farley lakes during construction to offset the increase in seepage from the two lakes (0.091 m^3/s). The changes to groundwater discharge rates for the remaining lakes and watercourses are relatively small (less than 0.001 m^3/s) compared to the overall anticipated flow rates in the surface water features.

Table 5.3 Estimated Groundwater Discharge to Receivers at End of Construction

Receiver	Net Groundwater Discharge to Receiver (m^3/s)		
	Baseline[1]	End of Construction[1]	Change From Baseline[2]
Lakes			
Susan Lake	0.00236	0.00240	0.00003
Pump Lake	-0.00057	-0.00054	0.00003
Marnie Lake	-0.00030	-0.00023	0.00007
Marnie Lake North	0.00024	0.00025	negligible
Gordon Lake	0.00340	-0.04167	-0.04506
Farley Lake	0.00893	-0.03667	-0.04559
Marie Lake	-0.00231	-0.00221	0.00010
Lake 3	0.00050	0.00021	-0.00029
Watercourses			
Watercourse connecting Susan and Marrow Lakes (SUS3)	0.00044	0.00045	0.00001
Tributary of Simpson Lake (FAR3-SIM2)	0.00115	0.00115	negligible
Tributary of Swede Lake (FAR3-A1)	0.00059	0.00059	0.00001
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	0.00013	0.00013	0.00001
Tributary of Farley Lake (FAR5-A1)	0.00003	0.00002	-0.00001
Southern Tributary of Gordon Lake (FAR7-A1)	0.00013	0.00010	-0.00003
Diversion Channel (FAR6)	0.00006	-0.00013	-0.00019
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	0.00009	0.00009	negligible
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	-0.00004	-0.00004	0.00001
Northern Tributary of Gordon Lake (FAR7-B1)	-0.00001	-0.00001	negligible
Water Management Features			
MRSA Contact Water Collection Ditch	N/A	0.00087	N/A
Interceptor Wells	N/A	0.10012	N/A

Notes:

[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

N/A – not applicable

5.2.2.3 Seepage From Mine Infrastructure

The particle tracks from the MRSAs at the end of the construction period are presented on Map 18, and the estimated discharge rates and travel time statistics to the receiving environment are presented in Table 5.4. The particles originating from the historical south MRSA are predicted to be captured by the interceptor wells with a mean advective travel time of approximately one year. The particles originating at the MRSA are predicted to discharge to the MRSA contact water collection ditch or be captured by the interceptor wells with a mean travel time of less than one year.

Table 5.4 Predicted Groundwater Discharge Rates and Travel Time from MRSAs to Receiving Environment at End of Construction

Source	Receptor	Discharge Arriving by End of Construction (m^3/s)	Travel Time (years)		
			Minimum	Mean	Maximum
Historical South MRSA	Interceptor Wells	1.8E-07	1	1	>1
MRSA	MRSA Contact Water Collection Ditch	9.8E-05	<1	<1	>1
	Interceptor Wells	4.9E-06	1	1	>1

5.3 Operation

The groundwater model was subsequently modified from the construction phase to simulate the effects of the Project during operation on groundwater levels and flow and the fate of groundwater originating from the historical and new MRSAs and the OSA during operation. As part of these simulations, the model was used to predict groundwater inflows to the open pit and to evaluate the flow paths and groundwater discharge rates to receptors for recharge that originates from the MRSA and the OSA.

5.3.1 Model Setup: Operation

The transient groundwater flow model used for the prediction of effects in construction described in Section 5.2.1 was simulated for a further 5 years (20 quarterly stress periods) with the following modifications to model the predicted effects of the operations phase.

5.3.1.1 Open Pit Dewatering

To evaluate the effects of groundwater inflows to the open pit, the construction groundwater flow model was modified to include the extent and depth of the open pit. Drain cells were used to represent the extent and depth of the open pit over time in the transient model. The ultimate footprint of the open pit has an area of 367,200 m^2 and an ultimate depth of about 200 m which corresponds to 116 m amsl.

The conductance of the drain cells was specified based on the dimensions of each grid cell and the hydraulic conductivity of the drain cells was assigned a sufficiently high value to facilitate drainage within the pit but low enough to avoid model instability. Drain cells were assigned from the water table to the deepest portion of the open pit in layer 11. The in-pit drains were simulated using the drain package.

To assess the influence of freezing the open pit walls in the winter, the hydraulic conductivity of the cells within the pit was adjusted from October 15 to April 15 of each year to simulate reduced hydraulic conductivity. The period during which the hydraulic conductivity was reduced was based on previous modeling completed in FEFLOW (Stantec 2020a). The hydraulic conductivity was linearly reduced from the calibrated value for each hydrostratigraphic unit within the pit to the reduced value from October 15 to November 1 of each year. From November 1 to March 31, the hydraulic conductivity remained at the reduced value. From March 31 to April 15, the hydraulic conductivity was linearly increased from the reduced value to the calibrated value for each hydrostratigraphic unit. Given the uncertainty of the extent of freezing in the winter, the relative change in hydraulic conductivity was assigned based on two factors: the calibrated hydraulic conductivity of each hydrostratigraphic unit in the pit was reduced by either two orders of magnitude or three orders of magnitude. Simulations which included freezing were completed using MODFLOW-SURFACT version 4. The time-varying material properties were simulated using the TMP1 package.

5.3.1.2 Groundwater Interceptor Wells

The groundwater interceptor wells installed during construction, as presented in Section 5.2.1.2, remain in place during operation to reduce inflows to the open pit due to a high permeability zone in the shallow bedrock associated with the East and Wendy faults (Map 9). The pumped water from the interceptor wells was assumed to be discharged to the nearest lake (Gordon or Farley). The interceptor wells were simulated using the MNW package. Two interceptor well pumping rates were evaluated, one to offset seepage from Gordon and Farly Lakes and a second pumping rate to reduce groundwater inflow to the open pit.

5.3.1.3 Mine Rock Storage Areas and Ore Storage Area

The historical south MRSA will have a similar footprint as in the construction simulation and the same recharge rate of 40 mm/year from construction and baseline, was applied through operation.

The MRSA will have a similar footprint as in construction but the height of the MRSA will increase throughout operations as additional mine rock is placed in the MRSA. The average recharge rate into the groundwater flow system under the MRSA was consistent with the construction phase parameterization which was 8.4 mm/yr on the top of the MRSA and 39 mm/yr on the side slopes.

Ore will be temporarily stockpiled in the OSA as mining progresses. The ore would then be transferred to the MacLellan site for processing. Therefore, the OSA extent and height will vary over time as material is removed for processing. Thus, it is not considered an enhanced recharge feature, and the average recharge rate of 40 mm/yr used in the baseline model was retained within the OSA footprint.

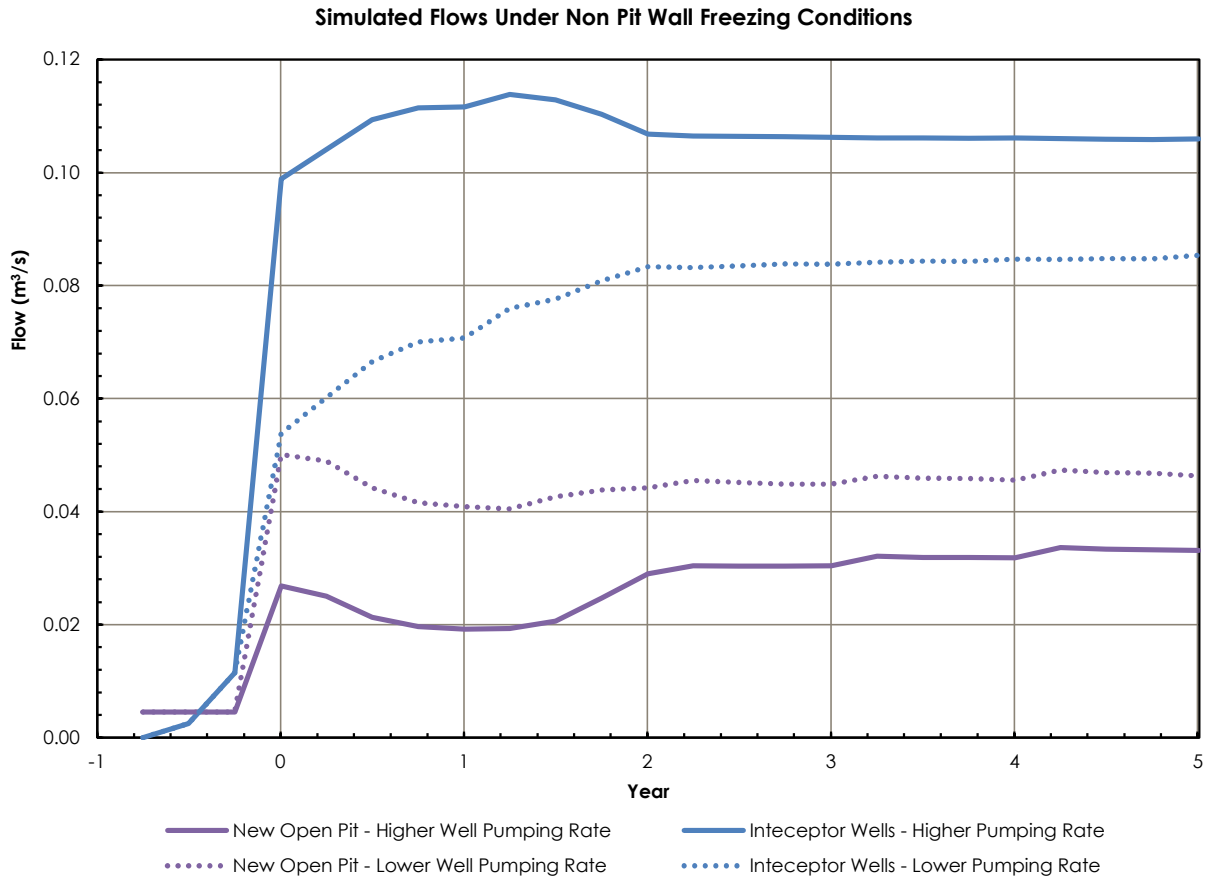
The forward particle tracking approach presented in Section 5.1.1 was used to predict the fate of recharge from the MRSAs and the OSA, where a particle was released from each model cell within the footprint of the MRSAs and OSA. The resulting predicted discharge rates to the environment from the MRSAs and OSA represent the end of operations when particles have been tracked for up to six years (one year of construction plus five years of operation).

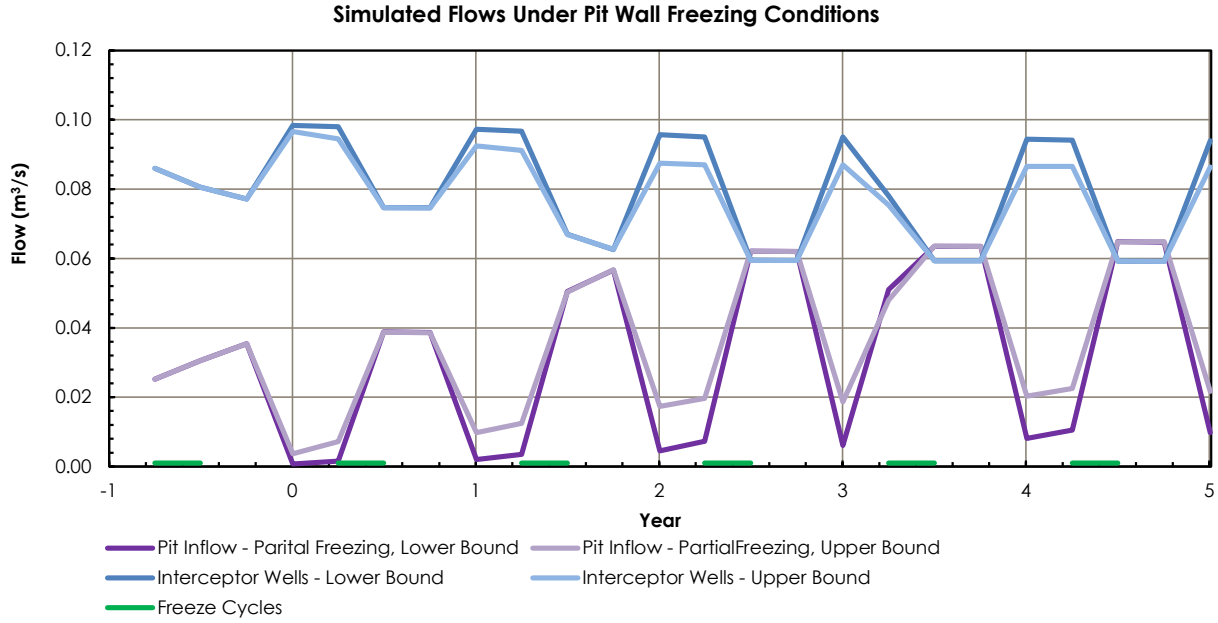
5.3.2 Model Results: Operation

5.3.2.1 Dewatering Volumes

The predicted groundwater inflow rate to the open pit and the combined pumping rate of the interceptor wells are presented in Figure 5-1. Two pumping rates for the interceptor wells are presented to assess the range of inflows expected for the open pit. After year 2, the combined pumping rate of the interceptor wells was simulated to stabilize at approximately 0.11 m^3/s at the higher rate and approximately 0.085 m^3/s at the lower rate. At the end of operations, when the open pit is excavated and dewatered to its full extent, flow into the new open pit is predicted to be approximately 0.033 m^3/s if the interceptor wells are pumping at the higher rate and approximately 0.047 m^3/s if the interceptor wells are pumping at the lower rate. Groundwater inflow to the open pit is mainly from the shallow bedrock. The open pit is mainly developed through the shallow flow system by year 1 of operations and therefore, groundwater inflow to the open pit does not vary significantly in the remaining three years of operations.

The predicted groundwater inflow rate to the open pit when partial pit wall freezing is simulated is presented in Figure 5-1. The partial pit wall freezing models were simulated with the interceptor wells pumping at the lower rate presented in the upper panel of Figure 5-1 (about 0.085 m^3/s). The partial pit wall freezing simulation is relevant for understanding the magnitude of the potential effect of pit wall freezing on groundwater inflow rates to the open pit. Predicted groundwater inflow to the open pit with partial pit wall freezing exhibits a cyclical pattern with lower inflow rates in the winter and higher inflow rates in non-freezing months. The extent of freezing is uncertain and may vary from year to year, consequently a lower and upper bound of flow rates are presented in Figure 5-1. While the majority of the pit walls may freeze in the winter, some inflow is expected to occur through fractures and faults associated with the blast zone along the pit wall. The minimum predicted inflow rate is generally less than 0.005 m^3/s in the first few years of operation in the winter and gradually increases later in operations to nearly 0.01 m^3/s. The maximum predicted inflow rate in the winter ranges from approximately 0.01 m^3/s to 0.02 m^3/s. In the spring and summer, the predicted inflow rates range from approximately 0.04 m^3/s in early operation to 0.065 m^3/s at the end of operation which is two to almost three times greater than the pit inflow rate in the winter months.





Notes:

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Figure No.

5-1

Title **Predicted Groundwater Inflow and Interceptor Well Pumping Rates During Construction and Operation**

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5.3.2.2 Groundwater Drawdown and Discharge to Surface Water

The predicted water table elevation and groundwater drawdown contours at the end of operations are presented on Map 19 and Map 20, respectively. The 1 m drawdown contour is predicted to extend approximately 500 m to the north and 1,000 m to the southwest of the open pit, increasing to more than 20 m of drawdown within 300 m of the open pit. The drawdown extent is limited to the east and west due to recharge to groundwater from Gordon and Farley lakes. The extent of drawdown related to the presence of the MRSA contact water collection ditch is masked by larger effects on the water table from pit dewatering and pumping from the interceptor wells.

Table 5.5 presents the comparison of baseline groundwater discharge rates with effects of dewatering at the end of the operation period. As shown in Table 5.5, Gordon and Farley lakes as well as the diversion channel (FAR6) are predicted to shift from gaining from groundwater to losing to groundwater, as was also predicted during construction. The lake north of the open pit (Lake 3) is also predicted to shift from gaining to losing during operations. The water pumped from the interceptor wells (0.11 m^3/s) will be returned to Gordon and Farley lakes during operations to offset the reduction in groundwater discharge in the two lakes (0.12 m^3/s). The changes to groundwater discharge rates for remaining lakes and watercourses are relatively small (less than 0.001 m^3/s) compared to the overall anticipated flow rates in the surface water features.

Table 5.5 Estimated Groundwater Discharge to Receivers at End of Operations

Receiver	Net Groundwater Discharge to Receiver (m^3/s)		
	Baseline[1]	End of Operations[1]	Change From Baseline[2]
Lakes			
Susan Lake	0.00236	0.00221	-0.00016
Pump Lake	-0.00057	-0.00057	0.00001
Marnie Lake	-0.00030	-0.00025	0.00005
Marnie Lake North	0.00024	0.00023	-0.00002
Gordon Lake	0.00340	-0.05496	-0.05836
Farley Lake	0.00893	-0.06016	-0.06909
Marie Lake	-0.00231	-0.00226	0.00005
Lake 3	0.00050	-0.00072	-0.00123
Watercourses			
Watercourse connecting Susan and Marrow Lakes (SUS3)	0.00044	0.00045	0.00001
Tributary of Simpson Lake (FAR3-SIM2)	0.00115	0.00114	-0.00001
Tributary of Swede Lake (FAR3-A1)	0.00059	0.00059	0.00000
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	0.00013	0.00011	-0.00002

Receiver	Net Groundwater Discharge to Receiver (m^3/s)		
	Baseline[1]	**End of Operations[1]**	**Change From Baseline[2]**
Tributary of Farley Lake (FAR5-A1)	0.00003	-0.00003	-0.00006
Southern Tributary of Gordon Lake (FAR7-A1)	0.00013	0.00005	-0.00008
Diversion Channel (FAR6)	0.00006	-0.00013	-0.00019
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	0.00009	0.00009	negligible
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	-0.00004	-0.00005	-0.00001
Northern Tributary of Gordon Lake (FAR7-B1)	-0.00001	-0.00001	negligible
Water Management Features			
MRSA Contact Water Collection Ditch	N/A	0.00049	N/A
Interceptor Wells	N/A	0.10601	N/A

Notes

[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

5.3.2.3 Seepage From Mine Infrastructure

The particle tracks from the MRSAs and the OSA at the end of the operations period (after six years of travel) are presented on Map 21, and the estimated discharge rates and travel time statistics to the receiving environment are presented in Table 5.6. The particles originating from the historical south MRSA are captured by the interceptor wells or discharge to the open pit with mean advective travel time of one and two years, respectively. Approximately 72% of the recharge from the MRSA discharges to the open pit or is captured by the interceptor wells or the MRSA contact water collection ditch with mean advective travel times of approximately two to four years. Approximately 0.8% of recharge ($3x10^{-6}$ m^3/s) from the MRSA is predicted to discharge to Susan Lake with a mean advective travel time of approximately five years. The annual volumes of recharge from the MRSA predicted to discharge to Susan Lake during the operations period represent 0.21% of the total predicted annual groundwater discharge to Susan Lake. The remaining recharge from the MRSA (28%), remains in the groundwater system during the operations period. Recharge from the OSA discharges to the open pit or is captured by the interceptor wells with mean advective travel times of two and three years, respectively.

Table 5.6 Predicted Groundwater Discharge Rates and Travel Time from MRSAs and OSA to Receiving Environment at the End of Operations

Source	Receptor	Discharge Arriving by End of Operations (m^3/s)	Travel Time (years)		
			Minimum	Mean	Maximum
Historical South MRSA	Interceptor Wells	1.1E-06	1	1	1
	Open Pit	1.9E-05	1	2	3
MRSA	MRSA Contact Water Collection Ditch	1.5E-04	<1	1	4
	Interceptor Wells	6.9E-05	1	2	4
	Open Pit	2.3E-04	2	4	>6
	Susan Lake	4.6E-06	5	5	>6
Ore Storage Area	Interceptor Wells	4.2E-05	1	2	2
	Open Pit	6.4E-05	2	3	4

5.4 Closure

The groundwater model was subsequently modified from the operation phase to simulate the effects of the Project on groundwater levels and flow and the fate of groundwater originating from the MRSAs during closure. As part of these simulations the model was used to predict groundwater inflows to the open pit as the pit fills and to evaluate the flow paths and groundwater discharge rates to receptors for recharge that originates from the MRSAs.

5.4.1 Model Setup: Closure

Starting with the calibrated groundwater flow model and modifications completed for the end of operation, the following additional modifications were completed: filling of the open pit, decreased pumping from the interceptor wells, removal of the OSA, and change in recharge for the MRSA. The transient groundwater flow model was simulated using 24 stress periods over 230 years.

5.4.1.1 Open Pit Filling

In closure, the open pit will be allowed to fill through precipitation and groundwater inflow. The filling of the open pit during closure was simulated by removing the drain boundary conditions representing the open pit during operation and replacing them with the lake module (LAK3). The stage (water level) of the pit lake is calculated using the dynamic pit lake water balance as follows:

$$h_l^n = h_l^{n-1} + t\frac{(P_{inflow} + R_{inflow} - W_{out} - Evap_{out} - SP - Q_s)}{A_s}$$

Variables:

- h_l^n = Stage of the pit lake, current time step; previous time step is n-1 (ft or m)
- t = time step length (days)
- P_{inflow} = Precipitation on the lake (user input; ft^3/day or m^3/day)
- R_{inflow} = Surface water runoff to the lake (user input; ft^3/day or m^3/day)
- W_{out} = Water withdrawal from the pit lake (user input; ft^3/day or m^3/day)
- $Evap_{out}$ = Evaporation from the pit lake surface (user input; ft^3/day or m^3/day)
- SP = Net seepage between the lake and the aquifer (ft^3/day or m^3/day)
- Q_s = Net inflow and outflow from streams (ft^3/day or m^3/day)
- A_s = Surface area of the pit lake (ft^2 or m^2)

P_{inflow}, R_{inflow}, W_{out}, $Evap_{out}$, and Q_s were all set to zero. The only inflow to the pit lake in the groundwater model is groundwater seepage and there will be no outlet for the pit lake. The hydraulic conductivity of the pit walls and pit bottom was assigned as 0.12 m/s to allow full hydraulic connection between the pit lake and the aquifer. Precipitation to the pit surface was set to zero because the pit filling rate will be estimated as a part of surface water modeling which will include precipitation. The groundwater inflow rate predicted using the groundwater flow model will be used as input for the surface water model.

5.4.1.2 Groundwater Interceptor Wells

The groundwater interceptor wells were assumed to continue to operate during the first stages of closure. Pumping of the interceptor wells decreased with time as the pit level stage increased, so that seepage from Gordon and Farley lakes could be returned to the lakes. The pumped water from the interceptor wells was assumed to be discharged to the nearest lake (Gordon or Farley).

5.4.1.3 Mine Rock Storage Area and Ore Storage Area

The historical south MRSA footprint from construction and operation remains for the closure scenario. The recharge rate from baseline, construction, and operation conditions of 40 mm/year was applied through the closure scenario.

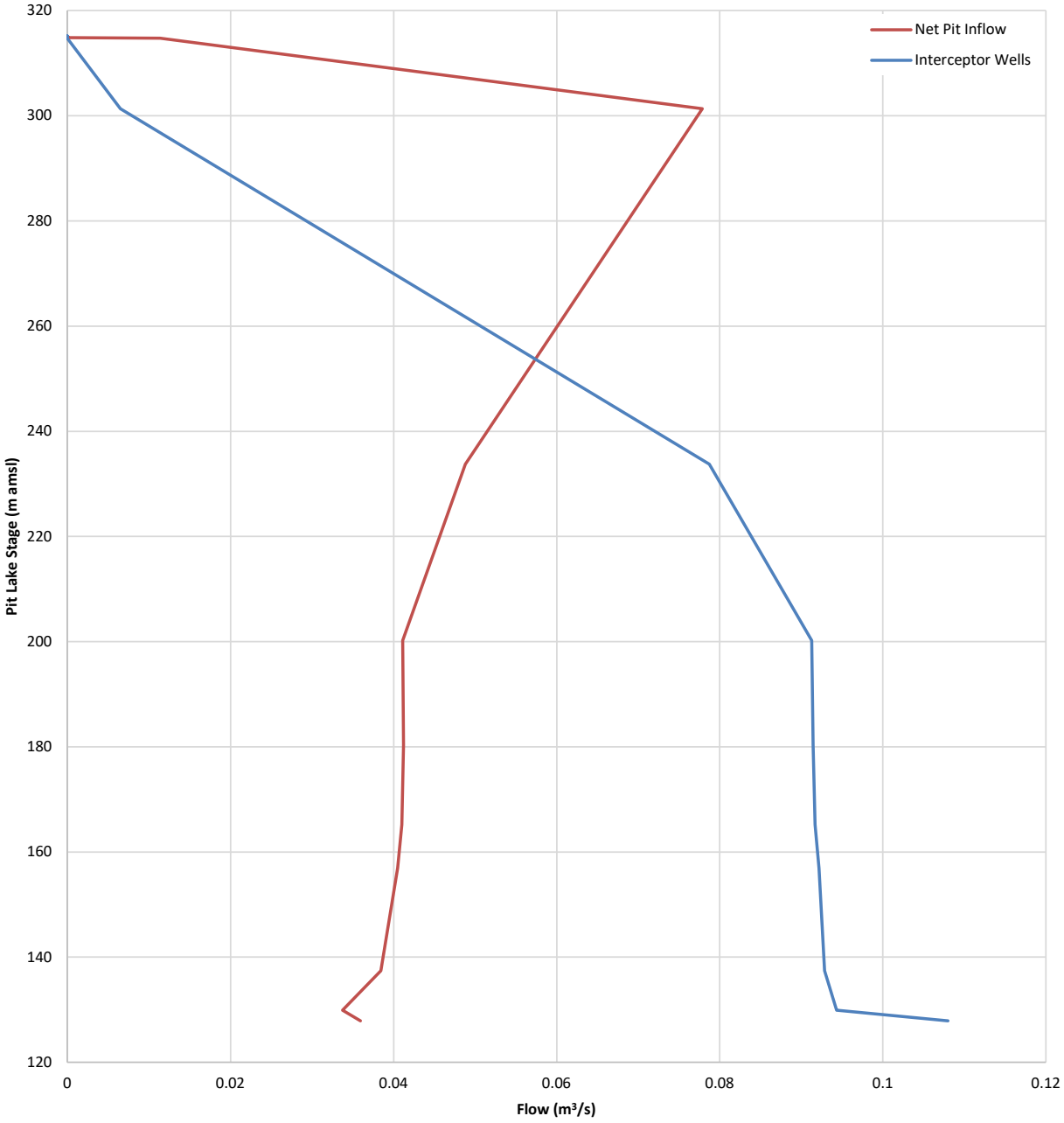
The MACRO model that was used to estimate recharge from the MRSA in operation was also used to estimate recharge from the MRSA once the MRSA has been covered, revegetated, and the rock has fully wetted up (Stantec 2020e). The wetting up time is the time to reach a steady-state saturation condition in the MRSA, where the volume of water infiltrating into the MRSA from precipitation will result in an equal amount of recharge from the base of the MRSA. The MRSA is predicted to wet up 19 years after the start of closure. Therefore, the recharge from the MRSA was increased in closure compared to operation. The average recharge rate to the groundwater flow system under the MRSA during the closure phase is predicted to be 35 mm/yr at the base of the MRSA and 39 mm/yr at the base of the side slopes of the MRSA. Applying these recharge rates for the full closure simulation is conservative as there are 19 years in closure where the recharge from the MRSA will be less than the wetted up recharge rates. These recharge rates account for a soil cover over the MRSA in closure. The contact water collection ditch around the MRSA remains in closure until contact water quality is suitable for discharge to the environment and so the contact water collection ditch was simulated in the closure model.

The OSA will be removed in closure as remaining ore will be processed at the end of operation. Therefore, seepage from the OSA (particle tracking) was not simulated in closure. Recharge through the rehabilitated footprint of the OSA was assumed to be consistent with baseline conditions which is 40 mm/yr.

5.4.2 Model Results: Closure

5.4.2.1 Open Pit Filling

The rate of groundwater inflow to the open pit after dewatering ceases is presented in Figure 5-2. After dewatering of the open pit ceases, the groundwater inflow rate is predicted to peak at approximately 0.1 m^3/s at a pit lake stage of 301 m amsl. At this pit lake stage, the pit lake will become a “flow-through” lake with groundwater flowing into the lake on the upgradient side, and out on the downgradient side. Near steady-state conditions are predicted to be reached at a stage of 315 m amsl at which point the net groundwater inflow to the pit nearly balances the net groundwater outflow. Groundwater flow into the interceptor wells will decrease from a rate of approximately 0.1 m^3/s at the start of closure to 0 m^3/s when the pit lake reaches a stage of approximately 301 m amsl.



Notes:

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Figure No.

5-2

Stantec

Title **Predicted Open Pit Filling Rate and Stage in Closure**

5.4.2.2 Groundwater Drawdown and Discharge

The predicted water table elevation and groundwater drawdown contours in closure are presented on Map 22 and Map 23, respectively. The water table is predicted to have returned to near baseline conditions in the vicinity of the open pit but remains drawn down below baseline conditions by up to 5 m in the vicinity of the MRSA contact water collection ditch. After removal of the MRSA contact water collection ditch, groundwater levels in the vicinity of the MRSA are anticipated to also return to near baseline conditions.

Table 5.7 presents the comparison of baseline groundwater discharge rates with effects of the pit lake on surface water flows at the end of closure (i.e., after the pit lake is full). As shown in Table 5.7, the groundwater flows to the receptors are predicted to return to near baseline rates (within 0.001 m^3/s of baseline conditions) once the pit is full except for Farley Lake. In closure, groundwater discharge to Farley Lake is predicted to increase by 0.002 m^3/s compared to baseline conditions. Given the area of Farley Lake is 773,944 m^2, a change in groundwater flux of 0.002 m^3/s represents a change in water level of less than 0.06 m over a year.

Table 5.7 Estimated Groundwater Discharge to Receivers in Closure

Receiver	Net Groundwater Discharge to Receiver (m^3/s)		
	Baseline[1]	Closure[1]	Change From Baseline[2]
Lakes			
Susan Lake	0.00236	0.00218	-0.00019
Pump Lake	-0.00057	-0.00055	0.00003
Marnie Lake	-0.00030	-0.00024	0.00006
Marnie Lake North	0.00024	0.00024	negligible
Gordon Lake	0.00340	0.00340	0.00001
Farley Lake	0.00893	0.01122	0.00229
Marie Lake	-0.00231	-0.00227	0.00004
Lake 3	0.00050	0.00062	0.00012
Watercourses			
Watercourse connecting Susan and Marrow Lakes (SUS3)	0.00044	0.00045	negligible
Tributary of Simpson Lake (FAR3-SIM2)	0.00115	0.00113	-0.00002
Tributary of Swede Lake (FAR3-A1)	0.00059	0.00058	negligible
Watercourse connecting Unnamed South Lake and Farley Lake (FAR5-MAN1)	0.00013	0.00013	negligible
Tributary of Farley Lake (FAR5-A1)	0.00003	0.00003	negligible
Southern Tributary of Gordon Lake (FAR7-A1)	0.00013	0.00007	-0.00006

Receiver	Net Groundwater Discharge to Receiver (m^3/s)		
	Baseline[1]	**Closure[1]**	**Change From Baseline[2]**
Diversion Channel (FAR6)	0.00006	0.00006	0.00001
Watercourse connecting Marie and Farley Lakes (FAR5-MAR1)	0.00009	0.00009	negligible
Watercourse connecting Marie and Farley Lakes (FAR5-MAR3)	-0.00004	-0.00005	negligible
Northern Tributary of Gordon Lake (FAR7-B1)	-0.00001	0.00000	negligible
Water Management Features			
MRSA Ditch	N/A	0.00063	N/A

Notes:

[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

5.4.2.3 Seepage from Mine Infrastructure

The particle tracks from the MRSA in closure are presented on Map 24, and the estimated discharge rates and travel time statistics to the receiving environment are presented in Table 5.8. The particles originating from the historical south MRSA discharge to the pit lake with a mean advective travel time of less than one year. Approximately 95% of the recharge from the MRSA discharges to the pit lake or the MRSA contact water collection ditch with mean advective travel times of approximately one and two years, respectively. Approximately three percent of recharge from the MRSA discharges to Simpson Lake with a mean advective travel time of 14 years. The annual volume of recharge from the MRSA predicted to discharge to Simpson Lake during the closure period represents 0.8% of the total predicted annual groundwater discharge to Simpson Lake. In comparison to operations, there is no predicted seepage from the MRSA to Susan Lake. In closure, the recharge rate of the MRSA increases due to steady state saturation of the MRSA (refer to Section 5.4.1.3). As a result of the increased recharge from the MRSA, the recharge is driven deeper into the groundwater flow system, bypassing Susan Lake in closure. The remaining recharge from the MRSA (6%), remains in storage in the groundwater system at the end of the closure period.

Table 5.8 Predicted Groundwater Discharge Rates and Travel Time from MRSAs to Receiving Environment in Closure

Source	Receptor	Discharge (m^3/s)	Travel Time (years)		
			Minimum	Mean	Maximum
Historical South MRSA	Pit Lake	1.8E-05	<1	<1	1
MRSA	MRSA Contact Water Collection Ditch	6.1E-05	<1	1	4
	Pit Lake	6.0E-04	<1	2	18
	Simpson Lake	2.2E-05	9	14	27

5.5 Predictive Scenarios Sensitivity Analysis

Sensitivity analyses were completed for several parameters: hydraulic conductivity of the hydrostratigraphic units, hydraulic conductivity of the lakebed and riverbed material, recharge, and storage. Parameter values were adjusted manually to higher and lower values in a symmetrical fashion (e.g., increased and decreased by a factor of ten) with one exception for hydraulic conductivity described below. The factor by which the parameters varied was based on the nature of the parameter (there is more uncertainty in hydraulic conductivity values than recharge values) and previous experience.

Sensitivities were evaluated by comparing discharge rates from groundwater to key receptors in the calibrated model to the discharge rates after varying the key parameters up and down.

5.5.1 Hydraulic Conductivity of Hydrostratigraphic Units

To evaluate model response to decreased hydraulic conductivity, all hydraulic conductivities for subsurface layers were reduced by a factor of ten. To evaluate higher hydraulic conductivities, most values were increased by a factor of ten except the glaciolacustrine and sand diamicton layers which were increased by a factor of five. The glaciolacustrine and sand diamicton layers were increased by a smaller factor because the calibrated values for these layers are already considered near the upper end for those lithologies. The change in net groundwater discharge to receivers compared to the base case for baseline, end of construction, end of operations, and end of closure is presented in Table 5.9. Only lakes and watercourses with a moderate or higher net groundwater discharge to receiver (> 0.001 m^3/s) are included in Table 5.9.

Table 5.9 Sensitivity Analysis Summary: Varying Hydraulic Conductivity (K) of Hydrostratigraphic Units

Receiver	Net Groundwater Discharge to Receiver (m^3/s)[1]											
	Baseline			End of Construction			End of Operations			End of Closure		
	Base Case	Reduced K	Increased K	Base Case	Reduced K	Increased K	Base Case	Reduced K	Increased K	Base Case	Reduced K	Increased K
Lakes												
Susan Lake	2.4E-03	2.3E-03	1.5E-03	2.4E-03	2.3E-03	1.4E-03	2.2E-03	2.3E-03	-4.9E-04	2.2E-03	2.0E-03	1.4E-03
Gordon Lake	3.4E-03	2.5E-03	7.9E-04	-4.2E-02	-3.4E-03	-1.1E-01	-5.5E-02	-8.1E-03	-1.4E-01	3.4E-03	2.6E-03	-1.2E-01
Farley Lake	8.9E-03	4.0E-03	2.3E-02	-3.7E-02	-2.7E-03	-1.2E-01	-6.0E-02	-7.4E-03	-1.7E-01	1.1E-02	4.5E-03	-1.3E-01
Marie Lake	-2.3E-03	1.5E-03	-1.9E-02	-2.2E-03	1.5E-03	-1.9E-02	-2.3E-03	1.5E-03	-2.0E-02	-2.3E-03	1.5E-03	-1.9E-02
Watercourses												
Tributary of Simpson Lake (FAR3-SIM2)	1.1E-03	2.0E-03	1.9E-03	1.2E-03	2.0E-03	1.9E-03	1.1E-03	2.0E-03	1.8E-03	1.1E-03	1.9E-03	1.9E-03
Water Management Features												
MRSA Contact Water Collection Ditch	N/A			8.7E-04	2.6E-03	0.0E+00	4.9E-04	1.5E-03	0.0E+00	N/A		
Interceptor Wells				1.0E-01	4.0E-02	1.0E-01	1.1E-01	2.0E-02	1.3E-01			
Open Pit				5.9E-02	2.6E-02	2.1E-01	3.3E-02	8.5E-03	2.4E-01			

Receiver	Change in Net Groundwater Discharge to Receiver Compared to Base Case (m^3/s)[2]							
	Baseline		End of Construction		End of Operations		End of Closure	
	Reduced K	Increased K	Reduced K	Increased K	Reduced K	Increased K	Reduced K	Increased K
Lakes								
Susan Lake	-1.7E-05	-8.3E-04	-5.4E-05	-9.9E-04	8.2E-05	-2.7E-03	-1.5E-04	-8.0E-04
Gordon Lake	-8.7E-04	-2.6E-03	3.8E-02	-6.7E-02	4.7E-02	-8.7E-02	-8.5E-04	-1.2E-01
Farley Lake	-5.0E-03	1.4E-02	3.4E-02	-8.1E-02	5.3E-02	-1.1E-01	-6.8E-03	-1.4E-01
Marie Lake	3.8E-03	-1.7E-02	3.7E-03	-1.7E-02	3.7E-03	-1.8E-02	3.7E-03	-1.7E-02
Watercourses								
Tributary of Simpson Lake (FAR3-SIM2)	8.5E-04	7.8E-04	8.5E-04	7.7E-04	8.6E-04	6.8E-04	8.1E-04	7.9E-04
Water Management Features								
MRSA Contact Water Collection Ditch	N/A		1.7E-03	-8.7E-04	1.0E-03	-4.9E-04	N/A	
Interceptor Wells			-6.0E-02	0.0E+00	-8.6E-02	2.7E-02		
Open Pit			-3.2E-02	1.5E-01	-2.5E-02	2.1E-01		

Notes:

[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

N/A – not applicable – feature not present in the modelled timeframe or at the end of the period indicated

Of the lakes and rivers assessed, net groundwater discharge to Farley Lake is most sensitive to changes in hydraulic conductivity of the hydrostratigraphic units with increases in hydraulic conductivity resulting in higher recharge from the lake to groundwater during construction, operations, and closure. While Marie Lake is not as sensitive to changes in hydraulic conductivity of the hydrostratigraphic units as Farley Lake, decreases in hydraulic conductivity change Marie Lake from a recharge feature to a discharge feature during baseline, end of construction, end of operations, and closure.

Net groundwater discharge to the tributary to Simpson Lake is sensitive to both decreases and increases in hydraulic conductivity, with both changes resulting in more discharge to the tributary. This may be due to an alteration of the groundwater divide for each sensitivity simulation or combined changes in discharge upgradient of the tributary.

Overall, net groundwater discharge to lakes and rivers is less sensitive to decreases in hydraulic conductivity of the hydrostratigraphic units than increases. The magnitude of the changes to net discharge to lakes and rivers with an increase in hydraulic conductivity of the hydrostratigraphic units may be more realistic than the magnitude of changes to net discharge to lakes and rivers with a decrease in hydraulic conductivity as the former has slightly better quality of calibration for the baseline model with a scaled RMS error of 56% with a decrease in hydraulic conductivity compared to 20% with an increase (Section 4.4.1).

Predicted groundwater discharge to the MRSA contact water collection ditch is very sensitive to changes in hydraulic conductivity of the hydrostratigraphic units. Increasing the hydraulic conductivity by a factor of ten reduces the net groundwater discharge to the MRSA contact water collection ditch to zero as the higher hydraulic conductivity promotes downward flow from the base of the MRSA, bypassing the shallow MRSA contact water collection ditch. Net groundwater discharge to the open pit is less sensitive to decreases in hydraulic conductivity of the hydrostratigraphic units than increases. Conversely, flow in the interceptor wells is less sensitive to increases in hydraulic conductivity of the hydrostratigraphic units than decreases. As hydraulic conductivity is directly proportional to groundwater flow rate, decreases in hydraulic conductivity of the hydrostratigraphic units results in decreases in flow to the open pit and the interceptor wells while increases in hydraulic conductivity of the hydrostratigraphic units results in increases in flow to the open pit and the interceptor wells.

5.5.2 Hydraulic Conductivity of Lakebed and Riverbed Material

To evaluate model response to changes in the hydraulic conductivity of the lakebed and riverbed materials, the hydraulic conductivity of riverbed material (as represented in the River boundary condition) and lake bed material (as represented in the General Head Boundary) was increased and decreased by a factor of ten. The change in net groundwater discharge to receivers compared to the base case for baseline, end of construction, end of operations, and end of closure is presented in Table 5.10. Only lakes and watercourses with a moderate or higher net groundwater discharge to receiver (> 0.001 m^3/s) are included in Table 5.10.

Table 5.10 Sensitivity Analysis Summary: Varying Riverbed and Lakebed Hydraulic Conductivity

Receiver	Net Groundwater Discharge to Receiver (m^3/s)[1]											
	Baseline			End of Construction			End of Operations			End of Closure		
	Base Case	Reduced K	Increased K	Base Case	Reduced K	Increased K	Base Case	Reduced K	Increased K	Base Case	Reduced K	Increased K
Lakes												
Susan Lake	2.4E-03	5.1E-03	1.7E-03	2.4E-03	5.1E-03	1.6E-03	2.2E-03	5.0E-03	1.5E-03	2.2E-03	4.8E-03	1.6E-03
Gordon Lake	3.4E-03	4.0E-03	2.3E-03	-4.2E-02	-8.3E-03	-6.1E-02	-5.5E-02	-1.2E-02	-8.6E-02	3.4E-03	4.0E-03	1.9E-03
Farley Lake	8.9E-03	9.3E-03	8.6E-03	-3.7E-02	-2.0E-03	-6.2E-02	-6.0E-02	-1.3E-02	-9.2E-02	1.1E-02	1.1E-02	1.1E-02
Marie Lake	-2.3E-03	-9.2E-04	-2.6E-03	-2.2E-03	-9.2E-04	-2.6E-03	-2.3E-03	-9.3E-04	-2.6E-03	-2.3E-03	-9.1E-04	-2.6E-03
Watercourses												
Tributary of Simpson Lake (FAR3-SIM2)	1.1E-03	7.8E-04	3.7E-04	1.2E-03	7.8E-04	3.6E-04	1.1E-03	7.7E-04	3.5E-04	1.1E-03	7.7E-04	3.6E-04
Water Management Features												
MRSA Contact Water Collection Ditch	N/A			8.7E-04	1.6E-03	5.7E-04	4.9E-04	8.4E-04	3.7E-04	N/A		
Interceptor Wells				1.0E-01	8.6E-02	1.0E-01	1.1E-01	3.1E-02	1.3E-01			
Open Pit				5.9E-02	4.3E-02	9.7E-02	3.3E-02	1.7E-02	9.2E-02			

Receiver	Change in Net Groundwater Discharge to Receiver Compared to Base Case (m^3/s)[2]							
	Baseline		End of Construction		End of Operations		End of Closure	
	Reduced K	Increased K	Reduced K	Increased K	Reduced K	Increased K	Reduced K	Increased K
Lakes								
Susan Lake	2.7E-03	-7.1E-04	2.7E-03	-7.5E-04	2.8E-03	-6.7E-04	2.6E-03	-8.0E-04
Gordon Lake	5.8E-04	-1.1E-03	3.3E-02	-2.0E-02	4.3E-02	-3.1E-02	6.2E-04	-1.5E-03
Farley Lake	3.2E-04	-2.9E-04	3.5E-02	-2.5E-02	4.7E-02	-3.2E-02	-6.6E-04	-5.8E-06
Marie Lake	1.4E-03	-2.5E-04	1.3E-03	-3.5E-04	1.3E-03	-3.1E-04	1.4E-03	-2.9E-04
Watercourses								
Tributary of Simpson Lake (FAR3-SIM2)	-3.7E-04	-7.8E-04	-3.8E-04	-7.9E-04	-3.6E-04	-7.9E-04	-3.6E-04	-7.7E-04
Water Management Features								
MRSA Contact Water Collection Ditch			7.7E-04	-3.1E-04	3.5E-04	-1.2E-04		
Interceptor Wells			-1.4E-02	0.0E+00	-7.5E-02	2.7E-02		
Open Pit			-1.5E-02	3.8E-02	-1.7E-02	5.9E-02		

Notes:

[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

N/A – not applicable – feature not present in the modelled timeframe or at the end of the period indicated

Of the lakes and rivers assessed, net groundwater discharge to Fairly Lake and Gordon Lake are most sensitive to changes in hydraulic conductivity of the riverbed and lakebed sediments. During construction and operations when the lakes recharge groundwater, decreasing the hydraulic conductivity decreases the recharge to groundwater and increasing the hydraulic conductivity increases the recharge to groundwater, as expected. The change in discharge to the tributary to Simpson Lake is small.

At the end of construction and operations, flow to the MRSA contact water collection ditch is higher for a decrease in hydraulic conductivity of the riverbed and lakebed sediments and lower for an increase in hydraulic conductivity of the riverbed and lakebed sediments. Groundwater removed by interceptor wells and flow to the pit decreases for a decrease in hydraulic conductivity of the riverbed and lakebed sediments and increases for an increase in hydraulic conductivity of the riverbed and lakebed sediments. Flow to the wells and pit is influenced more directly by flow from Gordon and Farley Lakes compared to the MRSA contact water collection ditch.

Confidence in the sensitivity analyses for increased and decreased hydraulic conductivity of the riverbed and lakebed sediments is similar as the calibration statistics for the models are generally similar (Section 4.4.1).

5.5.3 Recharge

Groundwater recharge was increased and decreased by a factor of two (i.e., doubled and halved) because this parameter is relatively well constrained by average yearly precipitation, which is known. The change in net groundwater discharge to receivers compared to the base case for baseline, end of construction, end of operations, and end of closure is presented in Table 5.11. Only lakes and watercourses with a moderate or higher net groundwater discharge to receiver (> 0.001 m^3/s) are included in Table 5.11. The range in recharge rate used in this sensitivity scenario is considered conservative as climate change forecasts for Lynn Lake, Manitoba are in the range of 11% to 15% increase in precipitation for the next 20 to 50 years, respectively, under a high emissions scenario (ClimateData.ca 2024).

Table 5.11 Sensitivity Analysis Summary: Varying Recharge

Receiver	Net Groundwater Discharge to Receiver (m^3/s)[1]											
	Baseline			End of Construction			End of Operations			End of Closure		
	Base Case	Reduced Recharge	Increased Recharge	Base Case	Reduced Recharge	Increased Recharge	Base Case	Reduced Recharge	Increased Recharge	Base Case	Reduced Recharge	Increased Recharge
Lakes												
Susan Lake	2.4E-03	4.9E-04	6.2E-03	2.4E-03	4.9E-04	6.1E-03	2.2E-03	4.4E-04	5.9E-03	2.2E-03	4.6E-04	5.6E-03
Gordon Lake	3.4E-03	1.4E-03	6.9E-03	-4.2E-02	-4.4E-02	-3.8E-02	-5.5E-02	-5.7E-02	-5.2E-02	3.4E-03	1.4E-03	6.8E-03
Farley Lake	8.9E-03	6.6E-03	1.3E-02	-3.7E-02	-3.9E-02	-3.2E-02	-6.0E-02	-6.2E-02	-5.6E-02	1.1E-02	8.5E-03	1.6E-02
Marie Lake	-2.3E-03	-3.1E-03	-4.2E-04	-2.2E-03	-3.1E-03	-4.2E-04	-2.3E-03	-3.1E-03	-4.3E-04	-2.3E-03	-3.1E-03	-4.2E-04
Watercourses												
Tributary of Simpson Lake (FAR3-SIM2)	1.1E-03	4.6E-04	2.5E-03	1.2E-03	4.6E-04	2.5E-03	1.1E-03	4.6E-04	2.5E-03	1.1E-03	4.6E-04	2.5E-03
Water Management Features												
MRSA Contact Water Collection Ditch	N/A			8.7E-04	1.1E-04	3.0E-03	4.9E-04	1.3E-05	1.9E-03	N/A		
Interceptor Wells				1.0E-01	1.0E-01	1.0E-01	1.1E-01	1.1E-01	1.1E-01			
Open Pit				5.9E-02	5.7E-02	6.1E-02	3.3E-02	3.2E-02	3.5E-02			

Receiver	Change in Net Groundwater Discharge to Receiver Compared to Base Case (m^3/s)[2]							
	Baseline		End of Construction		End of Operations		End of Closure	
	Reduced Recharge	Increased Recharge	Reduced Recharge	Increased Recharge	Reduced Recharge	Increased Recharge	Reduced Recharge	Increased Recharge
Lakes								
Susan Lake	-1.9E-03	3.8E-03	-1.9E-03	3.7E-03	-1.8E-03	3.7E-03	-1.7E-03	3.5E-03
Gordon Lake	-2.0E-03	3.5E-03	-2.0E-03	3.6E-03	-1.6E-03	2.8E-03	-2.0E-03	3.4E-03
Farley Lake	-2.3E-03	4.4E-03	-2.4E-03	4.4E-03	-2.1E-03	4.0E-03	-2.7E-03	4.8E-03
Marie Lake	-7.5E-04	1.9E-03	-8.5E-04	1.8E-03	-8.1E-04	1.8E-03	-7.9E-04	1.9E-03
Watercourses								
Tributary of Simpson Lake (FAR3-SIM2)	-6.8E-04	1.4E-03	-6.9E-04	1.4E-03	-6.8E-04	1.4E-03	-6.7E-04	1.4E-03
Water Management Features								
MRSA Contact Water Collection Ditch	N/A		-7.6E-04	2.1E-03	-4.8E-04	1.4E-03	N/A	
Interceptor Wells			0.0E+00	0.0E+00	-3.6E-04	7.5E-04		
Open Pit			-1.1E-03	2.3E-03	-8.3E-04	1.7E-03		

Notes:

[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

N/A – not applicable – feature not present in the modelled timeframe or at the end of the period indicated

Of the lakes and watercourses assessed, net groundwater discharge to Susan Lake, Gordon Lake, and Farley Lake are the most sensitive to changes in recharge. For each lake in each model/period, reducing recharge reduces the discharge from groundwater to receivers or reduces the recharge from the receiver (Marie Lake) while increasing recharge increases the discharge to receivers or increases the recharge from the receiver. This result is expected.

Net groundwater discharge to the open pit is more sensitive to changes in recharge than the net groundwater discharge to the MRSA contact water collection ditch and the interceptor wells. This is an expected result as the capture zone over which recharge is applied is larger for the open pit compared to the MRSA contact water collection ditch and the interceptor wells.

Confidence in the sensitivity analyses for increased and decreased recharge is similar as the calibration statistics for the baseline model with increased and decreased recharge are very similar to one another (Section 4.4.1).

5.5.4 Specific Yield and Specific Storage

Specific yield and specific storage were varied to evaluate model responsiveness to these parameters. Specific yield was increased and decreased by a factor of two (i.e., doubled and halved) while specific storage was increased and decreased by a factor of ten. The change in net groundwater discharge to receivers compared to the base case for end of construction, end of operations, and end of closure is presented in Table 5.12. Only lakes and watercourses with a moderate or higher net groundwater discharge to receiver (> 0.001 m^3/s) are included in Table 5.12; the table does not include a sensitivity analysis for baseline conditions because the baseline model is steady state, consequently, changes in aquifer storage properties do not influence results.

Table 5.12 Sensitivity Analysis Summary: Varying Specific Yield (Sy) and Specific Storage (S)

Receiver	Net Groundwater Discharge to Receiver (m^3/s)[1]								
	End of Construction			End of Operations			End of Closure		
	Base Case	Decreased Sy/S	Increased Sy/S	Base Case	Decreased Sy/S	Increased Sy/S	Base Case	Decreased Sy/S	Increased Sy/S
Lakes									
Susan Lake	2.4E-03	2.3E-03	2.4E-03	2.2E-03	2.1E-03	2.4E-03	2.2E-03	2.2E-03	2.2E-03
Farley Lake	-3.7E-02	-4.3E-02	-1.8E-02	-6.0E-02	-6.1E-02	-5.9E-02	1.1E-02	1.1E-02	1.1E-02
Marie Lake	-2.2E-03	-2.2E-03	-2.2E-03	-2.3E-03	-2.3E-03	-2.2E-03	-2.3E-03	-2.3E-03	-2.3E-03
Watercourses									
Tributary of Simpson Lake (FAR3-SIM2)	1.2E-03	1.1E-03	1.2E-03	1.1E-03	1.1E-03	1.2E-03	1.1E-03	1.1E-03	1.1E-03
Water Management Features									
MRSA Contact Water Collection Ditch	8.7E-04	5.8E-04	1.5E-03	4.9E-04	3.3E-04	9.6E-04	N/A		
Interceptor Wells	1.0E-01	9.9E-02	1.0E-01	1.1E-01	1.1E-01	1.1E-01			
Open Pit	5.9E-02	3.3E-02	1.5E-01	3.3E-02	3.3E-02	3.7E-02			

Receiver	Change in Net Groundwater Discharge to Receiver Compared to Base Case (m^3/s)[2]					
	End of Construction		End of Operations		End of Closure	
	Decreased Sy/S	Increased Sy/S	Decreased Sy/S	Increased Sy/S	Decreased Sy/S	Increased Sy/S
Lakes						
Susan Lake	-1.2E-04	3.2E-05	-1.5E-04	1.7E-04	4.7E-08	1.7E-08
Gordon Lake	-5.5E-03	1.8E-02	-3.8E-04	1.1E-03	-5.0E-05	-2.9E-05
Farley Lake	-6.8E-03	1.8E-02	-5.7E-04	1.7E-03	-8.1E-05	-4.2E-05
Marie Lake	-2.4E-05	2.8E-05	-2.0E-05	3.5E-05	8.1E-09	1.4E-07
Watercourses						
Tributary of Simpson Lake (FAR3-SIM2)	-5.1E-06	7.5E-07	-3.0E-05	1.4E-05	8.0E-09	-3.0E-09
Water Management Features						
MRSA Contact Water Collection Ditch	-3.0E-04	6.3E-04	-1.6E-04	4.7E-04	N/A	
Interceptor Wells	-1.1E-03	0.0E+00	-2.0E-04	1.2E-03		
Open Pit	-2.6E-02	8.9E-02	-4.7E-04	3.5E-03		

Notes:

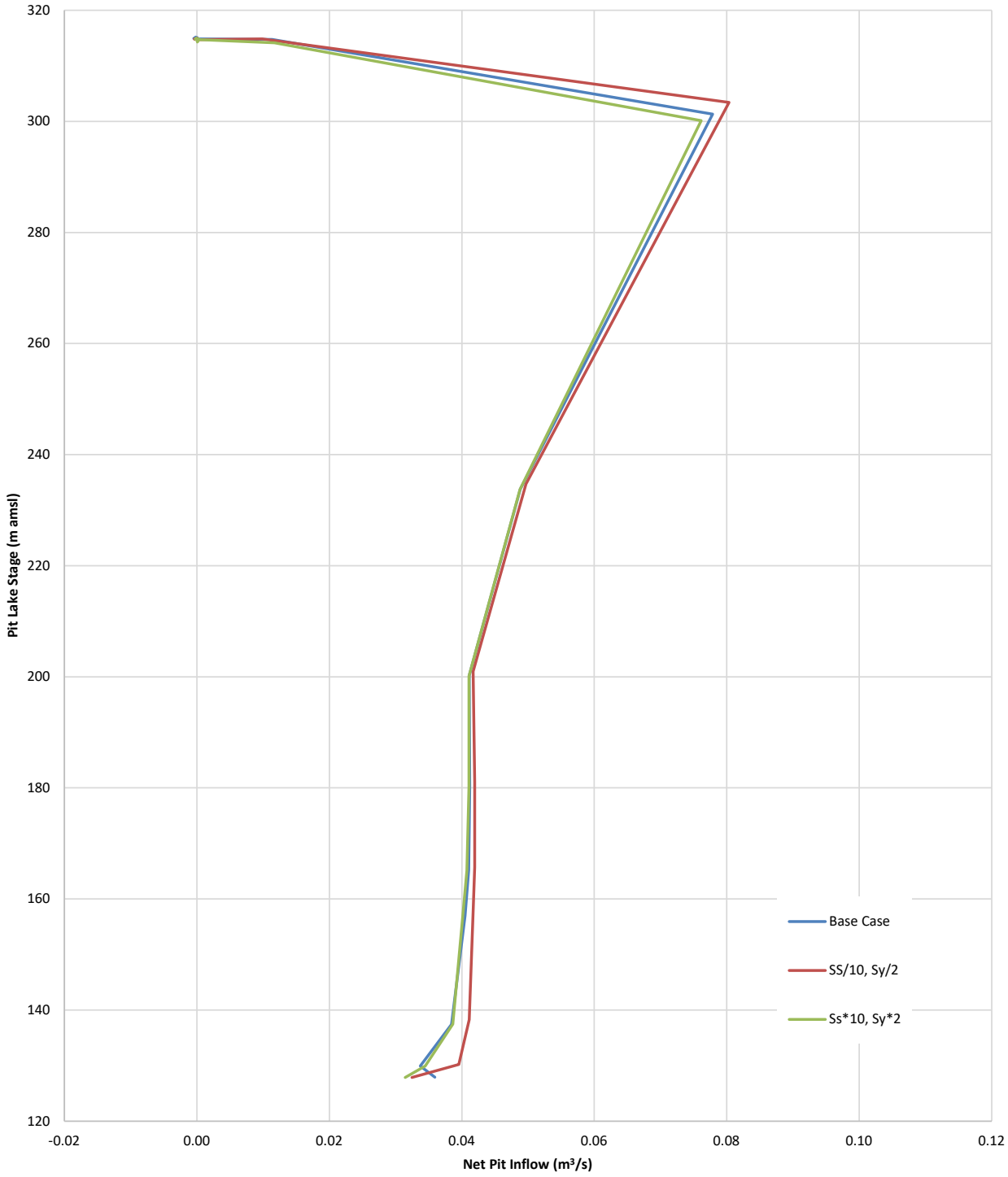
[1] Positive value represents flow from groundwater to receiver

[2] Change presented is predicted flow in the Mining Period minus flow simulated in Baseline

N/A – not applicable – feature not present in the modelled timeframe or at the end of the period indicated

Of the lakes and rivers assessed, net groundwater discharge to Farley Lake is most sensitive to changes in specific yield and specific storage. Overall, net groundwater discharge to lakes and rivers is less sensitive to decreases in specific yield and specific storage than increases.

Net groundwater discharge to the open pit is more sensitive to changes in specific yield and specific storage than the net groundwater discharge to the MRSA contact water collection ditch and the interceptor wells. This is an expected result as the capture zone over where groundwater is contained in storage is larger for the open pit compared to the MRSA contact water collection ditch and the interceptor wells. The sensitivity of predicted open pit filling rate and stage in closure to changes in specific yield and specific storage is presented on Figure 5-3. As indicated on Figure 5-3, the groundwater inflow rate to the pit is not very sensitive to changes in specific yield and specific storage and is more sensitive to reductions than increases. The maximum groundwater inflow to the pit for the base case, decreased specific yield and storage, and increased specific yield and storage simulations are 0.114, 0.117, and 0.112 m^3/s, respectively. Changes in specific yield and specific storage do not affect the predicted final stage of approximately 315 m amsl, as expected.



Notes:

Client/Project

Alamos Gold Inc.
Lynn Lake Gold Project
Gordon Site

Figure No.

5-3

Title

Sensitivity of Predicted Open Pit Filling Rate and Stage to Storage in Closure

Stantec

5.6 Comparison of Model Results to the EIS

The results of the model predictions for the current mine plan presented herein were compared with the predicted effects from the EIS (Stantec 2020a). A comparison of the current modelled mine plan, based on the Feasibility Study Update (Alamos 2023), with the EIS mine plan (Stantec 2020d) is presented in Table 5.13 for those mine features that have the potential to effect groundwater quantity or quality.

Table 5.13 Gordon Site Feature Footprint Layout Changes

Feature	Proposed Footprint Layout Area (ha)	EIS Footprint Layout Area (ha)
Mine Rock Storage Area	60.17	65.41
Open Pit	36.72	29.01
Ore Storage/Ore Stockpiles	8.80	3.38
Historical North MRSA	removed in construction	7.77
Historical South MRSA	2.59	12.95

The predicted groundwater inflow rate to the open pit at the end of operations is similar (within 10%) to that predicted for the EIS. Since the EIS, a pumping test and additional modelling was completed to support detailed design of the interceptor well system. The interceptor well system is designed to intercept seepage from Gordon and Farley lakes prior to entering the open pit and return the water to the lakes to mitigate potential changes in lake level due to open pit dewatering. Capturing the water prior to entering the open pit is anticipated to limit effects of blasting residual and metal leaching on quality of groundwater and therefore limit potential treatment prior to returning the water to the lakes. In the EIS, 14 interceptor wells were simulated whereas in this updated modelling 11 interceptor wells were simulated. The interceptor well locations were also shifted slightly to the south so more of the wells are located in the zone of fractured bedrock. As a result, the combined predicted pumping rate from the interceptor wells increased from approximately 0.014 m^3/s in the EIS to 0.085 m^3/s (to offset seepage from Farley and Gordon lakes) and 0.11 m^3/s (to offset lake seepage and reduce groundwater inflows to open pit) in this updated modelling.

The water table drawdown related to open pit dewatering is slightly smaller (the extent is about 200 to 500 m smaller) than that predicted in the EIS. The smaller drawdown cone is the result of increased seepage from Gordon and Farley lakes to the open pit compared to that in the EIS.

Similar to the EIS, the seepage from lakes and rivers remains consistent with baseline conditions throughout the various phases of mine life, except for Gordon and Farley Lakes. In both the EIS and this model update, Gordon and Farley lakes are predicted to shift from gaining from groundwater to losing to groundwater. The change in rate of seepage from Gordon and Farley lakes at the end of operation was predicted as 0.028 m^3/s in the EIS and 0.13 m^3/s in this updated modelling. The interceptor wells were optimized in terms of number of wells and pumping rate to offset the increased seepage from the lakes to the open pit which is why the pumping rate was increased to 0.11 m^3/s in this updated modelling. The

effect to water levels in Gordon and Farley lakes from the Project are predicted to be mitigated by the use of the interceptor wells in both the EIS and this updated modelling.

Receptors of groundwater seepage from mine infrastructure remained consistent with the EIS, except for Simpson Lake. A portion of seepage (2.2E-05 m^3/s or 3% of seepage from the MRSA) is predicted to discharge to Simpson Lake whereas in the EIS there was no predicted seepage from the MRSA to Simpson Lake. The rate of seepage from the MRSA to Simpson Lake represents 0.8% of the overall predicted groundwater discharge to Simpson Lake and therefore is not anticipated to affect the water quality of Simpson Lake. A full assessment of the effect of groundwater discharge on surface water quality is assessed in the water balance and water quality model update provided under separate cover.

Predictions of travel time of seepage from mine infrastructure also changed relative to the EIS. The porosity of the upper, intermediate, and deep bedrock in the EIS groundwater flow model was 0.2. In this model update, the porosity of the shallow bedrock and faulted shallow bedrock was set to 0.06 and 0.0003, respectively while the porosity for the upper, intermediate, and deep bedrock layers was set to 0.0001. The porosity of the shallow bedrock (faulted and unfaulted) was calibrated in the groundwater flow model to the results of pumping tests. These porosity values reflect discussions and sensitivity analysis completed through the Information Requests subsequent to the submission of the EIS (IR-IAAC-83, IR-IAAC-R2-72). The porosity does not affect the flux, or specific discharge, of groundwater through the rock, the porosity only affects the predicted timing of seepage from the mine infrastructure discharging to the receiver. As a result, the predicted travel times of seepage from mine infrastructure decreases from tens to thousands of years in the EIS to a few years to tens of years in this model update. The predictions of seepage rates and travel times from mine infrastructure is conservative in that processes along the groundwater flow path such as dispersion and geochemical reactions were not simulated and would serve to increase groundwater flow travel times and decrease concentrations along the groundwater flow path.

Compared with the results of the EIS (Stantec 2020a), the effects of the Project on groundwater remained similar and where they differed (i.e., Gordon and Farley Lake), mitigation measures were simulated to mitigate the potential effect. In conclusion, the results of the updated groundwater assessment do not change the characterization of residual effects, or the significance ratings summarized for groundwater as presented in the EIS (Stantec 2020d).

6 Prediction Confidence

The assessment of baseline conditions and the inferred conceptualization of groundwater processes are based on applying industry standards and practices under quality assurance and quality control programs.

The three-dimensional groundwater flow modelling was conducted using a model calibrated to within an acceptable range of error for groundwater levels and pumping tests to establish baseline conditions. Predictions made using the three-dimensional groundwater flow model are based on several conservatively protective assumptions to reduce the influence of uncertainty in the predictions. Therefore, the confidence in the predictions made using the three-dimensional groundwater flow model is considered high.

Groundwater recharge rates of the MRSA to the receiving environment is conservatively over predicted in closure. The recharge rate in closure is assumed to be the fully saturated recharge rate whereas the MRSA is predicted to take an additional 19 years in closure to reach a fully saturated recharge rate. Therefore, the recharge rate of the MRSA in closure is overestimated for 19 years of the closure simulation. As a result, the groundwater travel times from the MRSA to the receiving environment is predicted faster than likely to occur. In addition, the travel times of particles from the MRSAs to the receiving environments do not account for dispersion or geochemical reactions which will increase the travel times.

7 Conclusions

Hydrogeologic modelling was conducted to identify changes to groundwater levels and flow pathways to inform the assessment of potential effects of the Lynn Lake Gold Project on groundwater and surface water resources at the Gordon site. The modelling was conducted using MODLFOW and was calibrated to baseline conditions within acceptable industry standards.

The construction and operation of the open pit will require the open pit to be dewatered. This will also include dewatering from a series of interceptor wells installed between the pit and Gordon and Farley lakes that will be used to mitigate change in lake levels as a result of open pit dewatering. The dewatering of the open pit and pumping from the interceptor wells will result in the drawdown of the water table by up to 1 m over an area extending approximately 500 m to the north and 1,000 m to the southwest of the open pit. The extent of drawdown is limited to the east and west due to recharge to groundwater from Gordon and Farley lakes. The average annual groundwater inflow rate to the open pit at the end of operations is predicted as 0.033 m^3/s with the interceptor wells pumping at a combined rate of 0.11 m^3/s.

The dewatering of the open pit and interceptor wells will also result in changes to groundwater discharge conditions in lakes and watercourses located near the open pit. Changes in groundwater discharge to most surface water features will remain similar to baseline conditions throughout operations except for Gordon and Farley lakes. Gordon and Farley lakes shift from gaining to losing as a result of dewatering operations. However, these effects will be mitigated by using the groundwater interceptor wells to return water to the lakes.

Groundwater discharge to surface water features associated with the MRSA represents a minor component of the overall surface water flow systems. The modelling results will be considered in the assessment of potential effects on the receiving environment.

Compared with the results of the EIS (Stantec 2020a), the effects of the Project on groundwater remained similar and where they differed (i.e., Gordon and Farley lakes), mitigation measures were simulated to mitigate the potential effect. In conclusion, the results of the updated groundwater assessment do not change the characterization of residual effects, or the significance ratings summarized for groundwater as presented in the EIS (Stantec 2020d).

8 References

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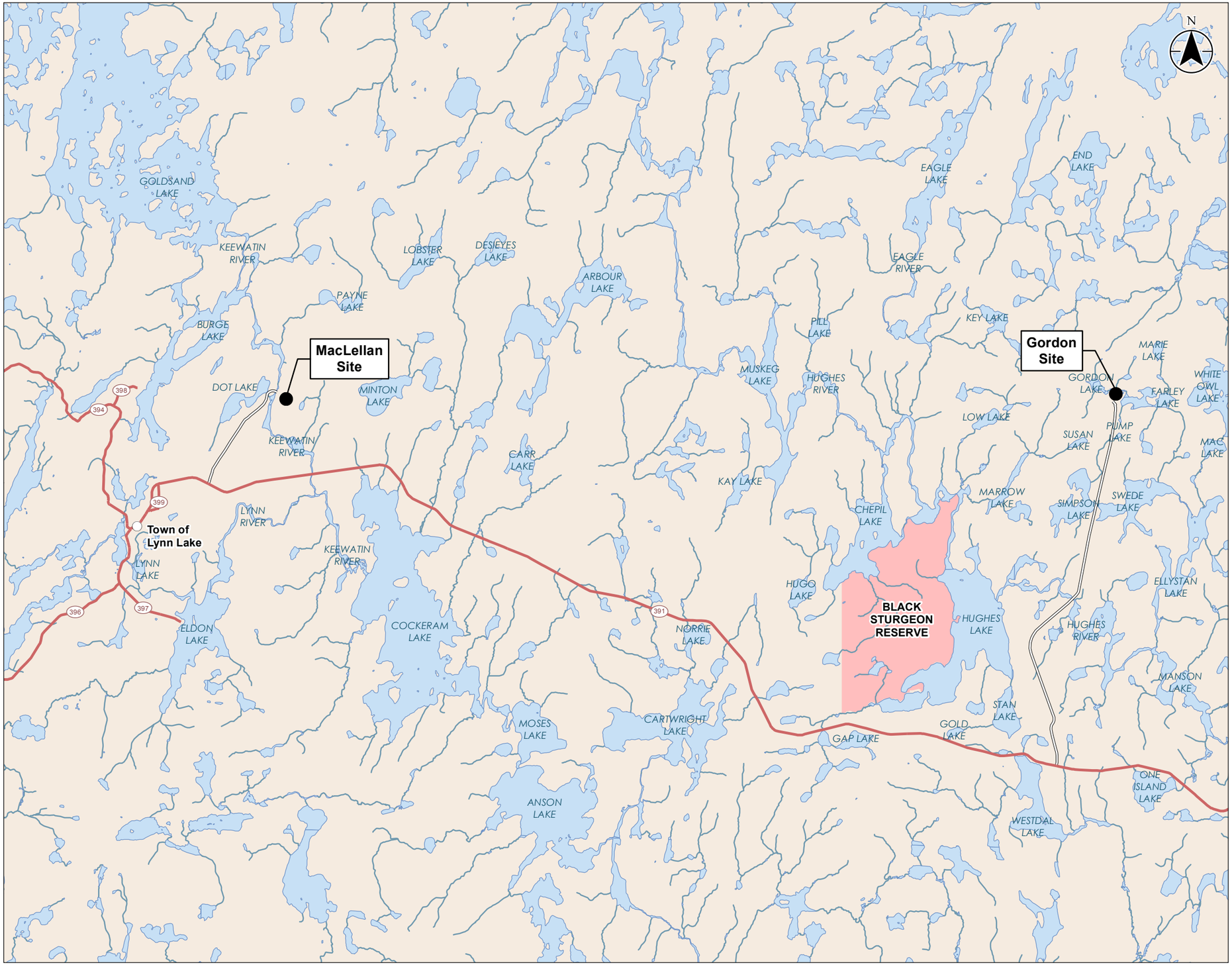
Appendices

Appendix A Maps



Stantec

Landbase

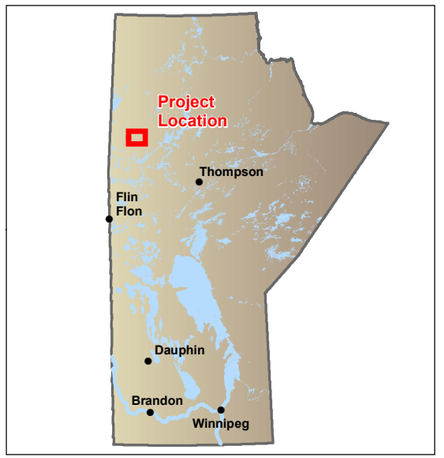
- Existing Access Road
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

0 4 8 Kilometres

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

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.



Project Location
MacLellan and Gordon Site
Lynn Lake, Manitoba

111473003

Prepared by AC on 2018-03-16
Technical Review by MF on 2018-03-19

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
1

Title
Location of the Proposed MacLellan and Gordon Mine Sites in Northwestern Manitoba

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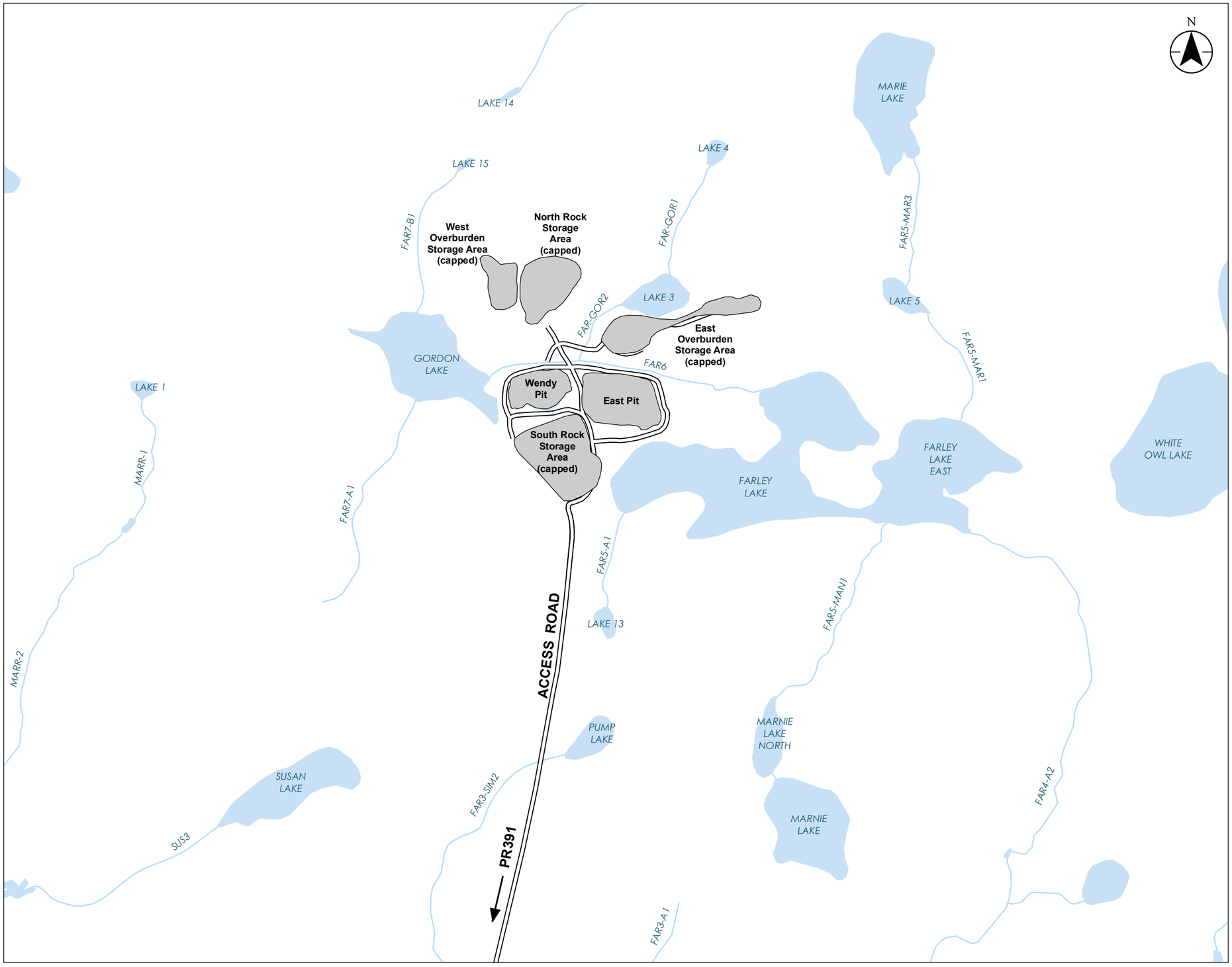


Stantec

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

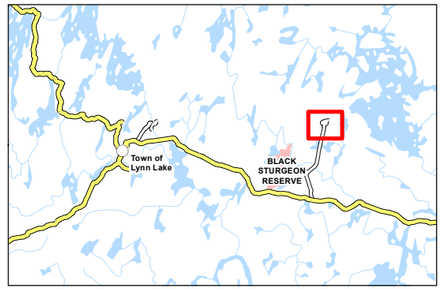
Landbase

- Existing Access Road
- Watercourse
- Waterbody

0 0.5 1 Kilometre
1:20,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.



Project Location
Gordon Site
Lynn Lake, Manitoba

111473000

Prepared by AC on 2024-10-16
Technical Review by MF on 2024-10-16

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
2

Title
Historical Project Infrastructure

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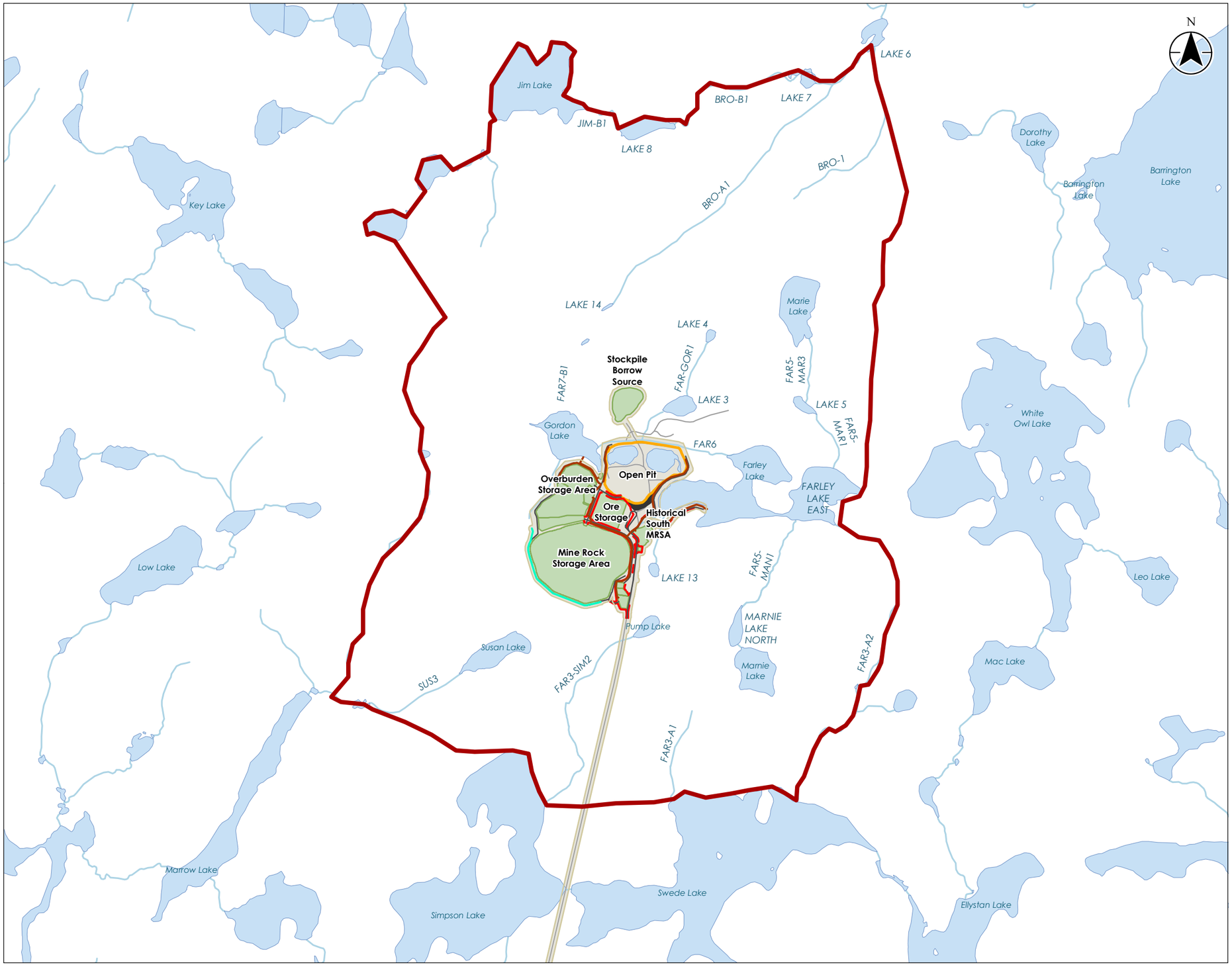

Stantec

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Proposed Infrastructure
- Contact Water Ditch
- Mine Site Road
- Diversion Ditch
- Discharge Pipeline

Study Area

- Study Area

Landbase

- Existing Access Road
- Watercourse
- Waterbody
- Remnant Historical Mine Rock Pile

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

111473076

Prepared by AC on 2024-10-17
Technical Review by AD on 2024-10-17

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
3

Title
Site Plan

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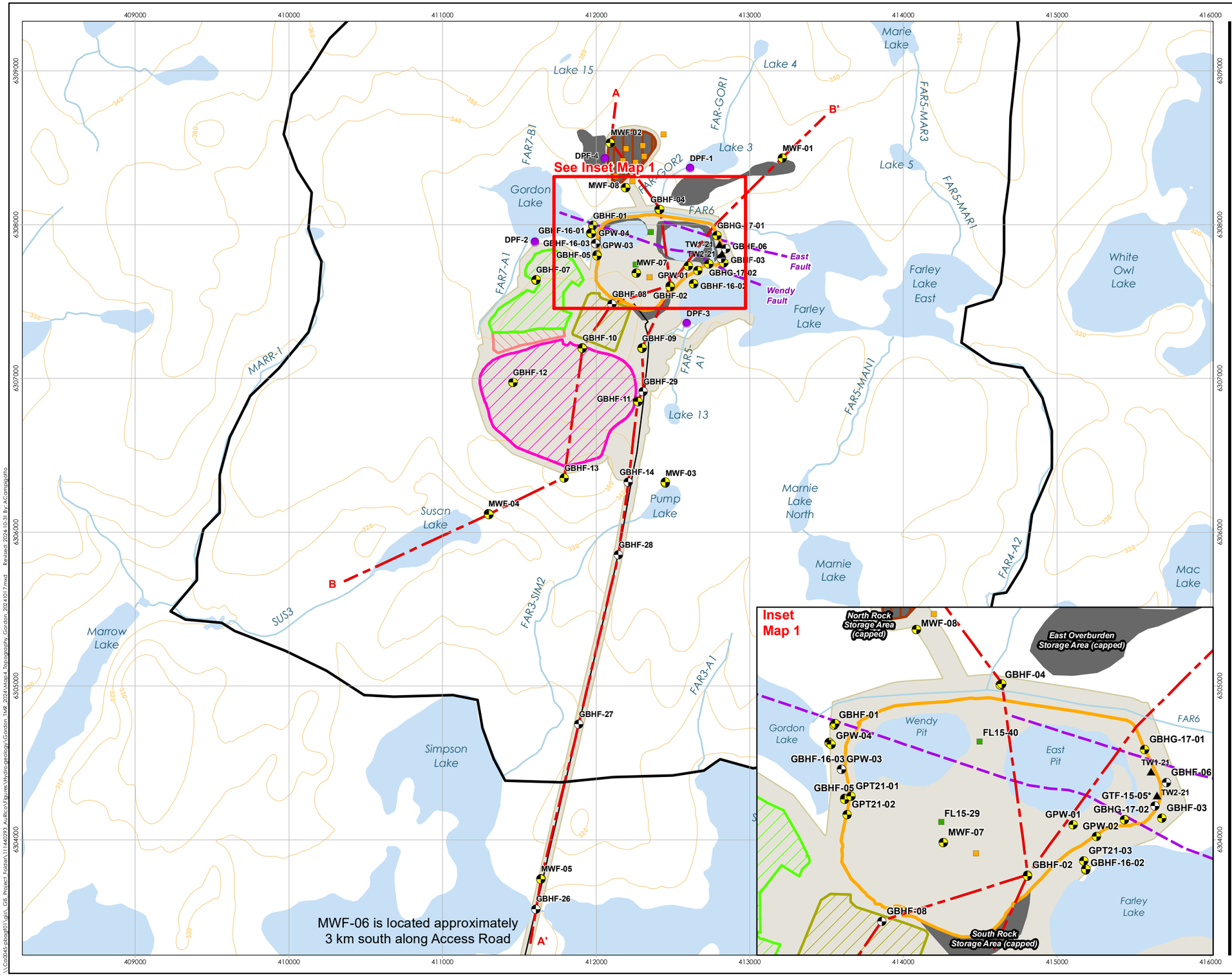

Stantec

Project Infrastructure

- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area

- Study Area

Survey Locations

- Borehole
- Drive-Point Piezometers
- Monitoring Well
- Exploration Borehole
- Test Pit
- Test Well
- Cross Section Locations

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Landbase

- Existing Access Road
- Fault Zone
- Elevation Contours (m)
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 AC on 2024-10-17
Technical Review by AD on 2024-10-17

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
4

Title
Topography of Study Area and Monitoring Well Locations

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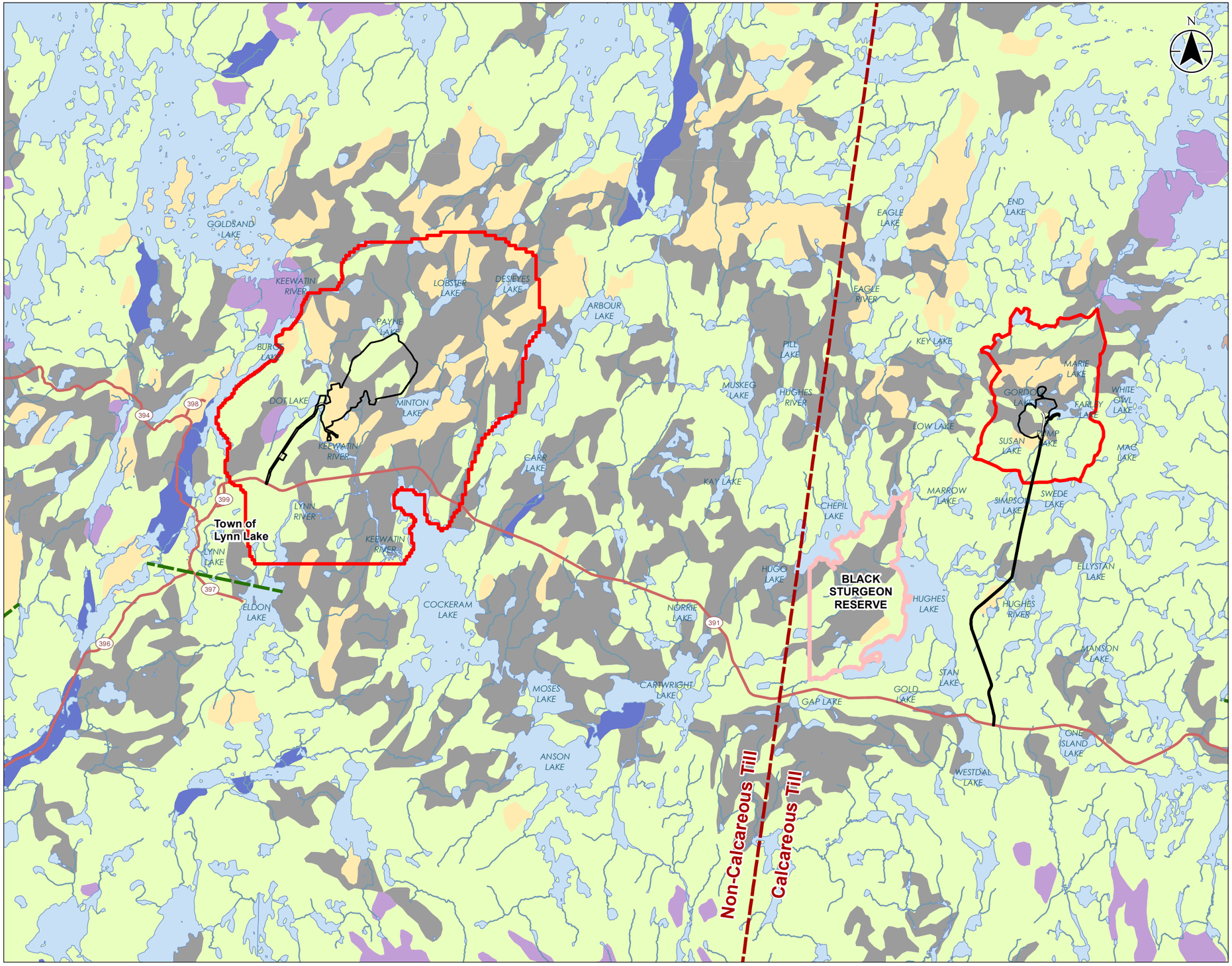

Stantec

Project Infrastructure
- Project Development Area

Study Area
- Study Area

Surficial Geology
- Organic Deposits
- Marginal Glaciolacustrine Sediments
- Offshore Glaciolacustrine Sediments
- Proximal Glaciofluvial Sediments
- Sand Diamicton
- Precambrian Terrane

Landbase
- Approximate Western Extent of Calcarious Till
- Approximate Locations of Eskers
- Existing Access Road
- Highway
- Watercourse
- Waterbody
- First Nation Reserve

0 5 10 Kilometres

1:175,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
MacLellan and Gordon Site
Lynn Lake, Manitoba

111473076

Prepared by ACampigotto on 2024-08-20
Technical Review by BAyumu on 2024-08-20

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5

Title
Surficial Geology

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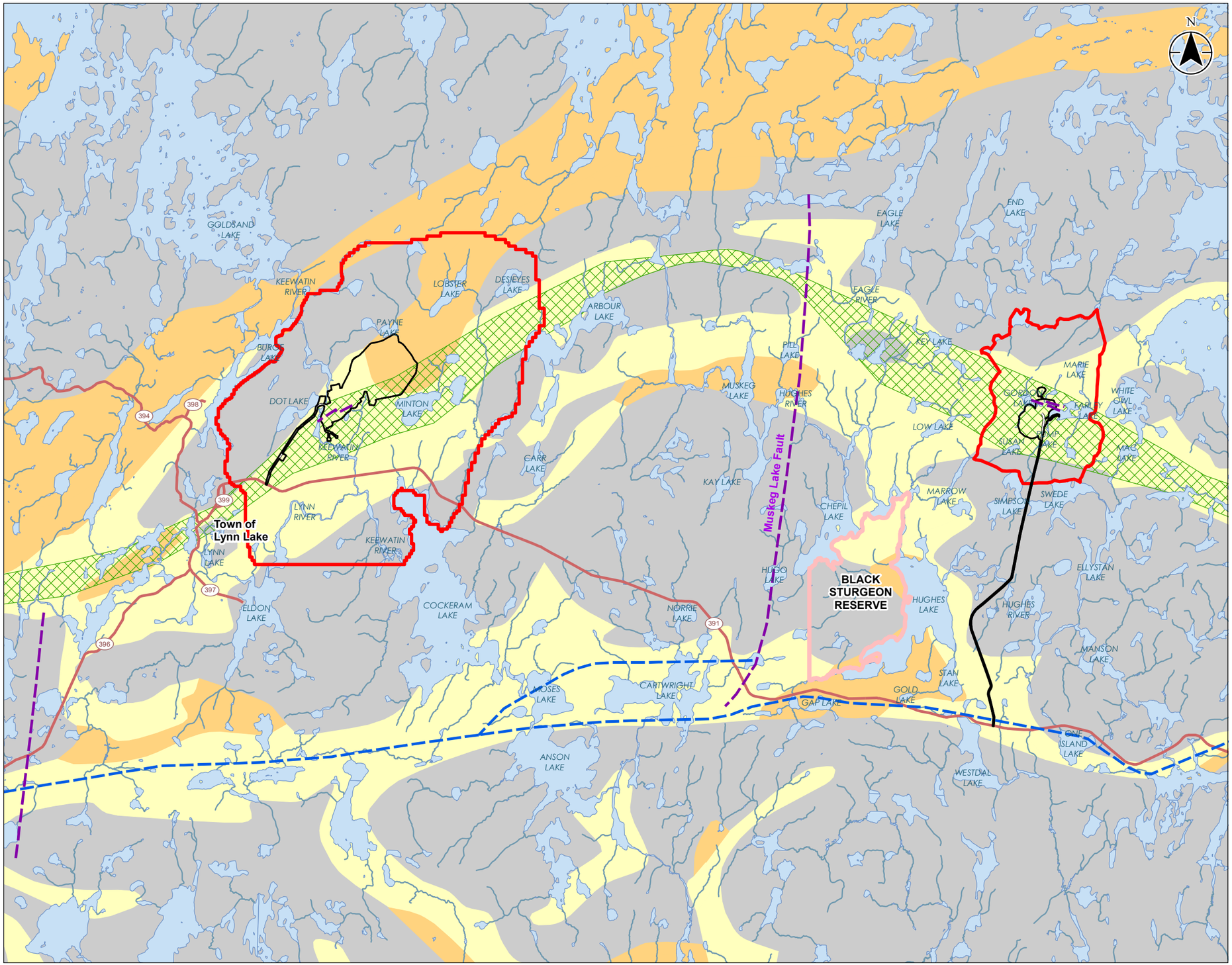

Stantec

Project Infrastructure
- Project Development Area

Study Area
- Study Area

Bedrock Geology
- Intrusive Rocks
- Metamorphic and Metasedimentary Rocks
- Metavolcanic Rocks (includes Amisk and Wasekwan Groups and Great Island volcanic rocks)

Landbase
- Approximate Location of Fault
- Approximate Location of Johnson Shear Zone
- Existing Access Road
- Highway
- Watercourse
- Approximate Location of Agassiz Metallatect / Greenstone Belt
- Waterbody
- First Nation Reserve

0 5 10 Kilometres
1:175,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location 111473076
MacLellan and Gordon Site
Lynn Lake, Manitoba
Prepared by AC on 2024-11-19
Technical Review by AD on 2024-11-19

Client/Project
Alamos Gold Inc.
Lynn Lake Gold Project
Gordon Site

Map No.
6

Title
Bedrock Geology

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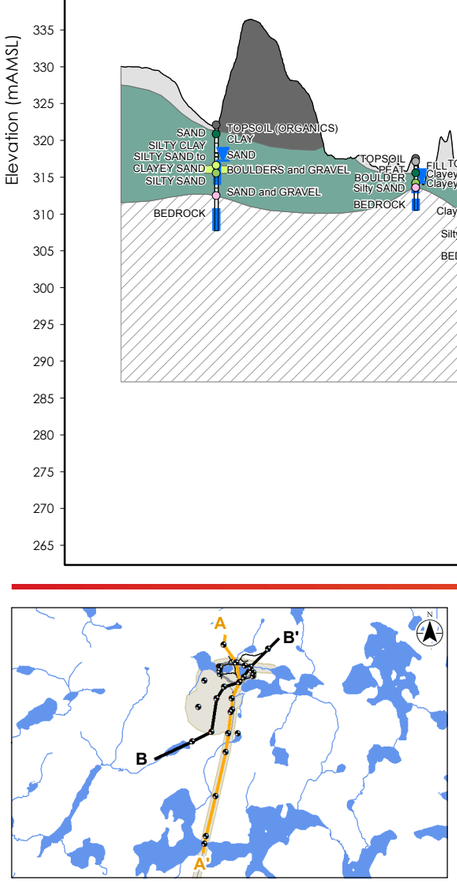
A
NORTH

A'
SOUTH

Elevation (mAMSL)

MWF-02A (OS 0 m)
GBHF-04A (OS 4 m)
GBHF-05A (OS 444 m)
GBHF-06 (OS 391 m)
GBHF-02A (OS 0 m)
Cross-Section B-B'
GBHF-09A (OS 0 m)
GBHF-29 (OS 0 m)
GBHF-11A (OS 0 m)
GBHF-14 (OS 0 m)
GBHF-28 (OS 0 m)
GBHF-27 (OS 0 m)
MWF-05A (OS 0 m)
GBHF-26 (OS 0 m)

Historical West Overburden Storage Area
Proposed Pit Outline Storage Area
Historical South Rock Storage Area



MW1-15 (OS m)
Sand
Well ID (Offset)
Stratigraphy
Water Level (Sept. 25-29, 2015)
Well Screen

Fill
Organics
Glaciofluvial
Glaciolacustrine Nearshore
Glaciolacustrine Offshore
Diamicton
Bedrock
Ground Surface

Rock Dump
Fill/Organics
Glaciolacustrine
Glaciofluvial
Diamicton
Bedrock

20x Vertical Exaggeration
0 0.5 1 km
1:17,500 (At original document size of 11x17)

Notes
1. Manual water level measurements from September 25 to 29, 2015.

Stantec

Project Location
Farley Lake Site
Lynn Lake, Manitoba

111440293 REVA
Prepared by PRM on 2015-12-10

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
7

Title
Cross-Section A-A'

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B
SOUTHWEST

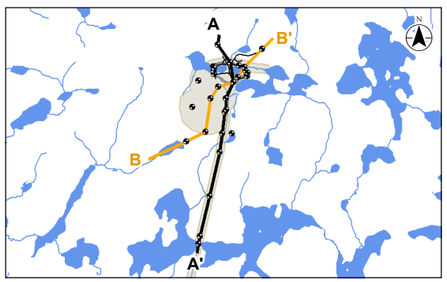
B'
NORTHEAST

Elevation (mAMSL)

MWF-04A (OS 6m)
GBHF-13 (OS 0m)
GBHF-12 (OS 418m)
GBHF-10A (OS 0m)
GBHF-08 (OS 0m)
GBHF-D03 (OS 475m)
GBHF-02A (OS 0m)
Cross-Section A-A'
GPW-01 (OS 18m)
GBHF-06 (OS 149m)
GBHF-D05 (OS 0m)
MWF-01A (OS 1m)

Susan Lake
Historical South Rock Storage Area
Proposed Pit Outline
Historical East Overburden Storage Area

PEAT
SAND and GRAVEL
BEDROCK
TOPSOIL SAND
FILL - SAND and GRAVEL
BOULDER
SILTY SAND
BEDROCK
ORGANICS and COBBLES and BOULDERS
SAND
SANDY CLAYEY SILT
SILT and SAND
BOULDERS
SILT and SAND
SILTY SAND
BEDROCK
Sandy PEAT
SAND to Silty SAND
BEDROCK
TOPSOIL
FILL - SAND and GRAVEL
BEDROCK
TOPSOIL
ROCK FILL - SAND and GRAVEL
PEAT
Clayey SILT
Silty SAND
BEDROCK
TOP SOIL
SAND
BOULDER
SAND
BEDROCK
FILL
SILTY CLAY
SILTY SAND
PEAT
Silty SAND
BEDROCK
GRAVEL
Fibrous PEAT/TOPSOIL
SILTY CLAY
SAND and GRAVEL
Sandy CLAY
BEDROCK
TOPSOIL
SAND
SILTY SAND
BEDROCK
BEDROCK



MW1-15 (OS m)
Well ID (Offset)
Sand
Stratigraphy
Water Level
(Sept. 25-29, 2015)
Well Screen

- Fill
- Organics
- Glaciofluvial
- Glaciolacustrine Nearshore
- Glaciolacustrine Offshore
- Diamicton
- Bedrock
- Ground Surface

- Rock Dump
- Fill/Organics
- Glaciolacustrine
- Glaciofluvial
- Diamicton
- Bedrock

20x Vertical Exaggeration
0 250 500 metres
1:15,000 (At original document size of 11x17)

Notes
1. Manual water level measurements from September 25 to 29, 2015.

Stantec

Project Location
Farley Lake Site
Lynn Lake, Manitoba

111440293 REVA
Prepared by PRM on 2015-12-10

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

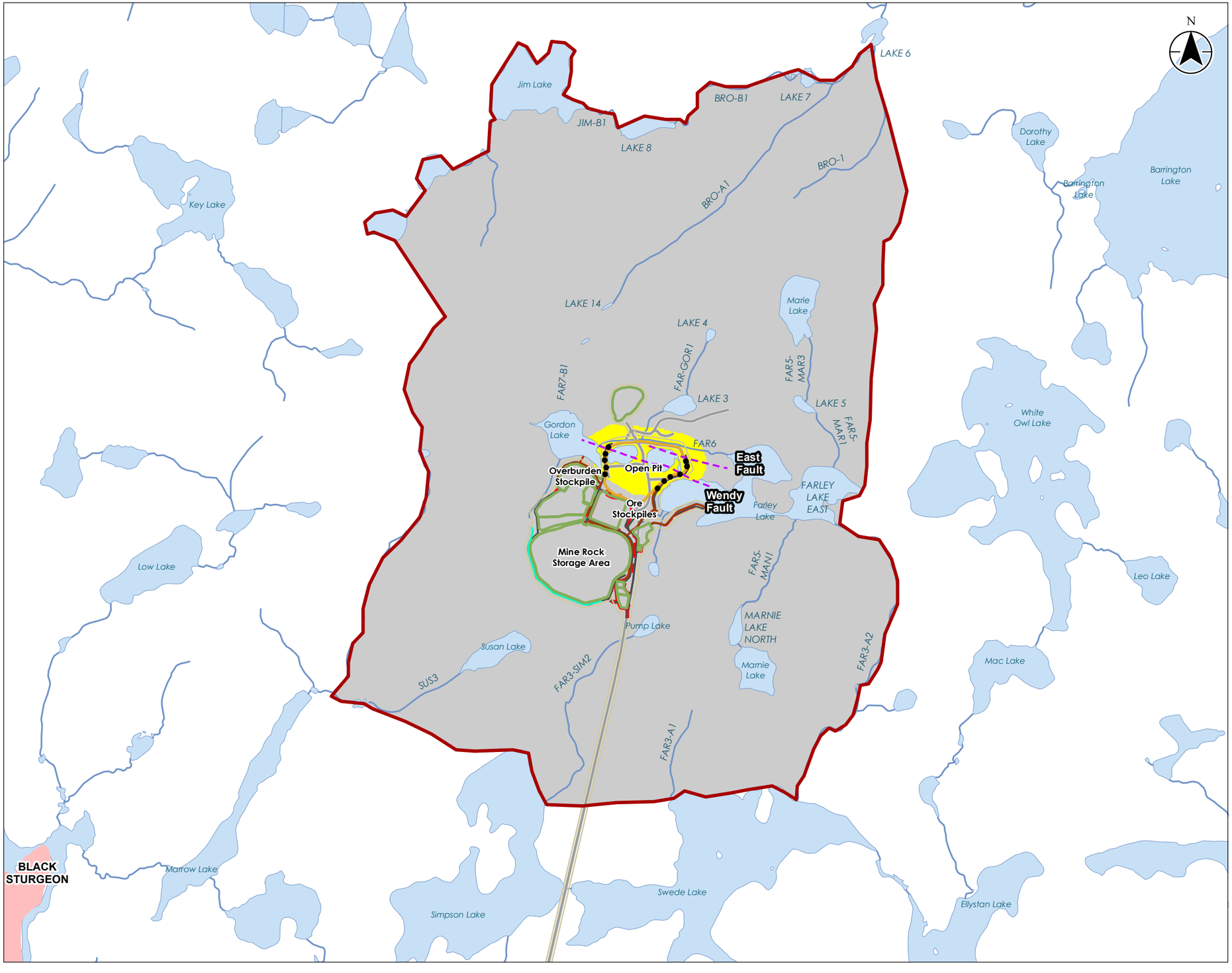
Map No.
8

Title
Cross-Section B-B'

Figure 01 of 01

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

\\Cd1004-f01\work_group\01609\active\111440293_Alamos\MXD\hydrogeology\TDR\111440293_HG_TDR_Map11_Gordon_SectionBB.mxd Revised: 2017-10-05 By: pmoser



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Stantec

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Proposed Infrastructure
- Contact Water Ditch
- Mine Site Road
- Diversion Ditch
- Discharge Pipeline

Study Area

- Study Area

Groundwater Wells and Collection Pond

- Groundwater Interceptor Wells

Bedrock Geology

- Approximate Location of Fault
- Faulted Shallow Bedrock
- Shallow Bedrock

Landbase

- Existing Access Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

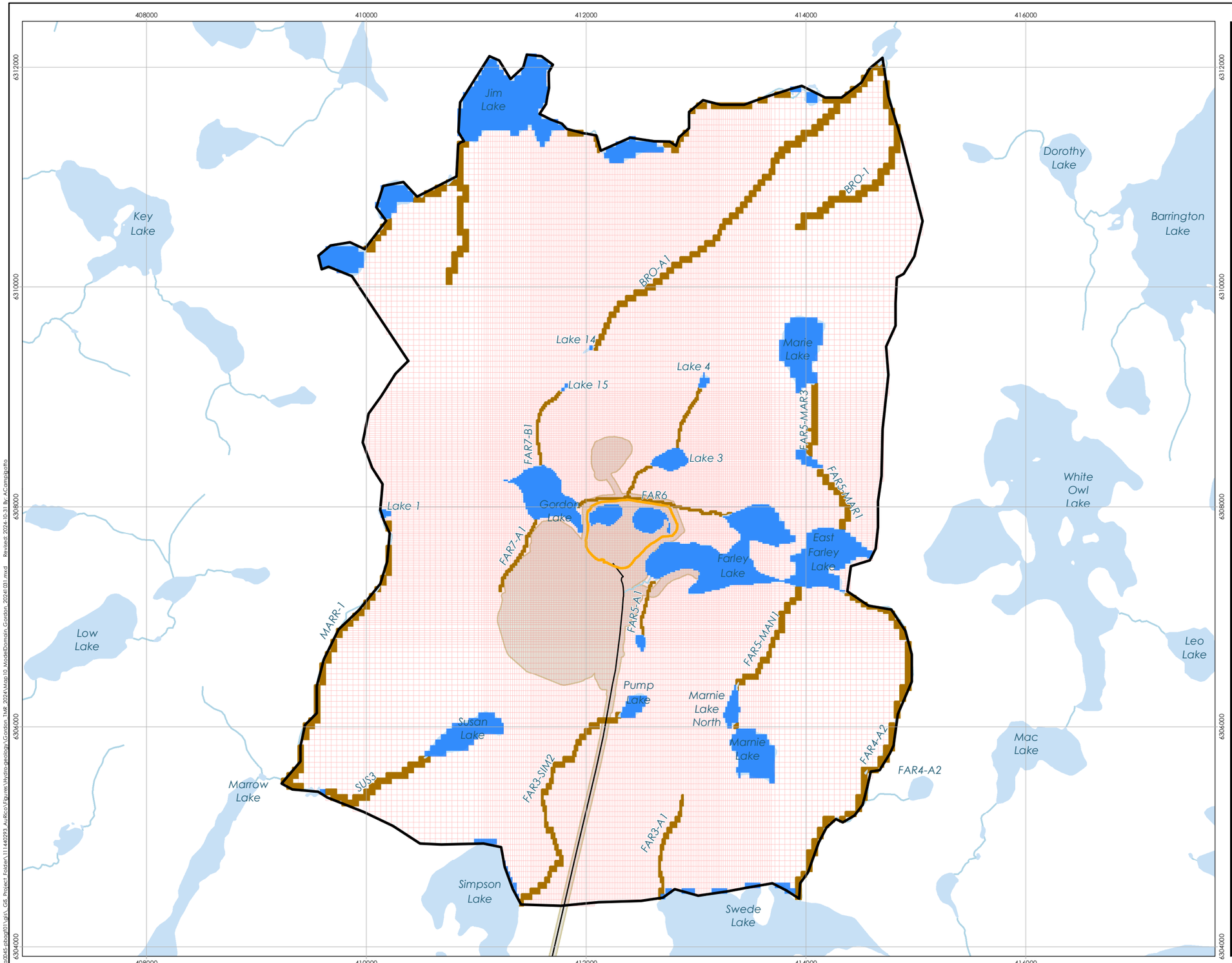
111473076

Prepared by ACampigotto on 2024-10-31
Technical Review by AD on 2024-10-31

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
9

Title
Shallow Bedrock Zones



Stantec

Project Infrastructure
- Proposed Open Pit
- Project Development Area

Study Area
- Study Area
- Watercourses (River Boundary)
- Waterbodies (General Head Boundary)
- Model Grid

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 0.5 1 Kilometre
(At original document size of 11x17)
1:35,000

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 AC on 2024-10-17
Technical Review by AD on 2024-10-17

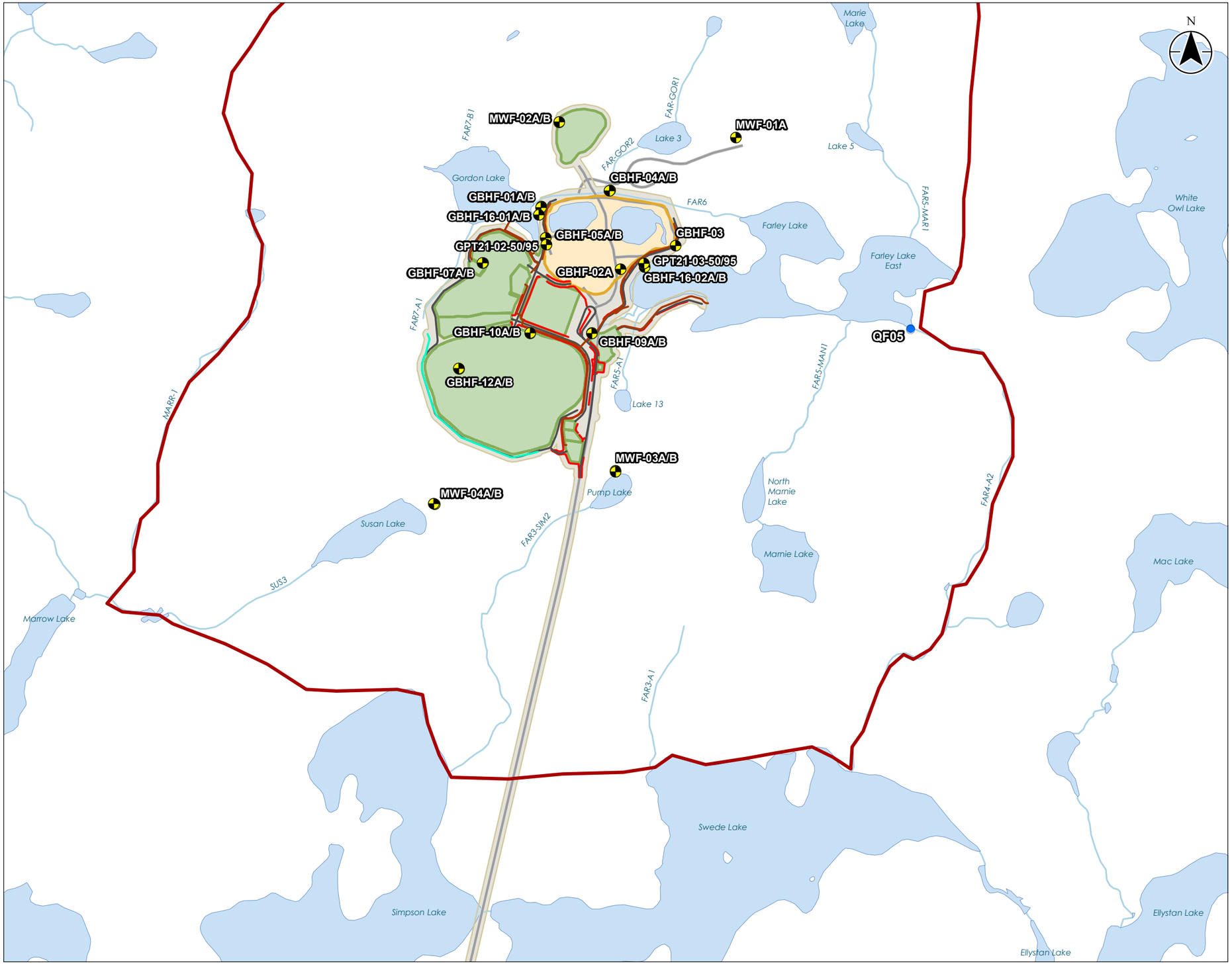
Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
10

Title
Model Domain and Boundary Conditions - Baseline Model

\\Cn0045-pbsgfl01\gis_GIS_Project_Folder\111440293 Aulfeco\Figures\Hydrogeology\Gordon_TMF_2024\Map10 ModelDomain_Gordon_20241031.mxd Revised: 2024-10-31 By: ACampagatto



Stantec

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Potential Infrastructure
- Contact Water Ditch
- Mine Site Road
- Diversion Ditch
- Discharge Pipeline

Study Area

- Groundwater Level Target
- Surface Water Calibration Target
- Study Area

Landbase

- Existing Access Road
- Watercourse
- Waterbody

0 500 1,000 Metres

1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

111473076

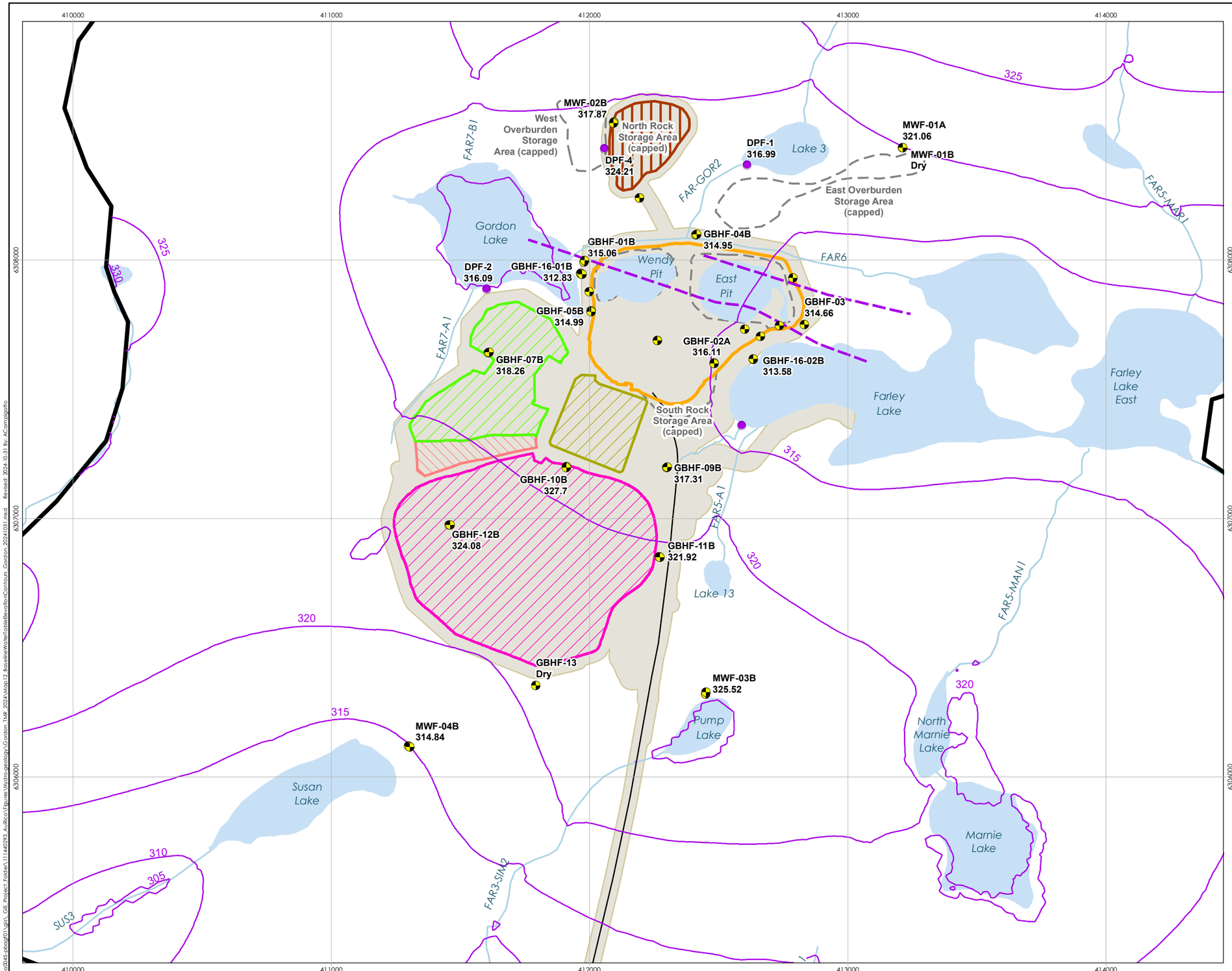
Prepared by AC on 2024-10-17
Technical Review by AD on 2024-10-17

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
11

Title
Location of Steady State Water Level and Baseflow Calibration Targets

\\Ca0245-pbsg01\gis_GIS_Project_Folder\111440293 AuRico\Figures\Hydrogeology\Gordon_TMF_2024\Map11_LocationOfSteadyStateWater Gordon_20241031.mxd Revised: 2024-10-31 By: ACampagnolo



Stantec

Project Infrastructure

- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Stockpile Borrow Source
- Project Development Area

Study Area

- Study Area

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Survey Locations

- Monitoring Well with Groundwater Elevation (mAMSL) June 25 to July 4, 2018
- Drive-Point Piezometers with Groundwater Elevation (mAMSL) June 25 to July 4, 2018
- Simulated Baseline Water Table Elevations (5 m interval)

Landbase

- Existing Access Road
- Fault Zone
- Watercourse
- Waterbody

N

0 150 300 Metres
(At original document size of 11x17)
1:15,000

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Data Sources: Government of Manitoba and Government of Canada.

111473076

Project Location
Lynn Lake, Manitoba

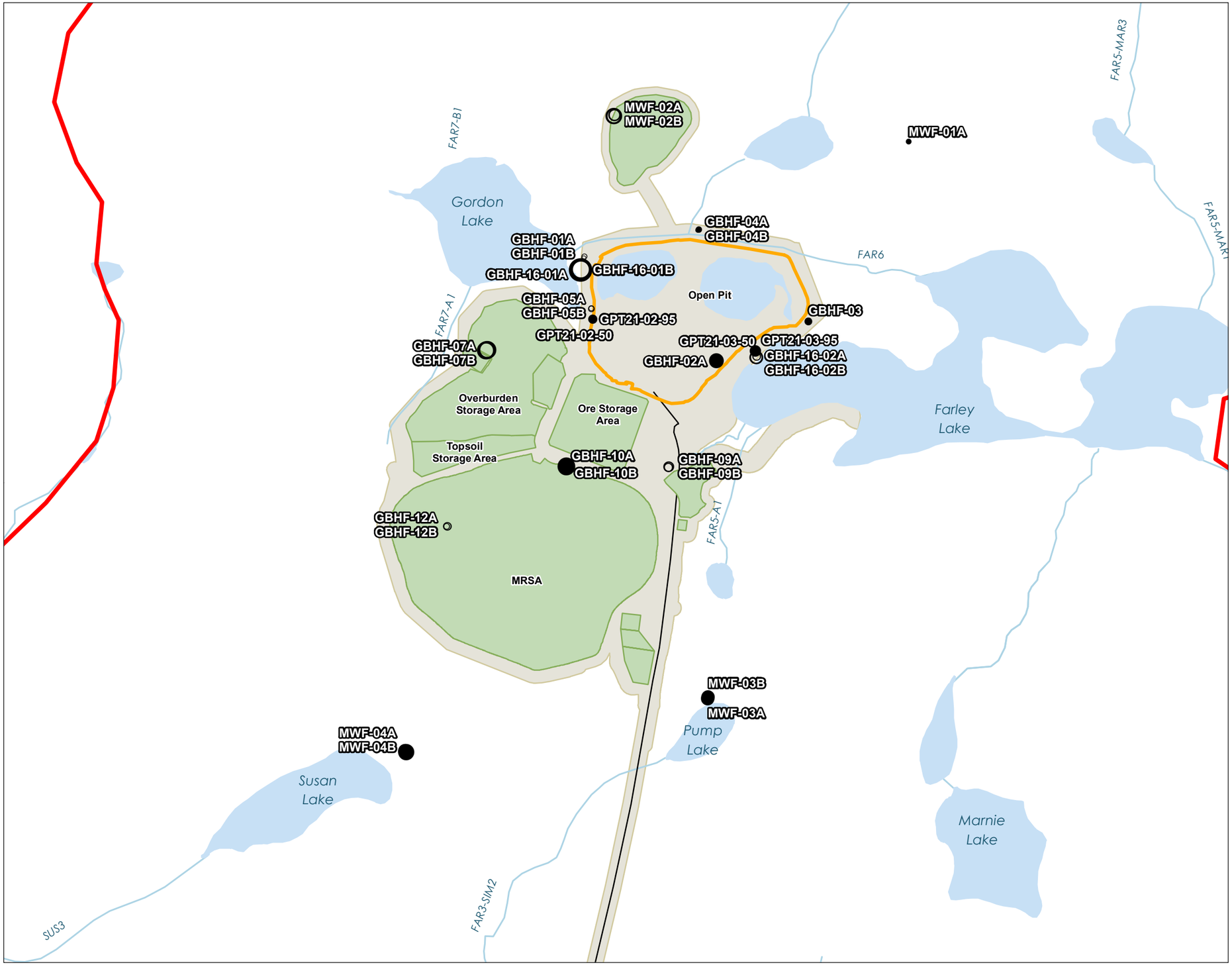
Prepared by AC on 2024-10-17
Technical Review by AD on 2024-10-17

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
12

Title
Simulated Baseline Water Table Contours and Measured Head Values

\\Cn045-pbsgfs01\gis_GIS_Project_Folder\111440293 Aurico\Figures\Hydrogeology\Gordon TMF 2024\Map12 BaselineWaterTableElevationContours_Gordon_20241031.mxd Revised: 2024-10-31 By: ACcampagnho



Stantec

Project Infrastructure
- Open Pit
- Proposed Infrastructure
- Project Development Area

Study Area

Positive Weighted Residual Errors (m)
- 0 to 1
- 1 to 2
- > 2

Negative Weighted Residual Errors (m)
- 0 to -1
- -1 to -2
- > -2

- Study Area

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 200 400 Metres
(At original document size of 11x17)
1:15,000

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 2024-12-04
Technical Review by KG on 2024-12-04

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473076

Map No.
13

Title
Spatial Distribution of Weighted Residual Errors in the Model

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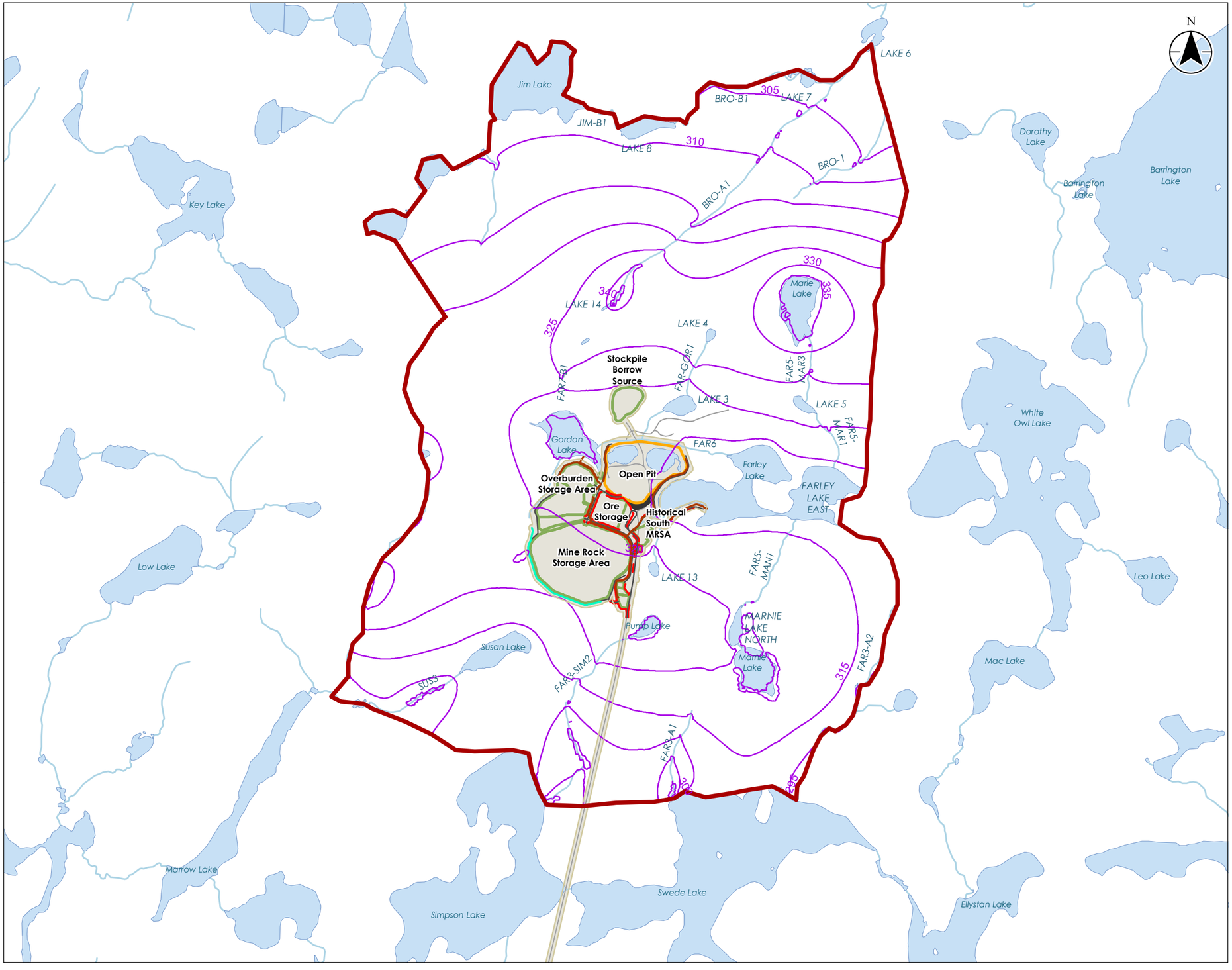


Stantec

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Proposed Infrastructure
- Contact Water Ditch
- Mine Site Road
- Diversion Ditch
- Discharge Pipeline

Study Area

- Simulated Baseline Water Table Elevations (5 m interval)
- Study Area

Landbase

- Existing Access Road
- Watercourse
- Waterbody
- Historical South MRSA

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

111473076

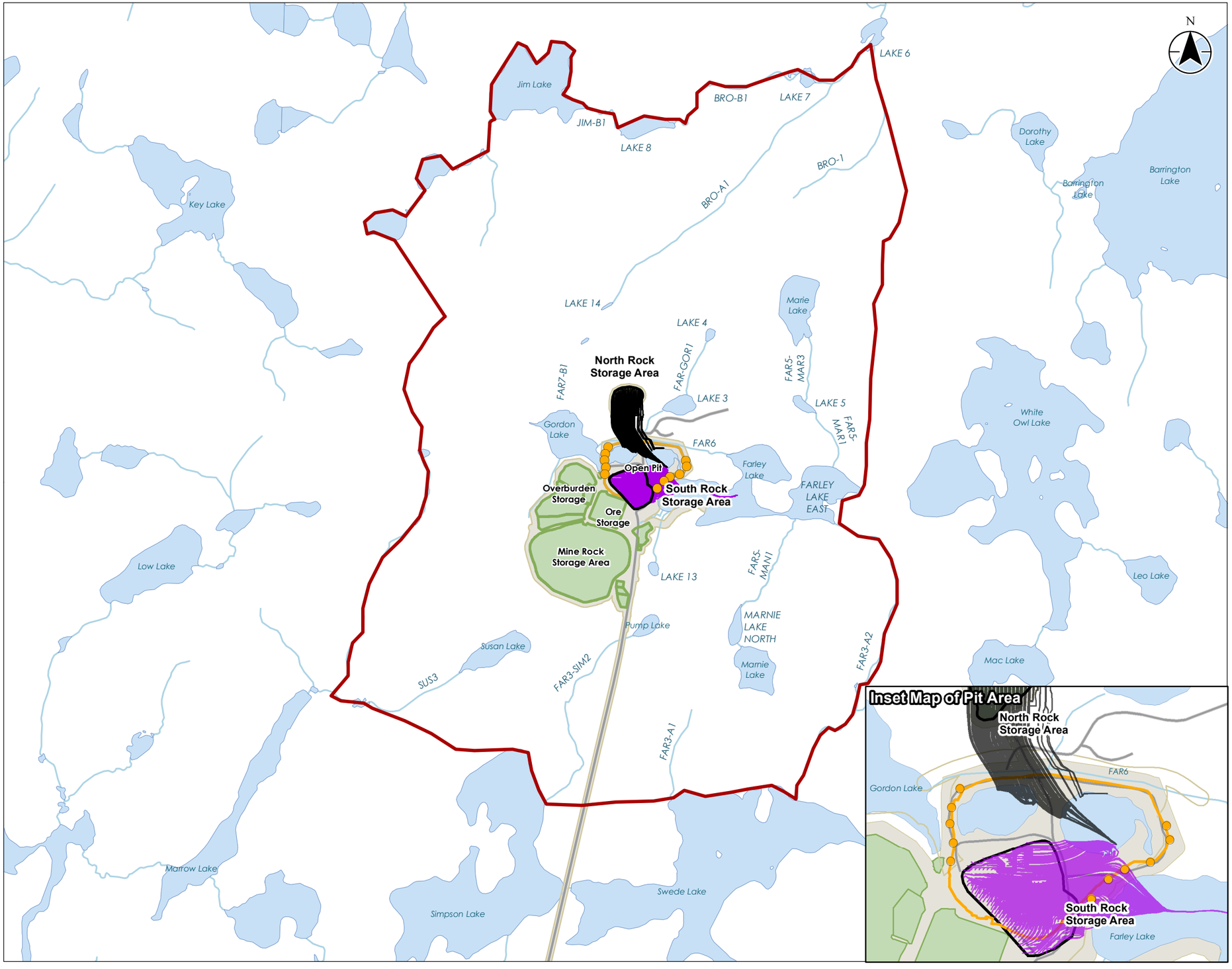
Prepared by AC on 2024-10-17
Technical Review by AD on 2024-10-17

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
14

Title
Simulated Baseline Water Table Elevation Contours

\\Cn0045-pbsgfl01\gis_GIS Project Folder\111440293_Author\Figures\Hydrogeology\Gordon_TMF_2024\Map14_SimulatedWaterTableElevations_20241203.mxd Revised: 2024-12-03 By: ACampagnolo



Stantec

Project Infrastructure
- Project Development Area
- Proposed Open Pit
- Potential Infrastructure

Study Area
- Groundwater Interceptor Wells
- Study Area

Particle Traces by Source
- North Rock Storage Area
- South Rock Storage Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Landbase
- Existing Access Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

111473076

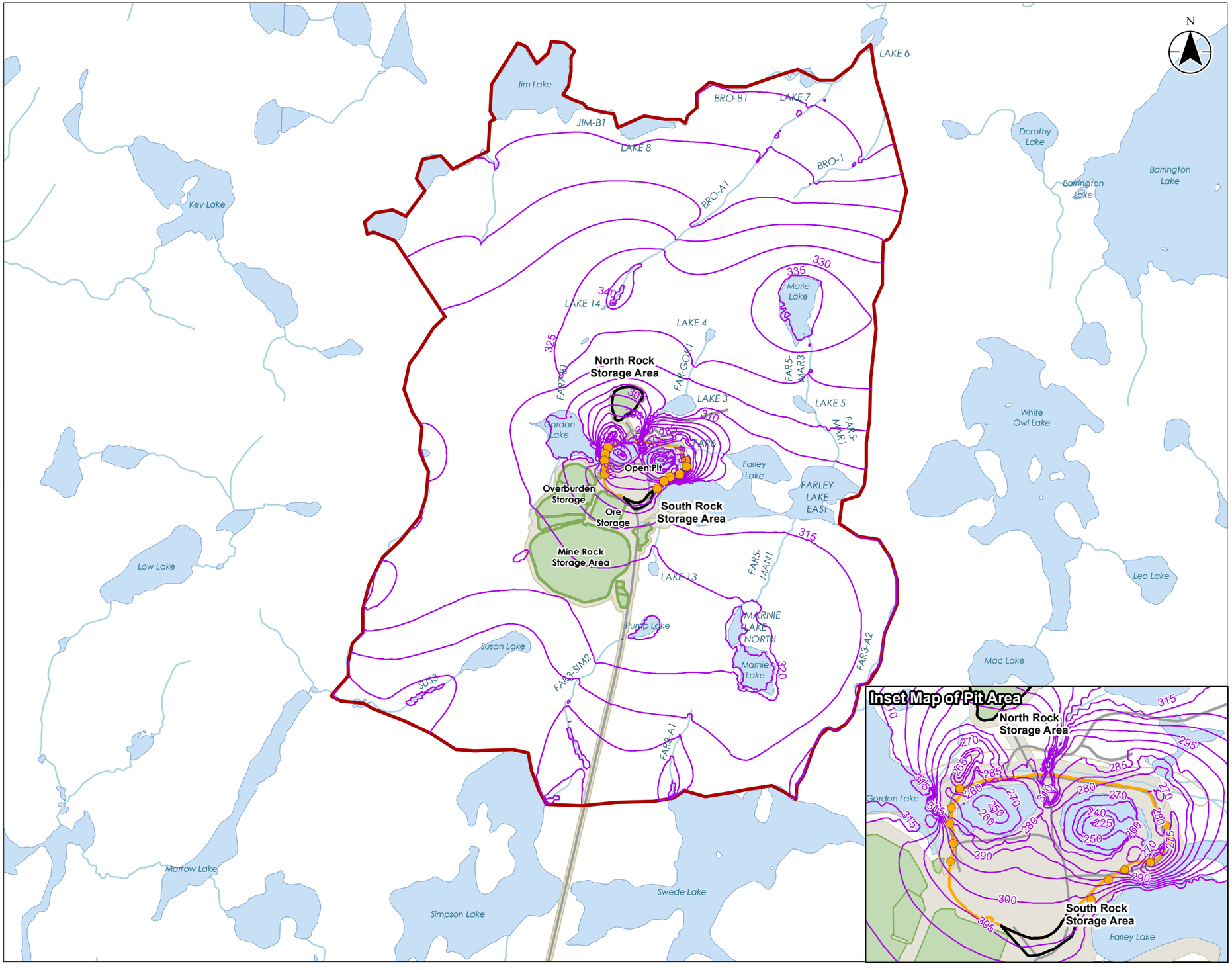
Prepared by ACampigotto on 2024-12-03
Technical Review by AD on 2024-12-03

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
15

Title
Simulated Baseline Particle Tracks

\\Cor045-pbsgfs01\gis_GIS Project Folder\111440293_Aurico\Figures\Hydrogeology\Gordon_TAR_2024\Map15_BaselineParticles_Gordon_20241203.mxd Revised: 2024-12-03 By: ACampigotto



Stantec

Project Infrastructure
- Project Development Area
- Proposed Open Pit
- Potential Infrastructure

Study Area
- Groundwater Interceptor Wells
- Water Table Elevation Contours
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Landbase
- Existing Access Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

111473076

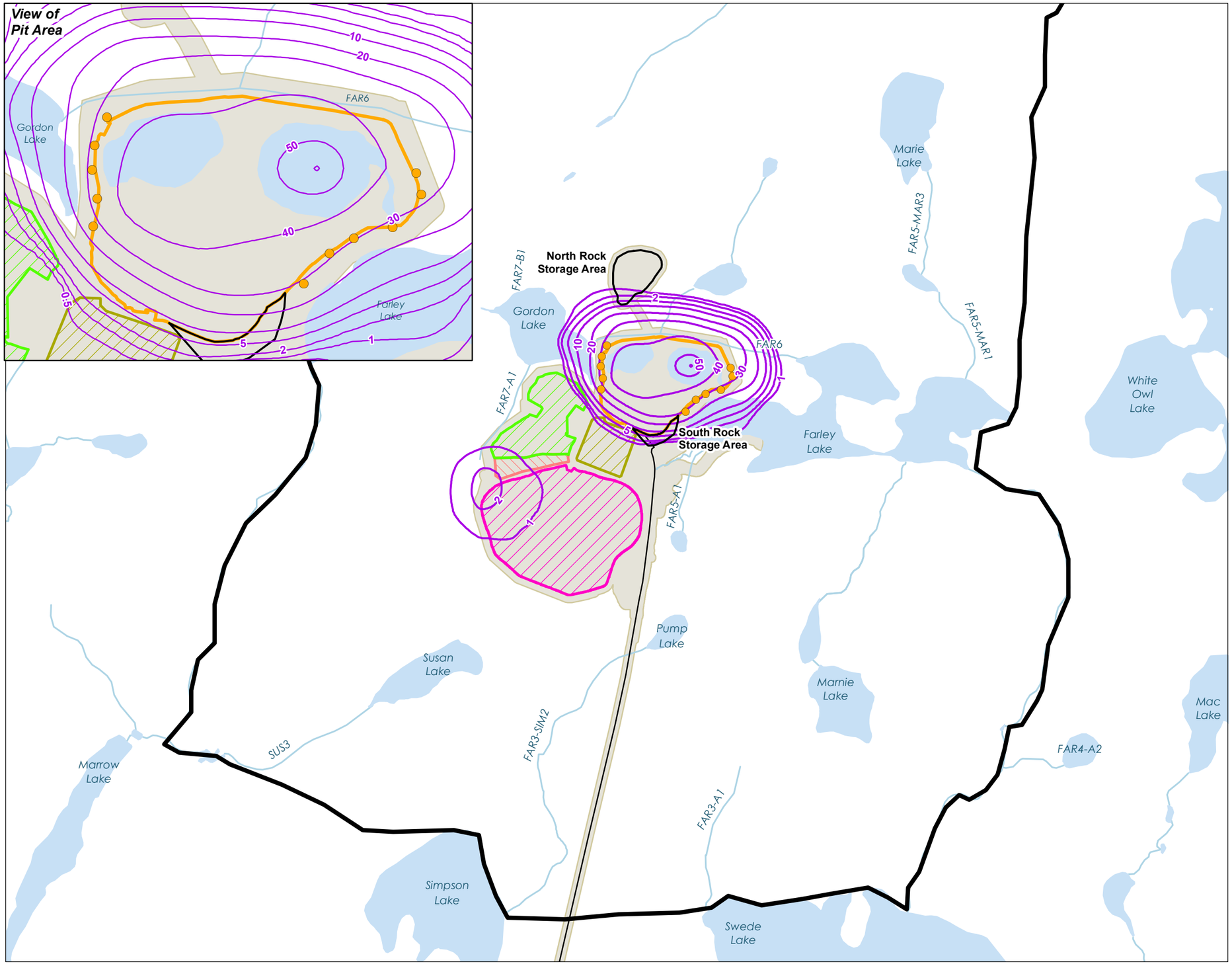
Prepared by ACampigotto on 2024-12-03
Technical Review by AD on 2024-12-03

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
16

Title
Predicted Water Table Elevation Contours at End of Construction

\\Cor045-pbogt01\gis_GIS Project Folders\111440293_AuRecon\Figures\Hydrogeology\Gordon_TMF_2024\Map16_WaterTableElevations_End_of_Construction_2024-12-03.mxd Revised: 2024-12-03 by ACampigotto



Stantec

Project Infrastructure
- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Survey Locations
- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2024-12-03
Technical Review by AD on 2024-12-03

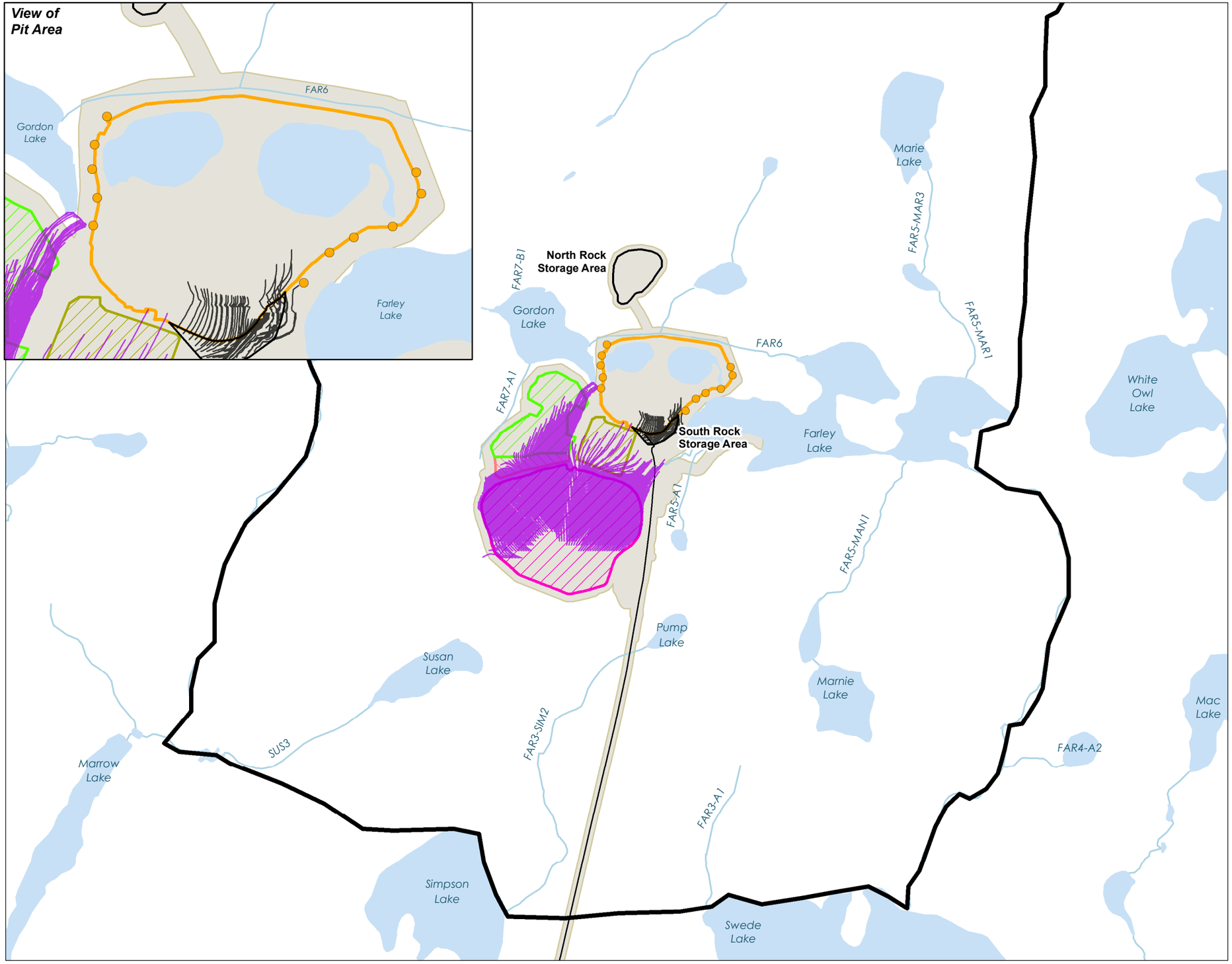
Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
17

Title
Predicted Water Table Drawdown at End of Construction

\\Cn0045-pbsgfl01.ghl\...GIS_Project_Folder\111440293_AulRec\Figures\Hydrogeology\Gordon_TWI_2024\Map17_WaterTableDrawdown_EoC_Gordon_2024 03.mxd Revised: 2024-12-03 By: ACampigotto



Stantec

Project Infrastructure
- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Survey Locations
- Groundwater Interceptor Wells

Particle Traces by Source
- Mine Rock Storage Area
- South Rock Storage Area

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2024-12-03
Technical Review by AD on 2024-12-03

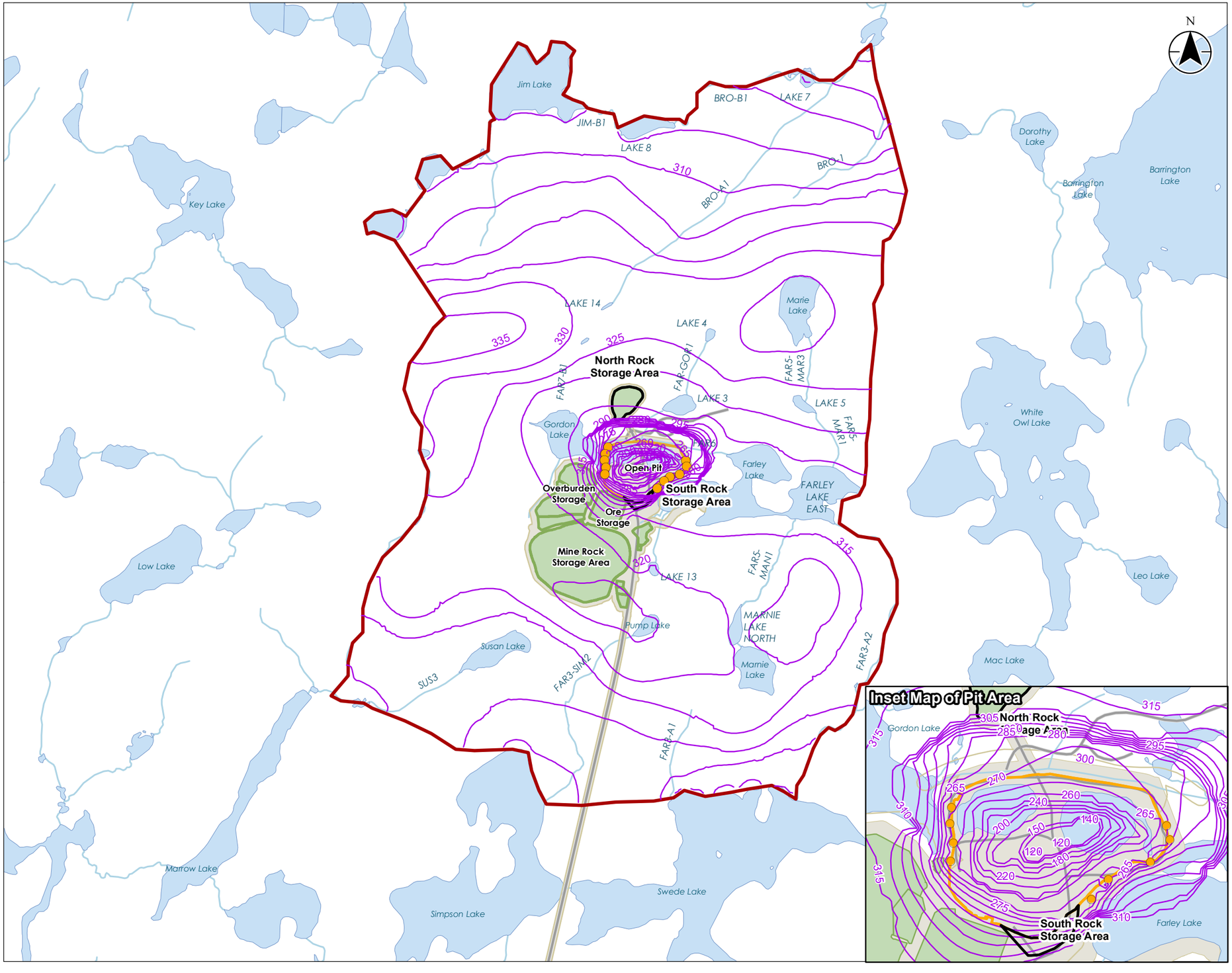
Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
18

Title
Predicted Particle Traces from MRSAs at End of Construction

\\Cor045-pbogl01\gis_GIS Project Folder\111440293_Author\Figures\Hydrogeology\Gordon_TMF_2024\Map18_ParticleTracks_EoC_Gordon_20241203.mxd Revised: 2024-12-03 By: ACampigotto



Stantec

Project Infrastructure
- Project Development Area
- Proposed Open Pit
- Potential Infrastructure

Study Area
- Groundwater Interceptor Wells
- Water Table Elevation Contours
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Landbase
- Existing Access Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location
Gordon Site
Lynn Lake, Manitoba

111473076

Prepared by ACampigotto on 2024-12-03
Technical Review by AD on 2024-12-03

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
19

Title
Predicted Water Table Elevation Contours at End of Operation

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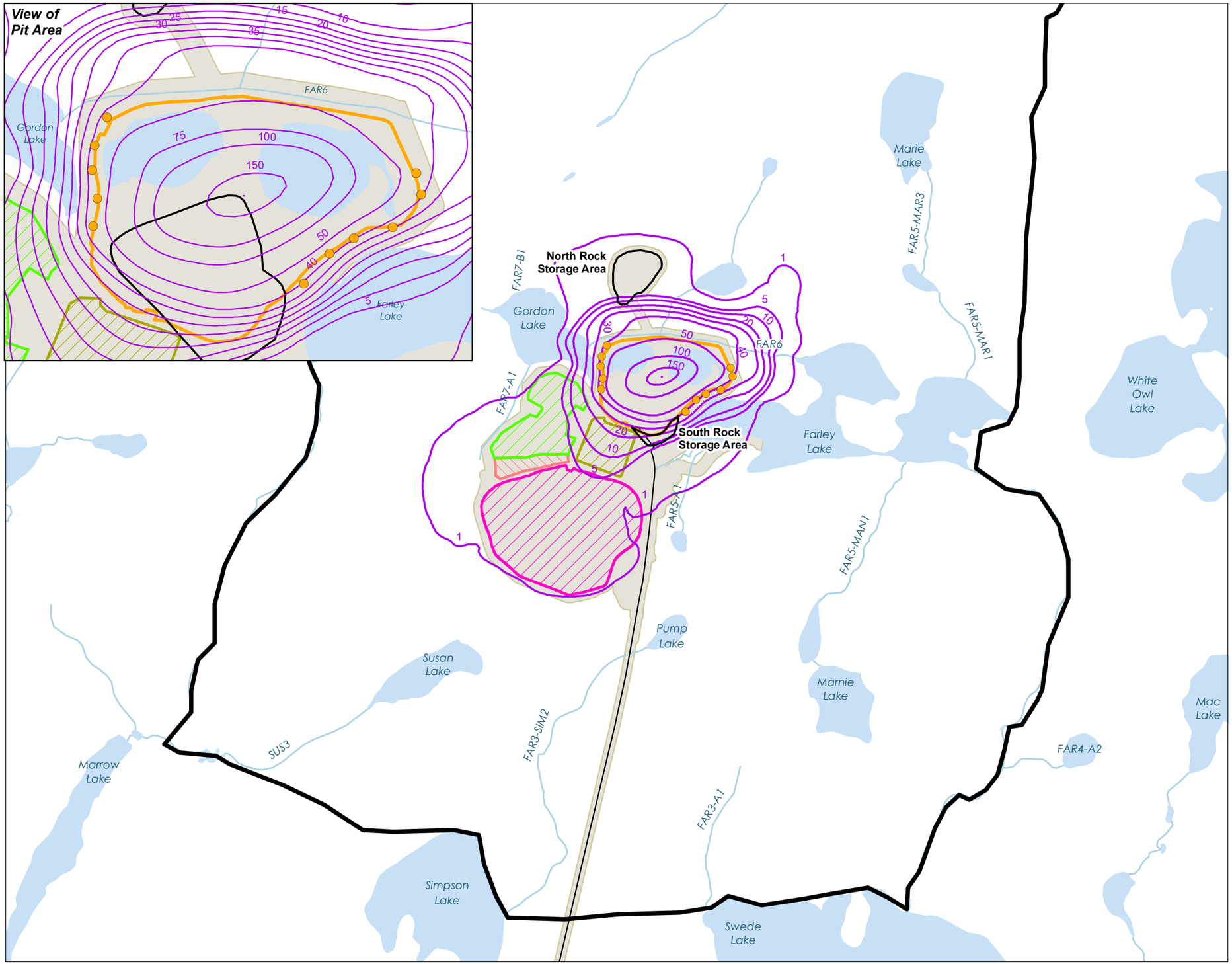


Stantec

Project Infrastructure
- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Survey Locations
- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2024-12-03
Technical Review by AD on 2024-12-03

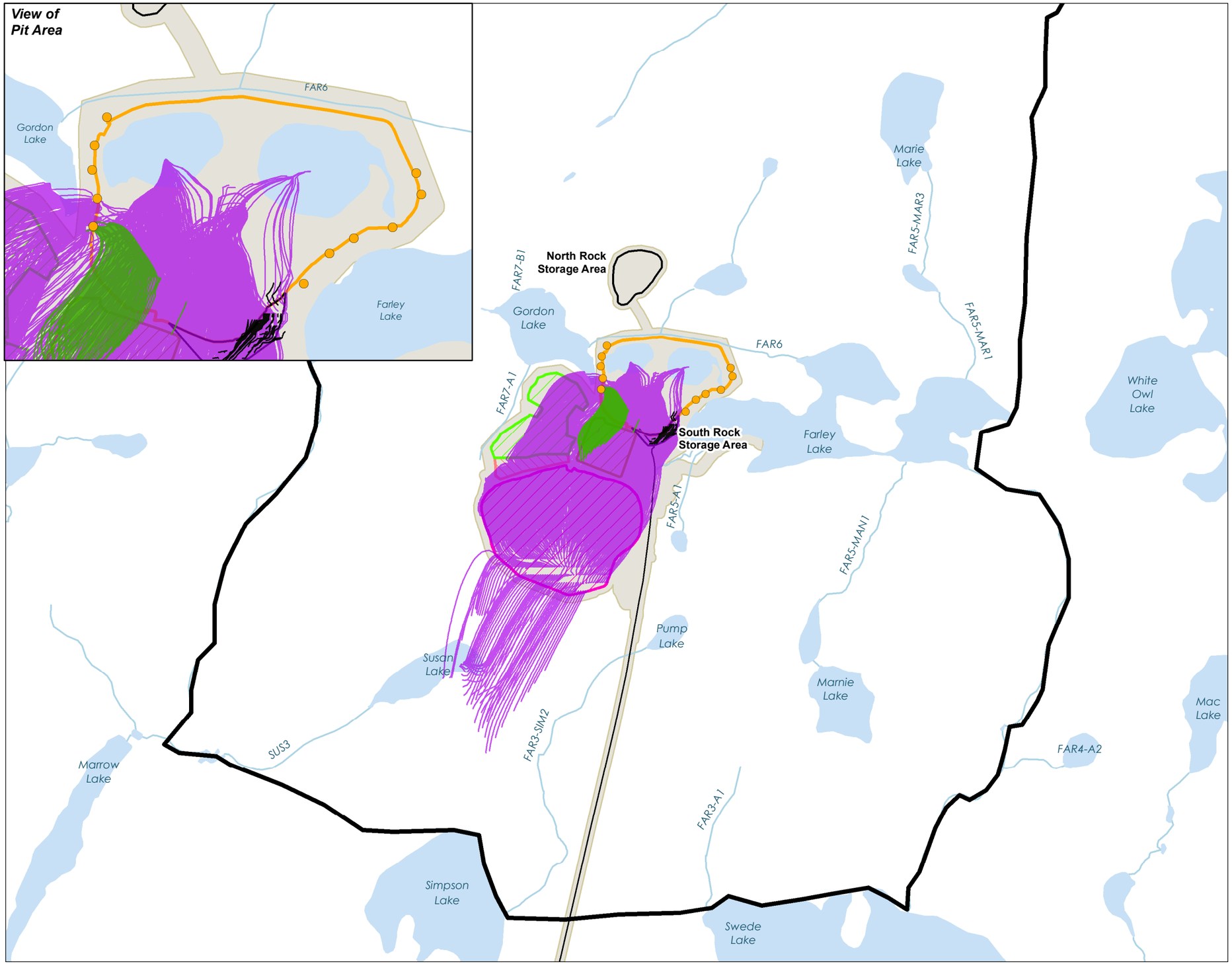
Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
20

Title
Predicted Water Table Drawdown at End of Operation

\\Cor045-pbsgfl01.ghl\...GIS_Project_Folder\111440293_AuRec\Figures\Hydrogeology\Gordon_TWI_2024\Map20_WaterTableDrawdown_EndOfOperation_Gordon_20241203.mxd Revised: 2024-12-03 By: ACampigotto



Stantec

Project Infrastructure
- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Survey Locations
- Groundwater Interceptor Wells

Particle Traces by Source
- Mine Rock Storage Area
- South Rock Storage Area
- Ore Storage Area

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2024-12-03
Technical Review by AD on 2024-12-03

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
21

Title
Predicted Particle Traces from MRSAs and OSA at End of Operations

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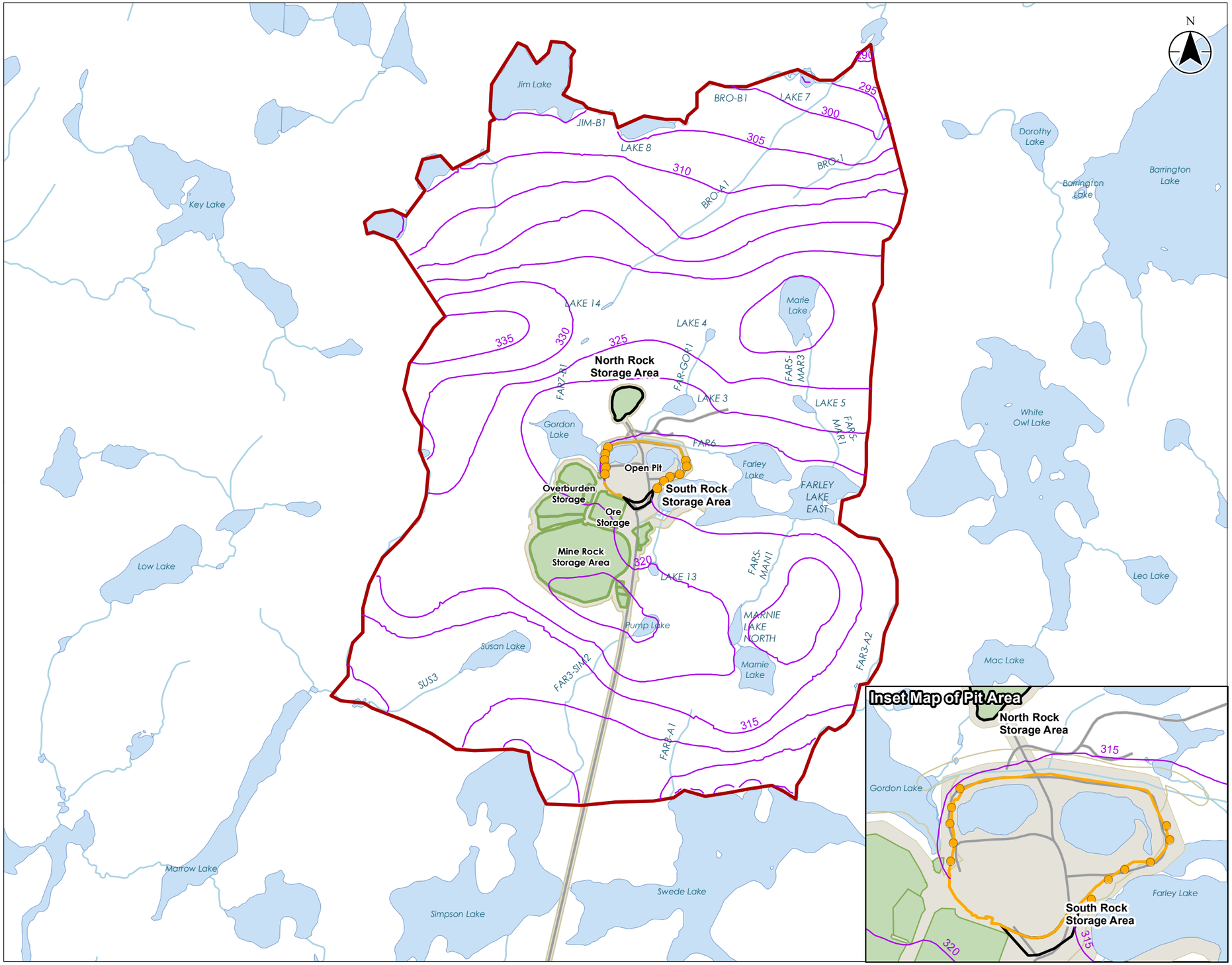


Stantec

Project Infrastructure

- Project Development Area
- Proposed Open Pit
- Potential Infrastructure

Study Area

- Groundwater Interceptor Wells
- Water Table Elevation Contours
- Study Area

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Landbase

- Existing Access Road
- Watercourse
- Waterbody

0 0.5 1 Kilometres
1:40,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base features provided by the Government of Manitoba and the Government of Canada.

Project Location 111473076
Gordon Site
Lynn Lake, Manitoba

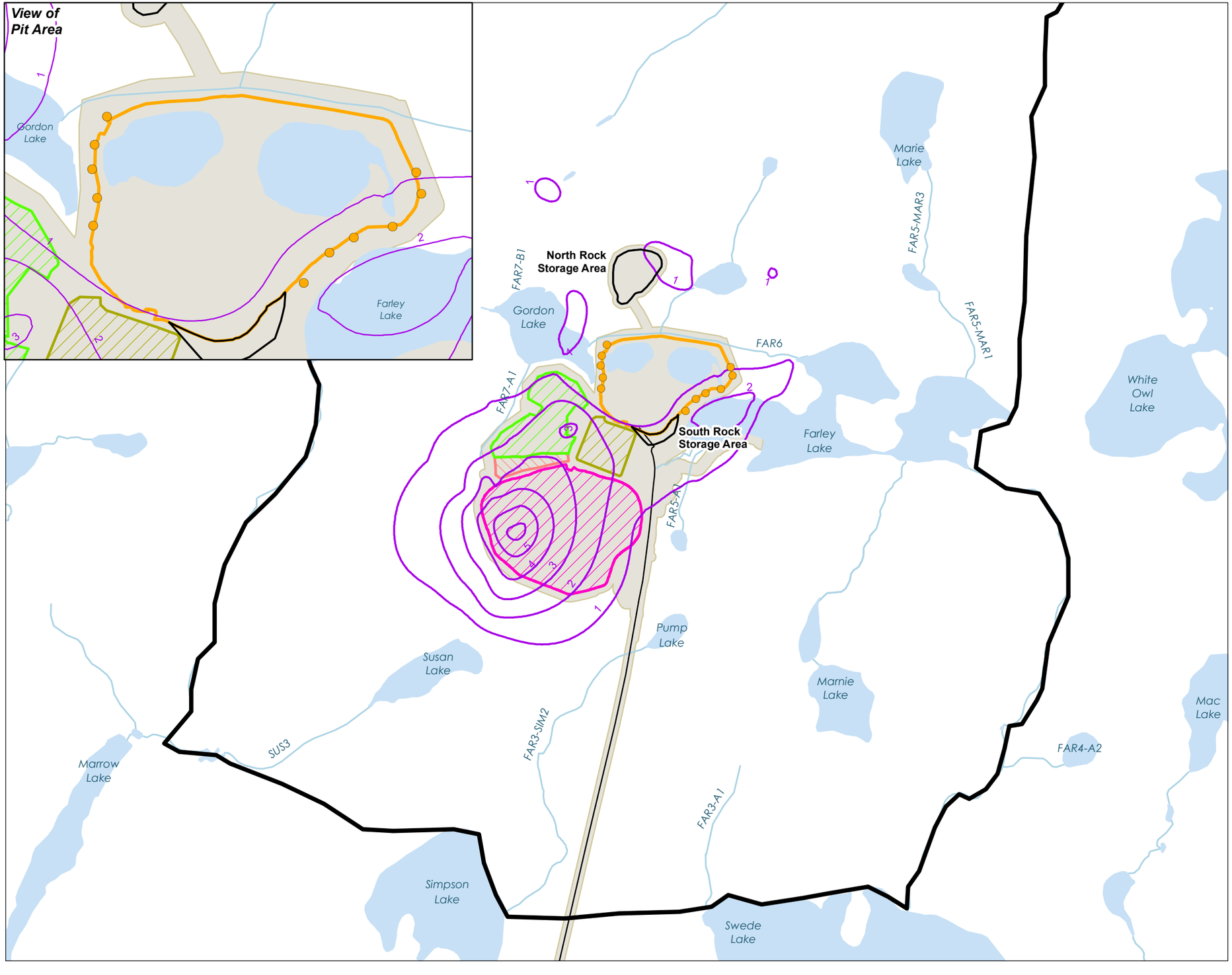
Prepared by ACampigotto on 2024-12-03
Technical Review by AD on 2024-12-03

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

Map No.
22

Title
Predicted Water Table Elevation Contours in Closure

\\Cor0045-pbsgfs01\gis_GIS_Project Folder\111440293 AuRico\Figures\Hydrogeology\Gordon_1MR_2024\Map22_WaterTableElevations_A1_Closure_Gordon_20241203.mxd Revised: 2024-12-03 By: ACampigotto



Stantec

Project Infrastructure
- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Survey Locations
- Groundwater Interceptor Wells
- Simulated Water Table Drawdown

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2024-12-03
Technical Review by AD on 2024-12-03

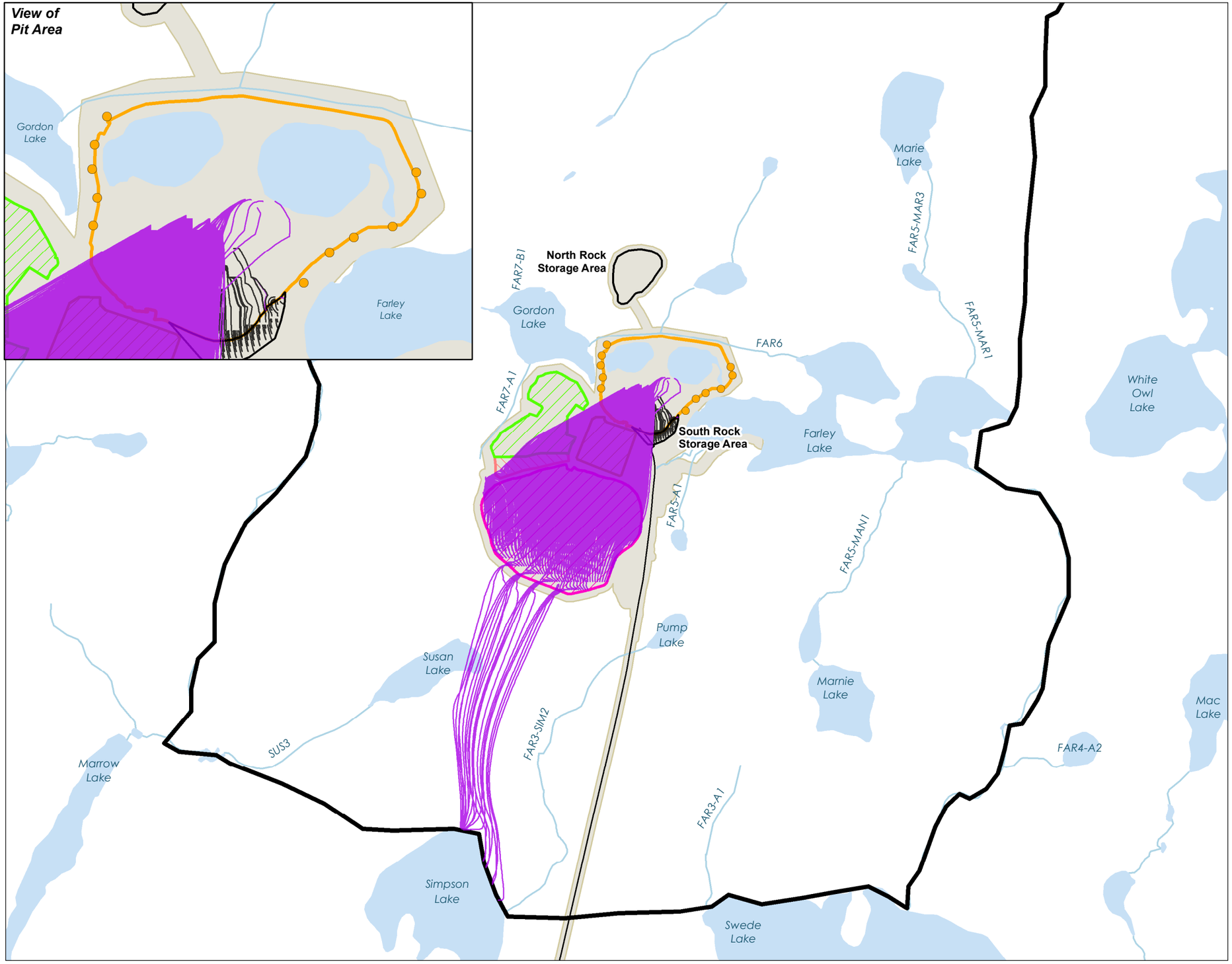
Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
23

Title
Predicted Water Table Drawdown in Closure

\\Cd045-fpsg01\gis_GIS_Project_Folder\111440293_AuRico\Figures\Hydrogeology\Gordon_TMF_2024\Map23_WaterTableDrawdown_Closure_Gordon_20241203.mxd Revised: 2024-12-03 by ACampigotto



Stantec

Project Infrastructure
- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Study Area
- Study Area

Historical Mine Infrastructure
- Existing Infrastructure Associated with Historical Mine

Survey Locations
- Groundwater Interceptor Wells

Particle Traces by Source
- Mine Rock Storage Area
- South Rock Storage Area

Landbase
- Existing Access Road
- Watercourse
- Waterbody

N

0 250 500 Metres
(At original document size of 11x17)
1:25,000

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 2024-12-03
Technical Review by AD on 2024-12-03

Client/Project
ALAMOS GOLD INC.
LYNN LAKE GOLD PROJECT
GORDON SITE

111473076

Map No.
24

Title
Particle Traces from MRSAs in Closure

J:\Cad\45-pbog01\gis_GIS_Project_Folder\111440293_AuRico\Figures\Hydrogeology\Gordon_TMF_2024\Map24_ParticleTracks_End_of_Closure_Gordon_20241203.mxd Revised: 2024-12-03 By: ACampigotto

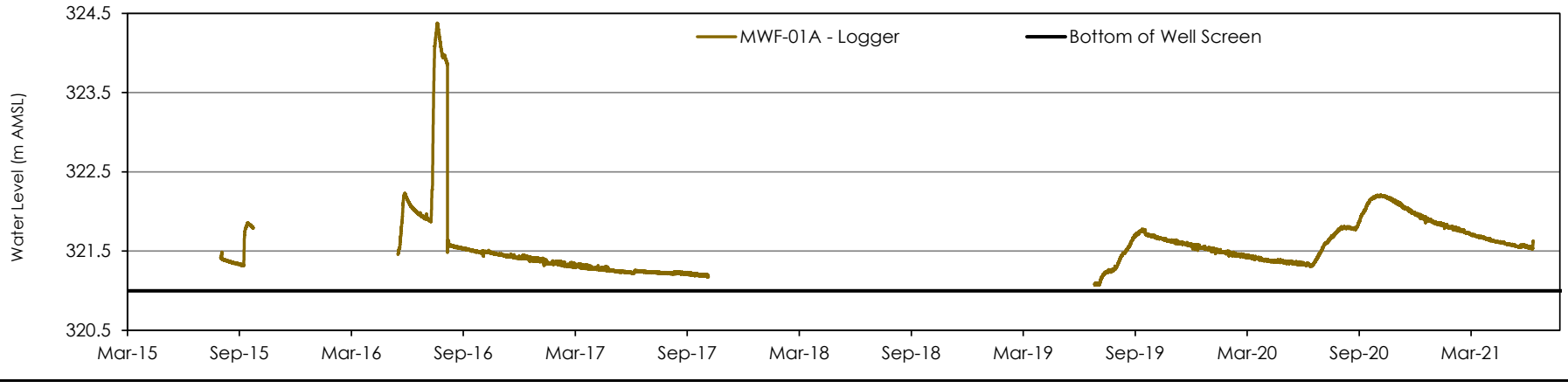
Appendix B Monitoring Well Construction Details and Hydrographs

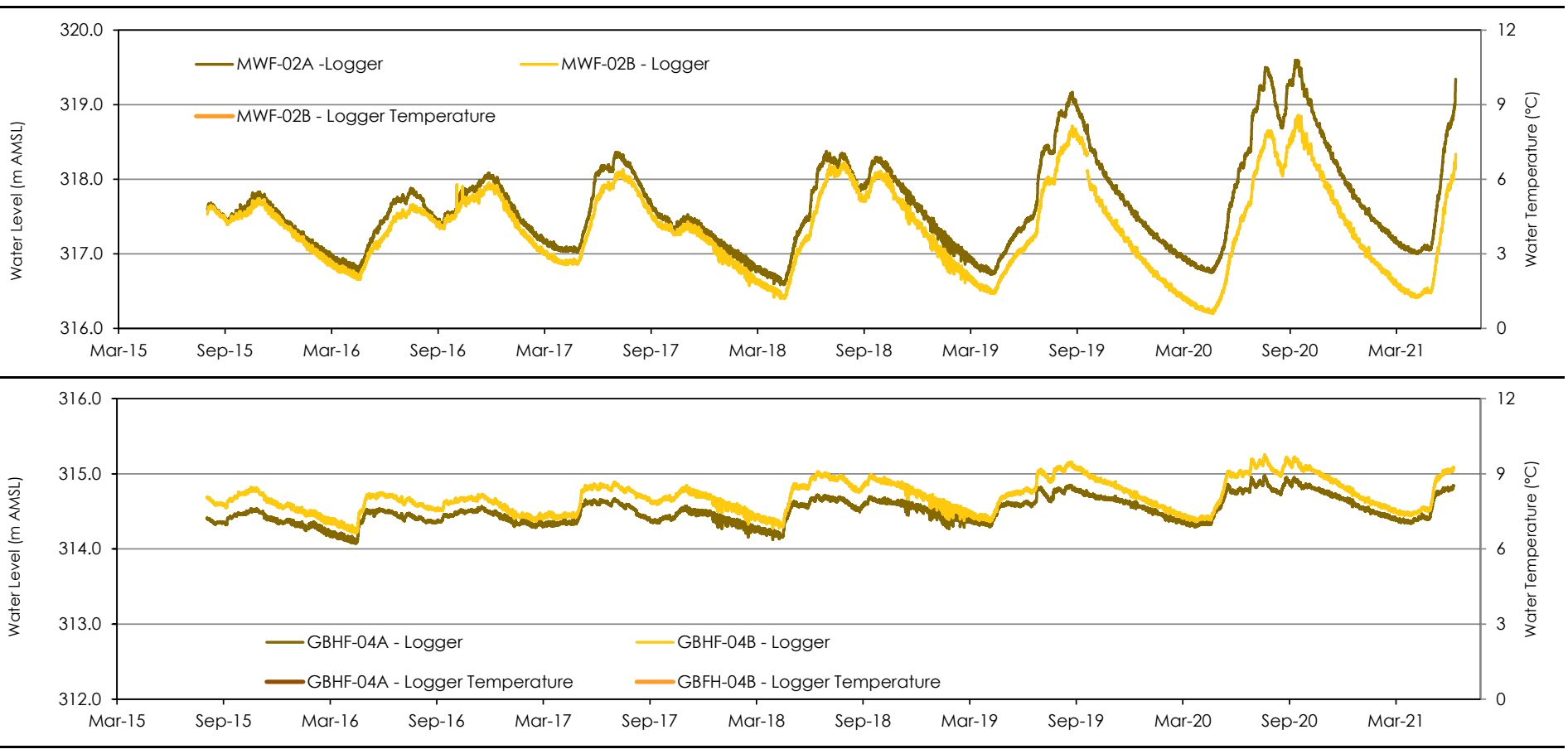
Table B1
Gordon Site Well Construction Details
Lynn Lake Gold Project (LLGP)

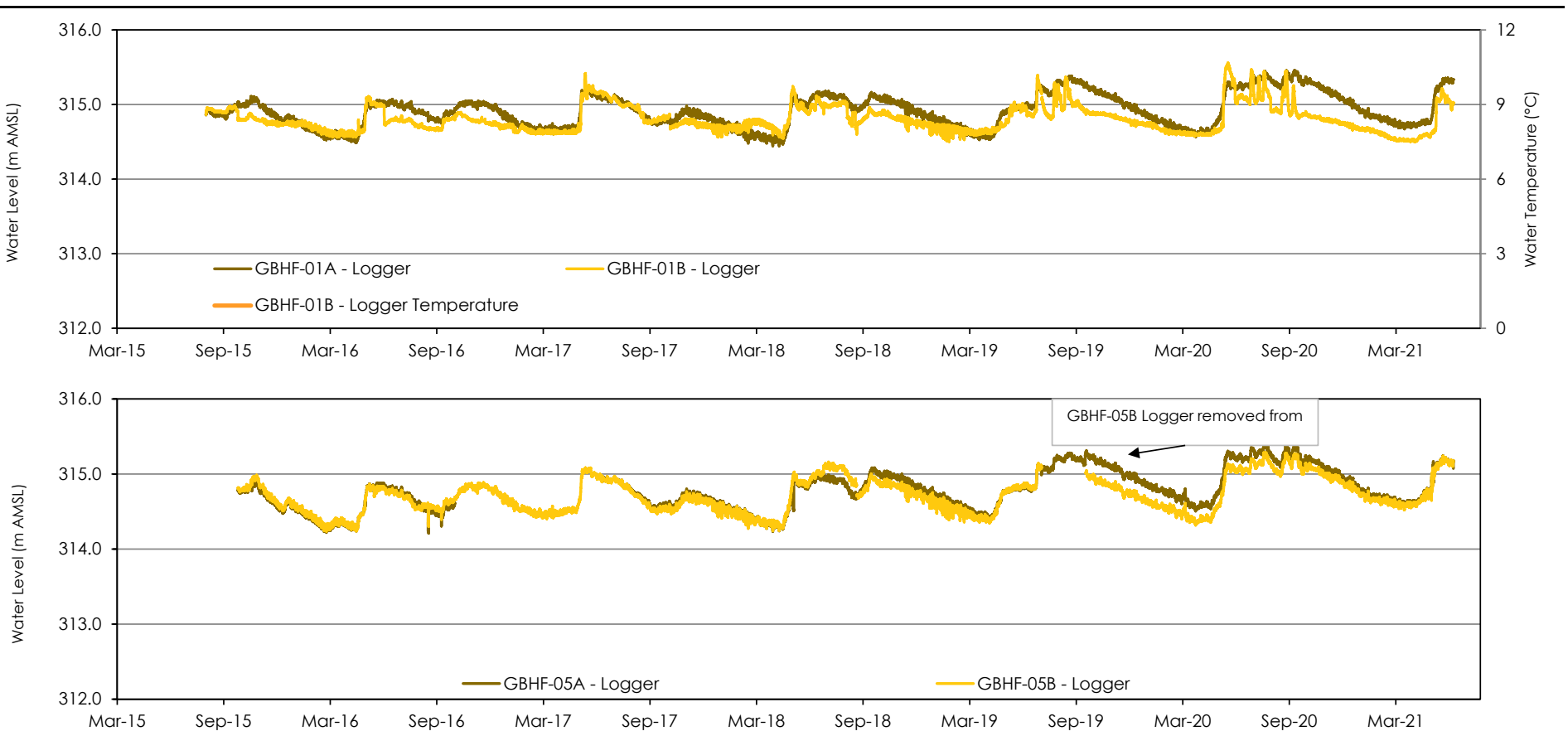
Well ID	Installation Date	Coordinates		Elevation		Borehole Depth	Well Diameter	Screened Interval				Screened Unit
								Top of Well Screen		Bottom of Well Screen		
		Northing	Easting	Ground Surface m AMSL	Top of Casing m AMSL	(m BGS)	(mm)	(m BGS)	(m AMSL)	(m BGS)	(m AMSL)	
MWF-01A	6-Jun-15	6308438	413213	327.70	328.65	6.7	51	3.60	324.10	6.70	321.00	Shallow Bedrock
MWF-01B	6-Jun-15	6308437	413214	327.78	328.64	2.3	51	1.40	326.38	2.30	325.48	Sand Diamicton
MWF-02A	8-Jun-15	6308537	412096	322.05	323.02	14.3	51	11.30	310.75	14.30	307.75	Shallow Bedrock
MWF-02B	8-Jun-15	6308534	412094	322.18	323.11	9.1	51	5.20	316.98	8.20	313.98	Glaciofluvial / Glaciolacustrine Nearshore
MWF-03A	9-Jun-15	6306322	412451	325.46	326.72	9.1	51	6.10	319.36	9.10	316.36	Shallow Bedrock
MWF-03B	9-Jun-15	6306330	412452	325.63	326.73	3.4	51	1.80	323.83	3.40	322.23	Glaciolacustrine Nearshore
MWF-04A	10-Jun-15	6306123	411300	315.04	316.12	11.9	51	8.80	306.24	11.90	303.14	Shallow Bedrock
MWF-04B	10-Jun-15	6306118	411305	314.92	315.83	6.7	51	3.70	311.22	6.70	308.22	Glaciolacustrine Offshore / Sand Diamicton
MWF-05A	5-Jun-15	6303751	411643	301.90	302.80	6.9	51	5.30	296.60	6.90	295.00	Shallow Bedrock
MWF-05B	5-Jun-15	6303750	411641	301.94	303.00	3.7	51	3.00	298.94	3.70	298.24	Sand Diamicton
MWF-06	4-Jun-15	6300569	410977	300.63	301.58	5.2	51	2.00	298.63	5.20	295.43	Shallow Bedrock
MWF-07R	24-Apr-17	6307691	412264	317.00	n/a	31.3	51	29.14	287.86	30.66	286.34	Shallow Bedrock
MWF-07S	24-Apr-17	6307691	412264	317.00	n/a	11.6	51	10.06	306.94	11.58	305.42	Sand Diamicton
MWF-08R	9-May-17	6308244	412194	314.08	n/a	15.4	51	13.72	300.36	15.24	298.84	Shallow Bedrock
MWF-08S	9-May-17	6308244	412194	314.08	n/a	10.4	51	8.84	305.24	10.36	303.72	Sand Diamicton
GBHF-01A	4-Jun-15	6307996	411979	316.04	317.02	8.8	51	5.79	310.25	7.32	308.73	Shallow Bedrock
GBHF-01B	4-Jun-15	6308001	411982	316.07	317.03	5.5	51	3.96	312.11	5.49	310.59	Glaciolacustrine Nearshore
GBHF-02A	9-Jun-15	6307605	412483	321.37	322.44	6.3	51	4.57	316.80	6.25	315.12	Shallow Bedrock
GBHF-02B	9-Jun-15	6307602	412483	321.58	322.46	3.2	51	1.62	319.95	3.15	318.43	Glaciolacustrine Nearshore
GBHF-03	13-Jun-15	6307753	412833	314.80	315.70	4.9	51	2.90	311.90	4.88	309.92	Shallow Bedrock
GBHF-04A	6-Jun-15	6308100	412412	317.52	318.47	7.0	51	5.49	312.03	7.01	310.51	Shallow Bedrock
GBHF-04B	7-Jun-15	6308102	412416	317.77	318.72	4.9	51	3.35	314.41	4.88	312.89	Glaciolacustrine Nearshore
GBHF-05A	5-Jun-15	6307806	412008	316.92	317.81	14.0	51	12.50	304.42	14.02	302.90	Shallow Bedrock
GBHF-05B	6-Jun-15	6307802	412008	316.95	318.05	10.7	51	9.14	307.81	10.67	306.28	Glaciolacustrine Offshore
GBHF-07A	10-Jun-15	6307644	411608	318.81	319.72	6.4	51	4.88	313.93	6.40	312.41	Shallow Bedrock
GBHF-07B	10-Jun-15	6307645	411612	318.88	319.80	3.3	51	1.72	317.16	3.25	315.63	Sand Diamicton
GBHF-09A	14-Jun-15	6307200	412300	317.11	318.11	12.7	51	11.13	305.98	12.65	304.46	Shallow Bedrock
GBHF-09B	14-Jun-15	6307202	412302	317.13	318.28 (Before Aug. 2017) 317.63 (After Aug. 2017) **	9.1	51	7.57	309.56	9.09	308.04	Sand Diamicton
GBHF-10A	17-Jun-15	6307203	411912	329.13	330.08	6.0	51	4.20	324.93	6.02	323.11	Shallow Bedrock
GBHF-10B	17-Jun-15	6307200	411911	329.12	330.02	3.0	51	1.52	327.60	3.05	326.07	Sand Diamicton
GBHF-11A	12-Jun-15	6306854	412270	321.18	322.38	9.0	51	7.49	313.69	9.02	312.16	Shallow Bedrock
GBHF-11B	12-Jun-15	6306853	412274	321.27	322.38	7.1	51	4.57	316.70	6.10	315.17	Glaciolacustrine Offshore
GBHF-12A	11-Jun-15	6306977	411458	324.54	325.81 (Before Aug. 2017) 325.17 ** (After Aug. 2017)	7.8	51	6.25	318.29	7.77	316.77	Shallow Bedrock
GBHF-12B	11-Jun-15	6306976	411461	324.50	325.73 (Before Aug. 2017) 325.13 **(After Aug. 2017)	4.6	51	2.13	322.37	3.66	320.84	Sand Diamicton
GBHF-13	16-Jun-15	6306357	411793	345.33	346.28	4.1	51	2.61	342.72	4.11	341.22	Shallow Bedrock
GBHF-16-01A	15-Jul-16	6307949	411967	314.33	315.58	10.7	51	7.62	306.71	9.14	305.19	Shallow Bedrock
GBHF-16-01B	15-Jul-16	6307951	411967	314.73	315.83	5.5	51	3.96	310.77	5.49	309.24	Glaciolacustrine Offshore / Diamicton
GBHF-16-02A	19-Jul-16	6307618	412635	313.19	314.29	15.2	51	9.14	304.05	10.67	302.52	Shallow Bedrock
GBHF-16-02B	19-Jul-16	6307621	412635	313.79	315.09	4.9	51	3.35	310.44	4.88	308.91	Glaciolacustrine Nearshore
GBHG-17-01	8-May-17	6307933	412788	296.56	n/a	38.1	51	33.40	263.16	34.92	261.64	Shallow Bedrock
GBHG-17-02	24-Apr-17	6307750	412736	309.73	n/a	26.9	51	24.31	285.42	25.83	283.90	Shallow Bedrock
GPT21-01*	n/a	6307811	412024	316.70	n/a	52.4	96	n/a	n/a	n/a	n/a	n/a
GPT21-02 (50)	n/a	6307763	412014	319.50	n/a	107.7	96	50.00	269.50	50.00	269.50	Shallow Bedrock
GPT21-02 (95)	n/a	6307763	412014	319.50	n/a	107.7	96	95.00	224.50	95.00	224.50	Intermediate Bedrock
GPT21-03 (50)	n/a	6307642	412630	314.80	n/a	100.5	96	50.00	264.80	50.00	264.80	Shallow Bedrock
GPT21-03 (95)	n/a	6307642	412630	314.8	n/a	100.5	96.00	95.00	219.80	95.00	219.80	Intermediate Bedrock
GPW-01	10-Aug-16	6307736	412602	316.83	317.58	82.3	152	6.90	309.93	82.30	234.53	Shallow Bedrock
GPW-02	18-Aug-16	6307707	412663	316.33	316.93	83.2	152	8.20	308.13	83.20	233.13	Shallow Bedrock
GPW-03	17-Aug-16	6307881	411999	316.11	316.67	84.1	152	9.10	307.01	84.10	232.01	Shallow Bedrock
GPW-04	17-Aug-16	6307946	411972	315.66	316.26	80.8	152	5.80	309.86	80.80	234.86	Shallow Bedrock
TW1-21	19-Aug-21	6307874	412806	316.11	316.72	58.2	203	7.62	308.49	58.22	257.89	Shallow Bedrock
TW2-21	21-Aug-21	6307812	412821	315.71	316.31	55.2	203	6.40	309.31	55.17	260.54	Shallow Bedrock

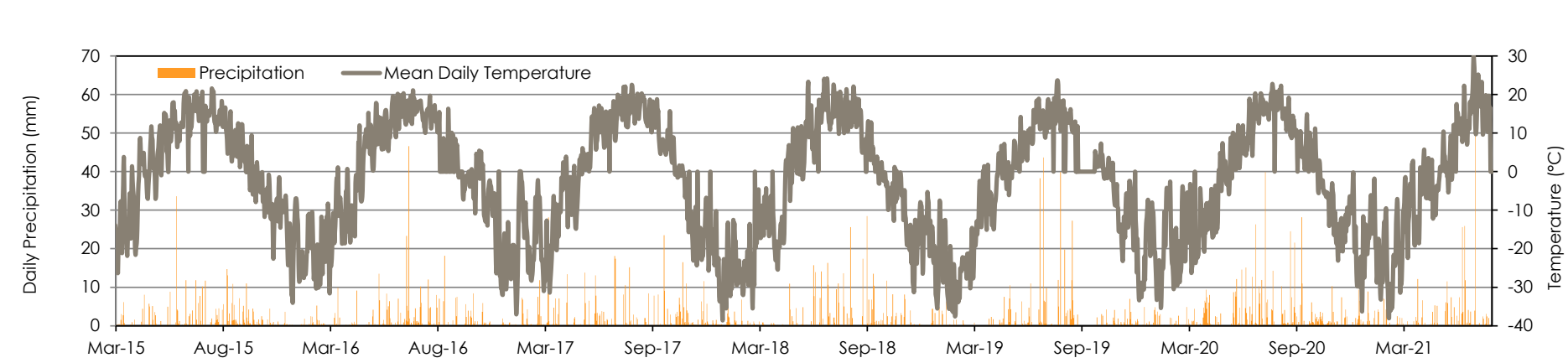
Notes:

n/a	na: not available
m BGS	m BGS: metres below ground surface
m AMSL	m AMSL: metres above mean sea level
*	* Borehole inclination of -85 degrees and azimuth of 171.0 degrees, borehole depth provided in table is metres along borehole.
**	** Stick-up cut to accommodate groundwater sampling
	Northing and Easting Coordinates presented as UTM NAD 83 Zone 14









Notes:

Client/Project

Lynn Lake Gold Project (LLGP)
Hydrogeology Baseline Technical Data Report

Figure No.

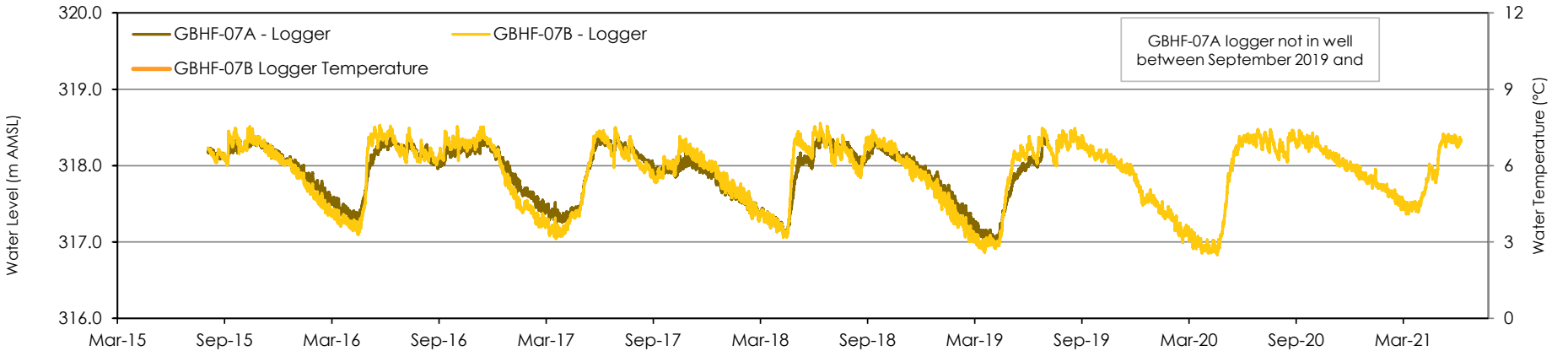
B1

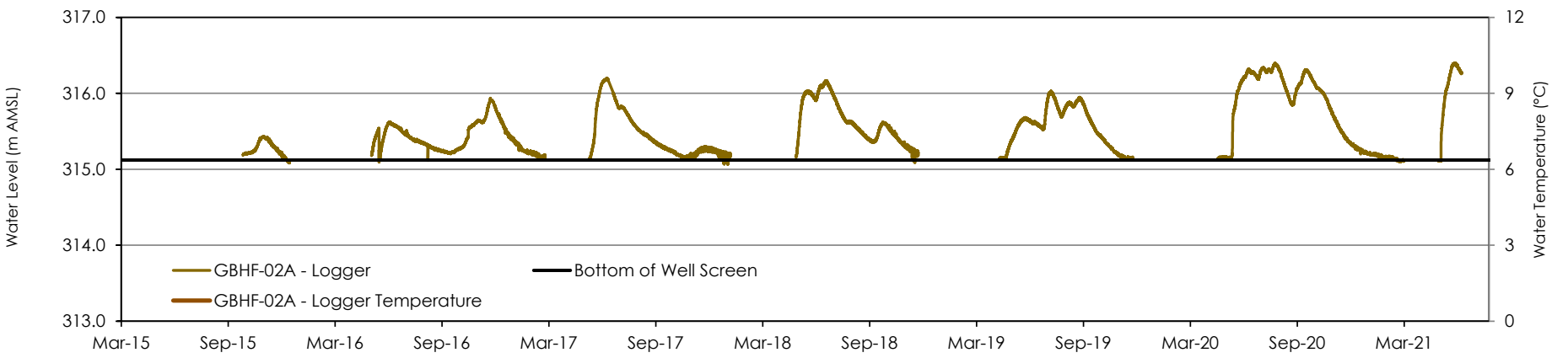
Title

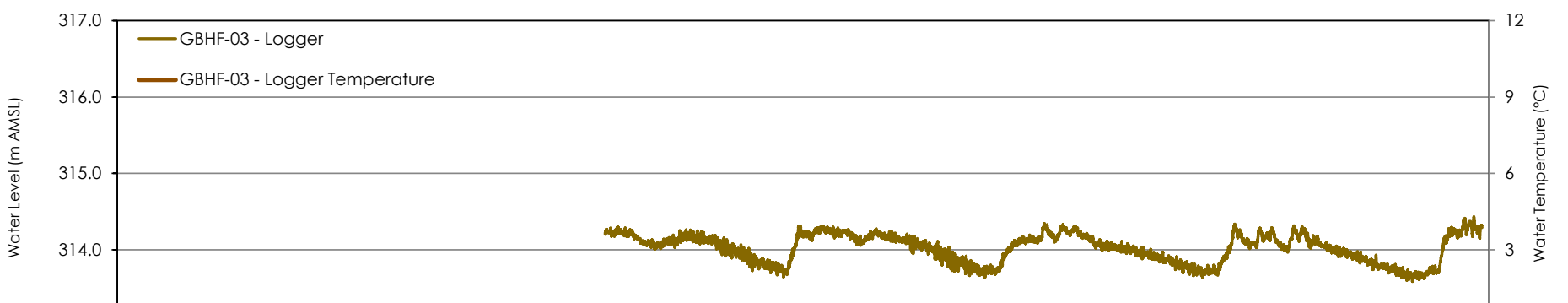
Hydrograph - Northern Portion of LSA
Gordon Site

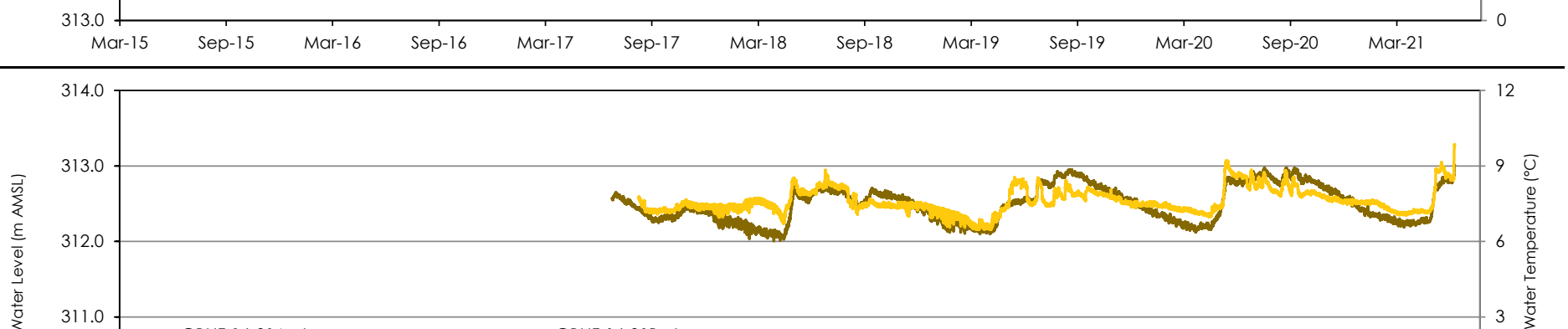
Stantec

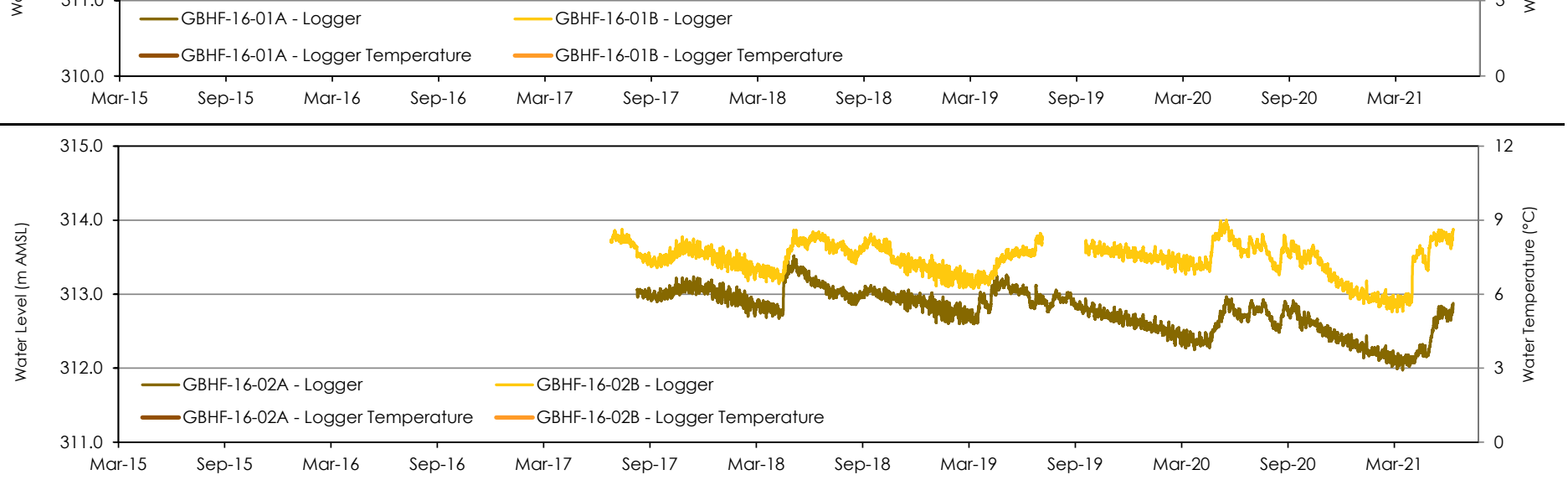
https://stantec.sharepoint.com/teams/160999003/BC1609/Projects/111473012_Alamos/Gordon Model Rebuild/Report/Appendices/AppendixB_Fig_01_Gordon_Hydrographs_all_20210812_RD-kg.xlsx

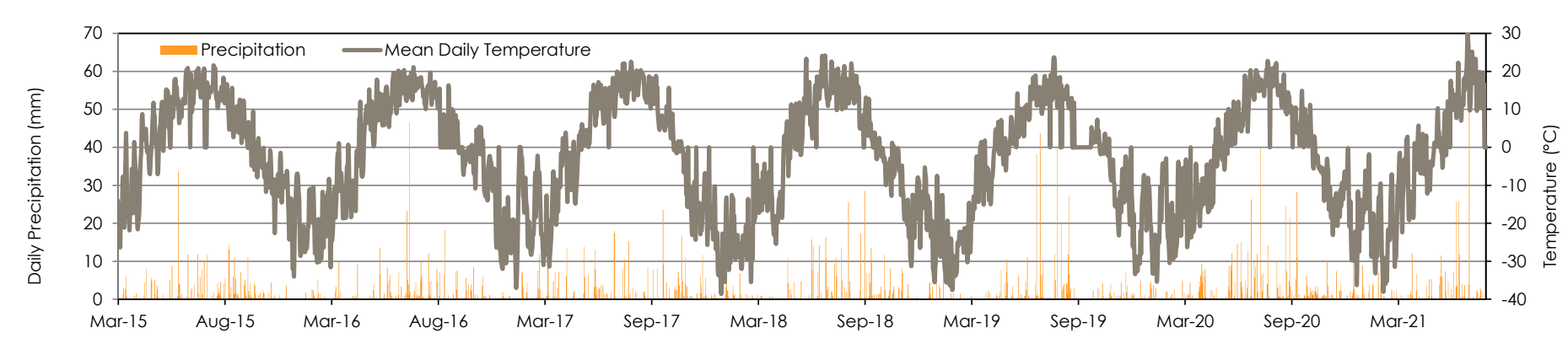












Notes:

Water level in GBHF-02A was below bottom of transducer between December 2015 and April 2016

Client/Project

Lynn Lake Gold Project (LLGP)
Hydrogeology Baseline Technical Data Report

Figure No.

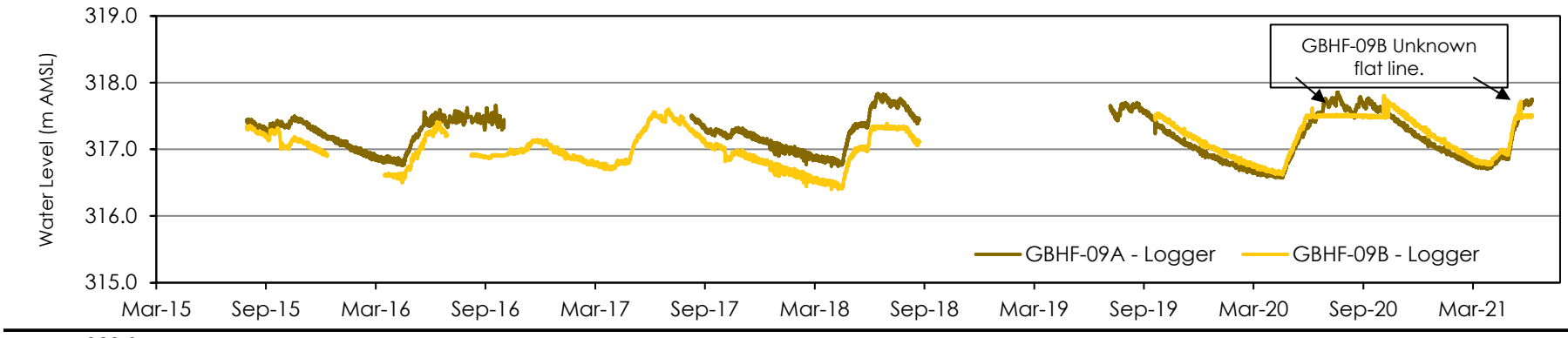
B2

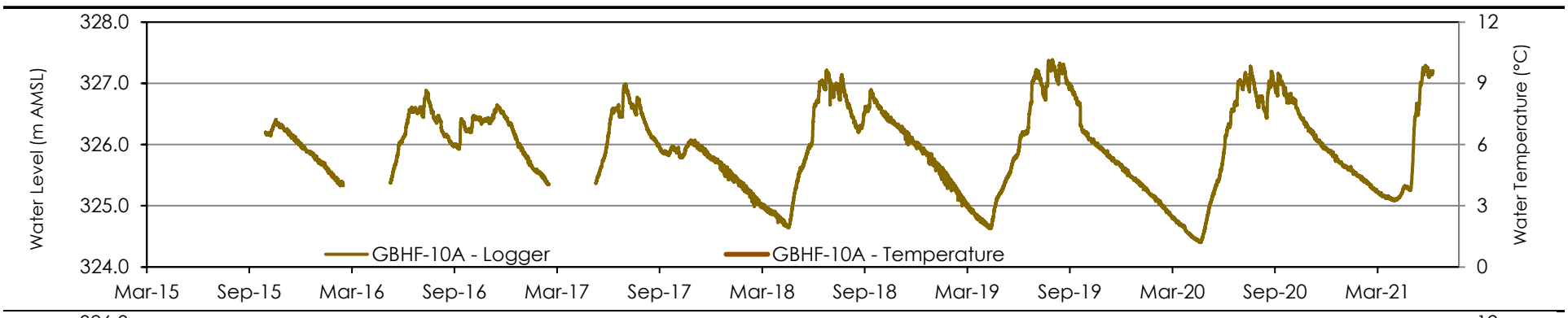
Title

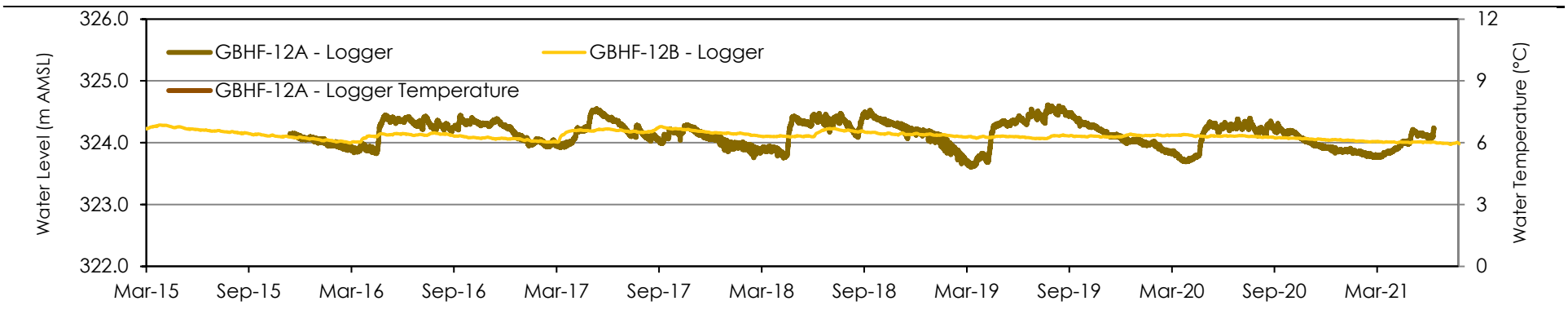
Hydrograph - Northern Portion of LSA
Gordon Site

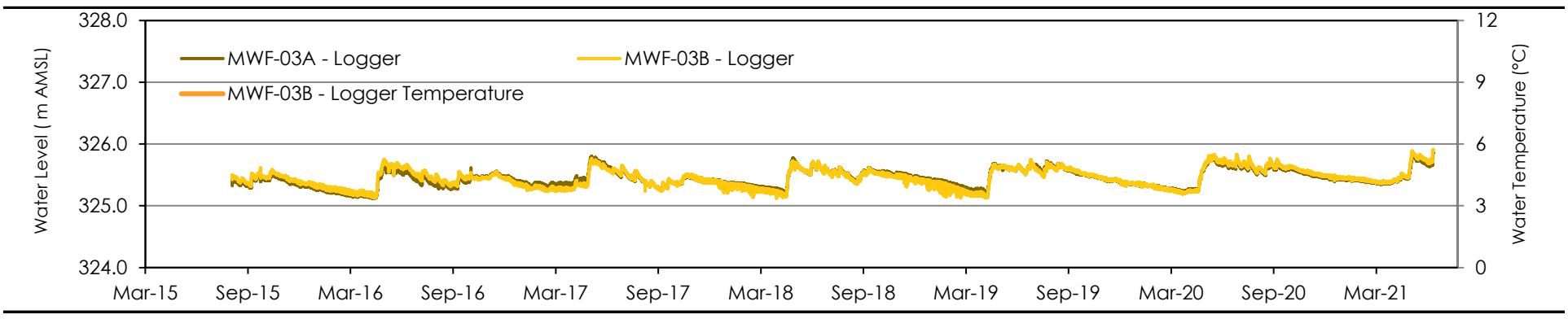
Stantec

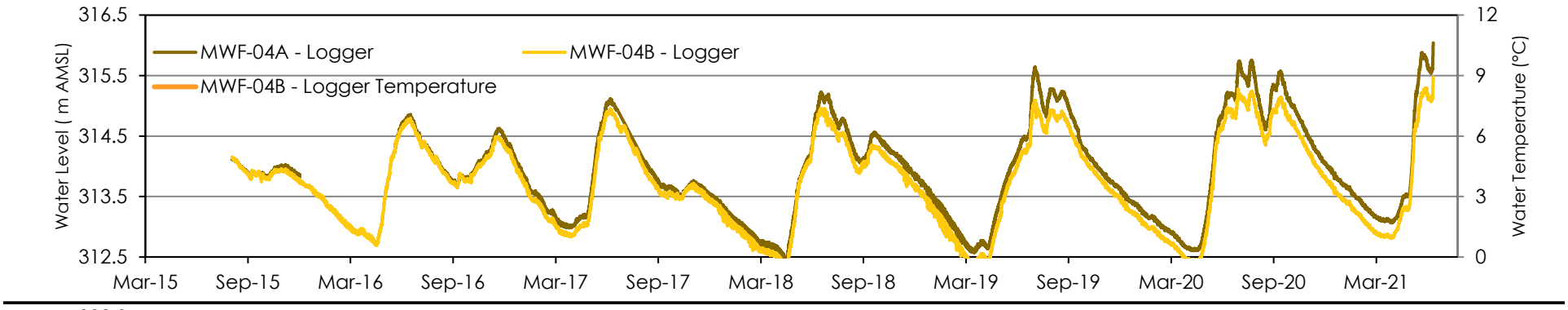
https://stantec.sharepoint.com/teams/160999003/BC1609/Projects/111473012_Alamos/Gordon Model Rebuild/Report/Appendices/AppendixB_Fig_01_Gordon_Hydrographs_all_20210812_RD-kg.xlsx

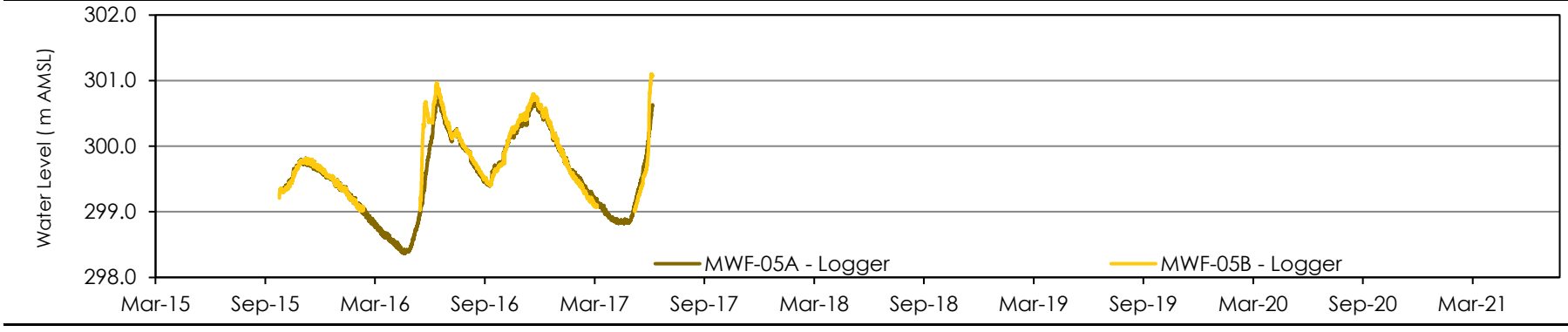


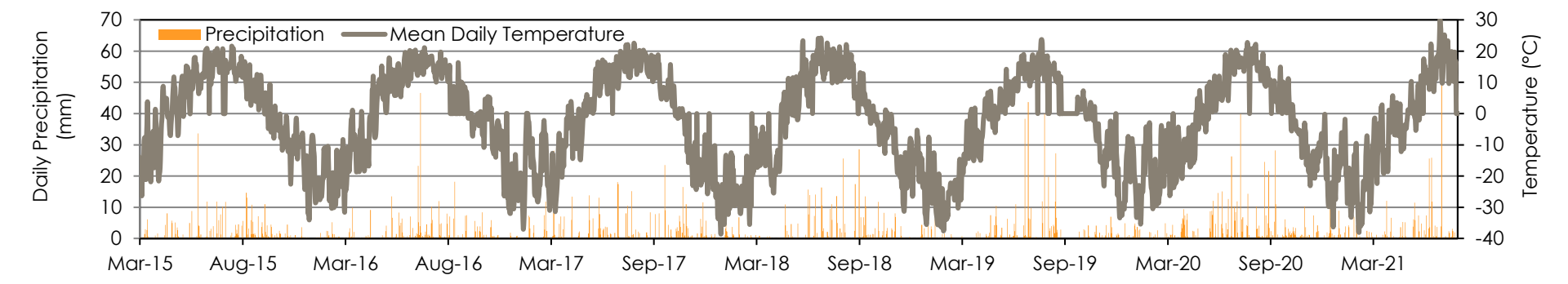












Notes:

1. The logger at GBHF-09B malfunctioned between December 2015 and March 2016 and July and August 2016. GBHF-09A and GBHF-09B frozen from October 2018 to July 2019.
2. Water level in GBHF-10A was below bottom of transducer between February 2016 and May 2016. Transducer lowered.
3. Pressure transducers removed from MWF-05A and MWF-05B in spring 2017.

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Client/Project

Lynn Lake Gold Project (LLGP)
Hydrogeology Baseline Technical Data Report

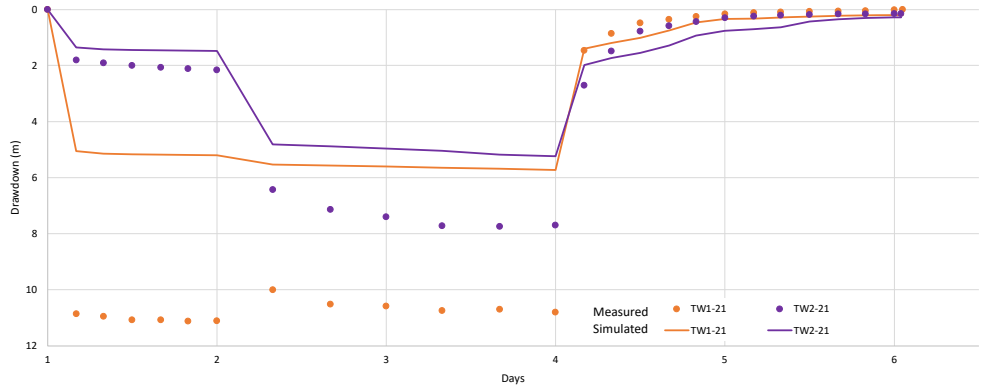
Figure No.

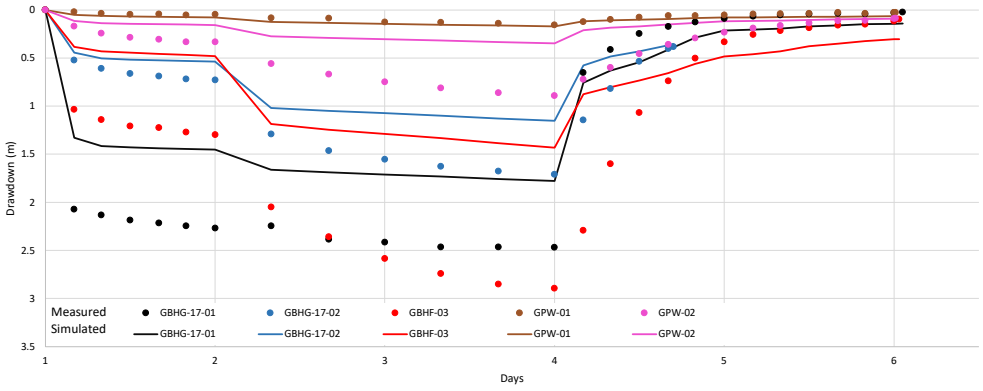
B3

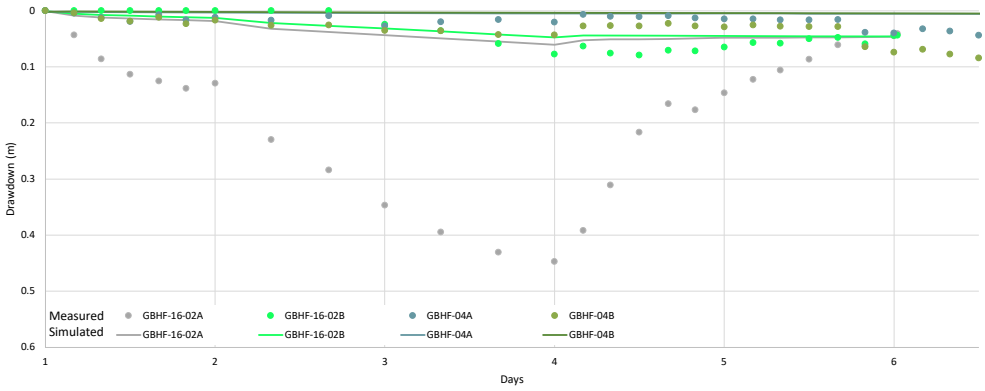
Title

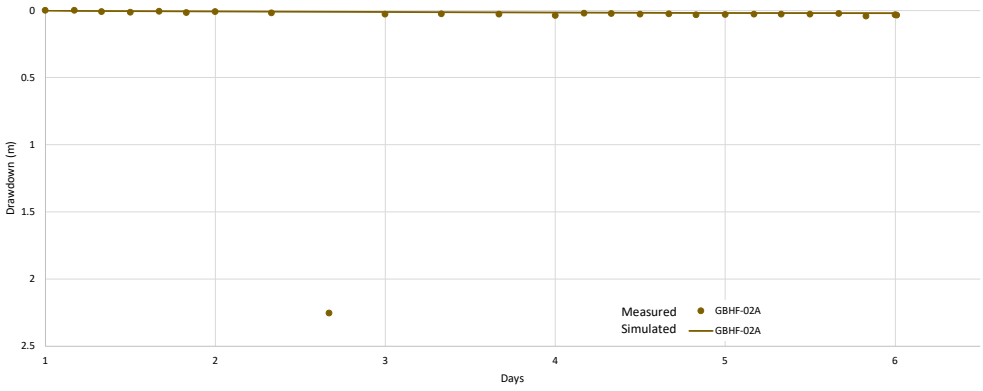
Hydrograph - Southern Portion of LSA Gordon Site

Appendix C Transient Calibration Hydrographs









Notes:

Client/Project

Alamos Gold Inc.
Lynn Lake Gold Project
Gordon Site

Figure No.

C1

Title

Hydrographs - Farley Lake Pumping Test

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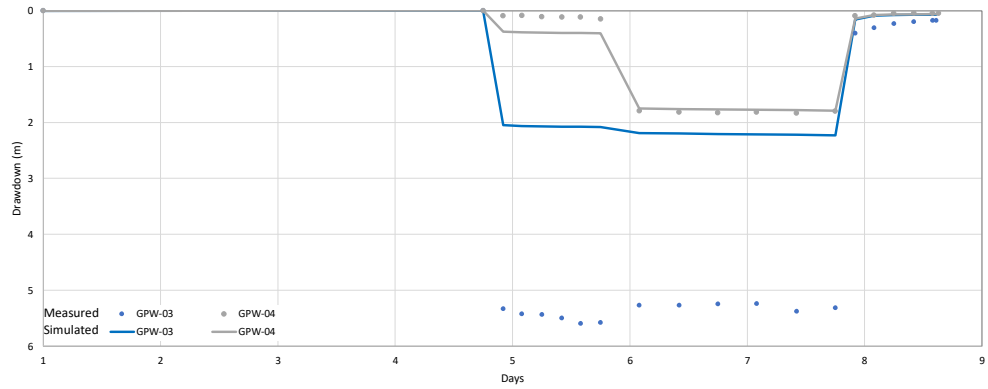
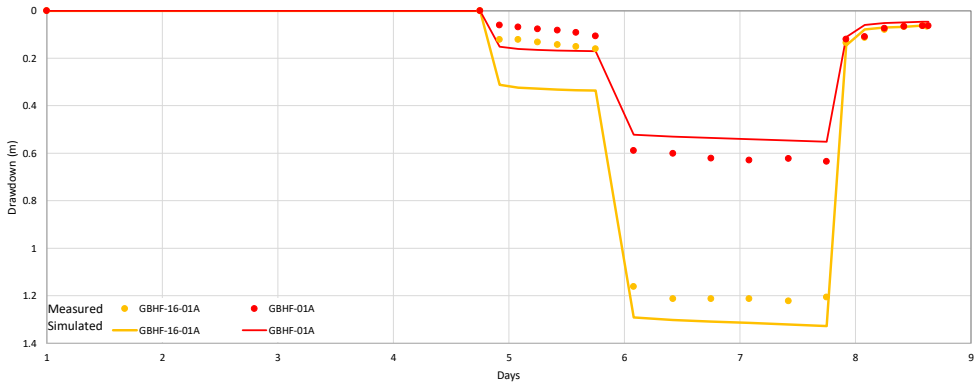
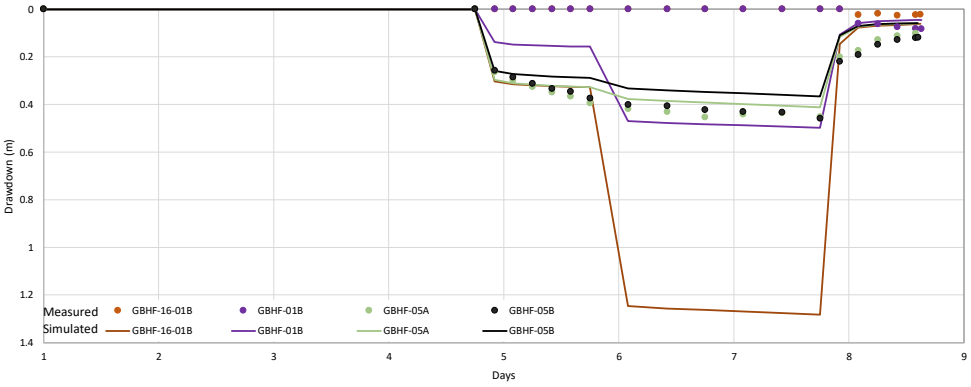
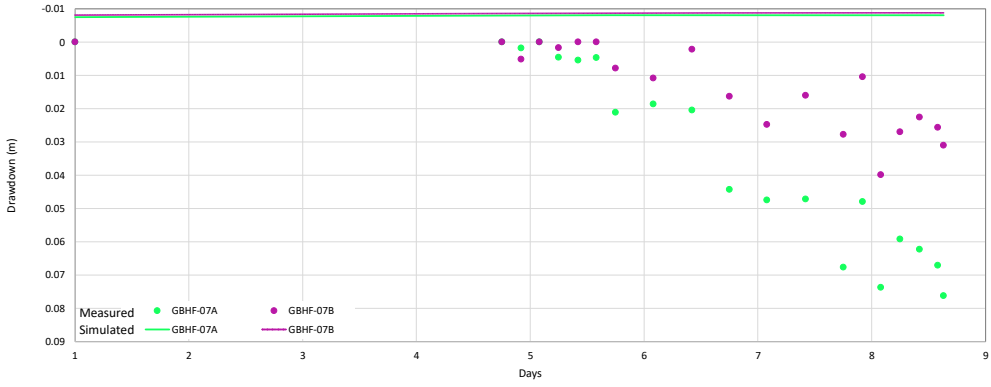
Stantec Document Classification: Stantec Internal









Notes:

Client/Project
Alamos Gold Inc.
Lynn Lake Gold Project
Gordon Site

Figure No.
C2

Title
Hydrographs - Gordon Lake Pumping Test

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Appendix F Lynn Lake Gold Project: Gordon Water Balance and Water Quality Model Update for the Notice of Alteration / Notice of Change

Lynn Lake Gold Project: Gordon Water Balance and Water Quality Model Update for the Notice of Alteration / Notice of Change

Stantec

Prepared for:
Alamos Gold Inc.

July 11, 2025

Prepared by:
Stantec Consulting Ltd.

Project/File:
111473084

Stantec Consulting Ltd.

Limitations and Sign-off

This document entitled Lynn Lake Gold Project: Gordon Water Balance and Water Quality Model Update for Notice of Alteration / Notice of Change was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Alamos Gold Inc. (the “Client”) for regulatory submission. Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Water Balance Prepared by:

PROVINCE OF MANITOBA
A. NAGHIBI
Member 51197
REGISTERED PROFESSIONAL ENGINEER
July 14/2025

Signature

Ali Naghibi, Ph.D., P.Eng.
Printed Name

Water Quality Prepared by:

Digitally signed by Phan, Thai
Date: 2025.07.11 19:01:03 -04'00'

Signature

Thai Phan, Ph.D.
Printed Name

Water Balance Reviewed by:

Digitally signed by Sinclair, Andrew
Date: 2025.07.14 13:00:18 -04'00'

Signature

Andrew Sinclair, Ph.D.
Printed Name

Water Quality Reviewed by:

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Brenda Bailey, Ph.D., P.Geo.
Printed Name

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
Stantec Consulting Ltd.
No. 1301

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Acronyms / Abbreviations

%	percent
<	less than
>	greater than
Alamos; 'the proponent'	Alamos Gold Inc.
ARD	acid rock drainage
EIS	Environmental Impact Statement
Golder	Golder Associates Ltd.
IAAC	Impact Assessment Agency of Canada
km	kilometre
km^2	square kilometre
m	metre
m^3/hr	cubic metres per hour
m^3/s	cubic metres per second
Gordon site	Gordon Gold Mine
mg/L	milligrams per litre
mm	millimetre
Mm^3	million cubic metre
MRSA	mine rock stockpile area
Mt	million tonne(s)
NAG	Non-Acid Generating
NOA	Notice of Alteration
NOC	Notice of Change
NSE	Nash-Sutcliffe Efficiency
PAG	potentially acid generating
Stantec	Stantec Consulting Ltd.
STP	Sewage Treatment Plant
t/day	tonne per day
t/m^3	tonnes per cubic metre
t/yr	tonne per year

the Project	Lynn Lake Gold Project
TMF	tailings management facility
TSS	total suspended solids
WSC	Water Survey of Canada
WSP	WSP Inc. Canada

1 Introduction

As part of the Lynn Lake Gold Project (the Project) Alamos Gold Inc. (Alamos; 'the proponent') plans to operate the Gordon Gold Mine, (hereinafter referred to as the 'Gordon site') near the Town of Lynn Lake in northern Manitoba. Alamos is seeking approval to proceed with alterations to the Gordon site as approved under *Environment Act* License No. 3390 and the conditions stipulated therein (March 6, 2023) and a Decision Statement issued under the *Canadian Environmental Assessment Act, 2012* as documented by the Impact Assessment Agency of Canada (IAAC), dated March 5, 2023. The proposed alterations include, but are not limited to, modifications to the open pit, mine rock storage area (MRSA), ore and overburden stockpiles (including use of the historical north MRSA as a borrow source), facility area (including buildings), and water management structures (i.e., sumps, collections ponds, discharge pipeline). The proposed mine plan is documented in the Feasibility Study Update (Alamos 2023).

This updated water balance and water quality model report for the Gordon site has been prepared to incorporate the proposed alterations to the mine plan and support the assessment of potential effects of the construction, operation, and closure phases of the Project on surface water quantity and quality in the receiving environment. This report forms part of the supporting documentation for the Gordon Mine Plan Amendment Notice of Alteration (NOA) / Notice of Change (NOC) completed for the Project.

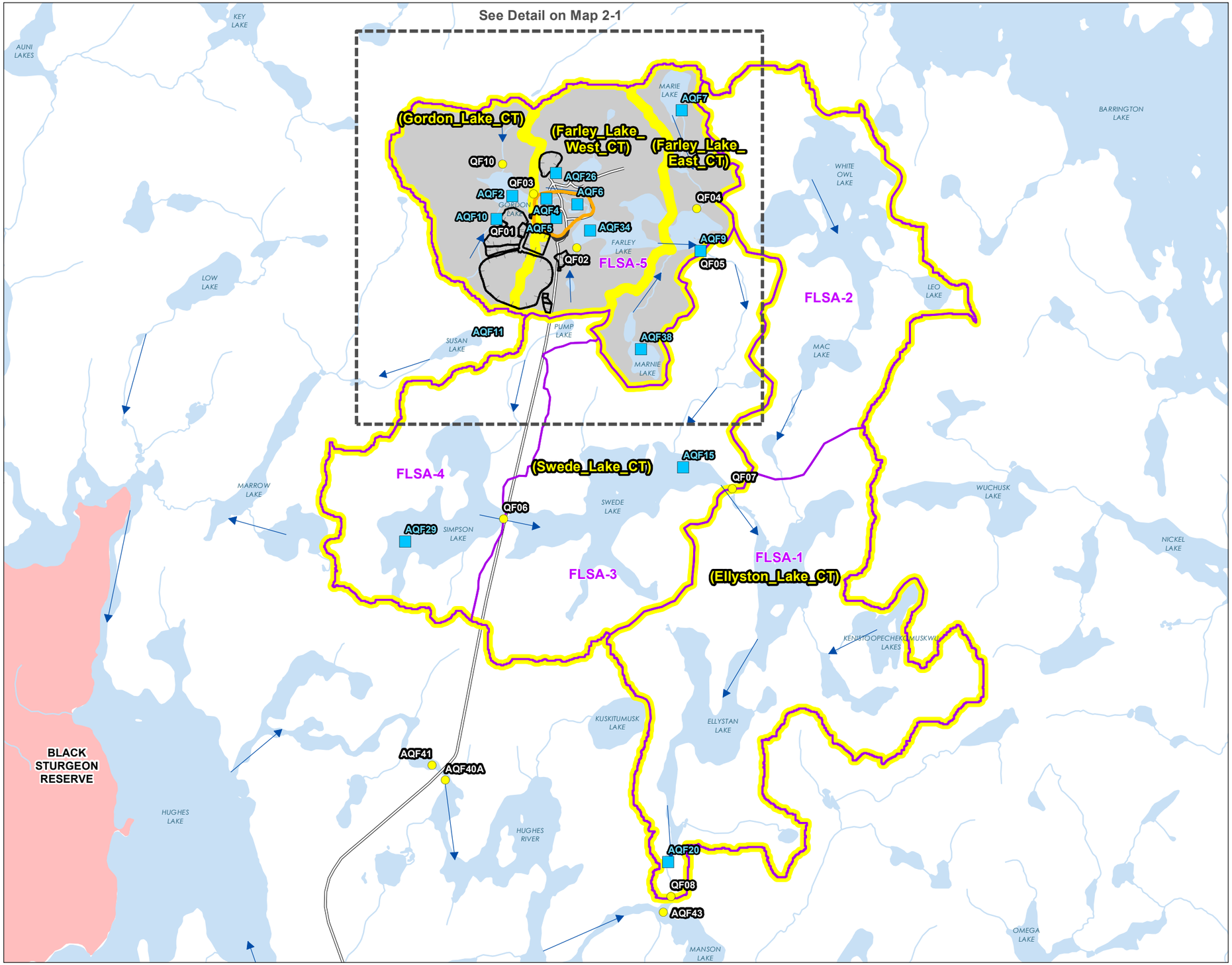
1.1 Previous Reports and Supporting Studies

Stantec Consulting Ltd. (Stantec; Stantec 2020a) developed a site-wide and receiving environment water balance and water quality model to support the Environmental Impact Statement (EIS; Stantec 2020b). The water balance and water quality model presented in Stantec (2020a and 2020b) is hereafter referred to as 'the EIS model'.

A site water balance was completed by Golder (2020). As part of the detailed design for the Project, WSP (2023) updated the assumptions and inputs to the site water balance.

1.2 Objectives

The objective of this water balance and water quality model update (hereafter referred to as 'the updated model') was to refine the EIS model with the proposed alterations in the Feasibility Study Update (Alamos 2023) and the site water balance update (WSP 2023) as described in the following sections. The updated model was then used to predict the effects of the Project on the receiving surface water quantity and quality in Section 3.3 of Gordon Mine Plan Amendment NOA/NOC. Hydrometric and water quality stations and catchment areas are unchanged from the EIS model (Figure 1.1).



Stantec

Project Infrastructure
- Proposed Open Pit
- Potential Infrastructure

Project Data
- Hydrology Model Subwatersheds (FLSA-2)
- Water Quality Model Catchments (Mixing Cells) (Swede_Lake_CT)
- Combined Subwatersheds
- Hydrology Monitoring Station
- Water Quality Station
- Local Study Area

Landbase
- Existing Access Road
- Surface Water Flow Direction
- Watercourse
- Waterbody
- First Nation Reserve
- Remnant Historical Mine Rock Pile

N

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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 2025-05-12
Technical Review by ANaghibi on 2025-05-12

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
1-1

Title
Hydrometric and Water Quality Monitoring Stations and Catchment Areas at Gordon Site

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2 Water Balance Model Updates

2.1 Inputs

The following sections present updates to the EIS water balance model inputs resulting from the proposed alterations. All other water balance model inputs remain unchanged from the EIS model (e.g., the average, 1:25-year dry, and 1:25-year wet annual precipitation of 478 millimetres (mm), 344 mm, and 655 mm, respectively).

2.1.1 Project Components

The proposed alterations involve adjusting the footprints of several of the Project components and adding several new components in comparison to the description of the Gordon site originally included in the EIS model. The components included in the proposed alterations are presented in Figure 2.1, with footprint areas summarized in Table 2.2.

Table 2.1 Footprint area of Project Components at Gordon Site

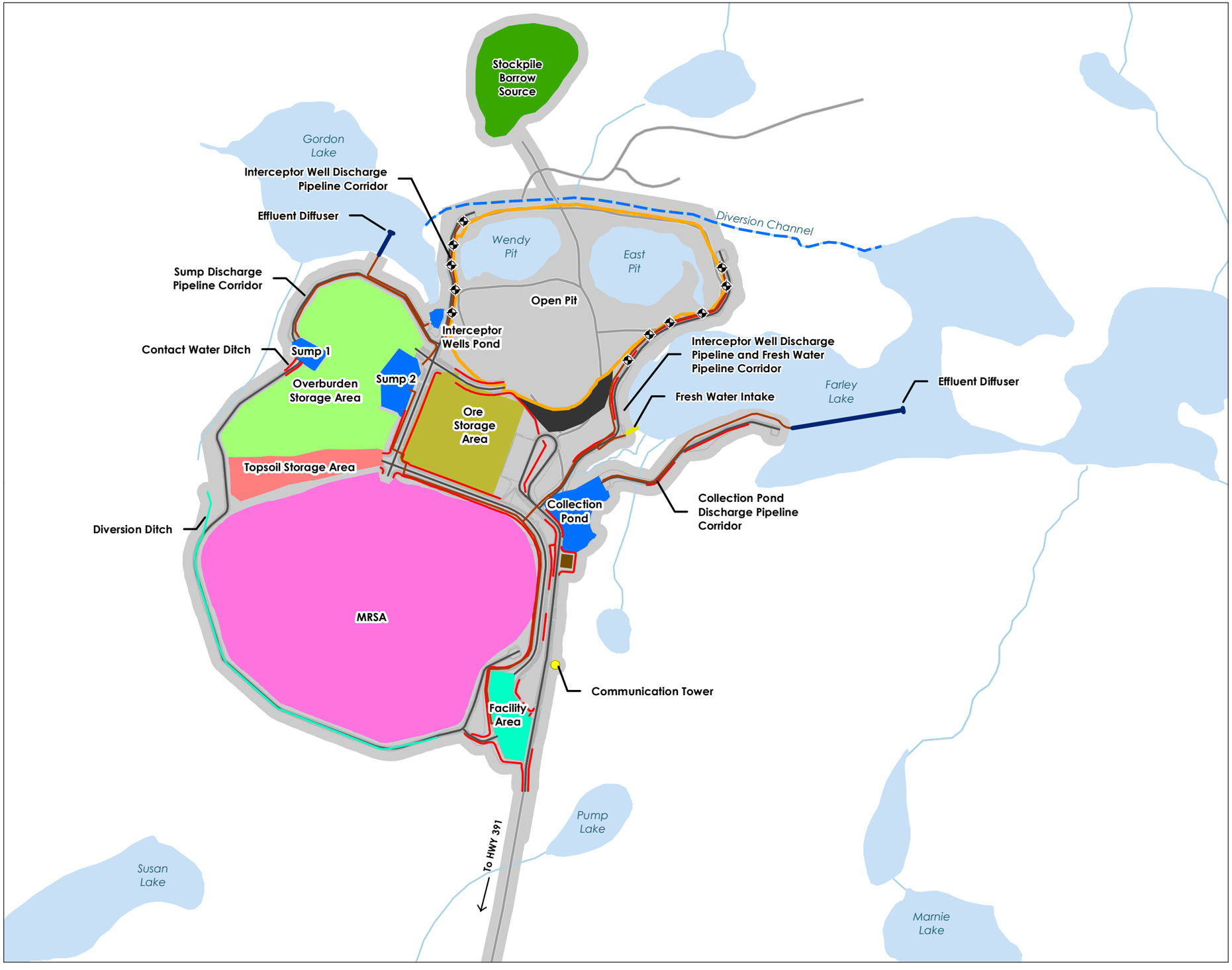
Project Component	Area (ha)	
	EIS Model[1] (Stantec 2020a)	Updated Model (this report)
Mine Rock Storage Area (MRSA) (modified by detailed design)	77	60.2
Open Pit (enlarged during detailed design to access additional resources)[2]	29.0	36.7
Ore Storage/Ore Stockpiles (modified by detailed design)	5	8.8
Overburden Storage/Stockpile (modified by detailed design)	17	17.8
Collection Pond/Ponds/ Discharge Pipeline (modified by detailed design with sumps also sited)	1.3	2.3
Sump 1 (sited during detailed design)	n/a	0.6
Sump 2 (sited during detailed design)	n/a	1.7
Facility Area (sited during detailed design)	n/a	2.3
Gen Set Area (sited during detailed design)	n/a	0.1
Interceptor Wells Pond (sited during detailed design)	n/a	0.2
Stockpile Borrow Source (new addition)	n/a	7.3
Topsoil Storage Area (sited during detailed design)	n/a	4.1
Adjusted Diversion Ditch (removed during detailed design as no longer required)	6.8	n/a

Notes:

1 The EIS model (Stantec 2020a) had slight variances in the mine infrastructure areas compared to the EIS Project description and the variance was not interpreted to alter the interpretation or conclusions of the EIS.

2 The open pit volume changed slightly between the EIS model (21.1 million cubic metres, Mm^3) and the updated model (22.7 Mm^3).

n/a – not applicable, ha – hectares



Stantec

Project Infrastructure (NOA)

- Interceptor Well
- Communication Tower
- Contact Water Ditch
- Mine Site Road
- Diversion Ditch
- Discharge Pipeline
- Fresh Water Intake
- Effluent Diffuser
- Collection Pond/Sumps
- Facility
- Gen Set
- Mine Rock Storage Area
- Open Pit
- Ore Storage
- Overburden Storage
- Topsoil Storage
- Stockpile Borrow Source
- NOA Project Development Area (PDA)

Landbase

- Existing Access
- Existing Diversion Channel
- Watercourse
- Waterbody
- Remnant Historical Mine Rock Pile

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. NOA Project Infrastructure features provided by Worley via Alamos.

Project Location
Lynn Lake, Manitoba

Prepared by ACampigotto on 2025-04-02
Technical Review by KMathers on 2025-04-02

Client/Project
ALAMOS GOLD INC.
Lynn Lake Gold Project

111473084

Map No.
2-1

Title
NOA Footprint Files - Gordon site

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2.1.2 Water Management

Water management, during different phases of the Gordon site is illustrated in Figure 2.2 to Figure 2.5. In the EIS model, historical pits (i.e., Wendy and East pits) were assumed to be dewatered into Farley Lake during construction. Based on detailed engineering design for the proposed alterations, these historical pits will be dewatered into Hughes River. Modelling nodes on Hughes River, upstream of the dewatering effluent (Hughes-us), downstream of the dewatering effluent (Hughes-mid), and downstream of confluence with Ellystan Lake outflow (Hughes-ds) were added to the model to evaluate the potential effects of the Project on Hughes River water quantity and quality.

Figure 2.2 Conceptual Water Management at the End of Construction

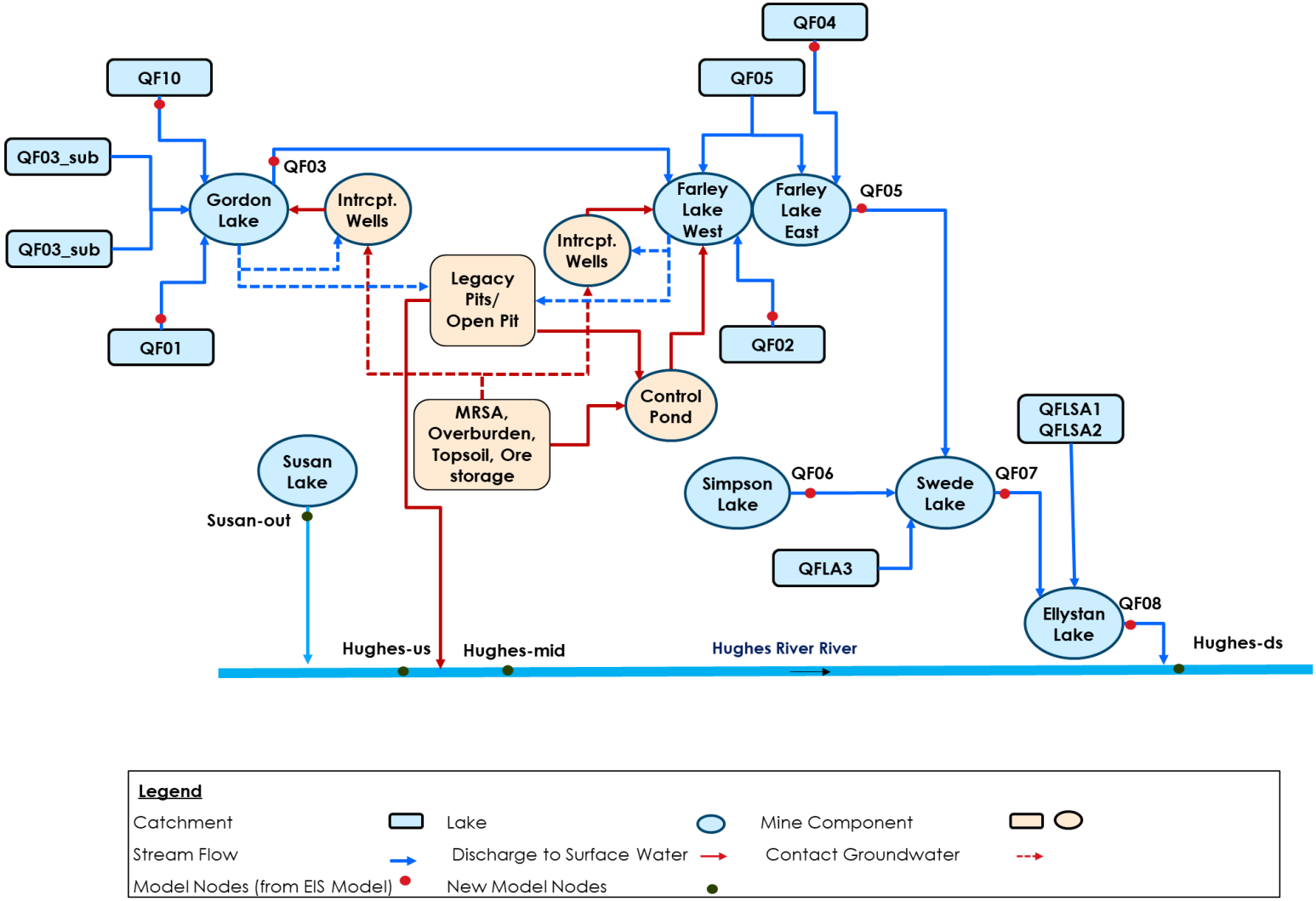


Figure 2.3 Conceptual Water Management during Operation

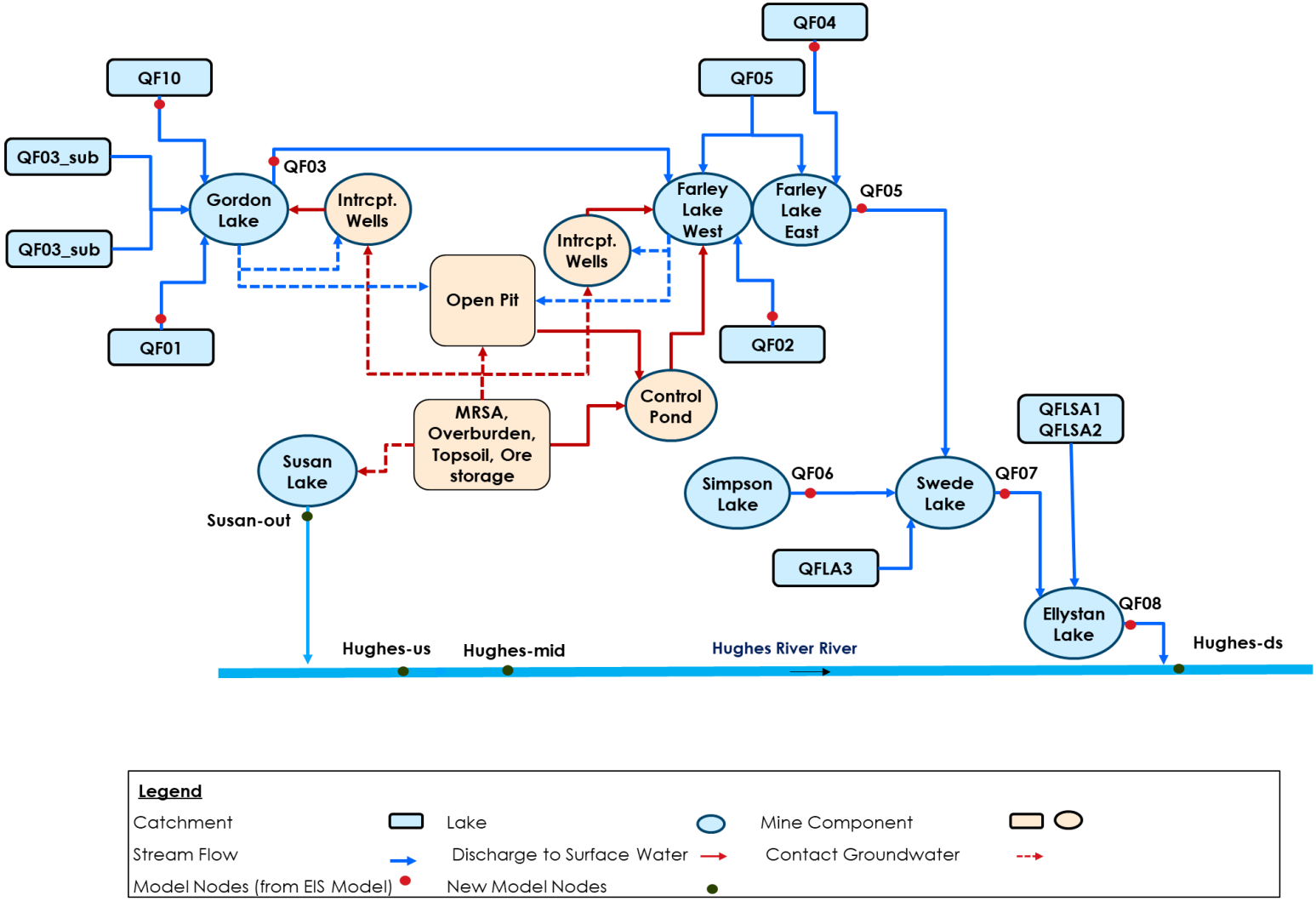


Figure 2.4 Conceptual Water Management during Closure (Pit Filling)

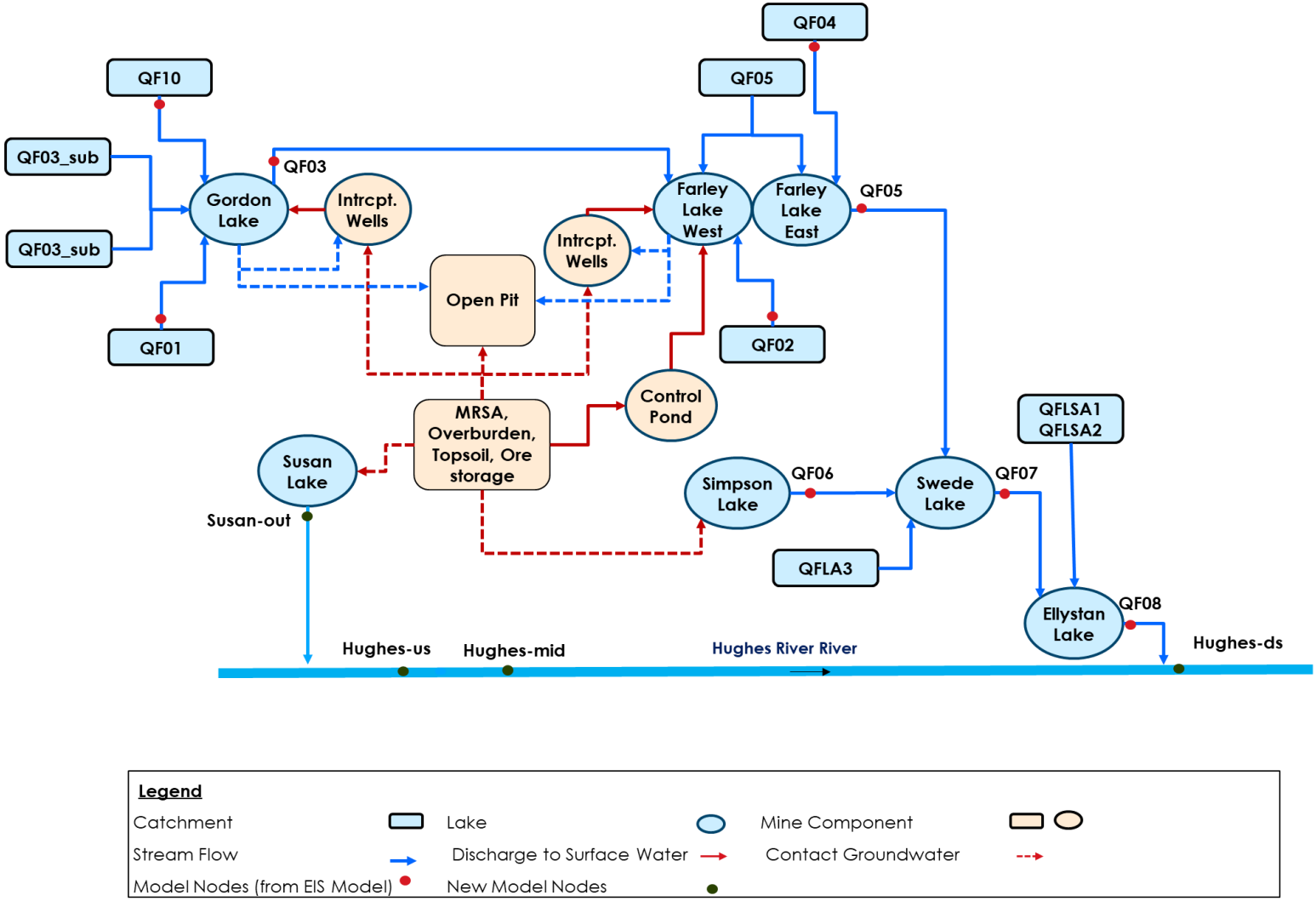
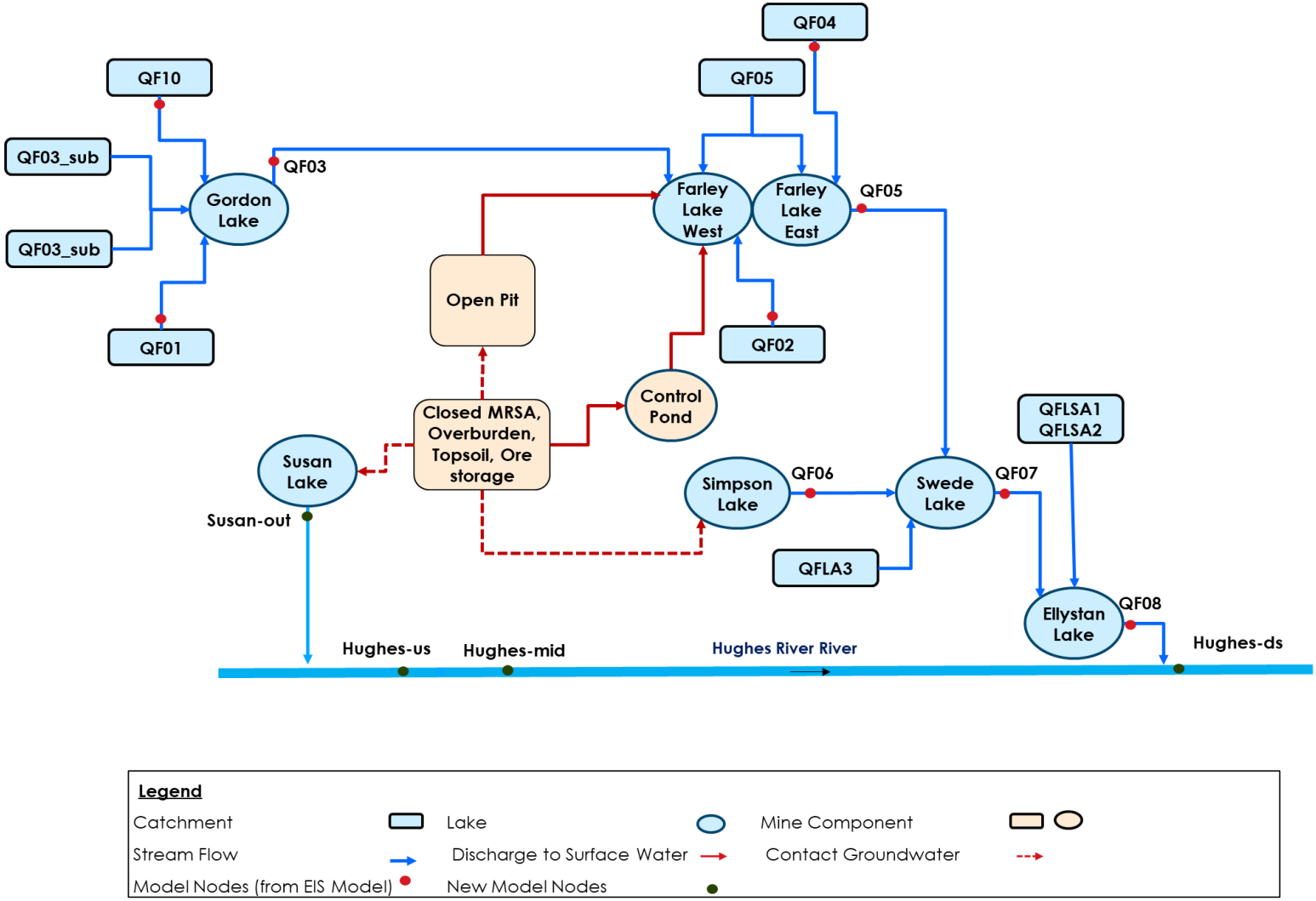


Figure 2.5 Conceptual Water Management at Post-Closure (after Pit Filling)



2.1.3 Runoff Coefficients

Monthly runoff coefficients, used to transform precipitation into site runoff, were updated based on estimates provided by WSP (2023) and are summarized in Table 2.2.

Table 2.2 Runoff Coefficients for Site Runoff

Month	Runoff Coefficient					
	Natural Ground	Prepared Ground	Ponds	Mine Rock	Overburden	Pit Walls
Jan	0.40	0.90	1.00	0.60	0.50	0.95
Feb	0.40	0.90	1.00	0.60	0.50	0.95
Mar	0.40	0.90	1.00	0.60	0.50	0.95
Apr	0.35	0.85	1.00	0.60	0.50	0.95
May	0.35	0.85	1.00	0.50	0.40	0.95
Jun	0.30	0.85	1.00	0.50	0.40	0.95
Jul	0.30	0.85	1.00	0.50	0.40	0.95
Aug	0.30	0.85	1.00	0.50	0.40	0.95
Sep	0.30	0.85	1.00	0.50	0.40	0.95
Oct	0.40	0.85	1.00	0.60	0.50	0.95
Nov	0.40	0.90	1.00	0.60	0.50	0.95
Dec	0.40	0.90	1.00	0.60	0.50	0.95

Source: WSP (2023)

2.1.4 Groundwater

Groundwater inputs to the water balance model including groundwater inflow to the historical open pits and new open pit, lake baseflow changes, and contact groundwater inflow into the lakes were updated based on Figure 5.1 and Tables 5.3 to 5.8 in the updated groundwater model report (Appendix E of the Gordon Mine Plan NOA/NOC). Seepage flows from the historical south and north MRSAs were not included in the water balance model as the recharge applied to the historical north and south MRSAs were consistent with recharge across the remainder of the groundwater flow model domain (except for Mine infrastructure) and therefore do not alter the results of the water balance model. The seepage rates for the historical north and south MRSAs were added as part of the water quality modelling, described in Section 3.1.3.

2.2 Methods

Like the EIS model, the updated model was run for the average, 1:25-year dry, and 1:25-year wet scenarios. The method for estimating receiving environment streamflow was improved using a combination of site-specific and long-term regional data, as described below. Other methods, as well as the use of the GoldSim software package with monthly time steps, remain unchanged from the EIS model.

2.2.1 Receiving Environment Streamflow

To develop long-term runoff estimates for the Gordon site watersheds, site-specific streamflow data collected from 2015 to 2022 from a representative station was supplemented with long-term data from the most relevant regional hydrometric station. From on-site hydrometric stations, QF08 was selected due to its relatively long record of data (2015 to 2022) and quality of the collected hydrometric data. The Water Survey of Canada (WSC) station on Footprint River above Footprint Lake (0705TF002; 150 km from the Project; drainage area = 643 km^2) was deemed most reliable for pairing local and regional hydrometric data. This selection was based on proximity, drainage area, elevation, as well as timing of freshet at WSC05TF002 and Gordon site watersheds during their concurrent period of record.

Two regression analysis methods were used to estimate long-term monthly and annual average runoff in the Gordon site watersheds:

- Chronological Regression: A linear regression analysis was conducted between the monthly flows measured at QF08 from 2015 to 2022 with corresponding monthly flows at WSC05TF002. The modelled monthly streamflow at QF08 during this period shows a good Nash-Sutcliffe Efficiency (NSE) of 0.84. However, modelled streamflows using the linear regression method underestimate the high flows (see 2018 high flows in Figure 2.6) and overestimate winter low flows (see 2017 low flows in Figure 2.6).
- Ranked Pairing: This method, frequently used by water resource practitioners in Canada, involves ranking concurrent monthly streamflow data at QF08 and WSC05TF002 (2015 to 2022) from lowest to highest. For historical streamflow at WSC05TF002, the modelled streamflow at QF08 was estimated by interpolation between (and extrapolation beyond) the ranked pairs. The modelled monthly streamflow at QF08 from 2015 to 2022 shows a reasonable NSE of 0.78 (Figure 2.6).

Both the chronological and ranked paring methods demonstrate reasonable NSE values; however, the ranked pairing was selected (due to its better visual match with observed high and low flows) to generate a synthetic long-term time-series of monthly flows in the receiving environment for the Gordon site. A 46-year time-series was generated for the Gordon site based on available monthly streamflows at WSC05TF002 from 1977 to 2022.The average, 1:25-year dry, and 1:25-year wet statistics from this long-term time-series were incorporated into the water balance model (Table 2.3).

Figure 2.6 Modelled and Observed Streamflows at QF08 during Concurrent Period of Record with Regional Hydrometric Station (WSC05TF002)

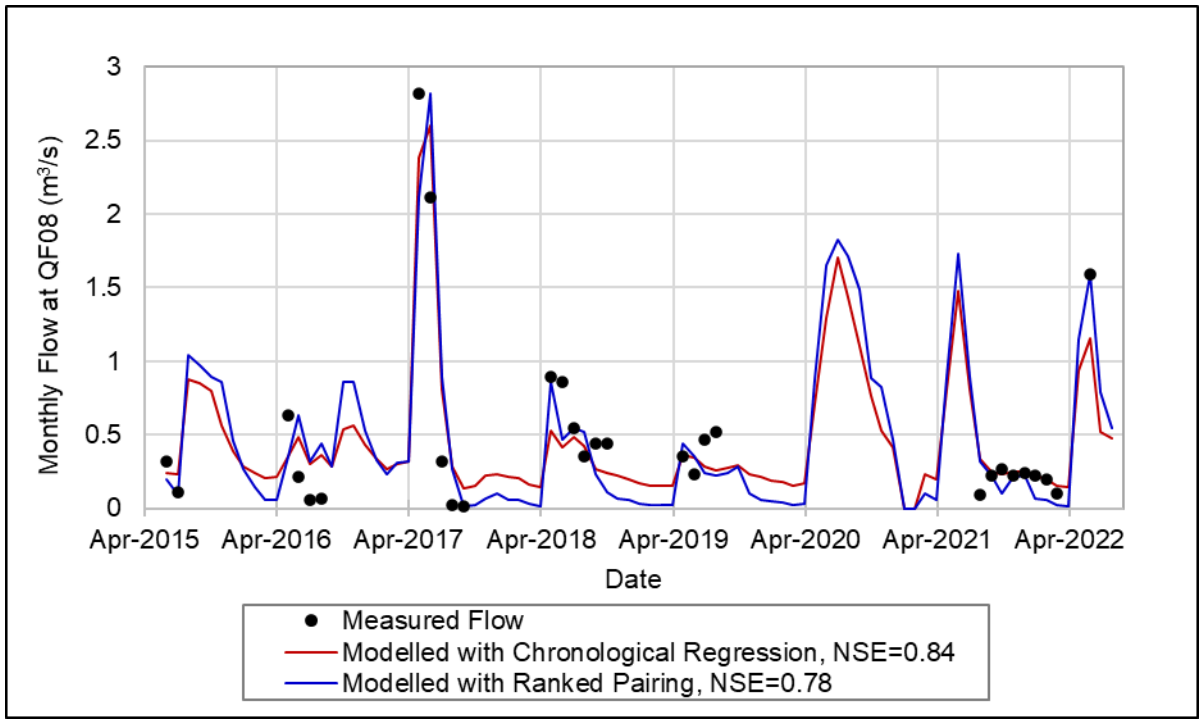


Table 2.3 Long-Term Estimates for Receiving Environment Runoff

Month	Runoff (mm)		
	Average	1:25-Year Dry	1:25-Year Wet
Jan	5.6	0.7	9.4
Feb	3.3	0.6	6.2
Mar	2.0	0.6	5.2
Apr	3.4	0.6	5.0
May	34.1	12.5	66.8
Jun	34.0	9.4	88.3
Jul	19.8	2.7	53.1
Aug	16.4	6.9	36.8
Sep	18.0	6.5	25.8
Oct	19.2	3.6	20.1
Nov	17.0	1.6	23.8
Dec	10.9	1.2	15.6
Annual	**184**	**47**	**356**

2.3 Results

Using updated inputs (described in Section 2.1) and the improved method for estimate receiving environment flows (described in Section 2.2.1), the updated model was run to simulate both existing conditions and projection-affected flows. Predicted monthly streamflows for the average scenario at model nodes QF01, QF02, QF03, QF05, QF06, QF07, QF08, Susan Outflow, Hughes-us, Hughes-mid, and Hughes-ds, as well as predicted water levels at Gordon, Farley, Simpson, Swede, and Ellystan lakes, are shown in Table 2.4 to Table 2.19 for each Project phase. These results are compared to those of the EIS model in Section 2.4.

Further assessment of these results (i.e., surface water quantity effects assessment) is provided in Section 3.3 of Gordon Mine Plan Amendment NOA/NOC. Detailed results at these model nodes, including the results for the 1:25-year dry and 1:25-year wet scenarios, as well as the variation of flow during each project phase, are provided in Appendix A.

Results at model nodes QF04 and QF10 are not provided because streamflow at these nodes is predicted to remain unchanged from existing conditions (i.e., unaffected by the Project).

Table 2.4 Simulated Average Monthly and Annual Streamflows at Model Node QF01 (Gordon Lake Inflow from South)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.003	0.003	0.000	0%	0.003	-0.001	-19%	0.002	-0.001	-44%	0.002	-0.001	-44%
Feb	0.002	0.002	0.000	0%	0.002	0.000	-20%	0.001	-0.001	-44%	0.001	-0.001	-44%
Mar	0.001	0.001	0.000	-1%	0.001	0.000	-20%	0.001	0.000	-44%	0.001	0.000	-44%
Apr	0.002	0.002	0.000	-1%	0.002	0.000	-21%	0.001	-0.001	-44%	0.001	-0.001	-44%
May	0.019	0.019	0.000	-1%	0.015	-0.004	-21%	0.011	-0.008	-44%	0.011	-0.008	-44%
Jun	0.020	0.019	0.000	-1%	0.015	-0.004	-22%	0.011	-0.009	-44%	0.011	-0.009	-44%
Jul	0.011	0.011	0.000	-2%	0.009	-0.002	-22%	0.006	-0.005	-44%	0.006	-0.005	-44%
Aug	0.009	0.009	0.000	-2%	0.007	-0.002	-23%	0.005	-0.004	-44%	0.005	-0.004	-44%
Sep	0.010	0.010	0.000	-2%	0.008	-0.002	-23%	0.006	-0.005	-44%	0.006	-0.005	-44%
Oct	0.011	0.010	0.000	-3%	0.008	-0.003	-24%	0.006	-0.005	-44%	0.006	-0.005	-44%
Nov	0.010	0.010	0.000	-3%	0.007	-0.002	-24%	0.005	-0.004	-44%	0.005	-0.004	-44%
Dec	0.006	0.006	0.000	-3%	0.005	-0.002	-25%	0.003	-0.003	-44%	0.003	-0.003	-44%
Annual	**0.009**	**0.009**	**0.000**	**-2%**	**0.007**	**-0.002**	**-22%**	**0.005**	**-0.004**	**-44%**	**0.005**	**-0.004**	**-44%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.5 Simulated Average Monthly and Annual Streamflows at Model Node QF02 (Farley Lake Inflow from South)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.002	0.002	0.000	-1%	0.002	0.000	-22%	0.001	-0.001	-44%	0.001	-0.001	-45%
Feb	0.002	0.001	0.000	-2%	0.001	0.000	-22%	0.001	-0.001	-44%	0.001	-0.001	-45%
Mar	0.001	0.001	0.000	-2%	0.001	0.000	-23%	0.000	0.000	-44%	0.000	0.000	-45%
Apr	0.001	0.001	0.000	-2%	0.001	0.000	-23%	0.001	-0.001	-44%	0.001	-0.001	-45%
May	0.014	0.014	0.000	-2%	0.011	-0.003	-24%	0.008	-0.006	-44%	0.008	-0.006	-45%
Jun	0.014	0.014	0.000	-3%	0.011	-0.003	-24%	0.008	-0.006	-44%	0.008	-0.006	-45%
Jul	0.008	0.008	0.000	-3%	0.006	-0.002	-25%	0.005	-0.004	-45%	0.005	-0.004	-45%
Aug	0.007	0.006	0.000	-4%	0.005	-0.002	-25%	0.004	-0.003	-45%	0.004	-0.003	-45%
Sep	0.008	0.007	0.000	-4%	0.006	-0.002	-26%	0.004	-0.003	-45%	0.004	-0.003	-45%
Oct	0.008	0.008	0.000	-5%	0.006	-0.002	-26%	0.004	-0.004	-45%	0.004	-0.004	-45%
Nov	0.007	0.007	0.000	-5%	0.005	-0.002	-27%	0.004	-0.003	-45%	0.004	-0.003	-45%
Dec	0.004	0.004	0.000	-6%	0.003	-0.001	-27%	0.002	-0.002	-45%	0.002	-0.002	-45%
Annual	**0.006**	**0.006**	**0.000**	**-3%**	**0.005**	**-0.002**	**-24%**	**0.004**	**-0.003**	**-44%**	**0.004**	**-0.003**	**-45%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.6 Simulated Average Monthly and Annual Streamflows at Model Node QF03 (Gordon Lake Outflow)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.009	0.009	0.000	0%	0.008	-0.001	-9%	0.007	-0.002	-21%	0.007	-0.002	-21%
Feb	0.006	0.006	0.000	0%	0.005	-0.001	-9%	0.005	-0.001	-21%	0.005	-0.001	-21%
Mar	0.003	0.003	0.000	0%	0.003	0.000	-10%	0.002	-0.001	-21%	0.002	-0.001	-21%
Apr	0.006	0.006	0.000	0%	0.005	-0.001	-10%	0.004	-0.001	-21%	0.004	-0.001	-21%
May	0.055	0.055	0.000	-1%	0.049	-0.006	-10%	0.043	-0.012	-21%	0.043	-0.012	-21%
Jun	0.056	0.056	0.000	-1%	0.050	-0.006	-10%	0.044	-0.012	-21%	0.044	-0.012	-21%
Jul	0.032	0.032	0.000	-1%	0.028	-0.003	-11%	0.025	-0.007	-21%	0.025	-0.007	-21%
Aug	0.026	0.026	0.000	-1%	0.023	-0.003	-11%	0.021	-0.006	-21%	0.021	-0.006	-21%
Sep	0.030	0.030	0.000	-1%	0.026	-0.003	-11%	0.024	-0.006	-21%	0.024	-0.006	-21%
Oct	0.031	0.030	0.000	-1%	0.027	-0.004	-11%	0.024	-0.007	-21%	0.024	-0.007	-21%
Nov	0.028	0.028	0.000	-1%	0.025	-0.003	-12%	0.022	-0.006	-21%	0.022	-0.006	-21%
Dec	0.018	0.017	0.000	-1%	0.015	-0.002	-12%	0.014	-0.004	-21%	0.014	-0.004	-21%
Annual	**0.025**	**0.025**	**0.000**	**-1%**	**0.022**	**-0.003**	**-11%**	**0.020**	**-0.005**	**-21%**	**0.020**	**-0.005**	**-21%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.7 Simulated Average Monthly and Annual Streamflows at Model Node QF05 (Farley Lake Outflow)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.038	0.038	0.000	0%	0.052	0.015	39%	0.029	-0.009	-23%	0.056	0.019	50%
Feb	0.025	0.025	0.000	0%	0.040	0.015	60%	0.018	-0.007	-30%	0.045	0.020	79%
Mar	0.013	0.015	0.002	11%	0.029	0.016	120%	0.008	-0.006	-43%	0.034	0.021	159%
Apr	0.024	0.026	0.003	11%	0.047	0.024	99%	0.016	-0.007	-30%	0.057	0.033	139%
May	0.232	0.234	0.002	1%	0.248	0.016	7%	0.206	-0.026	-11%	0.248	0.016	7%
Jun	0.239	0.240	0.001	1%	0.244	0.006	2%	0.212	-0.026	-11%	0.238	0.000	0%
Jul	0.135	0.136	0.002	1%	0.146	0.012	9%	0.118	-0.017	-13%	0.145	0.011	8%
Aug	0.111	0.115	0.004	3%	0.123	0.012	11%	0.096	-0.015	-13%	0.123	0.011	10%
Sep	0.126	0.130	0.004	3%	0.141	0.014	11%	0.110	-0.016	-13%	0.142	0.016	12%
Oct	0.131	0.135	0.005	4%	0.144	0.013	10%	0.114	-0.016	-13%	0.146	0.015	12%
Nov	0.119	0.125	0.006	5%	0.131	0.012	10%	0.104	-0.015	-13%	0.132	0.013	11%
Dec	0.074	0.083	0.008	11%	0.088	0.013	18%	0.063	-0.011	-15%	0.090	0.015	21%
Annual	**0.106**	**0.109**	**0.003**	**4%**	**0.120**	**0.014**	**33%**	**0.092**	**-0.014**	**-19%**	**0.122**	**0.016**	**42%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.8 Simulated Average Monthly and Annual Streamflows at Model Node QF06 (Simpson Lake Outflow)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.017	0.017	0.000	0%	0.017	0.000	0%	0.017	0.000	0%	0.017	0.000	0%
Feb	0.011	0.011	0.000	0%	0.011	0.000	0%	0.011	0.000	0%	0.011	0.000	0%
Mar	0.006	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%
Apr	0.010	0.010	0.000	0%	0.010	0.000	0%	0.010	0.000	0%	0.010	0.000	0%
May	0.102	0.102	0.000	0%	0.102	0.000	0%	0.102	0.000	0%	0.102	0.000	0%
Jun	0.105	0.105	0.000	0%	0.105	0.000	0%	0.105	0.000	0%	0.105	0.000	0%
Jul	0.059	0.059	0.000	0%	0.059	0.000	0%	0.059	0.000	0%	0.059	0.000	0%
Aug	0.049	0.049	0.000	0%	0.049	0.000	0%	0.049	0.000	0%	0.049	0.000	0%
Sep	0.056	0.056	0.000	0%	0.056	0.000	0%	0.056	0.000	0%	0.056	0.000	0%
Oct	0.057	0.057	0.000	0%	0.057	0.000	0%	0.057	0.000	0%	0.057	0.000	0%
Nov	0.052	0.052	0.000	0%	0.052	0.000	0%	0.052	0.000	0%	0.052	0.000	0%
Dec	0.033	0.033	0.000	0%	0.033	0.000	0%	0.033	0.000	0%	0.033	0.000	0%
Annual	**0.047**	**0.047**	**0.000**	**0%**	**0.047**	**0.000**	**0%**	**0.047**	**0.000**	**0%**	**0.047**	**0.000**	**0%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.9 Simulated Average Monthly and Annual Streamflows at Model Node QF07 (Swede Lake Outflow)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.081	0.081	0.000	0%	0.096	0.015	18%	0.072	-0.009	-11%	0.100	0.019	23%
Feb	0.054	0.054	0.000	0%	0.069	0.015	28%	0.047	-0.007	-14%	0.074	0.020	37%
Mar	0.029	0.030	0.002	5%	0.045	0.016	56%	0.023	-0.006	-20%	0.050	0.021	74%
Apr	0.051	0.054	0.003	5%	0.074	0.024	46%	0.044	-0.007	-14%	0.084	0.033	65%
May	0.500	0.502	0.002	0%	0.516	0.016	3%	0.474	-0.026	-5%	0.516	0.016	3%
Jun	0.514	0.515	0.001	0%	0.520	0.006	1%	0.487	-0.026	-5%	0.514	0.000	0%
Jul	0.291	0.292	0.002	1%	0.302	0.012	4%	0.274	-0.017	-6%	0.301	0.010	4%
Aug	0.240	0.243	0.004	1%	0.251	0.012	5%	0.225	-0.015	-6%	0.251	0.011	5%
Sep	0.272	0.276	0.004	1%	0.286	0.014	5%	0.256	-0.016	-6%	0.288	0.016	6%
Oct	0.281	0.286	0.005	2%	0.294	0.013	5%	0.265	-0.016	-6%	0.297	0.015	5%
Nov	0.256	0.263	0.006	2%	0.268	0.012	5%	0.241	-0.015	-6%	0.269	0.013	5%
Dec	0.160	0.169	0.009	5%	0.174	0.013	8%	0.149	-0.011	-7%	0.176	0.016	10%
Annual	**0.228**	**0.231**	**0.003**	**2%**	**0.242**	**0.014**	**15%**	**0.214**	**-0.014**	**-9%**	**0.244**	**0.016**	**20%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.10 Simulated Average Monthly and Annual Streamflows at Model Node QF08 (Ellystan Lake Outflow)

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.137	0.137	0.000	0%	0.152	0.015	11%	0.128	-0.009	-6%	0.156	0.019	14%
Feb	0.091	0.091	0.000	0%	0.107	0.015	17%	0.084	-0.007	-8%	0.111	0.020	22%
Mar	0.048	0.050	0.002	3%	0.064	0.016	33%	0.043	-0.006	-12%	0.070	0.021	44%
Apr	0.086	0.089	0.003	3%	0.110	0.023	27%	0.079	-0.007	-8%	0.119	0.033	38%
May	0.844	0.846	0.002	0%	0.860	0.016	2%	0.818	-0.026	-3%	0.861	0.017	2%
Jun	0.868	0.869	0.001	0%	0.874	0.006	1%	0.841	-0.026	-3%	0.868	0.000	0%
Jul	0.491	0.492	0.002	0%	0.502	0.012	2%	0.474	-0.017	-3%	0.501	0.011	2%
Aug	0.405	0.408	0.004	1%	0.416	0.012	3%	0.390	-0.015	-4%	0.416	0.011	3%
Sep	0.459	0.463	0.004	1%	0.474	0.014	3%	0.443	-0.016	-3%	0.475	0.016	3%
Oct	0.475	0.479	0.005	1%	0.488	0.013	3%	0.458	-0.016	-3%	0.490	0.015	3%
Nov	0.433	0.439	0.006	1%	0.445	0.012	3%	0.418	-0.015	-3%	0.446	0.013	3%
Dec	0.271	0.279	0.008	3%	0.284	0.013	5%	0.260	-0.011	-4%	0.286	0.015	6%
Annual	**0.386**	**0.388**	**0.003**	**1%**	**0.399**	**0.014**	**9%**	**0.371**	**-0.014**	**-5%**	**0.401**	**0.016**	**12%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.11 Simulated Average Monthly and Annual Streamflows at Model Node Susan Outflow

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	0.002	0.002	0.000	0%	0.002	0.000	0%	0.002	0.000	0%	0.002	0.000	0%
Feb	0.001	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%
Mar	0.001	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	1%	0.001	0.000	1%
Apr	0.001	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%	0.001	0.000	0%
May	0.013	0.013	0.000	0%	0.013	0.000	0%	0.013	0.000	0%	0.013	0.000	0%
Jun	0.014	0.014	0.000	0%	0.014	0.000	0%	0.014	0.000	0%	0.014	0.000	0%
Jul	0.008	0.008	0.000	0%	0.008	0.000	0%	0.008	0.000	0%	0.008	0.000	0%
Aug	0.006	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%	0.006	0.000	0%
Sep	0.007	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%
Oct	0.007	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%
Nov	0.007	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%	0.007	0.000	0%
Dec	0.004	0.004	0.000	0%	0.004	0.000	0%	0.004	0.000	0%	0.004	0.000	0%
Annual	**0.006**	**0.006**	**0.000**	**0%**	**0.006**	**0.000**	**0%**	**0.006**	**0.000**	**0%**	**0.006**	**0.000**	**0%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.12 Simulated Average Monthly and Annual Streamflows at Model Node Hughes-us

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	6.543	6.543	0.000	0%	6.543	0.000	0%	6.543	0.000	0%	6.543	0.000	0%
Feb	4.362	4.362	0.000	0%	4.362	0.000	0%	4.362	0.000	0%	4.362	0.000	0%
Mar	2.308	2.308	0.000	0%	2.308	0.000	0%	2.308	0.000	0%	2.308	0.000	0%
Apr	4.109	4.109	0.000	0%	4.109	0.000	0%	4.109	0.000	0%	4.109	0.000	0%
May	40.300	40.300	0.000	0%	40.300	0.000	0%	40.300	0.000	0%	40.300	0.000	0%
Jun	41.440	41.440	0.000	0%	41.440	0.000	0%	41.440	0.000	0%	41.440	0.000	0%
Jul	23.420	23.420	0.000	0%	23.420	0.000	0%	23.420	0.000	0%	23.420	0.000	0%
Aug	19.310	19.310	0.000	0%	19.310	0.000	0%	19.310	0.000	0%	19.310	0.000	0%
Sep	21.940	21.940	0.000	0%	21.940	0.000	0%	21.940	0.000	0%	21.940	0.000	0%
Oct	22.660	22.660	0.000	0%	22.660	0.000	0%	22.660	0.000	0%	22.660	0.000	0%
Nov	20.670	20.670	0.000	0%	20.670	0.000	0%	20.670	0.000	0%	20.670	0.000	0%
Dec	12.930	12.930	0.000	0%	12.930	0.000	0%	12.930	0.000	0%	12.930	0.000	0%
Annual	**18.407**	**18.407**	**0.000**	**0%**	**18.407**	**0.000**	**0%**	**18.407**	**0.000**	**0%**	**18.407**	**0.000**	**0%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.13 Simulated Average Monthly and Annual Streamflows at Model Node Hughes-mid

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	6.543	6.543	0.000	0%	6.543	0.000	0%	6.543	0.000	0%	6.543	0.000	0%
Feb	4.362	4.362	0.000	0%	4.362	0.000	0%	4.362	0.000	0%	4.362	0.000	0%
Mar	2.308	2.308	0.000	0%	2.308	0.000	0%	2.308	0.000	0%	2.308	0.000	0%
Apr	4.109	4.109	0.000	0%	4.109	0.000	0%	4.109	0.000	0%	4.109	0.000	0%
May	40.300	40.490	0.190	0%	40.300	0.000	0%	40.300	0.000	0%	40.300	0.000	0%
Jun	41.440	41.615	0.175	0%	41.440	0.000	0%	41.440	0.000	0%	41.440	0.000	0%
Jul	23.420	23.455	0.035	0%	23.420	0.000	0%	23.420	0.000	0%	23.420	0.000	0%
Aug	19.310	19.310	0.000	0%	19.310	0.000	0%	19.310	0.000	0%	19.310	0.000	0%
Sep	21.940	21.940	0.000	0%	21.940	0.000	0%	21.940	0.000	0%	21.940	0.000	0%
Oct	22.660	22.660	0.000	0%	22.660	0.000	0%	22.660	0.000	0%	22.660	0.000	0%
Nov	20.670	20.670	0.000	0%	20.670	0.000	0%	20.670	0.000	0%	20.670	0.000	0%
Dec	12.930	12.930	0.000	0%	12.930	0.000	0%	12.930	0.000	0%	12.930	0.000	0%
Annual	**18.407**	**18.440**	**0.033**	**0%**	**18.407**	**0.000**	**0%**	**18.407**	**0.000**	**0%**	**18.407**	**0.000**	**0%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.14 Simulated Average Monthly and Annual Streamflows at Model Node Hughes-ds

Month	Existing Condition	Construction			Operation			Closure (Pit Filling)			Post-Closure		
	Flow (m^3/s)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (m^3/s)	Change from Existing (%)
Jan	6.680	6.680	0.000	0%	6.695	0.015	0%	6.672	-0.009	0%	6.699	0.019	0%
Feb	4.454	4.454	0.000	0%	4.469	0.015	0%	4.446	-0.008	0%	4.473	0.019	0%
Mar	2.356	2.358	0.002	0%	2.372	0.016	1%	2.350	-0.006	0%	2.377	0.021	1%
Apr	4.195	4.198	0.003	0%	4.219	0.024	1%	4.188	-0.007	0%	4.228	0.033	1%
May	41.150	41.335	0.185	0%	41.164	0.014	0%	41.123	-0.027	0%	41.160	0.010	0%
Jun	42.310	42.485	0.175	0%	42.316	0.006	0%	42.283	-0.027	0%	42.310	0.000	0%
Jul	23.910	23.950	0.040	0%	23.926	0.016	0%	23.896	-0.014	0%	23.920	0.010	0%
Aug	19.720	19.720	0.000	0%	19.728	0.008	0%	19.704	-0.016	0%	19.730	0.010	0%
Sep	22.400	22.400	0.000	0%	22.412	0.012	0%	22.383	-0.018	0%	22.410	0.010	0%
Oct	23.140	23.140	0.000	0%	23.154	0.014	0%	23.124	-0.016	0%	23.150	0.010	0%
Nov	21.110	21.110	0.000	0%	21.118	0.008	0%	21.092	-0.018	0%	21.120	0.010	0%
Dec	13.200	13.205	0.005	0%	13.212	0.012	0%	13.187	-0.013	0%	13.210	0.010	0%
Annual	**18.795**	**18.829**	**0.034**	**0%**	**18.808**	**0.013**	**0%**	**18.780**	**-0.015**	**0%**	**18.808**	**0.013**	**0%**

Notes:

m^3/s – cubic metres per second; % - percent

0.0% and 0.000 m^3/s in the Table represent < 0.1% and <0.001 m^3/s, respectively.

Table 2.15 Simulated Average Monthly and Annual Water Levels at Gordon Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	315.18	315.18	0.00	315.17	-0.01	315.15	-0.03	315.15	-0.03
Feb	315.13	315.13	0.00	315.12	-0.01	315.11	-0.02	315.11	-0.02
Mar	315.07	315.07	0.00	315.06	-0.01	315.05	-0.02	315.05	-0.02
Apr	315.13	315.13	0.00	315.12	-0.01	315.10	-0.03	315.10	-0.03
May	315.47	315.47	0.00	315.45	-0.02	315.42	-0.05	315.42	-0.05
Jun	315.48	315.48	0.00	315.45	-0.03	315.43	-0.05	315.43	-0.05
Jul	315.37	315.37	0.00	315.35	-0.02	315.33	-0.04	315.33	-0.04
Aug	315.33	315.33	0.00	315.32	-0.01	315.30	-0.03	315.30	-0.03
Sep	315.36	315.36	0.00	315.34	-0.02	315.32	-0.04	315.32	-0.04
Oct	315.36	315.36	0.00	315.34	-0.02	315.32	-0.04	315.32	-0.04
Nov	315.35	315.35	0.00	315.33	-0.02	315.31	-0.04	315.31	-0.04
Dec	315.27	315.27	0.00	315.25	-0.02	315.24	-0.03	315.24	-0.03
Annual	**315.29**	**315.29**	**0.00**	**315.27**	**-0.02**	**315.26**	**-0.03**	**315.26**	**-0.04**

Notes:

m – metres

0.00 m in the Table represents < 0.01 m.

Table 2.16 Simulated Average Monthly and Annual Water Levels at Farley Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	313.55	313.55	0.00	313.57	0.02	313.53	-0.02	313.57	0.02
Feb	313.52	313.52	0.00	313.55	0.03	313.50	-0.02	313.56	0.04
Mar	313.48	313.49	0.00	313.53	0.05	313.44	-0.04	313.54	0.06
Apr	313.52	313.53	0.00	313.56	0.04	313.49	-0.03	313.57	0.05
May	313.68	313.69	0.00	313.69	0.01	313.67	-0.01	313.69	0.01
Jun	313.69	313.69	0.00	313.69	0.00	313.68	-0.01	313.69	0.00
Jul	313.64	313.64	0.00	313.65	0.01	313.63	-0.01	313.65	0.01
Aug	313.62	313.63	0.01	313.63	0.01	313.61	-0.01	313.63	0.01
Sep	313.63	313.64	0.01	313.64	0.01	313.62	-0.01	313.64	0.01
Oct	313.64	313.64	0.00	313.65	0.01	313.63	-0.01	313.65	0.01
Nov	313.63	313.63	0.00	313.64	0.01	313.62	-0.01	313.64	0.01
Dec	313.59	313.61	0.02	313.61	0.02	313.58	-0.01	313.61	0.02
Annual	**313.60**	**313.60**	**0.00**	**313.62**	**0.02**	**313.58**	**-0.02**	**313.62**	**0.02**

Notes:

m – metres

0.00 m in the Table represents < 0.01 m.

Table 2.17 Simulated Average Monthly and Annual Water Levels at Simpson Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	297.21	297.21	0.00	297.21	0.00	297.21	0.00	297.21	0.00
Feb	297.17	297.17	0.00	297.17	0.00	297.17	0.00	297.17	0.00
Mar	297.13	297.13	0.00	297.13	0.00	297.13	0.00	297.13	0.00
Apr	297.17	297.17	0.00	297.17	0.00	297.17	0.00	297.17	0.00
May	297.40	297.40	0.00	297.40	0.00	297.40	0.00	297.40	0.00
Jun	297.41	297.41	0.00	297.41	0.00	297.41	0.00	297.41	0.00
Jul	297.33	297.33	0.00	297.33	0.00	297.33	0.00	297.33	0.00
Aug	297.31	297.31	0.00	297.31	0.00	297.31	0.00	297.31	0.00
Sep	297.33	297.33	0.00	297.33	0.00	297.33	0.00	297.33	0.00
Oct	297.33	297.33	0.00	297.33	0.00	297.33	0.00	297.33	0.00
Nov	297.32	297.32	0.00	297.32	0.00	297.32	0.00	297.32	0.00
Dec	297.27	297.27	0.00	297.27	0.00	297.27	0.00	297.27	0.00
Annual	**297.28**	**297.28**	**0.00**	**297.28**	**0.00**	**297.28**	**0.00**	**297.28**	**0.00**

Notes:

m – metres

0.00 m in the Table represents < 0.01 m.

Table 2.18 Simulated Average Monthly and Annual Water Levels at Swede Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	297.15	297.15	0.00	297.17	0.02	297.14	-0.01	297.18	0.03
Feb	297.12	297.12	0.00	297.14	0.02	297.11	-0.01	297.15	0.03
Mar	297.08	297.08	0.00	297.10	0.02	297.07	-0.01	297.11	0.03
Apr	297.11	297.12	0.00	297.14	0.03	297.10	-0.01	297.16	0.05
May	297.46	297.46	0.00	297.47	0.01	297.45	-0.01	297.47	0.01
Jun	297.47	297.47	0.00	297.47	0.00	297.45	-0.02	297.47	0.00
Jul	297.34	297.34	0.00	297.35	0.01	297.32	-0.02	297.34	0.00
Aug	297.30	297.30	0.00	297.31	0.01	297.29	-0.01	297.31	0.01
Sep	297.32	297.33	0.00	297.33	0.01	297.31	-0.01	297.33	0.01
Oct	297.33	297.33	0.00	297.34	0.01	297.32	-0.01	297.34	0.01
Nov	297.31	297.32	0.01	297.32	0.01	297.30	-0.01	297.32	0.01
Dec	297.24	297.25	0.00	297.25	0.01	297.23	-0.01	297.25	0.01
Annual	**297.27**	**297.27**	**0.00**	**297.28**	**0.01**	**297.26**	**-0.01**	**297.29**	**0.02**

Notes:

m – metres

0.00 m in the Table represents < 0.01 m.

Table 2.19 Simulated Average Monthly and Annual Water Levels at Ellystan Lake

Month	Existing Condition	Construction		Operation		Closure (Pit Filling)		Post-Closure	
	Level (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)	Level (m)	Change from Existing (m)
Jan	282.88	282.88	0.00	282.89	0.01	282.88	0.00	282.89	0.01
Feb	282.85	282.85	0.00	282.86	0.01	282.84	-0.01	282.86	0.01
Mar	282.80	282.80	0.00	282.82	0.02	282.79	-0.01	282.82	0.02
Apr	282.84	282.85	0.01	282.86	0.02	282.84	0.00	282.87	0.03
May	283.06	283.06	0.00	283.07	0.01	283.06	0.00	283.07	0.01
Jun	283.07	283.07	0.00	283.07	0.00	283.06	-0.01	283.07	0.00
Jul	283.01	283.01	0.00	283.01	0.00	283.00	-0.01	283.01	0.00
Aug	282.99	282.99	0.00	282.99	0.00	282.98	-0.01	282.99	0.00
Sep	283.00	283.00	0.00	283.00	0.00	283.00	0.00	283.00	0.00
Oct	283.00	283.00	0.00	283.01	0.01	283.00	0.00	283.01	0.01
Nov	282.99	282.99	0.00	283.00	0.01	282.99	0.00	283.00	0.01
Dec	282.95	282.95	0.00	282.95	0.00	282.94	-0.01	282.95	0.00
Annual	**282.95**	**282.95**	**0.00**	**282.96**	**0.01**	**282.95**	**-0.01**	**282.96**	**0.01**

Notes:

m – metres

0.00 m in the Table represents < 0.01 m.

2.4 Comparison with EIS Model Results

Both the EIS model and updated model predicted a 12-year pit filling period. The EIS model results (Stantec 2020a and 2020b) and updated model results (Table 2.4 to Table 2.19) indicate the following effects (Table 2.20 and Table 2.21):

- QF01 and QF02:
    - Both the EIS and updated models predict reductions in average monthly streamflows under project-affected conditions.
- QF03:
    - The EIS model predicted monthly flow increases of over 100% during construction and operation compared to existing conditions. The updated model predicts small reductions (-1% to -12%) in flow instead, primarily due to optimization of the interceptor well placements and pumping rates.
    - Both the EIS and updated models predict reductions in average monthly streamflows during closure and post-closure compared to existing conditions.
- QF05:
    - The EIS model predicted flow increases of greater than 300% during construction and operation compared to existing conditions. The updated model predicts a flow increase of up to 120% in March but less than <120% in the other months (0% to 99%) during construction and operation compared to existing conditions. The difference in predicted increase in flow due to the Project is attributed to dewatering historical open pits into Hughes River (instead of dewatering into Farley Lake) and optimization of the interceptor well pumping system.
    - At closure, the updated model predicts flow reductions of up to 43% in winter (December through April) and 13% during the open water season (May through November; Table 2.7) compared to existing conditions. These reductions are predicted as the pit fills. Note that the maximum 43% winter flow reduction corresponds to a decrease of only 0.006 cubic metres per second (m3/s) from an average annual flow of 0.092 m3/s. The EIS model did not predict such a high percentage of winter flow reduction, due to its different surface water and groundwater inputs.
    - At post-closure, the updated model predicts flow increases of up to 159% during the winter months (equivalent to only 0.02 m3/s increase in flow, due to increased baseflows and disturbed areas) and 12% during the open water season compared to existing conditions (Table 2.7). The predicted increase in flow for post-closure compared to existing conditions in the EIS model was less than the predicted increase in flow in the updated model.
- QF06: Both the EIS and updated models predict less than 1% changes in flow between existing conditions and each Project phase.

- QF07 and QF08: These downstream nodes observed similar flow change patterns to QF05 between the EIS model and updated model.
- Susan Outflow, Hughes-us, Hughes-mid, and Hughes-ds: The updated model predicts less than 1% change in flow for each Project phase compared to existing conditions. Streamflows at these locations were not assessed in the EIS model.
- Gordon Lake, Farley Lake, Swede Lake and Ellystan Lake: Both the EIS model and updated model predict average monthly water level changes of less than 0.10 metre (m) for each Project phase compared to existing conditions.
- Simpson Lake: The updated model predicts changes of less than 0.01 m in average monthly water levels for each project phase compared to existing conditions. The water levels at this lake were not assessed in the EIS model.

Table 2.20 Comparison of Updated Water Balance Model Results with EIS Results – Monthly Streamflows

Model Node	Source	Construction		Operation		Closure (Pit Filling)		Post-Closure		Maximum of All Phases[3]	
		Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[3]	Increase[3]
QF01	EIS[4]	-31%	0%	-31%	0%	-31%	0%	-31%	0%	-31%	0%
	Updated[5]	-3%	0%	-25%	0%	-44%	0%	-44%	0%	-44%	0%
QF02	EIS[4]	-33%	0%	-33%	0%	-33%	0%	-33%	0%	-33%	0%
	Updated[5]	-6%	0%	-27%	0%	-45%	0%	-45%	0%	-45%	0%
QF03	EIS[4]	-3%	133%	-3%	133%	-18%	0%	-21%	0%	-21%	133%
	Updated[5]	-1%	0%	-12%	0%	-21%	0%	-21%	0%	-21%	0%
QF05	EIS[4]	0%	378%	0%	342%	-8%	10%	-3%	28%	-8%	378%
	Updated[5]	0%	11%	0%	120%	-43%	0%	0%	159%	-43%	159%
QF06	EIS[4]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Updated[5]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
QF07	EIS[4]	0%	139%	0%	136%	-3%	4%	-1%	9%	-3%	139%
	Updated[5]	0%	5%	0%	56%	-20%	0%	0%	74%	-20%	74%
QF08	EIS[4]	0%	76%	0%	84%	-3%	3%	-1%	4%	-3%	84%
	Updated[5]	0%	3%	0%	33%	-12%	0%	0%	44%	-12%	44%
Susan Outflow	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	0%	0%	1%	0%	1%	0%	1%
Hughes-us	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Model Node	Source	Construction		Operation		Closure (Pit Filling)		Post-Closure		Maximum of All Phases[3]	
		Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[3]	Increase[3]
Hughes-mid	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hughes-ds	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0%	0%	0%	1%	0%	0%	0%	1%	0%	1%

Notes:

1 maximum decrease of monthly flows during each Project phase. For example, in Table 2.10 (for QF08), during construction, maximum increase of average monthly flows is 3% which occurs in March, April, and December. This 3% flow change is shown in this Table, for 'updated' results for 'QF08' flow decrease during 'construction'.

2 maximum increase of monthly flows during each Project phase.

3 maximum of percent decrease and increase values for individual phases, as provided in the construction, operation, closure (pit filling) and post-closure columns of this table.

4 EIS model results (Stantec 2020a and 2020b)

5 Updated model results (Table 2.4 to Table 2.14)

0%: Lower than 1% change in streamflow

n/a: not assessed in the EIS model

Table 2.21 Comparison of Updated Water Balance Model Results with EIS Results – Monthly Lake Levels

Model Node	Source	Construction		Operation		Closure (Pit Filling)		Post-Closure		Maximum of All Phases[3]	
		Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[1]	Increase[2]	Decrease[3]	Increase[3]
Gordon Lake	EIS[4]	0.00	0.08	0.00	0.08	-0.03	0.00	-0.04	0.00	-0.04	0.08
	Updated[5]	0.00	0.00	-0.03	0.00	-0.05	0.00	-0.05	0.00	-0.05	0.00
Farley Lake	EIS[4]	0.00	0.26	0.00	0.25	-0.02	0.01	-0.01	0.03	-0.02	0.26
	Updated[5]	0.00	0.02	0.00	0.05	-0.04	0.00	0.00	0.06	-0.04	0.06
Simpson Lake	EIS[4]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Updated[5]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Swede Lake	EIS[4]	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.03
	Updated[5]	0.00	0.01	0.00	0.03	-0.02	0.00	0.00	0.05	-0.02	0.05
Ellystan Lake	EIS[4]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Updated[5]	0.00	0.01	0.00	0.02	-0.01	0.00	0.00	0.03	-0.01	0.03

Notes:

1 maximum decrease of monthly water level during each Project phase. For example, in Table 2.15 (for Gordon Lake), during operation, maximum reduction of average monthly lake level is 0.03 m which occurs in June. This -0.03 m level change is shown in this Table, for 'updated' results for Gordon Lake' water level decrease during 'operation'.

2 maximum increase of monthly water level during each Project phase.

4 EIS results (Stantec 2020a and 2020b)

5 Updated Results (Table 2.15 to Table 2.19)

0.00: Lower than 0.01m in lake level

n/a: not assessed in the EIS model

3 Water Quality Model Updates

3.1 Inputs

The following sections present updates to the water quality model inputs resulting from the proposed alterations for the expected case and upper case source terms. Water quality model inputs remain unchanged from the EIS model (Stantec 2020a) except for changes presented in this section.

3.1.1 Mine Rock and Ore Production Schedule

The EIS model was based on older estimated quantities of mine rock and ore of approximately 50.1 Mt and 8 Mt, respectively (Table 3.1), with an estimate of 22% of the total mine rock mass as potentially acid generating (PAG). The updated estimate of mine rock tonnage in the Feasibility Study Update (Alamos 2023) is 51.9 Mt which is about 4% higher than the mine rock mass used in the EIS model. The updated ore tonnage is 7.9 Mt which is comparable to the estimate of ore tonnage of 8 Mt in the EIS model. Likewise, the percentage of PAG mine rock in the updated water quality model is like the EIS model (Table 3.1).

Table 3.1 Mine Rock and Ore Production Rates

Mine Year	Updated Model		EIS Model	
	Mine Rock (t/yr)[1]	Ore (t/yr)	Mine Rock (t/yr)[1]	Ore (t/yr)
-1	2,046,260	6,001	1,784,000	29,000
1	11,152,452	790,164	11,902,000	1,246,000
2	14,369,304	1,630,663	13,406,000	2,256,000
3	13,053,964	2,946,036	11,957,000	1,775,000
4	8,622,912	1,678,571	8,730,000	1,769,000
5	2,595,824	817,362	2,294,000	930,000
6	0	0	0	0
Total	51,873,365	7,868,798	50,073,000	8,005,000

Note:

[1]PAG proportion was estimated to be 22% in the EIS model and in the updated model

3.1.2 Surface Water Quality for Model Nodes at Hughes River

Water quality at the model node upstream of the dewatering effluent (Hughes_Us_CT) is represented by the water quality at AQF41 monitoring station whereas runoff to the model node downstream of the confluence with Ellystan Lake outflow (Hughes_Ds_CT) is represented by the water quality at AQF40 and AFQ40a. The model node downstream of the dewatering effluent is a mix of water coming from model node Hughes_Us_CT and dewatering effluent from the historical pits in the construction phase.

3.1.3 Historical Mine Features

In the EIS model, the historical north MRSA and a portion of the historical south MRSA remained during each Project phase. In the updated model, the historical north MRSA will be used as a borrow source and/or relocated to the new MRSA and therefore is only modelled under existing conditions and not modelled in construction, operation, closure, or post-closure. The majority (about 80%) of the historical south MRSA will be moved to the new MRSA to accommodate the pit and ore stockpiles area. A portion of the historical south MRSA (about 20%) remains throughout the life of mine (Figure 1.1). In the EIS model, seepage from the north and south MRSA was captured by the open pit and interceptor wells during operation. In closure, Gordon Lake received groundwater seepage from the south (0.02 m^3/day) and north (1 m^3/day) MRSAs (Stantec 2020a) whereas Farley Lake West received groundwater seepage from the south MRSA (3.17 m^3/day). In the updated model, groundwater seepage from the south and north MRSA to the receivers were updated based on Tables 5.2 to 5.8 in the updated groundwater model report (Appendix E of the Gordon Mine Plan NOA/NOC). Due to the removal of the north MRSA and the majority of the south MRSA, seepage from these MRSAs to the receiving environment are reduced in the updated model compared to the EIS. Specifically, the Wendy and East pits receive seepage from the historical north MRSA before the start of the construction phase. East pit also receives seepage from the historical south MRSA before the start of the construction phase. The Farley Interceptor Wells receive seepage from the historical south MRSA in the construction and operation phases. In the operation and closure phases, the open pit receives seepage from the historical south MRSA.

The use of the non-PAG rock from the existing north MRSA as a borrow source material during construction is proposed in the Gordon Mine Plan NOA/NOC. In the updated model, it was assumed that the construction mine rock from the north MRSA contributes no load to the updated model.

3.1.4 Source Terms for Nitrogen Species

The mass rate of nitrogen from blasting residuals was calculated using the same approach as in the EIS model. However, the percentage of total nitrogen loss used for the expected case source term in the updated model was 0.5%. This estimate is higher than the 0.2% value used in the EIS model and is half of the maximum value of 1% reported for dry open pit mines (Ferguson and Leask 1988; Golder 2008). For the upper case in the updated model 1.5% was used, in comparison to the 1% for the upper case in the EIS model.

3.1.5 Open Pit Assumptions

Assumptions for the open pit in the EIS model were also applied in the updated model except for the updated open pit volume increased by approximately 9.2% as compared to the estimate of pit volume in the EIS model. Thus, the 3D surface of the ultimate open pit was assumed to increase 9.2% over the pit surface of 436,100 square metres in the EIS model. The updated pit surface was used to calculate the exposed rock mass that was subjected to elemental leaching. In addition, groundwater discharge into the open pit is represented by bedrock groundwater quality in the updated model based on the updated groundwater model report (Appendix E of the Gordon Mine Plan NOA/NOC) whereas groundwater quality in the EIS model was represented by 80% bedrock groundwater and 20% overburden groundwater.

3.1.6 MRSA Seepage Assumptions

Assumptions for the seepages from the MRSA in the EIS model are also applied in the updated model except for the following:

- Particulate in the groundwater seepage is not anticipated to transport through the aquifer. Thus, the total concentration in groundwater seepage discharging to surface water is set to be equal to the dissolved concentration in the updated model whereas this assumption was not applied in the EIS model.
- In the EIS model, uncertainty related to seepage travel time was captured by using the mean travel time for the expected source term and minimum travel time for the upper case source term (i.e., it took the seepage a minimal travel time to reach the receptor at the predicted flow rate). In the updated model, uncertainty related to the travel time was captured by interpolating the predicted flow rate. The seepage flow rate arriving at different receiving environment nodes was set to increase linearly from 0 (m3/s) through the predicted flow rate at the end of construction, operation, and closure phases (presented in Tables 5.4, 5.6, and 5.8 of the Groundwater Model Report). This approach was used for both expected case and upper case source terms of the updated model.

3.1.7 Mass Addition and Removal

In the EIS model, mass addition and removal rates were applied to lake reservoirs based on observed data to simulate seasonal water quality changes within the lake. Mass addition and removal rates were developed for the expected case and upper case source terms. In the updated model, the mass addition and removal rates for the upper case source term are the same as the expected case source term. This is a more conservative approach that the EIS model approach because the removal rates for the upper case source term are either the same or higher than those for the expected case source term and the mass additions for the upper case source term are either the same or lower than those for the expected case source term.

3.2 Model Scenarios

The updated model was completed for the expected case and upper case source term scenarios as in the EIS model. For the expected case source term, average and geometric mean concentrations for surface water and groundwater, respectively, were used. Average leaching rates of mine rock were used for the post-closure phase, representing neutral leaching conditions due to successful management of PAG materials. For the upper case source term, 95th percentile and log_{10} of 95th percentile concentrations for surface water and groundwater, respectively, were used, with the exception that average concentrations for baseline water quality for model nodes at Hughes River (Hughes_Us_CT and Hughes_Ds_CT) were used due to limited availability of the monitoring data. Elevated leaching rates compared to the average leaching rates of mine rock were used for the post-closure phase, representing acidic leaching conditions. This report presents the water quality model results for two scenarios: expected case - average climate and expected case source term scenario, upper case average climate and upper case source term scenario. A comparison to the EIS model water quality results is also provided.

3.3 Results

3.3.1 Updated Model Results

Summary statistics of the updated model water quality results for the expected case and the upper case scenarios are presented in Appendix B and Appendix C, respectively. Water quality results are reported for mine site components and receiving environment model nodes. The respective model node name is shown in the parentheses.

- Open Pit Discharge (Upper_OP_Dis_CT)
- Collection Pond Discharge (Collection_Pond_Dis_CT)
- Farley Dewatering Wells (Farley_Wells_CT)
- Gordon Dewatering Wells (Gordon_Wells_CT)
- Gordon Lake (Gordon_Lake_CT)
- Farley Lake West (Farley_Lake_West_CT)
- Simpson Lake (Simpson_Lake_CT)
- Swede Lake (Swede_Lake_CT)
- Ellystan Lake (Ellystan_Lake_CT)
- Susan Lake (Susan_Lake_CT)
- Hughes River, upstream of the dewatering effluent (Hughes_Us_CT)
- Hughes River, downstream of the dewatering effluent (Hughes_Mid_CT)
- Hughes River, downstream of confluence of Ellystan Lake outflow (Hughes_Ds_CT)

3.3.2 Comparison with EIS Model Results

Summary statistics of the updated model water quality results for the expected case (average – expected scenario) are compared to the summary statistics of the EIS model (Stantec 2020a). The comparison is completed by calculating the percentage changes to the summary statistics values (minimum, mean, median, and max) of the updated model expected case results to the EIS model expected case results (Stantec 2020a) for the following locations, either mine components or model nodes receiving discharges or seepages from the Project:

- Open Pit Discharge (Upper_OP_Dis_CT)
- Collection Pond Discharge (Collection_Pond_Dis_CT)
- Gordon Lake (Gordon_Lake_CT)
- Farley Lake West (Farley_Lake_West_CT)
- Susan Lake (Susan_Lake_CT)

The Hughes_Mid_CT model node receives dewatering effluent from the historical pits (i.e., Wendy and East pits). This model node was not included in the EIS model because dewatering effluent was previously assumed to discharge to Farley Lake West. Therefore, the comparison of the updated model to the EIS model was not made from this node. Hughes_Mid_CT model node was included in the updated model to evaluate the potential effects of the Project on Hughes River water quantity and quality.

The Simpson_Lake_CT model node receives seepage from the MRSA based on the updated groundwater model results (Appendix E of the Gordon Mine Plan NOA/NOC). This model was included in the EIS model but was not predicted for water quality because it did not receive seepage from the MRSA or other Project contact water. Therefore, the comparison of updated model to EIS model was not completed.

The comparison of results is shown in Appendix D and summarized for the open pit discharge and the collection pond discharge below.

Open Pit Discharge:

- Median and maximum concentrations predicted by the updated model for the post-closure phase were between half and two times (2x) the respective concentrations predicted by the EIS model except for the median and maximum concentrations of nitrite and maximum concentration of fluoride (> 2x). The following parameters are predicted by the updated model for the post-closure phase and are less than half of the respective maximum concentrations predicted by the EIS model:
    - Median and maximum concentrations of total and dissolved antimony, total and dissolved boron, total and dissolved molybdenum, dissolved potassium, total and dissolved selenium, total and dissolved sodium, and sulfate.
    - Median concentration of dissolved arsenic, total and dissolved copper, dissolved nickel, total phosphorus, radium-226, and total and dissolved uranium.

- The increase in the predicted nitrite concentration in the updated model for the open pit discharge in comparison to the EIS model is due to the increase in the assumed percentage of the total nitrogen loss from the explosives used in the updated model, as outlined in Section 3.1.4. In contrast, the decrease in the predicted concentrations of most parameters is primarily reflective of the increase in runoff to the open pit due to the increase in the open pit footprint area (Table 2.1). The increase in the maximum predicted fluoride concentration at the start of the post-closure phase (2.1 times greater than the maximum predicted concentration in the EIS model) is primarily attributed to increased mass load from the pit walls and bedrock groundwater during the pit filling period.

Collection Pond Discharge:

- Median and maximum concentrations predicted by the updated model for the operation phase were between half and two times (2x) the respective concentrations predicted by the EIS model except for the maximum concentrations of nitrite and total ammonia (> 2x). For the construction phase, median and maximum concentrations predicted by the updated model for modelled parameters were greater than two times (2x) the respective concentrations predicted by the EIS model except for the following which were between half and two times (2x) the respective concentrations predicted by the EIS model:
    - Maximum concentrations of total aluminum, total and dissolved cobalt, cyanide species, total and dissolved iron, total lead, total and dissolved manganese, total mercury, total nickel, total vanadium, and total zinc.
    - Median concentrations of bromide, chloride, total cadmium, total chromium, total cobalt, cyanide species, total and dissolved iron, total lead, total and dissolved manganese, total mercury, radium-226, total vanadium, and total zinc.
- The increase in the predicted nitrite and total ammonia concentration in the updated model for the collection pond discharge in comparison to the EIS model for the operation phase is due to the increase in the assumed percentage of the total nitrogen loss from the explosives used in the updated model, as outlined in Section 3.1.4. The increase in the predicted concentrations of most parameters in the construction phase is primarily attributed to dewatering discharge from the open pit which primarily receives an increased mass load from the pit walls.

4 Closing

Stantec has prepared this water balance and water quality model update in support of the Gordon Mine Plan Amendment NOA/NOC with respect to *Environment Act* License No. 3390 for the Lynn Lake Gold Project. The results of this model are assessed in Section 3.3.4 (Surface Water) of the Gordon Mine Plan Amendment NOA/NOC.

5 References

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Appendices

Appendix A Water Balance Results

Table A.1 Simulated Monthly Streamflows at Model Node QF01

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.003	0.003	-0.1%	0.003	-0.3%	0.003	0.0%	0.003	-19.2%	0.002	-31.8%	0.003	-6.6%	0.002	-43.7%	0.002	-44.2%	0.002	-38.1%	0.002	-44.2%	0.002	-44.2%	0.002	-44.2%
	Feb	0.002	0.002	-0.4%	0.002	-0.8%	0.002	0.0%	0.002	-19.7%	0.001	-32.3%	0.002	-7.1%	0.001	-43.7%	0.001	-44.2%	0.001	-38.6%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%
	Mar	0.001	0.001	-0.6%	0.001	-1.3%	0.001	0.0%	0.001	-20.2%	0.001	-32.8%	0.001	-7.6%	0.001	-43.8%	0.001	-44.2%	0.001	-39.2%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%
	Apr	0.002	0.002	-0.9%	0.002	-1.8%	0.002	0.0%	0.002	-20.8%	0.001	-33.4%	0.002	-8.1%	0.001	-43.8%	0.001	-44.2%	0.001	-39.7%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%
	May	0.019	0.019	-1.2%	0.019	-2.3%	0.019	0.0%	0.015	-21.3%	0.013	-33.9%	0.017	-8.6%	0.011	-43.8%	0.011	-44.1%	0.011	-40.2%	0.011	-44.1%	0.011	-44.1%	0.011	-44.1%
	Jun	0.020	0.019	-1.4%	0.019	-2.8%	0.020	0.0%	0.015	-21.8%	0.013	-34.4%	0.018	-9.2%	0.011	-43.9%	0.011	-44.2%	0.012	-40.7%	0.011	-44.2%	0.011	-44.2%	0.011	-44.2%
	Jul	0.011	0.011	-1.7%	0.011	-3.3%	0.011	0.0%	0.009	-22.3%	0.007	-34.9%	0.010	-9.6%	0.006	-43.9%	0.006	-44.2%	0.007	-41.3%	0.006	-44.2%	0.006	-44.2%	0.006	-44.2%
	Aug	0.009	0.009	-2.0%	0.009	-3.9%	0.009	0.0%	0.007	-22.9%	0.006	-35.5%	0.008	-10.2%	0.005	-44.0%	0.005	-44.2%	0.005	-41.8%	0.005	-44.2%	0.005	-44.2%	0.005	-44.2%
	Sep	0.010	0.010	-2.2%	0.010	-4.5%	0.010	0.0%	0.008	-23.4%	0.007	-36.0%	0.009	-10.8%	0.006	-44.0%	0.006	-44.2%	0.006	-42.3%	0.006	-44.2%	0.006	-44.2%	0.006	-44.2%
	Oct	0.011	0.010	-2.5%	0.010	-5.0%	0.011	0.0%	0.008	-24.0%	0.007	-36.6%	0.010	-11.3%	0.006	-44.1%	0.006	-44.2%	0.006	-42.9%	0.006	-44.2%	0.006	-44.2%	0.006	-44.2%
	Nov	0.010	0.010	-2.8%	0.009	-5.5%	0.010	0.0%	0.007	-24.4%	0.006	-37.1%	0.009	-11.8%	0.005	-44.1%	0.005	-44.2%	0.006	-43.4%	0.005	-44.2%	0.005	-44.2%	0.005	-44.2%
	Dec	0.006	0.006	-3.0%	0.006	-6.0%	0.006	0.0%	0.005	-25.0%	0.004	-37.6%	0.005	-12.3%	0.003	-44.2%	0.003	-44.2%	0.003	-43.9%	0.003	-44.2%	0.003	-44.2%	0.003	-44.2%
	Annual	0.009	0.009	-1.8%	0.008	-3.6%	0.009	0.0%	0.007	-22.5%	0.006	-35.1%	0.008	-9.9%	0.005	-43.9%	0.005	-44.2%	0.005	-41.5%	0.005	-44.2%	0.005	-44.2%	0.005	-44.2%
1:25-Year Dry	Jan	0.000	0.000	-0.1%	0.000	-0.3%	0.000	0.0%	0.000	-19.2%	0.000	-31.8%	0.000	-6.6%	0.000	-43.7%	0.000	-44.2%	0.000	-38.1%	0.000	-44.2%	0.000	-44.2%	0.000	-44.2%
	Feb	0.000	0.000	-0.4%	0.000	-0.8%	0.000	0.0%	0.000	-19.7%	0.000	-32.3%	0.000	-7.1%	0.000	-43.7%	0.000	-44.2%	0.000	-38.6%	0.000	-44.2%	0.000	-44.2%	0.000	-44.2%
	Mar	0.000	0.000	-0.6%	0.000	-1.3%	0.000	0.0%	0.000	-20.2%	0.000	-32.8%	0.000	-7.6%	0.000	-43.8%	0.000	-44.2%	0.000	-39.2%	0.000	-44.2%	0.000	-44.2%	0.000	-44.2%
	Apr	0.000	0.000	-0.9%	0.000	-1.8%	0.000	0.0%	0.000	-20.7%	0.000	-33.4%	0.000	-8.1%	0.000	-43.8%	0.000	-44.2%	0.000	-39.7%	0.000	-44.2%	0.000	-44.2%	0.000	-44.2%
	May	0.007	0.007	-1.2%	0.007	-2.3%	0.007	0.0%	0.006	-21.3%	0.005	-33.9%	0.006	-8.6%	0.004	-43.8%	0.004	-44.2%	0.004	-40.2%	0.004	-44.2%	0.004	-44.2%	0.004	-44.2%
	Jun	0.005	0.005	-1.4%	0.005	-2.9%	0.005	0.0%	0.004	-21.8%	0.004	-34.4%	0.005	-9.2%	0.003	-43.9%	0.003	-44.2%	0.003	-40.8%	0.003	-44.2%	0.003	-44.2%	0.003	-44.2%
	Jul	0.002	0.001	-1.7%	0.001	-3.4%	0.002	0.0%	0.001	-22.3%	0.001	-35.0%	0.001	-9.7%	0.001	-43.9%	0.001	-44.2%	0.001	-41.3%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%
	Aug	0.004	0.004	-2.0%	0.004	-3.9%	0.004	0.0%	0.003	-22.9%	0.002	-35.5%	0.003	-10.2%	0.002	-44.0%	0.002	-44.2%	0.002	-41.8%	0.002	-44.2%	0.002	-44.2%	0.002	-44.2%
	Sep	0.004	0.004	-2.2%	0.004	-4.5%	0.004	0.0%	0.003	-23.4%	0.002	-36.0%	0.003	-10.8%	0.002	-44.0%	0.002	-44.2%	0.002	-42.3%	0.002	-44.2%	0.002	-44.2%	0.002	-44.2%
	Oct	0.002	0.002	-2.5%	0.002	-5.0%	0.002	0.0%	0.002	-23.9%	0.001	-36.5%	0.002	-11.3%	0.001	-44.1%	0.001	-44.2%	0.001	-42.9%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%
	Nov	0.001	0.001	-2.8%	0.001	-5.5%	0.001	0.0%	0.001	-24.4%	0.001	-37.1%	0.001	-11.8%	0.001	-44.1%	0.001	-44.2%	0.001	-43.4%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%
	Dec	0.001	0.001	-3.0%	0.001	-6.0%	0.001	0.0%	0.001	-25.0%	0.000	-37.6%	0.001	-12.3%	0.000	-44.2%	0.000	-44.2%	0.000	-43.9%	0.000	-44.2%	0.000	-44.2%	0.000	-44.2%
	Annual	0.002	0.002	-1.7%	0.002	-3.4%	0.002	0.0%	0.002	-22.3%	0.001	-34.9%	0.002	-9.7%	0.001	-43.9%	0.001	-44.2%	0.001	-41.2%	0.001	-44.2%	0.001	-44.2%	0.001	-44.2%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.005	0.005	-0.1%	0.005	-0.3%	0.005	0.0%	0.004	-19.2%	0.004	-31.8%	0.005	-6.6%	0.003	-43.7%	0.003	-44.2%	0.003	-38.1%	0.003	-44.2%	0.003	-44.2%	0.003	-44.2%
	Feb	0.004	0.004	-0.4%	0.004	-0.8%	0.004	0.0%	0.003	-19.7%	0.003	-32.3%	0.004	-7.1%	0.002	-43.7%	0.002	-44.2%	0.002	-38.6%	0.002	-44.2%	0.002	-44.2%	0.002	-44.2%
	Mar	0.003	0.003	-0.6%	0.003	-1.3%	0.003	0.0%	0.002	-20.2%	0.002	-32.9%	0.003	-7.6%	0.002	-43.8%	0.002	-44.2%	0.002	-39.2%	0.002	-44.2%	0.002	-44.2%	0.002	-44.2%
	Apr	0.003	0.003	-0.9%	0.003	-1.8%	0.003	0.0%	0.002	-20.7%	0.002	-33.4%	0.003	-8.1%	0.002	-43.8%	0.002	-44.2%	0.002	-39.7%	0.002	-44.2%	0.002	-44.2%	0.002	-44.2%
	May	0.037	0.037	-1.2%	0.037	-2.3%	0.037	0.0%	0.029	-21.3%	0.025	-33.9%	0.034	-8.6%	0.021	-43.8%	0.021	-44.2%	0.022	-40.2%	0.021	-44.2%	0.021	-44.2%	0.021	-44.2%
	Jun	0.051	0.050	-1.4%	0.050	-2.9%	0.051	0.0%	0.040	-21.8%	0.034	-34.4%	0.046	-9.2%	0.029	-43.9%	0.029	-44.2%	0.030	-40.7%	0.029	-44.2%	0.029	-44.2%	0.029	-44.2%
	Jul	0.030	0.029	-1.7%	0.029	-3.4%	0.030	0.0%	0.023	-22.3%	0.019	-34.9%	0.027	-9.7%	0.017	-44.0%	0.017	-44.2%	0.017	-41.3%	0.017	-44.2%	0.017	-44.2%	0.017	-44.2%
	Aug	0.021	0.020	-2.0%	0.020	-3.9%	0.021	0.0%	0.016	-22.9%	0.013	-35.5%	0.018	-10.2%	0.012	-44.0%	0.012	-44.2%	0.012	-41.8%	0.012	-44.2%	0.012	-44.2%	0.012	-44.2%
	Sep	0.015	0.015	-2.2%	0.014	-4.5%	0.015	0.0%	0.011	-23.4%	0.010	-36.0%	0.013	-10.8%	0.008	-44.0%	0.008	-44.2%	0.009	-42.3%	0.008	-44.2%	0.008	-44.2%	0.008	-44.2%
	Oct	0.011	0.011	-2.5%	0.011	-5.0%	0.011	0.0%	0.009	-23.9%	0.007	-36.5%	0.010	-11.3%	0.006	-44.1%	0.006	-44.2%	0.006	-42.9%	0.006	-44.2%	0.006	-44.2%	0.006	-44.2%
	Nov	0.014	0.013	-2.7%	0.013	-5.5%	0.014	0.0%	0.010	-24.4%	0.009	-37.0%	0.012	-11.8%	0.008	-44.1%	0.008	-44.2%	0.008	-43.4%	0.008	-44.2%	0.008	-44.2%	0.008	-44.2%
	Dec	0.009	0.008	-3.0%	0.008	-6.0%	0.009	0.0%	0.007	-25.0%	0.005	-37.6%	0.008	-12.3%	0.005	-44.2%	0.005	-44.2%	0.005	-43.9%	0.005	-44.2%	0.005	-44.2%	0.005	-44.2%
	Annual	0.017	0.017	-1.7%	0.016	-3.4%	0.017	0.0%	0.013	-22.3%	0.011	-34.9%	0.015	-9.7%	0.009	-43.9%	0.009	-44.2%	0.010	-41.2%	0.009	-44.2%	0.009	-44.2%	0.009	-44.2%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.2 Simulated Monthly Streamflows at Model Node QF02

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.002	0.002	-1.2%	0.002	-2.4%	0.002	0.0%	0.002	-21.8%	0.002	-33.4%	0.002	-10.2%	0.001	-44.3%	0.001	-44.8%	0.001	-39.2%	0.001	-44.8%	0.001	-44.8%	0.001	-44.8%
	Feb	0.002	0.001	-1.5%	0.001	-3.0%	0.002	0.0%	0.001	-22.3%	0.001	-33.9%	0.001	-10.7%	0.001	-44.3%	0.001	-44.7%	0.001	-39.7%	0.001	-44.7%	0.001	-44.7%	0.001	-44.7%
	Mar	0.001	0.001	-1.8%	0.001	-3.7%	0.001	0.0%	0.001	-22.7%	0.001	-34.3%	0.001	-11.1%	0.000	-44.4%	0.000	-44.7%	0.000	-40.1%	0.000	-44.7%	0.000	-44.7%	0.000	-44.7%
	Apr	0.001	0.001	-2.2%	0.001	-4.3%	0.001	0.0%	0.001	-23.2%	0.001	-34.8%	0.001	-11.6%	0.001	-44.4%	0.001	-44.7%	0.001	-40.6%	0.001	-44.7%	0.001	-44.7%	0.001	-44.7%
	May	0.014	0.014	-2.5%	0.013	-4.9%	0.014	0.0%	0.011	-23.7%	0.009	-35.3%	0.012	-12.1%	0.008	-44.4%	0.008	-44.7%	0.008	-41.1%	0.008	-44.7%	0.008	-44.7%	0.008	-44.7%
	Jun	0.014	0.014	-2.8%	0.014	-5.6%	0.014	0.0%	0.011	-24.2%	0.009	-35.8%	0.013	-12.6%	0.008	-44.5%	0.008	-44.7%	0.008	-41.6%	0.008	-44.7%	0.008	-44.7%	0.008	-44.7%
	Jul	0.008	0.008	-3.2%	0.008	-6.3%	0.008	-0.2%	0.006	-24.7%	0.005	-36.3%	0.007	-13.1%	0.005	-44.5%	0.005	-44.7%	0.005	-42.1%	0.005	-44.7%	0.005	-44.7%	0.005	-44.7%
	Aug	0.007	0.006	-3.7%	0.006	-7.0%	0.007	-0.5%	0.005	-25.2%	0.004	-36.8%	0.006	-13.5%	0.004	-44.6%	0.004	-44.7%	0.004	-42.6%	0.004	-44.7%	0.004	-44.7%	0.004	-44.7%
	Sep	0.008	0.007	-4.2%	0.007	-7.6%	0.008	-0.9%	0.006	-25.6%	0.005	-37.2%	0.007	-14.0%	0.004	-44.6%	0.004	-44.7%	0.004	-43.0%	0.004	-44.7%	0.004	-44.7%	0.004	-44.7%
	Oct	0.008	0.008	-4.7%	0.007	-8.3%	0.008	-1.2%	0.006	-26.1%	0.005	-37.7%	0.007	-14.5%	0.004	-44.6%	0.004	-44.7%	0.004	-43.5%	0.004	-44.7%	0.004	-44.7%	0.004	-44.7%
	Nov	0.007	0.007	-5.2%	0.007	-8.9%	0.007	-1.6%	0.005	-26.6%	0.004	-38.2%	0.006	-15.0%	0.004	-44.7%	0.004	-44.7%	0.004	-44.0%	0.004	-44.7%	0.004	-44.7%	0.004	-44.7%
	Dec	0.004	0.004	-5.7%	0.004	-9.6%	0.004	-1.9%	0.003	-27.1%	0.003	-38.7%	0.004	-15.5%	0.002	-44.7%	0.002	-44.7%	0.002	-44.5%	0.002	-44.7%	0.002	-44.7%	0.002	-44.7%
	Annual	0.006	0.006	-3.5%	0.006	-6.5%	0.006	-0.5%	0.005	-24.8%	0.004	-36.4%	0.006	-13.2%	0.004	-44.5%	0.004	-44.7%	0.004	-42.2%	0.004	-44.7%	0.004	-44.7%	0.004	-44.7%
1:25-Year Dry	Jan	0.000	0.000	-1.2%	0.000	-2.4%	0.000	0.0%	0.000	-21.8%	0.000	-33.4%	0.000	-10.2%	0.000	-44.3%	0.000	-44.7%	0.000	-39.2%	0.000	-44.7%	0.000	-44.7%	0.000	-44.7%
	Feb	0.000	0.000	-1.5%	0.000	-3.0%	0.000	0.0%	0.000	-22.3%	0.000	-33.8%	0.000	-10.6%	0.000	-44.3%	0.000	-44.8%	0.000	-39.7%	0.000	-44.8%	0.000	-44.8%	0.000	-44.8%
	Mar	0.000	0.000	-1.8%	0.000	-3.7%	0.000	0.0%	0.000	-22.7%	0.000	-34.3%	0.000	-11.1%	0.000	-44.4%	0.000	-44.8%	0.000	-40.1%	0.000	-44.8%	0.000	-44.8%	0.000	-44.8%
	Apr	0.000	0.000	-2.2%	0.000	-4.3%	0.000	0.0%	0.000	-23.2%	0.000	-34.8%	0.000	-11.6%	0.000	-44.4%	0.000	-44.7%	0.000	-40.6%	0.000	-44.7%	0.000	-44.7%	0.000	-44.7%
	May	0.005	0.005	-2.5%	0.005	-5.0%	0.005	0.0%	0.004	-23.7%	0.003	-35.3%	0.005	-12.1%	0.003	-44.4%	0.003	-44.7%	0.003	-41.1%	0.003	-44.7%	0.003	-44.7%	0.003	-44.7%
	Jun	0.004	0.004	-2.8%	0.004	-5.6%	0.004	0.0%	0.003	-24.2%	0.003	-35.8%	0.003	-12.6%	0.002	-44.5%	0.002	-44.7%	0.002	-41.6%	0.002	-44.7%	0.002	-44.7%	0.002	-44.7%
	Jul	0.001	0.001	-3.2%	0.001	-6.3%	0.001	-0.2%	0.001	-24.7%	0.001	-36.3%	0.001	-13.1%	0.001	-44.5%	0.001	-44.7%	0.001	-42.1%	0.001	-44.7%	0.001	-44.7%	0.001	-44.7%
	Aug	0.003	0.003	-3.7%	0.003	-7.0%	0.003	-0.5%	0.002	-25.2%	0.002	-36.8%	0.002	-13.5%	0.002	-44.6%	0.002	-44.7%	0.002	-42.6%	0.002	-44.7%	0.002	-44.7%	0.002	-44.7%
	Sep	0.003	0.003	-4.2%	0.003	-7.6%	0.003	-0.9%	0.002	-25.6%	0.002	-37.2%	0.002	-14.0%	0.002	-44.6%	0.002	-44.7%	0.002	-43.0%	0.002	-44.7%	0.002	-44.7%	0.002	-44.7%
	Oct	0.001	0.001	-4.7%	0.001	-8.3%	0.001	-1.2%	0.001	-26.1%	0.001	-37.7%	0.001	-14.5%	0.001	-44.6%	0.001	-44.7%	0.001	-43.5%	0.001	-44.7%	0.001	-44.7%	0.001	-44.7%
	Nov	0.001	0.001	-5.2%	0.001	-8.9%	0.001	-1.5%	0.000	-26.6%	0.000	-38.2%	0.001	-15.0%	0.000	-44.7%	0.000	-44.7%	0.000	-44.0%	0.000	-44.7%	0.000	-44.7%	0.000	-44.7%
	Dec	0.001	0.000	-5.7%	0.000	-9.6%	0.000	-1.9%	0.000	-27.1%	0.000	-38.7%	0.000	-15.5%	0.000	-44.7%	0.000	-44.7%	0.000	-44.5%	0.000	-44.7%	0.000	-44.7%	0.000	-44.7%
	Annual	0.002	0.002	-3.3%	0.002	-6.3%	0.002	-0.4%	0.001	-24.6%	0.001	-36.2%	0.001	-13.0%	0.001	-44.5%	0.001	-44.7%	0.001	-42.0%	0.001	-44.7%	0.001	-44.7%	0.001	-44.7%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.004	0.004	-1.2%	0.004	-2.4%	0.004	0.0%	0.003	-21.8%	0.003	-33.4%	0.003	-10.2%	0.002	-44.3%	0.002	-44.7%	0.002	-39.2%	0.002	-44.7%	0.002	-44.7%	0.002	-44.7%
	Feb	0.003	0.003	-1.5%	0.003	-3.1%	0.003	0.0%	0.002	-22.3%	0.002	-33.8%	0.003	-10.7%	0.002	-44.3%	0.002	-44.7%	0.002	-39.7%	0.002	-44.7%	0.002	-44.7%	0.002	-44.7%
	Mar	0.002	0.002	-1.8%	0.002	-3.7%	0.002	0.0%	0.002	-22.7%	0.001	-34.3%	0.002	-11.1%	0.001	-44.4%	0.001	-44.8%	0.001	-40.1%	0.001	-44.8%	0.001	-44.8%	0.001	-44.8%
	Apr	0.002	0.002	-2.2%	0.002	-4.3%	0.002	0.0%	0.002	-23.2%	0.001	-34.8%	0.002	-11.6%	0.001	-44.4%	0.001	-44.8%	0.001	-40.6%	0.001	-44.8%	0.001	-44.8%	0.001	-44.8%
	May	0.027	0.027	-2.5%	0.026	-5.0%	0.027	0.0%	0.021	-23.7%	0.018	-35.3%	0.024	-12.1%	0.015	-44.4%	0.015	-44.7%	0.016	-41.1%	0.015	-44.7%	0.015	-44.7%	0.015	-44.7%
	Jun	0.037	0.036	-2.8%	0.035	-5.7%	0.037	0.0%	0.028	-24.2%	0.024	-35.8%	0.033	-12.6%	0.021	-44.5%	0.021	-44.7%	0.022	-41.6%	0.021	-44.7%	0.021	-44.7%	0.021	-44.7%
	Jul	0.022	0.021	-3.2%	0.020	-6.3%	0.022	-0.1%	0.016	-24.6%	0.014	-36.2%	0.019	-13.0%	0.012	-44.5%	0.012	-44.7%	0.013	-42.1%	0.012	-44.7%	0.012	-44.7%	0.012	-44.7%
	Aug	0.015	0.015	-3.7%	0.014	-7.0%	0.015	-0.5%	0.011	-25.1%	0.010	-36.7%	0.013	-13.5%	0.008	-44.5%	0.008	-44.7%	0.009	-42.5%	0.008	-44.7%	0.008	-44.7%	0.008	-44.7%
	Sep	0.011	0.010	-4.3%	0.010	-7.7%	0.011	-0.9%	0.008	-25.7%	0.007	-37.3%	0.009	-14.1%	0.006	-44.6%	0.006	-44.8%	0.006	-43.1%	0.006	-44.8%	0.006	-44.8%	0.006	-44.8%
	Oct	0.008	0.008	-4.7%	0.008	-8.3%	0.008	-1.2%	0.006	-26.1%	0.005	-37.7%	0.007	-14.5%	0.005	-44.6%	0.005	-44.7%	0.005	-43.5%	0.005	-44.7%	0.005	-44.7%	0.005	-44.7%
	Nov	0.010	0.010	-5.3%	0.009	-9.0%	0.010	-1.6%	0.007	-26.6%	0.006	-38.2%	0.009	-15.0%	0.006	-44.7%	0.006	-44.8%	0.006	-44.0%	0.006	-44.8%	0.006	-44.8%	0.006	-44.8%
	Dec	0.006	0.006	-5.7%	0.006	-9.6%	0.006	-1.9%	0.005	-27.1%	0.004	-38.7%	0.005	-15.5%	0.004	-44.7%	0.004	-44.7%	0.004	-44.5%	0.004	-44.7%	0.004	-44.7%	0.004	-44.7%
	Annual	0.012	0.012	-3.3%	0.012	-6.3%	0.012	-0.4%	0.009	-24.6%	0.008	-36.2%	0.011	-13.0%	0.007	-44.5%	0.007	-44.7%	0.007	-42.0%	0.007	-44.7%	0.007	-44.7%	0.007	-44.7%

Note:

Changes lower than 0.1% are shown as 0.0%.

Table A.3 Simulated Monthly Streamflows at Model Node QF03

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.009	0.009	-0.1%	0.009	-0.1%	0.009	0.0%	0.008	-9.2%	0.008	-15.3%	0.009	-3.2%	0.007	-21.0%	0.007	-21.2%	0.007	-18.3%	0.007	-21.2%	0.007	-21.2%	0.007	-21.2%
	Feb	0.006	0.006	-0.2%	0.006	-0.4%	0.006	0.0%	0.005	-9.5%	0.005	-15.5%	0.006	-3.4%	0.005	-21.0%	0.005	-21.2%	0.005	-18.6%	0.005	-21.2%	0.005	-21.2%	0.005	-21.2%
	Mar	0.003	0.003	-0.3%	0.003	-0.6%	0.003	0.0%	0.003	-9.7%	0.003	-15.8%	0.003	-3.7%	0.002	-21.0%	0.002	-21.2%	0.003	-18.8%	0.002	-21.2%	0.002	-21.2%	0.002	-21.2%
	Apr	0.006	0.006	-0.4%	0.006	-0.9%	0.006	0.0%	0.005	-10.0%	0.005	-16.0%	0.005	-3.9%	0.004	-21.1%	0.004	-21.2%	0.005	-19.1%	0.004	-21.2%	0.004	-21.2%	0.004	-21.2%
	May	0.055	0.055	-0.6%	0.054	-1.1%	0.055	0.0%	0.049	-10.2%	0.046	-16.3%	0.053	-4.1%	0.043	-21.1%	0.043	-21.2%	0.044	-19.3%	0.043	-21.2%	0.043	-21.2%	0.043	-21.2%
	Jun	0.056	0.056	-0.7%	0.056	-1.4%	0.056	0.0%	0.050	-10.5%	0.047	-16.5%	0.054	-4.4%	0.044	-21.1%	0.044	-21.2%	0.045	-19.6%	0.044	-21.2%	0.044	-21.2%	0.044	-21.2%
	Jul	0.032	0.032	-0.8%	0.031	-1.6%	0.032	0.0%	0.028	-10.7%	0.027	-16.8%	0.030	-4.6%	0.025	-21.1%	0.025	-21.2%	0.026	-19.8%	0.025	-21.2%	0.025	-21.2%	0.025	-21.2%
	Aug	0.026	0.026	-0.9%	0.026	-1.9%	0.026	0.0%	0.023	-11.0%	0.022	-17.1%	0.025	-4.9%	0.021	-21.1%	0.021	-21.2%	0.021	-20.1%	0.021	-21.2%	0.021	-21.2%	0.021	-21.2%
	Sep	0.030	0.030	-1.1%	0.029	-2.1%	0.030	0.0%	0.026	-11.2%	0.025	-17.3%	0.028	-5.2%	0.024	-21.2%	0.024	-21.2%	0.024	-20.3%	0.024	-21.2%	0.024	-21.2%	0.024	-21.2%
	Oct	0.031	0.030	-1.2%	0.030	-2.4%	0.031	0.0%	0.027	-11.5%	0.025	-17.5%	0.029	-5.4%	0.024	-21.2%	0.024	-21.2%	0.024	-20.6%	0.024	-21.2%	0.024	-21.2%	0.024	-21.2%
	Nov	0.028	0.028	-1.3%	0.027	-2.6%	0.028	0.0%	0.025	-11.7%	0.023	-17.8%	0.027	-5.7%	0.022	-21.2%	0.022	-21.2%	0.022	-20.8%	0.022	-21.2%	0.022	-21.2%	0.022	-21.2%
	Dec	0.018	0.017	-1.4%	0.017	-2.9%	0.018	0.0%	0.015	-12.0%	0.014	-18.1%	0.017	-6.0%	0.014	-21.3%	0.014	-21.3%	0.014	-21.1%	0.014	-21.3%	0.014	-21.3%	0.014	-21.3%
	Annual	0.025	0.025	-0.9%	0.025	-1.7%	0.025	0.0%	0.022	-10.8%	0.021	-16.9%	0.024	-4.7%	0.020	-21.1%	0.020	-21.2%	0.020	-19.9%	0.020	-21.2%	0.020	-21.2%	0.020	-21.2%
1:25-Year Dry	Jan	0.001	0.001	-0.1%	0.001	-0.2%	0.001	0.0%	0.001	-9.2%	0.001	-15.3%	0.001	-3.2%	0.001	-21.0%	0.001	-21.2%	0.001	-18.3%	0.001	-21.2%	0.001	-21.2%	0.001	-21.2%
	Feb	0.001	0.001	-0.2%	0.001	-0.4%	0.001	0.0%	0.001	-9.5%	0.001	-15.5%	0.001	-3.4%	0.001	-21.0%	0.001	-21.2%	0.001	-18.6%	0.001	-21.2%	0.001	-21.2%	0.001	-21.2%
	Mar	0.001	0.001	-0.3%	0.001	-0.6%	0.001	0.0%	0.001	-9.7%	0.001	-15.8%	0.001	-3.6%	0.001	-21.0%	0.001	-21.2%	0.001	-18.8%	0.001	-21.2%	0.001	-21.2%	0.001	-21.2%
	Apr	0.001	0.001	-0.4%	0.001	-0.9%	0.001	0.0%	0.001	-10.0%	0.001	-16.0%	0.001	-3.9%	0.001	-21.1%	0.001	-21.2%	0.001	-19.1%	0.001	-21.2%	0.001	-21.2%	0.001	-21.2%
	May	0.020	0.020	-0.6%	0.020	-1.1%	0.020	0.0%	0.018	-10.2%	0.017	-16.3%	0.019	-4.1%	0.016	-21.1%	0.016	-21.3%	0.016	-19.4%	0.016	-21.3%	0.016	-21.3%	0.016	-21.3%
	Jun	0.016	0.016	-0.7%	0.015	-1.4%	0.016	0.0%	0.014	-10.5%	0.013	-16.5%	0.015	-4.4%	0.012	-21.1%	0.012	-21.3%	0.013	-19.6%	0.012	-21.3%	0.012	-21.3%	0.012	-21.3%
	Jul	0.004	0.004	-0.8%	0.004	-1.6%	0.004	0.0%	0.004	-10.7%	0.004	-16.8%	0.004	-4.7%	0.003	-21.1%	0.003	-21.2%	0.003	-19.8%	0.003	-21.2%	0.003	-21.2%	0.003	-21.2%
	Aug	0.011	0.011	-1.0%	0.011	-1.9%	0.011	0.0%	0.010	-11.0%	0.009	-17.0%	0.011	-4.9%	0.009	-21.1%	0.009	-21.2%	0.009	-20.1%	0.009	-21.2%	0.009	-21.2%	0.009	-21.2%
	Sep	0.011	0.011	-1.1%	0.011	-2.1%	0.011	0.0%	0.010	-11.2%	0.009	-17.3%	0.010	-5.1%	0.009	-21.2%	0.009	-21.2%	0.009	-20.4%	0.009	-21.2%	0.009	-21.2%	0.009	-21.2%
	Oct	0.006	0.006	-1.2%	0.006	-2.4%	0.006	0.0%	0.005	-11.5%	0.005	-17.6%	0.005	-5.4%	0.005	-21.2%	0.005	-21.2%	0.005	-20.6%	0.005	-21.2%	0.005	-21.2%	0.005	-21.2%
	Nov	0.003	0.003	-1.3%	0.003	-2.6%	0.003	0.0%	0.002	-11.8%	0.002	-17.8%	0.002	-5.7%	0.002	-21.2%	0.002	-21.2%	0.002	-20.9%	0.002	-21.2%	0.002	-21.2%	0.002	-21.2%
	Dec	0.002	0.002	-1.4%	0.002	-2.9%	0.002	0.0%	0.002	-12.0%	0.002	-18.0%	0.002	-5.9%	0.002	-21.2%	0.002	-21.2%	0.002	-21.1%	0.002	-21.2%	0.002	-21.2%	0.002	-21.2%
	Annual	0.006	0.006	-0.8%	0.006	-1.6%	0.006	0.0%	0.006	-10.7%	0.005	-16.8%	0.006	-4.6%	0.005	-21.1%	0.005	-21.2%	0.005	-19.8%	0.005	-21.2%	0.005	-21.2%	0.005	-21.2%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.015	0.015	-0.1%	0.015	-0.1%	0.015	0.0%	0.014	-9.2%	0.013	-15.3%	0.015	-3.2%	0.012	-21.0%	0.012	-21.3%	0.012	-18.3%	0.012	-21.3%	0.012	-21.3%	0.012	-21.3%
	Feb	0.011	0.011	-0.2%	0.011	-0.4%	0.011	0.0%	0.010	-9.5%	0.009	-15.6%	0.011	-3.5%	0.009	-21.0%	0.009	-21.3%	0.009	-18.6%	0.009	-21.3%	0.009	-21.3%	0.009	-21.3%
	Mar	0.008	0.008	-0.3%	0.008	-0.6%	0.008	0.0%	0.008	-9.7%	0.007	-15.8%	0.008	-3.6%	0.007	-21.0%	0.007	-21.2%	0.007	-18.8%	0.007	-21.2%	0.007	-21.2%	0.007	-21.2%
	Apr	0.008	0.008	-0.4%	0.008	-0.9%	0.008	0.0%	0.008	-10.0%	0.007	-16.0%	0.008	-3.9%	0.007	-21.1%	0.007	-21.2%	0.007	-19.1%	0.007	-21.2%	0.007	-21.2%	0.007	-21.2%
	May	0.107	0.107	-0.6%	0.106	-1.1%	0.107	0.0%	0.096	-10.3%	0.090	-16.3%	0.103	-4.2%	0.085	-21.1%	0.084	-21.3%	0.086	-19.4%	0.084	-21.3%	0.084	-21.3%	0.084	-21.3%
	Jun	0.147	0.146	-0.7%	0.145	-1.4%	0.147	0.0%	0.131	-10.5%	0.122	-16.5%	0.140	-4.4%	0.116	-21.1%	0.115	-21.2%	0.118	-19.6%	0.115	-21.2%	0.115	-21.2%	0.115	-21.2%
	Jul	0.085	0.085	-0.8%	0.084	-1.6%	0.085	0.0%	0.076	-10.7%	0.071	-16.8%	0.081	-4.7%	0.067	-21.1%	0.067	-21.2%	0.068	-19.8%	0.067	-21.2%	0.067	-21.2%	0.067	-21.2%
	Aug	0.059	0.058	-0.9%	0.058	-1.9%	0.059	0.0%	0.053	-11.0%	0.049	-17.1%	0.056	-4.9%	0.047	-21.1%	0.047	-21.2%	0.047	-20.1%	0.047	-21.2%	0.047	-21.2%	0.047	-21.2%
	Sep	0.043	0.042	-1.1%	0.042	-2.1%	0.043	0.0%	0.038	-11.3%	0.035	-17.3%	0.041	-5.2%	0.034	-21.2%	0.034	-21.2%	0.034	-20.4%	0.034	-21.2%	0.034	-21.2%	0.034	-21.2%
	Oct	0.032	0.032	-1.2%	0.031	-2.4%	0.032	0.0%	0.029	-11.5%	0.027	-17.6%	0.031	-5.4%	0.025	-21.2%	0.025	-21.2%	0.026	-20.6%	0.025	-21.2%	0.025	-21.2%	0.025	-21.2%
	Nov	0.039	0.039	-1.3%	0.038	-2.6%	0.039	0.0%	0.035	-11.7%	0.032	-17.8%	0.037	-5.7%	0.031	-21.2%	0.031	-21.2%	0.031	-20.8%	0.031	-21.2%	0.031	-21.2%	0.031	-21.2%
	Dec	0.025	0.025	-1.4%	0.024	-2.9%	0.025	0.0%	0.022	-12.0%	0.020	-18.1%	0.024	-5.9%	0.020	-21.2%	0.020	-21.2%	0.020	-21.1%	0.020	-21.2%	0.020	-21.2%	0.020	-21.2%
	Annual	0.049	0.048	-0.8%	0.048	-1.6%	0.049	0.0%	0.043	-10.7%	0.040	-16.8%	0.046	-4.6%	0.038	-21.1%	0.038	-21.2%	0.039	-19.8%	0.038	-21.2%	0.038	-21.2%	0.038	-21.2%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.4 Simulated Monthly Streamflows at Model Node QF05

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.038	0.038	-0.1%	0.038	-0.2%	0.038	0.0%	0.052	39.0%	0.043	15.2%	0.057	50.6%	0.029	-23.4%	0.022	-41.8%	0.036	-4.3%	0.056	50.0%	0.036	-3.8%	0.057	50.5%
	Feb	0.025	0.025	-0.2%	0.025	-0.3%	0.025	0.0%	0.040	60.5%	0.031	23.6%	0.045	80.7%	0.018	-29.8%	0.012	-52.6%	0.025	-1.8%	0.045	78.8%	0.040	59.7%	0.045	79.0%
	Mar	0.013	0.015	11.4%	0.013	0.0%	0.016	22.8%	0.029	120.3%	0.020	47.6%	0.035	164.6%	0.008	-42.9%	0.004	-72.9%	0.014	4.8%	0.034	159.4%	0.034	159.4%	0.034	159.4%
	Apr	0.024	0.026	11.3%	0.024	0.0%	0.029	22.6%	0.047	99.4%	0.036	50.8%	0.058	144.4%	0.016	-30.4%	0.011	-54.8%	0.023	-1.2%	0.057	139.4%	0.057	139.4%	0.057	139.4%
	May	0.232	0.234	0.9%	0.232	0.0%	0.236	1.8%	0.248	6.8%	0.239	3.1%	0.255	9.7%	0.206	-11.2%	0.200	-13.7%	0.213	-8.3%	0.248	7.0%	0.248	7.0%	0.248	7.0%
	Jun	0.239	0.240	0.5%	0.239	0.0%	0.241	1.0%	0.244	2.4%	0.239	0.1%	0.247	3.6%	0.212	-11.1%	0.206	-13.6%	0.219	-8.3%	0.238	-0.1%	0.238	-0.1%	0.238	-0.1%
	Jul	0.135	0.136	1.1%	0.135	0.1%	0.138	2.1%	0.146	8.6%	0.141	4.2%	0.151	12.1%	0.118	-12.6%	0.112	-17.0%	0.125	-7.7%	0.145	7.8%	0.145	7.8%	0.145	7.8%
	Aug	0.111	0.115	3.1%	0.114	2.3%	0.116	4.0%	0.123	10.5%	0.116	4.6%	0.127	14.6%	0.096	-13.3%	0.090	-18.6%	0.103	-7.4%	0.123	10.2%	0.123	10.2%	0.123	10.2%
	Sep	0.126	0.130	2.9%	0.129	2.3%	0.131	3.5%	0.141	11.2%	0.132	4.5%	0.146	15.5%	0.110	-12.7%	0.104	-17.5%	0.117	-7.6%	0.142	12.4%	0.142	12.4%	0.142	12.4%
	Oct	0.131	0.135	3.5%	0.135	3.5%	0.135	3.5%	0.144	10.2%	0.136	3.9%	0.148	13.6%	0.114	-12.5%	0.108	-17.2%	0.121	-7.6%	0.146	11.8%	0.146	11.8%	0.146	11.8%
	Nov	0.119	0.125	5.3%	0.124	3.9%	0.127	6.8%	0.131	9.8%	0.123	3.5%	0.134	12.4%	0.104	-12.8%	0.098	-18.0%	0.110	-7.4%	0.132	10.8%	0.132	10.8%	0.132	10.8%
	Dec	0.074	0.083	11.4%	0.079	6.2%	0.087	16.6%	0.088	18.0%	0.079	6.4%	0.091	22.9%	0.063	-14.9%	0.057	-23.5%	0.070	-6.4%	0.090	20.8%	0.090	20.8%	0.090	20.8%
	Annual	0.106	0.109	2.8%	0.108	1.5%	0.110	4.1%	0.120	13.1%	0.112	5.3%	0.125	17.9%	0.092	-13.6%	0.086	-19.1%	0.098	-7.3%	0.122	14.9%	0.120	12.9%	0.122	14.9%
1:25-Year Dry	Jan	0.005	0.005	-0.1%	0.005	-0.2%	0.005	0.0%	0.021	306.6%	0.011	125.3%	0.026	404.3%	0.002	-56.2%	0.001	-72.8%	0.006	17.2%	0.026	407.6%	0.006	24.7%	0.026	415.7%
	Feb	0.005	0.005	-0.1%	0.005	-0.3%	0.005	0.0%	0.020	331.8%	0.011	132.5%	0.026	445.4%	0.002	-55.8%	0.001	-72.8%	0.006	20.2%	0.025	434.7%	0.006	27.8%	0.026	443.3%
	Mar	0.004	0.005	36.2%	0.004	0.0%	0.007	72.4%	0.020	399.8%	0.010	158.0%	0.026	547.4%	0.002	-55.5%	0.001	-72.9%	0.005	26.5%	0.025	520.1%	0.005	35.0%	0.025	530.4%
	Apr	0.004	0.007	59.1%	0.004	0.0%	0.010	118.3%	0.026	497.6%	0.015	245.5%	0.036	717.8%	0.002	-54.5%	0.001	-72.8%	0.005	24.5%	0.034	682.0%	0.006	31.9%	0.035	695.8%
	May	0.085	0.087	2.6%	0.085	0.0%	0.089	5.1%	0.102	20.5%	0.093	9.8%	0.110	29.5%	0.071	-15.8%	0.066	-21.7%	0.079	-7.3%	0.105	24.2%	0.079	-7.0%	0.106	24.9%
	Jun	0.066	0.067	1.6%	0.066	0.0%	0.068	3.3%	0.072	9.7%	0.067	1.1%	0.075	14.2%	0.054	-17.6%	0.049	-25.2%	0.062	-6.8%	0.068	3.1%	0.062	-6.4%	0.068	3.3%
	Jul	0.018	0.020	11.2%	0.020	10.0%	0.021	12.3%	0.026	40.9%	0.021	13.6%	0.029	57.7%	0.011	-39.3%	0.006	-67.9%	0.018	-0.5%	0.022	21.3%	0.019	0.9%	0.022	21.7%
	Aug	0.047	0.050	5.9%	0.048	2.8%	0.051	9.1%	0.053	14.3%	0.049	5.8%	0.056	20.5%	0.037	-20.8%	0.032	-31.9%	0.044	-5.7%	0.050	6.0%	0.044	-5.2%	0.050	6.3%
	Sep	0.046	0.049	7.2%	0.048	5.0%	0.050	9.3%	0.058	26.4%	0.051	10.3%	0.063	36.1%	0.036	-20.8%	0.031	-32.3%	0.043	-5.6%	0.059	27.2%	0.044	-5.1%	0.059	27.9%
	Oct	0.024	0.029	20.5%	0.029	18.8%	0.030	22.2%	0.041	69.2%	0.031	28.6%	0.048	94.9%	0.017	-30.8%	0.011	-53.2%	0.024	-2.4%	0.046	89.1%	0.024	-1.4%	0.046	90.6%
	Nov	0.011	0.018	64.0%	0.016	42.6%	0.020	85.3%	0.027	151.7%	0.018	61.3%	0.033	202.8%	0.006	-46.1%	0.003	-72.8%	0.012	6.2%	0.032	194.9%	0.012	8.3%	0.032	196.9%
	Dec	0.008	0.017	106.2%	0.013	55.3%	0.022	157.0%	0.025	196.4%	0.015	75.6%	0.030	257.1%	0.004	-47.3%	0.002	-72.8%	0.009	11.2%	0.029	245.2%	0.010	13.8%	0.029	247.6%
	Annual	0.027	0.030	11.2%	0.029	6.0%	0.032	16.5%	0.041	51.9%	0.033	21.1%	0.047	71.5%	0.021	-24.1%	0.017	-36.3%	0.026	-3.4%	0.044	60.5%	0.026	-2.4%	0.044	61.7%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.065	0.064	-0.9%	0.064	-1.8%	0.065	0.0%	0.078	20.2%	0.069	6.6%	0.082	26.4%	0.055	-15.2%	0.046	-29.1%	0.081	25.8%	0.081	25.8%	0.081	25.8%	0.081	25.8%
	Feb	0.048	0.047	-1.1%	0.046	-2.3%	0.048	0.0%	0.061	29.1%	0.052	9.8%	0.066	39.1%	0.040	-16.9%	0.032	-33.4%	0.065	37.7%	0.065	37.7%	0.065	37.7%	0.065	37.7%
	Mar	0.036	0.037	2.9%	0.036	0.0%	0.038	5.9%	0.051	40.0%	0.041	13.7%	0.056	55.4%	0.029	-19.2%	0.021	-41.2%	0.056	52.8%	0.056	52.8%	0.056	52.8%	0.056	52.8%
	Apr	0.037	0.039	5.9%	0.037	0.0%	0.041	11.8%	0.062	68.8%	0.050	35.3%	0.074	102.6%	0.031	-15.6%	0.021	-41.6%	0.073	99.5%	0.073	99.5%	0.073	99.5%	0.073	99.5%
	May	0.455	0.455	0.2%	0.454	-0.2%	0.457	0.6%	0.465	2.3%	0.458	0.7%	0.469	3.2%	0.412	-9.4%	0.402	-11.7%	0.459	1.0%	0.459	1.0%	0.459	1.0%	0.459	1.0%
	Jun	0.620	0.621	0.0%	0.620	0.0%	0.621	0.1%	0.614	-1.0%	0.609	-1.9%	0.619	-0.2%	0.562	-9.4%	0.553	-10.8%	0.595	-4.0%	0.595	-4.0%	0.595	-4.0%	0.595	-4.0%
	Jul	0.361	0.362	0.4%	0.361	0.0%	0.363	0.7%	0.369	2.4%	0.364	1.0%	0.373	3.3%	0.327	-9.4%	0.317	-12.1%	0.364	0.8%	0.364	0.8%	0.364	0.8%	0.364	0.8%
	Aug	0.250	0.253	1.4%	0.253	1.0%	0.254	1.8%	0.261	4.5%	0.255	2.0%	0.265	6.2%	0.226	-9.7%	0.217	-13.4%	0.259	3.8%	0.259	3.8%	0.259	3.8%	0.259	3.8%
	Sep	0.182	0.185	1.6%	0.185	1.4%	0.186	1.9%	0.198	8.6%	0.188	3.2%	0.205	12.2%	0.164	-10.2%	0.154	-15.4%	0.201	10.0%	0.201	10.0%	0.201	10.0%	0.201	10.0%
	Oct	0.138	0.141	2.2%	0.141	2.1%	0.142	2.3%	0.152	9.6%	0.143	3.0%	0.157	13.4%	0.123	-11.3%	0.114	-17.9%	0.155	11.9%	0.155	11.9%	0.155	11.9%	0.155	11.9%
	Nov	0.168	0.173	2.8%	0.172	1.9%	0.175	3.7%	0.177	5.1%	0.170	1.2%	0.179	6.5%	0.152	-9.8%	0.141	-16.1%	0.177	5.1%	0.177	5.1%	0.177	5.1%	0.177	5.1%
	Dec	0.107	0.114	6.9%	0.110	3.5%	0.118	10.4%	0.118	10.7%	0.110	3.1%	0.121	13.6%	0.096	-10.1%	0.085	-20.0%	0.119	11.9%	0.119	11.9%	0.119	11.9%	0.119	11.9%
	Annual	0.206	0.209	1.1%	0.207	0.5%	0.210	1.7%	0.218	5.6%	0.210	1.7%	0.223	8.1%	0.185	-10.2%	0.176	-14.7%	0.218	5.6%	0.218	5.6%	0.218	5.6%	0.218	5.6%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.5 Simulated Monthly Streamflows at Model Node QF06

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.017	0.017	0.0%	0.017	0.0%	0.017	0.0%	0.017	0.0%	0.017	0.0%	0.017	0.0%	0.017	0.1%	0.017	0.0%	0.017	0.1%	0.017	0.1%	0.017	0.1%	0.017	0.1%
	Feb	0.011	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.1%	0.011	0.0%	0.011	0.2%	0.011	0.2%	0.011	0.2%	0.011	0.2%
	Mar	0.006	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.2%	0.006	0.0%	0.006	0.4%	0.006	0.4%	0.006	0.4%	0.006	0.4%
	Apr	0.010	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.1%	0.010	0.0%	0.010	0.2%	0.010	0.2%	0.010	0.2%	0.010	0.2%
	May	0.102	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%	0.102	0.0%
	Jun	0.105	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%	0.105	0.0%
	Jul	0.059	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%	0.059	0.0%
	Aug	0.049	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%	0.049	0.0%
	Sep	0.056	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%	0.056	0.0%
	Oct	0.057	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%	0.057	0.0%
	Nov	0.052	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%	0.052	0.0%
	Dec	0.033	0.033	0.0%	0.033	0.0%	0.033	0.0%	0.033	0.0%	0.033	0.0%	0.033	0.0%	0.033	0.0%	0.033	0.0%	0.033	0.1%	0.033	0.1%	0.033	0.1%	0.033	0.1%
	Annual	0.047	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%
1:25-Year Dry	Jan	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.6%	0.002	0.0%	0.002	1.0%	0.002	1.0%	0.002	1.0%	0.002	1.0%
	Feb	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.6%	0.002	0.0%	0.002	1.1%	0.002	1.1%	0.002	1.1%	0.002	1.1%
	Mar	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.8%	0.002	0.1%	0.002	1.2%	0.002	1.3%	0.002	1.2%	0.002	1.2%
	Apr	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.7%	0.002	0.1%	0.002	1.1%	0.002	1.1%	0.002	1.1%	0.002	1.1%
	May	0.037	0.037	0.0%	0.037	0.0%	0.037	0.0%	0.037	0.0%	0.037	0.0%	0.037	0.0%	0.037	0.0%	0.037	0.0%	0.037	0.1%	0.037	0.1%	0.037	0.1%	0.037	0.1%
	Jun	0.029	0.029	0.0%	0.029	0.0%	0.029	0.0%	0.029	0.0%	0.029	0.0%	0.029	0.0%	0.029	0.0%	0.029	0.0%	0.029	0.1%	0.029	0.1%	0.029	0.1%	0.029	0.1%
	Jul	0.008	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.2%	0.008	0.0%	0.008	0.3%	0.008	0.3%	0.008	0.3%	0.008	0.3%
	Aug	0.021	0.021	0.0%	0.021	0.0%	0.021	0.0%	0.021	0.0%	0.021	0.0%	0.021	0.0%	0.021	0.1%	0.021	0.0%	0.021	0.1%	0.021	0.1%	0.021	0.1%	0.021	0.1%
	Sep	0.020	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.1%	0.020	0.0%	0.020	0.1%	0.020	0.1%	0.020	0.1%	0.020	0.1%
	Oct	0.011	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.0%	0.011	0.1%	0.011	0.0%	0.011	0.2%	0.011	0.2%	0.011	0.2%	0.011	0.2%
	Nov	0.005	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.3%	0.005	0.0%	0.005	0.5%	0.005	0.5%	0.005	0.5%	0.005	0.5%
	Dec	0.004	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.4%	0.004	0.1%	0.004	0.6%	0.004	0.6%	0.004	0.6%	0.004	0.6%
	Annual	0.012	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.1%	0.012	0.0%	0.012	0.2%	0.012	0.2%	0.012	0.2%	0.012	0.2%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.028	0.028	0.0%	0.028	0.0%	0.028	0.0%	0.028	0.0%	0.028	0.0%	0.028	0.0%	0.028	0.0%	0.028	0.0%	0.028	0.1%	0.028	0.1%	0.028	0.1%	0.028	0.1%
	Feb	0.020	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.1%	0.020	0.0%	0.021	0.1%	0.021	0.1%	0.021	0.1%	0.021	0.1%
	Mar	0.016	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.1%	0.016	0.0%	0.016	0.1%	0.016	0.1%	0.016	0.1%	0.016	0.1%
	Apr	0.016	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.0%	0.016	0.1%	0.016	0.0%	0.016	0.1%	0.016	0.1%	0.016	0.1%	0.016	0.1%
	May	0.199	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%	0.199	0.0%
	Jun	0.273	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%	0.273	0.0%
	Jul	0.159	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%	0.159	0.0%
	Aug	0.110	0.110	0.0%	0.110	0.0%	0.110	0.0%	0.110	0.0%	0.110	0.0%	0.110	0.0%	0.110	0.1%	0.110	0.0%	0.110	0.1%	0.110	0.1%	0.110	0.1%	0.110	0.1%
	Sep	0.080	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%	0.080	0.0%
	Oct	0.060	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%	0.060	0.0%
	Nov	0.073	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%	0.073	0.0%
	Dec	0.046	0.046	0.0%	0.046	0.0%	0.046	0.0%	0.046	0.0%	0.046	0.0%	0.046	0.0%	0.046	0.0%	0.046	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%	0.047	0.0%
	Annual	0.090	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%	0.090	0.0%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.6 Simulated Monthly Streamflows at Model Node QF07

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.081	0.081	0.0%	0.081	-0.1%	0.081	0.0%	0.096	18.1%	0.087	7.1%	0.100	23.5%	0.072	-10.9%	0.065	-19.4%	0.080	-2.0%	0.100	23.2%	0.080	-1.7%	0.100	23.5%
	Feb	0.054	0.054	-0.1%	0.054	-0.1%	0.054	0.0%	0.069	28.1%	0.060	10.9%	0.074	37.4%	0.047	-13.8%	0.041	-24.4%	0.054	-0.8%	0.074	36.6%	0.069	27.7%	0.074	36.7%
	Mar	0.029	0.030	5.3%	0.029	0.0%	0.032	10.6%	0.045	55.9%	0.035	22.1%	0.051	76.5%	0.023	-19.9%	0.019	-33.8%	0.029	2.3%	0.050	74.1%	0.050	74.1%	0.050	74.1%
	Apr	0.051	0.054	5.2%	0.051	0.0%	0.056	10.5%	0.074	46.1%	0.063	23.6%	0.085	67.1%	0.044	-14.1%	0.038	-25.5%	0.051	-0.5%	0.084	64.8%	0.084	64.8%	0.084	64.8%
	May	0.500	0.502	0.4%	0.500	0.0%	0.504	0.8%	0.516	3.2%	0.507	1.5%	0.522	4.5%	0.474	-5.2%	0.468	-6.4%	0.481	-3.9%	0.516	3.3%	0.516	3.3%	0.516	3.3%
	Jun	0.514	0.515	0.2%	0.514	0.0%	0.516	0.5%	0.520	1.1%	0.514	0.1%	0.523	1.7%	0.487	-5.1%	0.482	-6.3%	0.494	-3.9%	0.514	0.0%	0.514	0.0%	0.514	0.0%
	Jul	0.291	0.292	0.5%	0.291	0.1%	0.293	1.0%	0.302	4.0%	0.296	1.9%	0.307	5.6%	0.274	-5.8%	0.268	-7.9%	0.280	-3.6%	0.301	3.6%	0.301	3.6%	0.301	3.6%
	Aug	0.240	0.243	1.5%	0.242	1.1%	0.244	1.8%	0.251	4.9%	0.245	2.1%	0.256	6.8%	0.225	-6.1%	0.219	-8.6%	0.231	-3.4%	0.251	4.8%	0.251	4.8%	0.251	4.8%
	Sep	0.272	0.276	1.4%	0.275	1.1%	0.277	1.7%	0.286	5.2%	0.278	2.1%	0.292	7.2%	0.256	-5.9%	0.250	-8.1%	0.263	-3.5%	0.288	5.8%	0.288	5.8%	0.288	5.8%
	Oct	0.281	0.286	1.6%	0.286	1.6%	0.286	1.6%	0.294	4.7%	0.286	1.8%	0.299	6.3%	0.265	-5.8%	0.259	-8.0%	0.271	-3.5%	0.297	5.5%	0.297	5.5%	0.297	5.5%
	Nov	0.256	0.263	2.5%	0.261	1.8%	0.264	3.1%	0.268	4.5%	0.261	1.6%	0.271	5.8%	0.241	-5.9%	0.235	-8.4%	0.248	-3.5%	0.269	5.0%	0.269	5.0%	0.269	5.0%
	Dec	0.160	0.169	5.3%	0.165	2.9%	0.173	7.7%	0.174	8.4%	0.165	3.0%	0.177	10.7%	0.149	-6.9%	0.143	-10.9%	0.156	-2.9%	0.176	9.7%	0.176	9.7%	0.176	9.7%
	Annual	0.228	0.231	1.3%	0.230	0.7%	0.233	1.9%	0.242	6.1%	0.234	2.5%	0.247	8.3%	0.214	-6.3%	0.208	-8.9%	0.221	-3.4%	0.244	6.9%	0.242	6.0%	0.244	6.9%
1:25-Year Dry	Jan	0.011	0.011	0.0%	0.011	-0.1%	0.011	0.0%	0.027	142.2%	0.017	58.1%	0.032	187.6%	0.008	-26.0%	0.007	-33.8%	0.012	8.2%	0.032	189.3%	0.012	11.7%	0.032	193.1%
	Feb	0.010	0.010	0.0%	0.010	-0.1%	0.010	0.0%	0.026	154.1%	0.016	61.5%	0.031	206.9%	0.008	-25.8%	0.007	-33.8%	0.011	9.6%	0.031	202.1%	0.012	13.2%	0.031	206.1%
	Mar	0.009	0.010	16.8%	0.009	0.0%	0.012	33.6%	0.025	185.6%	0.015	73.4%	0.031	254.1%	0.006	-25.6%	0.006	-33.8%	0.010	12.6%	0.029	241.7%	0.010	16.5%	0.030	246.5%
	Apr	0.009	0.012	27.4%	0.009	0.0%	0.015	54.9%	0.031	231.0%	0.020	114.0%	0.041	333.2%	0.007	-25.2%	0.006	-33.8%	0.011	11.6%	0.039	316.9%	0.011	15.0%	0.040	323.3%
	May	0.183	0.185	1.2%	0.183	0.0%	0.187	2.4%	0.200	9.5%	0.191	4.5%	0.208	13.6%	0.169	-7.3%	0.164	-10.1%	0.177	-3.4%	0.203	11.2%	0.177	-3.2%	0.204	11.5%
	Jun	0.142	0.143	0.8%	0.142	0.0%	0.145	1.5%	0.149	4.5%	0.143	0.5%	0.152	6.6%	0.131	-8.2%	0.126	-11.7%	0.138	-3.2%	0.144	1.5%	0.138	-3.0%	0.145	1.5%
	Jul	0.040	0.042	5.2%	0.041	4.6%	0.042	5.7%	0.047	19.0%	0.042	6.3%	0.050	26.8%	0.032	-18.2%	0.027	-31.5%	0.040	-0.2%	0.044	10.0%	0.040	0.5%	0.044	10.2%
	Aug	0.101	0.104	2.8%	0.102	1.3%	0.105	4.3%	0.107	6.7%	0.103	2.7%	0.110	9.6%	0.091	-9.6%	0.086	-14.8%	0.098	-2.6%	0.104	2.9%	0.098	-2.3%	0.104	3.0%
	Sep	0.099	0.103	3.3%	0.102	2.3%	0.104	4.4%	0.111	12.3%	0.104	4.8%	0.116	16.8%	0.090	-9.6%	0.084	-15.0%	0.097	-2.6%	0.112	12.6%	0.097	-2.3%	0.112	12.9%
	Oct	0.053	0.058	9.5%	0.057	8.7%	0.058	10.3%	0.069	32.1%	0.060	13.3%	0.076	44.1%	0.045	-14.3%	0.040	-24.7%	0.052	-1.1%	0.074	41.4%	0.052	-0.6%	0.075	42.1%
	Nov	0.024	0.031	29.7%	0.028	19.8%	0.033	39.6%	0.040	70.4%	0.030	28.4%	0.046	94.2%	0.019	-21.3%	0.016	-33.8%	0.024	3.0%	0.045	90.6%	0.024	4.0%	0.045	91.5%
	Dec	0.018	0.027	49.3%	0.023	25.7%	0.031	72.9%	0.034	91.2%	0.024	35.1%	0.040	119.4%	0.014	-21.9%	0.012	-33.8%	0.019	5.3%	0.039	114.0%	0.019	6.5%	0.039	115.1%
	Annual	0.058	0.061	5.2%	0.060	2.8%	0.063	7.7%	0.073	24.1%	0.064	9.8%	0.078	33.2%	0.052	-11.2%	0.049	-16.8%	0.058	-1.6%	0.075	28.1%	0.058	-1.1%	0.075	28.7%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.138	0.138	-0.4%	0.137	-0.9%	0.138	0.0%	0.151	9.4%	0.143	3.1%	0.155	12.3%	0.128	-7.1%	0.119	-13.7%	0.155	12.1%	0.155	12.1%	0.155	12.1%	0.155	12.1%
	Feb	0.101	0.101	-0.5%	0.100	-1.1%	0.101	0.0%	0.115	13.6%	0.106	4.6%	0.120	18.4%	0.093	-7.9%	0.085	-15.7%	0.119	17.8%	0.119	17.8%	0.119	17.8%	0.119	17.8%
	Mar	0.077	0.078	1.4%	0.077	0.0%	0.079	2.8%	0.092	18.8%	0.082	6.5%	0.097	26.1%	0.070	-9.0%	0.062	-19.4%	0.096	24.9%	0.096	24.9%	0.096	24.9%	0.096	24.9%
	Apr	0.077	0.080	2.8%	0.077	0.0%	0.082	5.6%	0.103	32.5%	0.090	16.7%	0.115	48.5%	0.072	-7.3%	0.062	-19.7%	0.114	47.1%	0.114	47.1%	0.114	47.1%	0.114	47.1%
	May	0.978	0.979	0.1%	0.977	-0.1%	0.980	0.3%	0.988	1.1%	0.981	0.3%	0.993	1.5%	0.935	-4.4%	0.925	-5.4%	0.982	0.5%	0.982	0.5%	0.982	0.5%	0.982	0.5%
	Jun	1.336	1.336	0.0%	1.336	0.0%	1.336	0.0%	1.330	-0.5%	1.324	-0.9%	1.335	-0.1%	1.278	-4.4%	1.269	-5.0%	1.311	-1.9%	1.311	-1.9%	1.311	-1.9%	1.311	-1.9%
	Jul	0.777	0.778	0.2%	0.777	0.0%	0.780	0.3%	0.785	1.1%	0.781	0.5%	0.789	1.5%	0.743	-4.4%	0.733	-5.6%	0.780	0.4%	0.780	0.4%	0.780	0.4%	0.780	0.4%
	Aug	0.538	0.542	0.7%	0.541	0.5%	0.543	0.8%	0.550	2.1%	0.543	0.9%	0.554	2.9%	0.514	-4.5%	0.505	-6.2%	0.548	1.8%	0.548	1.8%	0.548	1.8%	0.548	1.8%
	Sep	0.392	0.395	0.8%	0.394	0.6%	0.395	0.9%	0.407	4.0%	0.397	1.5%	0.414	5.7%	0.373	-4.8%	0.363	-7.2%	0.410	4.7%	0.410	4.7%	0.410	4.7%	0.410	4.7%
	Oct	0.296	0.299	1.0%	0.299	1.0%	0.299	1.1%	0.309	4.5%	0.300	1.4%	0.314	6.3%	0.280	-5.3%	0.271	-8.4%	0.312	5.6%	0.312	5.6%	0.312	5.6%	0.312	5.6%
	Nov	0.361	0.366	1.3%	0.364	0.9%	0.367	1.7%	0.370	2.4%	0.363	0.6%	0.372	3.0%	0.344	-4.6%	0.334	-7.5%	0.369	2.4%	0.369	2.4%	0.369	2.4%	0.369	2.4%
	Dec	0.229	0.236	3.2%	0.232	1.6%	0.240	4.9%	0.240	5.0%	0.232	1.4%	0.243	6.3%	0.218	-4.7%	0.207	-9.3%	0.241	5.6%	0.241	5.6%	0.241	5.6%	0.241	5.6%
	Annual	0.443	0.446	0.5%	0.444	0.2%	0.447	0.8%	0.455	2.6%	0.447	0.8%	0.460	3.8%	0.422	-4.7%	0.413	-6.8%	0.455	2.6%	0.455	2.6%	0.455	2.6%	0.455	2.6%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.7 Simulated Monthly Streamflows at Model Node QF08

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.137	0.137	0.0%	0.137	0.0%	0.137	0.0%	0.152	10.7%	0.143	4.2%	0.156	13.9%	0.128	-6.4%	0.121	-11.5%	0.135	-1.2%	0.156	13.8%	0.136	-1.0%	0.156	13.9%
	Feb	0.091	0.091	0.0%	0.091	-0.1%	0.091	0.0%	0.107	16.6%	0.097	6.5%	0.112	22.2%	0.084	-8.2%	0.078	-14.5%	0.091	-0.5%	0.111	21.7%	0.106	16.5%	0.111	21.7%
	Mar	0.048	0.050	3.1%	0.048	0.0%	0.051	6.3%	0.064	33.1%	0.055	13.1%	0.070	45.3%	0.043	-11.8%	0.039	-20.0%	0.049	1.4%	0.070	43.9%	0.070	43.9%	0.070	43.9%
	Apr	0.086	0.089	3.1%	0.086	0.0%	0.091	6.2%	0.110	27.3%	0.098	14.0%	0.120	39.7%	0.079	-8.3%	0.073	-15.1%	0.086	-0.3%	0.119	38.4%	0.119	38.4%	0.119	38.4%
	May	0.844	0.846	0.2%	0.844	0.0%	0.848	0.5%	0.860	1.9%	0.851	0.9%	0.867	2.7%	0.818	-3.1%	0.812	-3.8%	0.825	-2.3%	0.861	2.0%	0.861	2.0%	0.861	2.0%
	Jun	0.868	0.869	0.1%	0.868	0.0%	0.870	0.3%	0.874	0.6%	0.868	0.0%	0.877	1.0%	0.841	-3.1%	0.836	-3.7%	0.848	-2.3%	0.868	0.0%	0.868	0.0%	0.868	0.0%
	Jul	0.491	0.492	0.3%	0.491	0.1%	0.494	0.6%	0.502	2.4%	0.496	1.2%	0.507	3.3%	0.474	-3.5%	0.468	-4.7%	0.480	-2.1%	0.501	2.2%	0.501	2.2%	0.501	2.2%
	Aug	0.405	0.408	0.9%	0.407	0.6%	0.409	1.1%	0.416	2.9%	0.410	1.3%	0.421	4.0%	0.390	-3.6%	0.384	-5.1%	0.396	-2.0%	0.416	2.8%	0.416	2.8%	0.416	2.8%
	Sep	0.459	0.463	0.8%	0.462	0.6%	0.464	1.0%	0.474	3.1%	0.465	1.2%	0.479	4.3%	0.443	-3.5%	0.437	-4.8%	0.450	-2.1%	0.475	3.4%	0.475	3.4%	0.475	3.4%
	Oct	0.475	0.479	0.9%	0.479	0.9%	0.479	0.9%	0.488	2.8%	0.480	1.1%	0.492	3.7%	0.458	-3.4%	0.452	-4.7%	0.465	-2.1%	0.490	3.2%	0.490	3.2%	0.490	3.2%
	Nov	0.433	0.439	1.5%	0.438	1.1%	0.441	1.9%	0.445	2.7%	0.437	1.0%	0.448	3.4%	0.418	-3.5%	0.412	-4.9%	0.424	-2.0%	0.446	3.0%	0.446	3.0%	0.446	3.0%
	Dec	0.271	0.279	3.1%	0.275	1.7%	0.283	4.5%	0.284	4.9%	0.276	1.7%	0.288	6.3%	0.260	-4.1%	0.253	-6.5%	0.266	-1.8%	0.286	5.7%	0.286	5.7%	0.286	5.7%
	Annual	0.386	0.388	0.8%	0.387	0.4%	0.390	1.1%	0.399	3.6%	0.391	1.5%	0.405	4.9%	0.371	-3.7%	0.365	-5.3%	0.378	-2.0%	0.401	4.1%	0.399	3.6%	0.401	4.1%
1:25-Year Dry	Jan	0.019	0.019	0.0%	0.019	-0.1%	0.019	0.0%	0.034	84.2%	0.025	34.4%	0.039	111.1%	0.016	-15.4%	0.015	-20.1%	0.019	4.9%	0.039	112.1%	0.020	6.9%	0.040	114.3%
	Feb	0.017	0.017	0.0%	0.017	-0.1%	0.017	0.0%	0.033	91.2%	0.023	36.4%	0.038	122.5%	0.015	-15.3%	0.014	-20.0%	0.018	5.7%	0.038	119.7%	0.019	7.8%	0.038	122.0%
	Mar	0.015	0.016	10.0%	0.015	0.0%	0.017	19.9%	0.031	110.0%	0.021	43.5%	0.036	150.5%	0.012	-15.1%	0.012	-20.0%	0.016	7.5%	0.035	143.2%	0.016	9.8%	0.036	146.0%
	Apr	0.016	0.018	16.2%	0.016	0.0%	0.021	32.5%	0.038	136.8%	0.027	67.5%	0.047	197.3%	0.014	-14.9%	0.013	-20.0%	0.017	6.9%	0.046	187.6%	0.017	8.9%	0.046	191.4%
	May	0.309	0.311	0.7%	0.309	0.0%	0.313	1.4%	0.326	5.6%	0.317	2.7%	0.333	8.1%	0.295	-4.3%	0.290	-6.0%	0.302	-2.0%	0.329	6.7%	0.303	-1.9%	0.330	6.8%
	Jun	0.240	0.241	0.5%	0.240	0.0%	0.243	0.9%	0.247	2.7%	0.241	0.3%	0.250	3.9%	0.229	-4.8%	0.224	-6.9%	0.236	-1.9%	0.242	0.9%	0.236	-1.7%	0.243	0.9%
	Jul	0.067	0.069	3.1%	0.069	2.8%	0.069	3.4%	0.074	11.2%	0.069	3.7%	0.077	15.9%	0.060	-10.8%	0.054	-18.7%	0.067	-0.1%	0.071	5.9%	0.067	0.3%	0.071	6.0%
	Aug	0.170	0.173	1.6%	0.171	0.8%	0.174	2.5%	0.177	4.0%	0.173	1.6%	0.180	5.6%	0.160	-5.7%	0.155	-8.8%	0.168	-1.5%	0.173	1.7%	0.168	-1.4%	0.173	1.8%
	Sep	0.168	0.171	2.0%	0.170	1.4%	0.172	2.6%	0.180	7.2%	0.172	2.8%	0.184	9.9%	0.158	-5.7%	0.153	-8.9%	0.165	-1.6%	0.180	7.5%	0.165	-1.4%	0.180	7.7%
	Oct	0.089	0.094	5.6%	0.093	5.2%	0.094	6.1%	0.106	19.1%	0.096	7.9%	0.112	26.1%	0.081	-8.5%	0.076	-14.6%	0.088	-0.6%	0.110	24.5%	0.088	-0.4%	0.111	24.9%
	Nov	0.040	0.047	17.6%	0.044	11.7%	0.049	23.5%	0.056	41.7%	0.046	16.8%	0.062	55.8%	0.035	-12.6%	0.032	-20.0%	0.040	1.8%	0.061	53.7%	0.041	2.3%	0.061	54.2%
	Dec	0.030	0.039	29.2%	0.035	15.2%	0.044	43.2%	0.047	54.0%	0.037	20.8%	0.052	70.7%	0.027	-12.9%	0.024	-20.0%	0.031	3.2%	0.051	67.5%	0.032	3.9%	0.051	68.1%
	Annual	0.099	0.102	3.1%	0.100	1.6%	0.103	4.5%	0.113	14.3%	0.104	5.8%	0.118	19.7%	0.092	-6.6%	0.089	-10.0%	0.098	-0.9%	0.115	16.7%	0.098	-0.6%	0.115	17.0%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.233	0.232	-0.3%	0.232	-0.5%	0.233	0.0%	0.246	5.6%	0.237	1.8%	0.250	7.3%	0.223	-4.2%	0.214	-8.1%	0.250	7.2%	0.250	7.2%	0.250	7.2%	0.250	7.2%
	Feb	0.170	0.170	-0.3%	0.169	-0.6%	0.170	0.0%	0.184	8.1%	0.175	2.8%	0.189	10.9%	0.162	-4.7%	0.155	-9.3%	0.188	10.6%	0.188	10.6%	0.188	10.6%	0.188	10.6%
	Mar	0.130	0.131	0.8%	0.130	0.0%	0.132	1.6%	0.144	11.2%	0.135	3.9%	0.150	15.5%	0.123	-5.4%	0.115	-11.6%	0.149	14.8%	0.149	14.8%	0.149	14.8%	0.149	14.8%
	Apr	0.130	0.132	1.7%	0.130	0.0%	0.134	3.4%	0.155	19.4%	0.143	9.9%	0.167	29.0%	0.124	-4.4%	0.115	-11.7%	0.166	28.1%	0.166	28.1%	0.166	28.1%	0.166	28.1%
	May	1.651	1.652	0.0%	1.650	-0.1%	1.653	0.1%	1.661	0.6%	1.654	0.2%	1.665	0.8%	1.608	-2.6%	1.598	-3.2%	1.655	0.2%	1.655	0.2%	1.655	0.2%	1.655	0.2%
	Jun	2.256	2.257	0.0%	2.256	0.0%	2.257	0.0%	2.250	-0.3%	2.244	-0.5%	2.255	0.0%	2.198	-2.6%	2.189	-3.0%	2.231	-1.1%	2.231	-1.1%	2.231	-1.1%	2.231	-1.1%
	Jul	1.312	1.314	0.1%	1.312	0.0%	1.315	0.2%	1.321	0.7%	1.316	0.3%	1.324	0.9%	1.278	-2.6%	1.269	-3.3%	1.315	0.2%	1.315	0.2%	1.315	0.2%	1.315	0.2%
	Aug	0.909	0.913	0.4%	0.912	0.3%	0.913	0.5%	0.920	1.3%	0.914	0.5%	0.925	1.7%	0.885	-2.7%	0.876	-3.7%	0.918	1.0%	0.918	1.0%	0.918	1.0%	0.918	1.0%
	Sep	0.660	0.663	0.5%	0.663	0.4%	0.664	0.5%	0.676	2.4%	0.666	0.9%	0.683	3.4%	0.642	-2.8%	0.632	-4.3%	0.679	2.8%	0.679	2.8%	0.679	2.8%	0.679	2.8%
	Oct	0.498	0.501	0.6%	0.501	0.6%	0.502	0.6%	0.512	2.7%	0.503	0.8%	0.517	3.7%	0.483	-3.1%	0.474	-5.0%	0.515	3.3%	0.515	3.3%	0.515	3.3%	0.515	3.3%
	Nov	0.609	0.613	0.8%	0.612	0.5%	0.615	1.0%	0.617	1.4%	0.611	0.3%	0.619	1.8%	0.592	-2.7%	0.581	-4.5%	0.617	1.4%	0.617	1.4%	0.617	1.4%	0.617	1.4%
	Dec	0.386	0.393	1.9%	0.389	0.9%	0.397	2.9%	0.397	3.0%	0.389	0.9%	0.400	3.8%	0.375	-2.8%	0.364	-5.5%	0.398	3.3%	0.398	3.3%	0.398	3.3%	0.398	3.3%
	Annual	0.748	0.750	0.3%	0.749	0.1%	0.752	0.5%	0.760	1.6%	0.752	0.5%	0.765	2.2%	0.727	-2.8%	0.718	-4.1%	0.760	1.5%	0.760	1.5%	0.760	1.5%	0.760	1.5%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.8 Simulated Monthly Streamflows at Model Node Susan Outflow

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.1%	0.002	0.0%	0.002	0.2%	0.002	0.2%	0.002	0.2%	0.002	0.2%	0.002	0.2%	0.002	0.2%	0.002	0.2%
	Feb	0.001	0.001	0.0%	0.001	0.0%	0.001	0.0%	0.001	0.2%	0.001	0.1%	0.001	0.3%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%
	Mar	0.001	0.001	0.0%	0.001	0.0%	0.001	0.0%	0.001	0.3%	0.001	0.0%	0.001	0.5%	0.001	0.6%	0.001	0.6%	0.001	0.6%	0.001	0.6%	0.001	0.6%	0.001	0.6%
	Apr	0.001	0.001	0.0%	0.001	0.0%	0.001	0.0%	0.001	0.1%	0.001	0.0%	0.001	0.3%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%
	May	0.013	0.013	0.0%	0.013	0.0%	0.013	0.0%	0.013	0.0%	0.013	0.0%	0.013	0.1%	0.013	0.1%	0.013	0.1%	0.013	0.1%	0.013	0.1%	0.013	0.1%	0.013	0.1%
	Jun	0.014	0.014	0.0%	0.014	0.0%	0.014	0.0%	0.014	0.0%	0.014	0.0%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%
	Jul	0.008	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%
	Aug	0.006	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%
	Sep	0.007	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%
	Oct	0.007	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%
	Nov	0.007	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.0%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%	0.007	0.1%
	Dec	0.004	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.1%	0.004	0.0%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%
	Annual	0.006	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%
1:25-Year Dry	Jan	0.000	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.7%	0.000	0.0%	0.000	1.3%	0.000	1.6%	0.000	1.6%	0.000	1.6%	0.000	1.6%	0.000	1.6%	0.000	1.6%
	Feb	0.000	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.7%	0.000	0.0%	0.000	1.4%	0.000	1.7%	0.000	1.7%	0.000	1.7%	0.000	1.7%	0.000	1.7%	0.000	1.7%
	Mar	0.000	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.9%	0.000	0.1%	0.000	1.7%	0.000	2.0%	0.000	2.0%	0.000	2.0%	0.000	2.0%	0.000	2.0%	0.000	2.0%
	Apr	0.000	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.8%	0.000	0.1%	0.000	1.6%	0.000	1.9%	0.000	1.9%	0.000	1.9%	0.000	1.9%	0.000	1.9%	0.000	1.9%
	May	0.005	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.0%	0.005	0.1%	0.005	0.1%	0.005	0.1%	0.005	0.1%	0.005	0.1%	0.005	0.1%	0.005	0.1%
	Jun	0.004	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.1%	0.004	0.0%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%
	Jul	0.001	0.001	0.0%	0.001	0.0%	0.001	0.0%	0.001	0.3%	0.001	0.1%	0.001	0.4%	0.001	0.5%	0.001	0.5%	0.001	0.5%	0.001	0.5%	0.001	0.5%	0.001	0.5%
	Aug	0.003	0.003	0.0%	0.003	0.0%	0.003	0.0%	0.003	0.1%	0.003	0.0%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%
	Sep	0.003	0.003	0.0%	0.003	0.0%	0.003	0.0%	0.003	0.1%	0.003	0.0%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%
	Oct	0.001	0.001	0.0%	0.001	0.0%	0.001	0.0%	0.001	0.2%	0.001	0.1%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%	0.001	0.4%
	Nov	0.001	0.001	0.0%	0.001	0.0%	0.001	0.0%	0.001	0.4%	0.001	0.1%	0.001	0.7%	0.001	0.7%	0.001	0.7%	0.001	0.7%	0.001	0.7%	0.001	0.7%	0.001	0.7%
	Dec	0.000	0.000	0.0%	0.000	0.0%	0.000	0.0%	0.000	0.6%	0.000	0.2%	0.000	1.0%	0.000	1.0%	0.000	1.0%	0.000	1.0%	0.000	1.0%	0.000	1.0%	0.000	1.0%
	Annual	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.2%	0.002	0.0%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	0.004	0.004	0.0%	0.004	0.0%	0.004	0.0%	0.004	0.1%	0.004	0.0%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%	0.004	0.1%
	Feb	0.003	0.003	0.0%	0.003	0.0%	0.003	0.0%	0.003	0.1%	0.003	0.0%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%	0.003	0.2%
	Mar	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.1%	0.002	0.0%	0.002	0.2%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%
	Apr	0.002	0.002	0.0%	0.002	0.0%	0.002	0.0%	0.002	0.1%	0.002	0.0%	0.002	0.2%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%	0.002	0.3%
	May	0.026	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%	0.026	0.0%
	Jun	0.035	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%	0.035	0.0%
	Jul	0.020	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%	0.020	0.0%
	Aug	0.014	0.014	0.0%	0.014	0.0%	0.014	0.0%	0.014	0.0%	0.014	0.0%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%	0.014	0.1%
	Sep	0.010	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%	0.010	0.0%
	Oct	0.008	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.0%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%	0.008	0.1%
	Nov	0.009	0.009	0.0%	0.009	0.0%	0.009	0.0%	0.009	0.0%	0.009	0.0%	0.009	0.1%	0.009	0.1%	0.009	0.1%	0.009	0.1%	0.009	0.1%	0.009	0.1%	0.009	0.1%
	Dec	0.006	0.006	0.0%	0.006	0.0%	0.006	0.0%	0.006	0.1%	0.006	0.0%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%	0.006	0.1%
	Annual	0.012	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%	0.012	0.0%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.9 Simulated Monthly Streamflows at Model Node Hughes-us

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	6.54	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%
	Feb	4.36	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%
	Mar	2.31	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%
	Apr	4.11	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%
	May	40.30	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%
	Jun	41.44	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%
	Jul	23.42	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%
	Aug	19.31	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%
	Sep	21.94	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%
	Oct	22.66	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%
	Nov	20.67	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%
	Dec	12.93	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%
	Annual	18.41	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%
1:25-Year Dry	Jan	0.89	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%
	Feb	0.82	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%
	Mar	0.70	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%
	Apr	0.76	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%
	May	14.73	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%
	Jun	11.47	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%
	Jul	3.19	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%
	Aug	8.12	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%
	Sep	8.00	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%
	Oct	4.24	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%
	Nov	1.90	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%
	Dec	1.45	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%
	Annual	4.71	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	11.06	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%
	Feb	8.09	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%
	Mar	6.13	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%
	Apr	6.13	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%
	May	78.77	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%
	Jun	107.7	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%
	Jul	62.65	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%
	Aug	43.40	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%
	Sep	31.48	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%
	Oct	23.71	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%
	Nov	28.99	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%
	Dec	18.37	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%
	Annual	35.68	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.10 Simulated Monthly Streamflows at Model Node Hughes-mid

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	6.54	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%	6.54	0.0%
	Feb	4.36	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%	4.36	0.0%
	Mar	2.31	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%	2.31	0.0%
	Apr	4.11	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%	4.11	0.0%
	May	40.30	40.49	19.0%	40.30	0.0%	40.68	38.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%	40.30	0.0%
	Jun	41.44	41.62	17.5%	41.44	0.0%	41.79	35.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%	41.44	0.0%
	Jul	23.42	23.46	3.5%	23.42	0.0%	23.49	7.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%	23.42	0.0%
	Aug	19.31	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%	19.31	0.0%
	Sep	21.94	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%	21.94	0.0%
	Oct	22.66	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%	22.66	0.0%
	Nov	20.67	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%	20.67	0.0%
	Dec	12.93	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%	12.93	0.0%
	Annual	18.41	18.44	3.3%	18.41	0.0%	18.47	6.7%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%	18.41	0.0%
1:25-Year Dry	Jan	0.89	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%	0.89	0.0%
	Feb	0.82	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%	0.82	0.0%
	Mar	0.70	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%	0.70	0.0%
	Apr	0.76	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%	0.76	0.0%
	May	14.73	14.92	19.0%	14.73	0.0%	15.11	38.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%	14.73	0.0%
	Jun	11.47	11.63	15.5%	11.47	0.0%	11.78	31.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%	11.47	0.0%
	Jul	3.19	3.21	1.8%	3.19	0.0%	3.23	3.6%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%	3.19	0.0%
	Aug	8.12	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%	8.12	0.0%
	Sep	8.00	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%	8.00	0.0%
	Oct	4.24	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%	4.24	0.0%
	Nov	1.90	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%	1.90	0.0%
	Dec	1.45	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%	1.45	0.0%
	Annual	4.71	4.74	3.0%	4.71	0.0%	4.77	6.1%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%	4.71	0.0%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	11.06	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%	11.06	0.0%
	Feb	8.09	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%	8.09	0.0%
	Mar	6.13	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%
	Apr	6.13	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%	6.13	0.0%
	May	78.77	78.96	19.0%	78.77	0.0%	79.15	38.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%	78.77	0.0%
	Jun	107.7	107.9	20.0%	107.7	0.0%	108.1	40.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%	107.7	0.0%
	Jul	62.65	62.69	3.5%	62.65	0.0%	62.72	7.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%	62.65	0.0%
	Aug	43.40	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%	43.40	0.0%
	Sep	31.48	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%	31.48	0.0%
	Oct	23.71	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%	23.71	0.0%
	Nov	28.99	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%	28.99	0.0%
	Dec	18.37	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%	18.37	0.0%
	Annual	35.68	35.71	3.6%	35.68	0.0%	35.75	7.1%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%	35.68	0.0%

Note:
Changes lower than 0.1% are shown as 0.0%.

Table A.11 Simulated Monthly Streamflows at Model Node Hughes-ds

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
Average	Jan	6.68	6.68	0.0%	6.68	0.0%	6.68	0.0%	6.70	0.2%	6.69	0.1%	6.70	0.3%	6.67	-0.1%	6.67	-0.2%	6.68	0.0%	6.70	0.3%	6.68	0.0%	6.70	0.3%
	Feb	4.45	4.45	0.0%	4.45	0.0%	4.45	0.0%	4.47	0.3%	4.46	0.1%	4.47	0.4%	4.45	-0.2%	4.44	-0.3%	4.45	0.0%	4.47	0.4%	4.47	0.3%	4.47	0.4%
	Mar	2.36	2.36	0.1%	2.36	0.0%	2.36	0.1%	2.37	0.7%	2.36	0.3%	2.38	0.9%	2.35	-0.2%	2.35	-0.4%	2.36	0.0%	2.38	0.9%	2.38	0.9%	2.38	0.9%
	Apr	4.20	4.20	0.1%	4.20	0.0%	4.20	0.1%	4.22	0.6%	4.21	0.3%	4.23	0.8%	4.19	-0.2%	4.18	-0.3%	4.20	0.0%	4.23	0.8%	4.23	0.8%	4.23	0.8%
	May	41.15	41.34	0.4%	41.15	0.0%	41.52	0.9%	41.16	0.0%	41.15	0.0%	41.17	0.0%	41.12	-0.1%	41.12	-0.1%	41.13	0.0%	41.16	0.0%	41.16	0.0%	41.16	0.0%
	Jun	42.31	42.49	0.4%	42.31	0.0%	42.66	0.8%	42.32	0.0%	42.31	0.0%	42.32	0.0%	42.28	-0.1%	42.28	-0.1%	42.29	0.0%	42.31	0.0%	42.31	0.0%	42.31	0.0%
	Jul	23.91	23.95	0.2%	23.92	0.0%	23.98	0.3%	23.93	0.1%	23.92	0.0%	23.93	0.1%	23.90	-0.1%	23.89	-0.1%	23.90	0.0%	23.92	0.0%	23.92	0.0%	23.92	0.0%
	Aug	19.72	19.72	0.0%	19.72	0.0%	19.72	0.0%	19.73	0.0%	19.72	0.0%	19.73	0.1%	19.70	-0.1%	19.70	-0.1%	19.71	-0.1%	19.73	0.1%	19.73	0.1%	19.73	0.1%
	Sep	22.40	22.40	0.0%	22.40	0.0%	22.40	0.0%	22.41	0.1%	22.40	0.0%	22.42	0.1%	22.38	-0.1%	22.37	-0.1%	22.39	0.0%	22.41	0.0%	22.41	0.0%	22.41	0.0%
	Oct	23.14	23.14	0.0%	23.14	0.0%	23.14	0.0%	23.15	0.1%	23.14	0.0%	23.16	0.1%	23.12	-0.1%	23.12	-0.1%	23.13	0.0%	23.15	0.0%	23.15	0.0%	23.15	0.0%
	Nov	21.11	21.11	0.0%	21.11	0.0%	21.11	0.0%	21.12	0.0%	21.11	0.0%	21.12	0.0%	21.09	-0.1%	21.08	-0.1%	21.10	0.0%	21.12	0.0%	21.12	0.0%	21.12	0.0%
	Dec	13.20	13.21	0.0%	13.20	0.0%	13.21	0.1%	13.21	0.1%	13.20	0.0%	13.22	0.2%	13.19	-0.1%	13.18	-0.2%	13.19	-0.1%	13.21	0.1%	13.21	0.1%	13.21	0.1%
	Annual	18.79	18.83	0.2%	18.80	0.0%	18.86	0.4%	18.81	0.1%	18.80	0.0%	18.81	0.1%	18.78	-0.1%	18.77	-0.1%	18.79	0.0%	18.81	0.1%	18.81	0.1%	18.81	0.1%
1:25-Year Dry	Jan	0.90	0.90	0.0%	0.90	0.0%	0.90	0.0%	0.92	1.7%	0.91	0.7%	0.92	2.3%	0.90	-0.3%	0.90	-0.4%	0.90	0.1%	0.92	2.3%	0.90	0.1%	0.92	2.3%
	Feb	0.84	0.84	0.0%	0.84	0.0%	0.84	0.0%	0.85	1.9%	0.85	0.8%	0.86	2.5%	0.84	-0.3%	0.84	-0.4%	0.84	0.1%	0.86	2.5%	0.84	0.2%	0.86	2.5%
	Mar	0.71	0.71	0.2%	0.71	0.0%	0.71	0.4%	0.73	2.3%	0.72	0.9%	0.73	3.1%	0.71	-0.3%	0.71	-0.4%	0.71	0.2%	0.73	2.9%	0.71	0.2%	0.73	3.0%
	Apr	0.77	0.78	0.3%	0.77	0.0%	0.78	0.7%	0.80	2.8%	0.79	1.4%	0.81	4.1%	0.77	-0.3%	0.77	-0.4%	0.78	0.1%	0.80	3.8%	0.78	0.2%	0.80	3.9%
	May	15.04	15.23	1.2%	15.04	0.0%	15.41	2.5%	15.06	0.1%	15.05	0.1%	15.06	0.1%	15.03	-0.1%	15.02	-0.1%	15.03	-0.1%	15.06	0.1%	15.03	-0.1%	15.06	0.1%
	Jun	11.71	11.87	1.4%	11.72	0.1%	12.02	2.6%	11.72	0.1%	11.72	0.1%	11.72	0.1%	11.70	-0.1%	11.70	-0.1%	11.71	0.0%	11.72	0.1%	11.71	0.0%	11.72	0.1%
	Jul	3.26	3.28	0.6%	3.26	0.0%	3.30	1.2%	3.27	0.2%	3.26	0.1%	3.27	0.3%	3.25	-0.2%	3.25	-0.4%	3.26	0.0%	3.26	0.1%	3.26	0.0%	3.26	0.1%
	Aug	8.29	8.30	0.0%	8.30	0.0%	8.30	0.0%	8.30	0.1%	8.30	0.0%	8.30	0.1%	8.28	-0.1%	8.28	-0.2%	8.29	0.0%	8.30	0.0%	8.29	0.0%	8.30	0.0%
	Sep	8.17	8.17	0.0%	8.17	0.0%	8.17	0.0%	8.18	0.2%	8.17	0.1%	8.18	0.2%	8.16	-0.1%	8.15	-0.2%	8.16	0.0%	8.18	0.2%	8.16	0.0%	8.18	0.2%
	Oct	4.32	4.33	0.1%	4.33	0.1%	4.33	0.1%	4.34	0.4%	4.33	0.2%	4.35	0.6%	4.32	-0.2%	4.31	-0.3%	4.32	0.0%	4.35	0.5%	4.32	0.0%	4.35	0.5%
	Nov	1.94	1.94	0.4%	1.94	0.3%	1.95	0.5%	1.95	0.9%	1.94	0.4%	1.96	1.1%	1.93	-0.2%	1.93	-0.4%	1.94	0.1%	1.96	1.1%	1.94	0.1%	1.96	1.1%
	Dec	1.49	1.49	0.6%	1.49	0.3%	1.50	0.9%	1.50	1.1%	1.49	0.4%	1.51	1.4%	1.48	-0.3%	1.48	-0.5%	1.49	0.0%	1.50	1.3%	1.49	0.1%	1.51	1.3%
	Annual	4.81	4.84	0.7%	4.81	0.0%	4.87	1.3%	4.82	0.3%	4.82	0.1%	4.83	0.4%	4.80	-0.1%	4.80	-0.2%	4.81	0.0%	4.83	0.4%	4.81	0.0%	4.83	0.4%

Climate Scenario	Month	Existing Condition	Construction						Operation						Closure (Pit Filling)						Post-Closure (after Pit Filling)					
			Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum		Average		Minimum		Maximum	
		Flow (m^3/s)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)	Flow (m^3/s)	Change from Existing (%)
1:25-Year Wet	Jan	11.30	11.30	0.0%	11.30	0.0%	11.30	0.0%	11.31	0.1%	11.30	0.0%	11.31	0.1%	11.29	-0.1%	11.28	-0.2%	11.31	0.1%	11.31	0.1%	11.31	0.1%	11.31	0.1%
	Feb	8.26	8.26	0.0%	8.26	0.0%	8.26	0.0%	8.28	0.2%	8.27	0.0%	8.28	0.2%	8.25	-0.1%	8.25	-0.2%	8.28	0.2%	8.28	0.2%	8.28	0.2%	8.28	0.2%
	Mar	6.26	6.26	0.0%	6.26	0.0%	6.26	0.0%	6.28	0.2%	6.27	0.1%	6.28	0.3%	6.25	-0.1%	6.25	-0.2%	6.28	0.3%	6.28	0.3%	6.28	0.3%	6.28	0.3%
	Apr	6.26	6.26	0.0%	6.26	0.0%	6.27	0.1%	6.29	0.4%	6.28	0.2%	6.30	0.6%	6.26	-0.1%	6.25	-0.2%	6.30	0.6%	6.30	0.6%	6.30	0.6%	6.30	0.6%
	May	80.42	80.62	0.2%	80.43	0.0%	80.80	0.5%	80.44	0.0%	80.43	0.0%	80.44	0.0%	80.38	0.0%	80.37	-0.1%	80.43	0.0%	80.43	0.0%	80.43	0.0%	80.43	0.0%
	Jun	110.0	110.2	0.1%	110.0	0.0%	110.3	0.3%	110.0	0.0%	110.0	0.0%	110.0	0.0%	109.9	-0.1%	109.9	-0.1%	110.0	0.0%	110.0	0.0%	110.0	0.0%	110.0	0.0%
	Jul	63.96	64.01	0.1%	63.97	0.0%	64.04	0.1%	63.98	0.0%	63.97	0.0%	63.98	0.0%	63.93	0.0%	63.92	-0.1%	63.97	0.0%	63.97	0.0%	63.97	0.0%	63.97	0.0%
	Aug	44.31	44.31	0.0%	44.31	0.0%	44.31	0.0%	44.32	0.0%	44.31	0.0%	44.33	0.0%	44.29	-0.1%	44.28	-0.1%	44.32	0.0%	44.32	0.0%	44.32	0.0%	44.32	0.0%
	Sep	32.14	32.15	0.0%	32.15	0.0%	32.15	0.0%	32.16	0.1%	32.15	0.0%	32.17	0.1%	32.13	0.0%	32.12	-0.1%	32.16	0.1%	32.16	0.1%	32.16	0.1%	32.16	0.1%
	Oct	24.21	24.21	0.0%	24.21	0.0%	24.21	0.0%	24.22	0.0%	24.21	0.0%	24.22	0.0%	24.19	-0.1%	24.18	-0.1%	24.22	0.0%	24.22	0.0%	24.22	0.0%	24.22	0.0%
	Nov	29.60	29.60	0.0%	29.60	0.0%	29.60	0.0%	29.61	0.0%	29.60	0.0%	29.61	0.0%	29.58	-0.1%	29.57	-0.1%	29.60	0.0%	29.60	0.0%	29.60	0.0%	29.60	0.0%
	Dec	18.75	18.76	0.0%	18.75	0.0%	18.76	0.1%	18.76	0.1%	18.75	0.0%	18.77	0.1%	18.74	-0.1%	18.73	-0.1%	18.76	0.1%	18.76	0.1%	18.76	0.1%	18.76	0.1%
	Annual	36.43	36.46	0.1%	36.43	0.0%	36.50	0.2%	36.44	0.0%	36.43	0.0%	36.45	0.0%	36.41	-0.1%	36.40	-0.1%	36.44	0.0%	36.44	0.0%	36.44	0.0%	36.44	0.0%

Note:
Changes lower than 0.1% are shown as 0.0%.

Appendix B Water Quality Results for the Expected Case Scenario – Summary Statistics

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Open Pit Discharge

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	na	na	na	na	na	na	5.0	5.1	5.2	5.3	5.6	6.7
Alkalinity_T	na	na	na	na	na	na	120	120	120	120	120	190
Aluminum_D	na	na	na	na	na	na	0.011	0.021	0.022	0.022	0.024	0.025
Aluminum_T	na	na	na	na	na	na	0.013	0.024	0.025	0.025	0.028	0.029
Antimony_D	na	na	na	na	na	na	0.00022	0.00037	0.00039	0.00039	0.00042	0.00044
Antimony_T	na	na	na	na	na	na	0.00022	0.00037	0.00039	0.00039	0.00043	0.00045
Arsenic_D	na	na	na	na	na	na	0.0021	0.0022	0.0023	0.0024	0.0026	0.0042
Arsenic_T	na	na	na	na	na	na	0.0023	0.0024	0.0025	0.0026	0.0028	0.0043
Barium_D	na	na	na	na	na	na	0.024	0.029	0.030	0.030	0.031	0.032
Barium_T	na	na	na	na	na	na	0.025	0.030	0.031	0.031	0.032	0.033
Beryllium_T	na	na	na	na	na	na	0.00010	0.00017	0.00018	0.00018	0.00019	0.00019
Boron_D	na	na	na	na	na	na	0.016	0.016	0.017	0.018	0.020	0.021
Boron_T	na	na	na	na	na	na	0.016	0.016	0.017	0.018	0.020	0.021
Bromide	na	na	na	na	na	na	0.027	0.028	0.029	0.030	0.029	0.061
Cadmium_D	na	na	na	na	na	na	0.0000049	0.0000049	0.0000050	0.0000052	0.0000051	0.000010
Cadmium_T	na	na	na	na	na	na	0.0000082	0.0000082	0.0000085	0.0000085	0.0000087	0.000012
Calcium_D	na	na	na	na	na	na	53	63	64	65	68	70
Chloride	na	na	na	na	na	na	0.48	0.48	0.50	0.53	0.60	0.96
Chromium_D	na	na	na	na	na	na	0.00018	0.00022	0.00022	0.00022	0.00023	0.00024
Chromium_D_Hex	na	na	na	na	na	na	0.00018	0.00022	0.00022	0.00022	0.00023	0.00024
Chromium_T	na	na	na	na	na	na	0.00029	0.00058	0.00061	0.00060	0.00064	0.00066
Cobalt_D	na	na	na	na	na	na	0.00011	0.00011	0.00011	0.00011	0.00012	0.00017
Cobalt_T	na	na	na	na	na	na	0.00015	0.00015	0.00016	0.00016	0.00017	0.00020
Copper_D	na	na	na	na	na	na	0.00043	0.00043	0.00046	0.00046	0.00048	0.00084
Copper_T	na	na	na	na	na	na	0.00048	0.00049	0.00052	0.00052	0.00055	0.00090
Cyanide_F	na	na	na	na	na	na	0.00034	0.00035	0.00036	0.00037	0.00036	0.00069
Cyanide_T	na	na	na	na	na	na	0.00047	0.00047	0.00047	0.00048	0.00048	0.00069
Cyanide_WAD	na	na	na	na	na	na	0.00034	0.00034	0.00035	0.00036	0.00035	0.00068
Fluoride	na	na	na	na	na	na	0.14	0.15	0.16	0.18	0.24	0.37
Hardness	na	na	na	na	na	na	130	130	130	140	140	210
Iron_D	na	na	na	na	na	na	0.21	0.22	0.23	0.23	0.25	0.28
Iron_T	na	na	na	na	na	na	0.22	0.24	0.24	0.25	0.28	0.30
Lead_D	na	na	na	na	na	na	0.000063	0.000095	0.000098	0.000098	0.00010	0.00011
Lead_T	na	na	na	na	na	na	0.000081	0.00015	0.00016	0.00016	0.00017	0.00018
Magnesium_D	na	na	na	na	na	na	11	11	11	11	12	15
Manganese_D	na	na	na	na	na	na	0.036	0.036	0.038	0.040	0.041	0.12
Manganese_T	na	na	na	na	na	na	0.040	0.040	0.042	0.045	0.046	0.12
Mercury_D	na	na	na	na	na	na	0.0000013	0.0000016	0.0000017	0.0000017	0.0000017	0.0000017
Mercury_T	na	na	na	na	na	na	0.0000013	0.0000018	0.0000018	0.0000019	0.0000019	0.0000020
Molybdenum_D	na	na	na	na	na	na	0.0025	0.0033	0.0034	0.0034	0.0035	0.0036
Molybdenum_T	na	na	na	na	na	na	0.0025	0.0033	0.0034	0.0034	0.0035	0.0036
N_Ammonia	na	na	na	na	na	na	0.054	0.055	0.055	0.057	0.056	0.12
N_Nitrate_Nitrite	na	na	na	na	na	na	0.047	0.047	0.048	0.053	0.052	0.21
N_Nitrite	na	na	na	na	na	na	0.036	0.059	0.061	0.061	0.065	0.068
Nickel_D	na	na	na	na	na	na	0.00035	0.00036	0.00037	0.00037	0.00039	0.00056
Nickel_T	na	na	na	na	na	na	0.00051	0.00051	0.00054	0.00054	0.00057	0.00068
Phosphorus_T	na	na	na	na	na	na	0.00028	0.00039	0.00072	0.00083	0.0014	0.0063
Potassium_D	na	na	na	na	na	na	4.9	8.1	8.4	8.5	9.1	9.5
Proton	na	na	na	na	na	na	0.00047	0.0016	0.0016	0.0016	0.0018	0.0018
Radium_226	na	na	na	na	na	na	0.0013	0.0018	0.0023	0.0026	0.0031	0.021
Selenium_D	na	na	na	na	na	na	0.00012	0.00013	0.00014	0.00014	0.00015	0.00016
Selenium_T	na	na	na	na	na	na	0.00013	0.00014	0.00014	0.00014	0.00015	0.00017
Silicon_D	na	na	na	na	na	na	6.8	6.8	6.9	6.9	7.0	8.9
Silicon_T	na	na	na	na	na	na	6.8	6.9	7.0	7.0	7.1	9.0
Silver_D	na	na	na	na	na	na	0.0000085	0.000011	0.000012	0.000012	0.000012	0.000012
Silver_T	na	na	na	na	na	na	0.0000085	0.000011	0.000012	0.000012	0.000012	0.000012
Sodium_D	na	na	na	na	na	na	11	13	13	13	14	15
Sodium_T	na	na	na	na	na	na	11	13	13	13	14	15
Strontium_D	na	na	na	na	na	na	0.13	0.16	0.17	0.17	0.18	0.18
Strontium_T	na	na	na	na	na	na	0.13	0.16	0.17	0.17	0.18	0.18
Sulfate	na	na	na	na	na	na	13	13	14	16	19	35
Thallium_D	na	na	na	na	na	na	0.000040	0.000066	0.000068	0.000068	0.000072	0.000075
Thallium_T	na	na	na	na	na	na	0.000042	0.000072	0.000074	0.000074	0.000079	0.000082
TSS	na	na	na	na	na	na	11	15	15	15	15	15
Uranium_D	na	na	na	na	na	na	0.0015	0.0016	0.0016	0.0016	0.0017	0.0024
Uranium_T	na	na	na	na	na	na	0.0015	0.0016	0.0016	0.0016	0.0017	0.0024
Vanadium_T	na	na	na	na	na	na	0.00040	0.00071	0.00074	0.00074	0.00078	0.00080
Zinc_D	na	na	na	na	na	na	0.0011	0.0011	0.0012	0.0012	0.0012	0.0029
Zinc_T	na	na	na	na	na	na	0.0014	0.0015	0.0015	0.0015	0.0015	0.0032

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Collection Pond Discharge

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	4.1	4.2	4.4	4.6	5.4	6.0	5.3	6.3	6.9	6.9	7.7	7.7
Alkalinity_T	150	150	170	210	320	420	27	31	33	34	38	42
Aluminum_D	0.0064	0.0066	0.014	0.015	0.026	0.029	0.068	0.070	0.073	0.074	0.082	0.083
Aluminum_T	0.0064	0.0066	0.019	0.021	0.041	0.047	0.086	0.086	0.086	0.086	0.086	0.086
Antimony_D	0.00012	0.00012	0.00040	0.0011	0.0027	0.0048	0.00090	0.0013	0.0014	0.0015	0.0020	0.0020
Antimony_T	0.00012	0.00012	0.00040	0.0011	0.0028	0.0048	0.00092	0.0013	0.0014	0.0016	0.0020	0.0021
Arsenic_D	0.0012	0.0013	0.0037	0.0044	0.0088	0.0098	0.018	0.018	0.019	0.019	0.020	0.025
Arsenic_T	0.0012	0.0013	0.0038	0.0045	0.0092	0.010	0.019	0.020	0.021	0.021	0.022	0.026
Barium_D	0.021	0.021	0.026	0.035	0.061	0.088	0.030	0.041	0.045	0.049	0.060	0.065
Barium_T	0.021	0.021	0.026	0.036	0.062	0.090	0.031	0.044	0.048	0.052	0.065	0.071
Beryllium_T	0.000068	0.000070	0.00010	0.00016	0.00032	0.00050	0.00027	0.00038	0.00041	0.00044	0.00055	0.00057
Boron_D	0.012	0.012	0.025	0.054	0.13	0.22	0.020	0.029	0.031	0.034	0.042	0.043
Boron_T	0.012	0.012	0.025	0.054	0.13	0.22	0.020	0.029	0.031	0.034	0.042	0.043
Bromide	0.042	0.045	0.047	0.048	0.053	0.054	0.031	0.036	0.037	0.038	0.040	0.040
Cadmium_D	0.0000070	0.0000072	0.0000089	0.000012	0.000021	0.000030	0.000012	0.000016	0.000017	0.000019	0.000023	0.000023
Cadmium_T	0.0000071	0.0000072	0.000010	0.000014	0.000025	0.000036	0.000027	0.000040	0.000044	0.000045	0.000050	0.000053
Calcium_D	45	46	54	68	110	150	62	88	96	100	130	140
Chloride	0.46	0.49	0.54	0.53	0.56	0.58	0.16	0.18	0.21	0.21	0.24	0.29
Chromium_D	0.00018	0.00018	0.00020	0.00023	0.00032	0.00038	0.00021	0.00028	0.00030	0.00032	0.00038	0.00038
Chromium_D_Hex	0.00018	0.00018	0.00020	0.00023	0.00032	0.00038	0.00021	0.00028	0.00030	0.00032	0.00038	0.00038
Chromium_T	0.00018	0.00018	0.00028	0.00034	0.00057	0.00081	0.00093	0.0014	0.0015	0.0016	0.0019	0.0023
Cobalt_D	0.000077	0.000078	0.00012	0.00019	0.00037	0.00056	0.00042	0.00055	0.00060	0.00062	0.00068	0.00083
Cobalt_T	0.000077	0.000078	0.00015	0.00022	0.00044	0.00068	0.00062	0.00083	0.00090	0.00095	0.0011	0.0013
Copper_D	0.00041	0.00042	0.00073	0.0015	0.0033	0.0055	0.0021	0.0031	0.0034	0.0037	0.0047	0.0048
Copper_T	0.00041	0.00042	0.00078	0.0015	0.0034	0.0057	0.0024	0.0035	0.0039	0.0042	0.0053	0.0057
Cyanide_F	0.00050	0.00052	0.00054	0.00056	0.00063	0.00066	0.00053	0.00056	0.00071	0.00069	0.00076	0.00076
Cyanide_T	0.00049	0.00050	0.00053	0.00054	0.00062	0.00065	0.00053	0.00057	0.00073	0.00071	0.00078	0.00078
Cyanide_WAD	0.00049	0.00050	0.00053	0.00054	0.00061	0.00065	0.00053	0.00056	0.00071	0.00069	0.00076	0.00076
Fluoride	0.13	0.13	0.14	0.15	0.18	0.19	0.14	0.15	0.15	0.16	0.17	0.19
Hardness	120	140	150	150	160	160	30	35	37	38	43	48
Iron_D	0.15	0.15	0.18	0.18	0.24	0.26	0.30	0.35	0.38	0.39	0.44	0.47
Iron_T	0.15	0.15	0.27	0.29	0.48	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Lead_D	0.000048	0.000049	0.000065	0.000093	0.00017	0.00026	0.00013	0.00018	0.00020	0.00022	0.00027	0.00028
Lead_T	0.000048	0.000049	0.000078	0.00011	0.00022	0.00034	0.00023	0.00034	0.00037	0.00041	0.00052	0.00061
Magnesium_D	9.8	10.0	11	14	21	28	7.0	9.6	10	11	14	15
Manganese_D	0.053	0.054	0.058	0.062	0.079	0.091	0.046	0.055	0.066	0.078	0.12	0.18
Manganese_T	0.054	0.055	0.060	0.065	0.084	0.099	0.071	0.083	0.091	0.11	0.16	0.22
Mercury_D	0.0000011	0.0000011	0.0000014	0.0000017	0.0000027	0.0000037	0.0000018	0.0000024	0.0000026	0.0000028	0.0000035	0.0000035
Mercury_T	0.0000011	0.0000011	0.0000015	0.0000018	0.0000028	0.0000040	0.0000019	0.0000026	0.0000030	0.0000033	0.0000043	0.0000049
Molybdenum_D	0.0023	0.0023	0.0034	0.0061	0.013	0.021	0.0035	0.0051	0.0056	0.0061	0.0077	0.0080
Molybdenum_T	0.0023	0.0023	0.0034	0.0061	0.013	0.021	0.0036	0.0051	0.0056	0.0061	0.0078	0.0081
N_Ammonia	0.096	0.13	0.33	0.50	1.2	1.6	0.0075	0.0097	0.013	0.016	0.024	0.037
N_Nitrate_Nitrite	0.20	0.50	2.1	3.5	9.1	13	0.017	0.020	0.021	0.021	0.022	0.022
N_Nitrite	0.015	0.022	0.059	0.090	0.22	0.29	0.16	0.22	0.25	0.27	0.34	0.35
Nickel_D	0.00029	0.00030	0.00050	0.00092	0.0020	0.0033	0.0011	0.0015	0.0016	0.0017	0.0021	0.0022
Nickel_T	0.00029	0.00030	0.00058	0.0010	0.0022	0.0036	0.0017	0.0024	0.0026	0.0028	0.0034	0.0037
Phosphorus_T	0.021	0.022	0.023	0.024	0.028	0.029	0.0084	0.0099	0.011	0.011	0.014	0.014
Potassium_D	3.1	3.2	6.8	15	36	61	13	19	20	22	29	30
Proton	0.000000030	0.000000031	0.000000043	0.000000054	0.000000097	0.00000012	0.0032	0.0046	0.0051	0.0056	0.0071	0.0074
Radium_226	0.021	0.024	0.027	0.026	0.028	0.028	0.0027	0.0031	0.0036	0.0039	0.0049	0.0058
Selenium_D	0.000091	0.000094	0.00021	0.00048	0.0012	0.0020	0.00035	0.00050	0.00055	0.00060	0.00076	0.00078
Selenium_T	0.000091	0.000094	0.00022	0.00049	0.0012	0.0020	0.00037	0.00053	0.00058	0.00063	0.00080	0.00081
Silicon_D	6.7	6.8	7.5	8.3	11	13	4.9	6.0	6.3	6.4	6.7	7.3
Silicon_T	6.7	6.8	7.5	8.3	11	13	5.0	6.1	6.6	6.6	7.1	8.1
Silver_D	0.0000072	0.0000074	0.0000095	0.000012	0.000022	0.000031	0.000012	0.000017	0.000019	0.000021	0.000027	0.000029
Silver_T	0.0000072	0.0000074	0.0000096	0.000012	0.000022	0.000031	0.000013	0.000018	0.000019	0.000022	0.000028	0.000029
Sodium_D	8.5	8.7	16	35	81	140	16	23	25	27	34	36
Sodium_T	8.5	8.7	16	35	81	140	16	23	25	27	34	36
Strontium_D	0.099	0.10	0.13	0.19	0.36	0.55	0.19	0.27	0.29	0.32	0.40	0.42
Strontium_T	0.099	0.10	0.13	0.19	0.36	0.55	0.19	0.27	0.29	0.32	0.40	0.42
Sulfate	21	21	46	100	240	400	1.5	1.6	1.7	2.4	3.6	5.2
Thallium_D	0.000028	0.000028	0.000045	0.000077	0.00016	0.00026	0.00010	0.00014	0.00015	0.00017	0.00021	0.00022
Thallium_T	0.000028	0.000028	0.000046	0.000079	0.00017	0.00027	0.00012	0.00016	0.00018	0.00019	0.00024	0.00024
TSS	12	13	15	14	15	15	8.9	9.9	12	12	15	15
Uranium_D	0.0013	0.0014	0.0023	0.0046	0.010	0.017	0.0041	0.0059	0.0065	0.0071	0.0090	0.0094
Uranium_T	0.0013	0.0014	0.0023	0.0046	0.010	0.017	0.0041	0.0059	0.0065	0.0071	0.0091	0.0094
Vanadium_T	0.00027	0.00028	0.00046	0.00072	0.0015	0.0024	0.0011	0.0015	0.0017	0.0018	0.0022	0.0026
Zinc_D	0.0023	0.0024	0.0026	0.0031	0.0045	0.0056	0.0016	0.0021	0.0023	0.0025	0.0032	0.0032
Zinc_T	0.0023	0.0024	0.0028	0.0033	0.0049	0.0063	0.0032	0.0042	0.0047	0.0048	0.0052	0.0063

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Gordon Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.96	1.4	4.8	4.4	7.0	8.3	3.2	3.7	5.5	5.9	7.9	8.6
Alkalinity_T	48	48	61	62	74	83	48	48	50	62	74	84
Aluminum_D	0.000032	0.000065	0.00058	0.0028	0.0086	0.013	0.0038	0.0039	0.0069	0.0074	0.012	0.014
Aluminum_T	0.000056	0.00015	0.0031	0.014	0.041	0.058	0.016	0.017	0.030	0.033	0.055	0.059
Antimony_D	0.000023	0.000027	0.000054	0.000049	0.000064	0.000074	0.000059	0.000070	0.000073	0.000079	0.000094	0.000099
Antimony_T	0.000032	0.000035	0.000065	0.000060	0.000076	0.000094	0.000063	0.000073	0.000078	0.000085	0.00010	0.00011
Arsenic_D	0.00015	0.00015	0.00023	0.00022	0.00026	0.00031	0.00024	0.00027	0.00028	0.00032	0.00039	0.00039
Arsenic_T	0.00016	0.00017	0.00026	0.00025	0.00030	0.00036	0.00026	0.00029	0.00031	0.00034	0.00042	0.00043
Barium_D	0.0055	0.0064	0.0091	0.0097	0.013	0.015	0.0078	0.0083	0.0094	0.011	0.014	0.015
Barium_T	0.0072	0.0078	0.011	0.011	0.014	0.016	0.0089	0.0093	0.010	0.012	0.014	0.016
Beryllium_T	0.000026	0.000031	0.000062	0.000056	0.000072	0.000087	0.000062	0.000072	0.000077	0.000083	0.000099	0.00011
Boron_D	0.0018	0.0019	0.0039	0.0044	0.0075	0.0085	0.0033	0.0034	0.0047	0.0056	0.0078	0.0086
Boron_T	0.0025	0.0028	0.0063	0.0064	0.010	0.012	0.0041	0.0044	0.0062	0.0075	0.011	0.012
Bromide	0.012	0.014	0.029	0.028	0.039	0.042	0.030	0.036	0.040	0.041	0.047	0.052
Cadmium_D	0.00000013	0.00000017	0.00000078	0.00000065	0.00000099	0.0000010	0.0000013	0.0000015	0.0000018	0.0000018	0.0000021	0.0000024
Cadmium_T	0.00000015	0.00000024	0.0000015	0.0000015	0.0000025	0.0000026	0.0000024	0.0000029	0.0000033	0.0000034	0.0000038	0.0000046
Calcium_D	7.9	10.0	12	12	15	17	13	13	15	17	20	22
Chloride	0.012	0.018	0.061	0.069	0.15	0.17	0.11	0.11	0.17	0.16	0.21	0.25
Chromium_D	0.0000039	0.0000056	0.000013	0.000015	0.000037	0.000041	0.000024	0.000029	0.000038	0.000038	0.000047	0.000055
Chromium_D_Hex	0.0000042	0.0000063	0.000028	0.000026	0.000047	0.000053	0.000027	0.000032	0.000047	0.000047	0.000059	0.000062
Chromium_T	0.000031	0.000040	0.000096	0.000090	0.00012	0.00015	0.00013	0.00015	0.00016	0.00017	0.00020	0.00023
Cobalt_D	0.000016	0.000025	0.000078	0.000071	0.00011	0.00013	0.000060	0.000070	0.000098	0.00011	0.00014	0.00015
Cobalt_T	0.000019	0.000028	0.000086	0.000079	0.00012	0.00015	0.000068	0.000079	0.00011	0.00012	0.00016	0.00017
Copper_D	0.0000058	0.0000077	0.000030	0.000036	0.000074	0.000079	0.000067	0.000084	0.000100	0.000096	0.00011	0.00012
Copper_T	0.000018	0.000025	0.000077	0.000069	0.00011	0.00013	0.00012	0.00013	0.00016	0.00017	0.00021	0.00023
Cyanide_F	0.000020	0.000030	0.00020	0.00023	0.00042	0.00045	0.00033	0.00038	0.00052	0.00054	0.00064	0.00081
Cyanide_T	0.00010	0.00012	0.00031	0.00029	0.00041	0.00047	0.00043	0.00047	0.00057	0.00060	0.00074	0.00079
Cyanide_WAD	0.000025	0.000033	0.00020	0.00021	0.00037	0.00039	0.00031	0.00036	0.00046	0.00048	0.00057	0.00070
Fluoride	0.036	0.039	0.048	0.049	0.061	0.064	0.039	0.040	0.045	0.052	0.063	0.067
Hardness	25	30	37	38	48	54	42	43	47	56	66	73
Iron_D	0.055	0.084	0.16	0.16	0.25	0.27	0.19	0.22	0.31	0.29	0.33	0.37
Iron_T	0.16	0.25	0.43	0.53	0.99	1.2	0.52	0.63	0.75	0.80	1.1	1.3
Lead_D	0.00000059	0.00000084	0.0000037	0.0000031	0.0000047	0.0000052	0.0000068	0.0000078	0.0000096	0.000010	0.000012	0.000013
Lead_T	0.0000062	0.0000083	0.000024	0.000022	0.000039	0.000041	0.000031	0.000031	0.000048	0.000048	0.000058	0.000063
Magnesium_D	1.3	1.5	1.7	2.0	2.5	3.0	2.5	2.5	2.6	3.2	3.9	4.4
Manganese_D	0.013	0.025	0.14	0.13	0.23	0.25	0.065	0.082	0.15	0.17	0.25	0.27
Manganese_T	0.024	0.046	0.17	0.16	0.27	0.30	0.089	0.11	0.18	0.20	0.30	0.32
Mercury_D	0.00000011	0.00000014	0.00000035	0.00000042	0.00000082	0.00000088	0.00000077	0.00000081	0.00000095	0.00000094	0.0000011	0.0000011
Mercury_T	0.00000047	0.00000072	0.0000010	0.0000010	0.0000015	0.0000017	0.0000011	0.0000012	0.0000015	0.0000015	0.0000016	0.0000017
Molybdenum_D	0.0000070	0.0000093	0.000017	0.000018	0.000031	0.000033	0.000037	0.000039	0.000042	0.000053	0.000066	0.000073
Molybdenum_T	0.0000080	0.000010	0.000020	0.000021	0.000037	0.000041	0.000042	0.000044	0.000050	0.000061	0.000078	0.000085
N_Ammonia	0.0091	0.017	0.048	0.045	0.072	0.075	0.020	0.024	0.042	0.054	0.083	0.088
N_Nitrate_Nitrite	0.0015	0.0022	0.012	0.012	0.023	0.024	0.016	0.020	0.022	0.024	0.028	0.034
N_Nitrite	0.00046	0.00066	0.0026	0.0025	0.0048	0.0056	0.0041	0.0042	0.0058	0.0058	0.0072	0.0085
Nickel_D	0.000016	0.000020	0.000047	0.000042	0.000060	0.000067	0.000082	0.000083	0.00010	0.00011	0.00014	0.00015
Nickel_T	0.000022	0.000030	0.000097	0.000094	0.00017	0.00018	0.00013	0.00014	0.00022	0.00021	0.00026	0.00030
Phosphorus_T	0.013	0.014	0.020	0.021	0.031	0.035	0.021	0.022	0.026	0.027	0.033	0.038
Potassium_D	0.36	0.39	0.54	0.50	0.58	0.70	0.58	0.61	0.71	0.75	0.84	0.96
Proton	0.0000000024	0.0000000028	0.0000000060	0.0000000079	0.000000016	0.000000020	0.000000019	0.000000022	0.000000024	0.000000025	0.000000031	0.000000031
Radium_226	0.00027	0.00037	0.0012	0.0010	0.0016	0.0019	0.0018	0.0020	0.0025	0.0026	0.0033	0.0035
Selenium_D	0.0000018	0.0000023	0.000010	0.000018	0.000053	0.000064	0.000030	0.000031	0.000038	0.000043	0.000064	0.000065
Selenium_T	0.0000019	0.0000024	0.000011	0.000019	0.000053	0.000064	0.000031	0.000032	0.000039	0.000044	0.000065	0.000066
Silicon_D	0.91	0.99	1.4	1.4	1.8	2.1	2.1	2.1	2.3	2.6	3.1	3.4
Silicon_T	0.93	1.0	1.5	1.5	1.9	2.2	2.1	2.2	2.3	2.7	3.2	3.5
Silver_D	0.00000010	0.00000014	0.00000089	0.0000017	0.0000052	0.0000064	0.0000027	0.0000028	0.0000037	0.0000042	0.0000064	0.0000065
Silver_T	0.00000014	0.00000018	0.0000011	0.0000018	0.0000053	0.0000064	0.0000030	0.0000031	0.0000039	0.0000044	0.0000065	0.0000066
Sodium_D	0.32	0.39	0.62	0.63	0.94	1.0	0.85	0.88	0.99	1.2	1.5	1.6
Sodium_T	0.32	0.40	0.64	0.65	0.96	1.0	0.86	0.89	1.0	1.2	1.5	1.7
Strontium_D	0.0076	0.0089	0.014	0.013	0.018	0.020	0.018	0.018	0.020	0.024	0.028	0.031
Strontium_T	0.015	0.017	0.022	0.024	0.032	0.035	0.022	0.022	0.024	0.030	0.036	0.040
Sulfate	0.83	1.1	1.9	1.8	2.4	2.7	1.4	1.5	1.7	2.1	2.5	2.8
Thallium_D	0.000011	0.000012	0.000025	0.000023	0.000030	0.000034	0.000027	0.000032	0.000034	0.000036	0.000043	0.000045
Thallium_T	0.000034	0.000037	0.000043	0.000044	0.000053	0.000055	0.000033	0.000036	0.000037	0.000043	0.000052	0.000054
TSS	0.35	0.45	0.74	0.87	1.5	1.9	1.7	1.7	2.0	2.0	2.3	2.4
Uranium_D	0.00000020	0.00000027	0.0000013	0.0000011	0.0000016	0.0000018	0.0000027	0.0000030	0.0000036	0.0000039	0.0000048	0.0000051
Uranium_T	0.0000013	0.0000016	0.0000023	0.0000037	0.0000070	0.0000091	0.0000053	0.0000054	0.0000082	0.0000100	0.000015	0.000017
Vanadium_T	0.000011	0.000017	0.000079	0.000074	0.00013	0.00015	0.00012	0.00014	0.00015	0.00016	0.00019	0.00024
Zinc_D	0.000032	0.000043	0.00013	0.00013	0.00022	0.00027	0.00024	0.00025	0.00039	0.00037	0.00045	0.00046
Zinc_T	0.000040	0.000056	0.00018	0.00019	0.00035	0.00043	0.00033	0.00034	0.00056	0.00055	0.00065	0.00071

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Farley Lake West

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.1	3.4	7.4	7.6	12	12	3.6	3.7	7.0	8.4	13	15
Alkalinity_T	67	79	150	150	210	290	62	63	110	120	190	280
Aluminum_D	0.00091	0.00099	0.0023	0.0028	0.0051	0.0069	0.0028	0.0034	0.0040	0.0046	0.0069	0.0081
Aluminum_T	0.0017	0.0018	0.0039	0.0046	0.0089	0.011	0.0049	0.0058	0.0070	0.0076	0.011	0.012
Antimony_D	0.00010	0.00011	0.00026	0.00033	0.00072	0.00094	0.000098	0.00013	0.00015	0.00016	0.00021	0.00024
Antimony_T	0.00011	0.00014	0.00030	0.00038	0.00078	0.00095	0.00012	0.00014	0.00018	0.00018	0.00023	0.00026
Arsenic_D	0.00080	0.0010	0.0019	0.0020	0.0028	0.0041	0.00072	0.00077	0.0016	0.0014	0.0021	0.0035
Arsenic_T	0.00082	0.0011	0.0020	0.0020	0.0029	0.0042	0.00076	0.00081	0.0016	0.0015	0.0022	0.0035
Barium_D	0.012	0.015	0.026	0.025	0.034	0.046	0.013	0.014	0.019	0.024	0.035	0.044
Barium_T	0.013	0.016	0.027	0.026	0.035	0.047	0.014	0.014	0.019	0.025	0.036	0.045
Beryllium_T	0.000060	0.000072	0.000088	0.000094	0.00013	0.00014	0.000076	0.000086	0.000097	0.00010	0.00013	0.00014
Boron_D	0.010	0.012	0.025	0.027	0.044	0.054	0.0099	0.010	0.013	0.018	0.027	0.039
Boron_T	0.010	0.012	0.025	0.028	0.045	0.055	0.010	0.010	0.014	0.018	0.028	0.040
Bromide	0.029	0.036	0.041	0.041	0.045	0.053	0.030	0.036	0.041	0.041	0.047	0.059
Cadmium_D	0.0000024	0.0000028	0.0000035	0.0000038	0.0000057	0.0000069	0.0000026	0.0000028	0.0000032	0.0000032	0.0000035	0.0000048
Cadmium_T	0.0000027	0.0000036	0.0000044	0.0000047	0.0000068	0.0000081	0.0000033	0.0000036	0.0000046	0.0000045	0.0000054	0.0000065
Calcium_D	27	31	52	52	71	98	31	31	41	53	76	98
Chloride	0.41	0.41	0.58	0.70	1.1	1.5	0.43	0.44	0.64	0.75	1.2	1.7
Chromium_D	0.000023	0.000028	0.000034	0.000042	0.000068	0.000082	0.000039	0.000047	0.000057	0.000058	0.000076	0.000084
Chromium_D_Hex	0.000034	0.000040	0.000055	0.000058	0.000085	0.00010	0.000063	0.000069	0.000073	0.000078	0.000092	0.00011
Chromium_T	0.000036	0.000052	0.000080	0.000080	0.00010	0.00012	0.000064	0.000094	0.00013	0.00013	0.00017	0.00018
Cobalt_D	0.000042	0.000061	0.000088	0.000085	0.00010	0.00012	0.000054	0.000060	0.000089	0.000092	0.00013	0.00015
Cobalt_T	0.000047	0.000068	0.00011	0.00011	0.00014	0.00017	0.000063	0.000069	0.00011	0.00012	0.00018	0.00020
Copper_D	0.00027	0.00031	0.00058	0.00064	0.0011	0.0012	0.00025	0.00027	0.00036	0.00037	0.00050	0.00086
Copper_T	0.00032	0.00036	0.00069	0.00076	0.0012	0.0014	0.00031	0.00031	0.00046	0.00050	0.00072	0.0011
Cyanide_F	0.00013	0.00015	0.00022	0.00023	0.00032	0.00034	0.00019	0.00023	0.00029	0.00029	0.00036	0.00045
Cyanide_T	0.00026	0.00030	0.00041	0.00041	0.00052	0.00054	0.00035	0.00041	0.00049	0.00049	0.00054	0.00066
Cyanide_WAD	0.00017	0.00019	0.00029	0.00031	0.00045	0.00046	0.00024	0.00028	0.00037	0.00037	0.00046	0.00056
Fluoride	0.064	0.073	0.098	0.098	0.12	0.14	0.069	0.073	0.11	0.11	0.14	0.22
Hardness	94	97	150	160	250	320	99	100	140	170	260	350
Iron_D	0.0077	0.0090	0.012	0.012	0.014	0.017	0.015	0.016	0.020	0.020	0.025	0.026
Iron_T	0.016	0.017	0.026	0.048	0.090	0.23	0.035	0.039	0.046	0.074	0.13	0.28
Lead_D	0.000011	0.000013	0.000020	0.000024	0.000046	0.000056	0.000019	0.000026	0.000029	0.000029	0.000035	0.000037
Lead_T	0.000024	0.000026	0.000038	0.000044	0.000074	0.000087	0.000037	0.000051	0.000058	0.000057	0.000063	0.000065
Magnesium_D	7.8	8.5	13	14	19	25	8.4	8.5	11	14	20	26
Manganese_D	0.036	0.046	0.19	0.22	0.44	0.54	0.041	0.049	0.18	0.23	0.45	0.59
Manganese_T	0.049	0.061	0.19	0.23	0.43	0.55	0.055	0.064	0.19	0.24	0.45	0.60
Mercury_D	0.00000037	0.00000042	0.00000057	0.00000073	0.0000013	0.0000015	0.00000073	0.00000075	0.00000081	0.00000092	0.0000013	0.0000013
Mercury_T	0.00000059	0.00000063	0.00000078	0.00000098	0.0000017	0.0000020	0.00000087	0.0000011	0.0000011	0.0000012	0.0000017	0.0000018
Molybdenum_D	0.00070	0.00091	0.0017	0.0020	0.0035	0.0042	0.00056	0.00083	0.0012	0.0012	0.0017	0.0019
Molybdenum_T	0.00071	0.00092	0.0018	0.0020	0.0035	0.0042	0.00059	0.00085	0.0012	0.0012	0.0017	0.0020
N_Ammonia	0.038	0.048	0.12	0.12	0.18	0.23	0.012	0.014	0.053	0.046	0.076	0.10
N_Nitrate_Nitrite	0.19	0.37	0.76	0.99	1.9	2.3	0.030	0.033	0.061	0.068	0.10	0.17
N_Nitrite	0.017	0.019	0.034	0.038	0.067	0.088	0.013	0.022	0.032	0.033	0.040	0.055
Nickel_D	0.00027	0.00034	0.00050	0.00055	0.00079	0.00093	0.00027	0.00029	0.00039	0.00042	0.00056	0.00075
Nickel_T	0.00031	0.00039	0.00065	0.00067	0.00093	0.0012	0.00034	0.00034	0.00047	0.00057	0.00081	0.0011
Phosphorus_T	0.0092	0.010	0.013	0.014	0.019	0.025	0.0080	0.0089	0.012	0.013	0.017	0.025
Potassium_D	2.8	3.1	6.7	7.4	12	14	3.0	3.4	4.6	5.8	8.2	11
Proton	0000000079	0.000000010	0.000000043	.000000040	0.000000062	00000067	0.000025	0.00012	0.00028	0.00034	0.00066	0.00081
Radium_226	0.0060	0.0063	0.0080	0.0083	0.011	0.011	0.0030	0.0032	0.0038	0.0038	0.0041	0.0086
Selenium_D	0.000042	0.000065	0.00013	0.00014	0.00021	0.00030	0.000049	0.000050	0.000086	0.000098	0.00015	0.00016
Selenium_T	0.000049	0.000059	0.00011	0.00012	0.00023	0.00034	0.000054	0.000055	0.000068	0.000071	0.000088	0.000097
Silicon_D	2.5	2.7	4.5	4.5	5.9	6.4	2.6	2.6	4.3	4.1	5.8	6.9
Silicon_T	2.5	2.7	4.7	4.5	6.0	6.5	2.6	2.7	4.3	4.2	6.0	7.0
Silver_D	0.0000025	0.0000029	0.0000044	0.0000051	0.0000090	0.000011	0.0000040	0.0000048	0.0000056	0.0000062	0.0000089	0.0000099
Silver_T	0.0000031	0.0000035	0.0000054	0.0000061	0.000010	0.000013	0.0000047	0.0000056	0.0000064	0.0000071	0.000010	0.000011
Sodium_D	5.8	6.8	14	16	26	29	5.9	6.1	7.9	9.8	13	17
Sodium_T	5.8	6.7	14	16	26	29	5.9	6.1	7.8	9.8	13	18
Strontium_D	0.055	0.068	0.12	0.12	0.17	0.25	0.067	0.069	0.094	0.12	0.17	0.23
Strontium_T	0.057	0.070	0.13	0.13	0.17	0.26	0.068	0.070	0.094	0.12	0.18	0.24
Sulfate	42	47	78	80	110	140	38	40	49	62	93	120
Thallium_D	0.000019	0.000030	0.000035	0.000039	0.000058	0.000079	0.000025	0.000032	0.000043	0.000042	0.000051	0.000054
Thallium_T	0.000021	0.000033	0.000039	0.000043	0.000062	0.000083	0.000027	0.000034	0.000045	0.000045	0.000056	0.000059
TSS	0.24	0.27	0.49	0.46	0.61	0.67	0.76	0.79	1.1	1.2	1.7	1.8
Uranium_D	0.00050	0.00067	0.0014	0.0016	0.0028	0.0034	0.00045	0.00046	0.00088	0.00075	0.0011	0.0015
Uranium_T	0.00050	0.00064	0.0013	0.0016	0.0028	0.0034	0.00045	0.00046	0.00079	0.00072	0.00100	0.0014
Vanadium_T	0.000099	0.00012	0.00019	0.00020	0.00029	0.00032	0.00015	0.00018	0.00023	0.00024	0.00030	0.00031
Zinc_D	0.00044	0.00052	0.00065	0.00068	0.00092	0.0011	0.00044	0.00046	0.00060	0.00060	0.00071	0.0010
Zinc_T	0.00054	0.00072	0.00096	0.00095	0.0012	0.0013	0.00058	0.00063	0.00099	0.00093	0.0011	0.0014

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Farley Lake East

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.0	3.3	6.8	7.1	11	12	3.3	3.5	5.5	7.7	12	14
Alkalinity_T	56	63	120	120	180	230	53	53	76	110	170	200
Aluminum_D	0.00082	0.0012	0.0023	0.0029	0.0051	0.0080	0.0015	0.0020	0.0029	0.0036	0.0056	0.0088
Aluminum_T	0.0026	0.0035	0.0076	0.0077	0.011	0.015	0.0048	0.0061	0.0095	0.0095	0.012	0.016
Antimony_D	0.000078	0.00011	0.00021	0.00028	0.00056	0.00073	0.000089	0.00012	0.00014	0.00015	0.00019	0.00021
Antimony_T	0.000085	0.00012	0.00025	0.00032	0.00066	0.00074	0.000096	0.00013	0.00015	0.00016	0.00022	0.00023
Arsenic_D	0.00050	0.00060	0.0011	0.0011	0.0016	0.0024	0.00045	0.00047	0.00091	0.00081	0.0012	0.0017
Arsenic_T	0.00056	0.00069	0.0011	0.0012	0.0019	0.0026	0.00054	0.00056	0.00095	0.00088	0.0012	0.0018
Barium_D	0.011	0.012	0.023	0.022	0.031	0.039	0.012	0.012	0.014	0.022	0.032	0.035
Barium_T	0.012	0.013	0.024	0.023	0.033	0.041	0.012	0.013	0.015	0.023	0.034	0.036
Beryllium_T	0.000053	0.000075	0.000090	0.000095	0.00012	0.00014	0.000065	0.000086	0.000093	0.00010	0.00013	0.00014
Boron_D	0.0078	0.0089	0.017	0.019	0.031	0.039	0.0080	0.0082	0.0094	0.012	0.018	0.022
Boron_T	0.0091	0.012	0.023	0.024	0.035	0.050	0.0089	0.0091	0.013	0.017	0.026	0.030
Bromide	0.027	0.037	0.044	0.044	0.051	0.068	0.027	0.038	0.043	0.044	0.049	0.072
Cadmium_D	0.0000020	0.0000023	0.0000030	0.0000033	0.0000046	0.0000061	0.0000021	0.0000023	0.0000027	0.0000028	0.0000033	0.0000042
Cadmium_T	0.0000031	0.0000041	0.0000049	0.0000052	0.0000071	0.0000085	0.0000036	0.0000037	0.0000051	0.0000050	0.0000060	0.0000078
Calcium_D	21	23	43	43	63	78	25	25	29	45	67	73
Chloride	0.22	0.23	0.52	0.56	0.96	1.0	0.23	0.24	0.47	0.60	1.0	1.2
Chromium_D	0.000021	0.000023	0.000032	0.000038	0.000066	0.000087	0.000032	0.000036	0.000043	0.000047	0.000068	0.000089
Chromium_D_Hex	0.000026	0.000029	0.000045	0.000049	0.000077	0.00010	0.000041	0.000046	0.000052	0.000059	0.000079	0.00010
Chromium_T	0.000060	0.000073	0.000093	0.000094	0.00012	0.00014	0.000081	0.00010	0.00014	0.00013	0.00017	0.00017
Cobalt_D	0.000057	0.000065	0.000093	0.000089	0.00011	0.00013	0.000065	0.000067	0.000085	0.000094	0.00013	0.00014
Cobalt_T	0.000061	0.000072	0.00011	0.00011	0.00014	0.00017	0.000072	0.000076	0.000095	0.00012	0.00017	0.00019
Copper_D	0.000055	0.000065	0.00016	0.00021	0.00048	0.00068	0.000054	0.000060	0.00012	0.00011	0.00016	0.00023
Copper_T	0.00017	0.00018	0.00030	0.00038	0.00068	0.00091	0.00016	0.00017	0.00022	0.00023	0.00028	0.00042
Cyanide_F	0.00019	0.00019	0.00031	0.00035	0.00055	0.00074	0.00022	0.00027	0.00036	0.00039	0.00057	0.00081
Cyanide_T	0.00027	0.00036	0.00046	0.00047	0.00054	0.00085	0.00032	0.00044	0.00051	0.00053	0.00058	0.00093
Cyanide_WAD	0.00021	0.00024	0.00037	0.00038	0.00046	0.00071	0.00025	0.00032	0.00042	0.00042	0.00046	0.00080
Fluoride	0.057	0.062	0.090	0.092	0.12	0.14	0.062	0.066	0.10	0.098	0.13	0.20
Hardness	75	77	130	140	210	240	79	80	100	150	220	260
Iron_D	0.013	0.014	0.023	0.025	0.030	0.064	0.018	0.019	0.030	0.031	0.035	0.070
Iron_T	0.043	0.046	0.16	0.14	0.26	0.27	0.058	0.064	0.17	0.16	0.24	0.31
Lead_D	0.0000061	0.0000070	0.000019	0.000021	0.000044	0.000050	0.0000086	0.000012	0.000020	0.000022	0.000036	0.000037
Lead_T	0.000012	0.000014	0.000029	0.000035	0.000070	0.000078	0.000019	0.000025	0.000034	0.000039	0.000060	0.000062
Magnesium_D	6.1	6.4	11	11	16	20	6.7	6.7	7.8	12	17	20
Manganese_D	0.033	0.042	0.18	0.19	0.35	0.37	0.036	0.043	0.14	0.20	0.37	0.46
Manganese_T	0.051	0.060	0.18	0.20	0.35	0.38	0.054	0.062	0.15	0.21	0.38	0.47
Mercury_D	0.00000051	0.00000057	0.00000071	0.00000083	0.0000012	0.0000014	0.00000073	0.00000078	0.00000095	.00000098	0.0000012	0.0000013
Mercury_T	0.00000078	0.00000091	0.0000012	0.0000012	0.0000016	0.0000018	0.00000098	0.0000011	0.0000014	0.0000014	0.0000016	0.0000018
Molybdenum_D	0.00029	0.00031	0.00065	0.00092	0.0017	0.0030	0.00019	0.00038	0.00046	0.00051	0.00075	0.00081
Molybdenum_T	0.00039	0.00042	0.00073	0.0010	0.0018	0.0030	0.00026	0.00049	0.00056	0.00059	0.00079	0.00084
N_Ammonia	0.033	0.056	0.15	0.16	0.26	0.33	0.013	0.016	0.046	0.100	0.18	0.22
N_Nitrate_Nitrite	0.025	0.062	0.25	0.33	0.75	0.91	0.0086	0.010	0.016	0.023	0.050	0.065
N_Nitrite	0.0019	0.0030	0.0052	0.0088	0.020	0.026	0.0016	0.0028	0.0061	0.0073	0.014	0.014
Nickel_D	0.00019	0.00021	0.00026	0.00030	0.00046	0.00051	0.00020	0.00021	0.00022	0.00023	0.00025	0.00034
Nickel_T	0.00023	0.00026	0.00035	0.00039	0.00055	0.00068	0.00026	0.00026	0.00029	0.00032	0.00037	0.00049
Phosphorus_T	0.011	0.012	0.017	0.017	0.024	0.026	0.011	0.012	0.016	0.016	0.023	0.026
Potassium_D	2.1	2.3	5.7	6.1	9.2	13	2.4	2.7	3.2	4.9	7.2	8.4
Proton	0.000000020	0.000000025	0.000000060	.000000055	0.000000080	0.000000088	0.0000056	0.000092	0.00023	0.00026	0.00050	0.00064
Radium_226	0.0047	0.0057	0.0073	0.0078	0.011	0.011	0.0026	0.0037	0.0042	0.0043	0.0054	0.0090
Selenium_D	0.000044	0.000069	0.00012	0.00012	0.00019	0.00025	0.000048	0.000050	0.000078	0.000093	0.00014	0.00016
Selenium_T	0.000048	0.000062	0.000093	0.00011	0.00020	0.00028	0.000052	0.000053	0.000074	0.000072	0.000091	0.000099
Silicon_D	1.0	1.4	3.4	3.3	5.3	5.6	1.1	1.3	3.0	3.2	5.3	6.1
Silicon_T	1.1	1.5	3.5	3.5	5.4	5.7	1.2	1.5	3.1	3.3	5.4	6.2
Silver_D	0.0000031	0.0000034	0.0000050	0.0000056	0.0000089	0.000010	0.0000044	0.0000051	0.0000055	0.0000064	0.0000090	0.0000093
Silver_T	0.0000036	0.0000040	0.0000057	0.0000064	0.000010	0.000012	0.0000050	0.0000058	0.0000061	0.0000071	0.000010	0.000010
Sodium_D	4.2	5.1	10	11	19	23	4.4	4.6	5.4	7.1	9.5	11
Sodium_T	4.4	5.1	12	13	20	27	4.7	4.8	5.5	8.2	12	14
Strontium_D	0.045	0.049	0.11	0.10	0.15	0.20	0.054	0.055	0.067	0.10	0.15	0.17
Strontium_T	0.046	0.050	0.11	0.11	0.16	0.21	0.055	0.056	0.067	0.10	0.16	0.18
Sulfate	23	27	42	44	62	82	21	23	30	33	46	58
Thallium_D	0.000025	0.000032	0.000038	0.000040	0.000054	0.000067	0.000030	0.000033	0.000042	0.000042	0.000050	0.000052
Thallium_T	0.000028	0.000035	0.000041	0.000044	0.000057	0.000071	0.000031	0.000035	0.000045	0.000045	0.000054	0.000056
TSS	0.062	0.074	0.14	0.14	0.19	0.21	0.090	0.11	0.21	0.19	0.23	0.28
Uranium_D	0.00010	0.00018	0.00035	0.00040	0.00069	0.0010	0.000092	0.000093	0.00024	0.00019	0.00027	0.00034
Uranium_T	0.00012	0.00022	0.00038	0.00048	0.00092	0.0013	0.00010	0.00012	0.00024	0.00021	0.00028	0.00037
Vanadium_T	0.000085	0.00012	0.00019	0.00019	0.00026	0.00036	0.00013	0.00015	0.00020	0.00023	0.00031	0.00034
Zinc_D	0.00026	0.00028	0.00041	0.00047	0.00073	0.00090	0.00025	0.00026	0.00040	0.00042	0.00060	0.00074
Zinc_T	0.00047	0.00055	0.0010	0.00096	0.0013	0.0015	0.00049	0.00055	0.0010	0.00092	0.0011	0.0016

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Swede Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.7	3.8	4.4	4.6	5.4	5.7	3.9	4.1	4.7	4.8	5.7	5.9
Alkalinity_T	55	58	73	73	89	96	56	57	67	68	81	89
Aluminum_D	0.0053	0.0057	0.0063	0.0063	0.0068	0.0072	0.0055	0.0060	0.0065	0.0065	0.0068	0.0075
Aluminum_T	0.025	0.025	0.027	0.027	0.029	0.030	0.025	0.026	0.027	0.027	0.028	0.031
Antimony_D	0.000088	0.000090	0.00015	0.00017	0.00027	0.00033	0.000081	0.00010	0.00011	0.00012	0.00013	0.00014
Antimony_T	0.00010	0.00011	0.00018	0.00020	0.00031	0.00037	0.000100	0.00012	0.00013	0.00013	0.00015	0.00016
Arsenic_D	0.00042	0.00045	0.00068	0.00067	0.00087	0.00096	0.00040	0.00046	0.00053	0.00053	0.00061	0.00073
Arsenic_T	0.00045	0.00047	0.00073	0.00072	0.00095	0.0010	0.00042	0.00049	0.00057	0.00057	0.00066	0.00078
Barium_D	0.010	0.011	0.014	0.014	0.016	0.018	0.011	0.012	0.013	0.014	0.016	0.016
Barium_T	0.011	0.012	0.014	0.014	0.017	0.019	0.011	0.012	0.014	0.014	0.017	0.017
Beryllium_T	0.000077	0.000077	0.000091	0.000091	0.00010	0.00011	0.000078	0.000085	0.000087	0.000094	0.00011	0.00011
Boron_D	0.0071	0.0078	0.011	0.012	0.016	0.018	0.0072	0.0074	0.0084	0.0087	0.010	0.011
Boron_T	0.0097	0.011	0.014	0.015	0.020	0.023	0.0098	0.010	0.012	0.012	0.014	0.015
Bromide	0.041	0.041	0.046	0.046	0.052	0.053	0.040	0.040	0.043	0.045	0.051	0.055
Cadmium_D	0.0000033	0.0000034	0.0000040	0.0000039	0.0000045	0.0000047	0.0000033	0.0000033	0.0000036	0.0000037	0.0000041	0.0000044
Cadmium_T	0.0000041	0.0000042	0.0000050	0.0000049	0.0000056	0.0000059	0.0000042	0.0000043	0.0000046	0.0000048	0.0000054	0.0000056
Calcium_D	18	19	24	24	30	32	20	22	25	26	30	31
Chloride	0.35	0.36	0.42	0.43	0.51	0.52	0.37	0.38	0.44	0.45	0.53	0.57
Chromium_D	0.000056	0.000061	0.000066	0.000065	0.000070	0.000071	0.000060	0.000065	0.000070	0.000069	0.000073	0.000074
Chromium_D_Hex	0.000061	0.000066	0.000072	0.000071	0.000076	0.000078	0.000065	0.000071	0.000077	0.000075	0.000080	0.000081
Chromium_T	0.00013	0.00013	0.00014	0.00014	0.00015	0.00016	0.00014	0.00015	0.00016	0.00016	0.00017	0.00017
Cobalt_D	0.000076	0.000077	0.000087	0.000088	0.000100	0.00010	0.000078	0.000079	0.000083	0.000087	0.000099	0.00010
Cobalt_T	0.000082	0.000084	0.000093	0.000095	0.00011	0.00011	0.000085	0.000086	0.000091	0.000096	0.00011	0.00011
Copper_D	0.00031	0.00034	0.00037	0.00038	0.00044	0.00049	0.00030	0.00031	0.00034	0.00033	0.00035	0.00037
Copper_T	0.00045	0.00050	0.00057	0.00057	0.00066	0.00071	0.00044	0.00046	0.00051	0.00050	0.00053	0.00058
Cyanide_F	0.00048	0.00049	0.00058	0.00058	0.00067	0.00070	0.00050	0.00050	0.00057	0.00059	0.00066	0.00072
Cyanide_T	0.00047	0.00048	0.00054	0.00054	0.00062	0.00065	0.00050	0.00050	0.00052	0.00056	0.00063	0.00065
Cyanide_WAD	0.00041	0.00041	0.00047	0.00047	0.00054	0.00057	0.00042	0.00043	0.00045	0.00048	0.00054	0.00057
Fluoride	0.070	0.072	0.082	0.082	0.094	0.096	0.074	0.075	0.088	0.087	0.098	0.12
Hardness	67	69	80	82	97	100	71	73	86	86	100	110
Iron_D	0.026	0.027	0.031	0.030	0.034	0.036	0.028	0.029	0.032	0.032	0.035	0.036
Iron_T	0.095	0.100	0.11	0.12	0.13	0.14	0.11	0.11	0.13	0.12	0.13	0.15
Lead_D	0.000027	0.000029	0.000034	0.000033	0.000037	0.000039	0.000028	0.000030	0.000032	0.000033	0.000037	0.000037
Lead_T	0.000052	0.000054	0.000062	0.000061	0.000068	0.000071	0.000053	0.000057	0.000060	0.000063	0.000069	0.000070
Magnesium_D	5.4	5.6	6.7	6.8	8.1	8.6	5.8	5.9	6.9	7.0	8.3	8.7
Manganese_D	0.058	0.062	0.079	0.080	0.098	0.11	0.062	0.067	0.084	0.084	0.10	0.12
Manganese_T	0.071	0.076	0.092	0.095	0.11	0.13	0.076	0.080	0.098	0.098	0.12	0.13
Mercury_D	0.00000077	0.00000081	0.00000091	0.00000091	0.00000100	0.0000010	0.00000083	0.00000086	0.00000091	0.00000096	0.0000010	0.0000011
Mercury_T	0.00000095	0.00000099	0.0000011	0.0000011	0.0000012	0.0000013	0.0000010	0.0000011	0.0000011	0.0000012	0.0000013	0.0000013
Molybdenum_D	0.00071	0.00077	0.00098	0.0010	0.0013	0.0015	0.00071	0.00079	0.00087	0.00085	0.00089	0.00091
Molybdenum_T	0.00075	0.00082	0.0010	0.0011	0.0014	0.0016	0.00076	0.00084	0.00093	0.00091	0.00096	0.00097
N_Ammonia	0.038	0.046	0.067	0.067	0.090	0.097	0.030	0.031	0.042	0.041	0.052	0.059
N_Nitrate_Nitrite	0.066	0.083	0.25	0.23	0.34	0.37	0.044	0.045	0.051	0.050	0.056	0.063
N_Nitrite	0.0066	0.0073	0.0093	0.0097	0.012	0.013	0.0067	0.0073	0.0084	0.0089	0.010	0.010
Nickel_D	0.00019	0.00019	0.00025	0.00025	0.00031	0.00034	0.00019	0.00020	0.00021	0.00022	0.00024	0.00026
Nickel_T	0.00023	0.00023	0.00029	0.00030	0.00037	0.00040	0.00023	0.00024	0.00025	0.00026	0.00030	0.00031
Phosphorus_T	0.016	0.017	0.018	0.018	0.020	0.021	0.016	0.016	0.018	0.018	0.019	0.021
Potassium_D	1.8	2.1	3.0	3.2	4.7	5.3	1.9	2.3	2.7	2.7	3.2	3.4
Proton	0.000000047	0.000000050	0.000000056	0.000000056	0.000000062	.000000065	0.0000027	0.00010	0.00011	0.00011	0.00013	0.00015
Radium_226	0.0047	0.0049	0.0058	0.0059	0.0070	0.0073	0.0040	0.0041	0.0048	0.0046	0.0052	0.0063
Selenium_D	0.000052	0.000055	0.000072	0.000078	0.00010	0.00012	0.000053	0.000056	0.000061	0.000063	0.000072	0.000075
Selenium_T	0.000049	0.000050	0.000072	0.000077	0.00011	0.00012	0.000048	0.000052	0.000054	0.000058	0.000065	0.000067
Silicon_D	1.4	1.5	1.9	1.9	2.3	2.5	1.4	1.6	1.9	1.9	2.2	2.4
Silicon_T	1.5	1.6	2.0	2.0	2.4	2.6	1.5	1.7	2.0	2.0	2.3	2.5
Silver_D	0.0000058	0.0000062	0.0000069	0.0000068	0.0000073	0.0000077	0.0000061	0.0000066	0.0000070	0.0000071	0.0000076	0.0000076
Silver_T	0.0000061	0.0000066	0.0000073	0.0000072	0.0000078	0.0000082	0.0000063	0.0000070	0.0000074	0.0000075	0.0000080	0.0000081
Sodium_D	3.3	3.5	5.7	6.1	9.2	11	3.3	3.7	4.2	4.3	5.0	5.2
Sodium_T	3.5	3.9	6.0	6.5	9.8	11	3.5	4.0	4.6	4.7	5.6	5.8
Strontium_D	0.042	0.045	0.058	0.059	0.075	0.080	0.044	0.051	0.059	0.060	0.071	0.073
Strontium_T	0.043	0.046	0.060	0.060	0.077	0.082	0.045	0.051	0.060	0.061	0.073	0.075
Sulfate	16	17	22	23	31	34	15	15	18	18	21	23
Thallium_D	0.000035	0.000036	0.000042	0.000041	0.000047	0.000049	0.000036	0.000038	0.000039	0.000042	0.000047	0.000047
Thallium_T	0.000036	0.000037	0.000043	0.000043	0.000049	0.000051	0.000036	0.000039	0.000040	0.000043	0.000048	0.000049
TSS	0.82	0.84	0.95	0.95	1.1	1.1	0.86	0.87	0.93	0.96	1.1	1.2
Uranium_D	0.000082	0.000087	0.00018	0.00020	0.00033	0.00039	0.000074	0.00010	0.00012	0.00012	0.00013	0.00016
Uranium_T	0.000091	0.000100	0.00021	0.00024	0.00041	0.00048	0.000079	0.00012	0.00013	0.00013	0.00015	0.00018
Vanadium_T	0.00017	0.00017	0.00020	0.00020	0.00023	0.00024	0.00018	0.00019	0.00022	0.00022	0.00024	0.00024
Zinc_D	0.00077	0.00080	0.00088	0.00087	0.00093	0.00095	0.00075	0.00078	0.00085	0.00084	0.00089	0.00096
Zinc_T	0.0026	0.0026	0.0030	0.0030	0.0032	0.0037	0.0026	0.0026	0.0029	0.0029	0.0031	0.0037

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Ellystan Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	4.4	4.6	5.3	5.3	5.8	6.4	4.5	4.8	5.4	5.4	5.8	6.5
Alkalinity_T	40	42	51	51	62	66	40	43	49	50	58	62
Aluminum_D	0.010	0.010	0.011	0.011	0.012	0.013	0.010	0.010	0.011	0.011	0.012	0.013
Aluminum_T	0.029	0.031	0.041	0.049	0.079	0.092	0.030	0.031	0.041	0.048	0.077	0.093
Antimony_D	0.000080	0.000083	0.00011	0.00012	0.00017	0.00020	0.000076	0.000091	0.000095	0.000100	0.00011	0.00011
Antimony_T	0.000080	0.000084	0.00011	0.00012	0.00017	0.00020	0.000076	0.000091	0.000096	0.000099	0.00011	0.00011
Arsenic_D	0.00033	0.00034	0.00046	0.00047	0.00059	0.00063	0.00030	0.00037	0.00042	0.00041	0.00046	0.00053
Arsenic_T	0.00036	0.00038	0.00051	0.00051	0.00066	0.00071	0.00033	0.00041	0.00048	0.00046	0.00051	0.00058
Barium_D	0.0094	0.0095	0.011	0.011	0.013	0.014	0.0094	0.010	0.011	0.011	0.013	0.013
Barium_T	0.010	0.011	0.012	0.012	0.014	0.015	0.010	0.011	0.012	0.013	0.014	0.014
Beryllium_T	0.000075	0.000076	0.000085	0.000085	0.000093	0.000096	0.000075	0.000080	0.000082	0.000087	0.000096	0.000097
Boron_D	0.0054	0.0057	0.0077	0.0078	0.010	0.011	0.0054	0.0057	0.0066	0.0068	0.0080	0.0083
Boron_T	0.0096	0.010	0.012	0.013	0.016	0.017	0.0096	0.010	0.012	0.012	0.013	0.013
Bromide	0.041	0.041	0.045	0.046	0.050	0.051	0.041	0.041	0.043	0.045	0.049	0.051
Cadmium_D	0.0000035	0.0000035	0.0000039	0.0000039	0.0000043	0.0000044	0.0000034	0.0000035	0.0000037	0.0000038	0.0000042	0.0000043
Cadmium_T	0.0000039	0.0000041	0.0000045	0.0000045	0.0000049	0.0000050	0.0000039	0.0000041	0.0000044	0.0000044	0.0000047	0.0000049
Calcium_D	13	13	16	16	19	21	13	15	16	17	20	21
Chloride	0.38	0.39	0.44	0.43	0.46	0.47	0.39	0.40	0.45	0.44	0.48	0.50
Chromium_D	0.000074	0.000078	0.000080	0.000081	0.000084	0.000086	0.000077	0.000080	0.000082	0.000082	0.000085	0.000087
Chromium_D_Hex	0.000054	0.000055	0.000062	0.000061	0.000068	0.000069	0.000056	0.000057	0.000060	0.000064	0.000071	0.000071
Chromium_T	0.00017	0.00017	0.00018	0.00018	0.00021	0.00022	0.00017	0.00018	0.00019	0.00019	0.00021	0.00022
Cobalt_D	0.000074	0.000076	0.000083	0.000083	0.000092	0.000094	0.000075	0.000076	0.000080	0.000083	0.000091	0.000093
Cobalt_T	0.000084	0.000086	0.000094	0.000094	0.00010	0.00011	0.000085	0.000087	0.000090	0.000095	0.00010	0.00010
Copper_D	0.00030	0.00032	0.00036	0.00036	0.00041	0.00044	0.00030	0.00031	0.00034	0.00034	0.00036	0.00038
Copper_T	0.00035	0.00038	0.00042	0.00042	0.00047	0.00050	0.00035	0.00037	0.00040	0.00039	0.00041	0.00043
Cyanide_F	0.00058	0.00059	0.00067	0.00065	0.00071	0.00072	0.00059	0.00060	0.00067	0.00065	0.00070	0.00073
Cyanide_T	0.00075	0.00077	0.00083	0.00085	0.00096	0.0011	0.00076	0.00078	0.00084	0.00086	0.00094	0.0011
Cyanide_WAD	0.00053	0.00054	0.00060	0.00059	0.00064	0.00065	0.00054	0.00054	0.00061	0.00059	0.00063	0.00065
Fluoride	0.064	0.066	0.073	0.074	0.083	0.085	0.065	0.069	0.080	0.077	0.086	0.097
Hardness	48	49	56	57	66	68	49	52	59	59	69	73
Iron_D	0.12	0.12	0.14	0.17	0.26	0.33	0.12	0.13	0.14	0.17	0.26	0.33
Iron_T	0.14	0.14	0.16	0.19	0.30	0.36	0.14	0.14	0.16	0.20	0.30	0.36
Lead_D	0.000030	0.000030	0.000033	0.000033	0.000036	0.000037	0.000030	0.000031	0.000032	0.000034	0.000037	0.000037
Lead_T	0.000047	0.000049	0.000053	0.000053	0.000060	0.000061	0.000047	0.000050	0.000054	0.000054	0.000060	0.000061
Magnesium_D	3.8	3.9	4.7	4.7	5.4	5.8	3.9	4.2	4.6	4.8	5.6	5.8
Manganese_D	0.057	0.061	0.067	0.069	0.080	0.088	0.061	0.065	0.070	0.070	0.078	0.089
Manganese_T	0.077	0.082	0.089	0.090	0.10	0.11	0.081	0.085	0.090	0.091	0.10	0.11
Mercury_D	0.00000072	0.00000081	0.00000085	0.00000084	0.00000088	0.00000092	0.00000074	0.00000084	0.00000087	0.00000086	0.00000089	0.00000093
Mercury_T	0.0000011	0.0000011	0.0000012	0.0000012	0.0000013	0.0000013	0.0000011	0.0000012	0.0000013	0.0000013	0.0000013	0.0000013
Molybdenum_D	0.00037	0.00040	0.00051	0.00053	0.00069	0.00077	0.00037	0.00042	0.00046	0.00049	0.00055	0.00055
Molybdenum_T	0.00040	0.00044	0.00055	0.00058	0.00075	0.00084	0.00040	0.00046	0.00051	0.00053	0.00059	0.00060
N_Ammonia	0.030	0.033	0.046	0.045	0.058	0.061	0.027	0.028	0.032	0.031	0.034	0.037
N_Nitrate_Nitrite	0.084	0.092	0.19	0.18	0.25	0.26	0.066	0.071	0.083	0.083	0.094	0.11
N_Nitrite	0.0058	0.0061	0.0073	0.0073	0.0087	0.0089	0.0058	0.0065	0.0068	0.0071	0.0078	0.0079
Nickel_D	0.00018	0.00019	0.00022	0.00022	0.00025	0.00027	0.00018	0.00018	0.00020	0.00020	0.00022	0.00023
Nickel_T	0.00025	0.00026	0.00029	0.00029	0.00032	0.00034	0.00025	0.00026	0.00028	0.00028	0.00029	0.00030
Phosphorus_T	0.015	0.016	0.019	0.019	0.021	0.022	0.015	0.015	0.019	0.018	0.020	0.023
Potassium_D	1.3	1.3	1.7	1.9	2.6	2.9	1.3	1.5	1.7	1.7	2.0	2.1
Proton	0.000000060	0.000000065	0.000000074	0.000000074	0.000000084	0.000000093	0.0000015	0.000065	0.000072	0.000070	0.000080	0.000086
Radium_226	0.0040	0.0043	0.0049	0.0049	0.0056	0.0058	0.0038	0.0039	0.0044	0.0043	0.0047	0.0053
Selenium_D	0.000069	0.000072	0.000081	0.000083	0.000097	0.00011	0.000069	0.000073	0.000075	0.000076	0.000081	0.000085
Selenium_T	0.000066	0.000069	0.000080	0.000081	0.000098	0.00011	0.000065	0.000070	0.000072	0.000073	0.000078	0.000082
Silicon_D	0.91	0.97	1.2	1.2	1.4	1.5	0.88	1.0	1.2	1.2	1.4	1.5
Silicon_T	1.1	1.1	1.3	1.3	1.6	1.7	1.0	1.2	1.4	1.4	1.6	1.7
Silver_D	0.0000073	0.0000076	0.0000079	0.0000079	0.0000083	0.0000084	0.0000075	0.0000078	0.0000081	0.0000081	0.0000084	0.0000085
Silver_T	0.0000075	0.0000078	0.0000082	0.0000082	0.0000085	0.0000087	0.0000077	0.0000081	0.0000084	0.0000083	0.0000087	0.0000088
Sodium_D	2.4	2.5	3.4	3.8	5.5	6.3	2.3	2.7	2.9	3.1	3.6	3.7
Sodium_T	2.5	2.6	3.6	4.0	5.8	6.7	2.4	2.9	3.2	3.3	3.8	3.9
Strontium_D	0.029	0.030	0.038	0.038	0.047	0.051	0.030	0.035	0.038	0.040	0.047	0.048
Strontium_T	0.032	0.032	0.041	0.041	0.050	0.054	0.032	0.037	0.040	0.043	0.049	0.050
Sulfate	7.6	7.9	10	11	14	16	7.4	7.6	8.7	8.8	10	11
Thallium_D	0.000033	0.000034	0.000038	0.000038	0.000042	0.000043	0.000034	0.000035	0.000037	0.000039	0.000043	0.000043
Thallium_T	0.000034	0.000035	0.000039	0.000039	0.000043	0.000045	0.000034	0.000036	0.000037	0.000039	0.000043	0.000044
TSS	2.5	2.5	2.8	3.0	3.8	4.4	2.5	2.5	2.9	3.0	3.8	4.5
Uranium_D	0.000055	0.000062	0.000098	0.00011	0.00019	0.00022	0.000052	0.000077	0.000087	0.000084	0.000091	0.00010
Uranium_T	0.000060	0.000069	0.00011	0.00014	0.00023	0.00028	0.000055	0.000086	0.000098	0.000095	0.00010	0.00012
Vanadium_T	0.00023	0.00024	0.00025	0.00026	0.00029	0.00031	0.00023	0.00025	0.00026	0.00027	0.00029	0.00031
Zinc_D	0.00085	0.00087	0.00097	0.00099	0.0011	0.0011	0.00083	0.00085	0.00094	0.00097	0.0011	0.0011
Zinc_T	0.0011	0.0012	0.0015	0.0015	0.0019	0.0020	0.0011	0.0011	0.0015	0.0015	0.0019	0.0020

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Simpson Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	2.6	2.7	3.3	3.4	4.1	4.6	2.6	2.7	2.8	3.4	4.1	4.6
Alkalinity_T	31	31	38	38	45	51	31	31	31	38	45	51
Aluminum_D	0.0070	0.0076	0.0090	0.0091	0.011	0.011	0.0071	0.0077	0.0082	0.0091	0.011	0.011
Aluminum_T	0.031	0.033	0.040	0.040	0.049	0.051	0.031	0.033	0.035	0.040	0.049	0.051
Antimony_D	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000092	0.000094	0.000096	0.00012	0.00014	0.00015
Antimony_T	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000092	0.000094	0.000096	0.00012	0.00014	0.00015
Arsenic_D	0.00026	0.00026	0.00033	0.00033	0.00039	0.00044	0.00030	0.00030	0.00031	0.00038	0.00045	0.00050
Arsenic_T	0.00027	0.00027	0.00034	0.00035	0.00041	0.00046	0.00031	0.00031	0.00032	0.00039	0.00046	0.00052
Barium_D	0.0064	0.0064	0.0079	0.0080	0.0093	0.011	0.0064	0.0065	0.0066	0.0081	0.0095	0.011
Barium_T	0.0068	0.0069	0.0085	0.0086	0.010	0.011	0.0069	0.0070	0.0071	0.0087	0.010	0.012
Beryllium_T	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000089	0.000091	0.000093	0.00011	0.00013	0.00015
Boron_D	0.0050	0.0050	0.0061	0.0062	0.0073	0.0083	0.0051	0.0051	0.0051	0.0063	0.0074	0.0084
Boron_T	0.0096	0.0098	0.013	0.013	0.017	0.019	0.0096	0.0099	0.012	0.014	0.017	0.019
Bromide	0.044	0.045	0.055	0.056	0.066	0.073	0.044	0.045	0.046	0.056	0.066	0.073
Cadmium_D	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000045	0.0000046	0.0000056	0.0000066	0.0000074
Cadmium_T	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000045	0.0000046	0.0000056	0.0000066	0.0000074
Calcium_D	7.7	7.7	9.5	9.6	11	13	7.9	8.0	8.1	9.9	12	13
Chloride	0.33	0.33	0.42	0.43	0.52	0.58	0.33	0.33	0.35	0.43	0.52	0.58
Chromium_D	0.000055	0.000056	0.000072	0.000072	0.000086	0.000094	0.000055	0.000056	0.000062	0.000072	0.000087	0.000094
Chromium_D_Hex	0.000055	0.000056	0.000072	0.000072	0.000086	0.000094	0.000055	0.000056	0.000062	0.000072	0.000087	0.000094
Chromium_T	0.000077	0.000077	0.000098	0.000098	0.00012	0.00013	0.000077	0.000077	0.000085	0.000099	0.00012	0.00013
Cobalt_D	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000089	0.000091	0.000093	0.00011	0.00013	0.00015
Cobalt_T	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000089	0.000091	0.000093	0.00011	0.00013	0.00015
Copper_D	0.00038	0.00038	0.00048	0.00048	0.00057	0.00064	0.00039	0.00039	0.00041	0.00049	0.00059	0.00065
Copper_T	0.00041	0.00041	0.00052	0.00052	0.00061	0.00069	0.00041	0.00042	0.00043	0.00053	0.00063	0.00070
Cyanide_F	0.00068	0.00069	0.00091	0.00090	0.0011	0.0012	0.00068	0.00069	0.00078	0.00090	0.0011	0.0012
Cyanide_T	0.00055	0.00056	0.00070	0.00071	0.00084	0.00094	0.00055	0.00056	0.00057	0.00071	0.00084	0.00094
Cyanide_WAD	0.00050	0.00050	0.00063	0.00064	0.00077	0.00084	0.00050	0.00050	0.00053	0.00064	0.00077	0.00084
Fluoride	0.070	0.070	0.086	0.087	0.10	0.12	0.070	0.070	0.072	0.088	0.10	0.12
Hardness	30	30	37	38	44	50	30	30	31	38	44	50
Iron_D	0.021	0.022	0.026	0.027	0.032	0.034	0.021	0.022	0.023	0.027	0.032	0.034
Iron_T	0.075	0.078	0.097	0.097	0.12	0.13	0.075	0.078	0.085	0.097	0.12	0.13
Lead_D	0.000040	0.000040	0.000050	0.000050	0.000059	0.000066	0.000040	0.000041	0.000042	0.000051	0.000060	0.000067
Lead_T	0.00011	0.00012	0.00014	0.00014	0.00017	0.00018	0.00011	0.00012	0.00013	0.00015	0.00017	0.00018
Magnesium_D	2.7	2.7	3.4	3.4	4.0	4.5	2.7	2.8	2.8	3.4	4.0	4.5
Manganese_D	0.0024	0.0025	0.0030	0.0030	0.0034	0.0036	0.0024	0.0025	0.0028	0.0030	0.0035	0.0036
Manganese_T	0.018	0.018	0.023	0.024	0.029	0.030	0.018	0.018	0.021	0.024	0.029	0.030
Mercury_D	0.00000062	0.00000065	0.00000078	0.00000078	0.00000092	0.0000010	0.00000062	0.00000065	0.00000067	0.00000079	0.00000093	0.0000010
Mercury_T	0.00000063	0.00000066	0.00000078	0.00000079	0.00000093	0.0000010	0.00000063	0.00000066	0.00000068	0.00000080	0.00000094	0.0000010
Molybdenum_D	0.00083	0.00083	0.0010	0.0011	0.0012	0.0014	0.00084	0.00085	0.00088	0.0011	0.0013	0.0014
Molybdenum_T	0.00087	0.00088	0.0011	0.0011	0.0013	0.0015	0.00089	0.00089	0.00092	0.0011	0.0013	0.0015
N_Ammonia	0.0072	0.0072	0.0089	0.0091	0.011	0.012	0.0072	0.0072	0.0074	0.0091	0.011	0.012
N_Nitrate_Nitrite	0.034	0.035	0.044	0.046	0.056	0.063	0.034	0.035	0.038	0.046	0.056	0.063
N_Nitrite	0.0077	0.0080	0.010	0.011	0.013	0.015	0.0082	0.0086	0.0097	0.011	0.014	0.016
Nickel_D	0.00018	0.00018	0.00022	0.00022	0.00026	0.00029	0.00018	0.00018	0.00019	0.00023	0.00027	0.00030
Nickel_T	0.00018	0.00018	0.00022	0.00022	0.00026	0.00029	0.00018	0.00018	0.00019	0.00023	0.00027	0.00030
Phosphorus_T	0.015	0.016	0.019	0.020	0.023	0.026	0.015	0.016	0.016	0.020	0.023	0.026
Potassium_D	0.73	0.73	0.90	0.91	1.1	1.2	0.77	0.79	0.80	0.98	1.2	1.3
Proton	0.000000035	0.000000036	0.000000045	0.000000047	0.000000056	0.000000063	0.000010	0.000014	0.000017	0.000018	0.000024	0.000024
Radium_226	0.0047	0.0047	0.0058	0.0059	0.0070	0.0077	0.0047	0.0047	0.0049	0.0059	0.0070	0.0077
Selenium_D	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000046	0.000046	0.000047	0.000058	0.000068	0.000076
Selenium_T	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000046	0.000046	0.000047	0.000058	0.000068	0.000076
Silicon_D	0.69	0.70	0.86	0.87	1.0	1.1	0.70	0.71	0.72	0.88	1.0	1.2
Silicon_T	0.75	0.76	0.93	0.94	1.1	1.2	0.75	0.76	0.78	0.95	1.1	1.2
Silver_D	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000045	0.0000046	0.0000056	0.0000066	0.0000074
Silver_T	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000045	0.0000046	0.0000056	0.0000066	0.0000074
Sodium_D	1.5	1.5	1.9	1.9	2.2	2.5	1.6	1.6	1.6	2.0	2.3	2.6
Sodium_T	1.5	1.5	1.9	1.9	2.2	2.5	1.6	1.6	1.6	2.0	2.3	2.6
Strontium_D	0.022	0.022	0.028	0.028	0.033	0.037	0.023	0.023	0.024	0.029	0.034	0.038
Strontium_T	0.022	0.022	0.028	0.028	0.033	0.037	0.023	0.023	0.024	0.029	0.034	0.038
Sulfate	0.61	0.61	0.75	0.76	0.89	1.0	0.61	0.61	0.62	0.76	0.89	1.0
Thallium_D	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000045	0.000045	0.000046	0.000056	0.000066	0.000074
Thallium_T	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000045	0.000045	0.000046	0.000056	0.000066	0.000074
TSS	2.0	2.0	2.5	2.5	3.1	3.3	2.0	2.0	2.2	2.5	3.1	3.3
Uranium_D	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000059	0.000064	0.000065	0.000079	0.000095	0.00010
Uranium_T	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000059	0.000064	0.000065	0.000079	0.000095	0.00010
Vanadium_T	0.00011	0.00011	0.00014	0.00014	0.00018	0.00019	0.00011	0.00011	0.00012	0.00015	0.00018	0.00019
Zinc_D	0.00053	0.00053	0.00066	0.00067	0.00080	0.00090	0.00054	0.00054	0.00055	0.00068	0.00081	0.00091
Zinc_T	0.00073	0.00073	0.00092	0.00094	0.0011	0.0013	0.00073	0.00073	0.00076	0.00094	0.0011	0.0013

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Susan Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.6	3.6	4.0	4.0	4.4	4.6	3.6	3.6	3.8	4.0	4.4	4.6
Alkalinity_T	44	44	48	48	52	54	43	44	44	47	51	53
Aluminum_D	0.014	0.015	0.016	0.016	0.017	0.017	0.015	0.015	0.016	0.016	0.017	0.017
Aluminum_T	0.027	0.028	0.030	0.030	0.032	0.032	0.027	0.028	0.029	0.030	0.032	0.032
Antimony_D	0.000084	0.000084	0.000098	0.000098	0.00011	0.00012	0.000089	0.000091	0.000091	0.000098	0.00011	0.00011
Antimony_T	0.000084	0.000084	0.000098	0.000098	0.00011	0.00012	0.000089	0.000091	0.000091	0.000098	0.00011	0.00011
Arsenic_D	0.00024	0.00024	0.00028	0.00028	0.00031	0.00033	0.00030	0.00030	0.00031	0.00033	0.00036	0.00037
Arsenic_T	0.00025	0.00026	0.00029	0.00029	0.00033	0.00034	0.00032	0.00032	0.00032	0.00035	0.00038	0.00039
Barium_D	0.0077	0.0078	0.0085	0.0085	0.0094	0.0097	0.0078	0.0079	0.0080	0.0086	0.0093	0.0097
Barium_T	0.0080	0.0080	0.0088	0.0088	0.0096	0.0100	0.0081	0.0082	0.0083	0.0089	0.0096	0.0099
Beryllium_T	0.000084	0.000084	0.000091	0.000091	0.000099	0.00010	0.000085	0.000085	0.000086	0.000093	0.000099	0.00010
Boron_D	0.0048	0.0048	0.0056	0.0055	0.0062	0.0066	0.0049	0.0049	0.0050	0.0054	0.0057	0.0060
Boron_T	0.0090	0.0094	0.011	0.011	0.012	0.012	0.0091	0.0094	0.010	0.011	0.012	0.012
Bromide	0.048	0.048	0.052	0.052	0.056	0.058	0.048	0.048	0.048	0.052	0.056	0.058
Cadmium_D	0.0000042	0.0000042	0.0000046	0.0000046	0.0000050	0.0000052	0.0000042	0.0000043	0.0000043	0.0000046	0.0000049	0.0000052
Cadmium_T	0.0000048	0.0000048	0.0000053	0.0000053	0.0000058	0.0000059	0.0000048	0.0000049	0.0000051	0.0000053	0.0000057	0.0000059
Calcium_D	12	12	13	13	15	15	12	13	13	14	15	15
Chloride	0.24	0.24	0.26	0.26	0.28	0.29	0.24	0.24	0.24	0.26	0.28	0.29
Chromium_D	0.000082	0.000083	0.000093	0.000093	0.00010	0.00010	0.000083	0.000084	0.000090	0.000093	0.00010	0.00010
Chromium_D_Hex	0.000082	0.000083	0.000093	0.000093	0.00010	0.00010	0.000083	0.000084	0.000090	0.000093	0.00010	0.00010
Chromium_T	0.00013	0.00013	0.00015	0.00015	0.00016	0.00016	0.00013	0.00013	0.00014	0.00015	0.00016	0.00016
Cobalt_D	0.000084	0.000084	0.000091	0.000091	0.000099	0.00010	0.000085	0.000085	0.000086	0.000093	0.000099	0.00010
Cobalt_T	0.000084	0.000084	0.000091	0.000091	0.000099	0.00010	0.000085	0.000085	0.000086	0.000093	0.000099	0.00010
Copper_D	0.00036	0.00037	0.00040	0.00040	0.00044	0.00046	0.00037	0.00038	0.00038	0.00041	0.00044	0.00046
Copper_T	0.00039	0.00040	0.00044	0.00044	0.00049	0.00050	0.00040	0.00041	0.00042	0.00045	0.00049	0.00050
Cyanide_F	0.00076	0.00076	0.00088	0.00087	0.00096	0.00097	0.00076	0.00076	0.00083	0.00087	0.00096	0.00097
Cyanide_T	0.00076	0.00076	0.00088	0.00087	0.00096	0.00097	0.00076	0.00076	0.00083	0.00087	0.00096	0.00097
Cyanide_WAD	0.00076	0.00076	0.00088	0.00087	0.00096	0.00097	0.00076	0.00076	0.00083	0.00087	0.00096	0.00097
Fluoride	0.077	0.077	0.084	0.084	0.090	0.094	0.077	0.077	0.078	0.084	0.091	0.094
Hardness	44	44	48	48	51	54	44	44	44	48	51	54
Iron_D	0.13	0.13	0.14	0.14	0.15	0.15	0.13	0.13	0.14	0.14	0.15	0.15
Iron_T	0.19	0.20	0.21	0.21	0.23	0.23	0.19	0.20	0.21	0.21	0.23	0.23
Lead_D	0.000038	0.000038	0.000042	0.000042	0.000045	0.000047	0.000039	0.000039	0.000039	0.000042	0.000045	0.000047
Lead_T	0.00012	0.00013	0.00014	0.00014	0.00014	0.00014	0.00012	0.00013	0.00014	0.00014	0.00014	0.00014
Magnesium_D	3.2	3.2	3.5	3.6	3.9	4.0	3.3	3.3	3.3	3.6	3.8	4.0
Manganese_D	0.020	0.020	0.022	0.022	0.023	0.024	0.020	0.020	0.022	0.022	0.023	0.024
Manganese_T	0.041	0.041	0.045	0.045	0.047	0.048	0.041	0.041	0.045	0.045	0.047	0.048
Mercury_D	0.0000012	0.0000012	0.0000013	0.0000013	0.0000014	0.0000014	0.0000012	0.0000012	0.0000013	0.0000013	0.0000014	0.0000014
Mercury_T	0.0000013	0.0000013	0.0000014	0.0000014	0.0000015	0.0000016	0.0000013	0.0000013	0.0000014	0.0000014	0.0000015	0.0000016
Molybdenum_D	0.0012	0.0012	0.0013	0.0013	0.0014	0.0015	0.0012	0.0012	0.0012	0.0013	0.0014	0.0015
Molybdenum_T	0.0013	0.0013	0.0014	0.0014	0.0016	0.0016	0.0013	0.0013	0.0013	0.0014	0.0015	0.0016
N_Ammonia	0.010	0.011	0.013	0.013	0.016	0.017	0.0100	0.010	0.011	0.011	0.012	0.013
N_Nitrate_Nitrite	0.050	0.055	0.071	0.072	0.091	0.097	0.048	0.049	0.053	0.056	0.063	0.064
N_Nitrite	0.0084	0.0086	0.0095	0.0096	0.011	0.011	0.0093	0.0097	0.0098	0.011	0.011	0.012
Nickel_D	0.00021	0.00022	0.00024	0.00024	0.00026	0.00027	0.00022	0.00022	0.00022	0.00024	0.00026	0.00027
Nickel_T	0.00025	0.00025	0.00028	0.00028	0.00031	0.00032	0.00025	0.00026	0.00027	0.00028	0.00031	0.00032
Phosphorus_T	0.019	0.019	0.021	0.021	0.023	0.023	0.019	0.019	0.019	0.021	0.023	0.023
Potassium_D	0.86	0.87	1.0	1.0	1.2	1.3	0.93	0.96	0.97	1.0	1.1	1.2
Proton	0.000000060	0.000000061	0.000000068	0.000000069	0.000000076	0.000000078	0.000018	0.000024	0.000027	0.000027	0.000031	0.000033
Radium_226	0.0062	0.0062	0.0070	0.0070	0.0077	0.0080	0.0062	0.0062	0.0065	0.0070	0.0077	0.0080
Selenium_D	0.000047	0.000048	0.000055	0.000054	0.000061	0.000065	0.000049	0.000050	0.000050	0.000054	0.000058	0.000061
Selenium_T	0.000049	0.000050	0.000057	0.000056	0.000063	0.000067	0.000051	0.000052	0.000052	0.000056	0.000060	0.000063
Silicon_D	1.6	1.6	1.7	1.7	1.9	2.0	1.6	1.6	1.6	1.7	1.9	2.0
Silicon_T	1.7	1.7	1.8	1.8	2.0	2.1	1.7	1.7	1.7	1.8	2.0	2.0
Silver_D	0.0000061	0.0000062	0.0000070	0.0000069	0.0000076	0.0000078	0.0000062	0.0000063	0.0000067	0.0000070	0.0000076	0.0000077
Silver_T	0.0000061	0.0000062	0.0000070	0.0000069	0.0000076	0.0000078	0.0000062	0.0000063	0.0000067	0.0000070	0.0000076	0.0000077
Sodium_D	1.6	1.7	2.0	2.0	2.3	2.5	1.7	1.8	1.8	1.9	2.1	2.2
Sodium_T	1.7	1.7	2.0	2.0	2.3	2.5	1.7	1.8	1.8	1.9	2.1	2.2
Strontium_D	0.025	0.025	0.028	0.028	0.031	0.033	0.026	0.027	0.027	0.029	0.031	0.033
Strontium_T	0.026	0.026	0.029	0.029	0.032	0.033	0.027	0.027	0.027	0.029	0.032	0.033
Sulfate	0.90	0.91	1.3	1.5	2.4	2.8	0.88	0.89	0.90	0.96	1.0	1.1
Thallium_D	0.000037	0.000037	0.000040	0.000040	0.000044	0.000045	0.000037	0.000038	0.000038	0.000041	0.000044	0.000045
Thallium_T	0.000037	0.000037	0.000040	0.000040	0.000044	0.000045	0.000037	0.000038	0.000038	0.000041	0.000044	0.000045
TSS	1.7	1.7	1.8	1.9	2.0	2.0	1.7	1.7	1.8	1.9	2.0	2.0
Uranium_D	0.000058	0.000061	0.000077	0.000088	0.00012	0.00014	0.000082	0.000091	0.000094	0.000099	0.00011	0.00011
Uranium_T	0.000068	0.000071	0.000088	0.000099	0.00013	0.00015	0.000093	0.00010	0.00010	0.00011	0.00012	0.00012
Vanadium_T	0.00014	0.00015	0.00016	0.00016	0.00018	0.00018	0.00015	0.00015	0.00015	0.00016	0.00017	0.00018
Zinc_D	0.00088	0.00089	0.00096	0.00096	0.0010	0.0011	0.00088	0.00089	0.00090	0.00097	0.0010	0.0011
Zinc_T	0.0010	0.0010	0.0011	0.0011	0.0012	0.0013	0.0010	0.0010	0.0010	0.0011	0.0012	0.0013

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Hughes River - Upstream of Dewatering Effluent Discharge from Legacy Pits (Hughes_Us_CT)

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.50	1.0	1.0	1.3	2.2	2.2	0.50	1.0	1.0	1.3	2.2	2.2
Alkalinity_T	6.2	9.0	12	11	12	12	6.2	9.0	12	11	12	12
Aluminum_D	0.0025	0.0068	0.014	0.014	0.018	0.033	0.0025	0.0068	0.014	0.014	0.018	0.033
Aluminum_T	0.012	0.017	0.024	0.042	0.091	0.17	0.012	0.017	0.025	0.042	0.091	0.17
Antimony_D	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Antimony_T	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Arsenic_D	0.000065	0.00011	0.00016	0.00036	0.00021	0.0027	0.000065	0.00011	0.00015	0.00036	0.00021	0.0027
Arsenic_T	0.000050	0.000075	0.00016	0.00042	0.00018	0.0035	0.000050	0.000075	0.00015	0.00042	0.00018	0.0035
Barium_D	0.0026	0.0038	0.0048	0.0065	0.0052	0.030	0.0026	0.0038	0.0048	0.0065	0.0052	0.030
Barium_T	0.0030	0.0042	0.0050	0.0072	0.0073	0.031	0.0030	0.0042	0.0049	0.0072	0.0073	0.031
Beryllium_T	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011
Boron_D	0.0050	0.0050	0.0050	0.0093	0.0050	0.057	0.0050	0.0050	0.0050	0.0093	0.0050	0.057
Boron_T	0.0050	0.0050	0.0050	0.0090	0.0050	0.053	0.0050	0.0050	0.0050	0.0090	0.0050	0.053
Bromide	0.000016	0.050	0.050	0.046	0.050	0.050	0.000016	0.050	0.050	0.046	0.050	0.050
Cadmium_D	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Cadmium_T	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090
Calcium_D	1.4	2.2	2.9	11	3.1	99	1.4	2.2	2.9	11	3.1	99
Chloride	0.25	0.25	0.25	0.65	0.25	5.0	0.25	0.25	0.25	0.65	0.25	5.0
Chromium_D	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025
Chromium_D_Hex	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057
Chromium_T	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025
Cobalt_D	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012
Cobalt_T	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028
Copper_D	0.00014	0.00022	0.00081	0.00091	0.0014	0.0027	0.00014	0.00022	0.00077	0.00091	0.0014	0.0027
Copper_T	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056
Cyanide_F	0.00050	0.00050	0.00050	0.00054	0.00050	0.00100	0.00050	0.00050	0.00050	0.00054	0.00050	0.00100
Cyanide_T	0.00025	0.00050	0.00050	0.00054	0.00075	0.00100	0.00025	0.00050	0.00050	0.00054	0.00075	0.00100
Cyanide_WAD	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012
Fluoride	0.038	0.050	0.063	0.065	0.074	0.11	0.038	0.050	0.062	0.065	0.074	0.11
Hardness	5.3	8.3	11	10	11	12	5.3	8.3	11	10	11	12
Iron_D	0.043	0.047	0.068	0.12	0.17	0.67	0.043	0.047	0.066	0.12	0.17	0.67
Iron_T	0.070	0.084	0.13	0.22	0.18	1.2	0.070	0.084	0.13	0.22	0.18	1.2
Lead_D	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030
Lead_T	0.000018	0.000025	0.000025	0.000054	0.00020	0.00021	0.000018	0.000025	0.000025	0.000055	0.00020	0.00021
Magnesium_D	0.43	0.64	0.86	3.3	0.88	31	0.43	0.64	0.86	3.3	0.88	31
Manganese_D	0.0014	0.0017	0.0030	0.065	0.021	0.72	0.0014	0.0017	0.0030	0.065	0.021	0.72
Manganese_T	0.0048	0.0076	0.012	0.078	0.027	0.80	0.0048	0.0076	0.013	0.078	0.027	0.80
Mercury_D	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Mercury_T	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Molybdenum_D	0.000034	0.000067	0.000087	0.00014	0.00011	0.00073	0.000034	0.000067	0.000088	0.00014	0.00011	0.00073
Molybdenum_T	0.000028	0.000058	0.000091	0.00017	0.00017	0.0011	0.000028	0.000058	0.000090	0.00017	0.00017	0.0011
N_Ammonia	0.0025	0.0043	0.0082	0.013	0.031	0.047	0.0025	0.0043	0.0079	0.013	0.031	0.047
N_Nitrate_Nitrite	0.011	0.011	0.023	0.028	0.052	0.080	0.011	0.011	0.019	0.028	0.052	0.080
N_Nitrite	0.00050	0.0050	0.0050	0.0046	0.0050	0.0050	0.00050	0.0050	0.0050	0.0046	0.0050	0.0050
Nickel_D	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051
Nickel_T	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094
Phosphorus_T	0.0000063	0.0051	0.011	0.013	0.016	0.043	0.0000063	0.0051	0.012	0.013	0.016	0.043
Potassium_D	0.25	0.38	0.54	1.1	0.58	7.7	0.25	0.38	0.53	1.1	0.58	7.7
Proton	0.23	0.0046	0.00012	0.00041	0.000080	0.000070	0.23	0.0046	0.00016	0.00041	0.000080	0.000070
Radium_226	0.0000020	0.0000020	0.0000023	0.0000023	0.0000025	0.0000026	0.0000020	0.0000020	0.0000021	0.0000023	0.0000025	0.0000026
Selenium_D	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014
Selenium_T	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016
Silicon_D	1.2	1.5	1.8	2.1	2.3	5.8	1.2	1.5	1.8	2.1	2.3	5.8
Silicon_T	1.3	1.5	1.9	2.2	2.6	6.2	1.3	1.5	1.8	2.2	2.6	6.2
Silver_D	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Silver_T	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Sodium_D	0.60	0.86	1.1	2.9	1.3	23	0.60	0.86	1.1	2.9	1.3	23
Sodium_T	0.65	0.91	1.2	3.0	1.4	23	0.65	0.91	1.2	3.0	1.4	23
Strontium_D	0.0067	0.0094	0.013	0.036	0.013	0.30	0.0067	0.0094	0.013	0.036	0.013	0.30
Strontium_T	0.0072	0.0100	0.013	0.036	0.014	0.30	0.0072	0.0100	0.013	0.036	0.014	0.30
Sulfate	0.25	0.34	0.56	18	0.72	210	0.25	0.34	0.56	18	0.72	210
Thallium_D	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
Thallium_T	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
TSS	0.50	0.50	0.69	1.3	1.5	6.9	0.50	0.50	0.87	1.3	1.5	6.9
Uranium_D	0.0000065	0.000012	0.000017	0.00038	0.000021	0.0044	0.0000065	0.000012	0.000017	0.00038	0.000021	0.0044
Uranium_T	0.0000090	0.000015	0.000018	0.00043	0.000028	0.0049	0.0000090	0.000015	0.000018	0.00043	0.000028	0.0049
Vanadium_T	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025
Zinc_D	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017
Zinc_T	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Hughes River - Downstream of Dewatering Effluent Discharge from Legacy Pit (Hughes_Mid_CT)

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.50	1.0	1.0	1.3	2.2	2.2	0.50	1.0	1.0	1.3	2.2	2.2
Alkalinity_T	6.2	9.0	12	11	12	12	6.2	9.0	12	11	12	12
Aluminum_D	0.0025	0.0068	0.014	0.014	0.018	0.033	0.0025	0.0068	0.014	0.014	0.018	0.033
Aluminum_T	0.012	0.017	0.024	0.042	0.091	0.17	0.012	0.017	0.025	0.042	0.091	0.17
Antimony_D	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Antimony_T	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Arsenic_D	0.000065	0.00011	0.00016	0.00036	0.00021	0.0027	0.000065	0.00011	0.00015	0.00036	0.00021	0.0027
Arsenic_T	0.000050	0.000075	0.00016	0.00042	0.00018	0.0035	0.000050	0.000075	0.00015	0.00042	0.00018	0.0035
Barium_D	0.0026	0.0038	0.0048	0.0065	0.0052	0.030	0.0026	0.0038	0.0048	0.0065	0.0052	0.030
Barium_T	0.0030	0.0042	0.0050	0.0072	0.0073	0.031	0.0030	0.0042	0.0049	0.0072	0.0073	0.031
Beryllium_T	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011
Boron_D	0.0050	0.0050	0.0050	0.0093	0.0050	0.057	0.0050	0.0050	0.0050	0.0093	0.0050	0.057
Boron_T	0.0050	0.0050	0.0050	0.0090	0.0050	0.053	0.0050	0.0050	0.0050	0.0090	0.0050	0.053
Bromide	0.000016	0.050	0.050	0.046	0.050	0.050	0.000016	0.050	0.050	0.046	0.050	0.050
Cadmium_D	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Cadmium_T	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090
Calcium_D	1.4	2.2	2.9	11	3.1	99	1.4	2.2	2.9	11	3.1	99
Chloride	0.25	0.25	0.25	0.65	0.25	5.0	0.25	0.25	0.25	0.65	0.25	5.0
Chromium_D	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025
Chromium_D_Hex	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057
Chromium_T	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025
Cobalt_D	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012
Cobalt_T	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028
Copper_D	0.00014	0.00022	0.00081	0.00091	0.0014	0.0027	0.00014	0.00022	0.00077	0.00091	0.0014	0.0027
Copper_T	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056
Cyanide_F	0.00050	0.00050	0.00050	0.00054	0.00050	0.00100	0.00050	0.00050	0.00050	0.00054	0.00050	0.00100
Cyanide_T	0.00025	0.00050	0.00050	0.00054	0.00075	0.00100	0.00025	0.00050	0.00050	0.00054	0.00075	0.00100
Cyanide_WAD	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012
Fluoride	0.038	0.050	0.063	0.065	0.074	0.11	0.038	0.050	0.062	0.065	0.074	0.11
Hardness	5.3	8.3	11	10	11	12	5.3	8.3	11	10	11	12
Iron_D	0.043	0.047	0.068	0.12	0.17	0.67	0.043	0.047	0.066	0.12	0.17	0.67
Iron_T	0.070	0.084	0.13	0.22	0.18	1.2	0.070	0.084	0.13	0.22	0.18	1.2
Lead_D	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030
Lead_T	0.000018	0.000025	0.000025	0.000054	0.00020	0.00021	0.000018	0.000025	0.000025	0.000055	0.00020	0.00021
Magnesium_D	0.43	0.64	0.86	3.3	0.88	31	0.43	0.64	0.86	3.3	0.88	31
Manganese_D	0.0014	0.0017	0.0030	0.065	0.021	0.72	0.0014	0.0017	0.0030	0.065	0.021	0.72
Manganese_T	0.0048	0.0076	0.012	0.078	0.027	0.80	0.0048	0.0076	0.013	0.078	0.027	0.80
Mercury_D	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Mercury_T	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Molybdenum_D	0.000034	0.000067	0.000087	0.00014	0.00011	0.00073	0.000034	0.000067	0.000088	0.00014	0.00011	0.00073
Molybdenum_T	0.000028	0.000058	0.000091	0.00017	0.00017	0.0011	0.000028	0.000058	0.000090	0.00017	0.00017	0.0011
N_Ammonia	0.0025	0.0043	0.0082	0.013	0.031	0.047	0.0025	0.0043	0.0079	0.013	0.031	0.047
N_Nitrate_Nitrite	0.011	0.011	0.023	0.028	0.052	0.080	0.011	0.011	0.019	0.028	0.052	0.080
N_Nitrite	0.00050	0.0050	0.0050	0.0046	0.0050	0.0050	0.00050	0.0050	0.0050	0.0046	0.0050	0.0050
Nickel_D	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051
Nickel_T	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094
Phosphorus_T	0.0000063	0.0051	0.011	0.013	0.016	0.043	0.0000063	0.0051	0.012	0.013	0.016	0.043
Potassium_D	0.25	0.38	0.54	1.1	0.58	7.7	0.25	0.38	0.53	1.1	0.58	7.7
Proton	0.23	0.0046	0.00012	0.00041	0.000080	0.000070	0.23	0.0046	0.00016	0.00041	0.000080	0.000070
Radium_226	0.0000020	0.0000020	0.0000023	0.0000023	0.0000025	0.0000026	0.0000020	0.0000020	0.0000021	0.0000023	0.0000025	0.0000026
Selenium_D	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014
Selenium_T	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016
Silicon_D	1.2	1.5	1.8	2.1	2.3	5.8	1.2	1.5	1.8	2.1	2.3	5.8
Silicon_T	1.3	1.5	1.9	2.2	2.6	6.2	1.3	1.5	1.8	2.2	2.6	6.2
Silver_D	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Silver_T	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Sodium_D	0.60	0.86	1.1	2.9	1.3	23	0.60	0.86	1.1	2.9	1.3	23
Sodium_T	0.65	0.91	1.2	3.0	1.4	23	0.65	0.91	1.2	3.0	1.4	23
Strontium_D	0.0067	0.0094	0.013	0.036	0.013	0.30	0.0067	0.0094	0.013	0.036	0.013	0.30
Strontium_T	0.0072	0.0100	0.013	0.036	0.014	0.30	0.0072	0.0100	0.013	0.036	0.014	0.30
Sulfate	0.25	0.34	0.56	18	0.72	210	0.25	0.34	0.56	18	0.72	210
Thallium_D	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
Thallium_T	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
TSS	0.50	0.50	0.69	1.3	1.5	6.9	0.50	0.50	0.87	1.3	1.5	6.9
Uranium_D	0.0000065	0.000012	0.000017	0.00038	0.000021	0.0044	0.0000065	0.000012	0.000017	0.00038	0.000021	0.0044
Uranium_T	0.0000090	0.000015	0.000018	0.00043	0.000028	0.0049	0.0000090	0.000015	0.000018	0.00043	0.000028	0.0049
Vanadium_T	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025
Zinc_D	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017
Zinc_T	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Hughes River - Downstream of Confluence of Susan Lake Outflow (Hughes_Ds_CT)

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.58	1.1	1.1	1.3	2.3	2.3	0.59	1.1	1.1	1.3	2.3	2.3
Alkalinity_T	7.3	9.8	12	12	13	13	7.5	9.8	12	12	13	13
Aluminum_D	0.0027	0.0068	0.014	0.014	0.018	0.032	0.0027	0.0069	0.014	0.014	0.018	0.032
Aluminum_T	0.012	0.017	0.025	0.042	0.091	0.17	0.012	0.017	0.025	0.042	0.090	0.17
Antimony_D	0.000012	0.000051	0.000051	0.000048	0.000053	0.000054	0.000011	0.000051	0.000051	0.000048	0.000052	0.000052
Antimony_T	0.000012	0.000051	0.000051	0.000048	0.000053	0.000054	0.000011	0.000051	0.000051	0.000048	0.000052	0.000052
Arsenic_D	0.000073	0.00011	0.00016	0.00036	0.00022	0.0026	0.000074	0.00011	0.00016	0.00036	0.00022	0.0026
Arsenic_T	0.000058	0.000084	0.00016	0.00042	0.00019	0.0035	0.000059	0.000087	0.00016	0.00042	0.00019	0.0035
Barium_D	0.0028	0.0039	0.0049	0.0066	0.0054	0.029	0.0029	0.0039	0.0049	0.0066	0.0054	0.029
Barium_T	0.0033	0.0044	0.0051	0.0073	0.0074	0.031	0.0033	0.0044	0.0050	0.0073	0.0073	0.031
Beryllium_T	0.000011	0.000011	0.000012	0.000012	0.000012	0.000013	0.000011	0.000011	0.000012	0.000012	0.000012	0.000013
Boron_D	0.0050	0.0050	0.0051	0.0093	0.0052	0.056	0.0050	0.0050	0.0050	0.0093	0.0051	0.056
Boron_T	0.0051	0.0051	0.0052	0.0091	0.0053	0.052	0.0051	0.0051	0.0051	0.0091	0.0052	0.052
Bromide	0.00090	0.050	0.050	0.046	0.050	0.050	0.00090	0.050	0.050	0.046	0.050	0.050
Cadmium_D	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000026	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000026
Cadmium_T	0.0000025	0.0000025	0.0000025	0.0000031	0.0000026	0.0000089	0.0000025	0.0000025	0.0000025	0.0000031	0.0000026	0.0000089
Calcium_D	1.8	2.5	3.2	11	3.3	97	1.9	2.5	3.2	11	3.3	97
Chloride	0.25	0.25	0.25	0.64	0.26	4.9	0.25	0.25	0.25	0.64	0.26	4.9
Chromium_D	0.000051	0.00024	0.00025	0.00023	0.00025	0.00025	0.000051	0.00025	0.00025	0.00023	0.00025	0.00025
Chromium_D_Hex	0.00024	0.00025	0.00025	0.00029	0.00049	0.00056	0.00024	0.00024	0.00025	0.00029	0.00049	0.00056
Chromium_T	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025
Cobalt_D	0.000034	0.000051	0.000051	0.000055	0.000051	0.00012	0.000035	0.000051	0.000051	0.000055	0.000051	0.00012
Cobalt_T	0.000026	0.000051	0.000051	0.000068	0.000052	0.00028	0.000026	0.000051	0.000051	0.000068	0.000052	0.00028
Copper_D	0.00015	0.00022	0.00080	0.00090	0.0014	0.0027	0.00015	0.00022	0.00076	0.00090	0.0014	0.0027
Copper_T	0.00024	0.00025	0.00025	0.00028	0.00026	0.00056	0.00024	0.00025	0.00025	0.00028	0.00025	0.00056
Cyanide_F	0.00050	0.00050	0.00050	0.00054	0.00051	0.00099	0.00050	0.00050	0.00050	0.00054	0.00051	0.00099
Cyanide_T	0.00026	0.00051	0.00051	0.00055	0.00075	0.00100	0.00026	0.00051	0.00051	0.00055	0.00075	0.00100
Cyanide_WAD	0.00026	0.00050	0.00050	0.00057	0.00084	0.0012	0.00026	0.00050	0.00050	0.00057	0.00084	0.0012
Fluoride	0.039	0.050	0.063	0.065	0.074	0.11	0.039	0.050	0.063	0.065	0.074	0.11
Hardness	6.7	9.2	12	11	12	13	7.0	9.3	12	11	12	13
Iron_D	0.045	0.050	0.072	0.13	0.17	0.66	0.045	0.050	0.072	0.13	0.17	0.66
Iron_T	0.073	0.086	0.13	0.22	0.18	1.2	0.073	0.086	0.13	0.22	0.18	1.2
Lead_D	0.000025	0.000025	0.000025	0.000026	0.000025	0.000030	0.000025	0.000025	0.000025	0.000026	0.000025	0.000030
Lead_T	0.000018	0.000026	0.000026	0.000054	0.00020	0.00020	0.000018	0.000026	0.000026	0.000054	0.00020	0.00020
Magnesium_D	0.54	0.72	0.93	3.3	0.97	30	0.57	0.73	0.93	3.3	0.97	30
Manganese_D	0.0029	0.0030	0.0045	0.065	0.022	0.71	0.0030	0.0031	0.0045	0.065	0.022	0.71
Manganese_T	0.0068	0.0094	0.014	0.078	0.028	0.78	0.0073	0.0095	0.014	0.078	0.028	0.78
Mercury_D	0.00000095	0.0000025	0.0000025	0.0000023	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000023	0.0000025	0.0000025
Mercury_T	0.00000095	0.0000025	0.0000025	0.0000023	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000023	0.0000025	0.0000025
Molybdenum_D	0.000045	0.000076	0.000097	0.00014	0.00011	0.00073	0.000047	0.000077	0.000096	0.00014	0.00011	0.00073
Molybdenum_T	0.000040	0.000066	0.00010	0.00018	0.00018	0.0011	0.000042	0.000067	0.000099	0.00018	0.00017	0.0011
N_Ammonia	0.0031	0.0049	0.0088	0.014	0.032	0.047	0.0031	0.0049	0.0084	0.014	0.031	0.047
N_Nitrate_Nitrite	0.013	0.013	0.026	0.031	0.055	0.084	0.013	0.013	0.020	0.029	0.052	0.080
N_Nitrite	0.00061	0.0050	0.0051	0.0047	0.0051	0.0051	0.00062	0.0050	0.0050	0.0047	0.0051	0.0051
Nickel_D	0.00019	0.00025	0.00025	0.00027	0.00025	0.00050	0.00019	0.00025	0.00025	0.00026	0.00025	0.00050
Nickel_T	0.00022	0.00025	0.00025	0.00030	0.00025	0.00093	0.00022	0.00025	0.00025	0.00030	0.00025	0.00092
Phosphorus_T	0.00041	0.0053	0.012	0.013	0.016	0.043	0.00040	0.0053	0.012	0.013	0.016	0.043
Potassium_D	0.29	0.40	0.56	1.1	0.62	7.6	0.29	0.40	0.56	1.1	0.60	7.5
Proton	0.29	0.0065	0.00017	0.00057	0.00011	0.000098	0.29	0.0065	0.00023	0.00058	0.00011	0.000099
Radium_226	0.000086	0.000090	0.00011	0.00011	0.00015	0.00017	0.000081	0.000083	0.000095	0.00010	0.00013	0.00016
Selenium_D	0.000021	0.000026	0.000026	0.000035	0.000027	0.00014	0.000021	0.000026	0.000026	0.000035	0.000026	0.00014
Selenium_T	0.000021	0.000026	0.000026	0.000054	0.00012	0.00016	0.000021	0.000026	0.000026	0.000054	0.00012	0.00016
Silicon_D	1.2	1.5	1.8	2.1	2.3	5.7	1.2	1.5	1.8	2.1	2.3	5.7
Silicon_T	1.3	1.5	1.9	2.2	2.5	6.1	1.3	1.5	1.8	2.2	2.5	6.1
Silver_D	0.0000026	0.0000051	0.0000051	0.0000049	0.0000051	0.0000051	0.0000026	0.0000051	0.0000051	0.0000049	0.0000051	0.0000051
Silver_T	0.0000026	0.0000051	0.0000051	0.0000049	0.0000051	0.0000051	0.0000026	0.0000051	0.0000051	0.0000049	0.0000051	0.0000051
Sodium_D	0.66	0.89	1.2	2.9	1.4	23	0.67	0.90	1.2	2.9	1.4	23
Sodium_T	0.71	0.95	1.2	3.0	1.5	23	0.72	0.96	1.2	3.0	1.4	23
Strontium_D	0.0074	0.0098	0.013	0.036	0.014	0.30	0.0076	0.0100	0.013	0.036	0.014	0.30
Strontium_T	0.0080	0.010	0.014	0.036	0.015	0.29	0.0082	0.011	0.014	0.036	0.015	0.29
Sulfate	0.41	0.57	0.76	18	0.97	210	0.41	0.61	0.72	18	0.87	210
Thallium_D	0.0000017	0.0000056	0.0000057	0.0000054	0.0000060	0.0000061	0.0000017	0.0000057	0.0000057	0.0000055	0.0000061	0.0000061
Thallium_T	0.0000017	0.0000056	0.0000057	0.0000054	0.0000060	0.0000062	0.0000017	0.0000057	0.0000057	0.0000055	0.0000061	0.0000061
TSS	0.55	0.55	0.73	1.3	1.5	6.8	0.55	0.55	0.91	1.3	1.5	6.8
Uranium_D	0.0000080	0.000013	0.000018	0.00037	0.000024	0.0043	0.0000081	0.000013	0.000018	0.00037	0.000022	0.0043
Uranium_T	0.000011	0.000016	0.000021	0.00042	0.000032	0.0048	0.000011	0.000017	0.000019	0.00042	0.000029	0.0048
Vanadium_T	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025
Zinc_D	0.00051	0.00051	0.00080	0.00085	0.0012	0.0017	0.00051	0.00051	0.00080	0.00084	0.0012	0.0017
Zinc_T	0.00028	0.0015	0.0015	0.0014	0.0015	0.0015	0.00028	0.0015	0.0015	0.0014	0.0015	0.0015

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Farley Dewatering Wells

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.1	3.4	7.5	7.6	12	12	3.6	3.8	7.2	8.4	13	15
Alkalinity_T	67	79	150	150	210	290	62	63	110	120	190	270
Aluminum_D	0.00091	0.00099	0.0023	0.0028	0.0052	0.0068	0.0028	0.0034	0.0040	0.0046	0.0070	0.0081
Aluminum_T	0.0017	0.0018	0.0039	0.0046	0.0090	0.010	0.0049	0.0059	0.0069	0.0076	0.011	0.012
Antimony_D	0.00010	0.00011	0.00026	0.00033	0.00072	0.00095	0.000097	0.00013	0.00016	0.00016	0.00021	0.00024
Antimony_T	0.00011	0.00013	0.00030	0.00038	0.00078	0.00096	0.00012	0.00014	0.00018	0.00018	0.00023	0.00026
Arsenic_D	0.00081	0.0010	0.0019	0.0020	0.0028	0.0041	0.00072	0.00076	0.0016	0.0014	0.0022	0.0034
Arsenic_T	0.00082	0.0011	0.0019	0.0020	0.0029	0.0042	0.00076	0.00080	0.0016	0.0015	0.0022	0.0035
Barium_D	0.012	0.015	0.026	0.025	0.034	0.045	0.013	0.014	0.019	0.024	0.035	0.043
Barium_T	0.013	0.016	0.027	0.026	0.035	0.047	0.014	0.014	0.020	0.025	0.037	0.044
Beryllium_T	0.000060	0.000072	0.000088	0.000094	0.00013	0.00014	0.000076	0.000087	0.000099	0.00010	0.00013	0.00014
Boron_D	0.010	0.012	0.025	0.027	0.044	0.053	0.0098	0.010	0.014	0.018	0.027	0.038
Boron_T	0.010	0.012	0.025	0.028	0.045	0.055	0.010	0.010	0.014	0.018	0.028	0.040
Bromide	0.029	0.036	0.041	0.041	0.045	0.053	0.030	0.037	0.041	0.041	0.047	0.059
Cadmium_D	0.0000024	0.0000028	0.0000035	0.0000038	0.0000057	0.0000069	0.0000026	0.0000028	0.0000032	0.0000032	0.0000035	0.0000048
Cadmium_T	0.0000028	0.0000036	0.0000044	0.0000047	0.0000068	0.0000082	0.0000034	0.0000036	0.0000045	0.0000045	0.0000053	0.0000065
Calcium_D	27	31	52	52	72	97	31	31	42	53	77	96
Chloride	0.41	0.41	0.58	0.70	1.1	1.5	0.43	0.44	0.65	0.75	1.2	1.7
Chromium_D	0.000023	0.000029	0.000034	0.000042	0.000067	0.000082	0.000040	0.000047	0.000057	0.000058	0.000077	0.000084
Chromium_D_Hex	0.000034	0.000040	0.000055	0.000058	0.000086	0.00010	0.000063	0.000069	0.000073	0.000078	0.000093	0.00011
Chromium_T	0.000036	0.000052	0.000081	0.000080	0.00010	0.00012	0.000065	0.000095	0.00013	0.00013	0.00017	0.00018
Cobalt_D	0.000042	0.000061	0.000087	0.000085	0.00010	0.00012	0.000054	0.000060	0.000088	0.000092	0.00013	0.00014
Cobalt_T	0.000048	0.000068	0.00011	0.00011	0.00014	0.00017	0.000063	0.000069	0.00011	0.00012	0.00018	0.00020
Copper_D	0.00027	0.00031	0.00058	0.00063	0.0011	0.0012	0.00025	0.00027	0.00036	0.00037	0.00050	0.00085
Copper_T	0.00032	0.00037	0.00070	0.00076	0.0012	0.0014	0.00031	0.00031	0.00046	0.00050	0.00073	0.0011
Cyanide_F	0.00013	0.00015	0.00022	0.00023	0.00032	0.00034	0.00019	0.00023	0.00029	0.00029	0.00036	0.00045
Cyanide_T	0.00026	0.00030	0.00041	0.00041	0.00052	0.00054	0.00035	0.00040	0.00049	0.00049	0.00054	0.00066
Cyanide_WAD	0.00017	0.00019	0.00030	0.00031	0.00045	0.00046	0.00024	0.00028	0.00036	0.00037	0.00046	0.00056
Fluoride	0.064	0.073	0.098	0.098	0.12	0.13	0.068	0.073	0.11	0.11	0.14	0.22
Hardness	94	97	150	160	250	310	99	100	140	170	260	340
Iron_D	0.0077	0.0091	0.012	0.012	0.014	0.017	0.015	0.016	0.020	0.020	0.024	0.026
Iron_T	0.016	0.017	0.026	0.048	0.092	0.23	0.036	0.039	0.046	0.074	0.13	0.27
Lead_D	0.000011	0.000013	0.000020	0.000024	0.000046	0.000056	0.000019	0.000026	0.000029	0.000029	0.000035	0.000036
Lead_T	0.000024	0.000026	0.000038	0.000044	0.000074	0.000087	0.000037	0.000051	0.000058	0.000057	0.000063	0.000065
Magnesium_D	7.8	8.6	13	14	19	25	8.4	8.5	11	14	20	26
Manganese_D	0.036	0.046	0.19	0.22	0.44	0.53	0.041	0.049	0.19	0.23	0.45	0.57
Manganese_T	0.050	0.061	0.19	0.23	0.44	0.54	0.055	0.064	0.20	0.24	0.45	0.58
Mercury_D	0.00000037	0.00000042	0.00000057	0.00000073	0.0000013	0.0000015	0.00000073	0.00000075	0.00000081	.00000092	0.0000013	0.0000013
Mercury_T	0.00000059	0.00000063	0.00000077	0.00000098	0.0000017	0.0000020	0.00000088	0.0000011	0.0000011	0.0000012	0.0000017	0.0000018
Molybdenum_D	0.00070	0.00093	0.0017	0.0020	0.0035	0.0042	0.00055	0.00083	0.0012	0.0012	0.0017	0.0019
Molybdenum_T	0.00071	0.00095	0.0018	0.0020	0.0035	0.0042	0.00058	0.00085	0.0012	0.0012	0.0017	0.0020
N_Ammonia	0.038	0.047	0.11	0.12	0.18	0.22	0.012	0.014	0.055	0.046	0.075	0.10
N_Nitrate_Nitrite	0.19	0.37	0.76	0.99	1.9	2.3	0.030	0.033	0.062	0.068	0.10	0.17
N_Nitrite	0.017	0.019	0.033	0.038	0.067	0.088	0.014	0.023	0.032	0.033	0.040	0.055
Nickel_D	0.00027	0.00034	0.00051	0.00055	0.00079	0.00092	0.00027	0.00029	0.00039	0.00042	0.00057	0.00074
Nickel_T	0.00031	0.00039	0.00065	0.00067	0.00094	0.0012	0.00034	0.00034	0.00048	0.00057	0.00081	0.0010
Phosphorus_T	0.0092	0.010	0.013	0.014	0.019	0.024	0.0080	0.0090	0.012	0.013	0.017	0.024
Potassium_D	2.8	3.2	6.7	7.4	12	14	3.0	3.4	4.7	5.8	8.3	11
Proton	0.0000000079	0.000000010	0.000000044	0.000000040	0.000000062	0.000000067	0.000023	0.00012	0.00028	0.00034	0.00065	0.00081
Radium_226	0.0060	0.0063	0.0080	0.0083	0.011	0.011	0.0030	0.0032	0.0038	0.0038	0.0041	0.0086
Selenium_D	0.000042	0.000066	0.00013	0.00014	0.00022	0.00030	0.000049	0.000050	0.000088	0.000098	0.00015	0.00016
Selenium_T	0.000049	0.000059	0.00011	0.00012	0.00023	0.00034	0.000054	0.000055	0.000068	0.000071	0.000088	0.000097
Silicon_D	2.5	2.7	4.5	4.5	5.9	6.4	2.6	2.6	4.4	4.1	5.8	6.9
Silicon_T	2.5	2.7	4.6	4.5	6.0	6.5	2.6	2.7	4.4	4.2	6.0	7.0
Silver_D	0.0000025	0.0000029	0.0000044	0.0000051	0.0000089	0.000011	0.0000040	0.0000048	0.0000055	0.0000062	0.0000089	0.0000099
Silver_T	0.0000031	0.0000035	0.0000054	0.0000061	0.000010	0.000013	0.0000047	0.0000056	0.0000064	0.0000071	0.000010	0.000011
Sodium_D	5.7	6.9	14	16	26	29	5.8	6.1	8.1	9.8	13	17
Sodium_T	5.8	6.8	14	16	26	29	5.9	6.1	8.0	9.7	13	17
Strontium_D	0.055	0.070	0.12	0.12	0.17	0.24	0.067	0.069	0.096	0.12	0.18	0.23
Strontium_T	0.057	0.071	0.13	0.13	0.17	0.25	0.068	0.070	0.097	0.12	0.18	0.24
Sulfate	42	47	77	80	110	140	39	40	50	62	93	120
Thallium_D	0.000019	0.000030	0.000035	0.000039	0.000058	0.000079	0.000025	0.000032	0.000043	0.000042	0.000051	0.000054
Thallium_T	0.000021	0.000033	0.000039	0.000043	0.000062	0.000084	0.000027	0.000034	0.000046	0.000045	0.000056	0.000059
TSS	0.24	0.28	0.50	0.47	0.61	0.68	0.76	0.79	1.1	1.2	1.7	1.8
Uranium_D	0.00050	0.00069	0.0014	0.0016	0.0028	0.0035	0.00045	0.00046	0.00088	0.00075	0.0011	0.0015
Uranium_T	0.00050	0.00066	0.0014	0.0016	0.0028	0.0035	0.00046	0.00046	0.00079	0.00072	0.00099	0.0014
Vanadium_T	0.000100	0.00013	0.00019	0.00020	0.00029	0.00033	0.00015	0.00017	0.00023	0.00024	0.00029	0.00030
Zinc_D	0.00044	0.00052	0.00065	0.00068	0.00091	0.0011	0.00044	0.00046	0.00060	0.00060	0.00071	0.0010
Zinc_T	0.00054	0.00072	0.00096	0.00095	0.0012	0.0013	0.00058	0.00065	0.00099	0.00093	0.0011	0.0014

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Expected Case Scenario - Gordon Dewatering Wells

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.97	1.4	4.9	4.4	7.0	8.3	3.2	3.8	5.5	5.9	7.9	8.6
Alkalinity_T	48	49	61	62	74	83	48	49	50	62	74	83
Aluminum_D	0.000032	0.000066	0.00059	0.0028	0.0081	0.013	0.0038	0.0039	0.0068	0.0074	0.012	0.014
Aluminum_T	0.000058	0.00015	0.0032	0.014	0.043	0.058	0.017	0.017	0.030	0.033	0.056	0.059
Antimony_D	0.000023	0.000027	0.000054	0.000049	0.000064	0.000074	0.000060	0.000069	0.000073	0.000079	0.000093	0.000099
Antimony_T	0.000032	0.000035	0.000065	0.000060	0.000076	0.000094	0.000064	0.000072	0.000078	0.000085	0.00010	0.00011
Arsenic_D	0.00015	0.00015	0.00023	0.00022	0.00026	0.00031	0.00025	0.00027	0.00028	0.00032	0.00038	0.00039
Arsenic_T	0.00016	0.00017	0.00026	0.00025	0.00030	0.00036	0.00026	0.00029	0.00031	0.00034	0.00042	0.00043
Barium_D	0.0056	0.0064	0.0090	0.0097	0.013	0.015	0.0078	0.0083	0.0094	0.011	0.014	0.015
Barium_T	0.0072	0.0078	0.011	0.011	0.014	0.016	0.0089	0.0093	0.010	0.012	0.014	0.016
Beryllium_T	0.000026	0.000031	0.000062	0.000056	0.000072	0.000087	0.000062	0.000071	0.000077	0.000083	0.000099	0.00010
Boron_D	0.0018	0.0019	0.0039	0.0044	0.0074	0.0085	0.0033	0.0034	0.0048	0.0056	0.0078	0.0086
Boron_T	0.0025	0.0028	0.0063	0.0064	0.010	0.012	0.0041	0.0043	0.0064	0.0075	0.011	0.012
Bromide	0.012	0.014	0.029	0.028	0.039	0.042	0.030	0.036	0.040	0.041	0.047	0.052
Cadmium_D	0.00000013	0.00000018	0.00000078	0.00000065	0.00000100	0.0000010	0.0000013	0.0000015	0.0000018	0.0000018	0.0000021	0.0000024
Cadmium_T	0.00000015	0.00000024	0.0000015	0.0000015	0.0000025	0.0000026	0.0000024	0.0000029	0.0000033	0.0000034	0.0000038	0.0000046
Calcium_D	8.0	10.0	12	12	15	17	13	13	15	17	20	22
Chloride	0.012	0.019	0.061	0.069	0.15	0.17	0.11	0.11	0.17	0.16	0.21	0.25
Chromium_D	0.0000040	0.0000057	0.000014	0.000015	0.000035	0.000042	0.000024	0.000029	0.000038	0.000038	0.000046	0.000056
Chromium_D_Hex	0.0000043	0.0000064	0.000028	0.000026	0.000047	0.000052	0.000027	0.000033	0.000047	0.000047	0.000059	0.000063
Chromium_T	0.000031	0.000040	0.000095	0.000090	0.00012	0.00015	0.00013	0.00015	0.00016	0.00017	0.00020	0.00023
Cobalt_D	0.000017	0.000025	0.000077	0.000071	0.00011	0.00013	0.000060	0.000071	0.000098	0.00011	0.00014	0.00015
Cobalt_T	0.000019	0.000029	0.000085	0.000079	0.00012	0.00015	0.000068	0.000080	0.00011	0.00012	0.00015	0.00017
Copper_D	0.0000058	0.0000078	0.000030	0.000036	0.000074	0.000079	0.000067	0.000085	0.000100	0.000096	0.00011	0.00012
Copper_T	0.000018	0.000025	0.000077	0.000069	0.00011	0.00013	0.00012	0.00013	0.00016	0.00017	0.00021	0.00023
Cyanide_F	0.000021	0.000030	0.00020	0.00023	0.00043	0.00045	0.00034	0.00038	0.00052	0.00054	0.00065	0.00080
Cyanide_T	0.00010	0.00012	0.00031	0.00029	0.00041	0.00047	0.00044	0.00047	0.00057	0.00060	0.00074	0.00078
Cyanide_WAD	0.000025	0.000034	0.00020	0.00021	0.00037	0.00039	0.00032	0.00036	0.00046	0.00048	0.00057	0.00069
Fluoride	0.037	0.039	0.048	0.049	0.061	0.064	0.040	0.040	0.045	0.052	0.063	0.066
Hardness	25	30	37	38	47	54	43	43	47	56	65	73
Iron_D	0.056	0.086	0.16	0.16	0.25	0.26	0.19	0.22	0.31	0.29	0.33	0.37
Iron_T	0.17	0.25	0.44	0.53	0.99	1.2	0.52	0.63	0.75	0.80	1.1	1.3
Lead_D	0.00000059	0.00000086	0.0000036	0.0000031	0.0000047	0.0000052	0.0000069	0.0000077	0.0000095	0.000010	0.000012	0.000013
Lead_T	0.0000063	0.0000081	0.000025	0.000022	0.000039	0.000041	0.000031	0.000032	0.000048	0.000048	0.000058	0.000063
Magnesium_D	1.3	1.5	1.7	2.0	2.5	3.0	2.5	2.5	2.6	3.2	3.9	4.4
Manganese_D	0.013	0.026	0.14	0.13	0.23	0.25	0.066	0.083	0.15	0.17	0.25	0.27
Manganese_T	0.024	0.047	0.17	0.16	0.27	0.30	0.089	0.11	0.18	0.20	0.29	0.32
Mercury_D	0.00000011	0.00000014	0.00000035	0.00000042	0.00000082	0.00000087	0.00000076	0.00000081	0.00000095	0.00000094	0.0000011	0.0000011
Mercury_T	0.00000047	0.00000070	0.0000010	0.0000010	0.0000015	0.0000017	0.0000011	0.0000013	0.0000015	0.0000015	0.0000017	0.0000017
Molybdenum_D	0.0000071	0.0000091	0.000017	0.000018	0.000031	0.000033	0.000037	0.000038	0.000042	0.000053	0.000066	0.000073
Molybdenum_T	0.0000080	0.000010	0.000020	0.000021	0.000038	0.000040	0.000042	0.000044	0.000050	0.000061	0.000077	0.000084
N_Ammonia	0.0093	0.018	0.048	0.045	0.071	0.073	0.020	0.024	0.043	0.054	0.083	0.086
N_Nitrate_Nitrite	0.0015	0.0023	0.013	0.012	0.023	0.024	0.017	0.020	0.023	0.024	0.028	0.034
N_Nitrite	0.00046	0.00067	0.0026	0.0025	0.0048	0.0056	0.0042	0.0042	0.0058	0.0058	0.0072	0.0085
Nickel_D	0.000016	0.000021	0.000047	0.000042	0.000061	0.000067	0.000082	0.000084	0.00010	0.00011	0.00014	0.00015
Nickel_T	0.000022	0.000029	0.000095	0.000094	0.00017	0.00018	0.00013	0.00014	0.00022	0.00021	0.00026	0.00030
Phosphorus_T	0.013	0.014	0.020	0.021	0.031	0.035	0.021	0.022	0.026	0.027	0.033	0.037
Potassium_D	0.36	0.39	0.53	0.50	0.58	0.70	0.58	0.61	0.71	0.75	0.84	0.95
Proton	0.0000000024	0.0000000028	0.0000000061	0.0000000079	0.000000017	0.000000020	0.000000019	0.000000022	0.000000024	0.000000025	0.000000031	0.000000031
Radium_226	0.00027	0.00038	0.0012	0.0010	0.0016	0.0019	0.0019	0.0020	0.0025	0.0026	0.0033	0.0035
Selenium_D	0.0000018	0.0000023	0.000011	0.000018	0.000054	0.000063	0.000030	0.000031	0.000038	0.000043	0.000064	0.000066
Selenium_T	0.0000019	0.0000024	0.000011	0.000019	0.000055	0.000063	0.000031	0.000032	0.000039	0.000044	0.000065	0.000067
Silicon_D	0.91	0.98	1.4	1.4	1.8	2.2	2.1	2.1	2.2	2.6	3.0	3.4
Silicon_T	0.93	1.0	1.5	1.5	1.9	2.2	2.1	2.2	2.3	2.7	3.2	3.5
Silver_D	0.00000010	0.00000014	0.00000090	0.0000017	0.0000053	0.0000063	0.0000027	0.0000029	0.0000037	0.0000042	0.0000063	0.0000066
Silver_T	0.00000014	0.00000018	0.0000011	0.0000018	0.0000055	0.0000063	0.0000030	0.0000031	0.0000039	0.0000044	0.0000064	0.0000067
Sodium_D	0.32	0.40	0.62	0.63	0.93	1.0	0.85	0.88	0.99	1.2	1.5	1.6
Sodium_T	0.32	0.41	0.64	0.65	0.95	1.1	0.86	0.89	1.0	1.2	1.5	1.6
Strontium_D	0.0076	0.0090	0.014	0.013	0.018	0.020	0.018	0.018	0.020	0.024	0.028	0.031
Strontium_T	0.016	0.017	0.022	0.024	0.032	0.035	0.022	0.023	0.024	0.030	0.036	0.040
Sulfate	0.83	1.1	1.9	1.8	2.4	2.7	1.4	1.5	1.7	2.1	2.5	2.8
Thallium_D	0.000011	0.000012	0.000025	0.000023	0.000030	0.000034	0.000028	0.000032	0.000034	0.000036	0.000042	0.000044
Thallium_T	0.000034	0.000037	0.000043	0.000044	0.000053	0.000055	0.000033	0.000036	0.000037	0.000043	0.000051	0.000054
TSS	0.35	0.45	0.74	0.87	1.5	1.9	1.7	1.7	2.0	2.0	2.3	2.4
Uranium_D	0.00000020	0.00000028	0.0000013	0.0000011	0.0000016	0.0000018	0.0000027	0.0000030	0.0000036	0.0000039	0.0000048	0.0000051
Uranium_T	0.0000013	0.0000016	0.0000023	0.0000037	0.0000070	0.0000092	0.0000053	0.0000055	0.0000084	0.0000100	0.000015	0.000017
Vanadium_T	0.000012	0.000018	0.000080	0.000074	0.00013	0.00015	0.00012	0.00014	0.00015	0.00016	0.00020	0.00024
Zinc_D	0.000032	0.000044	0.00013	0.00013	0.00023	0.00027	0.00024	0.00025	0.00038	0.00037	0.00045	0.00046
Zinc_T	0.000040	0.000057	0.00018	0.00019	0.00036	0.00043	0.00033	0.00035	0.00056	0.00055	0.00065	0.00071

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Appendix C Water Quality Results for the Upper Case Scenario – Summary Statistics

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Open Pit Discharge

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	na	na	na	na	na	na	5.1	5.1	5.2	5.4	6.3	7.3
Alkalinity_T	na	na	na	na	na	na	180	240	240	240	240	240
Aluminum_D	na	na	na	na	na	na	0.012	0.018	0.021	0.021	0.022	0.022
Aluminum_T	na	na	na	na	na	na	0.014	0.021	0.024	0.023	0.024	0.024
Antimony_D	na	na	na	na	na	na	0.00046	0.00079	0.00095	0.00091	0.00096	0.00096
Antimony_T	na	na	na	na	na	na	0.00047	0.00079	0.00095	0.00091	0.00096	0.00096
Arsenic_D	na	na	na	na	na	na	0.0022	0.0022	0.0023	0.0024	0.0028	0.0046
Arsenic_T	na	na	na	na	na	na	0.0024	0.0024	0.0024	0.0026	0.0030	0.0047
Barium_D	na	na	na	na	na	na	0.031	0.044	0.048	0.047	0.049	0.049
Barium_T	na	na	na	na	na	na	0.031	0.045	0.049	0.048	0.050	0.050
Beryllium_T	na	na	na	na	na	na	0.00013	0.00021	0.00026	0.00025	0.00026	0.00026
Boron_D	na	na	na	na	na	na	0.037	0.062	0.076	0.073	0.078	0.078
Boron_T	na	na	na	na	na	na	0.037	0.062	0.076	0.073	0.078	0.078
Bromide	na	na	na	na	na	na	0.029	0.029	0.029	0.033	0.042	0.063
Cadmium_D	na	na	na	na	na	na	0.0000086	0.0000086	0.0000086	0.0000090	0.000010	0.000013
Cadmium_T	na	na	na	na	na	na	0.000012	0.000012	0.000012	0.000012	0.000013	0.000016
Calcium_D	na	na	na	na	na	na	69	99	110	110	110	110
Chloride	na	na	na	na	na	na	0.48	0.48	0.51	0.58	0.82	1.1
Chromium_D	na	na	na	na	na	na	0.00023	0.00033	0.00036	0.00035	0.00036	0.00036
Chromium_D_Hex	na	na	na	na	na	na	0.00023	0.00033	0.00036	0.00035	0.00036	0.00036
Chromium_T	na	na	na	na	na	na	0.00034	0.00058	0.00072	0.00069	0.00073	0.00074
Cobalt_D	na	na	na	na	na	na	0.00015	0.00015	0.00015	0.00016	0.00017	0.00022
Cobalt_T	na	na	na	na	na	na	0.00020	0.00020	0.00020	0.00020	0.00022	0.00026
Copper_D	na	na	na	na	na	na	0.00087	0.00087	0.00089	0.00091	0.00097	0.0014
Copper_T	na	na	na	na	na	na	0.00093	0.00093	0.00094	0.00097	0.0010	0.0014
Cyanide_F	na	na	na	na	na	na	0.00036	0.00036	0.00036	0.00039	0.00049	0.00069
Cyanide_T	na	na	na	na	na	na	0.00047	0.00047	0.00048	0.00050	0.00058	0.00070
Cyanide_WAD	na	na	na	na	na	na	0.00035	0.00035	0.00035	0.00039	0.00048	0.00068
Fluoride	na	na	na	na	na	na	0.14	0.15	0.18	0.27	0.57	0.89
Hardness	na	na	na	na	na	na	130	130	140	150	180	210
Iron_D	na	na	na	na	na	na	0.23	0.23	0.23	0.24	0.28	0.32
Iron_T	na	na	na	na	na	na	0.24	0.24	0.24	0.26	0.30	0.35
Lead_D	na	na	na	na	na	na	0.000079	0.00012	0.00014	0.00013	0.00014	0.00014
Lead_T	na	na	na	na	na	na	0.00010	0.00016	0.00020	0.00019	0.00020	0.00020
Magnesium_D	na	na	na	na	na	na	14	18	18	18	18	19
Manganese_D	na	na	na	na	na	na	0.037	0.037	0.038	0.049	0.082	0.17
Manganese_T	na	na	na	na	na	na	0.041	0.041	0.042	0.053	0.086	0.18
Mercury_D	na	na	na	na	na	na	0.0000015	0.0000021	0.0000023	0.0000023	0.0000023	0.0000023
Mercury_T	na	na	na	na	na	na	0.0000016	0.0000023	0.0000025	0.0000024	0.0000025	0.0000025
Molybdenum_D	na	na	na	na	na	na	0.0043	0.0071	0.0087	0.0083	0.0089	0.0089
Molybdenum_T	na	na	na	na	na	na	0.0043	0.0071	0.0087	0.0083	0.0089	0.0089
N_Ammonia	na	na	na	na	na	na	0.056	0.056	0.058	0.065	0.090	0.13
N_Nitrate_Nitrite	na	na	na	na	na	na	0.047	0.048	0.062	0.11	0.28	0.50
N_Nitrite	na	na	na	na	na	na	0.058	0.092	0.10	0.100	0.10	0.10
Nickel_D	na	na	na	na	na	na	0.00065	0.00070	0.00071	0.00072	0.00075	0.00085
Nickel_T	na	na	na	na	na	na	0.00073	0.00086	0.00087	0.00087	0.00090	0.00097
Phosphorus_T	na	na	na	na	na	na	0.00058	0.00059	0.00070	0.00073	0.00082	0.0065
Potassium_D	na	na	na	na	na	na	12	22	29	28	30	30
Proton	na	na	na	na	na	na	0.0011	0.0026	0.0037	0.0035	0.0039	0.0039
Radium_226	na	na	na	na	na	na	0.0024	0.0024	0.0025	0.0028	0.0026	0.021
Selenium_D	na	na	na	na	na	na	0.00026	0.00037	0.00039	0.00039	0.00039	0.00039
Selenium_T	na	na	na	na	na	na	0.00026	0.00037	0.00039	0.00039	0.00040	0.00040
Silicon_D	na	na	na	na	na	na	7.6	9.1	9.1	9.2	9.6	10.0
Silicon_T	na	na	na	na	na	na	7.6	9.2	9.2	9.3	9.6	10
Silver_D	na	na	na	na	na	na	0.000011	0.000016	0.000018	0.000018	0.000019	0.000019
Silver_T	na	na	na	na	na	na	0.000011	0.000016	0.000019	0.000018	0.000019	0.000019
Sodium_D	na	na	na	na	na	na	21	35	44	42	45	45
Sodium_T	na	na	na	na	na	na	21	36	44	42	45	45
Strontium_D	na	na	na	na	na	na	0.20	0.31	0.36	0.35	0.37	0.37
Strontium_T	na	na	na	na	na	na	0.20	0.31	0.36	0.35	0.37	0.37
Sulfate	na	na	na	na	na	na	13	13	15	18	29	42
Thallium_D	na	na	na	na	na	na	0.000062	0.00010	0.00013	0.00012	0.00013	0.00013
Thallium_T	na	na	na	na	na	na	0.000064	0.00011	0.00014	0.00013	0.00014	0.00014
TSS	na	na	na	na	na	na	11	15	15	15	15	15
Uranium_D	na	na	na	na	na	na	0.0029	0.0033	0.0033	0.0033	0.0035	0.0038
Uranium_T	na	na	na	na	na	na	0.0029	0.0033	0.0033	0.0033	0.0035	0.0038
Vanadium_T	na	na	na	na	na	na	0.00049	0.00078	0.00093	0.00090	0.00095	0.00095
Zinc_D	na	na	na	na	na	na	0.0016	0.0016	0.0016	0.0018	0.0021	0.0033
Zinc_T	na	na	na	na	na	na	0.0019	0.0019	0.0019	0.0021	0.0024	0.0036

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Collection Pond Discharge

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	4.1	4.2	4.4	4.6	5.4	6.0	5.3	6.3	6.9	6.9	7.7	7.7
Alkalinity_T	150	150	180	240	410	590	270	380	420	450	550	580
Aluminum_D	0.0078	0.0081	0.016	0.017	0.028	0.031	0.068	0.070	0.073	0.074	0.082	0.083
Aluminum_T	0.0078	0.0081	0.021	0.023	0.042	0.048	0.086	0.086	0.086	0.086	0.086	0.086
Antimony_D	0.00015	0.00016	0.00059	0.0016	0.0042	0.0074	0.0025	0.0035	0.0039	0.0042	0.0052	0.0054
Antimony_T	0.00015	0.00016	0.00059	0.0016	0.0042	0.0074	0.0025	0.0036	0.0039	0.0042	0.0052	0.0055
Arsenic_D	0.0016	0.0017	0.0042	0.0049	0.0093	0.010	0.018	0.018	0.019	0.019	0.020	0.025
Arsenic_T	0.0016	0.0017	0.0043	0.0050	0.0096	0.011	0.019	0.020	0.021	0.021	0.022	0.026
Barium_D	0.021	0.022	0.030	0.044	0.084	0.13	0.071	0.10	0.11	0.12	0.15	0.15
Barium_T	0.021	0.022	0.030	0.045	0.085	0.13	0.073	0.10	0.11	0.12	0.15	0.16
Beryllium_T	0.000072	0.000073	0.00012	0.00021	0.00046	0.00074	0.00046	0.00065	0.00071	0.00076	0.00094	0.00097
Boron_D	0.013	0.014	0.034	0.079	0.19	0.33	0.15	0.21	0.23	0.25	0.31	0.33
Boron_T	0.013	0.014	0.034	0.079	0.19	0.33	0.15	0.21	0.23	0.25	0.31	0.33
Bromide	0.042	0.045	0.047	0.048	0.053	0.054	0.031	0.036	0.037	0.038	0.040	0.040
Cadmium_D	0.0000072	0.0000074	0.0000100	0.000015	0.000028	0.000043	0.000027	0.000038	0.000042	0.000045	0.000055	0.000057
Cadmium_T	0.0000073	0.0000074	0.000011	0.000017	0.000033	0.000049	0.000043	0.000062	0.000068	0.000071	0.000083	0.000086
Calcium_D	46	47	60	83	150	210	160	230	250	270	340	350
Chloride	0.46	0.49	0.54	0.53	0.56	0.58	0.16	0.18	0.21	0.21	0.24	0.29
Chromium_D	0.00018	0.00018	0.00021	0.00025	0.00039	0.00050	0.00051	0.00070	0.00077	0.00082	0.0010	0.0010
Chromium_D_Hex	0.00018	0.00018	0.00021	0.00025	0.00039	0.00050	0.00051	0.00070	0.00077	0.00082	0.0010	0.0010
Chromium_T	0.00018	0.00018	0.00030	0.00036	0.00064	0.00093	0.0012	0.0018	0.0019	0.0021	0.0025	0.0029
Cobalt_D	0.000080	0.000082	0.00015	0.00024	0.00050	0.00080	0.00061	0.00082	0.00089	0.00094	0.0011	0.0012
Cobalt_T	0.000080	0.000082	0.00017	0.00027	0.00058	0.00092	0.00082	0.0011	0.0012	0.0013	0.0014	0.0017
Copper_D	0.00044	0.00046	0.00096	0.0021	0.0049	0.0083	0.0048	0.0068	0.0074	0.0080	0.010	0.010
Copper_T	0.00044	0.00046	0.00100	0.0021	0.0050	0.0085	0.0051	0.0073	0.0079	0.0086	0.011	0.011
Cyanide_F	0.00050	0.00052	0.00054	0.00056	0.00063	0.00066	0.00053	0.00056	0.00071	0.00069	0.00076	0.00076
Cyanide_T	0.00049	0.00050	0.00053	0.00054	0.00062	0.00065	0.00053	0.00057	0.00073	0.00071	0.00078	0.00078
Cyanide_WAD	0.00049	0.00050	0.00053	0.00054	0.00061	0.00065	0.00053	0.00056	0.00071	0.00069	0.00076	0.00076
Fluoride	0.13	0.13	0.14	0.15	0.18	0.20	0.14	0.15	0.15	0.16	0.17	0.19
Hardness	120	140	150	150	160	160	30	35	37	38	43	48
Iron_D	0.15	0.15	0.18	0.19	0.26	0.27	0.32	0.38	0.42	0.42	0.47	0.47
Iron_T	0.15	0.15	0.27	0.29	0.48	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Lead_D	0.000050	0.000051	0.000074	0.00012	0.00024	0.00038	0.00023	0.00032	0.00035	0.00037	0.00046	0.00048
Lead_T	0.000050	0.000051	0.000087	0.00014	0.00029	0.00045	0.00033	0.00047	0.00052	0.00057	0.00071	0.00081
Magnesium_D	9.9	10	12	16	28	39	23	33	35	38	47	50
Manganese_D	0.053	0.055	0.059	0.064	0.084	0.094	0.048	0.058	0.069	0.082	0.13	0.18
Manganese_T	0.054	0.055	0.062	0.067	0.089	0.10	0.073	0.086	0.094	0.11	0.16	0.22
Mercury_D	0.0000011	0.0000012	0.0000015	0.0000020	0.0000035	0.0000050	0.0000033	0.0000044	0.0000048	0.0000052	0.0000065	0.0000066
Mercury_T	0.0000011	0.0000012	0.0000016	0.0000020	0.0000036	0.0000053	0.0000034	0.0000046	0.0000051	0.0000057	0.0000073	0.0000080
Molybdenum_D	0.0024	0.0025	0.0042	0.0083	0.019	0.031	0.015	0.022	0.024	0.026	0.032	0.034
Molybdenum_T	0.0024	0.0025	0.0042	0.0083	0.019	0.031	0.015	0.022	0.024	0.026	0.032	0.034
N_Ammonia	0.097	0.14	0.36	0.54	1.3	1.8	0.0075	0.0097	0.013	0.016	0.024	0.037
N_Nitrate_Nitrite	0.51	1.5	6.7	11	29	41	0.017	0.020	0.021	0.021	0.022	0.022
N_Nitrite	0.017	0.027	0.082	0.13	0.32	0.43	0.29	0.41	0.45	0.49	0.61	0.63
Nickel_D	0.00032	0.00032	0.00064	0.0013	0.0030	0.0049	0.0024	0.0034	0.0038	0.0040	0.0050	0.0052
Nickel_T	0.00032	0.00032	0.00071	0.0014	0.0032	0.0053	0.0031	0.0044	0.0048	0.0051	0.0062	0.0067
Phosphorus_T	0.022	0.022	0.023	0.025	0.031	0.032	0.0084	0.0099	0.011	0.011	0.014	0.014
Potassium_D	3.5	3.6	9.4	22	54	93	60	85	93	100	130	130
Proton	0.000000030	0.000000031	0.000000044	0.000000055	0.00000010	0.00000012	0.0081	0.012	0.013	0.014	0.017	0.018
Radium_226	0.021	0.024	0.027	0.026	0.028	0.028	0.0027	0.0031	0.0036	0.0039	0.0049	0.0058
Selenium_D	0.00011	0.00011	0.00030	0.00072	0.0018	0.0031	0.0013	0.0018	0.0019	0.0021	0.0026	0.0027
Selenium_T	0.00011	0.00011	0.00030	0.00072	0.0018	0.0031	0.0013	0.0018	0.0020	0.0021	0.0027	0.0028
Silicon_D	6.8	6.9	7.8	9.2	14	17	9.7	13	14	14	16	18
Silicon_T	6.8	6.9	7.8	9.2	14	17	9.8	13	14	15	17	18
Silver_D	0.0000074	0.0000076	0.000011	0.000015	0.000029	0.000044	0.000028	0.000039	0.000043	0.000047	0.000060	0.000061
Silver_T	0.0000074	0.0000076	0.000011	0.000015	0.000030	0.000044	0.000028	0.000040	0.000044	0.000048	0.000061	0.000061
Sodium_D	9.4	9.7	22	51	120	210	84	120	130	140	180	180
Sodium_T	9.4	9.7	22	51	120	210	84	120	130	140	180	190
Strontium_D	0.10	0.10	0.15	0.25	0.52	0.81	0.63	0.89	0.97	1.0	1.3	1.4
Strontium_T	0.10	0.10	0.15	0.25	0.52	0.81	0.63	0.89	0.97	1.0	1.3	1.4
Sulfate	23	24	67	150	370	620	1.5	1.6	1.7	2.4	3.6	5.2
Thallium_D	0.000029	0.000030	0.000055	0.00011	0.00024	0.00039	0.00024	0.00034	0.00037	0.00040	0.00050	0.00052
Thallium_T	0.000029	0.000030	0.000057	0.00011	0.00024	0.00040	0.00026	0.00037	0.00040	0.00043	0.00053	0.00055
TSS	12	13	15	14	15	15	8.9	9.9	12	12	15	15
Uranium_D	0.0015	0.0015	0.0030	0.0065	0.015	0.026	0.011	0.015	0.017	0.018	0.023	0.024
Uranium_T	0.0015	0.0015	0.0030	0.0065	0.015	0.026	0.011	0.015	0.017	0.018	0.023	0.024
Vanadium_T	0.00029	0.00029	0.00053	0.00093	0.0020	0.0033	0.0016	0.0022	0.0024	0.0026	0.0032	0.0037
Zinc_D	0.0024	0.0024	0.0028	0.0035	0.0056	0.0076	0.0035	0.0048	0.0053	0.0057	0.0070	0.0073
Zinc_T	0.0024	0.0024	0.0030	0.0037	0.0061	0.0083	0.0051	0.0069	0.0076	0.0079	0.0089	0.010

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Gordon Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	1.1	1.7	5.8	5.3	8.4	9.9	3.9	4.6	6.7	7.2	9.5	10
Alkalinity_T	50	51	65	66	79	89	51	52	53	66	79	90
Aluminum_D	0.00014	0.00022	0.0011	0.0035	0.010	0.015	0.0053	0.0055	0.0093	0.0096	0.015	0.017
Aluminum_T	0.00019	0.00037	0.0042	0.014	0.045	0.057	0.019	0.020	0.030	0.034	0.057	0.058
Antimony_D	0.000024	0.000029	0.000058	0.000053	0.000067	0.000081	0.000064	0.000074	0.000079	0.000086	0.00010	0.00011
Antimony_T	0.000034	0.000037	0.000069	0.000065	0.000084	0.00010	0.000068	0.000077	0.000086	0.000092	0.00011	0.00012
Arsenic_D	0.00016	0.00017	0.00025	0.00024	0.00029	0.00035	0.00027	0.00031	0.00033	0.00036	0.00043	0.00043
Arsenic_T	0.00018	0.00019	0.00030	0.00028	0.00033	0.00040	0.00029	0.00033	0.00035	0.00039	0.00047	0.00047
Barium_D	0.0063	0.0074	0.011	0.011	0.015	0.017	0.0090	0.0097	0.011	0.013	0.016	0.018
Barium_T	0.0082	0.0090	0.012	0.013	0.016	0.018	0.010	0.011	0.012	0.014	0.017	0.019
Beryllium_T	0.000027	0.000033	0.000066	0.000060	0.000079	0.000095	0.000066	0.000076	0.000085	0.000090	0.00011	0.00012
Boron_D	0.0020	0.0022	0.0066	0.0077	0.014	0.016	0.0042	0.0045	0.0085	0.0095	0.015	0.016
Boron_T	0.0031	0.0038	0.011	0.011	0.019	0.021	0.0058	0.0064	0.011	0.013	0.019	0.021
Bromide	0.012	0.014	0.029	0.028	0.039	0.042	0.030	0.036	0.040	0.041	0.047	0.052
Cadmium_D	0.00000013	0.00000018	0.00000082	0.00000070	0.0000011	0.0000012	0.0000014	0.0000016	0.0000019	0.0000020	0.0000023	0.0000027
Cadmium_T	0.00000017	0.00000029	0.0000022	0.0000021	0.0000038	0.0000040	0.0000036	0.0000042	0.0000051	0.0000050	0.0000056	0.0000069
Calcium_D	8.5	11	13	13	16	18	14	15	16	18	22	24
Chloride	0.014	0.022	0.064	0.088	0.21	0.25	0.13	0.13	0.22	0.21	0.29	0.36
Chromium_D	0.0000045	0.0000053	0.0000097	0.000020	0.000062	0.000073	0.000041	0.000043	0.000050	0.000057	0.000075	0.000098
Chromium_D_Hex	0.0000045	0.0000062	0.0000099	0.000022	0.000068	0.000078	0.000043	0.000044	0.000052	0.000059	0.000080	0.00010
Chromium_T	0.000051	0.000066	0.00015	0.00014	0.00020	0.00025	0.00021	0.00022	0.00026	0.00028	0.00033	0.00037
Cobalt_D	0.000021	0.000034	0.00011	0.00010	0.00016	0.00019	0.000085	0.00010	0.00014	0.00015	0.00020	0.00022
Cobalt_T	0.000024	0.000038	0.00012	0.00011	0.00017	0.00021	0.000096	0.00011	0.00016	0.00017	0.00023	0.00025
Copper_D	0.0000071	0.0000093	0.000036	0.000043	0.000089	0.000096	0.000081	0.00010	0.00012	0.00012	0.00014	0.00014
Copper_T	0.000023	0.000033	0.000092	0.000086	0.00013	0.00016	0.00015	0.00016	0.00020	0.00021	0.00027	0.00029
Cyanide_F	0.000023	0.000036	0.00027	0.00033	0.00064	0.00067	0.00047	0.00052	0.00078	0.00080	0.00097	0.0012
Cyanide_T	0.00012	0.00014	0.00038	0.00035	0.00051	0.00055	0.00053	0.00060	0.00069	0.00074	0.00089	0.00096
Cyanide_WAD	0.000025	0.000036	0.00024	0.00025	0.00044	0.00046	0.00037	0.00046	0.00057	0.00058	0.00067	0.00084
Fluoride	0.039	0.042	0.052	0.053	0.065	0.069	0.042	0.044	0.048	0.055	0.067	0.072
Hardness	26	32	41	41	51	58	46	46	52	60	71	79
Iron_D	0.084	0.14	0.23	0.24	0.39	0.46	0.30	0.36	0.44	0.44	0.52	0.53
Iron_T	0.19	0.28	1.1	0.98	1.5	1.8	0.59	0.70	1.1	1.3	1.8	2.2
Lead_D	0.00000061	0.00000089	0.0000038	0.0000034	0.0000050	0.0000057	0.0000073	0.0000082	0.000010	0.000011	0.000013	0.000015
Lead_T	0.000013	0.000014	0.000046	0.000044	0.000078	0.000082	0.000055	0.000061	0.000100	0.000096	0.00012	0.00013
Magnesium_D	1.3	1.6	1.9	2.1	2.7	3.2	2.6	2.7	2.8	3.5	4.2	4.8
Manganese_D	0.021	0.048	0.62	0.54	0.93	0.98	0.20	0.26	0.56	0.70	1.1	1.2
Manganese_T	0.058	0.12	0.69	0.61	1.0	1.0	0.24	0.31	0.62	0.77	1.2	1.3
Mercury_D	0.00000015	0.00000018	0.00000042	0.00000049	0.00000093	0.00000099	0.00000091	0.00000094	0.0000011	0.0000011	0.0000012	0.0000013
Mercury_T	0.00000057	0.00000093	0.0000014	0.0000014	0.0000020	0.0000022	0.0000014	0.0000017	0.0000021	0.0000020	0.0000022	0.0000024
Molybdenum_D	0.0000096	0.000013	0.000023	0.000024	0.000042	0.000044	0.000049	0.000050	0.000056	0.000071	0.000089	0.000100
Molybdenum_T	0.000010	0.000014	0.000027	0.000029	0.000049	0.000054	0.000056	0.000059	0.000068	0.000082	0.00011	0.00011
N_Ammonia	0.017	0.033	0.065	0.062	0.087	0.096	0.037	0.046	0.060	0.077	0.11	0.11
N_Nitrate_Nitrite	0.0017	0.0027	0.016	0.016	0.032	0.033	0.022	0.026	0.030	0.032	0.039	0.048
N_Nitrite	0.00073	0.0011	0.0052	0.0050	0.0089	0.010	0.0084	0.0094	0.011	0.011	0.013	0.016
Nickel_D	0.000019	0.000024	0.000050	0.000046	0.000068	0.000073	0.000091	0.000093	0.00011	0.00013	0.00016	0.00017
Nickel_T	0.000027	0.000034	0.00012	0.00012	0.00023	0.00024	0.00015	0.00017	0.00029	0.00028	0.00035	0.00041
Phosphorus_T	0.0018	0.0024	0.0076	0.010	0.027	0.027	0.017	0.017	0.021	0.023	0.033	0.035
Potassium_D	0.40	0.43	0.60	0.56	0.66	0.79	0.65	0.68	0.78	0.85	0.96	1.1
Proton	0.0000000015	0.0000000017	0.0000000043	0.0000000067	0.000000015	0.000000019	0.000000017	0.000000017	0.000000020	0.000000021	0.000000027	0.000000027
Radium_226	0.00028	0.00038	0.0012	0.0011	0.0016	0.0020	0.0019	0.0021	0.0026	0.0027	0.0034	0.0037
Selenium_D	0.0000020	0.0000026	0.000018	0.000037	0.00011	0.00013	0.000053	0.000056	0.000077	0.000087	0.00014	0.00014
Selenium_T	0.0000020	0.0000027	0.000018	0.000037	0.00011	0.00013	0.000054	0.000057	0.000078	0.000088	0.00014	0.00014
Silicon_D	0.93	1.1	1.5	1.5	2.0	2.3	2.3	2.4	2.6	2.9	3.4	3.7
Silicon_T	0.95	1.1	1.5	1.6	2.0	2.3	2.3	2.4	2.6	2.9	3.5	3.7
Silver_D	0.00000011	0.00000015	0.0000015	0.0000035	0.000011	0.000013	0.0000049	0.0000052	0.0000075	0.0000085	0.000014	0.000014
Silver_T	0.00000014	0.00000020	0.0000017	0.0000036	0.000011	0.000013	0.0000051	0.0000055	0.0000077	0.0000087	0.000014	0.000014
Sodium_D	0.33	0.41	0.65	0.66	0.98	1.1	0.89	0.92	1.0	1.2	1.5	1.7
Sodium_T	0.34	0.42	0.66	0.67	1.00	1.1	0.90	0.93	1.1	1.3	1.6	1.7
Strontium_D	0.0081	0.0096	0.014	0.014	0.019	0.021	0.019	0.019	0.021	0.025	0.030	0.034
Strontium_T	0.016	0.018	0.024	0.026	0.035	0.038	0.023	0.024	0.026	0.032	0.039	0.044
Sulfate	0.053	0.068	0.12	0.13	0.23	0.23	0.31	0.32	0.37	0.47	0.60	0.68
Thallium_D	0.000012	0.000014	0.000028	0.000026	0.000033	0.000040	0.000031	0.000036	0.000039	0.000042	0.000050	0.000054
Thallium_T	0.000017	0.000018	0.000034	0.000032	0.000041	0.000050	0.000033	0.000038	0.000042	0.000045	0.000054	0.000058
TSS	0.72	0.91	1.3	1.5	2.1	2.7	2.7	2.8	3.7	3.5	4.2	4.3
Uranium_D	0.00000021	0.00000028	0.0000014	0.0000012	0.0000017	0.0000020	0.0000029	0.0000032	0.0000041	0.0000042	0.0000053	0.0000058
Uranium_T	0.00000022	0.00000031	0.0000015	0.0000013	0.0000020	0.0000024	0.0000032	0.0000035	0.0000046	0.0000048	0.0000060	0.0000066
Vanadium_T	0.000016	0.000025	0.00011	0.00010	0.00021	0.00024	0.00016	0.00018	0.00023	0.00024	0.00030	0.00037
Zinc_D	0.000046	0.000064	0.00019	0.00019	0.00034	0.00041	0.00034	0.00036	0.00058	0.00056	0.00068	0.00071
Zinc_T	0.000055	0.000077	0.00024	0.00026	0.00049	0.00060	0.00043	0.00046	0.00077	0.00075	0.00090	0.00098

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Farley Lake West

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	1.1	1.5	6.7	6.3	10	11	1.8	2.2	7.0	7.2	11	14
Alkalinity_T	68	85	130	130	150	170	81	84	110	120	170	180
Aluminum_D	0.00038	0.00041	0.0010	0.0031	0.0094	0.012	0.0012	0.0014	0.0023	0.0045	0.0098	0.013
Aluminum_T	0.00068	0.00072	0.0017	0.0048	0.013	0.019	0.0021	0.0024	0.0038	0.0069	0.014	0.020
Antimony_D	0.000098	0.00011	0.00033	0.00045	0.0011	0.0014	0.000097	0.00022	0.00026	0.00027	0.00035	0.00039
Antimony_T	0.00014	0.00016	0.00042	0.00053	0.0012	0.0014	0.00013	0.00024	0.00032	0.00032	0.00046	0.00051
Arsenic_D	0.00092	0.0012	0.0020	0.0021	0.0028	0.0039	0.00073	0.00076	0.0016	0.0014	0.0021	0.0032
Arsenic_T	0.00094	0.0012	0.0021	0.0021	0.0029	0.0040	0.00077	0.00080	0.0017	0.0014	0.0022	0.0032
Barium_D	0.013	0.015	0.024	0.023	0.030	0.033	0.015	0.017	0.023	0.024	0.034	0.036
Barium_T	0.014	0.016	0.025	0.025	0.030	0.034	0.016	0.017	0.024	0.025	0.036	0.037
Beryllium_T	0.000048	0.000053	0.000079	0.000091	0.00015	0.00017	0.000075	0.000095	0.00010	0.00011	0.00013	0.00013
Boron_D	0.012	0.013	0.025	0.030	0.057	0.068	0.016	0.021	0.028	0.029	0.041	0.045
Boron_T	0.012	0.013	0.026	0.031	0.057	0.068	0.016	0.021	0.029	0.029	0.042	0.046
Bromide	0.027	0.029	0.038	0.038	0.043	0.048	0.029	0.033	0.040	0.039	0.045	0.054
Cadmium_D	0.00000090	0.0000011	0.0000021	0.0000028	0.0000065	0.0000098	0.0000017	0.0000020	0.0000023	0.0000026	0.0000038	0.0000049
Cadmium_T	0.0000010	0.0000012	0.0000019	0.0000021	0.0000033	0.0000035	0.0000020	0.0000020	0.0000023	0.0000025	0.0000032	0.0000041
Calcium_D	27	31	49	47	57	59	35	38	51	54	75	79
Chloride	0.40	0.41	0.52	0.52	0.65	0.67	0.43	0.44	0.62	0.57	0.71	0.92
Chromium_D	0.000013	0.000016	0.000032	0.000033	0.000055	0.000074	0.000034	0.000045	0.000050	0.000054	0.000066	0.000077
Chromium_D_Hex	0.000058	0.000080	0.00012	0.00013	0.00020	0.00025	0.000094	0.00013	0.00017	0.00017	0.00022	0.00023
Chromium_T	0.000028	0.000048	0.000086	0.000084	0.00011	0.00013	0.000059	0.000097	0.00015	0.00015	0.00020	0.00020
Cobalt_D	0.000030	0.000036	0.000049	0.000051	0.000070	0.000080	0.000045	0.000047	0.000057	0.000062	0.000079	0.000088
Cobalt_T	0.000031	0.000039	0.000058	0.000057	0.000072	0.000080	0.000047	0.000050	0.000065	0.000073	0.000100	0.00011
Copper_D	0.000096	0.00011	0.00022	0.00034	0.00082	0.0011	0.00011	0.00018	0.00023	0.00022	0.00026	0.00037
Copper_T	0.00012	0.00026	0.00045	0.00056	0.0010	0.0016	0.00018	0.00023	0.00041	0.00040	0.00061	0.00084
Cyanide_F	0.000048	0.000060	0.00010	0.00012	0.00020	0.00021	0.00010	0.00012	0.00018	0.00017	0.00024	0.00026
Cyanide_T	0.00017	0.00019	0.00030	0.00030	0.00039	0.00041	0.00026	0.00026	0.00042	0.00039	0.00046	0.00053
Cyanide_WAD	0.000074	0.000089	0.00015	0.00018	0.00030	0.00033	0.00013	0.00016	0.00024	0.00024	0.00033	0.00037
Fluoride	0.066	0.075	0.096	0.095	0.12	0.12	0.070	0.076	0.11	0.13	0.21	0.47
Hardness	92	96	120	130	170	170	98	100	130	130	170	200
Iron_D	0.011	0.016	0.029	0.041	0.095	0.12	0.026	0.037	0.054	0.066	0.12	0.16
Iron_T	0.011	0.012	0.020	0.040	0.11	0.16	0.025	0.029	0.035	0.058	0.14	0.18
Lead_D	0.0000034	0.0000041	0.0000064	0.0000078	0.000014	0.000016	0.0000072	0.000010	0.000011	0.000012	0.000013	0.000014
Lead_T	0.0000054	0.0000061	0.000022	0.000033	0.000082	0.00010	0.000018	0.000022	0.000035	0.000039	0.000063	0.000073
Magnesium_D	7.8	8.4	13	12	14	14	9.6	9.9	11	13	17	17
Manganese_D	0.050	0.068	0.20	0.22	0.39	0.43	0.083	0.097	0.19	0.25	0.42	0.56
Manganese_T	0.077	0.10	0.25	0.25	0.40	0.44	0.11	0.13	0.27	0.28	0.43	0.57
Mercury_D	0.00000024	0.00000028	0.00000069	0.00000080	0.0000015	0.0000019	0.00000066	0.00000070	0.00000096	0.0000010	0.0000014	0.0000016
Mercury_T	0.00000037	0.00000041	0.00000059	0.00000099	0.0000022	0.0000025	0.00000080	0.00000088	0.00000094	0.0000013	0.0000022	0.0000024
Molybdenum_D	0.00033	0.00040	0.00087	0.0011	0.0024	0.0026	0.00030	0.00088	0.0013	0.0013	0.0019	0.0021
Molybdenum_T	0.00034	0.00040	0.00087	0.0011	0.0023	0.0027	0.00031	0.00089	0.0013	0.0013	0.0019	0.0021
N_Ammonia	0.033	0.043	0.11	0.11	0.19	0.24	0.014	0.015	0.039	0.044	0.074	0.10
N_Nitrate_Nitrite	0.49	0.99	2.1	2.6	4.8	5.6	0.027	0.030	0.060	0.066	0.11	0.26
N_Nitrite	0.00067	0.0012	0.012	0.025	0.067	0.094	0.0041	0.0052	0.016	0.022	0.043	0.049
Nickel_D	0.00029	0.00035	0.00053	0.00059	0.00098	0.0012	0.00035	0.00035	0.00045	0.00045	0.00056	0.00063
Nickel_T	0.00035	0.00039	0.00062	0.00069	0.0011	0.0012	0.00042	0.00042	0.00053	0.00056	0.00072	0.00077
Phosphorus_T	0.00024	0.00035	0.0053	0.0063	0.017	0.021	0.00099	0.0013	0.0064	0.0069	0.016	0.021
Potassium_D	3.1	3.5	6.9	8.3	16	19	4.2	6.9	9.7	9.9	15	17
Proton	0.0000000090	0.000000012	0.000000044	0.000000042	0.000000065	0.000000069	0.000061	0.00026	0.00062	0.00074	0.0015	0.0018
Radium_226	0.0023	0.0028	0.0035	0.0035	0.0041	0.0043	0.0015	0.0017	0.0019	0.0019	0.0022	0.0041
Selenium_D	0.000028	0.000070	0.00017	0.00016	0.00024	0.00037	0.000050	0.000056	0.00014	0.00016	0.00029	0.00030
Selenium_T	0.000021	0.000025	0.000056	0.000079	0.00017	0.00023	0.000041	0.000055	0.000062	0.000066	0.000080	0.000085
Silicon_D	1.5	2.1	3.5	3.5	4.7	5.3	2.1	2.2	3.6	3.9	5.9	6.4
Silicon_T	1.5	2.2	3.7	3.6	4.9	5.5	2.2	2.3	3.8	4.0	6.1	6.5
Silver_D	0.00000071	0.00000085	0.0000016	0.0000019	0.0000034	0.0000046	0.0000018	0.0000025	0.0000028	0.0000030	0.0000039	0.0000043
Silver_T	0.00000086	0.0000010	0.0000020	0.0000024	0.0000043	0.0000057	0.0000022	0.0000030	0.0000035	0.0000037	0.0000050	0.0000053
Sodium_D	6.4	7.6	16	19	35	42	8.2	11	16	16	24	26
Sodium_T	6.4	7.5	15	18	35	42	8.2	11	16	16	23	26
Strontium_D	0.058	0.067	0.11	0.12	0.17	0.19	0.081	0.10	0.14	0.14	0.21	0.23
Strontium_T	0.059	0.068	0.11	0.12	0.17	0.19	0.082	0.10	0.14	0.14	0.21	0.22
Sulfate	38	47	73	80	130	140	34	38	47	49	61	78
Thallium_D	0.000024	0.000026	0.000039	0.000047	0.000082	0.000098	0.000039	0.000049	0.000055	0.000055	0.000064	0.000068
Thallium_T	0.000027	0.000028	0.000043	0.000051	0.000087	0.00010	0.000042	0.000053	0.000058	0.000059	0.000069	0.000074
TSS	0.25	0.30	0.52	0.49	0.62	0.69	0.80	0.84	1.2	1.2	1.7	1.8
Uranium_D	0.00023	0.00034	0.00073	0.00095	0.0019	0.0025	0.00037	0.00041	0.00064	0.00068	0.0011	0.0013
Uranium_T	0.00022	0.00033	0.00071	0.00095	0.0020	0.0029	0.00029	0.00041	0.00060	0.00065	0.00100	0.0012
Vanadium_T	0.000095	0.00011	0.00017	0.00018	0.00028	0.00031	0.00015	0.00018	0.00020	0.00023	0.00030	0.00030
Zinc_D	0.00024	0.00028	0.00036	0.00045	0.00075	0.0010	0.00034	0.00035	0.00043	0.00044	0.00057	0.00077
Zinc_T	0.00020	0.00030	0.00041	0.00040	0.00050	0.00054	0.00027	0.00031	0.00048	0.00047	0.00059	0.00074

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Farley Lake East

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	1.6	2.1	6.3	6.3	10	11	2.2	2.6	5.4	7.1	11	12
Alkalinity_T	52	60	100	97	120	150	61	64	79	95	130	150
Aluminum_D	0.00015	0.00021	0.00075	0.0021	0.0049	0.0096	0.00024	0.00029	0.00096	0.0023	0.0055	0.010
Aluminum_T	0.0025	0.0034	0.011	0.011	0.019	0.024	0.0039	0.0046	0.013	0.012	0.021	0.024
Antimony_D	0.000069	0.000088	0.00020	0.00030	0.00067	0.00076	0.000074	0.00014	0.00017	0.00018	0.00024	0.00029
Antimony_T	0.00010	0.00015	0.00033	0.00044	0.00095	0.0011	0.00012	0.00020	0.00024	0.00028	0.00039	0.00043
Arsenic_D	0.00063	0.00075	0.0013	0.0013	0.0018	0.0029	0.00047	0.00052	0.00097	0.00090	0.0014	0.0021
Arsenic_T	0.00067	0.00080	0.0013	0.0014	0.0020	0.0032	0.00052	0.00057	0.0010	0.00098	0.0015	0.0022
Barium_D	0.011	0.012	0.022	0.021	0.025	0.031	0.013	0.015	0.017	0.021	0.031	0.032
Barium_T	0.012	0.013	0.023	0.022	0.027	0.033	0.014	0.015	0.018	0.023	0.033	0.034
Beryllium_T	0.000043	0.000048	0.000070	0.000081	0.00013	0.00015	0.000059	0.000075	0.000090	0.000089	0.000096	0.00012
Boron_D	0.0071	0.0094	0.017	0.021	0.036	0.044	0.0094	0.012	0.019	0.020	0.028	0.032
Boron_T	0.010	0.013	0.022	0.026	0.047	0.056	0.014	0.018	0.023	0.025	0.036	0.040
Bromide	0.024	0.029	0.036	0.037	0.042	0.053	0.025	0.031	0.037	0.037	0.043	0.056
Cadmium_D	0.00000039	0.00000045	0.0000016	0.0000019	0.0000043	0.0000079	0.00000056	0.00000062	0.0000016	0.0000016	0.0000031	0.0000045
Cadmium_T	0.0000018	0.0000021	0.0000029	0.0000035	0.0000041	0.000011	0.0000023	0.0000026	0.0000032	0.0000039	0.0000043	0.000011
Calcium_D	19	22	34	33	41	50	25	27	34	38	50	55
Chloride	0.14	0.15	0.35	0.35	0.52	0.57	0.15	0.15	0.37	0.38	0.59	0.74
Chromium_D	0.000011	0.000013	0.000020	0.000027	0.000048	0.000081	0.000020	0.000024	0.000030	0.000037	0.000052	0.000084
Chromium_D_Hex	0.000034	0.000044	0.000061	0.000075	0.00013	0.00020	0.000046	0.000057	0.000083	0.000094	0.00012	0.00019
Chromium_T	0.000057	0.000071	0.000093	0.000096	0.00012	0.00015	0.000082	0.00011	0.00014	0.00014	0.00019	0.00019
Cobalt_D	0.000032	0.000042	0.000056	0.000055	0.000070	0.000079	0.000043	0.000045	0.000055	0.000063	0.000081	0.000092
Cobalt_T	0.000040	0.000050	0.000068	0.000067	0.000083	0.000091	0.000055	0.000058	0.000066	0.000078	0.00010	0.00011
Copper_D	0.000016	0.000020	0.000076	0.00013	0.00034	0.00063	0.000020	0.000029	0.000052	0.000070	0.00013	0.00020
Copper_T	0.00010	0.00011	0.00016	0.00026	0.00051	0.00091	0.00010	0.00012	0.00017	0.00017	0.00021	0.00030
Cyanide_F	0.00011	0.00014	0.00022	0.00025	0.00045	0.00055	0.00017	0.00017	0.00025	0.00029	0.00047	0.00060
Cyanide_T	0.00022	0.00029	0.00038	0.00038	0.00046	0.00070	0.00028	0.00035	0.00044	0.00045	0.00053	0.00080
Cyanide_WAD	0.00014	0.00016	0.00025	0.00027	0.00035	0.00049	0.00019	0.00021	0.00030	0.00031	0.00037	0.00057
Fluoride	0.056	0.062	0.077	0.080	0.10	0.11	0.059	0.068	0.091	0.10	0.16	0.32
Hardness	65	66	92	95	130	130	68	69	93	99	130	150
Iron_D	0.0092	0.014	0.035	0.040	0.078	0.097	0.016	0.023	0.055	0.057	0.095	0.12
Iron_T	0.019	0.022	0.042	0.053	0.11	0.15	0.025	0.030	0.053	0.064	0.12	0.17
Lead_D	0.00000093	0.0000011	0.0000050	0.0000067	0.000016	0.000020	0.0000013	0.0000018	0.0000053	0.0000070	0.000015	0.000017
Lead_T	0.0000015	0.0000020	0.000012	0.000022	0.000056	0.000084	0.0000027	0.0000035	0.000014	0.000022	0.000052	0.000061
Magnesium_D	5.4	5.8	9.0	8.6	10	13	7.0	7.0	7.7	9.4	12	12
Manganese_D	0.035	0.047	0.18	0.22	0.42	0.53	0.044	0.059	0.10	0.24	0.42	0.57
Manganese_T	0.078	0.098	0.22	0.26	0.44	0.55	0.099	0.12	0.20	0.28	0.44	0.58
Mercury_D	0.00000036	0.00000041	0.00000082	0.00000087	0.0000014	0.0000016	0.00000070	0.00000076	0.0000011	0.0000010	0.0000013	0.0000013
Mercury_T	0.00000047	0.00000054	0.00000084	0.0000012	0.0000022	0.0000028	0.00000087	0.00000090	0.0000012	0.0000014	0.0000021	0.0000029
Molybdenum_D	0.000096	0.00012	0.00027	0.00043	0.00095	0.0014	0.000089	0.00029	0.00036	0.00040	0.00059	0.00061
Molybdenum_T	0.00014	0.00016	0.00033	0.00050	0.0010	0.0015	0.00013	0.00039	0.00045	0.00049	0.00065	0.00071
N_Ammonia	0.037	0.065	0.13	0.15	0.22	0.33	0.015	0.019	0.070	0.090	0.17	0.24
N_Nitrate_Nitrite	0.098	0.21	0.71	1.0	2.3	2.7	0.013	0.015	0.019	0.023	0.036	0.072
N_Nitrite	0.00066	0.00098	0.0035	0.011	0.030	0.042	0.00086	0.0012	0.0053	0.0088	0.020	0.022
Nickel_D	0.00012	0.00015	0.00021	0.00027	0.00048	0.00053	0.00016	0.00018	0.00020	0.00020	0.00022	0.00027
Nickel_T	0.00016	0.00026	0.00033	0.00040	0.00070	0.00083	0.00021	0.00021	0.00033	0.00032	0.00038	0.00043
Phosphorus_T	0.0019	0.0027	0.0074	0.0079	0.013	0.018	0.0027	0.0035	0.0081	0.0083	0.013	0.017
Potassium_D	2.0	2.7	5.5	6.7	13	14	3.4	5.3	7.2	7.9	12	14
Proton	0.000000020	0.000000025	0.000000061	0.000000057	0.000000083	0.000000092	0.000014	0.00021	0.00050	0.00057	0.0011	0.0014
Radium_226	0.0023	0.0030	0.0040	0.0040	0.0051	0.0061	0.0018	0.0024	0.0026	0.0028	0.0034	0.0056
Selenium_D	0.000034	0.000069	0.00014	0.00014	0.00019	0.00024	0.000050	0.000055	0.00011	0.00014	0.00025	0.00026
Selenium_T	0.000032	0.000035	0.000059	0.000078	0.00015	0.00020	0.000047	0.000054	0.000066	0.000067	0.000079	0.000088
Silicon_D	1.3	1.8	2.9	2.9	4.3	4.5	1.8	1.9	2.9	3.3	5.2	5.6
Silicon_T	1.4	1.9	3.1	3.1	4.5	4.7	1.9	2.0	2.9	3.4	5.4	5.8
Silver_D	0.00000068	0.00000075	0.0000017	0.0000019	0.0000036	0.0000058	0.0000011	0.0000014	0.0000020	0.0000024	0.0000036	0.0000056
Silver_T	0.00000076	0.00000083	0.0000020	0.0000022	0.0000042	0.0000066	0.0000013	0.0000017	0.0000024	0.0000028	0.0000041	0.0000062
Sodium_D	4.6	5.8	13	15	29	32	6.4	8.7	11	13	20	22
Sodium_T	4.5	5.8	12	15	29	32	6.4	8.7	11	13	19	22
Strontium_D	0.040	0.044	0.078	0.081	0.12	0.14	0.056	0.069	0.094	0.098	0.13	0.15
Strontium_T	0.041	0.046	0.081	0.084	0.12	0.15	0.057	0.071	0.095	0.10	0.14	0.15
Sulfate	16	23	40	44	69	80	15	19	24	26	36	41
Thallium_D	0.000022	0.000025	0.000036	0.000042	0.000071	0.000081	0.000031	0.000040	0.000047	0.000047	0.000054	0.000058
Thallium_T	0.000023	0.000027	0.000038	0.000046	0.000075	0.000084	0.000032	0.000042	0.000051	0.000050	0.000059	0.000063
TSS	0.068	0.10	0.26	0.24	0.32	0.45	0.10	0.15	0.36	0.34	0.46	0.62
Uranium_D	0.000036	0.000073	0.00015	0.00018	0.00034	0.00060	0.000057	0.000059	0.00014	0.00013	0.00018	0.00021
Uranium_T	0.000037	0.000081	0.00015	0.00020	0.00039	0.00071	0.000049	0.000066	0.00014	0.00014	0.00019	0.00022
Vanadium_T	0.000081	0.00011	0.00018	0.00018	0.00026	0.00032	0.00013	0.00015	0.00018	0.00022	0.00030	0.00031
Zinc_D	0.00011	0.00013	0.00022	0.00028	0.00055	0.00074	0.00012	0.00013	0.00023	0.00026	0.00044	0.00058
Zinc_T	0.00018	0.00023	0.00045	0.00047	0.00075	0.00083	0.00020	0.00025	0.00048	0.00048	0.00068	0.00088

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Swede Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.4	3.6	4.1	4.2	5.0	5.4	3.7	3.8	4.4	4.5	5.3	5.5
Alkalinity_T	47	48	62	63	79	85	46	58	61	65	74	75
Aluminum_D	0.0049	0.0055	0.0060	0.0060	0.0064	0.0066	0.0050	0.0057	0.0061	0.0060	0.0063	0.0069
Aluminum_T	0.020	0.022	0.025	0.025	0.027	0.029	0.021	0.022	0.025	0.025	0.027	0.030
Antimony_D	0.000081	0.000084	0.00016	0.00018	0.00030	0.00037	0.000076	0.00012	0.00013	0.00014	0.00016	0.00016
Antimony_T	0.00013	0.00014	0.00023	0.00027	0.00044	0.00052	0.00013	0.00018	0.00020	0.00020	0.00023	0.00023
Arsenic_D	0.00049	0.00053	0.00076	0.00076	0.00099	0.0011	0.00042	0.00048	0.00056	0.00057	0.00065	0.00083
Arsenic_T	0.00052	0.00056	0.00081	0.00081	0.0011	0.0012	0.00044	0.00051	0.00060	0.00061	0.00070	0.00088
Barium_D	0.0096	0.0099	0.013	0.013	0.016	0.018	0.0097	0.012	0.013	0.014	0.016	0.016
Barium_T	0.010	0.011	0.014	0.014	0.017	0.018	0.010	0.013	0.014	0.015	0.017	0.017
Beryllium_T	0.000070	0.000072	0.000088	0.000087	0.00010	0.00011	0.000072	0.000081	0.000084	0.000090	0.00010	0.00010
Boron_D	0.0065	0.0068	0.011	0.012	0.019	0.022	0.0066	0.011	0.012	0.012	0.014	0.015
Boron_T	0.0093	0.0096	0.015	0.016	0.024	0.028	0.0094	0.014	0.016	0.016	0.019	0.019
Bromide	0.038	0.038	0.043	0.043	0.049	0.050	0.038	0.038	0.042	0.043	0.048	0.051
Cadmium_D	0.0000028	0.0000030	0.0000035	0.0000035	0.0000039	0.0000042	0.0000028	0.0000030	0.0000032	0.0000033	0.0000036	0.0000037
Cadmium_T	0.0000036	0.0000037	0.0000042	0.0000042	0.0000048	0.0000049	0.0000037	0.0000038	0.0000040	0.0000043	0.0000049	0.0000050
Calcium_D	16	16	20	21	26	28	16	21	23	24	27	28
Chloride	0.28	0.28	0.32	0.33	0.38	0.38	0.28	0.29	0.33	0.34	0.39	0.44
Chromium_D	0.000051	0.000056	0.000061	0.000060	0.000063	0.000065	0.000055	0.000060	0.000065	0.000064	0.000068	0.000068
Chromium_D_Hex	0.000072	0.000079	0.000087	0.000086	0.000092	0.000096	0.000074	0.000088	0.000096	0.000095	0.000099	0.000100
Chromium_T	0.00012	0.00013	0.00013	0.00013	0.00014	0.00015	0.00013	0.00014	0.00015	0.00015	0.00016	0.00016
Cobalt_D	0.000063	0.000064	0.000071	0.000072	0.000081	0.000084	0.000066	0.000066	0.000069	0.000073	0.000083	0.000085
Cobalt_T	0.000068	0.000069	0.000077	0.000078	0.000088	0.000093	0.000072	0.000072	0.000075	0.000080	0.000091	0.000093
Copper_D	0.00022	0.00023	0.00027	0.00028	0.00033	0.00036	0.00022	0.00023	0.00025	0.00025	0.00028	0.00028
Copper_T	0.00047	0.00051	0.00057	0.00058	0.00066	0.00071	0.00047	0.00049	0.00053	0.00053	0.00058	0.00064
Cyanide_F	0.00044	0.00045	0.00054	0.00053	0.00061	0.00064	0.00046	0.00046	0.00052	0.00054	0.00061	0.00066
Cyanide_T	0.00043	0.00044	0.00050	0.00050	0.00057	0.00060	0.00046	0.00046	0.00048	0.00052	0.00058	0.00060
Cyanide_WAD	0.00036	0.00036	0.00042	0.00042	0.00048	0.00050	0.00038	0.00038	0.00041	0.00043	0.00048	0.00051
Fluoride	0.062	0.063	0.071	0.073	0.084	0.086	0.066	0.067	0.081	0.085	0.11	0.15
Hardness	56	57	64	65	75	78	59	60	69	69	78	85
Iron_D	0.035	0.038	0.042	0.042	0.047	0.051	0.042	0.044	0.049	0.048	0.051	0.053
Iron_T	0.066	0.073	0.080	0.080	0.086	0.092	0.072	0.078	0.085	0.083	0.087	0.094
Lead_D	0.000022	0.000022	0.000025	0.000025	0.000027	0.000028	0.000022	0.000022	0.000024	0.000025	0.000027	0.000029
Lead_T	0.000046	0.000047	0.000056	0.000055	0.000060	0.000064	0.000046	0.000048	0.000053	0.000054	0.000060	0.000061
Magnesium_D	4.6	4.8	5.9	5.8	6.9	7.3	4.9	5.6	5.9	6.3	7.2	7.3
Manganese_D	0.060	0.064	0.085	0.086	0.11	0.13	0.070	0.074	0.096	0.096	0.12	0.14
Manganese_T	0.094	0.10	0.12	0.12	0.15	0.17	0.10	0.11	0.13	0.13	0.16	0.17
Mercury_D	0.00000079	0.00000083	0.00000096	0.00000094	0.0000011	0.0000011	0.00000085	0.00000089	0.00000094	0.00000100	0.0000011	0.0000011
Mercury_T	0.0000011	0.0000011	0.0000012	0.0000012	0.0000013	0.0000014	0.0000011	0.0000012	0.0000013	0.0000013	0.0000014	0.0000014
Molybdenum_D	0.00061	0.00066	0.00076	0.00079	0.00093	0.0010	0.00065	0.00074	0.00082	0.00081	0.00086	0.00086
Molybdenum_T	0.00066	0.00072	0.00083	0.00085	0.0010	0.0011	0.00070	0.00081	0.00090	0.00088	0.00094	0.00094
N_Ammonia	0.040	0.046	0.070	0.069	0.092	0.096	0.031	0.032	0.043	0.043	0.053	0.059
N_Nitrate_Nitrite	0.097	0.15	0.68	0.61	0.96	1.0	0.038	0.040	0.046	0.047	0.055	0.067
N_Nitrite	0.0069	0.0077	0.011	0.011	0.015	0.015	0.0071	0.0080	0.0095	0.010	0.012	0.012
Nickel_D	0.00016	0.00017	0.00023	0.00023	0.00031	0.00034	0.00017	0.00018	0.00019	0.00020	0.00023	0.00023
Nickel_T	0.00021	0.00021	0.00029	0.00030	0.00040	0.00044	0.00021	0.00023	0.00025	0.00026	0.00030	0.00031
Phosphorus_T	0.012	0.012	0.014	0.014	0.015	0.016	0.012	0.012	0.014	0.014	0.015	0.017
Potassium_D	1.7	1.7	3.2	3.5	5.7	6.7	1.6	3.5	4.2	4.2	5.0	5.2
Proton	0.000000045	0.000000047	0.000000054	0.000000054	0.000000060	.000000064	0.0000064	0.00018	0.00026	0.00025	0.00029	0.00032
Radium_226	0.0040	0.0040	0.0045	0.0046	0.0052	0.0053	0.0036	0.0037	0.0043	0.0041	0.0046	0.0051
Selenium_D	0.000053	0.000058	0.000073	0.000079	0.00010	0.00012	0.000058	0.000071	0.000079	0.000080	0.000092	0.000095
Selenium_T	0.000040	0.000042	0.000058	0.000062	0.000085	0.000098	0.000042	0.000051	0.000052	0.000057	0.000064	0.000065
Silicon_D	1.4	1.4	1.8	1.8	2.1	2.3	1.4	1.8	1.9	2.0	2.3	2.4
Silicon_T	1.4	1.5	1.9	1.8	2.2	2.4	1.4	1.8	2.0	2.1	2.4	2.5
Silver_D	0.0000042	0.0000045	0.0000049	0.0000049	0.0000051	0.0000053	0.0000043	0.0000047	0.0000051	0.0000050	0.0000053	0.0000055
Silver_T	0.0000043	0.0000047	0.0000051	0.0000050	0.0000053	0.0000055	0.0000045	0.0000049	0.0000053	0.0000052	0.0000055	0.0000057
Sodium_D	3.4	3.5	6.8	7.6	13	15	3.2	6.1	6.9	7.1	8.3	8.6
Sodium_T	3.4	3.4	6.8	7.5	13	15	3.2	6.1	6.9	7.0	8.3	8.6
Strontium_D	0.034	0.034	0.048	0.051	0.069	0.076	0.034	0.054	0.059	0.061	0.071	0.073
Strontium_T	0.035	0.035	0.050	0.052	0.071	0.078	0.035	0.056	0.061	0.063	0.073	0.075
Sulfate	13	14	21	22	32	36	12	12	14	14	17	18
Thallium_D	0.000034	0.000035	0.000043	0.000043	0.000052	0.000056	0.000035	0.000041	0.000042	0.000045	0.000051	0.000051
Thallium_T	0.000035	0.000036	0.000045	0.000045	0.000055	0.000058	0.000036	0.000042	0.000043	0.000047	0.000053	0.000053
TSS	0.87	0.90	1.0	1.0	1.1	1.2	0.93	0.95	1.0	1.0	1.2	1.3
Uranium_D	0.000046	0.000049	0.000092	0.00010	0.00017	0.00020	0.000048	0.000083	0.000091	0.000092	0.00011	0.00011
Uranium_T	0.000047	0.000051	0.00010	0.00011	0.00020	0.00023	0.000048	0.000088	0.000096	0.000097	0.00011	0.00012
Vanadium_T	0.00017	0.00017	0.00020	0.00020	0.00023	0.00025	0.00018	0.00019	0.00022	0.00021	0.00023	0.00024
Zinc_D	0.00071	0.00073	0.00080	0.00079	0.00083	0.00088	0.00070	0.00072	0.00078	0.00077	0.00081	0.00090
Zinc_T	0.0044	0.0045	0.0048	0.0051	0.0063	0.0074	0.0044	0.0045	0.0047	0.0050	0.0061	0.0076

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Ellystan Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	3.9	4.1	5.9	5.6	6.9	7.0	4.1	4.3	5.4	5.7	6.9	7.0
Alkalinity_T	35	37	46	46	57	61	35	43	45	49	56	57
Aluminum_D	0.018	0.020	0.031	0.035	0.053	0.061	0.019	0.021	0.032	0.035	0.052	0.062
Aluminum_T	0.032	0.034	0.044	0.050	0.071	0.080	0.033	0.034	0.045	0.049	0.070	0.080
Antimony_D	0.000050	0.000053	0.000075	0.000084	0.00013	0.00015	0.000048	0.000068	0.000072	0.000075	0.000083	0.000084
Antimony_T	0.000067	0.000072	0.00010	0.00012	0.00018	0.00021	0.000064	0.000093	0.000099	0.00010	0.00011	0.00011
Arsenic_D	0.00033	0.00036	0.00046	0.00046	0.00058	0.00061	0.00028	0.00035	0.00039	0.00039	0.00042	0.00051
Arsenic_T	0.00038	0.00040	0.00053	0.00053	0.00067	0.00072	0.00033	0.00041	0.00047	0.00046	0.00050	0.00060
Barium_D	0.0087	0.0088	0.011	0.011	0.013	0.014	0.0086	0.010	0.011	0.012	0.013	0.013
Barium_T	0.0097	0.010	0.013	0.013	0.016	0.016	0.0097	0.012	0.012	0.013	0.015	0.015
Beryllium_T	0.000070	0.000072	0.000082	0.000081	0.000091	0.000095	0.000070	0.000076	0.000079	0.000084	0.000092	0.000092
Boron_D	0.0060	0.0065	0.0087	0.0093	0.013	0.015	0.0061	0.0088	0.0097	0.010	0.012	0.012
Boron_T	0.010	0.011	0.018	0.018	0.025	0.028	0.010	0.013	0.018	0.019	0.023	0.024
Bromide	0.038	0.039	0.042	0.042	0.046	0.047	0.038	0.038	0.041	0.042	0.046	0.047
Cadmium_D	0.0000031	0.0000032	0.0000036	0.0000036	0.0000040	0.0000041	0.0000031	0.0000032	0.0000034	0.0000035	0.0000038	0.0000039
Cadmium_T	0.0000041	0.0000041	0.0000046	0.0000046	0.0000051	0.0000051	0.0000042	0.0000042	0.0000044	0.0000047	0.0000051	0.0000052
Calcium_D	11	12	14	14	17	19	11	15	15	16	19	19
Chloride	0.31	0.32	0.43	0.41	0.49	0.50	0.32	0.32	0.41	0.42	0.51	0.53
Chromium_D	0.000050	0.000051	0.000058	0.000057	0.000062	0.000064	0.000052	0.000053	0.000060	0.000059	0.000064	0.000065
Chromium_D_Hex	0.000053	0.000055	0.000068	0.000066	0.000076	0.000077	0.000053	0.000059	0.000067	0.000071	0.000082	0.000082
Chromium_T	0.00014	0.00015	0.00015	0.00017	0.00021	0.00023	0.00015	0.00015	0.00016	0.00018	0.00021	0.00023
Cobalt_D	0.000065	0.000067	0.000073	0.000074	0.000080	0.000083	0.000067	0.000069	0.000071	0.000075	0.000081	0.000082
Cobalt_T	0.000077	0.000078	0.000088	0.000088	0.000098	0.00010	0.000079	0.000080	0.000083	0.000089	0.000099	0.000100
Copper_D	0.00017	0.00018	0.00020	0.00020	0.00023	0.00024	0.00017	0.00018	0.00019	0.00019	0.00021	0.00021
Copper_T	0.00030	0.00031	0.00034	0.00034	0.00038	0.00040	0.00030	0.00031	0.00034	0.00033	0.00035	0.00035
Cyanide_F	0.00049	0.00050	0.00058	0.00058	0.00065	0.00066	0.00050	0.00051	0.00056	0.00058	0.00064	0.00067
Cyanide_T	0.00096	0.0010	0.0021	0.0020	0.0028	0.0032	0.00098	0.0011	0.0019	0.0020	0.0028	0.0032
Cyanide_WAD	0.00043	0.00044	0.00052	0.00051	0.00057	0.00058	0.00044	0.00045	0.00050	0.00051	0.00057	0.00059
Fluoride	0.057	0.058	0.064	0.065	0.073	0.075	0.057	0.061	0.072	0.073	0.089	0.11
Hardness	41	41	46	47	53	55	41	43	48	49	55	59
Iron_D	0.054	0.058	0.085	0.081	0.099	0.10	0.058	0.062	0.078	0.084	0.10	0.10
Iron_T	0.13	0.13	0.17	0.17	0.19	0.20	0.13	0.14	0.18	0.17	0.18	0.20
Lead_D	0.000015	0.000016	0.000017	0.000017	0.000019	0.000019	0.000015	0.000016	0.000017	0.000017	0.000019	0.000019
Lead_T	0.000038	0.000041	0.000042	0.000044	0.000052	0.000053	0.000038	0.000041	0.000042	0.000044	0.000052	0.000053
Magnesium_D	3.3	3.3	4.0	4.0	4.7	5.0	3.3	3.8	4.0	4.3	5.0	5.0
Manganese_D	0.060	0.064	0.10	0.096	0.12	0.13	0.066	0.070	0.098	0.10	0.13	0.14
Manganese_T	0.095	0.10	0.16	0.15	0.19	0.20	0.10	0.11	0.14	0.15	0.19	0.21
Mercury_D	0.00000065	0.00000072	0.00000076	0.00000076	0.00000083	0.00000085	0.00000067	0.00000075	0.00000077	0.00000078	0.00000085	0.00000087
Mercury_T	0.00000085	0.00000090	0.00000095	0.00000097	0.0000011	0.0000011	0.00000088	0.00000093	0.00000097	0.00000099	0.0000011	0.0000011
Molybdenum_D	0.00032	0.00033	0.00039	0.00039	0.00046	0.00049	0.00032	0.00037	0.00039	0.00041	0.00045	0.00045
Molybdenum_T	0.00034	0.00036	0.00042	0.00042	0.00050	0.00054	0.00035	0.00040	0.00043	0.00044	0.00048	0.00048
N_Ammonia	0.019	0.021	0.045	0.042	0.062	0.064	0.018	0.018	0.034	0.033	0.045	0.046
N_Nitrate_Nitrite	0.099	0.11	0.43	0.39	0.65	0.68	0.054	0.057	0.092	0.089	0.11	0.12
N_Nitrite	0.0042	0.0046	0.0061	0.0061	0.0081	0.0083	0.0042	0.0048	0.0057	0.0059	0.0072	0.0072
Nickel_D	0.00016	0.00017	0.00020	0.00020	0.00024	0.00027	0.00016	0.00018	0.00018	0.00019	0.00021	0.00022
Nickel_T	0.00025	0.00027	0.00039	0.00038	0.00049	0.00055	0.00025	0.00027	0.00033	0.00037	0.00045	0.00048
Phosphorus_T	0.0093	0.0098	0.013	0.013	0.017	0.018	0.0093	0.0096	0.013	0.013	0.017	0.018
Potassium_D	1.1	1.2	1.7	1.9	3.0	3.5	1.1	2.2	2.5	2.6	3.0	3.1
Proton	0.000000047	0.000000049	0.000000057	0.000000058	0.000000068	0.000000070	0.0000036	0.00011	0.00016	0.00015	0.00019	0.00019
Radium_226	0.0027	0.0028	0.0031	0.0031	0.0034	0.0034	0.0026	0.0026	0.0029	0.0029	0.0032	0.0034
Selenium_D	0.000085	0.000097	0.00016	0.00015	0.00021	0.00024	0.000087	0.00010	0.00014	0.00015	0.00020	0.00022
Selenium_T	0.000076	0.000087	0.00015	0.00014	0.00020	0.00022	0.000077	0.000088	0.00012	0.00014	0.00018	0.00020
Silicon_D	0.90	0.94	1.1	1.1	1.3	1.4	0.88	1.1	1.3	1.3	1.4	1.5
Silicon_T	1.0	1.1	1.3	1.3	1.5	1.6	1.0	1.3	1.4	1.4	1.6	1.6
Silver_D	0.0000071	0.0000075	0.000011	0.000011	0.000014	0.000015	0.0000072	0.0000077	0.0000100	0.000011	0.000014	0.000016
Silver_T	0.0000072	0.0000076	0.000011	0.000011	0.000014	0.000016	0.0000073	0.0000078	0.000010	0.000011	0.000014	0.000016
Sodium_D	2.2	2.3	3.6	4.1	6.5	7.8	2.1	3.8	4.2	4.4	5.1	5.2
Sodium_T	2.3	2.4	3.7	4.2	6.8	8.1	2.2	3.9	4.4	4.5	5.3	5.4
Strontium_D	0.023	0.024	0.031	0.032	0.042	0.046	0.023	0.035	0.037	0.039	0.045	0.046
Strontium_T	0.026	0.027	0.034	0.035	0.046	0.050	0.026	0.038	0.041	0.043	0.050	0.051
Sulfate	6.6	6.7	8.8	9.7	14	16	6.3	6.3	7.1	7.1	8.0	8.7
Thallium_D	0.000034	0.000035	0.000040	0.000039	0.000045	0.000047	0.000034	0.000037	0.000039	0.000041	0.000045	0.000045
Thallium_T	0.000034	0.000036	0.000041	0.000040	0.000046	0.000048	0.000034	0.000038	0.000040	0.000042	0.000046	0.000046
TSS	3.0	3.3	6.3	6.0	8.4	9.5	3.0	3.3	5.6	6.0	8.3	9.6
Uranium_D	0.000036	0.000041	0.000057	0.000065	0.00010	0.00012	0.000038	0.000061	0.000065	0.000066	0.000072	0.000074
Uranium_T	0.000038	0.000043	0.000061	0.000071	0.00011	0.00013	0.000038	0.000064	0.000069	0.000070	0.000076	0.000079
Vanadium_T	0.00023	0.00025	0.00036	0.00035	0.00045	0.00050	0.00024	0.00026	0.00032	0.00036	0.00045	0.00049
Zinc_D	0.00022	0.00024	0.00035	0.00036	0.00049	0.00050	0.00022	0.00023	0.00032	0.00035	0.00048	0.00051
Zinc_T	0.00088	0.00094	0.0013	0.0013	0.0018	0.0018	0.00088	0.00094	0.0013	0.0013	0.0017	0.0018

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Simpson Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	2.6	2.7	3.3	3.4	4.1	4.6	2.6	2.7	2.8	3.4	4.1	4.6
Alkalinity_T	31	31	38	38	45	51	31	32	32	40	47	53
Aluminum_D	0.0070	0.0076	0.0090	0.0091	0.011	0.011	0.0071	0.0077	0.0082	0.0091	0.011	0.011
Aluminum_T	0.031	0.033	0.040	0.040	0.049	0.051	0.031	0.033	0.035	0.040	0.049	0.051
Antimony_D	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000097	0.00010	0.00010	0.00012	0.00015	0.00016
Antimony_T	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000097	0.00010	0.00010	0.00012	0.00015	0.00016
Arsenic_D	0.00026	0.00026	0.00033	0.00033	0.00039	0.00044	0.00030	0.00030	0.00031	0.00038	0.00045	0.00050
Arsenic_T	0.00027	0.00027	0.00034	0.00035	0.00041	0.00046	0.00031	0.00031	0.00032	0.00039	0.00046	0.00052
Barium_D	0.0064	0.0064	0.0079	0.0080	0.0093	0.011	0.0066	0.0067	0.0067	0.0083	0.0098	0.011
Barium_T	0.0068	0.0069	0.0085	0.0086	0.010	0.011	0.0071	0.0072	0.0073	0.0089	0.010	0.012
Beryllium_T	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000090	0.000092	0.000094	0.00011	0.00013	0.00015
Boron_D	0.0050	0.0050	0.0061	0.0062	0.0073	0.0083	0.0055	0.0056	0.0058	0.0070	0.0084	0.0094
Boron_T	0.0096	0.0098	0.013	0.013	0.017	0.019	0.010	0.010	0.012	0.014	0.018	0.020
Bromide	0.044	0.045	0.055	0.056	0.066	0.073	0.044	0.045	0.046	0.056	0.066	0.073
Cadmium_D	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000046	0.0000047	0.0000057	0.0000067	0.0000075
Cadmium_T	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000046	0.0000047	0.0000057	0.0000067	0.0000075
Calcium_D	7.7	7.7	9.5	9.6	11	13	8.2	8.5	8.5	10	12	14
Chloride	0.33	0.33	0.42	0.43	0.52	0.58	0.33	0.33	0.35	0.43	0.52	0.58
Chromium_D	0.000055	0.000056	0.000072	0.000072	0.000086	0.000094	0.000056	0.000058	0.000063	0.000074	0.000088	0.000096
Chromium_D_Hex	0.000055	0.000056	0.000072	0.000072	0.000086	0.000094	0.000056	0.000058	0.000063	0.000074	0.000088	0.000096
Chromium_T	0.000077	0.000077	0.000098	0.000098	0.00012	0.00013	0.000078	0.000078	0.000086	0.00010	0.00012	0.00013
Cobalt_D	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000090	0.000092	0.000094	0.00011	0.00013	0.00015
Cobalt_T	0.000089	0.000090	0.00011	0.00011	0.00013	0.00015	0.000090	0.000092	0.000094	0.00011	0.00013	0.00015
Copper_D	0.00038	0.00038	0.00048	0.00048	0.00057	0.00064	0.00040	0.00041	0.00042	0.00051	0.00060	0.00067
Copper_T	0.00041	0.00041	0.00052	0.00052	0.00061	0.00069	0.00042	0.00043	0.00045	0.00054	0.00064	0.00072
Cyanide_F	0.00068	0.00069	0.00091	0.00090	0.0011	0.0012	0.00068	0.00069	0.00078	0.00090	0.0011	0.0012
Cyanide_T	0.00055	0.00056	0.00070	0.00071	0.00084	0.00095	0.00055	0.00056	0.00057	0.00071	0.00084	0.00094
Cyanide_WAD	0.00050	0.00050	0.00063	0.00064	0.00077	0.00084	0.00050	0.00050	0.00053	0.00064	0.00077	0.00084
Fluoride	0.070	0.070	0.086	0.087	0.10	0.12	0.070	0.070	0.072	0.088	0.10	0.12
Hardness	30	30	37	38	44	50	30	30	31	38	44	50
Iron_D	0.021	0.022	0.026	0.027	0.032	0.034	0.021	0.022	0.023	0.027	0.032	0.034
Iron_T	0.075	0.078	0.097	0.097	0.12	0.13	0.075	0.078	0.085	0.098	0.12	0.13
Lead_D	0.000040	0.000040	0.000050	0.000050	0.000059	0.000066	0.000041	0.000041	0.000042	0.000051	0.000061	0.000067
Lead_T	0.00011	0.00012	0.00014	0.00014	0.00017	0.00018	0.00011	0.00012	0.00013	0.00015	0.00017	0.00018
Magnesium_D	2.7	2.7	3.4	3.4	4.0	4.5	2.8	2.8	2.9	3.5	4.1	4.7
Manganese_D	0.0024	0.0025	0.0030	0.0030	0.0034	0.0036	0.0024	0.0025	0.0028	0.0030	0.0035	0.0037
Manganese_T	0.018	0.018	0.023	0.024	0.029	0.030	0.018	0.018	0.021	0.024	0.029	0.030
Mercury_D	0.00000062	0.00000065	0.00000078	0.00000078	0.00000092	0.0000010	0.00000063	0.00000066	0.00000068	0.00000080	0.00000094	0.0000010
Mercury_T	0.00000063	0.00000066	0.00000078	0.00000079	0.00000093	0.0000010	0.00000063	0.00000067	0.00000068	0.00000080	0.00000094	0.0000010
Molybdenum_D	0.00083	0.00083	0.0010	0.0011	0.0012	0.0014	0.00088	0.00090	0.00093	0.0011	0.0013	0.0015
Molybdenum_T	0.00087	0.00088	0.0011	0.0011	0.0013	0.0015	0.00092	0.00094	0.00097	0.0012	0.0014	0.0016
N_Ammonia	0.0072	0.0072	0.0089	0.0091	0.011	0.012	0.0072	0.0072	0.0074	0.0091	0.011	0.012
N_Nitrate_Nitrite	0.034	0.035	0.044	0.046	0.056	0.063	0.034	0.035	0.038	0.046	0.056	0.063
N_Nitrite	0.0077	0.0080	0.010	0.011	0.013	0.015	0.0086	0.0092	0.010	0.012	0.015	0.017
Nickel_D	0.00018	0.00018	0.00022	0.00022	0.00026	0.00029	0.00019	0.00019	0.00019	0.00024	0.00028	0.00031
Nickel_T	0.00018	0.00018	0.00022	0.00022	0.00026	0.00029	0.00019	0.00019	0.00019	0.00024	0.00028	0.00031
Phosphorus_T	0.015	0.016	0.019	0.020	0.023	0.026	0.015	0.016	0.016	0.020	0.023	0.026
Potassium_D	0.73	0.73	0.90	0.91	1.1	1.2	0.92	0.99	1.0	1.2	1.5	1.6
Proton	0.000000035	0.000000036	0.000000045	0.00000047	0.000000056	0.000000063	0.000025	0.000035	0.000041	0.000045	0.000059	0.000059
Radium_226	0.0047	0.0047	0.0058	0.0059	0.0070	0.0077	0.0047	0.0047	0.0049	0.0059	0.0070	0.0077
Selenium_D	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000049	0.000051	0.000051	0.000062	0.000073	0.000082
Selenium_T	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000049	0.000051	0.000051	0.000062	0.000073	0.000082
Silicon_D	0.69	0.70	0.86	0.87	1.0	1.1	0.72	0.73	0.74	0.90	1.1	1.2
Silicon_T	0.75	0.76	0.93	0.94	1.1	1.2	0.77	0.79	0.80	0.97	1.1	1.3
Silver_D	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000046	0.0000047	0.0000057	0.0000067	0.0000075
Silver_T	0.0000044	0.0000045	0.0000055	0.0000056	0.0000066	0.0000073	0.0000045	0.0000046	0.0000047	0.0000057	0.0000067	0.0000075
Sodium_D	1.5	1.5	1.9	1.9	2.2	2.5	1.8	1.9	1.9	2.4	2.8	3.1
Sodium_T	1.5	1.5	1.9	1.9	2.2	2.5	1.8	1.9	1.9	2.4	2.8	3.1
Strontium_D	0.022	0.022	0.028	0.028	0.033	0.037	0.024	0.025	0.025	0.031	0.037	0.041
Strontium_T	0.022	0.022	0.028	0.028	0.033	0.037	0.024	0.025	0.025	0.031	0.037	0.041
Sulfate	0.61	0.61	0.75	0.76	0.89	1.0	0.61	0.61	0.62	0.76	0.89	1.0
Thallium_D	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000045	0.000046	0.000047	0.000057	0.000067	0.000075
Thallium_T	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000045	0.000046	0.000047	0.000057	0.000067	0.000075
TSS	2.0	2.0	2.5	2.5	3.1	3.3	2.0	2.0	2.2	2.5	3.1	3.3
Uranium_D	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000079	0.000092	0.000098	0.00011	0.00014	0.00015
Uranium_T	0.000044	0.000045	0.000055	0.000056	0.000066	0.000073	0.000079	0.000092	0.000098	0.00011	0.00014	0.00015
Vanadium_T	0.00011	0.00011	0.00014	0.00014	0.00018	0.00019	0.00011	0.00012	0.00012	0.00015	0.00018	0.00020
Zinc_D	0.00053	0.00053	0.00066	0.00067	0.00080	0.00090	0.00054	0.00055	0.00056	0.00069	0.00082	0.00092
Zinc_T	0.00073	0.00073	0.00092	0.00094	0.0011	0.0013	0.00074	0.00074	0.00077	0.00095	0.0011	0.0013

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Susan Lake

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	5.5	5.5	6.2	6.2	6.7	7.0	5.5	5.5	5.8	6.2	6.7	7.0
Alkalinity_T	46	46	51	51	56	58	48	48	49	52	57	59
Aluminum_D	0.022	0.023	0.024	0.024	0.026	0.026	0.022	0.023	0.023	0.024	0.026	0.026
Aluminum_T	0.035	0.037	0.039	0.039	0.042	0.042	0.035	0.037	0.038	0.039	0.042	0.042
Antimony_D	0.000096	0.000097	0.00011	0.00012	0.00013	0.00014	0.00011	0.00011	0.00012	0.00012	0.00014	0.00014
Antimony_T	0.000096	0.000097	0.00011	0.00012	0.00013	0.00014	0.00011	0.00011	0.00012	0.00012	0.00014	0.00014
Arsenic_D	0.00026	0.00026	0.00030	0.00030	0.00034	0.00035	0.00033	0.00033	0.00033	0.00035	0.00038	0.00040
Arsenic_T	0.00031	0.00031	0.00035	0.00035	0.00039	0.00041	0.00038	0.00038	0.00038	0.00041	0.00044	0.00045
Barium_D	0.0083	0.0083	0.0092	0.0092	0.010	0.010	0.0086	0.0088	0.0089	0.0096	0.010	0.011
Barium_T	0.0085	0.0086	0.0095	0.0094	0.010	0.011	0.0089	0.0091	0.0092	0.0098	0.011	0.011
Beryllium_T	0.000096	0.000096	0.00011	0.00011	0.00011	0.00012	0.000098	0.000099	0.000100	0.00011	0.00012	0.00012
Boron_D	0.0048	0.0049	0.0056	0.0057	0.0066	0.0070	0.0056	0.0059	0.0060	0.0064	0.0070	0.0072
Boron_T	0.023	0.025	0.030	0.029	0.032	0.033	0.024	0.026	0.030	0.030	0.033	0.033
Bromide	0.048	0.048	0.052	0.052	0.056	0.058	0.048	0.048	0.048	0.052	0.056	0.058
Cadmium_D	0.0000048	0.0000048	0.0000053	0.0000053	0.0000058	0.0000060	0.0000049	0.0000050	0.0000050	0.0000054	0.0000058	0.0000060
Cadmium_T	0.0000071	0.0000073	0.0000084	0.0000082	0.0000091	0.0000092	0.0000072	0.0000075	0.0000082	0.0000084	0.0000092	0.0000093
Calcium_D	14	14	15	15	17	17	14	15	15	16	17	18
Chloride	0.24	0.24	0.26	0.26	0.28	0.29	0.24	0.24	0.24	0.26	0.28	0.29
Chromium_D	0.00015	0.00015	0.00018	0.00017	0.00019	0.00019	0.00015	0.00016	0.00017	0.00018	0.00019	0.00020
Chromium_D_Hex	0.00015	0.00015	0.00018	0.00017	0.00019	0.00019	0.00015	0.00016	0.00017	0.00018	0.00019	0.00020
Chromium_T	0.00024	0.00024	0.00027	0.00027	0.00029	0.00029	0.00024	0.00024	0.00026	0.00027	0.00029	0.00029
Cobalt_D	0.000096	0.000096	0.00011	0.00011	0.00011	0.00012	0.000098	0.000099	0.000100	0.00011	0.00012	0.00012
Cobalt_T	0.000096	0.000096	0.00011	0.00011	0.00011	0.00012	0.000098	0.000099	0.000100	0.00011	0.00012	0.00012
Copper_D	0.00049	0.00049	0.00054	0.00054	0.00060	0.00062	0.00051	0.00053	0.00053	0.00057	0.00061	0.00063
Copper_T	0.00062	0.00064	0.00070	0.00070	0.00078	0.00080	0.00065	0.00067	0.00068	0.00073	0.00079	0.00082
Cyanide_F	0.0012	0.0012	0.0014	0.0014	0.0016	0.0016	0.0012	0.0012	0.0014	0.0014	0.0016	0.0016
Cyanide_T	0.0012	0.0012	0.0014	0.0014	0.0016	0.0016	0.0012	0.0012	0.0013	0.0014	0.0016	0.0016
Cyanide_WAD	0.0012	0.0012	0.0014	0.0014	0.0016	0.0016	0.0012	0.0012	0.0014	0.0014	0.0016	0.0016
Fluoride	0.081	0.082	0.089	0.089	0.096	0.100	0.082	0.082	0.082	0.089	0.096	0.10
Hardness	48	48	52	53	57	59	48	48	49	53	57	59
Iron_D	0.20	0.21	0.22	0.22	0.23	0.24	0.20	0.21	0.22	0.22	0.23	0.24
Iron_T	0.28	0.29	0.31	0.31	0.33	0.33	0.28	0.29	0.31	0.31	0.33	0.33
Lead_D	0.000043	0.000043	0.000047	0.000047	0.000052	0.000054	0.000044	0.000045	0.000045	0.000049	0.000052	0.000054
Lead_T	0.00038	0.00040	0.00042	0.00042	0.00044	0.00045	0.00038	0.00040	0.00043	0.00042	0.00044	0.00045
Magnesium_D	3.5	3.5	3.9	3.9	4.3	4.4	3.6	3.7	3.7	4.0	4.4	4.5
Manganese_D	0.049	0.050	0.055	0.054	0.056	0.058	0.049	0.050	0.055	0.054	0.056	0.058
Manganese_T	0.082	0.084	0.091	0.090	0.095	0.095	0.082	0.084	0.091	0.090	0.095	0.095
Mercury_D	0.0000015	0.0000015	0.0000017	0.0000017	0.0000018	0.0000018	0.0000015	0.0000016	0.0000016	0.0000017	0.0000018	0.0000018
Mercury_T	0.0000018	0.0000019	0.0000020	0.0000020	0.0000021	0.0000022	0.0000018	0.0000019	0.0000019	0.0000020	0.0000021	0.0000022
Molybdenum_D	0.0013	0.0013	0.0015	0.0015	0.0017	0.0017	0.0014	0.0014	0.0015	0.0016	0.0017	0.0018
Molybdenum_T	0.0013	0.0013	0.0015	0.0015	0.0017	0.0017	0.0014	0.0014	0.0015	0.0016	0.0017	0.0018
N_Ammonia	0.020	0.021	0.025	0.025	0.029	0.031	0.020	0.020	0.022	0.023	0.025	0.026
N_Nitrate_Nitrite	0.074	0.078	0.13	0.13	0.18	0.20	0.068	0.069	0.075	0.078	0.088	0.091
N_Nitrite	0.024	0.025	0.027	0.027	0.030	0.030	0.026	0.027	0.027	0.029	0.032	0.032
Nickel_D	0.00027	0.00027	0.00030	0.00030	0.00033	0.00035	0.00028	0.00029	0.00030	0.00031	0.00034	0.00035
Nickel_T	0.00039	0.00040	0.00046	0.00046	0.00050	0.00052	0.00040	0.00041	0.00045	0.00047	0.00052	0.00052
Phosphorus_T	0.026	0.026	0.028	0.028	0.031	0.032	0.026	0.026	0.027	0.028	0.031	0.032
Potassium_D	0.92	0.92	1.1	1.1	1.3	1.5	1.2	1.4	1.4	1.5	1.7	1.7
Proton	0.000000028	0.000000029	0.000000033	0.000000034	0.000000038	0.000000039	0.000043	0.000060	0.000068	0.000067	0.000076	0.000080
Radium_226	0.010	0.010	0.012	0.012	0.013	0.014	0.010	0.010	0.011	0.012	0.013	0.014
Selenium_D	0.000055	0.000056	0.000065	0.000065	0.000074	0.000079	0.000062	0.000064	0.000066	0.000070	0.000077	0.000079
Selenium_T	0.000056	0.000056	0.000066	0.000065	0.000075	0.000079	0.000062	0.000065	0.000067	0.000071	0.000078	0.000080
Silicon_D	2.0	2.0	2.2	2.2	2.4	2.5	2.0	2.0	2.1	2.2	2.4	2.5
Silicon_T	2.1	2.1	2.3	2.3	2.4	2.5	2.1	2.1	2.1	2.3	2.5	2.6
Silver_D	0.000010	0.000011	0.000013	0.000012	0.000014	0.000014	0.000011	0.000011	0.000013	0.000013	0.000014	0.000014
Silver_T	0.000010	0.000011	0.000013	0.000012	0.000014	0.000014	0.000011	0.000011	0.000013	0.000013	0.000014	0.000014
Sodium_D	1.8	1.8	2.2	2.2	2.7	3.0	2.2	2.4	2.5	2.6	2.9	2.9
Sodium_T	1.8	1.8	2.2	2.2	2.7	3.0	2.2	2.4	2.5	2.6	2.9	2.9
Strontium_D	0.027	0.027	0.031	0.031	0.035	0.036	0.031	0.032	0.033	0.035	0.038	0.039
Strontium_T	0.027	0.027	0.031	0.031	0.035	0.036	0.031	0.032	0.033	0.035	0.038	0.039
Sulfate	0.99	1.0	1.6	1.9	3.3	3.8	0.97	0.97	0.99	1.1	1.1	1.2
Thallium_D	0.000048	0.000048	0.000053	0.000053	0.000058	0.000060	0.000049	0.000050	0.000050	0.000054	0.000058	0.000060
Thallium_T	0.000048	0.000048	0.000053	0.000053	0.000058	0.000060	0.000049	0.000050	0.000050	0.000054	0.000058	0.000060
TSS	2.7	2.8	3.0	3.0	3.2	3.3	2.7	2.8	2.9	3.0	3.3	3.3
Uranium_D	0.000078	0.000081	0.00011	0.00012	0.00018	0.00020	0.00014	0.00016	0.00017	0.00017	0.00020	0.00020
Uranium_T	0.000093	0.000097	0.00012	0.00014	0.00019	0.00022	0.00015	0.00018	0.00018	0.00019	0.00021	0.00021
Vanadium_T	0.00023	0.00023	0.00025	0.00025	0.00028	0.00028	0.00023	0.00023	0.00024	0.00025	0.00027	0.00028
Zinc_D	0.0014	0.0014	0.0015	0.0015	0.0016	0.0017	0.0014	0.0014	0.0014	0.0015	0.0016	0.0017
Zinc_T	0.0016	0.0017	0.0019	0.0018	0.0020	0.0021	0.0017	0.0017	0.0017	0.0019	0.0020	0.0021

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Hughes River - Upstream of Dewatering Effluent Discharge from Legacy Pits (Hughes_Us_CT)

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.50	1.0	1.0	1.3	2.2	2.2	0.50	1.0	1.0	1.3	2.2	2.2
Alkalinity_T	6.2	9.0	12	11	12	12	6.2	9.0	12	11	12	12
Aluminum_D	0.0025	0.0068	0.014	0.014	0.018	0.033	0.0025	0.0068	0.014	0.014	0.018	0.033
Aluminum_T	0.012	0.017	0.024	0.042	0.091	0.17	0.012	0.017	0.025	0.042	0.091	0.17
Antimony_D	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Antimony_T	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Arsenic_D	0.000065	0.00011	0.00016	0.00036	0.00021	0.0027	0.000065	0.00011	0.00015	0.00036	0.00021	0.0027
Arsenic_T	0.000050	0.000075	0.00016	0.00042	0.00018	0.0035	0.000050	0.000075	0.00015	0.00042	0.00018	0.0035
Barium_D	0.0026	0.0038	0.0048	0.0065	0.0052	0.030	0.0026	0.0038	0.0048	0.0065	0.0052	0.030
Barium_T	0.0030	0.0042	0.0050	0.0072	0.0073	0.031	0.0030	0.0042	0.0049	0.0072	0.0073	0.031
Beryllium_T	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011
Boron_D	0.0050	0.0050	0.0050	0.0093	0.0050	0.057	0.0050	0.0050	0.0050	0.0093	0.0050	0.057
Boron_T	0.0050	0.0050	0.0050	0.0090	0.0050	0.053	0.0050	0.0050	0.0050	0.0090	0.0050	0.053
Bromide	0.000016	0.050	0.050	0.046	0.050	0.050	0.000016	0.050	0.050	0.046	0.050	0.050
Cadmium_D	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Cadmium_T	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090
Calcium_D	1.4	2.2	2.9	11	3.1	99	1.4	2.2	2.9	11	3.1	99
Chloride	0.25	0.25	0.25	0.65	0.25	5.0	0.25	0.25	0.25	0.65	0.25	5.0
Chromium_D	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025
Chromium_D_Hex	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057
Chromium_T	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025
Cobalt_D	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012
Cobalt_T	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028
Copper_D	0.00014	0.00022	0.00081	0.00091	0.0014	0.0027	0.00014	0.00022	0.00077	0.00091	0.0014	0.0027
Copper_T	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056
Cyanide_F	0.00050	0.00050	0.00050	0.00054	0.00050	0.0010	0.00050	0.00050	0.00050	0.00054	0.00050	0.0010
Cyanide_T	0.00025	0.00050	0.00050	0.00054	0.00075	0.0010	0.00025	0.00050	0.00050	0.00054	0.00075	0.0010
Cyanide_WAD	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012
Fluoride	0.038	0.050	0.063	0.065	0.074	0.11	0.038	0.050	0.062	0.065	0.074	0.11
Hardness	5.3	8.3	11	10	11	12	5.3	8.3	11	10	11	12
Iron_D	0.043	0.047	0.068	0.12	0.17	0.67	0.043	0.047	0.066	0.12	0.17	0.67
Iron_T	0.070	0.084	0.13	0.22	0.18	1.2	0.070	0.084	0.13	0.22	0.18	1.2
Lead_D	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030
Lead_T	0.000018	0.000025	0.000025	0.000055	0.00021	0.00021	0.000018	0.000025	0.000025	0.000055	0.00021	0.00021
Magnesium_D	0.43	0.64	0.86	3.3	0.88	31	0.43	0.65	0.86	3.3	0.88	31
Manganese_D	0.0014	0.0017	0.0030	0.065	0.021	0.72	0.0014	0.0017	0.0030	0.065	0.021	0.72
Manganese_T	0.0048	0.0077	0.012	0.078	0.027	0.80	0.0048	0.0077	0.013	0.078	0.027	0.80
Mercury_D	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Mercury_T	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Molybdenum_D	0.000034	0.000067	0.000087	0.00014	0.00011	0.00073	0.000034	0.000068	0.000089	0.00014	0.00011	0.00073
Molybdenum_T	0.000028	0.000058	0.000091	0.00017	0.00017	0.0011	0.000028	0.000058	0.000090	0.00017	0.00017	0.0011
N_Ammonia	0.0025	0.0043	0.0082	0.013	0.031	0.047	0.0025	0.0043	0.0079	0.013	0.031	0.047
N_Nitrate_Nitrite	0.011	0.011	0.023	0.028	0.052	0.080	0.011	0.011	0.019	0.028	0.052	0.080
N_Nitrite	0.00051	0.0050	0.0050	0.0046	0.0050	0.0050	0.00051	0.0050	0.0050	0.0046	0.0050	0.0050
Nickel_D	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051
Nickel_T	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094
Phosphorus_T	0.0000087	0.0051	0.011	0.013	0.016	0.043	0.0000087	0.0051	0.012	0.013	0.016	0.043
Potassium_D	0.25	0.38	0.54	1.1	0.58	7.7	0.25	0.38	0.53	1.1	0.58	7.7
Proton	0.23	0.0046	0.00012	0.00041	0.000080	0.000070	0.23	0.0046	0.00016	0.00041	0.000080	0.000070
Radium_226	0.0000033	0.0000034	0.0000039	0.0000039	0.0000044	0.0000046	0.0000033	0.0000034	0.0000037	0.0000039	0.0000044	0.0000046
Selenium_D	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014
Selenium_T	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016
Silicon_D	1.2	1.5	1.8	2.1	2.3	5.8	1.2	1.5	1.8	2.1	2.3	5.8
Silicon_T	1.3	1.5	1.9	2.2	2.6	6.2	1.3	1.5	1.8	2.2	2.6	6.2
Silver_D	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Silver_T	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Sodium_D	0.60	0.86	1.1	2.9	1.3	23	0.60	0.86	1.1	2.9	1.3	23
Sodium_T	0.65	0.91	1.2	3.0	1.4	23	0.65	0.91	1.2	3.0	1.4	23
Strontium_D	0.0067	0.0094	0.013	0.036	0.013	0.30	0.0067	0.0094	0.013	0.036	0.013	0.30
Strontium_T	0.0072	0.0100	0.013	0.036	0.014	0.30	0.0072	0.0100	0.013	0.036	0.014	0.30
Sulfate	0.25	0.34	0.56	18	0.72	210	0.25	0.34	0.56	18	0.72	210
Thallium_D	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
Thallium_T	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
TSS	0.50	0.50	0.69	1.3	1.5	6.9	0.50	0.50	0.87	1.3	1.5	6.9
Uranium_D	0.0000065	0.000012	0.000017	0.00038	0.000021	0.0044	0.0000066	0.000012	0.000017	0.00038	0.000021	0.0044
Uranium_T	0.0000090	0.000015	0.000018	0.00043	0.000028	0.0049	0.0000091	0.000015	0.000018	0.00043	0.000028	0.0049
Vanadium_T	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025
Zinc_D	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017
Zinc_T	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Hughes River - Downstream of Dewatering Effluent Discharge from Legacy Pit (Hughes_Mid_CT)

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.50	1.0	1.0	1.3	2.2	2.2	0.50	1.0	1.0	1.3	2.2	2.2
Alkalinity_T	6.2	9.0	12	11	12	12	6.2	9.0	12	11	12	12
Aluminum_D	0.0025	0.0068	0.014	0.014	0.018	0.033	0.0025	0.0068	0.014	0.014	0.018	0.033
Aluminum_T	0.012	0.017	0.024	0.042	0.091	0.17	0.012	0.017	0.025	0.042	0.091	0.17
Antimony_D	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Antimony_T	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050	0.000010	0.000050	0.000050	0.000047	0.000050	0.000050
Arsenic_D	0.000065	0.00011	0.00016	0.00036	0.00021	0.0027	0.000065	0.00011	0.00015	0.00036	0.00021	0.0027
Arsenic_T	0.000050	0.000075	0.00016	0.00042	0.00018	0.0035	0.000050	0.000075	0.00015	0.00042	0.00018	0.0035
Barium_D	0.0026	0.0038	0.0048	0.0065	0.0052	0.030	0.0026	0.0038	0.0048	0.0065	0.0052	0.030
Barium_T	0.0030	0.0042	0.0050	0.0072	0.0073	0.031	0.0030	0.0042	0.0049	0.0072	0.0073	0.031
Beryllium_T	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011	0.000010	0.000010	0.000010	0.000010	0.000010	0.000011
Boron_D	0.0050	0.0050	0.0050	0.0093	0.0050	0.057	0.0050	0.0050	0.0050	0.0093	0.0050	0.057
Boron_T	0.0050	0.0050	0.0050	0.0090	0.0050	0.053	0.0050	0.0050	0.0050	0.0090	0.0050	0.053
Bromide	0.000016	0.050	0.050	0.046	0.050	0.050	0.000016	0.050	0.050	0.046	0.050	0.050
Cadmium_D	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Cadmium_T	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090	0.0000025	0.0000025	0.0000025	0.0000030	0.0000025	0.0000090
Calcium_D	1.4	2.2	2.9	11	3.1	99	1.4	2.2	2.9	11	3.1	99
Chloride	0.25	0.25	0.25	0.65	0.25	5.0	0.25	0.25	0.25	0.65	0.25	5.0
Chromium_D	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025	0.000050	0.00025	0.00025	0.00023	0.00025	0.00025
Chromium_D_Hex	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057	0.00025	0.00025	0.00025	0.00030	0.00049	0.00057
Chromium_T	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025
Cobalt_D	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012	0.000034	0.000050	0.000050	0.000054	0.000050	0.00012
Cobalt_T	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028	0.000025	0.000050	0.000050	0.000067	0.000050	0.00028
Copper_D	0.00014	0.00022	0.00081	0.00091	0.0014	0.0027	0.00014	0.00022	0.00077	0.00091	0.0014	0.0027
Copper_T	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056	0.00024	0.00025	0.00025	0.00027	0.00025	0.00056
Cyanide_F	0.00050	0.00050	0.00050	0.00054	0.00050	0.0010	0.00050	0.00050	0.00050	0.00054	0.00050	0.0010
Cyanide_T	0.00025	0.00050	0.00050	0.00054	0.00075	0.0010	0.00025	0.00050	0.00050	0.00054	0.00075	0.0010
Cyanide_WAD	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012	0.00025	0.00050	0.00050	0.00057	0.00085	0.0012
Fluoride	0.038	0.050	0.063	0.065	0.074	0.11	0.038	0.050	0.062	0.065	0.074	0.11
Hardness	5.3	8.3	11	10	11	12	5.3	8.3	11	10	11	12
Iron_D	0.043	0.047	0.068	0.12	0.17	0.67	0.043	0.047	0.066	0.12	0.17	0.67
Iron_T	0.070	0.084	0.13	0.22	0.18	1.2	0.070	0.084	0.13	0.22	0.18	1.2
Lead_D	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030
Lead_T	0.000018	0.000025	0.000025	0.000055	0.00021	0.00021	0.000018	0.000025	0.000025	0.000055	0.00021	0.00021
Magnesium_D	0.43	0.64	0.86	3.3	0.88	31	0.43	0.65	0.86	3.3	0.88	31
Manganese_D	0.0014	0.0017	0.0030	0.065	0.021	0.72	0.0014	0.0017	0.0030	0.065	0.021	0.72
Manganese_T	0.0048	0.0077	0.012	0.078	0.027	0.80	0.0048	0.0077	0.013	0.078	0.027	0.80
Mercury_D	.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Mercury_T	.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000024	0.0000025	0.0000025
Molybdenum_D	0.000034	0.000067	0.000087	0.00014	0.00011	0.00073	0.000034	0.000068	0.000089	0.00014	0.00011	0.00073
Molybdenum_T	0.000028	0.000058	0.000091	0.00017	0.00017	0.0011	0.000028	0.000058	0.000090	0.00017	0.00017	0.0011
N_Ammonia	0.0025	0.0043	0.0082	0.013	0.031	0.047	0.0025	0.0043	0.0079	0.013	0.031	0.047
N_Nitrate_Nitrite	0.011	0.011	0.023	0.028	0.052	0.080	0.011	0.011	0.019	0.028	0.052	0.080
N_Nitrite	0.00051	0.0050	0.0050	0.0046	0.0050	0.0050	0.00051	0.0050	0.0050	0.0046	0.0050	0.0050
Nickel_D	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051	0.00019	0.00025	0.00025	0.00027	0.00025	0.00051
Nickel_T	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094	0.00022	0.00025	0.00025	0.00030	0.00025	0.00094
Phosphorus_T	0.0000087	0.0051	0.011	0.013	0.016	0.043	0.0000087	0.0051	0.012	0.013	0.016	0.043
Potassium_D	0.25	0.38	0.54	1.1	0.58	7.7	0.25	0.38	0.53	1.1	0.58	7.7
Proton	0.23	0.0046	0.00012	0.00041	0.000080	0.000070	0.23	0.0046	0.00016	0.00041	0.000080	0.000070
Radium_226	0.0000033	0.0000034	0.0000039	0.0000039	0.0000044	0.0000046	0.0000033	0.0000034	0.0000037	0.0000039	0.0000044	0.0000046
Selenium_D	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014	0.000020	0.000025	0.000025	0.000034	0.000025	0.00014
Selenium_T	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016	0.000020	0.000025	0.000025	0.000054	0.00012	0.00016
Silicon_D	1.2	1.5	1.8	2.1	2.3	5.8	1.2	1.5	1.8	2.1	2.3	5.8
Silicon_T	1.3	1.5	1.9	2.2	2.6	6.2	1.3	1.5	1.8	2.2	2.6	6.2
Silver_D	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Silver_T	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050	0.0000025	0.0000050	0.0000050	0.0000048	0.0000050	0.0000050
Sodium_D	0.60	0.86	1.1	2.9	1.3	23	0.60	0.86	1.1	2.9	1.3	23
Sodium_T	0.65	0.91	1.2	3.0	1.4	23	0.65	0.91	1.2	3.0	1.4	23
Strontium_D	0.0067	0.0094	0.013	0.036	0.013	0.30	0.0067	0.0094	0.013	0.036	0.013	0.30
Strontium_T	0.0072	0.0100	0.013	0.036	0.014	0.30	0.0072	0.0100	0.013	0.036	0.014	0.30
Sulfate	0.25	0.34	0.56	18	0.72	210	0.25	0.34	0.56	18	0.72	210
Thallium_D	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
Thallium_T	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050	0.0000010	0.0000050	0.0000050	0.0000047	0.0000050	0.0000050
TSS	0.50	0.50	0.69	1.3	1.5	6.9	0.50	0.50	0.87	1.3	1.5	6.9
Uranium_D	0.0000065	0.000012	0.000017	0.00038	0.000021	0.0044	0.0000066	0.000012	0.000017	0.00038	0.000021	0.0044
Uranium_T	0.0000090	0.000015	0.000018	0.00043	0.000028	0.0049	0.0000091	0.000015	0.000018	0.00043	0.000028	0.0049
Vanadium_T	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025	0.00010	0.00025	0.00025	0.00024	0.00025	0.00025
Zinc_D	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017	0.00050	0.00050	0.00080	0.00084	0.0012	0.0017
Zinc_T	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015	0.00026	0.0015	0.0015	0.0014	0.0015	0.0015

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Hughes River - Downstream of Confluence of Susan Lake Outflow (Hughes_Ds_CT)

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	0.57	1.1	1.1	1.4	2.3	2.3	0.58	1.1	1.1	1.4	2.3	2.3
Alkalinity_T	7.1	9.6	12	12	13	13	7.3	9.8	12	12	13	13
Aluminum_D	0.0031	0.0073	0.014	0.014	0.018	0.033	0.0032	0.0074	0.014	0.014	0.018	0.033
Aluminum_T	0.012	0.018	0.025	0.042	0.091	0.17	0.012	0.018	0.025	0.042	0.091	0.17
Antimony_D	0.000011	0.000050	0.000050	0.000048	0.000052	0.000052	0.000011	0.000050	0.000050	0.000047	0.000051	0.000051
Antimony_T	0.000011	0.000050	0.000051	0.000048	0.000053	0.000054	0.000011	0.000051	0.000051	0.000048	0.000052	0.000052
Arsenic_D	0.000073	0.00011	0.00016	0.00036	0.00022	0.0026	0.000073	0.00011	0.00016	0.00036	0.00021	0.0026
Arsenic_T	0.000059	0.000085	0.00016	0.00042	0.00019	0.0035	0.000058	0.000088	0.00016	0.00042	0.00019	0.0035
Barium_D	0.0028	0.0039	0.0049	0.0066	0.0054	0.029	0.0028	0.0039	0.0049	0.0067	0.0054	0.029
Barium_T	0.0033	0.0044	0.0051	0.0073	0.0074	0.031	0.0033	0.0044	0.0051	0.0073	0.0073	0.031
Beryllium_T	0.000011	0.000011	0.000012	0.000012	0.000012	0.000013	0.000011	0.000011	0.000012	0.000012	0.000012	0.000012
Boron_D	0.0050	0.0050	0.0051	0.0093	0.0053	0.056	0.0050	0.0051	0.0051	0.0093	0.0052	0.056
Boron_T	0.0051	0.0051	0.0053	0.0092	0.0056	0.052	0.0051	0.0052	0.0053	0.0092	0.0055	0.052
Bromide	0.00085	0.050	0.050	0.046	0.050	0.050	0.00085	0.050	0.050	0.046	0.050	0.050
Cadmium_D	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Cadmium_T	0.0000025	0.0000025	0.0000026	0.0000031	0.0000026	0.0000089	0.0000025	0.0000025	0.0000026	0.0000031	0.0000026	0.0000089
Calcium_D	1.7	2.4	3.2	11	3.3	97	1.8	2.5	3.2	11	3.3	97
Chloride	0.25	0.25	0.25	0.64	0.26	4.9	0.25	0.25	0.25	0.64	0.26	4.9
Chromium_D	0.000050	0.00024	0.00025	0.00023	0.00025	0.00025	0.000050	0.00024	0.00025	0.00023	0.00025	0.00025
Chromium_D_Hex	0.00024	0.00025	0.00025	0.00029	0.00049	0.00056	0.00024	0.00025	0.00025	0.00029	0.00049	0.00056
Chromium_T	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025	0.00016	0.00025	0.00025	0.00024	0.00025	0.00025
Cobalt_D	0.000034	0.000050	0.000051	0.000055	0.000051	0.00012	0.000034	0.000050	0.000050	0.000055	0.000051	0.00012
Cobalt_T	0.000026	0.000051	0.000051	0.000068	0.000051	0.00028	0.000026	0.000051	0.000051	0.000068	0.000051	0.00028
Copper_D	0.00014	0.00022	0.00080	0.00089	0.0014	0.0027	0.00014	0.00022	0.00076	0.00089	0.0014	0.0027
Copper_T	0.00024	0.00025	0.00025	0.00028	0.00025	0.00056	0.00024	0.00025	0.00025	0.00028	0.00025	0.00056
Cyanide_F	0.00050	0.00050	0.00050	0.00054	0.00050	0.00099	0.00050	0.00050	0.00050	0.00054	0.00050	0.00099
Cyanide_T	0.00027	0.00051	0.00055	0.00058	0.00076	0.0010	0.00027	0.00051	0.00055	0.00058	0.00076	0.0010
Cyanide_WAD	0.00026	0.00050	0.00050	0.00057	0.00084	0.0012	0.00026	0.00050	0.00050	0.00057	0.00084	0.0012
Fluoride	0.039	0.050	0.063	0.065	0.074	0.11	0.039	0.050	0.063	0.065	0.074	0.11
Hardness	6.4	9.0	12	11	12	13	6.6	9.0	12	11	12	13
Iron_D	0.043	0.047	0.069	0.12	0.16	0.66	0.043	0.047	0.067	0.12	0.16	0.66
Iron_T	0.072	0.086	0.13	0.22	0.18	1.2	0.072	0.087	0.13	0.22	0.18	1.2
Lead_D	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000030
Lead_T	0.000018	0.000025	0.000026	0.000054	0.00020	0.00020	0.000018	0.000025	0.000026	0.000054	0.00020	0.00020
Magnesium_D	0.52	0.70	0.92	3.3	0.96	30	0.54	0.72	0.92	3.3	0.96	30
Manganese_D	0.0030	0.0040	0.0055	0.065	0.022	0.71	0.0031	0.0042	0.0057	0.065	0.022	0.71
Manganese_T	0.0089	0.011	0.015	0.079	0.029	0.78	0.0099	0.012	0.015	0.080	0.029	0.78
Mercury_D	.00000095	0.0000024	0.0000025	0.0000023	0.0000025	0.0000025	0.00000095	0.0000024	0.0000025	0.0000023	0.0000025	0.0000025
Mercury_T	.00000095	0.0000025	0.0000025	0.0000023	0.0000025	0.0000025	0.00000095	0.0000025	0.0000025	0.0000023	0.0000025	0.0000025
Molybdenum_D	0.000042	0.000074	0.000095	0.00014	0.00011	0.00073	0.000044	0.000076	0.000095	0.00014	0.00011	0.00073
Molybdenum_T	0.000037	0.000064	0.000098	0.00018	0.00017	0.0011	0.000039	0.000065	0.000097	0.00018	0.00017	0.0011
N_Ammonia	0.0030	0.0049	0.0085	0.014	0.032	0.047	0.0030	0.0049	0.0082	0.014	0.031	0.047
N_Nitrate_Nitrite	0.013	0.015	0.029	0.036	0.062	0.093	0.012	0.012	0.020	0.029	0.052	0.081
N_Nitrite	0.00058	0.0050	0.0050	0.0047	0.0051	0.0051	0.00059	0.0050	0.0050	0.0047	0.0051	0.0051
Nickel_D	0.00019	0.00025	0.00025	0.00026	0.00025	0.00050	0.00019	0.00025	0.00025	0.00026	0.00025	0.00050
Nickel_T	0.00022	0.00025	0.00025	0.00031	0.00026	0.00093	0.00022	0.00025	0.00025	0.00031	0.00026	0.00093
Phosphorus_T	0.00028	0.0052	0.011	0.013	0.016	0.043	0.00028	0.0052	0.012	0.013	0.016	0.043
Potassium_D	0.28	0.39	0.57	1.1	0.63	7.6	0.28	0.42	0.57	1.1	0.62	7.6
Proton	0.29	0.0065	0.00017	0.00057	0.00011	0.000098	0.29	0.0065	0.00023	0.00058	0.00011	0.000099
Radium_226	0.000060	0.000062	0.000069	0.000073	0.000093	0.00010	0.000058	0.000059	0.000065	0.000071	0.000093	0.00010
Selenium_D	0.000021	0.000026	0.000028	0.000037	0.000030	0.00014	0.000021	0.000027	0.000027	0.000037	0.000030	0.00014
Selenium_T	0.000021	0.000027	0.000029	0.000056	0.00012	0.00016	0.000021	0.000027	0.000029	0.000056	0.00012	0.00016
Silicon_D	1.2	1.5	1.8	2.1	2.3	5.7	1.2	1.5	1.8	2.1	2.3	5.7
Silicon_T	1.3	1.5	1.9	2.2	2.5	6.1	1.2	1.5	1.8	2.2	2.5	6.1
Silver_D	0.0000026	0.0000051	0.0000051	0.0000049	0.0000052	0.0000052	0.0000026	0.0000051	0.0000051	0.0000049	0.0000052	0.0000052
Silver_T	0.0000026	0.0000051	0.0000051	0.0000049	0.0000052	0.0000052	0.0000026	0.0000051	0.0000051	0.0000049	0.0000052	0.0000053
Sodium_D	0.66	0.89	1.2	2.9	1.4	23	0.66	0.93	1.2	2.9	1.4	23
Sodium_T	0.71	0.94	1.3	3.0	1.5	23	0.71	0.98	1.2	3.0	1.5	23
Strontium_D	0.0072	0.0097	0.013	0.036	0.014	0.30	0.0073	0.0099	0.013	0.036	0.014	0.30
Strontium_T	0.0078	0.010	0.014	0.036	0.015	0.29	0.0079	0.011	0.014	0.036	0.015	0.29
Sulfate	0.38	0.52	0.76	18	0.98	210	0.38	0.55	0.68	18	0.84	210
Thallium_D	0.0000017	0.0000056	0.0000058	0.0000055	0.0000060	0.0000062	0.0000017	0.0000057	0.0000057	0.0000055	0.0000061	0.0000062
Thallium_T	0.0000017	0.0000056	0.0000058	0.0000055	0.0000060	0.0000062	0.0000018	0.0000057	0.0000058	0.0000055	0.0000062	0.0000062
TSS	0.57	0.66	0.81	1.4	1.6	6.8	0.57	0.67	0.92	1.4	1.6	6.8
Uranium_D	0.0000075	0.000012	0.000017	0.00037	0.000023	0.0043	0.0000077	0.000013	0.000018	0.00037	0.000022	0.0043
Uranium_T	0.0000100	0.000016	0.000019	0.00042	0.000030	0.0048	0.000010	0.000016	0.000019	0.00042	0.000029	0.0048
Vanadium_T	0.00010	0.00025	0.00025	0.00024	0.00025	0.00026	0.00010	0.00025	0.00025	0.00024	0.00026	0.00026
Zinc_D	0.00049	0.00050	0.00079	0.00083	0.0012	0.0017	0.00049	0.00050	0.00079	0.00083	0.0012	0.0017
Zinc_T	0.00027	0.0015	0.0015	0.0014	0.0015	0.0015	0.00027	0.0015	0.0015	0.0014	0.0015	0.0015

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Farley Dewatering Wells

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	1.1	1.5	6.7	6.3	10	11	1.9	2.3	7.2	7.2	11	14
Alkalinity_T	68	86	130	130	150	170	81	84	120	120	170	180
Aluminum_D	0.00038	0.00041	0.0010	0.0031	0.0089	0.012	0.0012	0.0014	0.0023	0.0045	0.0093	0.014
Aluminum_T	0.00068	0.00071	0.0017	0.0048	0.013	0.019	0.0021	0.0024	0.0039	0.0069	0.015	0.020
Antimony_D	0.000098	0.00011	0.00033	0.00045	0.0011	0.0014	0.000095	0.00022	0.00026	0.00027	0.00035	0.00039
Antimony_T	0.00014	0.00016	0.00042	0.00053	0.0012	0.0014	0.00013	0.00024	0.00032	0.00032	0.00046	0.00051
Arsenic_D	0.00093	0.0012	0.0020	0.0021	0.0028	0.0039	0.00073	0.00076	0.0016	0.0014	0.0021	0.0031
Arsenic_T	0.00095	0.0012	0.0021	0.0021	0.0029	0.0040	0.00077	0.00080	0.0017	0.0014	0.0022	0.0032
Barium_D	0.013	0.015	0.024	0.023	0.029	0.033	0.015	0.017	0.023	0.024	0.034	0.036
Barium_T	0.013	0.016	0.025	0.025	0.030	0.034	0.016	0.017	0.024	0.025	0.036	0.037
Beryllium_T	0.000048	0.000054	0.000078	0.000091	0.00015	0.00017	0.000076	0.000095	0.00010	0.00011	0.00013	0.00013
Boron_D	0.012	0.013	0.025	0.030	0.057	0.068	0.015	0.021	0.028	0.029	0.041	0.045
Boron_T	0.012	0.013	0.025	0.031	0.057	0.069	0.016	0.021	0.029	0.029	0.042	0.046
Bromide	0.026	0.030	0.038	0.038	0.043	0.048	0.029	0.033	0.040	0.039	0.045	0.054
Cadmium_D	0.00000091	0.0000011	0.0000021	0.0000028	0.0000062	0.0000099	0.0000017	0.0000020	0.0000023	0.0000026	0.0000038	0.0000049
Cadmium_T	0.0000010	0.0000012	0.0000019	0.0000021	0.0000033	0.0000035	0.0000020	0.0000020	0.0000023	0.0000025	0.0000032	0.0000040
Calcium_D	27	32	48	47	56	60	35	38	52	54	75	79
Chloride	0.40	0.41	0.52	0.52	0.65	0.67	0.43	0.44	0.62	0.57	0.71	0.92
Chromium_D	0.000013	0.000016	0.000032	0.000033	0.000055	0.000073	0.000034	0.000045	0.000051	0.000054	0.000067	0.000077
Chromium_D_Hex	0.000058	0.000081	0.00012	0.00013	0.00020	0.00025	0.000095	0.00013	0.00018	0.00017	0.00021	0.00023
Chromium_T	0.000029	0.000049	0.000086	0.000084	0.00011	0.00013	0.000060	0.000098	0.00015	0.00015	0.00020	0.00020
Cobalt_D	0.000031	0.000036	0.000049	0.000051	0.000070	0.000080	0.000045	0.000048	0.000057	0.000062	0.000079	0.000088
Cobalt_T	0.000031	0.000039	0.000058	0.000057	0.000072	0.000081	0.000047	0.000050	0.000066	0.000073	0.000100	0.00011
Copper_D	0.000096	0.00011	0.00022	0.00034	0.00082	0.0011	0.00011	0.00018	0.00022	0.00022	0.00026	0.00036
Copper_T	0.00012	0.00027	0.00045	0.00056	0.0010	0.0016	0.00018	0.00023	0.00041	0.00040	0.00061	0.00083
Cyanide_F	0.000048	0.000060	0.00010	0.00012	0.00020	0.00021	0.00010	0.00012	0.00017	0.00017	0.00024	0.00026
Cyanide_T	0.00017	0.00019	0.00030	0.00030	0.00039	0.00041	0.00026	0.00027	0.00042	0.00039	0.00046	0.00053
Cyanide_WAD	0.000074	0.000089	0.00015	0.00018	0.00031	0.00032	0.00013	0.00016	0.00024	0.00024	0.00033	0.00037
Fluoride	0.066	0.075	0.096	0.095	0.12	0.12	0.069	0.076	0.11	0.13	0.21	0.46
Hardness	92	96	120	130	170	170	98	100	130	130	170	200
Iron_D	0.011	0.017	0.029	0.041	0.096	0.12	0.026	0.037	0.054	0.066	0.13	0.15
Iron_T	0.011	0.012	0.019	0.040	0.12	0.16	0.025	0.029	0.035	0.058	0.14	0.18
Lead_D	0.0000034	0.0000041	0.0000063	0.0000078	0.000014	0.000016	0.0000072	0.000010	0.000011	0.000012	0.000013	0.000014
Lead_T	0.0000054	0.0000061	0.000021	0.000033	0.000082	0.00010	0.000018	0.000022	0.000035	0.000039	0.000063	0.000072
Magnesium_D	7.8	8.5	13	12	14	14	9.6	9.9	11	13	17	17
Manganese_D	0.051	0.068	0.21	0.22	0.39	0.43	0.083	0.098	0.20	0.25	0.42	0.56
Manganese_T	0.077	0.10	0.25	0.25	0.40	0.44	0.11	0.13	0.28	0.28	0.43	0.57
Mercury_D	0.00000024	0.00000028	0.00000070	0.00000080	0.0000015	0.0000019	0.00000066	0.00000071	0.00000096	0.0000010	0.0000014	0.0000016
Mercury_T	0.00000037	0.00000041	0.00000059	0.00000099	0.0000021	0.0000025	0.00000081	0.00000088	0.00000094	0.0000013	0.0000023	0.0000024
Molybdenum_D	0.00033	0.00041	0.00086	0.0011	0.0024	0.0027	0.00029	0.00088	0.0013	0.0013	0.0019	0.0021
Molybdenum_T	0.00034	0.00040	0.00086	0.0011	0.0024	0.0028	0.00030	0.00089	0.0013	0.0013	0.0019	0.0021
N_Ammonia	0.033	0.044	0.11	0.11	0.18	0.24	0.014	0.015	0.040	0.044	0.074	0.10
N_Nitrate_Nitrite	0.48	1.0	2.1	2.6	4.9	5.6	0.027	0.030	0.060	0.065	0.11	0.26
N_Nitrite	0.00068	0.0012	0.013	0.025	0.067	0.094	0.0040	0.0052	0.016	0.022	0.042	0.049
Nickel_D	0.00029	0.00035	0.00053	0.00059	0.00098	0.0012	0.00035	0.00035	0.00046	0.00045	0.00056	0.00063
Nickel_T	0.00035	0.00039	0.00062	0.00069	0.0011	0.0012	0.00042	0.00042	0.00054	0.00056	0.00072	0.00077
Phosphorus_T	0.00024	0.00035	0.0053	0.0063	0.017	0.021	0.0010	0.0013	0.0065	0.0069	0.016	0.021
Potassium_D	3.1	3.5	6.8	8.3	16	19	4.2	6.9	9.7	9.9	15	16
Proton	0.0000000091	0.000000012	0.000000044	0.000000042	0.000000065	0.000000069	0.000056	0.00026	0.00063	0.00074	0.0015	0.0018
Radium_226	0.0023	0.0028	0.0035	0.0035	0.0041	0.0043	0.0015	0.0017	0.0019	0.0019	0.0021	0.0041
Selenium_D	0.000028	0.000071	0.00017	0.00016	0.00024	0.00038	0.000050	0.000056	0.00013	0.00016	0.00029	0.00030
Selenium_T	0.000021	0.000025	0.000057	0.000079	0.00017	0.00023	0.000041	0.000055	0.000062	0.000066	0.000080	0.000084
Silicon_D	1.5	2.1	3.5	3.5	4.7	5.3	2.1	2.2	3.6	3.9	5.9	6.4
Silicon_T	1.5	2.2	3.7	3.6	4.9	5.4	2.2	2.3	3.7	4.0	6.1	6.5
Silver_D	0.00000071	0.00000085	0.0000016	0.0000019	0.0000034	0.0000046	0.0000018	0.0000025	0.0000029	0.0000030	0.0000040	0.0000043
Silver_T	0.00000087	0.0000010	0.0000020	0.0000024	0.0000044	0.0000057	0.0000022	0.0000030	0.0000034	0.0000037	0.0000050	0.0000052
Sodium_D	6.5	7.6	16	19	35	42	8.2	11	16	16	24	26
Sodium_T	6.4	7.5	15	18	35	42	8.2	11	16	16	23	26
Strontium_D	0.057	0.068	0.11	0.12	0.17	0.19	0.080	0.10	0.15	0.14	0.21	0.22
Strontium_T	0.059	0.069	0.11	0.12	0.17	0.19	0.082	0.10	0.15	0.14	0.21	0.22
Sulfate	38	47	73	80	130	140	34	38	47	49	61	78
Thallium_D	0.000025	0.000026	0.000039	0.000047	0.000082	0.000099	0.000039	0.000049	0.000055	0.000055	0.000064	0.000068
Thallium_T	0.000027	0.000028	0.000042	0.000051	0.000087	0.00010	0.000042	0.000053	0.000058	0.000059	0.000069	0.000074
TSS	0.27	0.32	0.54	0.51	0.65	0.72	0.80	0.84	1.2	1.2	1.7	1.8
Uranium_D	0.00024	0.00034	0.00073	0.00095	0.0019	0.0026	0.00036	0.00041	0.00064	0.00068	0.0011	0.0013
Uranium_T	0.00023	0.00033	0.00071	0.00095	0.0020	0.0029	0.00028	0.00041	0.00059	0.00065	0.00099	0.0012
Vanadium_T	0.000095	0.00011	0.00017	0.00018	0.00028	0.00032	0.00015	0.00018	0.00021	0.00023	0.00030	0.00030
Zinc_D	0.00024	0.00028	0.00036	0.00045	0.00076	0.0010	0.00034	0.00035	0.00043	0.00044	0.00058	0.00076
Zinc_T	0.00020	0.00030	0.00041	0.00040	0.00050	0.00053	0.00027	0.00031	0.00048	0.00047	0.00059	0.00074

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Summary Statistics of the Updated Model Results (mg/L) for the Upper Case Scenario - Gordon Dewatering Wells

Parameters	Operations (Mine Years 1 - 5)						Post-closure (Mine Years 18 - 194)					
	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum	Minimum	10th Percentile	Median	Mean	90th Percentile	Maximum
Acidity_T	1.1	1.7	5.8	5.3	8.3	9.9	3.9	4.6	6.8	7.2	9.5	10
Alkalinity_T	50	51	65	66	78	88	51	51	53	66	79	89
Aluminum_D	0.00014	0.00022	0.0011	0.0035	0.0095	0.015	0.0053	0.0056	0.0093	0.0096	0.015	0.018
Aluminum_T	0.00019	0.00037	0.0043	0.014	0.046	0.056	0.019	0.019	0.030	0.034	0.056	0.059
Antimony_D	0.000024	0.000029	0.000059	0.000053	0.000067	0.000081	0.000064	0.000074	0.000079	0.000086	0.00010	0.00011
Antimony_T	0.000034	0.000037	0.000069	0.000065	0.000084	0.00010	0.000069	0.000077	0.000086	0.000092	0.00011	0.00012
Arsenic_D	0.00016	0.00017	0.00025	0.00024	0.00029	0.00034	0.00028	0.00031	0.00033	0.00036	0.00043	0.00043
Arsenic_T	0.00018	0.00019	0.00030	0.00028	0.00033	0.00040	0.00030	0.00033	0.00035	0.00039	0.00047	0.00047
Barium_D	0.0063	0.0074	0.011	0.011	0.015	0.017	0.0090	0.0097	0.011	0.013	0.016	0.018
Barium_T	0.0083	0.0090	0.012	0.013	0.016	0.018	0.010	0.011	0.012	0.014	0.017	0.019
Beryllium_T	0.000027	0.000032	0.000067	0.000060	0.000079	0.000095	0.000067	0.000076	0.000085	0.000090	0.00011	0.00012
Boron_D	0.0020	0.0022	0.0066	0.0077	0.014	0.016	0.0042	0.0045	0.0083	0.0095	0.015	0.016
Boron_T	0.0031	0.0038	0.011	0.011	0.019	0.021	0.0059	0.0063	0.011	0.013	0.019	0.021
Bromide	0.012	0.014	0.029	0.028	0.039	0.042	0.030	0.036	0.040	0.041	0.047	0.052
Cadmium_D	0.00000013	0.00000019	0.00000082	0.00000070	0.0000011	0.0000012	0.0000014	0.0000016	0.0000019	0.0000020	0.0000023	0.0000026
Cadmium_T	0.00000018	0.00000030	0.0000022	0.0000021	0.0000038	0.0000039	0.0000035	0.0000042	0.0000050	0.0000050	0.0000056	0.0000069
Calcium_D	8.5	11	14	13	16	18	14	15	16	18	22	24
Chloride	0.014	0.022	0.064	0.088	0.21	0.25	0.13	0.13	0.22	0.21	0.29	0.36
Chromium_D	0.0000046	0.0000052	0.0000097	0.000020	0.000059	0.000075	0.000042	0.000043	0.000050	0.000057	0.000075	0.000099
Chromium_D_Hex	0.0000046	0.0000063	0.000010	0.000022	0.000064	0.000080	0.000043	0.000045	0.000053	0.000059	0.000079	0.00010
Chromium_T	0.000051	0.000067	0.00015	0.00014	0.00020	0.00025	0.00021	0.00022	0.00026	0.00028	0.00033	0.00037
Cobalt_D	0.000022	0.000034	0.00011	0.00010	0.00016	0.00019	0.000085	0.00010	0.00014	0.00015	0.00020	0.00022
Cobalt_T	0.000025	0.000039	0.00012	0.00011	0.00017	0.00021	0.000097	0.00012	0.00016	0.00017	0.00023	0.00025
Copper_D	0.0000071	0.0000095	0.000036	0.000043	0.000089	0.000096	0.000082	0.00010	0.00012	0.00012	0.00014	0.00014
Copper_T	0.000023	0.000034	0.000092	0.000086	0.00013	0.00016	0.00015	0.00016	0.00020	0.00021	0.00027	0.00029
Cyanide_F	0.000023	0.000037	0.00027	0.00033	0.00064	0.00067	0.00048	0.00052	0.00078	0.00080	0.00097	0.0012
Cyanide_T	0.00012	0.00015	0.00038	0.00035	0.00051	0.00055	0.00054	0.00059	0.00069	0.00074	0.00089	0.00095
Cyanide_WAD	0.000025	0.000036	0.00024	0.00025	0.00044	0.00046	0.00038	0.00045	0.00057	0.00058	0.00068	0.00083
Fluoride	0.040	0.042	0.052	0.053	0.065	0.068	0.043	0.044	0.048	0.055	0.067	0.071
Hardness	26	32	41	41	51	58	46	47	52	60	70	79
Iron_D	0.085	0.14	0.23	0.24	0.40	0.46	0.30	0.37	0.44	0.44	0.53	0.53
Iron_T	0.19	0.28	1.1	0.98	1.5	1.7	0.59	0.70	1.1	1.3	1.9	2.2
Lead_D	0.00000061	0.00000090	0.0000038	0.0000034	0.0000050	0.0000057	0.0000074	0.0000082	0.000010	0.000011	0.000013	0.000015
Lead_T	0.000013	0.000014	0.000044	0.000044	0.000079	0.000081	0.000055	0.000062	0.000100	0.000096	0.00012	0.00013
Magnesium_D	1.4	1.6	1.9	2.1	2.7	3.2	2.6	2.7	2.8	3.5	4.2	4.7
Manganese_D	0.021	0.050	0.62	0.54	0.93	0.95	0.20	0.26	0.57	0.70	1.1	1.2
Manganese_T	0.059	0.12	0.69	0.61	0.99	1.0	0.25	0.31	0.64	0.77	1.2	1.2
Mercury_D	0.00000015	0.00000018	0.00000042	0.00000049	0.00000093	0.00000098	0.00000091	0.00000094	0.0000011	0.0000011	0.0000012	0.0000013
Mercury_T	0.00000058	0.00000092	0.0000014	0.0000014	0.0000020	0.0000021	0.0000014	0.0000017	0.0000021	0.0000020	0.0000022	0.0000024
Molybdenum_D	0.0000097	0.000012	0.000023	0.000024	0.000041	0.000044	0.000049	0.000050	0.000056	0.000071	0.000089	0.000099
Molybdenum_T	0.000011	0.000014	0.000027	0.000029	0.000050	0.000054	0.000056	0.000059	0.000068	0.000082	0.00010	0.00011
N_Ammonia	0.018	0.034	0.065	0.062	0.086	0.096	0.037	0.046	0.061	0.077	0.11	0.11
N_Nitrate_Nitrite	0.0017	0.0027	0.016	0.016	0.032	0.034	0.022	0.026	0.030	0.032	0.039	0.048
N_Nitrite	0.00073	0.0011	0.0053	0.0050	0.0088	0.010	0.0084	0.0094	0.011	0.011	0.013	0.016
Nickel_D	0.000019	0.000024	0.000050	0.000046	0.000069	0.000073	0.000091	0.000095	0.00011	0.00013	0.00016	0.00016
Nickel_T	0.000027	0.000033	0.00012	0.00012	0.00023	0.00024	0.00015	0.00018	0.00029	0.00028	0.00035	0.00041
Phosphorus_T	0.0018	0.0024	0.0076	0.010	0.026	0.027	0.017	0.017	0.021	0.023	0.033	0.034
Potassium_D	0.40	0.43	0.60	0.56	0.66	0.80	0.65	0.68	0.78	0.85	0.96	1.1
Proton	0.0000000015	0.0000000018	0.0000000042	0.0000000067	0.000000015	0.000000019	0.000000017	0.000000018	0.000000020	0.000000021	0.000000027	0.000000027
Radium_226	0.00028	0.00039	0.0012	0.0011	0.0016	0.0020	0.0019	0.0021	0.0026	0.0027	0.0034	0.0036
Selenium_D	0.0000020	0.0000027	0.000018	0.000037	0.00011	0.00013	0.000053	0.000056	0.000077	0.000087	0.00014	0.00014
Selenium_T	0.0000020	0.0000028	0.000019	0.000037	0.00011	0.00013	0.000054	0.000057	0.000078	0.000088	0.00014	0.00015
Silicon_D	0.93	1.1	1.5	1.5	2.0	2.3	2.3	2.4	2.6	2.9	3.4	3.7
Silicon_T	0.95	1.1	1.5	1.6	2.0	2.3	2.3	2.4	2.6	2.9	3.4	3.7
Silver_D	0.00000011	0.00000015	0.0000015	0.0000035	0.000011	0.000013	0.0000049	0.0000052	0.0000076	0.0000085	0.000014	0.000014
Silver_T	0.00000014	0.00000020	0.0000017	0.0000036	0.000011	0.000013	0.0000051	0.0000055	0.0000077	0.0000087	0.000014	0.000014
Sodium_D	0.33	0.42	0.65	0.66	0.97	1.1	0.89	0.92	1.0	1.2	1.5	1.7
Sodium_T	0.34	0.43	0.67	0.67	0.99	1.1	0.90	0.93	1.0	1.3	1.6	1.7
Strontium_D	0.0080	0.0096	0.014	0.014	0.019	0.022	0.019	0.019	0.021	0.025	0.030	0.033
Strontium_T	0.017	0.018	0.024	0.026	0.035	0.038	0.023	0.024	0.026	0.032	0.039	0.043
Sulfate	0.053	0.067	0.12	0.13	0.22	0.24	0.31	0.32	0.38	0.47	0.60	0.68
Thallium_D	0.000012	0.000014	0.000029	0.000026	0.000033	0.000040	0.000031	0.000036	0.000039	0.000042	0.000050	0.000053
Thallium_T	0.000017	0.000018	0.000034	0.000032	0.000041	0.000050	0.000034	0.000038	0.000042	0.000045	0.000054	0.000058
TSS	0.72	0.92	1.3	1.5	2.1	2.7	2.7	2.8	3.7	3.5	4.2	4.3
Uranium_D	0.00000021	0.00000029	0.0000014	0.0000012	0.0000017	0.0000020	0.0000029	0.0000032	0.0000040	0.0000042	0.0000052	0.0000057
Uranium_T	0.00000022	0.00000032	0.0000015	0.0000013	0.0000020	0.0000024	0.0000032	0.0000035	0.0000046	0.0000048	0.0000060	0.0000066
Vanadium_T	0.000017	0.000026	0.00011	0.00010	0.00021	0.00024	0.00017	0.00018	0.00023	0.00024	0.00030	0.00037
Zinc_D	0.000047	0.000065	0.00019	0.00019	0.00035	0.00041	0.00034	0.00036	0.00059	0.00056	0.00068	0.00070
Zinc_T	0.000055	0.000079	0.00024	0.00026	0.00050	0.00060	0.00043	0.00047	0.00077	0.00075	0.00090	0.00097

Notes:
na denotes not applicable. The model results are not reported for the period when the water volume reached the lower bound (empty reservoir)

Appendix D Comparison of the Water Quality Results Between the Updated Model and the EIS Model for the Average Case

Concentration Ratio of the Updated Model Results to the EIS Model Results (Stantec 2020a) for the Expected Case Scenario - Open Pit Discharge

Parameters	Construction				Operations				Closure				Post-closure			
	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max
Acidity_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.1	0.9	1.2
Alkalinity_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.6	0.5	0.8
Aluminum_D	na	na	na	na	na	na	na	na	na	na	na	na	na	1.5	1.3	1.5
Aluminum_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	0.9
Antimony_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.4	0.4
Antimony_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.4	0.4
Arsenic_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.6	0.5	0.9
Arsenic_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.6	0.5	0.9
Barium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	0.7
Barium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	0.7
Beryllium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.8	0.9
Boron_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.3	0.2	0.3
Boron_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.3	0.2	0.3
Bromide	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.8	1.7
Cadmium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	1.1
Cadmium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.9	0.7	1.1
Calcium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.8	0.7	0.7
Chloride	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	1.1
Chromium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	0.9
Chromium_D_Hex	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	0.9
Chromium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.3	1.1	1.0
Cobalt_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.8	0.7	1.0
Cobalt_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.9	0.8	1.0
Copper_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.8
Copper_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.8
Cyanide_F	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	1.7
Cyanide_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.2	1.0	1.5
Cyanide_WAD	na	na	na	na	na	na	na	na	na	na	na	na	na	1.1	0.9	1.7
Fluoride	na	na	na	na	na	na	na	na	na	na	na	na	na	1.2	0.9	2.1
Hardness	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	1.2
Iron_D	na	na	na	na	na	na	na	na	na	na	na	na	na	1.3	1.1	1.4
Iron_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.8	1.0
Lead_D	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	0.9
Lead_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.2	1.1	1.1
Magnesium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	0.9
Manganese_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	1.8
Manganese_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	1.7
Mercury_D	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.9	0.9
Mercury_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.1	0.9	1.0
Molybdenum_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.5
Molybdenum_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.5
N_Ammonia	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	1.3
N_Nitrate_Nitrite	na	na	na	na	na	na	na	na	na	na	na	na	na	0.8	0.6	2.7
N_Nitrite	na	na	na	na	na	na	na	na	na	na	na	na	na	7.2	6.2	6.8
Nickel_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.7
Nickel_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.6	0.6	0.7
Phosphorus_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.2	0.1	1.0
Potassium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.4	0.4
Radium_226	na	na	na	na	na	na	na	na	na	na	na	na	na	0.3	0.2	1.8
Selenium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.3	0.4
Selenium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.3	0.4
Silicon_D	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.8	1.1
Silicon_T	na	na	na	na	na	na	na	na	na	na	na	na	na	1.0	0.8	1.1
Silver_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.9	0.8	0.8
Silver_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.9	0.8	0.8
Sodium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.3	0.3
Sodium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.4	0.3	0.3
Strontium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	0.6
Strontium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	0.6
Sulfate	na	na	na	na	na	na	na	na	na	na	na	na	na	0.1	0.1	0.2
Thallium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.8	0.7	0.7
Thallium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.8	0.7	0.7
Uranium_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.7
Uranium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.5	0.4	0.7
Vanadium_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.9	0.8	0.8
Zinc_D	na	na	na	na	na	na	na	na	na	na	na	na	na	0.7	0.6	1.4
Zinc_T	na	na	na	na	na	na	na	na	na	na	na	na	na	0.8	0.6	1.3

Notes:

	updated model concentration/EIS model concentration <0.5
	0.5 < updated model concentration/EIS model concentration <2
	updated model concentration/EIS model concentration >2

Concentration Ratio of the Updated Model Results to the EIS Model Results (Stantec 2020a) for the Expected Case Scenario - Collection Pond Dischagre

Parameters	Construction				Operations				Closure				Post-closure			
	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max
Acidity_T	na	1.6	1.5	1.6	1.6	1.2	1.1	1.2	na	na	na	na	na	na	na	na
Alkalinity_T	na	3.3	2.5	3.6	1.5	1.1	1.0	1.3	na	na	na	na	na	na	na	na
Aluminum_D	na	2.9	4.6	2.2	0.7	0.7	0.7	0.6	na	na	na	na	na	na	na	na
Aluminum_T	na	2.0	2.8	1.5	0.6	0.7	0.7	0.8	na	na	na	na	na	na	na	na
Antimony_D	na	11.1	9.1	11.6	0.9	0.9	0.4	1.2	na	na	na	na	na	na	na	na
Antimony_T	na	10.8	9.0	11.3	0.9	0.9	0.4	1.2	na	na	na	na	na	na	na	na
Arsenic_D	na	12.2	9.9	12.7	0.9	0.4	0.4	0.3	na	na	na	na	na	na	na	na
Arsenic_T	na	10.0	8.2	10.7	0.9	0.4	0.4	0.3	na	na	na	na	na	na	na	na
Barium_D	na	2.7	2.2	3.5	1.1	1.0	0.8	1.2	na	na	na	na	na	na	na	na
Barium_T	na	2.6	2.1	3.3	1.0	1.0	0.7	1.2	na	na	na	na	na	na	na	na
Beryllium_T	na	3.7	3.0	5.2	1.1	1.0	0.7	1.3	na	na	na	na	na	na	na	na
Boron_D	na	7.5	5.7	11.2	1.0	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Boron_T	na	7.5	5.7	11.2	1.0	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Bromide	na	2.2	1.9	2.5	2.0	1.4	1.2	1.2	na	na	na	na	na	na	na	na
Cadmium_D	na	3.4	2.7	4.1	1.3	1.1	0.9	1.3	na	na	na	na	na	na	na	na
Cadmium_T	na	2.2	2.0	2.3	0.9	1.0	0.9	1.3	na	na	na	na	na	na	na	na
Calcium_D	na	3.5	2.6	3.8	1.3	1.1	0.9	1.2	na	na	na	na	na	na	na	na
Chloride	na	2.0	1.7	2.2	1.8	1.2	1.1	1.0	na	na	na	na	na	na	na	na
Chromium_D	na	3.0	2.4	3.3	1.8	1.3	1.1	1.5	na	na	na	na	na	na	na	na
Chromium_D_Hex	na	3.0	2.4	3.3	1.8	1.3	1.1	1.5	na	na	na	na	na	na	na	na
Chromium_T	na	0.9	1.1	0.5	0.7	0.9	0.8	1.1	na	na	na	na	na	na	na	na
Cobalt_D	na	1.8	2.0	1.2	0.9	0.9	0.7	1.2	na	na	na	na	na	na	na	na
Cobalt_T	na	1.1	1.4	0.6	0.7	0.9	0.7	1.1	na	na	na	na	na	na	na	na
Copper_D	na	4.5	3.5	6.8	0.9	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Copper_T	na	3.2	2.9	3.1	0.7	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Cyanide_F	na	1.9	1.6	1.9	1.6	1.3	1.2	1.2	na	na	na	na	na	na	na	na
Cyanide_T	na	1.9	1.7	1.9	1.6	1.3	1.2	1.3	na	na	na	na	na	na	na	na
Cyanide_WAD	na	1.9	1.7	1.9	1.6	1.3	1.2	1.3	na	na	na	na	na	na	na	na
Fluoride	na	3.2	2.5	3.6	1.4	0.9	0.9	0.8	na	na	na	na	na	na	na	na
Hardness	na	2.6	2.0	2.5	2.1	1.4	1.3	1.1	na	na	na	na	na	na	na	na
Iron_D	na	1.5	1.6	0.8	1.4	1.4	1.4	1.5	na	na	na	na	na	na	na	na
Iron_T	na	0.8	0.7	0.8	0.6	0.8	0.7	1.0	na	na	na	na	na	na	na	na
Lead_D	na	3.8	3.1	4.9	1.3	1.1	0.8	1.3	na	na	na	na	na	na	na	na
Lead_T	na	1.6	1.7	0.8	0.9	1.0	0.8	1.2	na	na	na	na	na	na	na	na
Magnesium_D	na	3.3	2.5	3.5	1.5	1.1	1.0	1.3	na	na	na	na	na	na	na	na
Manganese_D	na	1.3	1.2	0.7	1.5	1.1	1.0	1.2	na	na	na	na	na	na	na	na
Manganese_T	na	1.2	1.2	0.6	1.2	1.0	1.0	1.2	na	na	na	na	na	na	na	na
Mercury_D	na	2.5	2.1	2.9	1.3	1.2	1.0	1.4	na	na	na	na	na	na	na	na
Mercury_T	na	2.0	1.9	1.4	1.2	1.1	1.0	1.4	na	na	na	na	na	na	na	na
Molybdenum_D	na	5.1	3.7	6.4	1.1	1.0	0.6	1.3	na	na	na	na	na	na	na	na
Molybdenum_T	na	5.0	3.7	6.4	1.1	1.0	0.6	1.3	na	na	na	na	na	na	na	na
N_Ammonia	na	5.9	5.0	7.8	0.7	1.9	1.5	2.8	na	na	na	na	na	na	na	na
N_Nitrate_Nitrite	na	27.4	38.0	21.5	0.5	2.3	1.7	3.0	na	na	na	na	na	na	na	na
N_Nitrite	na	8.5	7.5	10.6	0.8	2.1	1.6	2.9	na	na	na	na	na	na	na	na
Nickel_D	na	3.3	2.8	4.5	0.8	0.9	0.6	1.2	na	na	na	na	na	na	na	na
Nickel_T	na	2.1	2.1	1.6	0.6	0.8	0.6	1.2	na	na	na	na	na	na	na	na
Phosphorus_T	na	3.0	2.3	3.0	2.6	1.5	1.4	1.4	na	na	na	na	na	na	na	na
Potassium_D	na	7.3	5.6	10.0	0.9	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Radium_226	na	2.1	1.7	2.2	1.7	1.1	1.1	0.9	na	na	na	na	na	na	na	na
Selenium_D	na	7.6	6.0	10.3	1.0	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Selenium_T	na	7.2	5.7	9.6	0.9	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Silicon_D	na	2.9	2.2	3.1	1.8	1.2	1.1	1.4	na	na	na	na	na	na	na	na
Silicon_T	na	2.8	2.2	3.1	1.7	1.2	1.1	1.4	na	na	na	na	na	na	na	na
Silver_D	na	3.5	2.8	4.2	1.4	1.1	0.9	1.3	na	na	na	na	na	na	na	na
Silver_T	na	3.4	2.8	4.1	1.3	1.1	0.9	1.3	na	na	na	na	na	na	na	na
Sodium_D	na	6.5	4.9	9.9	0.9	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Sodium_T	na	6.4	4.9	9.9	0.9	0.9	0.5	1.2	na	na	na	na	na	na	na	na
Strontium_D	na	4.5	3.3	5.1	1.3	1.0	0.8	1.2	na	na	na	na	na	na	na	na
Strontium_T	na	4.5	3.3	5.1	1.3	1.0	0.8	1.2	na	na	na	na	na	na	na	na
Sulfate	na	6.7	5.2	9.2	0.9	0.8	0.5	1.1	na	na	na	na	na	na	na	na
Thallium_D	na	4.3	3.5	5.8	1.1	1.0	0.7	1.2	na	na	na	na	na	na	na	na
Thallium_T	na	3.9	3.3	5.1	1.0	1.0	0.7	1.2	na	na	na	na	na	na	na	na
Uranium_D	na	7.2	5.1	9.3	1.1	0.9	0.6	1.2	na	na	na	na	na	na	na	na
Uranium_T	na	7.1	5.1	9.3	1.1	0.9	0.6	1.2	na	na	na	na	na	na	na	na
Vanadium_T	na	1.6	1.7	1.0	0.7	0.9	0.7	1.2	na	na	na	na	na	na	na	na
Zinc_D	na	2.7	2.2	3.0	1.6	1.1	1.0	1.3	na	na	na	na	na	na	na	na
Zinc_T	na	2.0	1.8	2.0	1.2	1.1	1.0	1.3	na	na	na	na	na	na	na	na

Notes:

	updated model concentration/EIS model concentration <0.5
	0.5 < updated model concentration/EIS model concentration <2
	updated model concentration/EIS model concentration >2

Concentration Ratio of the Updated Model Results to the EIS Model Results (Stantec 2020a) for the Expected Case Scenario - Gordon Lake

Parameters	Construction				Operations				Closure				Post-closure			
	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max
Acidity_T	1.6	1.6	1.4	1.7	0.6	1.3	1.3	1.8	0.7	1.4	1.3	1.9	na	1.5	1.3	1.8
Alkalinity_T	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	na	1.1	0.9	0.5
Aluminum_D	29.4	2.1	3.4	1.6	0.6	1.0	0.8	1.2	0.7	1.5	3.5	1.3	na	0.6	0.6	0.7
Aluminum_T	69.8	2.8	4.7	2.0	0.6	1.7	1.4	1.9	0.8	2.3	5.5	1.8	na	0.8	0.8	0.9
Antimony_D	1.7	1.5	1.4	1.3	0.7	1.0	1.1	1.2	0.7	1.2	1.1	1.5	na	1.0	0.9	0.9
Antimony_T	1.7	1.5	1.4	1.3	0.8	1.1	1.2	1.4	0.9	1.3	1.2	1.5	na	1.0	0.9	0.9
Arsenic_D	0.6	0.6	0.6	0.6	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.6	na	0.9	0.8	0.6
Arsenic_T	0.6	0.6	0.6	0.6	0.4	0.5	0.5	0.6	0.4	0.6	0.6	0.7	na	0.9	0.8	0.6
Barium_D	0.5	0.6	0.6	0.7	0.4	0.5	0.5	0.7	0.4	0.6	0.5	0.7	na	1.2	1.1	0.7
Barium_T	0.6	0.6	0.7	0.7	0.5	0.6	0.6	0.7	0.5	0.6	0.5	0.7	na	1.2	1.0	0.7
Beryllium_T	1.4	1.3	1.2	1.2	0.6	0.9	1.0	1.1	0.6	1.1	1.1	1.3	na	1.0	0.9	0.9
Boron_D	0.6	0.8	0.8	0.9	0.4	0.6	0.6	0.9	0.4	0.7	0.6	0.9	na	1.5	1.5	0.9
Boron_T	0.7	0.9	0.9	1.1	0.5	0.8	0.8	1.1	0.5	0.9	0.7	1.1	na	1.5	1.4	1.2
Bromide	0.8	0.8	0.8	0.9	0.4	0.6	0.7	0.8	0.4	0.8	0.8	0.9	na	0.8	0.8	0.8
Cadmium_D	0.8	0.7	0.7	0.7	0.1	0.3	0.3	0.3	0.1	0.4	0.4	0.7	na	0.9	0.9	0.7
Cadmium_T	1.3	0.9	0.9	0.8	0.1	0.4	0.4	0.5	0.1	0.6	0.6	0.8	na	0.8	0.9	0.8
Calcium_D	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.5	na	1.0	0.9	0.5
Chloride	0.7	0.6	0.7	0.5	0.1	0.3	0.3	0.4	0.1	0.4	0.4	0.5	na	0.8	0.9	0.6
Chromium_D	0.9	0.5	0.5	0.6	0.2	0.2	0.2	0.4	0.2	0.3	0.2	0.5	na	0.8	0.8	0.5
Chromium_D_Hex	0.9	0.5	0.4	0.4	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.4	na	0.9	1.0	0.4
Chromium_T	1.2	1.1	1.0	1.0	0.3	0.6	0.7	0.8	0.4	0.8	0.8	1.1	na	0.8	0.8	0.8
Cobalt_D	1.8	1.7	1.5	1.8	0.6	1.2	1.2	1.7	0.7	1.4	1.3	1.9	na	1.4	1.3	1.7
Cobalt_T	1.8	1.8	1.6	1.7	0.6	1.3	1.3	1.9	0.8	1.5	1.4	2.1	na	1.4	1.2	1.6
Copper_D	0.8	1.0	1.0	0.8	0.1	0.4	0.3	0.5	0.1	0.5	0.6	0.7	na	0.9	0.8	0.8
Copper_T	1.3	1.1	1.1	1.0	0.2	0.4	0.5	0.5	0.2	0.6	0.6	0.9	na	1.0	1.0	0.9
Cyanide_F	3.4	1.6	1.7	1.4	0.2	0.8	0.7	0.9	0.3	1.0	1.0	1.6	na	0.8	0.8	0.9
Cyanide_T	1.8	1.6	1.4	1.3	0.4	0.8	0.8	1.0	0.4	1.0	1.0	1.5	na	1.0	0.9	0.9
Cyanide_WAD	2.9	1.6	1.5	1.4	0.2	0.7	0.7	0.9	0.3	1.0	1.0	1.5	na	0.8	0.8	0.9
Fluoride	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	na	0.9	0.8	0.5
Hardness	0.5	0.4	0.4	0.5	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.5	na	1.0	0.9	0.5
Iron_D	1.9	1.9	2.2	1.6	0.7	1.2	1.2	1.2	0.9	1.5	1.6	1.6	na	1.2	1.2	1.3
Iron_T	2.9	2.3	2.6	1.8	1.3	2.0	2.2	1.8	1.7	2.4	3.0	1.9	na	0.9	0.9	1.0
Lead_D	1.2	1.0	0.9	0.9	0.1	0.3	0.4	0.4	0.1	0.5	0.5	0.8	na	0.9	0.9	0.8
Lead_T	1.6	1.3	1.4	1.0	0.4	0.7	0.8	0.8	0.4	0.9	1.0	1.2	na	0.8	0.8	0.8
Magnesium_D	0.4	0.4	0.4	0.5	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.5	na	1.0	0.9	0.5
Manganese_D	2.6	3.1	2.5	3.6	0.8	2.7	2.6	3.5	1.1	2.9	2.7	3.6	na	2.5	2.1	3.1
Manganese_T	2.5	3.2	3.0	3.5	0.9	2.9	3.0	3.6	1.3	3.1	3.1	3.8	na	2.2	1.8	2.7
Mercury_D	1.1	1.2	1.2	1.2	0.2	0.6	0.6	0.9	0.2	0.8	0.9	1.1	na	0.9	0.8	0.9
Mercury_T	1.6	1.4	1.4	1.2	0.8	1.0	1.0	1.2	0.9	1.1	1.1	1.2	na	1.1	1.0	1.0
Molybdenum_D	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	na	0.6	0.6	0.1
Molybdenum_T	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	na	0.6	0.7	0.1
N_Ammonia	0.4	0.7	0.7	0.9	0.3	0.7	0.7	0.8	0.3	0.7	0.6	1.0	na	1.0	1.0	0.8
N_Nitrate_Nitrite	0.8	0.6	0.6	0.6	0.1	0.3	0.3	0.4	0.1	0.4	0.4	0.6	na	0.8	0.8	0.5
N_Nitrite	0.9	0.7	0.7	0.7	0.1	0.4	0.4	0.5	0.1	0.5	0.4	0.7	na	0.8	0.9	0.7
Nickel_D	1.0	0.9	0.9	0.9	0.2	0.4	0.4	0.4	0.2	0.6	0.5	0.9	na	0.9	0.8	0.8
Nickel_T	1.4	1.1	1.2	0.9	0.3	0.6	0.7	0.7	0.3	0.8	0.9	1.1	na	0.7	0.7	0.7
Phosphorus_T	1.0	1.0	0.9	1.2	0.8	0.9	0.8	1.2	0.9	1.0	1.0	1.3	na	0.9	0.8	1.0
Potassium_D	0.4	0.4	0.4	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	na	1.1	1.0	0.4
Radium_226	0.3	0.3	0.3	0.2	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.2	na	0.8	0.9	0.3
Selenium_D	1.0	1.3	1.4	1.1	0.1	0.6	0.5	1.0	0.1	0.8	1.0	1.0	na	0.9	0.8	1.0
Selenium_T	1.1	1.3	1.4	1.1	0.1	0.6	0.5	1.0	0.1	0.9	0.9	1.0	na	0.9	0.8	0.9
Silicon_D	0.6	0.6	0.5	0.7	0.2	0.3	0.3	0.4	0.3	0.4	0.4	0.6	na	1.0	1.0	0.7
Silicon_T	0.6	0.6	0.6	0.7	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.6	na	1.0	1.0	0.7
Silver_D	1.2	1.3	1.5	1.1	0.1	0.6	0.4	1.0	0.1	0.9	1.0	1.0	na	0.9	0.8	0.9
Silver_T	1.1	1.3	1.3	1.1	0.1	0.6	0.5	1.0	0.1	0.8	0.9	1.0	na	0.9	0.8	0.9
Sodium_D	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.3	na	0.9	0.8	0.3
Sodium_T	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.3	na	0.9	0.8	0.3
Strontium_D	0.4	0.4	0.3	0.4	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.4	na	1.0	0.9	0.4
Strontium_T	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	na	1.0	0.9	0.4
Sulfate	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2	na	0.8	0.8	0.2
Thallium_D	1.7	1.5	1.4	1.3	0.6	1.0	1.1	1.2	0.7	1.2	1.1	1.4	na	1.0	1.0	0.9
Thallium_T	1.5	1.5	1.5	1.3	1.4	1.5	1.5	1.5	1.4	1.5	1.3	1.5	na	1.1	1.0	1.0
Uranium_D	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	na	0.5	0.5	0.1
Uranium_T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	na	0.5	0.5	0.0
Vanadium_T	1.1	0.9	0.8	0.9	0.1	0.5	0.5	0.6	0.2	0.6	0.6	0.9	na	0.7	0.7	0.8
Zinc_D	0.6	0.5	0.5	0.4	0.1	0.2	0.2	0.3	0.1	0.3	0.3	0.4	na	0.8	0.8	0.5
Zinc_T	0.7	0.6	0.6	0.5	0.1	0.3	0.2	0.3	0.1	0.4	0.4	0.6	na	0.7	0.6	0.6

Notes:

	updated model concentration/EIS model concentration <0.5
	0.5 < updated model concentration/EIS model concentration <2
	updated model concentration/EIS model concentration >2

Concentration Ratio of the Updated Model Results to the EIS Model Results (Stantec 2020a) for the Expected Case Scenario - Farley Lake West

Parameters	Construction				Operations				Closure				Post-closure			
	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max	Min	Mean	Median	Max
Acidity_T	0.8	1.4	1.6	1.3	0.7	1.4	1.4	1.7	0.8	2.1	2.0	2.4	na	1.1	0.9	1.5
Alkalinity_T	0.4	0.7	0.7	0.9	0.5	0.8	0.8	1.2	0.5	0.9	0.7	1.2	na	0.7	0.6	1.1
Aluminum_D	6.0	2.6	2.4	2.0	1.5	1.7	1.3	2.3	3.3	3.0	2.8	3.3	na	0.9	0.7	1.3
Aluminum_T	4.9	2.4	2.1	1.5	1.5	1.6	1.3	2.1	3.2	2.8	2.6	2.9	na	0.7	0.6	1.0
Antimony_D	1.3	1.4	1.3	1.7	1.7	1.6	1.4	2.2	1.5	1.3	1.4	1.0	na	0.6	0.5	0.6
Antimony_T	1.4	1.4	1.4	1.6	1.6	1.7	1.5	2.1	1.8	1.4	1.6	1.1	na	0.6	0.6	0.5
Arsenic_D	0.6	0.9	1.1	1.2	1.1	1.0	0.9	1.2	0.9	1.4	1.2	1.3	na	0.6	0.7	1.0
Arsenic_T	0.6	0.9	1.0	1.2	1.1	1.0	0.9	1.2	0.9	1.4	1.2	1.3	na	0.6	0.7	1.0
Barium_D	0.5	0.8	0.9	1.0	0.6	0.9	1.0	1.2	0.6	1.1	0.9	1.4	na	0.8	0.6	1.0
Barium_T	0.5	0.8	0.9	1.0	0.6	1.0	1.0	1.2	0.6	1.1	0.9	1.4	na	0.8	0.6	1.0
Beryllium_T	1.1	1.0	1.0	0.9	1.0	1.1	1.1	1.3	1.2	1.2	1.1	1.1	na	0.9	0.8	0.8
Boron_D	0.8	0.9	1.0	0.9	1.0	1.5	1.4	1.6	1.1	1.7	1.4	1.9	na	0.6	0.4	0.8
Boron_T	0.8	0.9	1.0	0.9	1.0	1.5	1.4	1.6	1.1	1.7	1.5	1.9	na	0.6	0.4	0.8
Bromide	0.9	0.8	0.8	0.7	0.7	0.8	0.8	0.9	0.9	1.0	0.9	1.0	na	0.8	0.8	0.9
Cadmium_D	0.6	0.7	0.7	0.6	0.7	0.8	0.8	1.2	0.7	0.8	0.8	0.8	na	0.8	0.8	0.9
Cadmium_T	0.7	0.8	0.8	0.9	0.7	0.9	0.9	1.2	0.8	0.9	0.9	0.9	na	0.9	0.9	1.0
Calcium_D	0.5	0.8	0.9	1.0	0.7	1.0	1.0	1.3	0.7	1.1	0.9	1.4	na	0.9	0.7	1.1
Chloride	0.8	0.7	0.7	0.7	0.9	1.2	1.1	1.6	1.3	1.7	1.5	1.9	na	0.9	0.8	1.4
Chromium_D	0.7	0.9	0.8	1.2	0.5	0.8	0.7	1.2	0.5	0.9	0.9	1.4	na	1.0	0.9	1.1
Chromium_D_Hex	0.8	0.8	0.8	1.1	0.5	0.8	0.7	1.2	0.5	0.9	0.8	1.4	na	1.0	0.9	1.0
Chromium_T	0.8	1.7	1.6	2.1	0.6	1.1	1.1	1.3	0.8	1.4	1.4	2.1	na	1.2	1.2	1.1
Cobalt_D	1.1	1.5	1.5	1.4	0.8	1.3	1.4	1.3	1.0	1.8	1.6	2.5	na	1.0	1.0	1.2
Cobalt_T	1.1	1.8	1.9	1.9	0.8	1.5	1.6	1.8	1.0	2.1	1.8	3.1	na	1.1	1.1	1.4
Copper_D	0.7	0.7	0.7	1.0	0.9	1.3	1.2	1.4	1.0	1.2	1.0	1.5	na	0.6	0.6	0.9
Copper_T	0.8	1.0	1.1	1.2	1.0	1.4	1.3	1.5	1.1	1.5	1.3	1.7	na	0.7	0.6	1.0
Cyanide_F	1.2	1.0	0.9	1.0	0.6	0.8	0.8	0.9	0.7	1.0	1.1	1.3	na	0.7	0.7	0.9
Cyanide_T	1.2	1.0	1.1	0.9	0.8	0.9	0.9	1.0	0.9	1.1	1.2	1.3	na	0.8	0.8	0.9
Cyanide_WAD	1.2	1.0	0.9	1.0	0.7	0.9	0.8	0.9	0.8	1.1	1.1	1.3	na	0.7	0.7	0.9
Fluoride	0.5	0.5	0.5	0.6	0.5	0.7	0.7	0.7	0.5	0.6	0.5	0.7	na	1.0	1.1	1.5
Hardness	0.6	0.8	0.9	1.0	0.7	0.9	0.9	1.3	0.8	1.2	1.0	1.5	na	1.0	0.8	1.4
Iron_D	1.0	1.0	1.0	0.8	0.6	0.8	0.8	1.0	0.7	1.0	0.9	1.6	na	0.9	0.9	0.9
Iron_T	1.6	1.3	1.2	2.0	0.7	1.0	0.7	1.9	1.0	1.5	1.3	2.5	na	0.4	0.3	1.1
Lead_D	0.9	0.8	0.8	0.9	0.7	1.0	0.9	1.4	0.6	1.0	1.0	1.3	na	1.0	0.9	0.9
Lead_T	1.2	1.3	1.2	1.2	1.0	1.2	1.1	1.4	1.3	1.3	1.3	1.4	na	1.0	1.0	0.9
Magnesium_D	0.8	1.0	1.0	1.0	0.9	1.2	1.1	1.5	1.1	1.6	1.3	1.8	na	1.0	0.8	1.3
Manganese_D	0.8	1.6	2.1	1.3	0.6	2.2	2.3	2.5	0.9	3.5	4.0	2.8	na	0.9	0.7	1.6
Manganese_T	1.0	1.5	2.0	1.2	0.8	2.1	2.2	2.4	1.1	3.4	3.8	2.7	na	0.9	0.7	1.5
Mercury_D	1.1	1.1	1.0	1.2	0.7	1.0	0.8	1.4	0.8	1.2	1.2	1.5	na	0.8	0.7	1.0
Mercury_T	1.3	1.4	1.4	1.4	0.9	1.1	0.9	1.5	1.0	1.4	1.4	1.7	na	0.9	0.8	1.1
Molybdenum_D	0.3	0.3	0.2	0.5	0.5	0.9	0.8	1.3	0.2	0.3	0.3	0.7	na	0.6	0.6	0.6
Molybdenum_T	0.3	0.3	0.2	0.5	0.5	0.9	0.8	1.3	0.2	0.3	0.3	0.7	na	0.6	0.6	0.6
N_Ammonia	0.2	0.7	0.8	0.7	0.7	1.4	1.4	1.6	0.2	0.8	0.7	1.1	na	1.0	1.0	1.2
N_Nitrate_Nitrite	0.5	1.3	0.9	2.3	2.2	3.8	3.0	5.5	0.7	1.1	1.0	1.4	na	0.6	0.5	1.3
N_Nitrite	0.6	1.0	0.8	1.5	1.5	1.9	1.8	2.7	0.8	1.5	1.2	2.0	na	1.1	0.9	1.5
Nickel_D	1.0	1.1	1.1	1.0	1.2	1.5	1.4	1.5	1.5	1.9	1.8	1.8	na	0.8	0.8	1.0
Nickel_T	1.0	1.3	1.4	1.2	1.2	1.5	1.5	1.6	1.6	2.0	1.9	2.0	na	0.8	0.7	1.0
Phosphorus_T	0.7	0.7	0.7	1.0	0.6	0.7	0.7	1.1	0.6	0.9	0.8	1.5	na	0.6	0.5	0.9
Potassium_D	0.9	1.1	1.2	1.4	1.1	1.5	1.4	1.6	1.3	1.8	1.5	1.8	na	0.6	0.5	0.8
Radium_226	0.4	0.3	0.3	0.3	0.4	0.5	0.4	0.5	0.2	0.3	0.3	0.5	na	0.6	0.6	0.5
Selenium_D	1.0	2.0	1.9	2.7	1.0	1.6	1.6	2.0	1.0	2.2	2.0	1.9	na	1.0	0.8	1.1
Selenium_T	1.0	1.2	1.2	1.4	1.1	1.3	1.3	2.1	1.1	1.2	1.2	1.0	na	0.6	0.6	0.6
Silicon_D	0.4	0.5	0.5	0.6	0.5	0.7	0.7	0.8	0.3	0.5	0.5	0.8	na	0.9	0.9	1.1
Silicon_T	0.4	0.5	0.5	0.6	0.5	0.7	0.7	0.8	0.3	0.5	0.5	0.8	na	0.9	0.9	1.1
Silver_D	0.9	1.1	0.9	1.6	0.7	1.1	0.9	1.8	0.6	1.3	1.1	2.1	na	0.9	0.8	1.2
Silver_T	0.9	1.1	0.9	1.5	0.7	1.1	1.0	1.7	0.7	1.3	1.1	2.1	na	0.9	0.8	1.1
Sodium_D	0.7	0.9	0.9	1.0	0.9	1.4	1.2	1.5	1.0	1.3	1.1	1.2	na	0.6	0.5	0.7
Sodium_T	0.7	0.9	0.9	1.0	0.9	1.3	1.2	1.5	1.0	1.3	1.1	1.3	na	0.6	0.5	0.7
Strontium_D	0.5	0.8	0.8	1.0	0.7	1.1	1.1	1.4	0.7	1.2	1.0	1.6	na	0.8	0.6	1.0
Strontium_T	0.5	0.7	0.8	1.0	0.7	1.0	1.0	1.4	0.7	1.1	0.9	1.5	na	0.8	0.6	1.0
Sulfate	2.4	1.7	1.8	1.3	2.2	2.1	2.1	2.1	3.6	3.8	3.6	3.2	na	0.8	0.6	1.1
Thallium_D	1.1	1.2	1.3	1.0	0.8	1.2	1.1	1.8	1.0	1.4	1.4	1.3	na	0.9	0.9	0.8
Thallium_T	1.1	1.2	1.3	1.0	0.9	1.2	1.2	1.7	1.1	1.4	1.5	1.3	na	0.9	0.9	0.9
Uranium_D	0.2	0.4	0.5	0.5	0.7	1.3	1.1	1.7	0.4	0.7	0.6	1.0	na	0.7	0.8	0.8
Uranium_T	0.2	0.3	0.3	0.4	0.6	1.2	1.0	1.6	0.3	0.5	0.5	0.9	na	0.7	0.7	0.8
Vanadium_T	1.3	1.3	1.2	1.3	0.9	1.1	1.1	1.1	1.2	1.3	1.2	1.4	na	0.9	0.9	0.9
Zinc_D	0.6	0.6	0.6	0.6	0.5	0.7	0.7	0.9	0.4	0.6	0.6	0.7	na	0.8	0.8	1.0
Zinc_T	0.7	0.9	0.9	0.9	0.6	0.8	0.8	0.9	0.6	0.9	0.8	1.1	na	0.8	0.9	1.0

Notes:

	updated model concentration/EIS model concentration <0.5
	0.5 < updated model concentration/EIS model concentration <2
	updated model concentration/EIS model concentration >2

Appendix G Surface Water Quality Figures

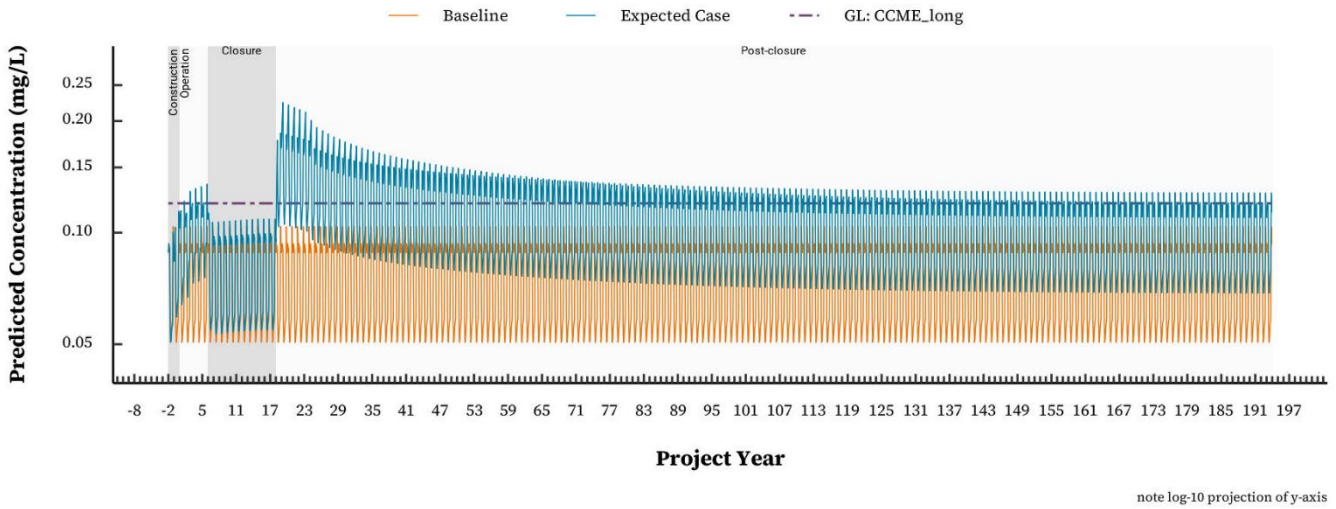

Figure H-1 Predicted Project vs. Baseline Concentrations of Fluoride in West Farley Lake for the Expected Case Scenario

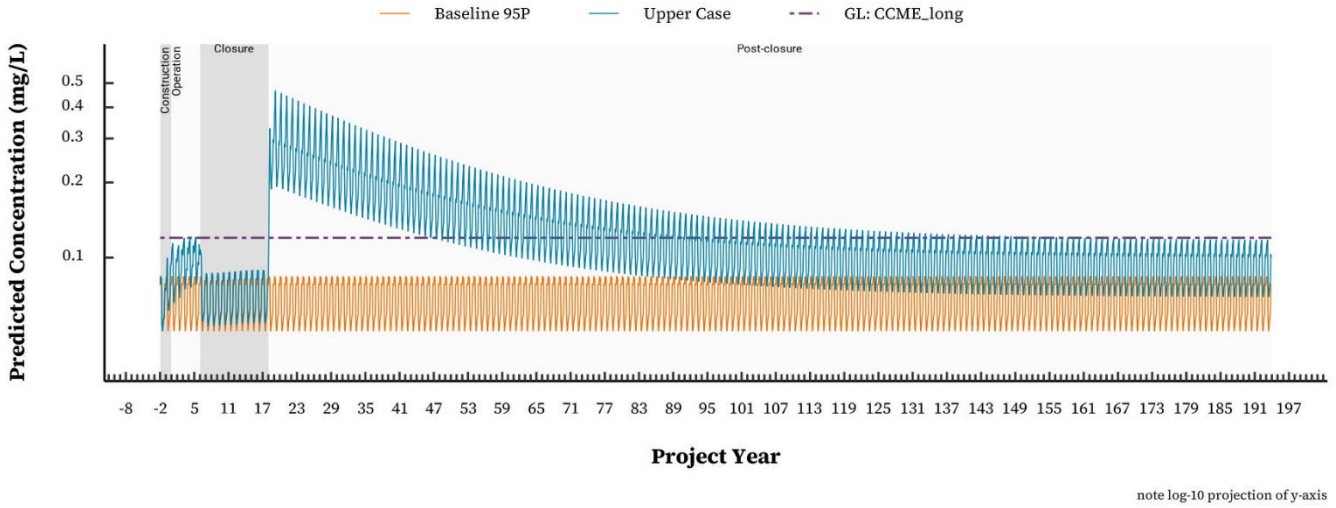

Figure H-2 Predicted Project vs. Baseline Concentrations of Fluoride in West Farley Lake for the Upper-Case Scenario

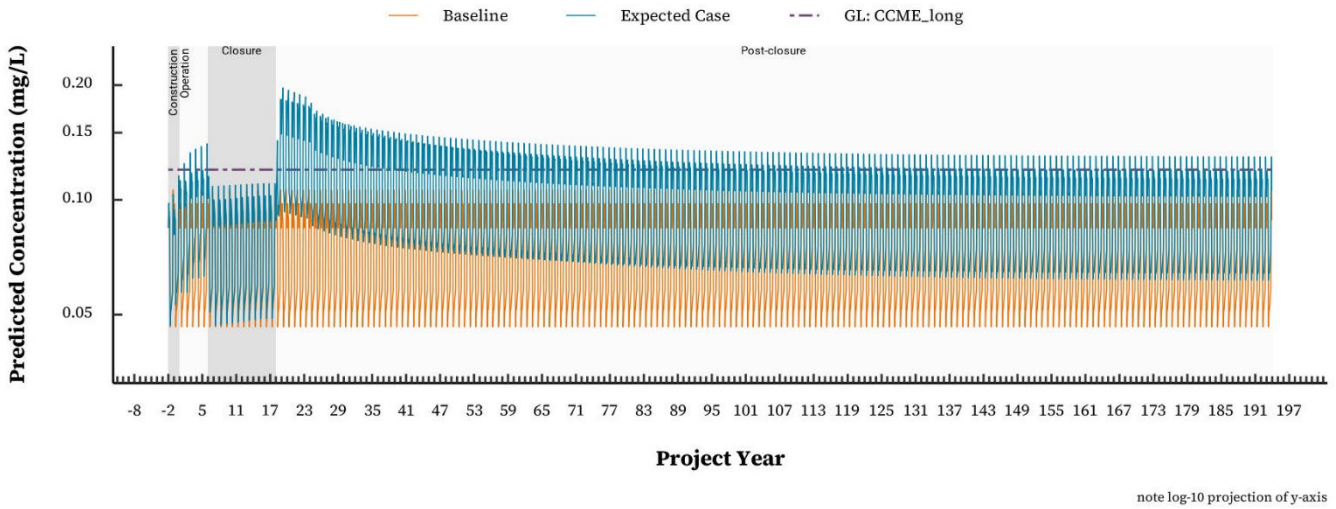

Figure H-3 Predicted Project vs. Baseline Concentrations of Fluoride in East Farley Lake for the Expected Case Scenario

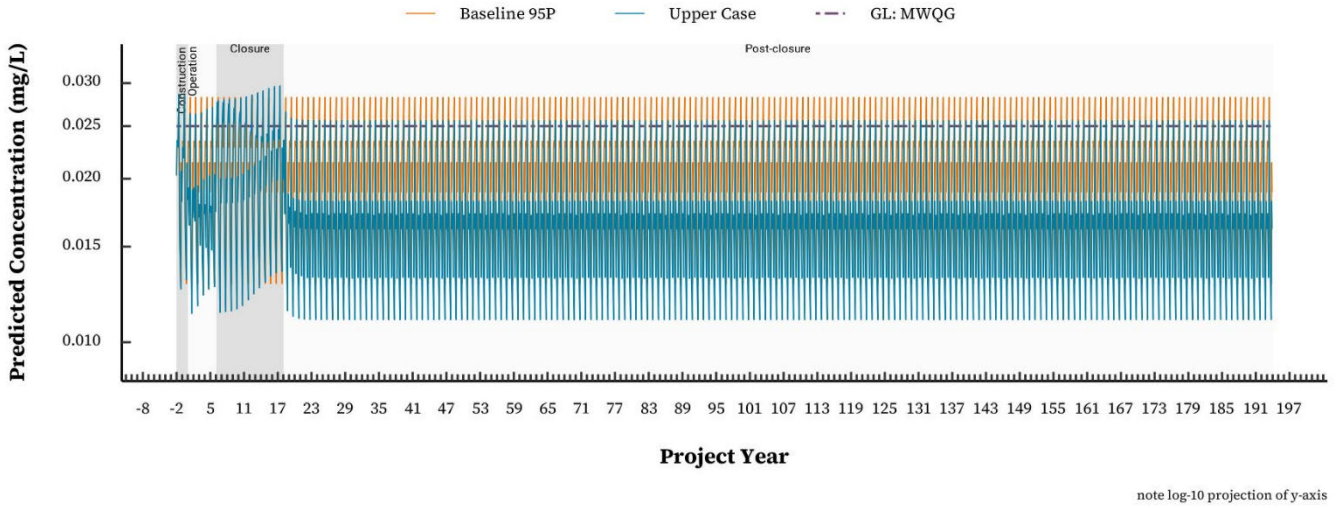

Figure H-4 Predicted Project vs. Baseline Concentrations of Fluoride in East Farley Lake for the Upper-Case Scenario

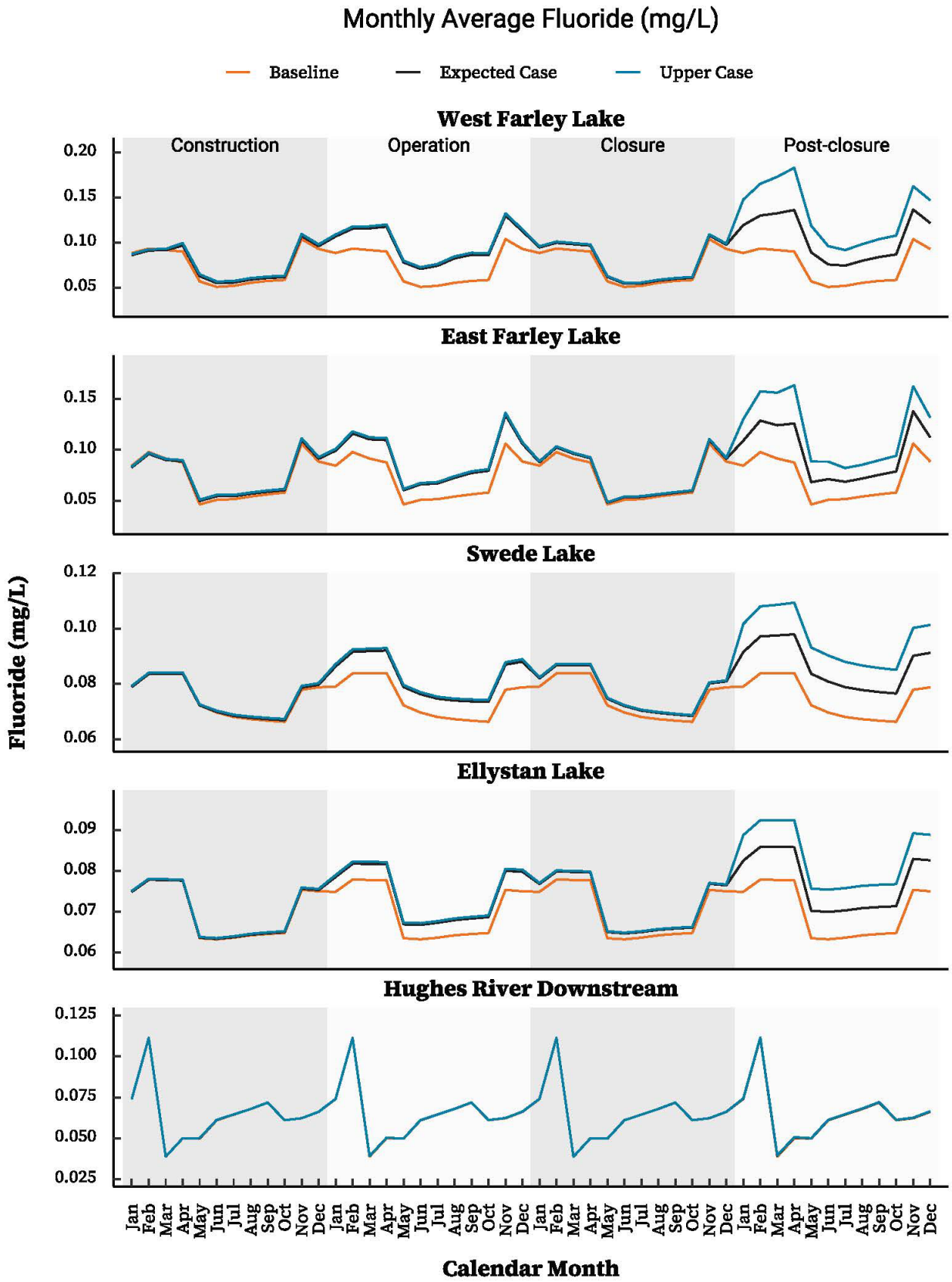

Figure H-5 **Predicted Monthly Mean Fluoride Concentrations in West Farley Lake, East Farley Lake, Swede Lake, Ellystan Lake, and the Hughes River (downstream of LAA) during Construction, Operation, Closure, and Post-Closure Phases. Note: Baseline, Expected Case, and Upper-Case scenarios are indistinguishable from each other in the Hughes River.**

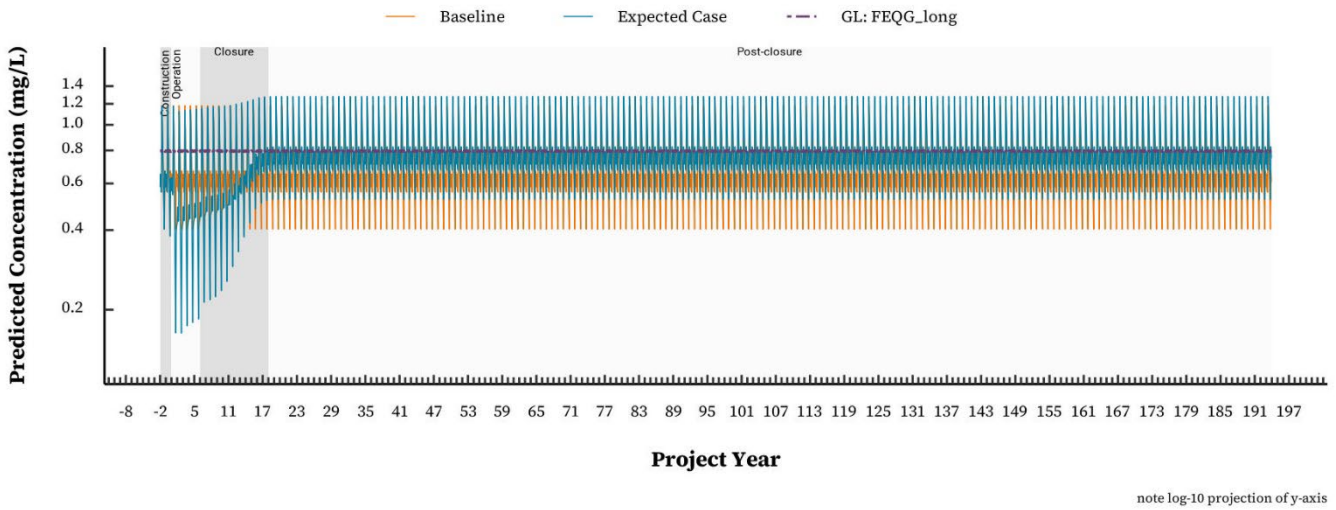

Figure H-6 Predicted Project vs. Baseline Concentrations of Total Iron in Gordon Lake for the Expected Case Scenario

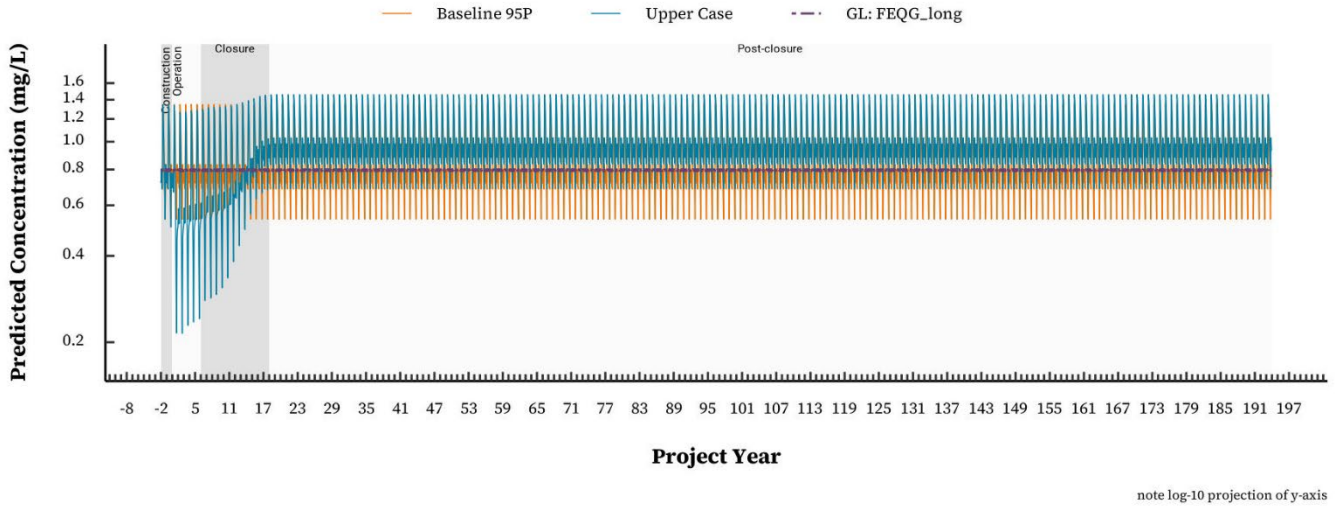

Figure H-7 Predicted Project vs. Baseline Concentrations of Total Iron in Gordon Lake for the Upper-Case Scenario

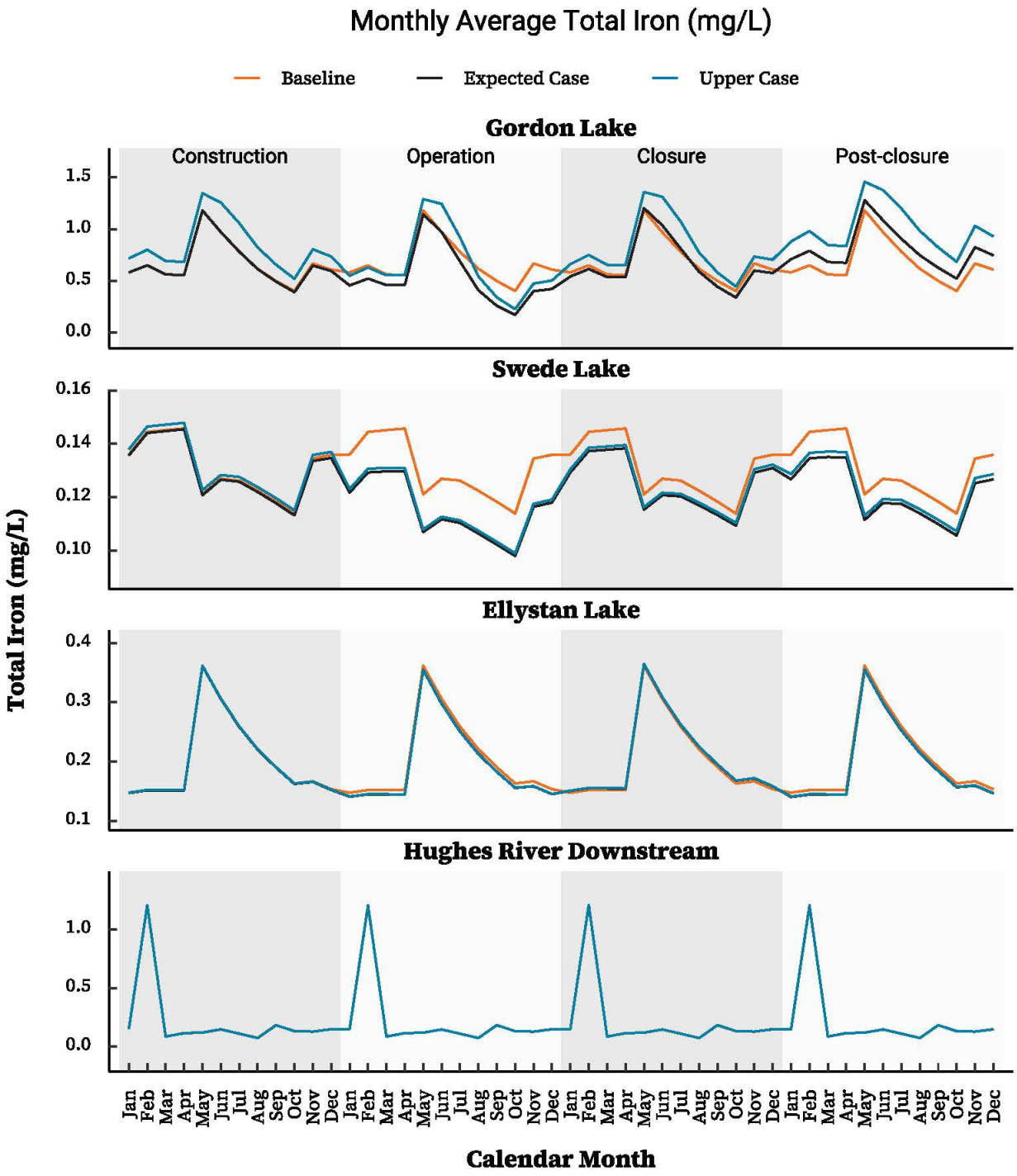

Figure H-8 **Predicted Monthly Mean Total Iron Concentrations in Gordon Lake, Swede Lake, Ellystan Lake, and the Hughes River (downstream) in Construction, Operation, Closure, and Post-Closure. Note: Baseline, Expected Case, and Upper-Case scenarios are indistinguishable from each other in the Hughes River.**

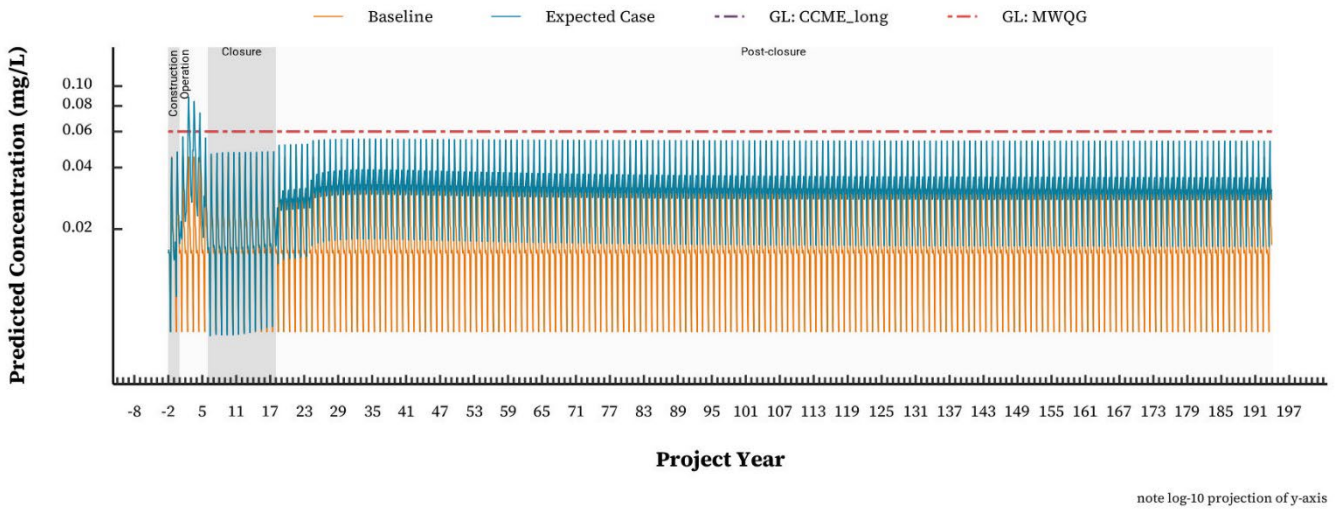

Figure H-9 **Predicted Project vs. Baseline Concentrations of Nitrite in West Farley Lake for the Expected Case Scenario**

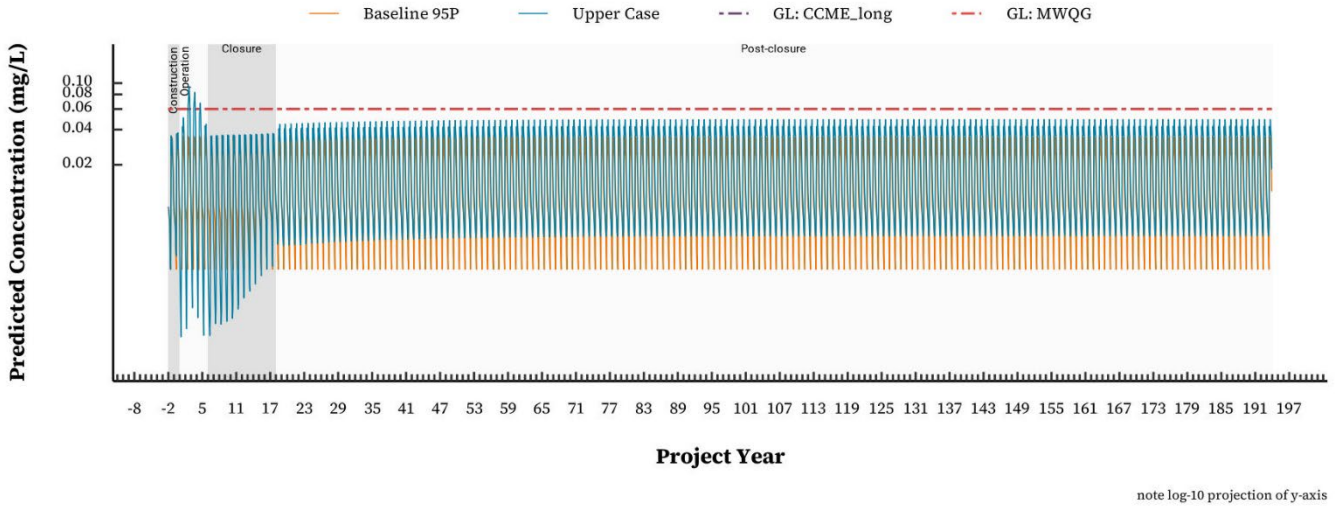

Figure H-10 **Predicted Project vs. Baseline Concentrations of Nitrite in West Farley Lake for the Upper-Case Scenario**

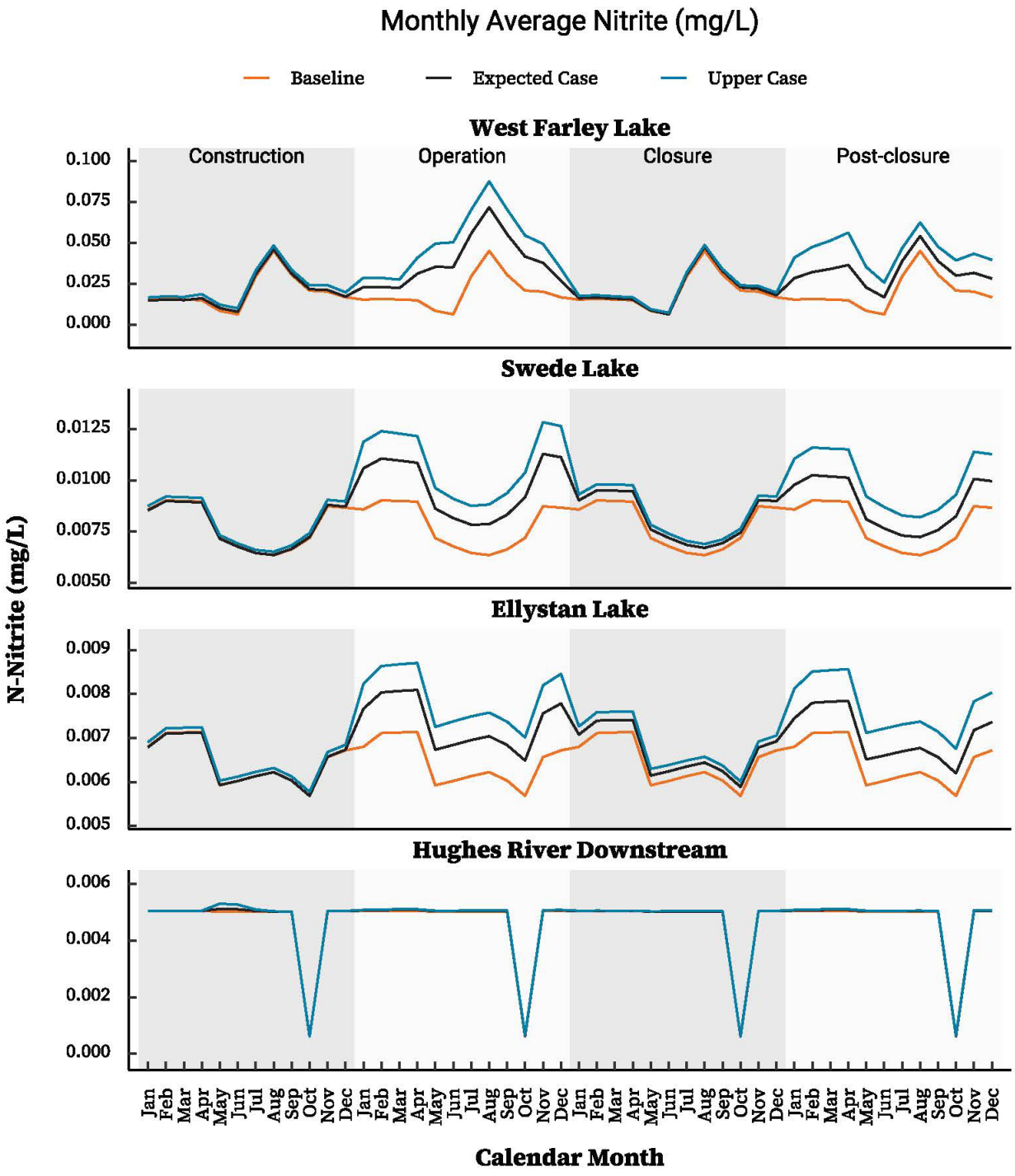

Figure H-11 Predicted Monthly Mean Nitrite Concentrations in West Farley Lake, Swede Lake, Ellystan Lake, and the Hughes River (downstream) in Construction, Operation, Closure, and Post-Closure. Note: Baseline, Expected Case, and Upper-Case scenarios are indistinguishable from each other in the Hughes River.

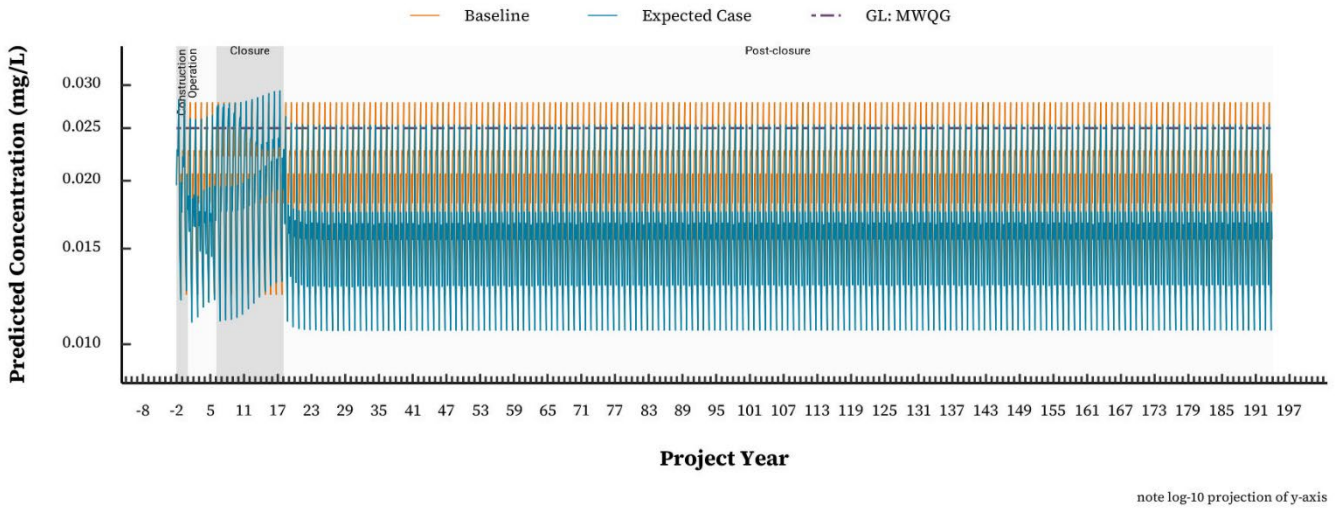

Figure H-12 **Predicted Project vs. Baseline Concentrations of Total Phosphorus in East Farley Lake for the Expected Case Scenario**

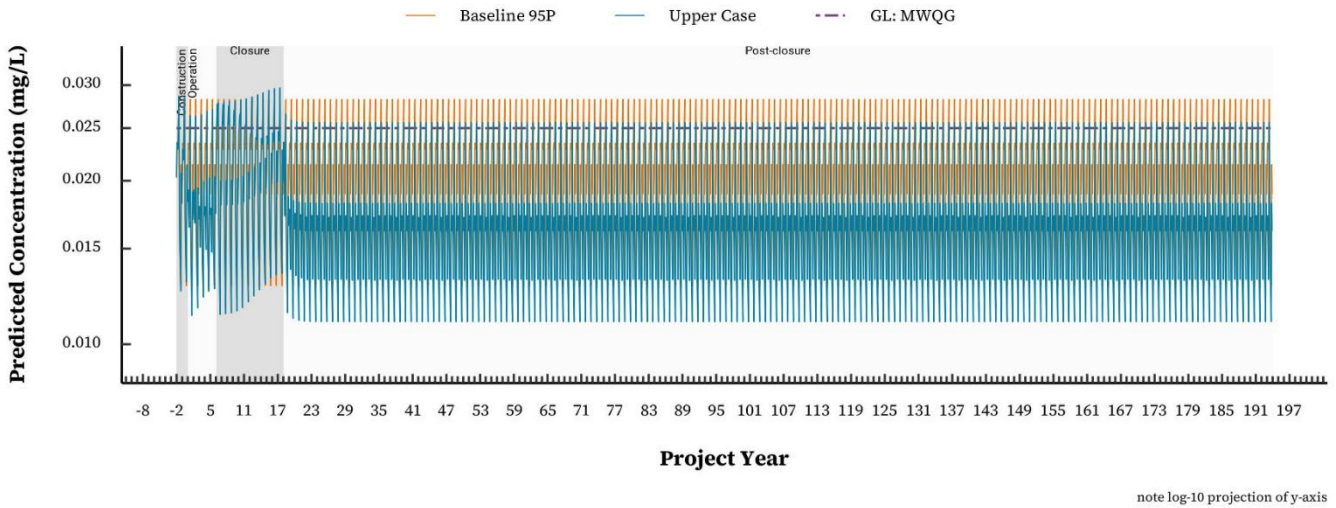

Figure H-13 **Predicted Project vs. Baseline Concentrations of Total Phosphorus in East Farley Lake for the Upper-Case Scenario**

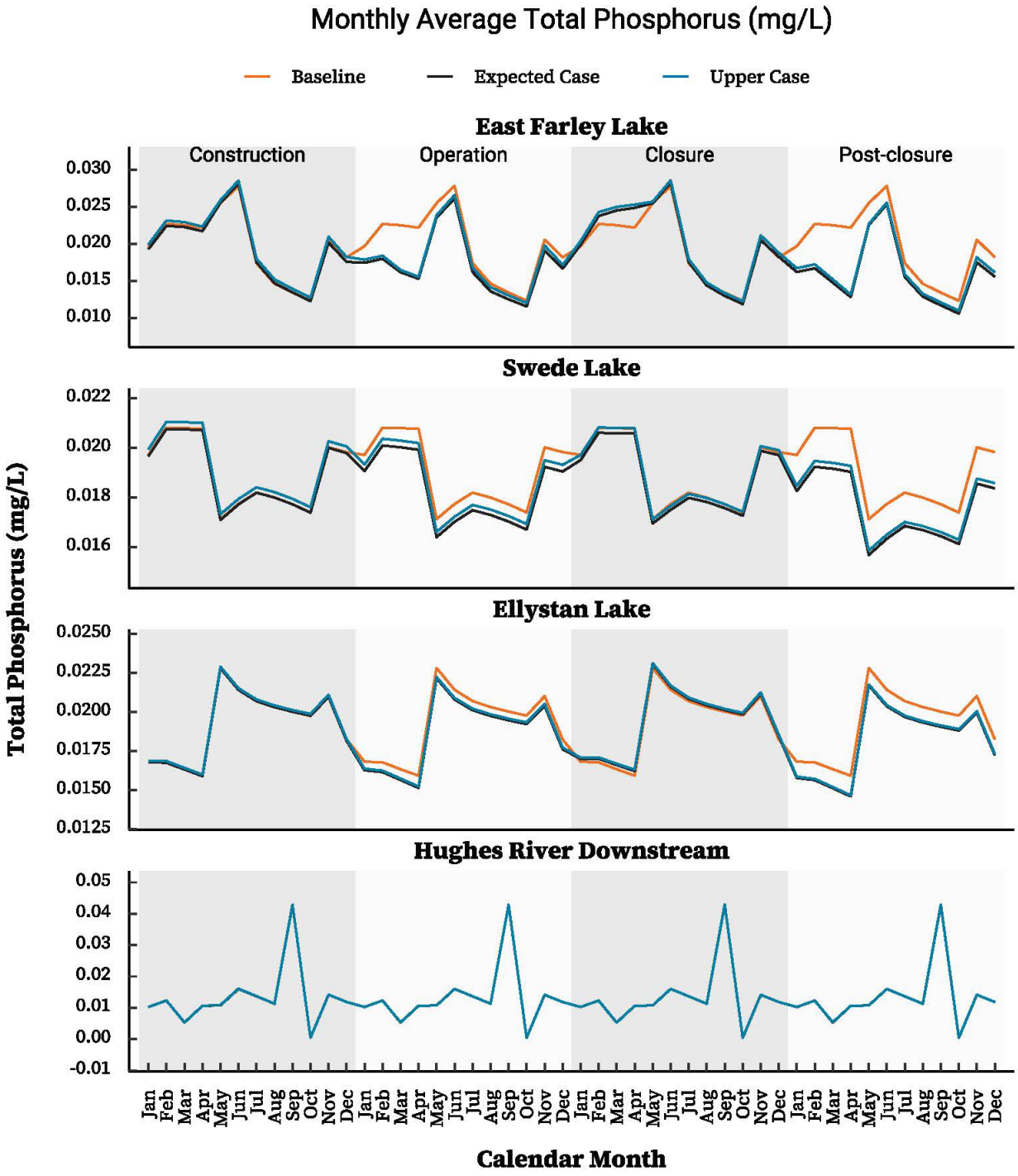

Figure H-14 Predicted Monthly Mean Total Phosphorus Concentrations in East Farley Lake, Swede Lake, Ellystan Lake, and the Hughes River (downstream) in Construction, Operation, Closure, and Post-Closure. Note: Baseline, Expected Case, and Upper-Case scenarios are indistinguishable from each other in the Hughes River.