ALAMOS GOLD INC.
LYNN LAKE

Lynn Lake Gold Project: Groundwater Management and Monitoring Plan

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Document History

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Approvals

This document requires the following approvals:

Name	Company Title	Date	Signature

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Acronyms and Abbreviations

Alamos	Alamos Gold Inc.
AMP	Adaptive Management Plan
CRA	commercial, recreational and Aboriginal
CWQG-FAL	Canadian Water Quality Guidelines for the Protection of Aquatic Life
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMMP	Environmental Management and Monitoring Program
FAL	freshwater aquatic life
GCDWQ	Guidelines for Canadian Drinking Water Quality
GMMP	Groundwater Management and Monitoring Plan
IAAC	Impact Assessment Agency of Canada
km	kilometres
MDMER	Metal and Diamond Mining Effluent Regulations
MECC	Manitoba Environment and Climate Change (formerly Manitoba Environment, Climate and Parks, and formerly Manitoba Conservation and Climate)
MRSA	Mine Rock Storage Area
MWQSOG	Manitoba Water Quality Standards, Objectives and Guidelines
the Project	Lynn Lake Gold Project
TLRU	Traditional Land and Resource Use
TMF	Tailings Management Facility
VWP	vibrating wire piezometer

1.0 INTRODUCTION

The following presents the Groundwater Management and Monitoring Plan (‘GMMP’ or ‘the Plan’), which considers the construction, operation, and decommissioning/closure phases of the Lynn Lake Gold Project (‘LLGP’ or ‘the Project’) and the mitigation, management, and monitoring of Project-related effects on groundwater quantity and quality. It is one component of the overall Environmental Management and Monitoring Program (EMMP) for the Project.

For clarity, the term “follow-up programs” as stated in the federal Decision Statement refers to “management and monitoring programs” as outlined in the provincial Licences. Both terms are used interchangeably but refer to the same monitoring activities that extend over the life of mine through all phases.

1.1 PURPOSE

The purpose of the GMMP is to describe the groundwater management and monitoring (follow-up) measures that will be implemented to assess effects of Project activities against predictions described in the Project Environmental Impact Statement (EIS), address regulatory and permit requirements, and outline how monitoring results will be used to guide management, such as the implementation of additional mitigation measures. The GMMP addresses planning, management and/or monitoring activities related to groundwater during construction, operation, and decommissioning of both the Gordon and MacLellan sites. The GMMP focuses primarily on groundwater quantity and quality management. The specifics of water quality mitigation planning and management, including geochemical aspects and erosion prevention and sediment control, are addressed in other management plans.

1.2 OBJECTIVES

As part of Alamos Gold Inc.’s (Alamos’) approach to environmental management, the company sets, implements, and maintains documented environmental objectives that consider the Project’s environmental risks and compliance obligations. These obligations are aligned with the Project’s Environmental Policy and are communicated to employees, contractors, and interested parties, regularly monitored, and updated as appropriate. Objectives are set to drive continuous improvement in environmental performance and are aligned with the overall strategic goals of the Project. Objectives are measurable (where possible), monitored, communicated, and updated as appropriate.

Alamos’ overarching environmental objective is to avert adverse effects, where technologically and economically feasible, and mitigate adverse effects that are unavoidable. In support of Alamos’ underlying environmental objectives (i.e., to work to limit or mitigate adverse environmental effects, meet or surpass regulatory requirements, and strive to continually improve environmental practices and performance), Alamos has established the following performance objectives for the GMMP that consider key Project interactions and compliance obligations:

- Establish and/or maintain baseline monitoring locations to differentiate between natural seasonal or climatic variability in groundwater quantity and quality as the Project progresses.
- Monitoring of groundwater levels in monitoring wells to document changes in water levels and groundwater flow direction in response to dewatering of historical underground workings, open pits (including the historical East and Wendy pits), operation of the interceptor wells at Gordon site, and changes to recharge due to Project components (e.g., MRSAs and TMF).
- Monitoring of groundwater quality to document the effects of changes in groundwater quality associated with Project components, including the MRSAs and TMF.
- Validate the prediction of environmental effects of the Project on groundwater quality and quantity as presented in the EIS for the Project (Stantec 2020), which included the cumulative effect of mitigation measures on groundwater quality and quantity.
- Maintain a groundwater quantity and quality monitoring well network sufficient to assess effects if a trigger, as defined in the adaptive management plan (Section 6.0), is exceeded and to assess effectiveness of subsequent adaptive mitigation measures.
- Validate the initial three-dimensional numerical groundwater flow models used in the EIS (Stantec 2020) and update, if required, with new data at routine intervals throughout operation of the Project.
- Maintain compliance with applicable permits and approvals.

1.3 RELATIONSHIP TO OTHER MANAGEMENT PLANS

The following management and monitoring plans are reliant on groundwater monitoring and management and changes to groundwater conditions may trigger additional monitoring or mitigation requirements in the following plans:

- Surface Water Monitoring and Management Plan which addresses surface water resources and surface water ecosystems at points of discharge interacting directly with groundwater.
- Vegetation and Weed Management Plan which specifies details on how changes in groundwater levels may affect communities (wetlands) that are formed by or supported by groundwater.
- Aquatic Effects Monitoring Program (AEMP) which focuses on fish and fish habitat and the productivity of the fisheries that they support, and changes in surface water quantity and quality that may affect fish health and fish habitat, with surface water linked to groundwater.

The GMMP relies on, particularly the avoidance and mitigation measures, from the following management plans:

- Acid Rock Drainage and Metal Leaching Management and Monitoring Plan.
- Erosion and Sediment Control Plan.
- Soil Management and Rehabilitation Plan.
- Emergency Response and Spill Prevention and Contingency Plan.
- Explosives Management Plan.
- Waste Management Plan.

1.4 REGULATORY CONTEXT

The Project EIS was submitted to the Impact Assessment Agency of Canada (formerly the Canadian Environmental Assessment Agency) pursuant to CEAA 2012, and to Manitoba Environment and Climate Change (MECC; formerly Manitoba Environment, Climate and Parks, and formerly Manitoba Conservation and Climate) as an Environment Act Proposal pursuant to *The Environment Act* of Manitoba. Within the EIS, and with Project approval, federal and provincial regulatory requirements were identified. The relevant federal and provincial regulatory requirements related to groundwater are outlined below.

1.4.1 Federal Regulatory Requirements

The following provides a summary of federal regulations, policies, and/or guidelines that apply directly or indirectly to groundwater.

Fisheries Act

The *Fisheries Act* outlines the protection of the productivity and sustainability of commercial, recreational and Aboriginal (CRA) fisheries, as administered primarily by Fisheries and Oceans Canada (DFO) with some provisions administered by Environment and Climate Change Canada (ECCC). The *Fisheries Act* also restricts or controls the deposit of deleterious substances into waters or locations frequented by fish unless authorized by regulation. Any alteration of fish habitat, including the deposit of deleterious substances in or near water, must not result in “serious harm” to fish that are part of or support a CRA fishery, otherwise an authorization and associated offsetting is required. The *Fisheries Act* applies to the Project through protection of fish habitat and water quality. Additional details related to the application of the *Fisheries Act* can be found in the AEMP for the Project.

A number of regulations have been made to carry out the purposes and provisions of the *Fisheries Act*. The *Metal and Diamond Mining Effluent Regulations* (MDMER) are administered by ECCC and apply to metal and diamond mines (except placer mines) in commercial operation that exceed an effluent flow rate of 50 cubic metres per day (m^3/d) based on effluent deposited from all final discharge points of the mine. The MDMER define arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids (TSS), radium 226 and un-ionized ammonia 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. With respect to groundwater, the MDMER definition of effluent includes seepage containing any deleterious substance that flows over, through or out of the site of a mine. The MDMER Schedule 4 criteria are used to define the maximum discharge criteria from the final discharge points from the Project to the receiving environment.

Schedule 4 of the MDMER define two sets of criteria: Table 1 and Table 2. Table 2 is applicable to mines operating prior to June 1, 2021. Table 1 is applicable to mines operating after June 1, 2021. Therefore, Table 1 is applicable for the Project.

Guidelines for Canadian Drinking Water Quality

The Guidelines for Canadian Drinking Water Quality (GCDWQ) are established by Health Canada in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water and other federal government departments and are published by Health Canada (2020). These guidelines are based on current, published scientific research related to health effects, aesthetic effects, and operational conditions of various parameters in drinking water. For the parameters analyzed as part of the Project, the GCDWQ generally have the same values as the Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOG), except for barium, cadmium, copper, lead, manganese, nitrite, and selenium.

1.4.2 Provincial Regulatory Requirements

The following provides a summary of provincial regulations, policies, and/or guidelines that apply directly or indirectly to groundwater.

The Mines and Minerals Act

The Mines and Minerals Act and *Mine Closure Regulation* under Part 14 of the Act sets out standards for mine closure. The monitoring requirements for the Project related to groundwater will be developed to meet the requirements under the Act.

The Environment Act

The *Environment Act* is the principal environmental protection and control statute in Manitoba and is used in conjunction with *The Water Protection Act* to address sources of water pollution. *The Environment Act* incorporates 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

The Water Protection Act is the principal statute governing water management and water quality in Manitoba and is designed to be protective of the environmental, economic, and social well-being of Manitoba now and in the future. The MWQSOG for use under Part 2 of the Act sets out prescribed water quality standards for several activities, including drinking water, freshwater aquatic life, and common classes of discharge.

Under Tier I MWQSOG, the quality of metal mining liquid effluents is specified to comply with the discharge limits in the Metal Mining Effluent Regulation (MMER). The MMER were amended to the MDMER (Section 2.4.1) on June 1, 2018.

The Tier III MWQSOG were developed for the protection of groundwater and surface water from constituents attributable to sewage, industrial, agricultural, and other land use practices, or other human-induced point or non-point source discharges that may unacceptably impair water quality. Under the Tier III MWQSOG, standards are set for the protection of drinking water (groundwater and surface water) and freshwater aquatic life (surface water) as well as irrigation, livestock, sediment, and recreational uses. The Tier III MWQSOG are used where there are potential effects of groundwater on drinking water quality.

Because of the similarity between the GCDWQ and the MWQSOG for drinking water, further discussion is limited to the more stringent guideline for a given parameter.

MECC Assessment Criteria for Groundwater

MECC released an information bulletin in June 2016 regarding Assessment Criteria for Groundwater. The information bulletin provides guidance on appropriate criteria to assess the risk to human and ecological receptors from contaminants in groundwater at sites in Manitoba. Where groundwater discharges to surface water, the following Canadian Environmental Quality Guidelines are recommended: the Canadian Water Quality Guidelines for the Protection of Aquatic Life – Freshwater (CWQG-FAL) (CCME 2018) and Guidelines for Canadian Recreational Water Quality (Health Canada 2012). These Canadian Environmental Quality Guidelines are surface water quality criteria and therefore are not directly applicable to groundwater quality. The information bulletin provides additional reference documents where the Canadian Environmental Quality Guidelines do not provide guidance for the risk to receptor via a particular pathway. One of the recommended references is the Ontario Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the *Environmental Protection Act* (Ontario Ministry of the Environment 2011b).

The criteria presented in Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the *Environmental Protection Act* (Ontario Ministry of the Environment 2011b) are referred to as Site Condition Standards. The Site Condition Standards were developed based on a series of pathways such as drinking water, groundwater discharge, and vapour migration for a variety of receptors (e.g., drinking water, aquatic life, human health) with the criteria often being set to be representative of the most sensitive receptor. The development of the Site Condition Standards is documented in the Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario (Ontario Ministry of the Environment 2011a).

The Site Condition Standards rationale document (Ontario Ministry of the Environment 2011a) presents Aquatic Protection Values to protect aquatic biota from migration of impacted groundwater to surface water. The Aquatic Protection Values are designed to provide a scientifically defensible and reasonably conservative level of protection for aquatic organisms from the migration of contaminated groundwater to surface water resources. The Aquatic Protection Values are the established water quality criteria in surface water and are used to determine the acceptable concentrations in groundwater (GW3 criteria) by back calculating through a defined modelling process that considers a ten times dilution in the receiving environment. For this Project, the GW3 are used as a screening criterion in areas where groundwater is anticipated to discharge to surface water.

The Water Rights Act

The Water Rights Act is a general management statute that applies to groundwater and surface water to ensure the sustainable allocation of the province's water resources. Administered by the Water Use Licensing Section of Manitoba Conservation and Climate, *The Water Rights Act* regulates withdrawals and control of water. A water use licence will be required if pumping in excess of 25 m^3/d. The Act also requires permit holders to collect, record, and report on monitoring requirements specified within an issued Water Licence.

Groundwater and Water Well Act

The purpose of the *Groundwater and Water Well Act* is to provide for the protection and stewardship of Manitoba's aquifers and groundwater. This includes the rules for constructing, maintaining and sealing wells in Manitoba as set out in the Act and supporting regulations, the Groundwater and Water Well (general matters) Regulation and the Well Standards Regulation.

1.4.3 Corporate or Other Policies

As a member of the World Gold Council, Alamos Gold Inc. (Alamos) is a proud supporter of the Responsible Gold Mining Principles (RGMPs). The ten RGMPs provide a framework that sets expectations for consumers, investors, and the downstream gold supply chain as to what constitutes responsible gold mining, addressing key environmental, social and governance issues for the gold mining sector. They are designed to provide confidence to governments, investors, employees and contractors, communities, supply chain partners and civil society that gold has been produced responsibly. Following the release of the RGMPs in September 2019, Alamos has implemented and aligned to the framework, and obtained external assurance to provide further confidence that the gold produced by Alamos is responsibly mined. In 2023, Alamos communicated its progress on implementing the RGMPs through Alamos' 2022 RGMP Progress Report which received independent audit/assurance from EEM EHS Management Inc. (Alamos 2023). The 2022 RGMP Progress Report reflects Alamos' third year reporting under the RGMP. Alamos will continue to implement the RGMPs through 2024 and beyond. The RGMPs are only applicable to operating mines. The Lynn Lake Gold Project will be incorporated as it transitions through construction into operation.

Working with its members, the World Gold Council has set out RGMPs to address key environmental, social and governance issues for the gold mining sector.

Alamos has a series of guiding corporate sustainability standards, including:

- Environmental Monitoring
- Hazard Identification & Risk Management
- Incident Classification, Investigation & Reporting.

Those corporate standards that may be applicable specifically to the GMMP (Table 1-1) include:

- Air Quality, Noise & Vibration Management
- Water Management
- Mine Closure
- Environmental Monitoring.

Alamos' standards are regularly updated to reflect the latest developments. For the most current and up-to-date standards, please refer to the online version.

Table 1-1 Corporate Sustainability Standards

Corporate Standard	Requirement
Environmental Monitoring (CSS-ENV-10.1)	Sites shall develop and implement an environmental monitoring program. The site's environmental monitoring program will be documented as to list of points monitored, coordinates of points monitored, description of points (including the reason for monitoring (e.g., regulatory compliance, baseline, trend analysis, etc.), frequency of monitoring, anticipated duration of monitoring (e.g., the life of the mine), and parameters monitored. The monitoring program will be of sufficient scope to allow for the timely identification of potential environmental impacts prior to their migration offsite. Sites will regularly review their monitoring programs and update for and changes at the mine site as required. At a minimum, the program will meet all environmental regulatory requirements.
Environmental Monitoring (CSS-ENV-10.2)	Compliance monitoring data will be subject to Quality Assurance/Quality Control (QA/QC) verification. Sample results that do not meet QA/QC guidelines will be disregarded and sample collection repeated. Sites must use reliable and accredited labs.
Environmental Monitoring (CSS-ENV-10.3)	Monitoring data will be stored in an electronic database.
Environmental Monitoring (CSS-ENV-10.4)	When compliance monitoring results indicate exceedances of permit or regulatory requirements, or significant deviation from previous results, the results will be reconfirmed with the person or company that did the analysis, and a confirmatory monitoring or sample will be taken as soon as is feasible if the result is reconfirmed. Sites will also follow any permit-specific or jurisdictional requirements.
Environmental Monitoring (CSS-ENV-10.5)	Monitoring data will be reviewed at least quarterly by the responsible manager to identify trends that may indicate potential for future exceedances of permit conditions or applicable standards, and potential risk. The site General Manager will be formally notified of any exceedances and emerging compliance issues. Refer to CSS-GOV-08 Incident Reporting Standard for any moderate, major, or catastrophic incidents.
Environmental Monitoring (CSS-ENV-10.6)	Sites will assess the need for a monitoring program involving external stakeholders.
Hazard Identification & Risk Management (CSS-GOV-2.1)	All Alamos locations shall maintain systems to identify, prevent and/or manage sustainability risks that face its operations and those which its activities may pose to others. This includes but is not limited to hazards and risks related to the: • Health and Safety of our workforce and communities, • Environmental impacts of our activities (local and downstream), • Societal and community impacts, and • Security and protection of people and property.

Corporate Standard	Requirement
Hazard Identification & Risk Management CSS-GOV-2.2)	Site Managers are responsible to ensure that appropriate resources, both internal and external, are available to identify, quantify, manage, and report sustainability hazards and risks. Assessments shall consider all site activities including: • Contractor works, • Regulatory requirements • Permit or licence requirements, • Alamos Sustainability Standards requirements, and • Other site-specific requirements.
Hazard Identification & Risk Management (CSS-GOV-2.3)	Sites shall maintain a risk registry of all site risks. The risk registry will be updated at least quarterly or when major changes/incidents occur. Clear responsibility and authority for implementing, managing, reporting, and coordinating updates to the risk registry shall be designated to a specific employee(s).
Hazard Identification & Risk Management (CSS-GOV-2.4)	All corporate, site and task-level risks shall be assessed against the Alamos Risk Matrix, including likelihood and consequence assessments.
Hazard Identification & Risk Management (CSS-GOV-2.5)	Sites shall apply the hierarchy of controls considering (in order of priority): 1. Elimination – Remove the hazard 2. Substitution – Replace the hazard 3. Engineering control – physically control or isolate the hazard (e.g., dikes, guarding, interlocks) 4. Administrative control – control response/avoidance of hazard (e.g., training, procedures, reducing employee exposure to hazards, signage) 5. PPE or Mitigation – Protect people (personal protective equipment) or the environment (spill kits) from the hazard. This is the last line of defense. Extreme and high risks that exist after controls have been applied should go through a formal review with the Site Manager.
Hazard Identification & Risk Management (CSS-GOV-2.6)	Sites shall ensure effective communication of risks and controls to the workforce based on the nature of the activity and related risk. The nature of communication may change based on the risk frequency and consequence. For example, communication may include induction training, refresher training, policies, procedures and/or signage.
Hazard Identification & Risk Management (CSS-GOV-2.7)	For each identified risk, management shall assess and manage the risk appropriately with consideration to the risk rating. In considering risk mitigation, management must evaluate the cost of controls versus the benefit derived and ensure the resultant control framework is effective.
Hazard Identification & Risk Management (CSS-GOV-2.9)	The Alamos Executive and Internal Audit Director shall review and verify enterprise risks on a quarterly basis.
Incident Classification, Investigation & Reporting (CSS-GOV-8.3)	The Corporate Sustainability Team shall maintain an Incident Alert email group user list comprised of, at a minimum: • Alamos Executive and Management, • Country Managers, • General Managers; and • Project Managers.

Corporate Standard	Requirement
Incident Classification, Investigation & Reporting (CSS-GOV-8.6)	The Corporate Sustainability Team shall provide a report on significant incidents on a quarterly basis to senior management and the Technical & Sustainability Committee of the Board.
Incident Classification, Investigation & Reporting (CSS-GOV-8.7)	Corporate Sustainability and Risk Management teams shall annually review and revise the Alamos Risk Assessment Consequence Table to ensure thresholds are consistent with the Alamos Enterprise Risk Management system.
Water Management (CSS-ENV-2.1)	Sites shall develop and maintain a Water Management Plan that describes the operational control measures that will be implemented to manage all aspects of water handling including water withdrawals, storage, recycle, treatment and discharge. The Water Management Plan shall consider the water context in terms of site needs, needs of other upstream and downstream users, and permitting and quality considerations. A site-wide water balance model will be developed and maintained on an ongoing basis for all Alamos sites with the exception of remote exploration projects. A hydrogeological model will also be developed and maintained as required to model the effects on the groundwater system and surrounding environment.
Water Management (CSS-ENV-2.3)	There shall be no release of process solution/water, mine water or wastewater other than through controlled discharges that meet regulatory requirements for surface water and groundwater protection.
Mine Closure (CSS-ENV-9.5)	Water management including seepage collection, diversion of non-contact water and drainage and erosion control for storm events and groundwater inputs.

1.4.4 Approval-Related Requirements

The conditions relating to groundwater, including annual reporting requirements, laid out in the federal Decision Statement issued under the *Canadian Environmental Assessment Act, 2012,* provincial *Environment Act* Licence No. 3390 (Gordon), *and* provincial Environment Act Licence No. 3391 (MacLellan) are outlined in Table 1-2.

Table 1-2 Approval Related Requirements

Licence	Condition	Corresponding GMMP Section
CEAA, 2012	2.1 The Proponent shall ensure that its actions in meeting the conditions set out in this Decision Statement during all phases of the Designated Project are considered in a careful and precautionary manner, promote sustainable development, are informed by the best information and knowledge available at the time the Proponent takes action, including policies, guidelines and directives and community and Indigenous knowledge, are based on methods and models that are recognized by standard-setting bodies, are undertaken by qualified individuals, and have applied the best available economically and technically feasible technologies.	2.0
CEAA, 2012	2.2 The Proponent shall ensure that its actions in meeting the conditions set out in the Decision Statement are taken in a way that is consistent with any applicable recovery strategy and action plans for listed species at risk.	2.0
CEAA, 2012	2.5 The Proponent shall, where a follow-up program is a requirement of a condition set out in this Decision Statement, determine, as part of the development of each follow-up program and in consultation with Indigenous groups and any other parties being consulted during the development, the following information, unless otherwise specified in the condition: 2.5.1 the methodology, location, frequency, timing and duration of monitoring associated with the follow-up program; 2.5.2 the scope, content and frequency of reporting of the results of the follow-up program to the parties consulted for the development of the follow-up program; 2.5.3 the scope, content and frequency of reporting of the results of the follow-up program to the parties consulted for the development of the follow-up program; 2.5.4 the scope, content and frequency of reporting of the results of the follow-up program to the parties consulted for the development of the follow-up program; 2.5.5 the technically and economically feasible mitigation measures to be implemented by the Proponent if monitoring conducted as part of the follow-up program shows that the levels of environmental change referred to in condition 2.5.4 have been reached or exceeded; and 2.5.6 the specific and measurable end points that must be achieved before the follow-up program can end. Those end points should indicate that the accuracy of the environmental assessment has been verified and/or that the mitigation measures are effective.	2.0, 4.0, 5.0, 6.0, 7.0
CEAA, 2012	2.6 The Proponent shall update the information determined for each follow-up program pursuant to condition 2.5 during the implementation of each follow-up program, at the minimum frequency determined pursuant to condition 2.5.3 and in consultation with Indigenous groups and any other parties being consulted during the development of each follow-up program.	7.0
CEAA, 2012	2.7 The Proponent shall provide details of the follow-up programs referred to in conditions 3.12, 3.13, 3.14, 3.15, 4.5, 4.6, 6.3, 6.4, 6.5, 9.3, 10.5 and 12.2, including the information determined for each follow-up program pursuant to condition 2.5, to the Agency and to Indigenous groups and any other parties being consulted during the development of each follow-up program prior to the implementation of each follow-up program. The Proponent shall also provide any update made pursuant to condition 2.6 to the Agency and to Indigenous groups and any other parties being consulted during the development of each follow-up program within 30 days of the follow-up program being updated.	7.0
CEAA, 2012	2.8 The Proponent shall, where a follow-up program is a requirement of a condition set out in this Decision Statement: 2.8.1 implement the follow-up program according to the information determined pursuant to condition 2.5; 2.8.2 conduct monitoring and analysis to verify the accuracy of the environmental assessment as it pertains to the particular condition and/or to determine the effectiveness of any mitigation measure; 2.8.3 determine whether modified or additional mitigation measure(s) are required based on the monitoring and analysis undertaken pursuant to condition 2.8.2; 2.8.4 if modified or additional mitigation measure(s) are required pursuant to condition 2.8.3, develop and implement these mitigation measure(s) as soon as feasible and monitor them pursuant to condition 2.8.2. The Proponent shall notify the Agency in writing within 48 hours of any modified or additional mitigation measure being implemented. If the Proponent implements any additional or modified mitigation measure not previously submitted to the Agency pursuant to condition 2.5, the Proponent shall submit a detailed description of the measure(s) to the Agency within 7 days of their implementation; and 2.8.5 report all results of the follow-up program to the Agency no later than March 31 following each reporting year during which the follow-up program is implemented and, subject to information determined pursuant to 2.5.2, to the parties being consulted during the development of the follow-up program.	4.0, 5.0, 6.0, 7.0

Licence	Condition	Corresponding GMMP Section
CEAA, 2012	2.9 Where consultation with Indigenous groups is a requirement of a follow-up program, the Proponent shall discuss the follow-up program with each group and shall determine, in consultation with each group, opportunities for their participation in the implementation of the follow-up program, including the conduct of monitoring, the analysis and reporting of follow-up results and the determination of whether modified or additional mitigation measure(s) are required, as set out in condition 2.8, and opportunities for training to support participation in monitoring. The Proponent shall permit the participation of any interested Indigenous group in the identified follow-up program and training.	7.2
CEAA, 2012	2.10 The Proponent shall prepare an annual report for each reporting year that sets out: 2.10.1 the activities undertaken by the Proponent to comply with each of the conditions set out in this Decision Statement; 2.10.2 how the Proponent complied with condition 2.1; 2.10.3 for conditions set out in this Decision Statement for which consultation is a requirement, how the Proponent considered any views and information that the Proponent received during or as a result of the consultation, and the resources provided to support their participation in consultation activities; 2.10.4 the information referred to in conditions 2.5 and 2.8 for each follow-up program; 2.10.5 a summary of the available results of the follow-up program requirements identified in conditions 3.12, 3.13, 3.14, 3.15, 4.5, 4.6, 6.3, 6.4, 6.5, 9.3, 10.5 and 12.2; 2.10.6 for any plan that is a requirement of a condition set out in this Decision Statement, any update(s) to the plan that have been made during the reporting year; and 2.10.7 any modified or additional mitigation measure implemented or proposed to be implemented by the Proponent, as determined pursuant to condition 2.8.	7.1
CEAA, 2012	2.11 The Proponent shall submit to the Agency the annual report referred to in condition 2.10, including a plain language executive summary in both official languages, no later than March 31 following the reporting year to which the annual report applies.	7.1
CEAA, 2012	2.12 The first reporting year for which the Proponent shall prepare an annual report pursuant to condition 2.10 shall start on the day the Minister of the Environment issues the Decision Statement pursuant to subsection 54 (1) of the Canadian Environmental Assessment Act, 2012.	7.1
CEAA, 2012	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.	3.1.2, 6.0
CEAA, 2012	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.	3.1.2, 6.0
CEAA, 2012	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 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).	3.1.2, 6.0

Licence	Condition	Corresponding GMMP Section
CEAA, 2012	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.	3.0
CEAA, 2012	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; 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.	2.0, 4.0, 5.0, 6.0
CEAA, 2012	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 F 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.	2.0, 4.0, 5.0, 6.0
Environment Act Licence No. 3390 (Gordon)	19. The licensee shall, prior to operation of the development a) prepare and submit to the director for approval, the following comprehensive environmental monitoring plans: i) Surface Water Monitoring and Management Plan; ii) Fish Habitat Offsetting Plan; iii) Fish Salvage Plan; iv) Aquatic Effects Monitoring Program; v) the Groundwater Monitoring and Management Plan; and b) implement the environmental management plans in accordance with the Director of the Environmental Approvals Branch's approval.	All

Licence	Condition	Corresponding GMMP Section
Environment Act Licence No. 3391 (MacLellan)	19. The licensee shall, prior to operation of the development a) prepare and submit to the director for approval, the following comprehensive environmental monitoring plans: i) Surface Water Monitoring and Management Plan; ii) Fish Habitat Offsetting Plan; iii) Fish Salvage Plan; iv) Aquatic Effects Monitoring Program; v) the Groundwater Monitoring and Management Plan; and b) implement the environmental management plans in accordance with the Director of the Environmental Approvals Branch’s approval.	All

2.0 ENVIRONMENTAL SETTING

Throughout the Gordon site and MacLellan site, bedrock is generally covered by glaciolacustrine sediments overlying a discontinuous regional glacial sand diamicton (Stantec 2020). Organic deposits are observed as a thin veneer with thicker accumulations observed in low-lying areas. Isolated pockets of glaciofluvial sediments are encountered. Bedrock is associated with the Churchill Structural Province of the Canadian Shield and the north belt of the Lynn Lake greenstone belt. The north belt of the Lynn Lake greenstone belt comprises rhyolite, overlain by andesite and sedimentary rocks, and an upper unit of basaltic rocks (MEM 1986). Bedrock topography was interpreted to follow a similar trend to ground surface topography. Bedrock is observed near surface and/or outcropping in areas associated with topographic highs.

At the Gordon site, two northwest trending parallel faults extend across the historical Wendy and East pits from Gordon Lake in the west to south of Farley Lake in the east and are called the Wendy and East faults (KGS 2014) (Map 1; Appendix A). Hydraulic testing and groundwater quality sampling of the bedrock along the Wendy and East faults, as well as groundwater flow modelling, support a higher hydraulic conductivity between the faults compared with the surrounding bedrock. Therefore, the zone of shallow bedrock associated with the Wendy and East faults was included as a separate hydrostratigraphic feature in the conceptual hydrostratigraphic model and the Gordon site numerical groundwater flow model.

At the MacLellan site, a bedrock depression or valley was observed at the eastern edge of the proposed open pit, between the open pit and the Keewatin River, and north of Minton Lake where boreholes were terminated at up to 28 m below ground surface prior to encountering bedrock. The North Shear Zone (NSZ) extends through the proposed open pit. The hydraulic properties of the NSZ were characterized as similar to the surrounding bedrock based on hydraulic testing.

At both sites, the regional groundwater flow is strongly influenced by topography, which results in localized groundwater flow from topographic highs with groundwater discharge in topographic low areas generally associated with wetland areas or surface water. Because of the strong influence of topography on groundwater flow there were no notable seasonal changes to the groundwater flow regimes.

Baseline groundwater quality was compared with groundwater thresholds for drinking water, GCDWQ and MWQSOG (drinking water), and groundwater thresholds for the discharge of groundwater to surface water, GW3. Overall, groundwater quality in the region meets the MWQSOG (drinking water) and the GCDWQ except for dissolved iron and manganese. These parameters are typically elevated in groundwater within northern areas where reducing groundwater conditions exist. In addition, select monitoring wells exceeded the MWQSOG (drinking water) and GCDWQ for sulphate and dissolved lead. Monitoring wells located within the historical mine operational areas for both sites also exceeded the MWQSOG (drinking water) and/or GCDWQ for dissolved arsenic. Mean background groundwater quality also meets the GW3.

Based on review of the GWDrill database (MCC 2015), there are no known groundwater well users located within 30 km of the Gordon site. At the MacLellan site, the nearest production well user is located 6.7 km west of the site.

3.0 MITIGATION AND MANAGEMENT MEASURES

Mitigation measures were developed to avoid or reduce Project-related effects on groundwater quality and quantity. The following sections summarize the potential effect of the Project on groundwater quantity and quality and the proposed mitigation measures as described in Section 8.4 of the EIS (Stantec 2020).

3.1 GORDON SITE

3.1.1 Potential Effects

The potential effects of the Project on groundwater quantity and quality at the Gordon site were detailed in Section 8.4 of the EIS (Stantec 2020), a summary of which is presented herein for context with the groundwater mitigation measures and monitoring program. The preliminary mine plan is provided in Map 1 (Appendix A) for reference.

During construction, the following Project components and activities have the potential to affect groundwater quantity and/or quality:

- Construction of Project mine components, particularly initial development of the ore stockpile, overburden stockpile, and MRSA, including the alteration of the historical MRSAs.
- Changes to infiltration rates resulting from the construction of roads.
- Temporary dewatering for the installation of foundations for buildings and utilities.
- Dewatering of the historical Wendy and East pits.

Of these Project components and activities, groundwater quantity and/or flow are anticipated to be primarily affected by the lowering of groundwater levels through initial dewatering of the historical Wendy and East pits. The initial development of the Gordon site ore stockpile, overburden stockpile, and MRSA, and the alteration of the historical south MRSA, also have the potential to affect groundwater recharge and consequently groundwater quantity and/or flow. With respect to groundwater quality, the primary effect is predicted to be the redirection of groundwater recharge from the historical MRSAs to the open pit where it will be pumped to a settling pond prior to discharge to the environment. Treatment will be implemented, if required, to meet regulatory discharge criteria prior to discharge to the environment.

During operation, the following Project components and activities have the potential to affect groundwater quantity and/or quality:

- Dewatering of the open pit.
- Overburden and ore stockpiling.
- Continued development of the MRSA.
- General site water management.

Groundwater quantity and/or flow during Project operation are anticipated to be primarily affected by the lowering of water levels through dewatering of the open pit. Groundwater flow patterns will be altered by open pit dewatering and continued development of the MRSA. The resulting change in groundwater flow pattern and recharge rates may affect groundwater discharge (quantity and quality) to surface water and wetlands. With respect to groundwater quality, groundwater recharge from the MRSA and historical MRSAs have the potential to affect groundwater and surface water quality where groundwater originating from these areas discharges to surface water.

During decommissioning/closure, the following Project components and activities have the potential to affect groundwater:

- Open pit filling from the ceasing of dewatering and the direction of surface water runoff to the open pit.
- Closure of water management facilities including removal of contact water collections systems.
- Removal and rehabilitation of ore stockpile.
- Changes in moisture content due to rehabilitation of the MRSA.

During decommissioning/closure, as surface water runoff from the Project is directed to the open pit and as the open pit fills, groundwater levels will slowly rise, and changes to groundwater flow direction and discharge locations are expected. Closure of water management facilities will result in the removal of contact water collection systems that may result in changes to the fate and flow of groundwater originating from the MRSA, overburden stockpile, and historical MRSAs. These changes will extend into post-closure and reach a steady-state condition once the open pit is filled. At closure, the removal and rehabilitation of the ore stockpile and changes in moisture content and rehabilitation for the MRSA have the potential to change groundwater recharge rates which may affect groundwater flow patterns. The change in groundwater flow patterns as a result of filling of the open pit has the potential to affect surface water quality where groundwater recharge originating from the MRSA and historical MRSAs discharges to surface water and wetlands.

3.1.2 Mitigation

As described in the EIS (Stantec 2020), the following mitigation measures are proposed to avoid or reduce Project-related effects on groundwater quantity and quality:

- Limit construction footprint to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the Project.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Design of the MRSA to increase the amount of runoff and reduce the amount of infiltration through the MRSA, thereby reducing the recharge and loading to groundwater.
- Install contact water collection ditches around the perimeter of the MRSA, and ore stockpile to mitigate the migration of seepage.

- Intercept groundwater flowing into the open pit prior to discharge at the pit wall and return water generated from pumping groundwater interceptor wells to Gordon and Farley lakes to offset a reduction in groundwater discharge.
- Install contact water and seepage collection ditches around the perimeter of the MRSA to mitigate the migration of seepage.

As described in Section 3.0, a high permeability zone in the shallow bedrock associated with the East and Wendy faults was identified through baseline studies and the groundwater flow model calibration. To control inflow to the open pit and effects to surface water levels of Gordon and Farley lakes as a result of open pit dewatering, interceptor wells will be installed between the open pit and the adjacent lakes extending from the top of rock through the shallow bedrock (upper 50 m of bedrock). The water pumped from the interceptor wells will be discharged into Gordon and/or Farley lakes at rates suitable to maintain lake levels within the predicted ranges of natural variability. If necessary, the water will be treated to meet applicable federal and provincial regulatory requirements for water quality and temperature prior to discharge to the environment. To support the EIS, 13 interceptor wells were simulated in the groundwater flow model at a pumping rate of 1,209 m^3/d each. Operation of the interceptor wells will commence with dewatering of the historical Wendy and East pits and will continue through operation while the open pit is dewatered and for a portion of closure as the open pit fills. Map 1 (Appendix A) presents the simulated locations of the interceptor wells around the Gordon pit. The number, location, and design of the interceptor wells will be determined through detailed design.

3.2 MACLELLAN SITE

3.2.1 Potential Effects

The potential effects of the Project on groundwater quantity and quality at the MacLellan site were detailed in Section 8.4 of the EIS (Stantec 2020) a summary of which is presented herein for context with the groundwater mitigation measures and monitoring program. The preliminary mine plan is provided in Map 2 (Appendix A) for reference.

During construction, the following Project components and activities have the potential to affect groundwater quantity and/or quality:

- Construction of Project mine components, particularly initial development of the MRSA, TMF, ore stockpile, and overburden stockpile.
- Changes to infiltration rates resulting from the construction of roads.
- Temporary dewatering for the installation of foundations for buildings and utilities.
- Dewatering of the historical underground workings.
- Initial dewatering of the open pit.

Of these Project components and activities, groundwater quantity and/or flow are anticipated to be primarily affected by the lowering of groundwater levels through initial dewatering of the starter pit and historical underground workings. The initial development of the MRSA and TMF also have the potential to affect groundwater recharge and consequently groundwater quantity and/or flow. With respect to groundwater quality, the potential change to groundwater flow patterns and discharge may result in changes to the mass loading of parameters from groundwater to surface water. Groundwater recharge from the MRSA and TMF has the potential to affect groundwater and surface water quality where groundwater discharges to surface water.

During operation, the following Project components and activities have the potential to affect groundwater quantity and/or quality:

- Dewatering of the open pit and historical underground workings.
- Overburden and ore stockpiling.
- Ongoing development of MRSA and TMF.
- Ore milling and processing.
- General site water management.

Groundwater quantity and/or flow during Project operation are anticipated to be primarily affected by the lowering of water levels through dewatering of the open pit and historical underground workings. Groundwater flow patterns are expected to be altered by open pit dewatering and the ongoing development of the MRSA and TMF. The resulting change in groundwater flow pattern and recharge rates may affect groundwater discharge (quantity and quality) to surface water and wetlands. Groundwater recharge from the MRSA and TMF have the potential to affect groundwater quality and surface water quality where groundwater discharges to surface water.

During decommissioning/closure, the following Project components and activities have the potential to affect groundwater quantity and/or quality:

- Open pit filling from the ceasing of dewatering and the direction of surface water runoff to the open pit.
- Closure of water management facilities including removal of contact water collections systems.
- Removal and rehabilitation of ore stockpile.
- Changes in moisture content and rehabilitation of the MRSA and TMF.

During decommissioning/closure, as surface water runoff from the Project is directed to the open pit and as the open pit fills, groundwater levels will slowly rise and changes to groundwater flow direction and discharge locations are expected. Closure of water management facilities will result in the removal of contact water collection systems that may result in groundwater originating from the MRSA and TMF discharging to the natural environment. These changes will extend into post-closure and reach a steady-state condition as the open pit is filled.

At closure, the removal and rehabilitation of the ore stockpile, changes in moisture content and rehabilitation of the MRSA and TMF have the potential to change groundwater recharge rates, affecting groundwater flow patterns and discharge to surface water and wetlands. Changes to groundwater flow patterns have the potential to affect surface water quality where groundwater recharge originating from the TMF and MRSA discharges to surface water.

3.2.2 Mitigation

The following mitigation measures are proposed to avoid or reduce Project-related effects on groundwater quantity and quality.

- Limit construction footprint to the extent possible to reduce the potential for reductions in groundwater recharge and limit the number of watersheds overprinted by the Project.
- Use standard management practices throughout the Project, including drainage control and excavation and open pit dewatering.
- Design of the MRSA to increase the amount of runoff and reduce the amount of infiltration through the MRSA, thereby reducing the recharge and loading to groundwater.
- Use standard construction methods, such as seepage cutoff collars, where trenches extend below the water table to mitigate preferential flow paths.
- Install contact water collection ditches around the MRSA, TMF, and stockpiles to mitigate the migration of seepage.

4.0 MONITORING

Monitoring is the continuation of observation, measurement, or assessment of environmental conditions at and surrounding the Project, its components or activities. Two types of monitoring are typically undertaken for environmental assessments: environmental monitoring to verify predictions and implemented mitigation measures; and compliance monitoring to verify practices or procedures to meet legislated requirements. Monitoring will be carried out on select valued components (VCs) using environmental indicators and measurable parameters identified in the EIS. Components to be monitored have been determined based on regulatory instrument requirements as per legislation, environmental importance, sensitivity and vulnerability, and licence requirements.

Monitoring plans describe sampling procedures, quality control and assurance programs, laboratory methods and protocols, laboratory accreditations, and reporting requirements, where applicable. The plans also provide details on the location, design, methods (e.g., parameters to be measured), applicable regulatory instruments, and schedule for the follow-up and monitoring programs. Engagement of Indigenous Nations in monitoring will be incorporated into the monitoring plans where appropriate and applicable.

The monitoring plan listed below for groundwater was developed as part of the EIS and through information requests received on the EIS. Additional monitoring requirements that were identified as part of the Project approval and permitting have been incorporated into these sections.

The groundwater monitoring locations, sampling frequency, sampling methods, and analytical parameters are presented in the following sections. The specific and measurable end points for concluding the monitoring program will be set to ensure the accuracy of the environmental assessment and the effectiveness of mitigation measures. These end points will be achieved either at permanent closure or earlier if it can be demonstrated that there are no further impacts warranting continued monitoring.

4.1 MONITORING LOCATIONS

Groundwater levels and quality within the vicinity of the open pit, TMF (MacLellan site only), MRSAs, stockpiles, seepage collection systems, and key surface water features will be monitored to assess potential effects of the Project on groundwater quantity and quality. Key surface water features at the Gordon site include Susan Lake, Gordon Lake, Farley Lake, and Pump Lake while key surface water features at the MacLellan site include the Keewatin River, Keewatin River Tributary (KEE3-B1), Minton Lake, the unnamed lakes northeast of Minton Lake, and Payne Lake Tributary. In addition, the water pumped from the open pits, interceptor wells (Gordon site only) and historical underground workings (MacLellan site only) will be measured. Maps 3 and 4 (Appendix A) present the groundwater level monitoring locations for the Gordon and MacLellan sites, respectively. Maps 5 and 6 (Appendix A) present the groundwater quality monitoring locations for the Gordon and MacLellan sites, respectively. A summary of the groundwater quantity and quality monitoring locations is presented in Table B-1 and Table B-2 (Appendix B) for the Gordon and

MacLellan sites, respectively. The monitoring well completion table is presented in Table B-3 (Appendix B) for the Gordon site and Table B-4 (Appendix B) for the MacLellan site for reference.

Three types of monitoring points will be used in the GMMP, monitoring wells, drive-point piezometers, and vibrating wire piezometers (VWPs). Monitoring wells are typically 51 mm diameter PVC slotted screens with risers installed in a borehole in accordance with the Groundwater and Water Well Act and associated regulations. Monitoring wells are used to measure water level and quality to understand groundwater flow directions and changes in groundwater quality downgradient of mine infrastructure. Drive-point piezometers are typically 19 to 25 mm diameter stainless steel pipe with screened pointed tip that is manually pounded into a stream bed. The drive-point piezometer allows the measurement of surface water and groundwater (level) below the stream bed to understand groundwater-surface water interactions. VWPs are grouted into boreholes at various depths below ground surface. VWPs record a frequency that is converted to a water level measurement, which is used to understand water level responses within deep bedrock in the areas of mine infrastructure.

Groundwater quantity monitoring locations were selected to confirm the extent of influence of open pit dewatering, confirm groundwater flow paths from the TMF and MRSAs to the receiving environment, and to understand seasonal variation at background monitoring locations. Groundwater level monitoring at the Gordon site will be completed at a total of 51 monitoring points across 25 locations. These include up to 38 monitoring wells (19 locations), three drive-point piezometers (three locations), and seven VWPs (three locations). Six of these monitoring points, at three locations, will be decommissioned during construction as they are located within the footprint of mine infrastructure. Data loggers will be installed in 15 of the 38 monitoring wells and at the drive-point piezometers (three locations for groundwater and surface water) to record pressure at a defined time interval.

Groundwater level monitoring at the MacLellan site will be completed at a total of 108 monitoring points across 63 locations. These include up to 89 monitoring wells (55 locations), five drive-point piezometers (five locations), and nine VWPs (three locations). Forty (40) of these monitoring points (23 locations) will be decommissioned during construction as they are located within the footprint of mine infrastructure. Data loggers will be installed in 24 of the 90 monitoring wells and at the drive-point piezometers (four locations for groundwater and surface water) to record pressure at a defined time interval. In addition, water quantity (flow rate and total daily volume) of water pumped from the open pits, historical underground workings, and interceptor wells will be monitored from both sites, as applicable.

Groundwater quality monitoring locations were selected upgradient, cross gradient, and downgradient of the TMF and MRSA to monitor for changes in groundwater quality due to Project development. Groundwater quality monitoring will also focus on confirming source seepage concentrations and the potential for attenuation along the groundwater flow path prior to discharging to the environment. Groundwater quality monitoring at the Gordon site will be completed at up to 31 monitoring wells (16 locations). Six of these monitoring wells (three locations) will be decommissioned during construction as they are located within the footprint of mine infrastructure. Groundwater quality monitoring at the MacLellan site will be completed at up to 32 monitoring wells (22 locations). Three of these monitoring wells (two locations) will be decommissioned during construction as they are located within the footprint of mine infrastructure.

The proposed new monitoring well locations for groundwater quantity and quality are presented in Maps 3 through 6 (Appendix A) with the rationale for the monitoring location provided in Table 5-1. The proposed new monitoring locations are based on the mine plan and are subject to change based on field observations. The intent of the proposed new monitoring wells is to install them in a location where they won't be overprinted by future mine infrastructure so that long-term data sets can be developed. Most of the proposed monitoring wells will be installed during construction to allow sufficient time to assess baseline conditions prior to commencement of mining activities. Single well response tests should be completed on newly installed monitoring wells to estimate the hydraulic conductivity of the aquifer immediately surrounding the well screen.

Monitoring wells located within close proximity of the open pits have the potential to go dry due to open pit dewatering (as noted on Table 5-1). Monitoring of these wells is intended to support an understanding of the effects of dewatering early in open pit development. For example, monitoring of levels to understand the development of the drawdown cone around the open pit and/or monitoring of quality to understand influence of groundwater quality and/or seepage from nearby surface water features on overall quality of water pumped from the open pit. If these monitoring wells are dry at some point during open pit development, there are additional monitoring wells located further afield from the open pit which will serve the purpose of monitoring the drawdown of the open pit and therefore will not need to be deepened unless recommended by a qualified professional.

Several monitoring wells are located within the footprint of proposed infrastructure and will be decommissioned as the mine is constructed (as noted on Table 5-1). A selection of these monitoring wells will continue to be monitored for water level and/or quality for a period of time (as noted on Table 5-1), as feasible, with the intent to overlap monitoring with the proposed new monitoring wells. The overlap of data may allow an understanding of the relationship between the data collected from the historical monitoring location with the proposed new monitoring locations.

Monitoring wells that will be decommissioned to facilitate development of mine infrastructure will be decommissioned in accordance with the *Groundwater and Water Well Act* and associated regulations except where the earth around the full length of the monitoring well and the monitoring well itself will be removed (e.g., within the open pit). Within the footprint of the TMF and/or MRSA, monitoring well decommissioning in accordance with the Well Standards Regulation is important to limit potential for preferential pathways for seepage. The Well Standards Regulation requires the use of slurry grout over the full length of the well (for wells less than 51 mm diameter and depth greater than 9 m) for decommissioning.

Groundwater monitoring locations will be reviewed at regular intervals through the Adaptive Management Plan presented in Section 6.0. Monitoring locations may be added or removed from the monitoring program in accordance with their utility in monitoring the effects of the Project on the environment or to account for modifications during detailed design (e.g., existing monitoring wells may be overprinted by Project components and, as a result, new replacement wells may be required). Monitoring locations will be maintained until the location is no longer required. If a monitoring location is no longer required but is identified as part of a regulatory approval, it will only be removed from the monitoring program once the required amendments are approved.

4.2 MONITORING FREQUENCY

The frequency of sampling for each of the groundwater monitoring locations is described as follows:

- Water quantity (flow rate and total daily volume) of water pumped from the open pits, historical underground workings, and interceptor wells on a daily basis.
- Groundwater levels monitoring in spring, summer, and fall at a selection of monitoring wells (see Table B-1 and B-2 [Appendix B]) with a portion of these monitoring wells instrumented with data loggers (set to record at 1-hour intervals). Manual water level measurements in the winter are not recommended as most monitoring wells are frozen and safe access to the monitoring wells is an issue. The data loggers installed in monitoring wells selected for on-going water level monitoring will capture the groundwater level fluctuations in the winter provided the monitoring well does not freeze at the depth of the data logger installation.
- Groundwater quality sampling in spring, summer, and fall at a selection of monitoring wells (see Table B-1 and B-2 [Appendix B]) with the frequency progressively reduced in stages based on monitoring results and Project phase. Winter groundwater quality sampling is not recommended because, based on the baseline data, the monitoring wells are generally frozen.

Monitoring will be completed throughout the life of the Project and into closure until the sites are restored to a satisfactory condition in accordance with federal and/or provincial legislation and guidelines. Existing groundwater quantity and quality data for both sites are sufficient to characterize baseline groundwater conditions. Therefore, groundwater quantity monitoring at each site should commence at least one month prior to the start of long-term dewatering (i.e., open pit dewatering) at the given site, and groundwater quality monitoring should commence prior to the placement of mine rock and/or tailings within respective storage and/or management areas at each site. The GMMP will be implemented throughout construction and operation with the monitoring locations and frequency reviewed on an annual basis and adjusted, as needed, based on results of monitoring and adaptive management. Prior to ceasing open pit dewatering and/or the decommissioning phase, the GMMP will be reviewed to confirm the requirements for monitoring locations and frequency with respect to the anticipated potential effects of Project activities during closure on groundwater. Groundwater quantity and quality are expected to stabilize during Post Closure after the open pits have filled. The GMMP will continue to be implemented at both the Gordon and MacLellan sites during pit filling and six years (estimated) post-pit filling.

4.1 FIELD SAMPLING METHODS

4.3.1 Pumped Volume

The pumped volume from the open pit, historical pits, historical underground workings, and interceptor wells (Gordon site only) will be monitored using a flow meter or totalizer so that the pumped volume may be measured or calculated based on flow rate and duration of pumping on a daily basis. In some instances, it may only be possible to measure a combined flow of two or more of these features (e.g., MacLellan open pit and historical underground workings).

4.1.2 Water Level Monitoring

Water levels at the monitoring wells and drive-point piezometers will be monitored using a combination of manual and automated techniques. Manual water level measurements will be collected using a battery-operated probe and calibrated tape, water depths will be measured in metres below the top of casing (BTOC) and recorded.

A portion of the monitoring wells and VWPs will be instrumented with a data logger that records either pressure or frequency. If the data logger is not vented, then the atmospheric pressure will be recorded at the site so that the data logger readings may be corrected for atmospheric pressure to obtain the actual height of water above the data logger. The data loggers should be set to record at a frequency that is sufficient to understand the variability in the groundwater level at the given monitoring well (minimum 1-hour intervals).

4.1.3 Water Quality Monitoring

Groundwater quality sampling for general chemistry and metals analysis will be completed using inertial lift pumps, mechanical pumps, and/or low flow sampling techniques appropriate for the conditions encountered in the field. Field parameters comprising temperature, pH, conductivity, oxidation-reduction potential (ORP), and dissolved oxygen (DO) will be measured during purging using a multi-parameter water quality meter and flow through cell where feasible. The meter will be calibrated daily prior to use according to the manufacturer's specifications using the appropriate calibration standards.

Dedicated equipment will be used when possible and reusable equipment will be decontaminated between sampling locations using phosphate free detergent and deionized water. Groundwater samples will be collected in laboratory supplied bottles containing the appropriate preservative. Samples that require filtering (e.g., samples for metals analysis) will be filtered in the field using a dedicated 0.45 μm filter.

Quality assurance and quality control (QA/QC) samples will be collected as a check on the field methodology, laboratory analytical methods, and on sample precision in accordance with Environment Canada (2012). A minimum of one field blank and trip blank will be collected per sampling event in addition to one field duplicate for approximately 10 groundwater samples per sampling event.

Samples for laboratory analysis will be placed on ice in coolers and submitted to an accredited laboratory under chain-of-custody documentation.

4.1.4 Hydraulic Conductivity Testing

Single well hydraulic response tests should be completed on newly installed monitoring wells after well development has been completed. For the vibrating wire installations, a packer system should be used to isolate portions of the borehole prior to completing the hydraulic response testing. The single well hydraulic response testing consists of creating a near-instantaneous change in the water level followed by recording the time taken for the water level to return to static conditions. A near instantaneous change in water level can be made by placing a slug of known volume below the water table in the well, using a bailer to remove a known volume of water, and/or by purging the well dry. Well recovery should be monitored using a combination of manual water level measurements and a data logger temporarily installed in each well. For vibrating wire installations, constant head tests may also be used in which a constant head is applied using a pump and water with the flow rate measured using a totalizer and stopwatch. The results of the response testing should be analyzed using an appropriate analytical solution (e.g., Bouwer and Rice solution (1976), Hvorslev (1951), Quiñones-Rozo (2010) etc.) to determine the horizontal hydraulic conductivity of the formation within the immediate vicinity of the monitoring well screen.

4.4 ANALYTICAL PARAMETERS

Groundwater quality samples will be sent to an analytical laboratory that is accredited under the Canadian Association for Laboratory Accreditation (CALA). Groundwater quality samples collected as part of this monitoring program will be analyzed for general chemistry, nutrients, and select metals, with the parameters listed in Table 4-1 as a minimum.

Samples analysis should be completed with detection limits that can discern the MWQSOG, CWQG-FAL, GCDWQ and the GW3.

Dissolved metals analyses are considered more appropriate than total metals analyses for groundwater samples and is more representative of metals chemistry in the aquifer since the suspended solids are generally not transported through aquifer materials to receptors such as streams, lakes and wetlands. Therefore, it is recommended that the dissolved metals fraction be analyzed and compared with regulatory criteria and/or the trigger thresholds presented in the Adaptive Management Plan (Section 6.0).

Table 4-1 Summary of Analytical Parameters for Groundwater Quality Samples

Parameter Samples to be submitted for general chemistry, nutrients, and dissolved metals analyses with the minimum parameters for analyses listed below	
Alkalinity	Dissolved aluminum*
Ammonia (as N)	Dissolved antimony*
Chloride	Dissolved arsenic*
Electrical conductivity	Dissolved barium
Cyanide (total)	Dissolved cadmium
Cyanide (free), Cyanide (WAD)	Dissolved chromium
Fluoride	Dissolved cobalt*
Hardness (as CaCO3)	Dissolved copper
Nitrate* (as N)	Dissolved iron*
Nitrite* (as N)	Dissolved lead*
pH	Dissolved manganese
Phosphorous	Dissolved molybdenum
Sodium*	Dissolved nickel
Sulphate*	Dissolved selenium
Total dissolved solids	Dissolved silver
Total suspended solids	Dissolved thallium
Turbidity	Dissolved uranium*
	Dissolved vanadium
	Dissolved zinc
Notes: *: required parameter per condition 3.12.3 of the EIS approval.	

5.0 ADAPTIVE MANAGEMENT

Adaptive management is a planned process for responding to uncertainty or to an unanticipated or underestimated project effect. Information learned from monitoring actual project effects is applied and compared to predicted effects. Where a variance between the actual and predicted effects occurs, a determination is made as to whether modifications or other actions are necessary to revise the existing mitigation measures. As part of this commitment, Alamos will implement technically and economically feasible mitigation measures if monitoring indicates that specified levels of environmental change have been reached or exceeded. Feasibility and implementation decisions will be made based on the circumstances and considerations at the time.

Results from monitoring will be used through an adaptive management process to adjust mitigation measures and to modify plans on an ongoing basis, if required.

Adaptive management will be used with respect to groundwater to identify, assess the environmental significance of, and as appropriate, response to an effect of the Project on groundwater beyond that predicted in the EIS. Important aspects of the adaptive management framework for groundwater are as follows:

- Risk narrative: description of the component and potential environmental effect and/or conditions that implementation of the adaptive management plan will limit (i.e., potential effects described in Section 4.0).
- Monitoring component: monitoring location and physical parameters to be monitored and assessed.
- Trigger: a specific threshold that initiates action when exceeded. Trigger thresholds are staged to accommodate levels of concern and a diversity of actions. This allows timely and informative responses to be initiated before higher potential impact trigger thresholds are met or exceeded. Trend analysis is an early warning tool to determine potential for exceeding subsequent thresholds. Thresholds for groundwater will include groundwater level and quality.
- Response Actions: staged according to specific thresholds and describes the actions to be implemented should a threshold be crossed. The response actions will include a hierarchical plan to investigate the potential causes of a threshold exceedance to determine if the threshold exceedance is related to measurement error, equipment malfunction, a single anomalous event, a naturally occurring local phenomenon, a regional phenomenon, or a Project-related effect. A hierarchical plan will be used to implement remedial actions to existing mitigation measures or to implement additional or new mitigation measures to reduce or eliminate threshold exceedances. Mitigation measures may include additional monitoring, or modifications to Project infrastructure.
- Reporting and Review: a plan to report Project-related threshold exceedances to the appropriate regulatory authorities, Indigenous Nations, and stakeholders.

This adaptive management framework allows for a systematic approach to data evaluation and the identification of actions that are commensurate with the degree of risk potentially associated with the occurrence of data that is different than baseline. Data that are elevated above triggers and indicate a higher degree of risk to the environment would have more substantial response actions compared with minor changes in data that would be appropriately followed, monitored, and acted upon as necessary.

5.1 THRESHOLDS FOR ADAPTIVE MANAGEMENT

The following section describes the groundwater adaptive management plan (AMP) trigger monitoring locations, frequency of evaluation, parameters to be monitored, trigger thresholds, and associated response plan. Due to the rural location of the Project, the main receptors for change in groundwater quantity and/or quality are the ecosystems associated with the receiving water bodies, predominantly Gordon and Farley lakes at the Gordon site, and Keewatin River and Minton Lake at the MacLellan site. Therefore, the trigger threshold locations and trigger thresholds defined for the groundwater AMP are focused on identifying changing conditions in groundwater that have the potential to affect surface water and the associated aquatic biota and/or wetlands.

5.1.1 Groundwater Quantity Indicator Parameters

The pumped volume from the open pit and interceptor wells can be compared with the predicted dewatering rate to assess whether there is potential for drawdown greater than that predicted in the EIS (Stantec 2020; Stantec 2023). For example, if the pumping rate is greater than that predicted in the EIS or subsequent groundwater model updates then the resulting drawdown may be greater than predicted in the EIS or subsequent groundwater model updates, which can potentially result in changes in baseflow in nearby surface water features.

The groundwater levels in monitoring wells can be compared with baseline conditions and those predicted in the EIS or subsequent groundwater model updates to assess whether there is potential for a change in associated baseflow to nearby surface water features that is greater than that predicted in the EIS or subsequent groundwater model updates.

5.1.2 Groundwater Quality Indicator Parameters

Groundwater quality indicator parameters will be chosen based on their relevance to the Project and regulatory criteria, particularly the GW3 as the GW3 are the criteria for groundwater that discharges to surface water which is the main pathway for groundwater within the local assessment area. The groundwater indicator parameters for seepage from various Project components were defined in the EIS. The groundwater indicator parameters were reviewed with respect to baseline data, fate in groundwater, and ability to consistently and reliably quantify above a laboratory detection limit to determine which groundwater indicator parameters would be defined as indicator parameters as part of the AMP. In addition, parameters typically indicative of mine operations and/or acid rock drainage were chosen as indicator parameters. The indicator parameters for groundwater quality are defined as follows, including rationale:

- Arsenic: Defined as a groundwater indicator parameter for the MRSAs and TMF in the EIS. Arsenic was predicted to exceed the GCDWQ, MWQSOG (drinking water), CWQG-FAL, and/or MWQSOG (for protection of freshwater aquatic life [FAL]) in source seepage associated with the MRSAs and TMF. The concentration of arsenic was predicted to be about an order of magnitude greater in source seepage from the MRSAs and TMF than baseline concentrations in groundwater.
- Antimony: Defined as a groundwater indicator parameter for the MRSAs and TMF in the EIS. Antimony was predicted to exceed the GCDWQ and MWQSOG (drinking water) in source seepage associated with the MRSAs and TMF. The concentration of antimony in baseline conditions was generally less than the laboratory detection limit.
- Copper: Predicted to exceed the MWQSOG-FAL and/or CWQG-FAL in source seepage associated with the MRSAs and TMF. The concentration of copper was predicted to be about an order of magnitude greater in source seepage associated with the MRSAs and TMF than baseline concentrations in groundwater.
- Cyanide (total, free, and WAD): Sodium cyanide (NaCN) is used in the processing of ore. A cyanide destruction circuit will be included in the mill process thereby limiting the amount of cyanide discharged with the tailings to the TMF. Cyanide is not commonly found in the natural environment and is therefore an appropriate indicator parameter for the potential of seepage associated with the TMF.
- Selenium: Predicted to exceed the MWQSOG-FAL and/or CWQG-FAL in source seepage associated with the MRSAs and TMF. The concentration of selenium was predicted to be about one to two orders of magnitude greater in source seepage from the MRSAs and TMF than baseline concentrations in groundwater.
- Sulphate: Defined as a groundwater indicator parameter for the MRSAs and TMF in the EIS. The concentration of sulphate was predicted to be elevated above baseline groundwater concentrations in source seepage from the MRSAs and TMF by an order of magnitude. Sulphate is a common indicator of acid rock drainage.

Iron and uranium were evaluated for their applicability as indicator parameters for the groundwater AMP because their concentration in source seepage from the MRSAs and TMF were predicted to be elevated above regulatory criteria. However, the concentration of iron and uranium in source seepage associated with the MRSAs and/or TMF is similar to the background concentrations of these parameters in groundwater and therefore would not be an effective indicator parameter for the purpose of the AMP. Iron and uranium will be analyzed as part of the routine groundwater quality sampling described in Section 4.1.

5.1.3 Groundwater Trigger Monitoring Locations and Frequency

At the Gordon site, five monitoring points (three locations) as well as pumping from the open pits and interceptor wells have been chosen as trigger monitoring locations for groundwater quantity. Map 3 (Appendix A) presents the groundwater quantity monitoring network and groundwater quantity trigger threshold monitoring locations for the Gordon site. Thresholds related to surface water level of Gordon and Farley lakes are provided in the Surface Water Management and Monitoring Plan. At the MacLellan site, eight monitoring points (five locations) as well as pumping from the open pit have been chosen as trigger monitoring locations for groundwater quantity. Map 4 (Appendix A) presents the groundwater quantity monitoring network and groundwater quantity trigger monitoring locations for the MacLellan Site. Trigger monitoring locations at both the Gordon and MacLellan sites were chosen to allow identification of potential changing groundwater conditions associated with the effect of dewatering the open pit, and historical pits, on nearby surface water features and wetlands. The frequency of monitoring the groundwater quantity trigger threshold locations is consistent with the rationale presented in Section 4.2, Monitoring Frequency, which is daily measurements of pump volumes and manual measurements of groundwater levels in monitoring wells in spring, summer, and fall with data loggers in monitoring wells set to record at 1-hour intervals.

At the Gordon site, seven monitoring points (five locations) have been chosen as trigger monitoring locations for groundwater quality. Map 5 presents the groundwater quality monitoring network and groundwater quality trigger monitoring locations for the Gordon site. At the MacLellan site, 12 monitoring points (eight locations) have been chosen as trigger monitoring locations for groundwater quality. Map 6 presents the groundwater quality monitoring network and groundwater quality trigger monitoring locations for the MacLellan site. Trigger thresholds related to surface water level and/or flow (i.e., Gordon Lake, Farley Lake, Keewatin River) are part of the Surface Water Management and Monitoring Plan. Trigger monitoring locations were chosen to allow identification of potential changing groundwater quality downgradient of the TMF and MRSAs prior to discharge to surface water. The groundwater quality trigger threshold locations will be monitored in spring, summer, and fall which is consistent with Section 4.2, Monitoring Frequency.

Table 5-1 presents a summary of the groundwater quality and quantity trigger monitoring locations, parameters, and associated rationale. The groundwater quantity and quality data for trigger monitoring locations will be reviewed with respect to the trigger thresholds in spring, summer, and fall of a given year as per the sampling frequency. The frequency of monitoring should be reviewed as the hydraulic gradients associated with open pit dewatering develop and the MRSA and TMF are constructed, and the effects of dewatering and seepage quality are confirmed.

Table 5-1 Groundwater Trigger Monitoring Locations, Frequency, Parameters and Rationale

Trigger Monitoring Location	Frequency of Measurement and Comparison with Trigger Threshold	Indicator Parameter(s)	Rationale
Groundwater Quantity			
Gordon Site			
Open Pit(s)	Measured Daily Compared with Trigger Threshold-Quarterly	Pumped Volume	Indirectly monitor potential effects of dewatering the open pit on groundwater levels
Interceptor Wells	Measured Daily Compared with Trigger Threshold-Quarterly	Pumped Volume	
GBHF-09A MWF-02A/B MWF-09A/B	Manual – Spring, Summer, and Fall Data Logger – 1-hour intervals Compared with Trigger Threshold – Spring, Summer, and Fall	Water Level	Monitor potential changes in groundwater levels associated with dewatering the open pit to be protective of wetlands and baseflow to surface water features
MacLellan Site			
Open Pit(s)	Measured Daily Compared with Trigger Threshold-Quarterly	Pumped Volume	Indirectly monitor potential effects of dewatering the open pit on groundwater levels
GBHM-17-03 MWM-06B MWM-10A/B MWM-17A/B MWM-18A/B	Manual – Spring, Summer, and Fall Data Logger – 1-hour intervals Compared with Trigger Threshold – Spring, Summer, and Fall	Water Level	Monitor potential changes in groundwater levels associated with dewatering the open pit to be protective of wetlands and baseflow to surface water features
Groundwater Quality			
Gordon Site			
GBHF-13	Spring, Summer, and Fall	Arsenic, Antimony, Copper, Selenium, and Sulphate	Monitor for potential effects of seepage from the MRSA upgradient of Susan Lake
GBHF-11A GBHF-09A MWF-09A/B MWF-10A/B	Spring, Summer, and Fall	Arsenic, Antimony, Copper, Selenium, and Sulphate	Monitor for potential effects of seepage from the MRSA upgradient of Gordon Lake and Farley Lake
MacLellan Site			
GBHM-20 GBHM-16-03R/S MWM-14A/B MWM-15A/B MWM-16A/B	Spring, Summer, and Fall	Arsenic, Antimony, Copper, Cyanide (total and free), Selenium, and Sulphate	Monitor for potential effects of seepage from the MRSA/TMF upgradient/cross-gradient of Minton Lake

Trigger Monitoring Location	Frequency of Measurement and Comparison with Trigger Threshold	Indicator Parameter(s)	Rationale
MWM-02A MWM-13	Spring, Summer, and Fall	Arsenic, Antimony, Copper, Cyanide (total and free), Selenium, and Sulphate	Monitor for potential effects of seepage from the MRSA/TMF upgradient of Payne Lake and associated tributary of Keewatin River
GBHM-12	Spring, Summer, and Fall	Arsenic, Antimony, Copper, Cyanide (total and free), Selenium, and Sulphate	Monitor for potential effects of seepage from the TMF upgradient of the Keewatin River

5.1.4 Groundwater Trigger Thresholds and Response Plans

Trigger thresholds for groundwater quantity and quality have been defined for the respective indicator parameters that would initiate specific adaptive management actions depending on the severity of the action level triggered. Up to two trigger thresholds have been defined, each with a varying level of sensitivity and associated level of response. The purpose of establishing multiple action levels is to identify potential groundwater issues as soon as possible through routine screening and to identify the appropriate action level to address potential impacts to groundwater resources as a result of the Project. If the trigger threshold is exceeded, an associated response plan would be initiated. The specifics of the groundwater trigger thresholds (including values) and associated response plans are presented in the following sections.

Groundwater Quantity

Two indicator parameters, groundwater level and average daily pumped volume, were defined for groundwater quantity. A groundwater quantity response plan would be initiated in the event where one of the following trigger thresholds are exceeded:

- The groundwater level declines below the predicted minimum groundwater level elevation for the given monitoring location (based on observed minimum groundwater elevation from baseline data minus the maximum predicted drawdown over the life of the Project) (refer to Table 5-2). For monitoring wells that have less than one year of baseline data, the minimum groundwater level elevation may be adjusted to account for anticipated seasonal water level variations at the given location. The groundwater levels will be compared with the trigger thresholds in spring, summer, and fall.
- The average daily pumped volume from the open pits and interceptor wells, determined on a quarterly basis, exceeds the predicted climate normal dewatering rate (combined groundwater plus surface water inflows) presented in the EIS and as updated over the life of the Project (refer to Table 5-3).

If one of the trigger thresholds for groundwater quantity is exceeded, then the following response plan (“Actions”) will be initiated:

- **Action 1** Confirm the Result: – remeasure the water level or pumped volume to confirm the value. Confirm the equipment used to make the measurement is operating as intended by the manufacturer.
  - If remeasuring indicates a value that is equal to or below the defined groundwater quantity trigger threshold, then no action is required and continue with the monitoring plan.
  - If the original measurement is validated, then proceed to Action 2.
- **Action 2** Evaluate the Dataset:
  - Compare the groundwater level or pumping volume with meteorological data and groundwater and surface water quantity data for the Project. Determine if the exceedance is related to a single anomalous event, such as a meteorological event, seasonal variation, or the potential for a Project-related effect.
  - If the trigger threshold exceedance is not Project-related, then continue with ongoing monitoring. Otherwise proceed to Action 3.
- **Action 3** Complete an Investigation: determine if an adverse effect is occurring in the receiving environment.
  - Based on the information derived from the investigation, the potential relevance of the exceedance event to surface water features, aquatics, and wetlands will be evaluated through a qualitative risk evaluation. At this time, more rigorous monitoring may be recommended for the nearby surface water features, aquatics, and/or wetlands.
  - Notify IAAC, MECC, and the Environmental Advisory Committee if new mitigation is required. Document the results of the assessment in the annual report (refer to Section 7.1).

Table 5-2 Preliminary Groundwater Level Trigger Thresholds

Trigger Monitoring Location	Minimum Groundwater Level (m amsl)	Date Observed	Predicted Drawdown (m)	Groundwater Level Trigger Threshold (m amsl)
Gordon Site				
GBHF-09A	316.7	3/25/2022	12	304.7
MWF-02A	316.6	4/19/2018	37	279.6
MWF-02B	316.4	4/19/2018	37	279.4
MWF-09A	Proposed location		5	TBD
MWF-09B	Proposed location		5	TBD
MacLellan Site				
GBHM-17-03	Baseline Data Required		10	TBD
MWM-06B	330.5	4/15/2016	1	329.5
MWM-10A	325.3	4/16/2016	5	320.3
MWM-10B	325.1	4/17/2018	5	320.1
MWM-17A	Proposed location		Negligible	TBD
MWM-17B	Proposed location		Negligible	TBD
MWM-18A	Proposed location		Negligible	TBD
MWM-18B	Proposed location		Negligible	TBD

Notes:

amsl: above mean seal level <: less than

TBD: trigger threshold value is to be determined. Location has not yet been established or baseline monitoring data is required. Trigger thresholds may be updated as additional baseline groundwater level data is collected and groundwater and water balance modelling updates are made over the life of the Project.

Table 5-3 Pumping Rate Trigger Thresholds

Trigger monitoring location	Pumping Rate Trigger Threshold**** (Predicted Maximum Monthly Pumping Rate) (m^3/day)
Gordon Site***	
Open Pit	9,500*
Interceptor Wells	4,300 combined Farley Lake side of open pit** 4,900 combined Gordon Lake side of open pit**
MacLellan Site	
Open Pit	8,630*

Notes:

Trigger thresholds may be updated as groundwater and water balance modelling updates are made over the life of the Project.

* average conditions based on the water balance and water quality impact assessment presented in Appendix E and D of Stantec (2020) with revised groundwater inflow to the pit based on Stantec (2023).

** Maximum average annual pumping rate from interceptor wells based on Stantec (2023).

*** Given variability between model set up of interceptor wells and open pit compared with actual site conditions, the trigger threshold comparison should be the combined pumping rate of the open pit and interceptor wells compared with the combined pumping rate trigger threshold for the open pit and interceptor wells.

**** Rates to be updated over time based on most recent iteration of water balance and groundwater flow modelling.

Groundwater Quality

Trigger thresholds have been defined as concentrations for key indicator parameters that would initiate specific adaptive management actions depending on the severity of the action level triggered. Two trigger thresholds for groundwater quality have been defined each with a varying level of sensitivity and associated levels of response. The purpose of establishing multiple action levels is to identify potential groundwater issues as soon as possible through routine screening and to identify the appropriate action level to address potential impacts to groundwater resources as a result of the Project. The two groundwater quality trigger thresholds and response plans are defined as follows.

Trigger Threshold 1

The early identification of increasing trends in the concentration of indicator parameters, prior to guideline exceedance, is a primary component of the groundwater AMP. Trigger Threshold 1 is meant to identify potential issues associated with the Project before they have the potential to result in a measurable adverse effect on the environment. The goal of Trigger Threshold 1 is to obtain more information about potential seepage, identify the source of the trend, if possible, and generally provide increased attention, information, and awareness of potential seepage before it reaches a Trigger Threshold 2 concentration. Trigger Threshold 1 is defined as a statistically significant upward trend for a given indicator parameter or for stations that have a statistically significant upward trend in the baseline data, an increase in the magnitude of the trend compared with baseline.

Ongoing trend analysis will be completed using the Mann-Kendall test (Mann 1945; Kendall 1970, Walker and Harrison 2013). The Mann-Kendall test has been found to be a simple and effective way to measure whether an indicator parameter is rising or falling. The test can be applied to as few as four points. For this application, the Mann-Kendall test will be applied to the entire dataset for a given monitoring location. Using the method cited by Walker and Harrison (2013), the Mann-Kendall test statistic (S) and the coefficient of variation will be calculated and applied using the 90% confidence level chart.

If Trigger Threshold 1 is exceeded the following responses (“Actions”) will be initiated:

- **Action 1** Quality Review of the Reported Data: Complete a quality assurance/quality control (QA/QC) review of the sampling methods, laboratory reports, and chain of custody. Assess the validity of outliers that may be biasing the trend analysis. Resample the well and/or re-run the laboratory sample (if the sample’s hold time has not been exceeded) to confirm the reported result.
  - If the QA/QC review indicates sampling or laboratory error and upon further analysis the applicable trigger threshold is not exceeded, then continue with monitoring.
  - If the QA/QC review confirms that the trigger threshold has been exceeded, then proceed to Action 2.
- **Action 2** Physical Inspection: Complete a physical inspection of the identified monitoring well and associated area.
  - If the monitoring well is compromised, contract a licensed well contractor to repair the well and complete resampling of the well once repaired and re-developed to confirm if the applicable trigger threshold is exceeded.
  - If the monitoring well is in good condition and there is no obvious reason for the exceedance of the applicable trigger threshold, then proceed to Action 3.
- **Action 3** Review Additional Available Data: Review available data to determine if a cause for the trigger threshold exceedance can be determined. For example, is the exceedance related to a single anomalous event such as a meteorological event, seasonal variation, or the potential for a Project-related effect.
  - If the review indicates the occurrence is anomalous or may subside, such as for non-Project related effects, document the assessment in the annual report (refer to Section 7.1) and continue monitoring to confirm reduction in parameter concentration.
  - If the review suggests concentrations are increasing or remaining elevated above predicted concentrations for extended periods and/or has the potential to be related to the Project, proceed to Action 4.
- **Action 4** Refer to Trigger Threshold 2 Action Plan

Trigger Threshold 2

An exceedance of Trigger Threshold 2 is defined as:

1. an exceedance of Trigger Threshold 1 and
2. an exceedance of predicted source concentrations for the mine component located upgradient of the trigger threshold monitoring well location (TMF, MRSA, etc.) as defined in the EIS (Tables 8A-8 and 8A-11 of Chapter 8 of the EIS) and appended herein as Tables C-1 and C-2.

Trigger Threshold 2 is defined to alert to the need for additional investigation prior to the potential to significantly affect the receiving surface water quality. The EIS was completed assuming at-source seepage concentrations discharging from groundwater to surface water with no attenuation along the groundwater flow path such that the effect to surface water quality was assessed as not significant. If the concentration of an indicator parameter does not exceed Trigger Threshold 2, then continue monitoring as planned. If the concentration of an indicator parameter exceeds Trigger Threshold 2, the following actions will be undertaken.

- **Action 1** Complete an Investigation: Complete an investigation to assess whether the exceedance is Project-related. The investigation will be designed, implemented, and interpreted by a Qualified Person. The investigation may include the following key aspects:
  - Lateral and vertical extent assess whether the exceedance event is isolated to one well or several wells, and whether the exceedance is limited to one or both of the shallow and deep wells at a given location.
  - Migration pathway: based on the screened interval(s) showing the exceedance and on borehole logs for the well installations, define the geological properties and hydrostratigraphic unit(s) of the seepage pathway.
  - Additional parameter(s): assess whether there are changing trends associated with other parameters at the given monitoring well.
  - Magnitude of exceedance: assess whether the exceedance represents a minor or significant deviation from the trigger threshold. Review the concentration of the source of the exceedance relative to predicted concentrations to assess the potential for the parameter to further degrade groundwater quality.
  - If required, augment the monitoring network to the delineate source of seepage or increase sample frequency.
- **Action 2** Qualitative Risk Evaluation: Based on the information derived from the Trigger Threshold 1 action plan and/or Trigger Threshold 2 investigation, the potential relevance of the exceedance event to surface water quality in the receiving surface water feature will be evaluated through a qualitative risk evaluation. At this time, more rigorous monitoring may be recommended for the downgradient surface water features (e.g., increased sampling frequency, additional sample locations, additional parameters).

- **Action 3** Determine Project Influence: Conclude whether exceedance is related to the Project and, if so, whether it is incidental (accident/malfunction), operational (related to an operational procedure that may be mitigated, e.g., pumping configuration), and/or the result of seepage from mine components (e.g., TMF, MRSA).
  - If the exceedance is not related to the Project, continue with the monitoring plan with modifications recommended by the Qualified Person based on the outcomes of the investigation, and document the assessment in the annual report (refer to Section 7.1).
  - If the exceedance is deemed related to the Project, proceed to Action 4.
- **Action 4** Notification: Internal Corporate Notification and Notification of IAAC, MECC, and the Environmental Advisory Committee of the trigger threshold exceedance and the results of the Actions taken.
- **Action 5** Mitigate Effects of the Project: If mitigation is deemed necessary, options designed to reduce the seepage flow reporting to groundwater may include:
  - Persistent seepage flows detected in the seepage collection ditches that cannot be adequately captured by existing sump stations will be addressed through the installation of larger seepage collection pumps, where necessary, to direct seepage to the appropriate facility (e.g., pumped back to TMF).
  - Modifications to the existing ditch system to increase seepage collection efficiency (e.g., modification of ditch geometry, alignment, or construction materials).
  - Installation of one or multiple groundwater pump-back wells that could serve as a hydraulic barrier (i.e., collection of plume waters and pump back to TMF).
  - Installation of a barrier wall that could include sheet pile, grout curtain or localized grouting of bedrock.
  - For some parameters and flow paths, passive treatment options may offer a viable alternative to other contingency measures. These could include permeable reactive barriers or other forms of seepage interception systems designed to passively treat groundwater plumes in situ.
  - Based on consideration of the primary investigation described as part of Trigger Threshold 1, secondary evaluation measures may be proposed to better define the source, extent and/or pathway of the contaminant plume. This may include installation of additional monitoring wells to better constrain the seepage pathway (nature of conductive unit and vertical/lateral extent of the plume) and/or hydraulic testing and discrete interval sampling to better determine whether the seepage plume is isolated to discrete units or fracture zones or distributed over a wider area.
  - Numerical modelling to better quantify the contaminant flux to local watercourses.

6.0 REPORTING

Reports from the GMMP monitoring programs will be submitted annually to regulatory authorities and shared with interested Indigenous Nations and stakeholders.

The annual report will incorporate data collected during a calendar year and submitted to regulatory authorities in the following the reporting year. The initial report will be submitted the year after the start of construction at either the Gordon or MacLellan site, whichever occurs first. Depending on the amount of data in a given reporting year, the report may be separated into two volumes, one for each site. The report(s) will be factual and may include the following:

- Summary of monitoring activities that were conducted.
- Tabulated results of the data collected through the GMMP.
- Comparison of data to trigger thresholds, identification if a trigger threshold was exceeded, and the mitigation and/or adaptive management that was implemented, if required.

Investigations completed due to a trigger threshold exceedance under the Groundwater Trigger Thresholds and Response Plans (Section 6.1.4) will be documented as stand-alone technical memorandums at the time of the investigation and appended to the annual report. Notifications regarding the trigger threshold exceedances and associated investigation report will be documented in the annual report.

If modifications to the monitoring program are warranted, based on sufficient supporting information, a request will be made in writing to IAAC.

7.0 GROUNDWATER FLOW MODEL REVIEW

The basis for the adaptive management plan described in Section 5.0 is the comparison of observed conditions with the effects predicted, in part, using the numerical groundwater flow model (Stantec 2020; Stantec 2023). Therefore, the groundwater flow model will be reviewed every four years, and the following thresholds used to determine if the model needs to be reviewed by a qualified hydrogeologist:

1. The observed drawdown for a particular trigger threshold monitoring location exceeds the predicted drawdown at that location by more than 25%.
2. The actual dewatering volume for the open pits for the relevant stage of open pit development exceeds the predicted dewatering volume by more than 25%.
3. The extents (areal and depth) of the open pits, TSMF, or MRSA for the Project exceed the extents used in the numerical groundwater flow model.

If none of these three thresholds are exceeded, no further action is required, and validation of the groundwater flow model will be documented in the annual GMMP report (refer to Section 7.1). If further review or adjustments to the groundwater flow model are recommended by the qualified hydrogeologist as a result of the groundwater flow model review process, then the results and updates to the numerical groundwater flow model will be documented in a stand-alone report. If the predictions of effects of the Project on groundwater are updated, then the trigger thresholds for groundwater quantity will be reviewed and updated, as required, in the GMMP.

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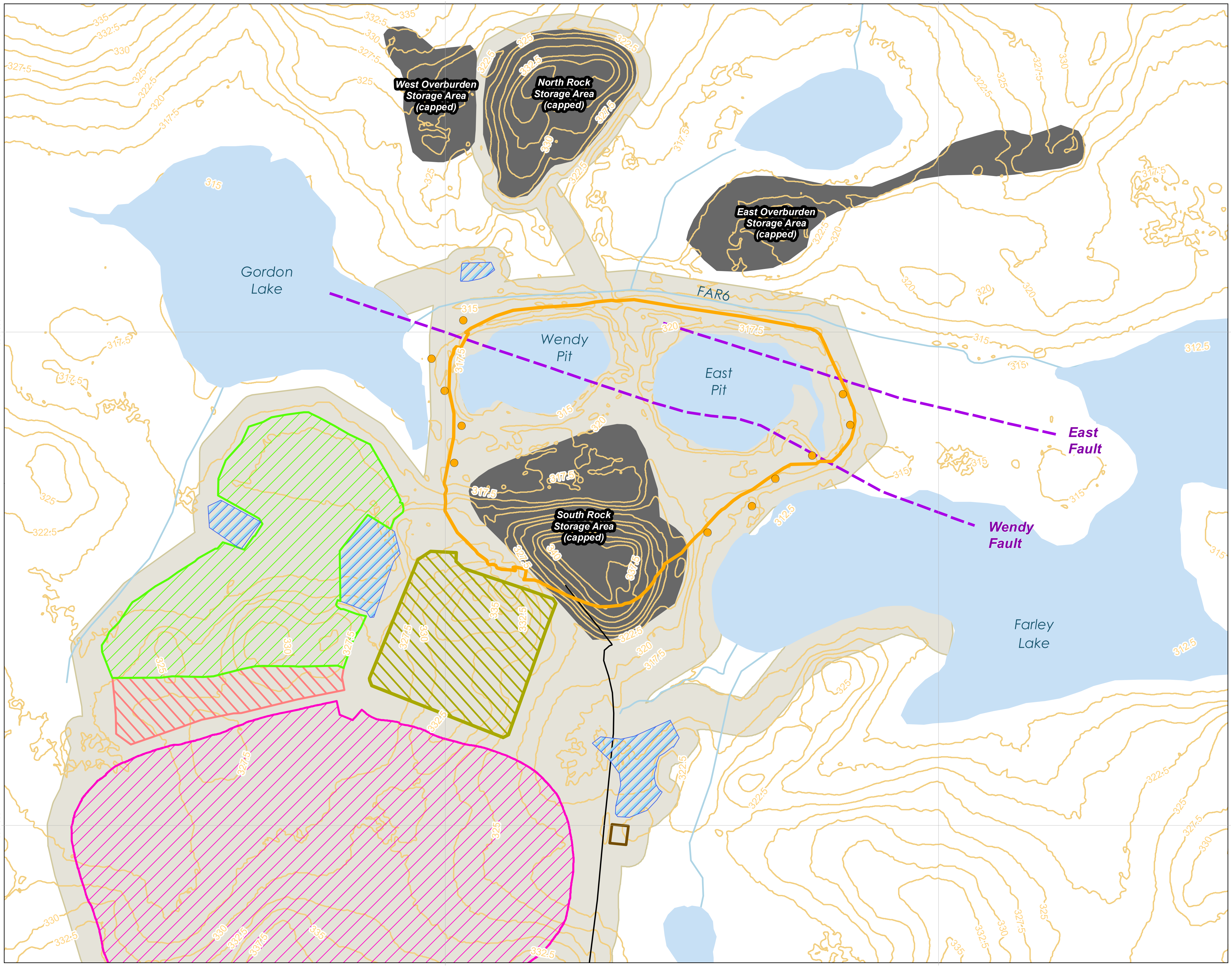
Appendix A Maps



Stantec

Project Infrastructure

- Open Pit
- Mine Rock Storage Area
- Collection Pond/Sumps
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Gen Set Area
- Project Development Area

Survey Locations

- ● Modelled Interceptor Well Location

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical Mine

Landbase

- Existing Access Road
- Fault Zone
- Elevation Contours (m)
- Watercourse
- Waterbody

N

0 100 200 Metres

(At original document size of 11x17)
1:8,000

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

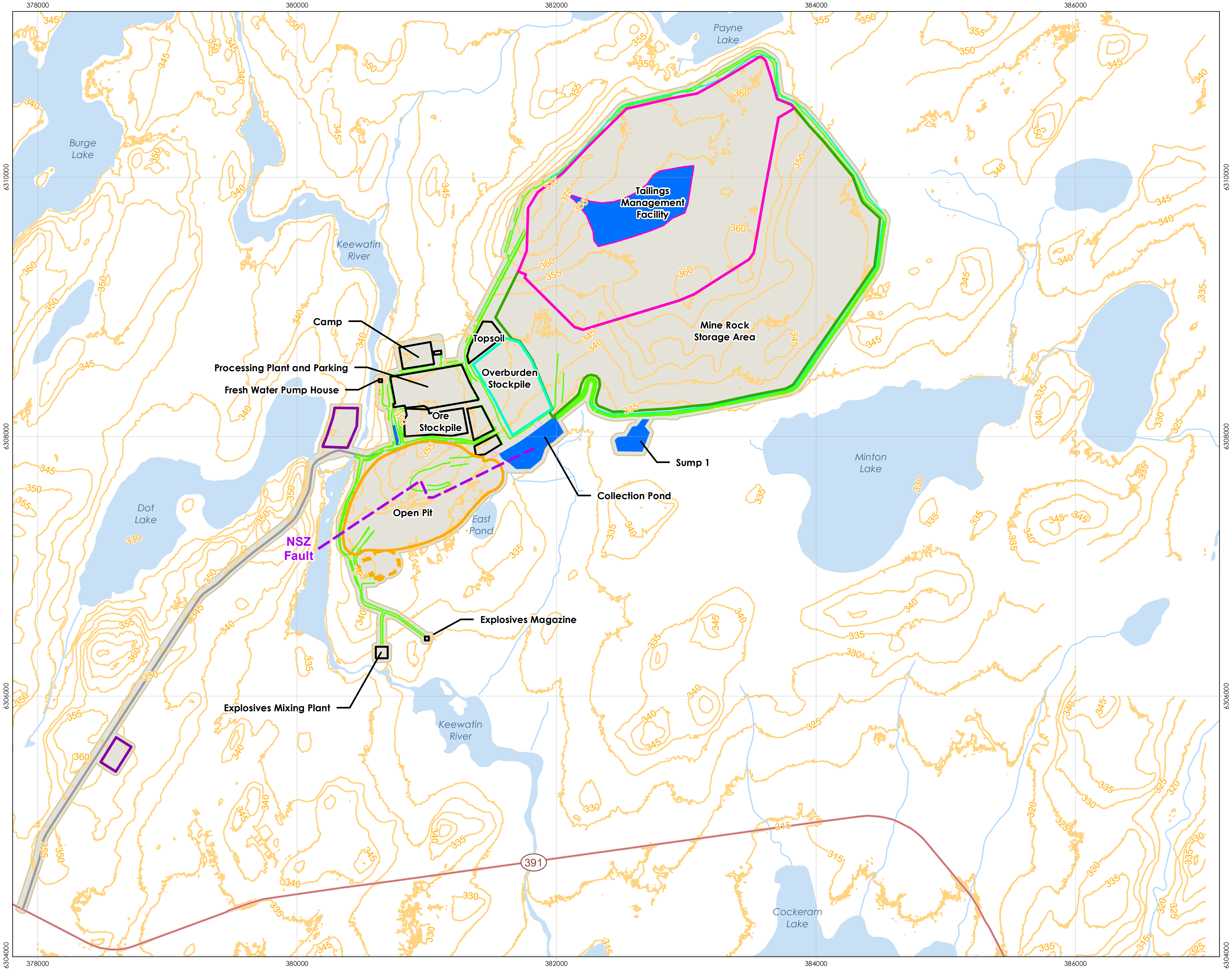
Prepared by ACampigotto on 2023-10-11
Technical Review by LNelson on 2023-10-11

Client/Project
111473054
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
1

Title
Preliminary Gordon Site Plan

G:_GIS_Project_Folder\111473008_LLGP_EA\RI\Groundwater Work Program\NOA\Map1_NOA_SitePlan_Gordon_20231011.mxd Revised: 2023-10-11 By: ACampigotto



Stantec

Project Infrastructure

- 🟧 Open Pit
- ▭ Satellite Pit
- 🟪 Tailing Management Facility
- 🟩 Mine Rock Storage Area
- ▭ Overburden Stockpile
- 🟦 Collection Pond/Sumps
- ⬛ Other Infrastructure
- 🟪 Construction Laydown Area
- — Culvert
- — Ditching
- — Corridor / Access Road
- ▨ Project Development Area

Landbase

- — Highway
- — Existing Access Road
- - - Fault Zone
- — Elevation Contours (m)
- — Watercourse
- 🟦 Waterbody

N

0 0.5 1 Kilometres
(At original document size of 11x17)
1:30,000

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

Project Location
Lynn Lake,
Manitoba

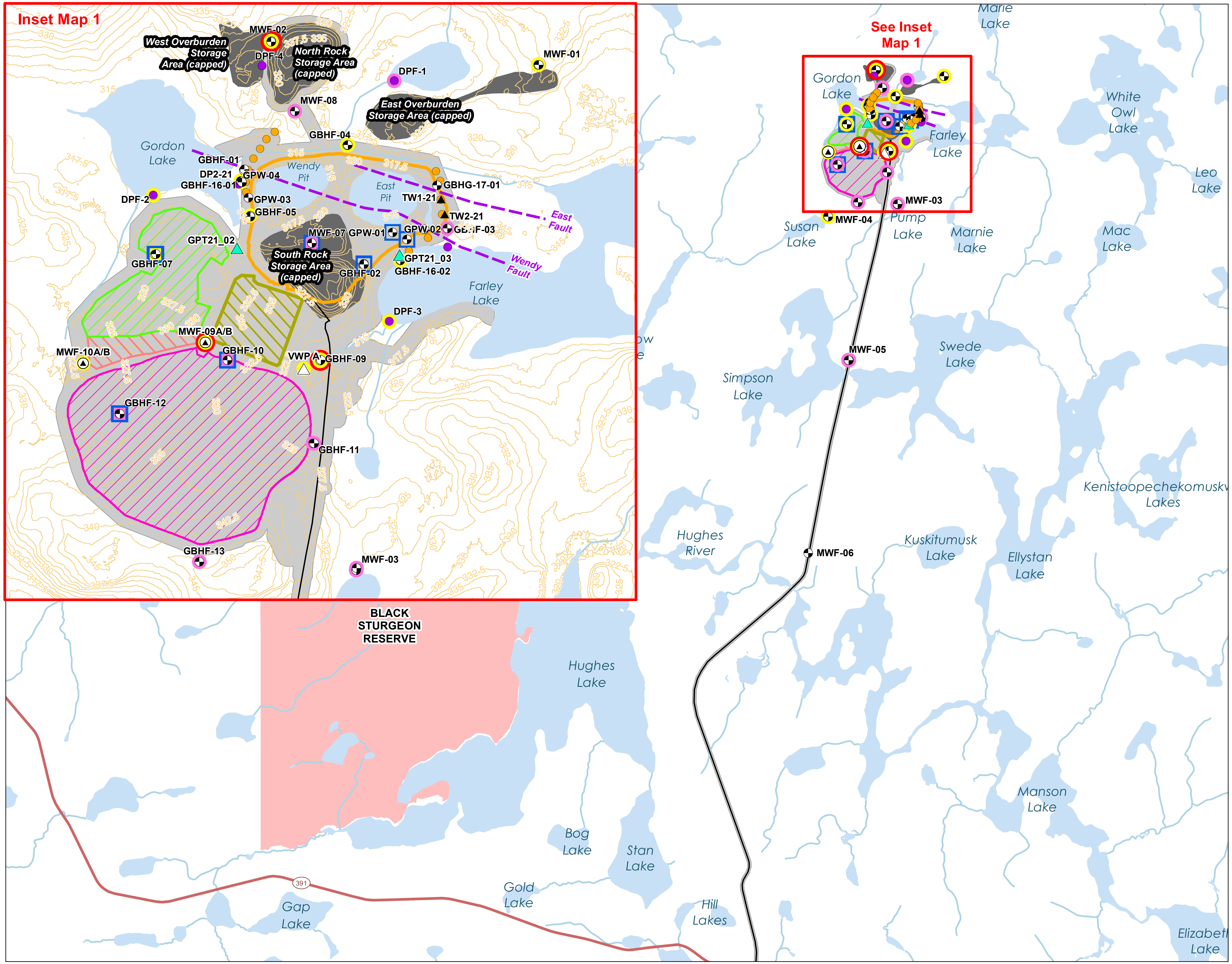
Prepared by ACampigotto on 2023-09-25
Technical Review by LNelson on 2023-09-25

Client/Project
111473054
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
2

Title
Preliminary MacLellan Site Plan

G:_GIS_Project_Folder\111473008_LLGP_EA\IRs\Groundwater Work Program\NOA\Map2_NOA_SitePlan_MacLellan_20230925.mxd Revised: 2023-09-25 By: ACampigotto



Stantec

Project Infrastructure

- Open Pit
- Mine Rock Storage Area
- Ore Storage
- Overburden Storage
- Topsoil Storage Area
- Project Development Area

Survey Locations

- Proposed Monitoring Well
- Proposed Vibrating Wire Piezometer
- Test Well (newly drilled)
- Modelled Interceptor Well Location
- Vibrating Wire Piezometer
- Drive-Point Piezometers
- Monitoring Well
- Manual Water Level Measurement
- Data Logger Installed
- Groundwater Quantity Trigger Monitoring Location
- Monitoring Well to be Removed

Historical Mine Infrastructure

- Existing Infrastructure Associated with Historical

Landbase

- Existing Access Road
- Highway
- Fault Zone
- Elevation Contours (m)
- Watercourse
- Waterbody
- First Nation Reserve

N

0 1 2 Kilometres

(At original document size of 11x17)
1:65,000

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 2023-12-12
Technical Review by LNelson on 2023-12-12

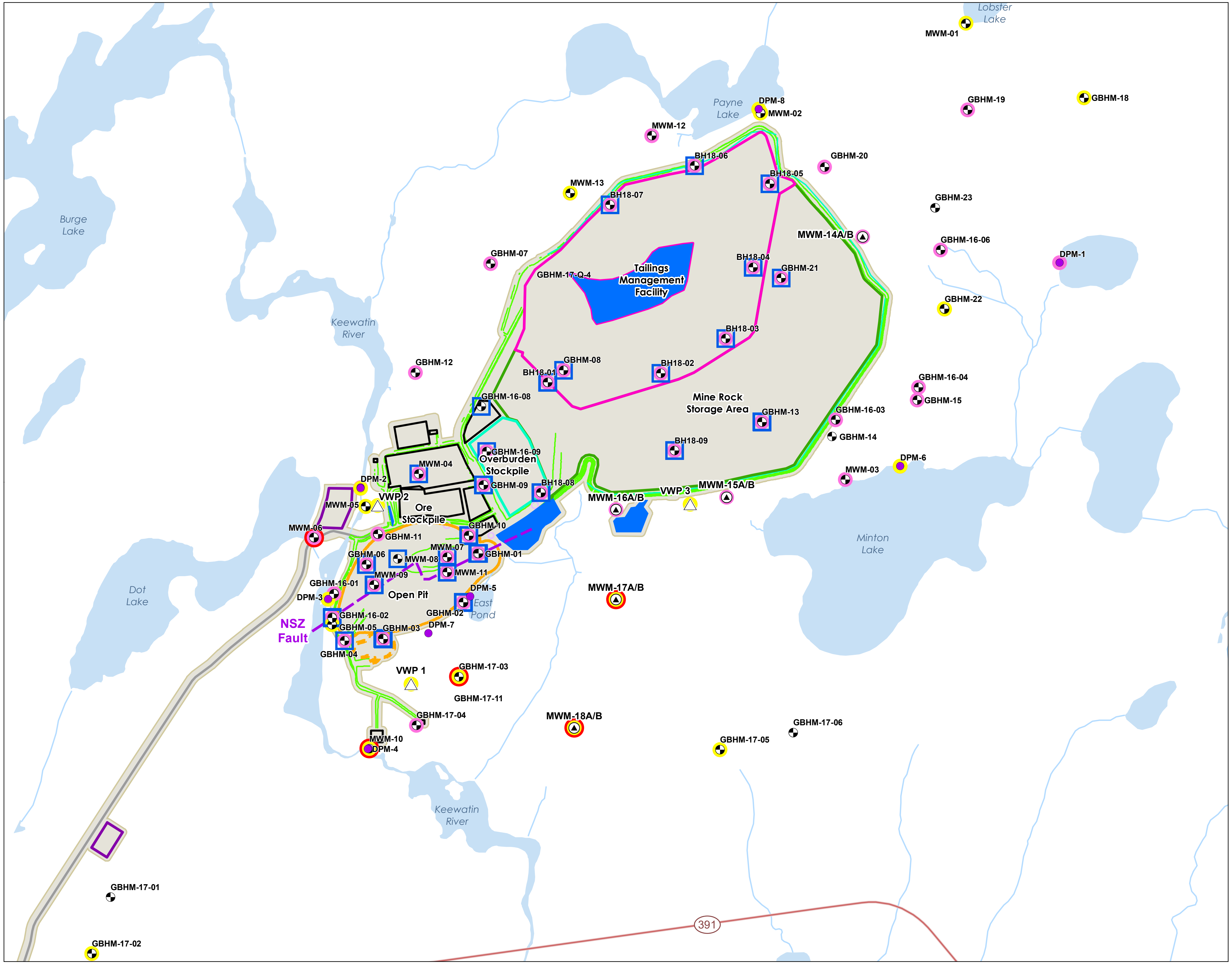
Client/Project
111473054
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
3

Title

Groundwater Level Monitoring Locations - Gordon Site

G:_GIS_Project_Folder\111473008_LLGP_EA\IRs\Groundwater Work Program\NOA\Map3_NOA_GMMP_GW_Level_Gordon_20231211.mxd Revised: 2023-12-12 By: ACampigotto



Stantec

Project Infrastructure

- 🟧 Open Pit
- ▭ Satellite Pit
- ▭ Tailing Management Facility
- ▭ Mine Rock Storage Area
- ▭ Overburden Stockpile
- 🟦 Collection Pond/Sumps
- ▭ Other Infrastructure
- ▭ Construction Laydown Area
- — Culvert
- — Ditching
- — Corridor / Access Road
- ▭ Project Development Area

Survey Locations

- ▲ Proposed Monitoring Well
- △ Proposed Vibrating Wire Piezometer
- ● Drive-Point Piezometers
- ◐ Monitoring Well
- ● Manual Water Level Measurement
- ● Data Logger Installed
- ○ Groundwater Quantity Trigger Monitoring Location
- ☐ Monitoring Well to be Removed

Landbase

- — Highway
- — Existing Access Road
- – – Fault Zone
- — Watercourse
- ▭ Waterbody

N

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

Notes

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

Project Location
Lynn Lake,
Manitoba

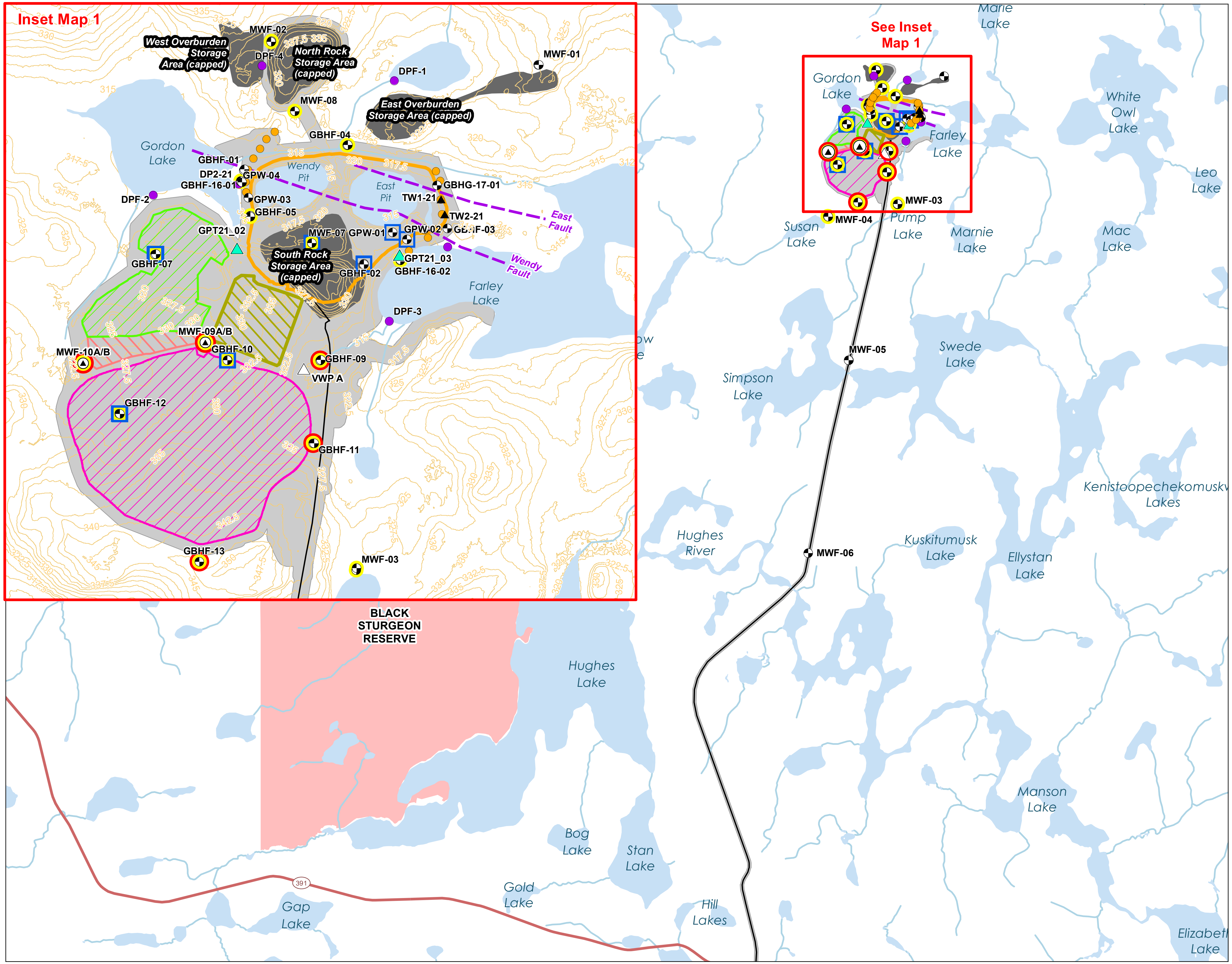
Prepared by ACampigotto on 2023-12-12
Technical Review by LNelson on 2023-12-12

Client/Project
111473054
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
4

Title

Groundwater Level Monitoring Locations - MacLellan Site



Stantec

Project Infrastructure

- 🟧 Open Pit
- ▨ Mine Rock Storage Area
- ▨ Ore Storage
- ▨ Overburden Storage
- ▨ Topsoil Storage Area
- ■ Project Development Area

Survey Locations

- ⊕ Proposed Monitoring Well
- △ Proposed Vibrating Wire Piezometer
- ▲ Test Well (newly drilled)
- ● Modelled Interceptor Well Location
- ▲ Vibrating Wire Piezometer
- ● Drive-Point Piezometers
- ⊕ Monitoring Well
- ● Groundwater Quality Sampling Location
- ○ Groundwater Quality Trigger Monitoring Location
- □ Monitoring Well to be Removed

Historical Mine Infrastructure

- ■ Existing Infrastructure Associated with Historical Mine

Landbase

- — Existing Access Road
- — Highway
- - - Fault Zone
- — Elevation Contours (m)
- — Watercourse
- ■ Waterbody
- ■ First Nation Reserve

N

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(At original document size of 11x17)
1:65,000

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

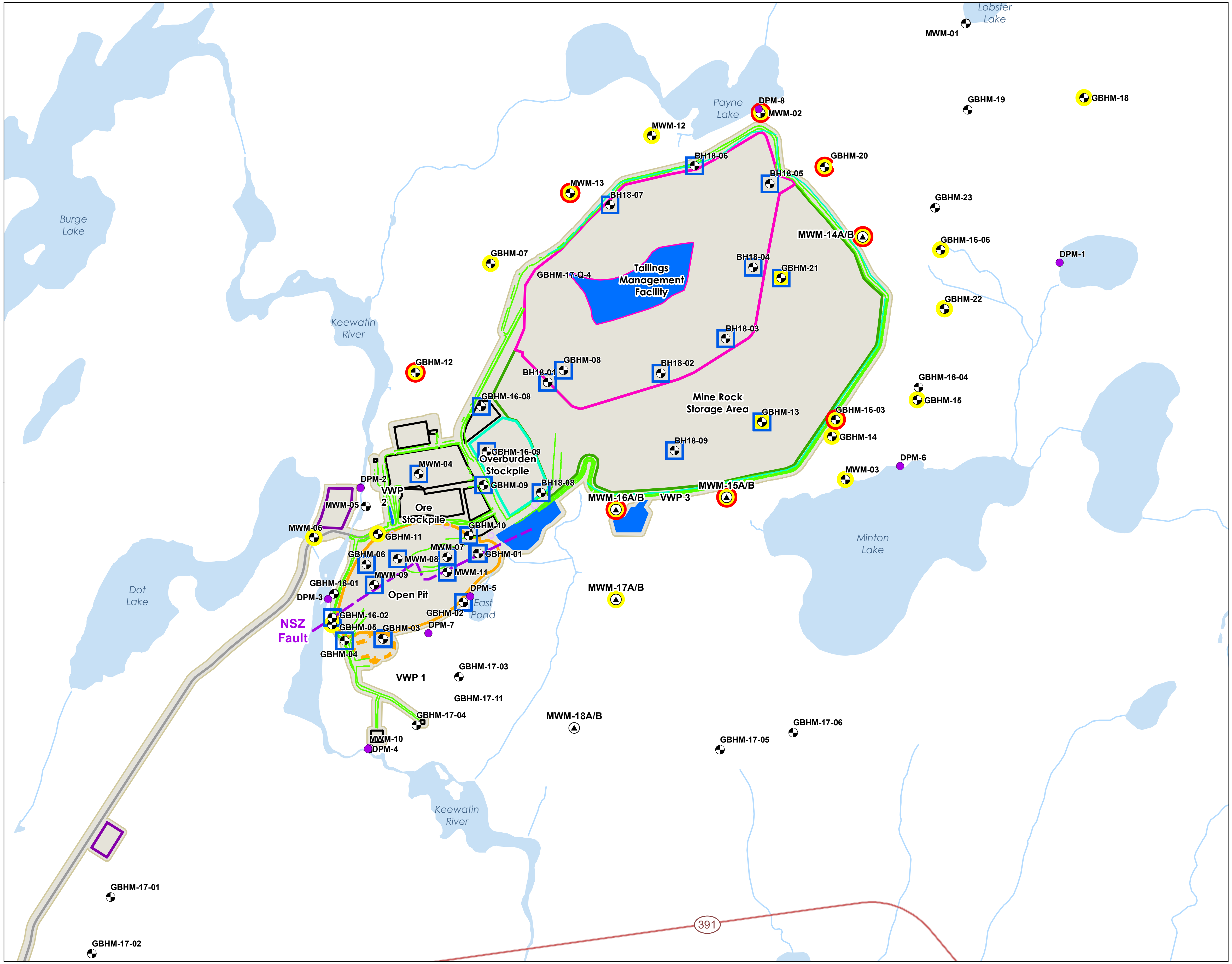
Prepared by ACampigotto on 2023-12-12
Technical Review by LNelson on 2023-12-12

Client/Project
111473054
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
5

Title
Groundwater Quality Monitoring Locations - Gordon Site

G:_GIS_Project_Folder\111473008_LLGP_EA\IRs\Groundwater Work Program\NOA\Map5_NOA_GMMP_GW_Quality_Gordon_20231211.mxd Revised: 2023-12-12 By: ACampigotto



Stantec

Project Infrastructure

- ▭ Open Pit
- ▭ Satellite Pit
- ▭ Tailing Management Facility
- ▭ Mine Rock Storage Area
- ▭ Overburden Stockpile
- ■ Collection Pond/Sumps
- ▭ Other Infrastructure
- ▭ Construction Laydown Area
- — Culvert
- — Ditching
- — Corridor / Access Road
- ■ Project Development Area

Survey Locations

- ⊕ Proposed Monitoring Well
- ● Drive-Point Piezometers
- ⊕ Monitoring Well
- ● Groundwater Quality Sampling Location
- ○ Groundwater Quality Trigger Monitoring Location
- □ Monitoring Well to be Removed

Landbase

- — Highway
- — Existing Access Road
- – – Fault Zone
- — Watercourse
- ■ Waterbody

N

0 0.5 1 Kilometres

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

Notes

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

Project Location
Lynn Lake,
Manitoba

Prepared by ACampigotto on 2023-12-12
Technical Review by LNelson on 2023-12-12

Client/Project
111473054
ALAMOS GOLD INC.
Lynn Lake Gold Project

Map No.
6

Title

Groundwater Quality Monitoring Locations - MacLellan Site

G:_GIS_Project_Folder\111473008_LLGP_EA\IRs\Groundwater Work Program\NOA\Map6_NOA_GMMP_GW_Quality_MacLellan_20231211.mxd Revised: 2023-12-12 By: ACampigotto

Appendix B Tables

Table B-1 Summary of Groundwater Quantity and Quality Monitoring Locations for the Gordon Site

Location ID	NAD1983 UTM Zone 14N		Total Daily Pumped Volume	Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)	Location	Rationale
	Northings	Eastings		Manual	Data Logger			
Monitoring Wells								
GBHF-01A	6307996	411979	-	-	-	-	Between open pit and Gordon Lake	Redundant, other monitoring wells in vicinity will be monitored
GBHF-01B	6308001	411982	-	-	-	-	Between open pit and Gordon Lake	Redundant, other monitoring wells in vicinity will be monitored
GBHF-02A	6307605	412483	-	-	-	-	Southeastern edge of open pit	Monitor will be removed with development of open pit
GBHF-02B	6307602	412483	-	-	-	-	Southeastern edge of open pit	Monitor will be removed with development of open pit
GBHF-03	6307753	412833	-	✓**	-	-	Adjacent (east) to open pit	Monitor potential changes in water level due to open pit dewatering
GBHF-04A	6308100	412412	-	✓**	✓**	✓**	Adjacent (north) to open pit	Monitor for potential changes in water level and quality due to open pit dewatering
GBHF-04B	6308102	412416	-	✓**	✓**	✓**	Adjacent (north) to open pit	Monitor for potential changes in water level and quality due to open pit dewatering
GBHF-05A	6307806	412008	-	✓**	✓**	-	Between open pit and Gordon Lake, adjacent to VWP	Monitor for potential changes in water level due to open pit dewatering
GBHF-05B	6307802	412008	-	✓**	✓**	-	Between open pit and Gordon Lake, adjacent to VWP	Monitor for potential changes in water level due to open pit dewatering
GBHF-07A	6307644	411608	-	✓	✓	✓	Within western portion of overburden storage, downgradient of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA. Monitor will be removed with development of the overburden storage.
GBHF-07B	6307645	411612	-	✓	✓	✓	Within western portion of overburden storage, downgradient of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA. Monitor will be removed with development of the overburden storage.
GBHF-09A	6307200	412300	-	✓	✓	✓	Adjacent to ore stockpile, downgradient (northeast) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
GBHF-09B	6307202	412302	-	✓***	✓***	✓***	Adjacent to ore stockpile, downgradient of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
GBHF-10A	6307203	411912	-	✓*	-	✓*	Within northern portion of MRSA footprint	Monitor to obtain overlap of historical data from GBHF-10A with proposed monitoring well MWF-09A. Monitor will be removed with development of the MRSA.
GBHF-10B	6307200	411911	-	✓*	-	✓*	Within northern portion of MRSA footprint	Monitor to obtain overlap of historical data from GBHF-10B with proposed monitoring well MWF-09B. Monitor will be removed with development of the MRSA.
GBHF-11A	6306854	412270	-	✓	-	✓	Downgradient (east) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
GBHF-11B	6306853	412274	-	✓***	-	✓***	Downgradient (east) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.

Location ID	NAD1983 UTM Zone 14N		Total Daily Pumped Volume	Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)	Location	Rationale
	Northings	Eastings		Manual	Data Logger			
GBHF-12A	6306977	411458	-	✓*	-	✓*	Within western portion of MRSA footprint	Monitor to obtain overlap of historical data from GBHF-12A with proposed monitoring well MWF-10A. Monitor will be removed with development of the MRSA.
GBHF-12B	6306976	411461	-	✓*	-	✓*	Within western portion of MRSA footprint	Monitor to obtain overlap of historical data from GBHF-12A with proposed monitoring well MWF-10B. Monitor will be removed with development of the MRSA.
GBHF-13	6306357	411793	-	✓	-	✓	Adjacent (south) to MRSA	Monitor water quality within predicted flow path of seepage from MRSA. Well will need to be deepened for monitoring (possibly up to 30 m).
GBHF-16-01A	6307949	411967	-	✓**	✓**	✓**	Between open pit and Gordon Lake	Monitor potential changes in water level due to open pit dewatering, monitor quality of groundwater between open pit and Gordon Lake.
GBHF-16-01B	6307951	411967	-	✓**	✓**	✓**	Between open pit and Gordon Lake	Monitor potential changes in water level due to open pit dewatering, monitor quality of groundwater between open pit and Gordon Lake.
GBHF-16-02A	6307618	412635	-	✓**	✓**	✓**	Adjacent (southeast) to open pit, adjacent to Farley Lake	Monitor potential changes in water level due to open pit dewatering, monitor quality of groundwater between open pit and Farley Lake.
GBHF-16-02B	6307621	412635	-	✓**	✓**	✓**	Adjacent (southeast) to open pit, adjacent to Farley Lake	Monitor potential changes in water level due to open pit dewatering, monitor quality of groundwater between open pit and Farley Lake.
MWF-01A	6308438	413213	-	✓	✓	-	Northeast of open pit and diversion channel	Monitor for potential changes in water level due to open pit dewatering
MWF-01B	6308437	413214	-	✓***	-	-	Northeast of open pit and diversion channel	Monitor for potential changes in water level due to open pit dewatering
MWF-02A	6308537	412096	-	✓	✓	✓	North of open pit, between historical overburden and rock storage areas	Monitor for potential changes in water level due to open pit dewatering and for general water quality trends
MWF-02B	6308534	412094	-	✓	✓	✓	North of open pit, between historical overburden and rock storage areas	Monitor for potential changes in water level due to open pit dewatering and for general water quality trends
MWF-03A	6306322	412451	-	✓	-	✓	Adjacent to Pump Lake	Monitor water quality east of MRSA, outside predicted flow path of seepage from MRSA
MWF-03B	6306330	412452	-	✓	-	✓	Adjacent to Pump Lake	Monitor water quality east of MRSA, outside predicted flow path of seepage from MRSA
MWF-04A	6306123	411300	-	✓	-	✓	Adjacent to Susan Lake	Monitor water quality within predicted flow path of seepage from MRSA.
MWF-04B	6306118	411305	-	✓***	-	✓***	Adjacent to Susan Lake	Monitor water quality within predicted flow path of seepage from MRSA.
MWF-05A	6303751	411643	-	✓	-	-	Along access road north of Simpson Lake	Understand background water level variation. Located about 2.5 kms south of mine activities that may affect groundwater.
MWF-05B	6303750	411641	-	✓	-	-	Along access road north of Simpson Lake	Understand background water level variation. Located about 2.5 kms south of mine activities that may affect groundwater.
MWF-06	6300569	410977	-	-	-	-	Along access road north of Hughes River	Located about 6 kms south of mine activities that may affect groundwater.

	NAD1983 UTM Zone 14N			Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)		
Location ID	**Northings**	**Eastings**	**Total Daily Pumped Volume**	**Manual**	**Data Logger**		**Location**	**Rationale**
MWF-07R	6307691	412264	-	✓*	-	✓*	Within open pit footprint and historical south rock storage area	Monitor until decommissioning is required to support open pit development. Water quality data to support estimates of seepage quality from historical mine rock.
MWF-07S	6307691	412264	-	✓*	-	✓*	Within open pit footprint and historical south rock storage area	Monitor until decommissioning is required to support open pit development. Water quality data to support estimates of seepage quality from historical mine rock.
MWF-08R	6308244	412194	-	✓	-	✓	Between north rock storage area and open pit	Monitor potential changes in water level due to open pit dewatering and quality of water that may be flowing into the open pit from the north. Well has elevated iron in groundwater relative to other areas around open pit.
MWF-08S	6308244	412194	-	✓	-	✓	Between north rock storage area and open pit	Monitor potential changes in water level due to open pit dewatering and quality of water that may be flowing into the open pit from the north. Well has elevated iron in groundwater relative to other areas around open pit.
GPW-01	6307736	412602	-	-	-	-	Within footprint of open pit	Will be removed with open pit development.
GPW-02	6307707	412663	-	-	-	-	Within footprint of open pit	Will be removed with open pit development.
GPW-03	6307881	411999	-	-	-	-	Between open pit and Gordon Lake	Bedrock test well approximately 50 m deep with 152 mm diameter. May be converted to interceptor well.
GPW-04	6307946	411972	-	-	-	-	Between open pit and Gordon Lake	Bedrock test well approximately 50 m deep with 152 mm diameter. May be converted to interceptor well.
TW1-21	6307874	412805	-	-	-	-	Adjacent (east) to open pit	Bedrock test well approximately 50 m deep with 203 mm diameter. May be converted to interceptor well.
TW2-21	6307811	412820	-	-	-	-	Adjacent (east) to open pit	Bedrock test well approximately 50 m deep with 203 mm diameter. May be converted to interceptor well.
Summary of Monitoring Wells			0	34	15	27		
Proposed Monitoring Wells								
MWF-09A	6307275	411819	-	✓	✓	✓	Downgradient (north) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
MWF-09B			-	✓	✓	✓	Downgradient (north) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
MWF-10A	6307188	411307	-	✓	✓	✓	Downgradient (northeast) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
MWF-10B			-	✓	✓	✓	Downgradient (northeast) of MRSA	Monitor potential changes in water level due to open pit dewatering and monitor water quality within predicted flow path of seepage from MRSA.
Summary of Proposed Monitoring Wells			0	4	4	4		

	NAD1983 UTM Zone 14N			Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)		
Location ID	**Northings**	**Eastings**	**Total Daily Pumped Volume**	**Manual**	**Data Logger**		**Location**	**Rationale**
Vibrating Wire Piezometers (VWPs)								
GGT21-02 (50)	6307761	412012	-	-	✓	-	Adjacent to open pit, near Farley Lake	Monitor groundwater level in upper bedrock. Required per conditions of EIS Decision Statement. If removed with open pit development, replacement will be required.
GGT21-02 (95)	6307761	412012	-	-	✓	-	Adjacent to open pit, near Farley Lake	Monitor groundwater level in upper bedrock. Required per conditions of EIS Decision Statement. If removed with open pit development, replacement will be required.
GGT21-03 (50)	6307641	412632	-	-	✓	-	Adjacent to open pit, near Gordon Lake	Monitor groundwater level in shallow bedrock. Required per conditions of EIS Decision Statement.
GGT21-03 (95)	6307641	412632	-	-	✓	-	Adjacent to open pit, near Gordon Lake	Monitor groundwater level in upper bedrock. Required per conditions of EIS Decision Statement.
Summary of Vibrating Wire Piezometers			0	0	4	0		
Proposed Vibrating Wire Piezometers (VWPs)								
VWP A (50)	6307165	412232	-	-	✓****	-	Adjacent to MRSA and ore stockpile	Monitor groundwater level in shallow bedrock. Required per conditions of EIS Decision Statement.
VWP A (100)			-	-	✓****		Adjacent to MRSA and ore stockpile	Monitor groundwater level in upper bedrock. Required per conditions of EIS Decision Statement.
VWP A (150)			-	-	✓****	-	Adjacent to MRSA and ore stockpile	Monitor groundwater level in upper bedrock. Required per conditions of EIS Decision Statement.
Summary of Proposed Vibrating Wire Piezometers			0	0	3	0		
Drive-Point Piezometers								
DP1-21 GW	6307675	412833	-	✓	✓	-	Within Farley Lake, adjacent to open pit	Monitor response of shallow groundwater level and surface water level within lake to open pit dewatering. Data loggers will likely freeze in winter so may be removed from wells during freezing conditions to reduce potential for damage.
DP1-21 SW	6307675	412833		✓	✓		Within Farley Lake, adjacent to open pit	Monitor groundwater-surface water interactions
DP2-21	6307938	411962	-	-	-	-	Within Gordon Lake, adjacent to open pit	Other drive-points installed in the lake will be monitored
DPF-1GW	6308370	412609	-	✓	-	-	Within lake north of open pit	Monitor for potential changes in groundwater level due to open pit dewatering
DPF-1SW	6308370	412609	-	✓			Within lake north of open pit	Monitor groundwater-surface water interactions
DPF-2GW	6307890	411601	-	✓	✓	-	Within Gordon Lake, adjacent to open pit	Monitor response of shallow groundwater level and surface water level within lake to open pit dewatering. Data loggers will likely freeze in winter so may be removed from wells during freezing conditions to reduce potential for damage.
DPF-2SW	6307890	411601	-	✓	✓	-	Within Gordon Lake, adjacent to open pit	Monitor groundwater-surface water interactions
DPF-3GW	6307363	412589	-	-	-	-	Along western shoreline of Farley Lake, south of open pit	Other drive-points installed in the lake will be monitored
DPF-3SW	6307363	412589	-	-	-	-	Along western shoreline of Farley Lake, south of open pit	Other drive-points installed in the lake will be monitored
DPF-4GW	6308433	412057	-	-	-	-	West of historical North Rock Storage Area	
DPF-4 SW	6308433	412057	-	-	-	-	West of historical North Rock Storage Area	
Summary of Drive-Point Piezometers			0	6	4	0		

	NAD1983 UTM Zone 14N			Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)		
Location ID	**Northings**	**Eastings**	**Total Daily Pumped Volume**	**Manual**	**Data Logger**		**Location**	**Rationale**
Mine Infrastructure								
East Pit			✓*	-	-	-	Historical East Pit	Confirm dewatering volumes with predicted volumes from EIS/EA, permitting, and/or subsequent iterations of the groundwater flow model
Wendy Pit			✓*	-	-	-	Historical Wendy Pit	Confirm dewatering volumes with predicted volumes from EIS/EA, permitting, and/or subsequent iterations of the groundwater flow model
Open Pit			✓	-	-	✓	Open Pit	Confirm dewatering volumes with predicted volumes from EIS/EA, permitting, and/or subsequent iterations of the groundwater flow model
Interceptor Wells			✓	✓	-	✓	Adjacent to open pit	Confirm dewatering volumes with predicted volumes from EIS/EA, permitting, and/or subsequent iterations of the groundwater flow model
Summary Mine Infrastructure			4	1	0	2		
Total Monitoring Points			4	45	30	33		
		✓	2	26	21	18		
		✓*	2	6	0	6		
		✓**	0	9	8	6		
		✓***	0	4	1	3		

Notes:

✓ Monitoring recommended as per rationale.

\- Monitoring not recommended.

* Monitor until decommissioning is required to support mine development.

** Monitor until well goes dry due to open pit dewatering, recommence monitoring in closure as open pit is flooded.

*** Monitor is typically dry or frozen at this location, monitoring will only occur if sufficient water in well.

**** Locations to be confirmed based on consultation with Alamos' geotechnical team for the Lynn Lake Gold Project.

Table B-2 Summary of Groundwater Quantity and Quality Monitoring Locations for the MacLellan Site

Location ID	NAD1983 UTM Zone 14N		Total Daily Pumped Volume	Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)	Location	Rationale
	Northings	Eastings		Manual	Data Logger			
Monitoring Wells								
BH18-01B	6309026	381952	-	✓*	-	-	Within footprint of MRSA	Monitor will be removed with development of MRSA
BH18-01S	6309026	381951	-	✓*	-	-	Within footprint of MRSA	Monitor will be removed with development of MRSA
BH18-02	6309096	382811	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-03	6309358	383304	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-04B	6305900	383513	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-04S	6305900	383512	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-05	6310535	383639	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-06	6310671	383067	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-07	6310374	382425	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of TMF
BH18-08B	6308502	382913	-	✓*	-	-	Within footprint of MRSA	Monitor will be removed with development of MRSA
BH18-08S	6308502	382915	-	✓*	-	-	Within footprint of MRSA	Monitor will be removed with development of MRSA
BH18-09B	6308508	382915	-	✓*	-	-	Within footprint of MRSA	Monitor will be removed with development of MRSA
BH18-09S	6308508	382914	-	✓*	-	-	Within footprint of MRSA	Monitor will be removed with development of MRSA
GBHM-01A	6307726	381419	-	✓*	-	-	Within footprint of open pit	Monitor will be removed with development of the open pit
GBHM-01B	6307726	381426	-	✓*	-	-	Within footprint of open pit	Monitor will be removed with development of the open pit
GBHM-02A	6307354	381313	-	✓*	-	-	Between open pit and East Pond	Monitor will be removed with development of the open pit
GBHM-02B	6307354	381309	-	✓*	-	-	Between open pit and East Pond	Monitor will be removed with development of the open pit
GBHM-03A	6307082	380699	-	✓*	-	-	Adjacent to south rim of open pit	Monitor will be removed with development of the open pit
GBHM-03B	6307076	380703	-	✓*	-	-	Adjacent to south rim of open pit	Monitor will be removed with development of the open pit
GBHM-04	6307063	380409	-	✓*	-	-	Southwestern rim of open pit	Monitor will be removed with development of the open pit
GBHM-05A	6307184	380313	-	✓	✓	✓	Between open pit and Keewatin River	Monitor potential changes in water level and quality due to open pit dewatering
GBHM-05B	6307186	380313	-	✓	✓	✓	Between open pit and Keewatin River	Monitor potential changes in water level and quality due to open pit dewatering
GBHM-06A	6307643	380575	-	✓*	-	-	Within footprint of the open pit	Monitor will be removed with development of the open pit
GBHM-06B	6307643	380573	-	✓*	-	-	Within footprint of the open pit	Monitor will be removed with development of the open pit
GBHM-07	6309928	381518	-	✓***	-	✓***	Northwest of TMF	Monitor potential changes in water level in relation to TMF and monitor quality within predicted flow path of seepage from TMF. Historically well has limited water for sampling.
GBHM-08	6309118	382073	-	✓*	-	-	Within footprint of TMF	Monitor will be removed with development of the TMF
GBHM-09A	6308247	381463	-	✓*	-	-	Within footprint of overburden stockpile	Monitor will be removed with development of the overburden stockpile
GBHM-09B	6308246	381465	-	✓*	-	-	Within footprint of overburden stockpile	Monitor will be removed with development of the overburden stockpile
GBHM-10A	6307862	381351	-	✓*	-	-	Adjacent to north rim of open pit	Monitor will be removed with development of mine infrastructure

	NAD1983 UTM Zone 14N			Water Level				
Location ID	**Northings**	**Eastings**	**Total Daily Pumped Volume**	**Manual**	**Data Logger**	**Sample (General Chemistry, Nutrients, Dissolved Metals)**	**Location**	**Rationale**
GBHM-10B	6307861	381353	-	✓*	-	-	Adjacent to north rim of open pit	Monitor will be removed with development of mine infrastructure
GBHM-11A	6307873	380660	-	✓**	-	✓**	Adjacent to northwest rim of open pit	Monitor potential changes in water level and quality due to open pit dewatering
GBHM-11B	6307874	380661	-	✓**	-	-	Adjacent to northwest rim of open pit	Monitor potential changes in water level due to open pit dewatering
GBHM-12	6309100	380946	-	✓	-	✓	Between TMF and Keewatin River	Monitor potential changes in water level in relation to TMF and monitor quality within predicted flow path of seepage from TMF
GBHM-13A	6308726	383577	-	✓*	-	✓*	Within footprint of MRSA	Monitor will be removed with development of MRSA
GBHM-13B	6308725	383580	-	✓*	-	✓*	Within footprint of MRSA	Monitor will be removed with development of MRSA
GBHM-14	6308614	384112	-	-	-	-	Adjacent to southwest boundary of MRSA,	Completed within overburden that infills bedrock valley. Historically, well has been frozen and ability to sample is limited.
GBHM-15	6308891	384758	-	✓	-	✓	East of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF.
GBHM-18	6311189	386027	-	✓	✓	✓	South of Lobster Lake, upgradient of MRSA	Monitor to understand background fluctuation in water level and quality
GBHM-19	6311097	385143	-	✓	-	-	Northeast of TMF, east of Payne Lake	Monitor potential changes in water level in relation to TMF
GBHM-20	6310662	384056	-	✓	-	✓	Northeast of TMF, southeast of Payne Lake	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF.
GBHM-21	6309818	383724	-	✓*	-	✓*	Within footprint of MRSA	Monitor will be removed with development of MRSA
GBHM-22A	6309582	384968	-	✓	✓	✓	East of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF
GBHM-22B	6309584	384966	-	✓	✓	✓	East of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF
GBHM-23A	6310353	384892	-	-	-	-	Located northeast of the TMF	Monitoring of this well unsuccessful historically due to frozen conditions
GBHM-23B	6310352	384895	-	-	-	-	Located northeast of the TMF	Monitoring of this well unsuccessful historically due to frozen conditions
GBHM-16-01R	6307421	380329	-	✓	-	-	Between open pit and Keewatin River	Monitor potential changes in water level due to open pit dewatering and monitor water quality between open pit and Keewatin River.
GBHM-16-01S	6307419	380328	-	✓	-	-	Between open pit and Keewatin River	Monitor potential changes in water level due to open pit dewatering and monitor water quality between open pit and Keewatin River.
GBHM-16-02R	6307240	380313	-	✓*	-	-	Located within footprint of open pit	Monitor will be removed with development of open pit
GBHM-16-02S	6307236	380314	-	✓*	-	-	Located within footprint of open pit	Monitor will be removed with development of open pit
GBHM-16-03R	6308741	384139	-	✓	-	✓	Adjacent to southwest boundary of MRSA,	Monitor water quality within predicted flow path of seepage from the TMF and MRSA

Location ID	NAD1983 UTM Zone 14N		Total Daily Pumped Volume	Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)	Location	Rationale
	Northings	Eastings		Manual	Data Logger			
GBHM-16-03S	6308741	384139	-	✓	-	✓	Adjacent to southwest boundary of MRSA,	Monitor water quality within predicted flow path of seepage from the TMF and MRSA
GBHM-16-04R	6308989	384769	-	✓	-	-	East of MRSA, north of Minton Lake	Located near to GBHM-15 which is being monitored for quality
GBHM-16-04S	6308989	384769	-	✓	-	-	East of MRSA, north of Minton Lake	Located near to GBHM-15 which is being monitored for quality
GBHM-16-06	6310032	384937	-	✓	-	✓	East of MRSA, adjacent to tributaries of Minton Lake	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF
GBHM-16-08R	6308841	381449	-	-	-	-	Western edge of MRSA	Monitor will be removed with development of MRSA
GBHM-16-08S	6308841	381449	-	-	-	-	Western edge of MRSA	Monitor will be removed with development of MRSA
GBHM-16-09	6308499	381488	-	✓*	-	-	Within footprint of overburden stockpile	Monitor will be removed with development of the overburden stockpile
GBHM-17-01R	6305114	378631	-	-	-	-	Along access road, south of Keewatin River	Near GBHM-17-02 which is included in monitoring program
GBHM-17-02R	6304685	378489	-	✓	✓	-	Along access road, south of Keewatin River	Monitor potential changes in water level due to open pit dewatering
GBHM-17-02S	6304685	378489	-	✓	✓	-	Along access road, south of Keewatin River	Monitor potential changes in water level due to open pit dewatering
GBHM-17-03R	6306790	381276	-	✓	✓	-	South of open pit, adjacent to explosives magazine access road	Monitor potential changes in water level due to open pit dewatering
GBHM-17-04R	6306421	380953	-	✓	-	-	Adjacent to explosives magazine	Monitor potential changes in water level due to open pit dewatering
GBHM-17-05R	6306234	383261	-	✓	✓	-	Southwest of Minton Lake, east of open pit	Monitor potential changes in water level due to open pit dewatering
GBHM-17-05S	6306234	383261	-	✓	✓	-	Southwest of Minton Lake, east of open pit	Monitor potential changes in water level due to open pit dewatering
GBHM-17-06R	6306365	383816	-	-	-	-	Southwest of Minton Lake, east of open pit	Near GBHM-17-05 which is included in the monitoring program
GBHM-17-06S	6306365	383816	-	-	-	-	Southwest of Minton Lake, east of open pit	Near GBHM-17-05 which is included in the monitoring program
MWM-01A	6311753	385129	-	✓	✓	-	Adjacent to Lobster Lake, background monitoring well	Monitor to understand background fluctuation in water level
MWM-01B	6311751	385128	-	-	-	-	Adjacent to Lobster Lake, background monitoring well	Insufficient water to monitor or collect sample historically
MWM-02A	6311074	383570	-	✓	✓	✓	Between TMF and Payne Lake	Monitor for potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF
MWM-02B	6311072	383569	-	✓	✓	✓***	Between TMF and Payne Lake	Monitor for potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF.
MWM-03	6308286	384213	-	✓***	-	✓***	Adjacent to Minton Lake, completed within infilled bedrock valley	Monitor water quality within predicted flow path of seepage from MRSA and TMF.
MWM-04	6308330	380972	-	✓*	-	-	Within footprint of process plant and parking lot	Monitor will be removed with development of mine infrastructure
MWM-05A	6308081	380571	-	✓	✓	-	Adjacent to Keewatin River, north of open pit	Monitor potential changes in water level due to open pit dewatering
MWM-05B	6308084	380569	-	✓	✓	-	Adjacent to Keewatin River, north of open pit	Monitor potential changes in water level due to open pit dewatering

	NAD1983 UTM Zone 14N			Water Level				
Location ID	**Northings**	**Eastings**	**Total Daily Pumped Volume**	**Manual**	**Data Logger**	**Sample (General Chemistry, Nutrients, Dissolved Metals)**	**Location**	**Rationale**
MWM-06A	6307845	380177	-	✓	-	-	Between Dot Lake and Keewatin River	Monitor potential changes in water level due to open pit dewatering. Well has historically been frozen, monitoring may be limited.
MWM-06B	6307848	380175	-	✓	✓	✓	Between Dot Lake and Keewatin River	Monitor potential changes in water level due to open pit dewatering
MWM-07A	6307697	381187	-	✓*	-	-	Within footprint of open pit	Monitor will be removed with development of open pit
MWM-07B	6307698	381189	-	✓*	-	-	Within footprint of open pit	Monitor will be removed with development of open pit
MWM-08	6307685	380812	-	-	-	-	Within footprint of open pit	Monitor will be removed with development of open pit
MWM-09A	6307487	380634	-	✓*	-	-	Within footprint of open pit	Monitor will be removed with development of open pit
MWM-09B	6307487	380632	-	✓*	-	-	Within footprint of open pit	Monitor will be removed with development of open pit
MWM-10A	6306242	380596	-	✓	✓	-	Adjacent to Keewatin River, south of open pit	Monitor potential changes in water level and quality due to open pit dewatering
MWM-10B	6306244	380597	-	✓	✓	-	Adjacent to Keewatin River, south of open pit	Monitor potential changes in water level and quality due to open pit dewatering
MWM-11R	6307583	381188	-	✓*	-	-	Within footprint of open pit, adjacent to historical MRSA	Monitor will be removed with development of open pit
MWM-11S	6307583	381188	-	✓*	-	-	Within footprint of open pit, adjacent to historical MRSA	Monitor will be removed with development of open pit
MWM-12A	6310900	382742	-	✓***	-	✓***	Between TMF and Payne Lake	Monitor water quality within predicted flow path of seepage from the TMF and MRSA. Well is historically frozen so monitoring may be limited.
MWM-12B	6310900	382742	-	✓***	-	✓***	Between TMF and Payne Lake	Monitor water quality within predicted flow path of seepage from the TMF and MRSA. Well is historically frozen so monitoring may be limited.
MWM-13A	6310465	382122	-	✓	✓	✓	Northwest of TMF	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF.
MWM-13B	6310465	382122	-	✓	✓	✓	Northwest of TMF	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF.
Summary Monitoring Wells			0	79	20	24		
Proposed Monitoring Wells								
MWM-14A	6310130	384344	-	✓	-	✓	Adjacent to northeast boundary of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within bedrock
MWM-14B			-	✓	-	✓	Adjacent to northeast boundary of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within overburden
MWM-15A	6308154	383312	-	✓	-	✓	Adjacent to southern boundary of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within bedrock
MWM-15B			-	✓	-	✓	Adjacent to southern boundary of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within overburden

Location ID	NAD1983 UTM Zone 14N		Total Daily Pumped Volume	Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)	Location	Rationale
	Northings	Eastings		Manual	Data Logger			
MWM-16A	6308059	382470	-	✓	-	✓	Adjacent to southern boundary of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within bedrock
MWM-16B			-	✓	-	✓	Adjacent to southern boundary of MRSA	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within overburden
MWM-17A	6307376	382470	-	✓	✓	✓	East of open pit and tributary of Keewatin River	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within bedrock
MWM-17B			-	✓	✓	✓	East of open pit and tributary of Keewatin River	Monitor potential changes in water level in relation to TMF and monitor water quality within predicted flow path of seepage from MRSA and TMF within overburden
MWM-18A	6306399	382153	-	✓	✓	-	East of open pit and tributary of Keewatin River	Monitor potential changes in water level due to open pit dewatering within bedrock
MWM-18B			-	✓	✓	-	East of open pit and tributary of Keewatin River	Monitor potential changes in water level due to open pit dewatering within overburden
Summary Proposed Monitoring Wells			0	10	4	8		
Proposed Vibrating Wire Piezometers****								
VWP-1 (50)	6306733	380915	-	-	✓****	-	Located south of open pit	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-1 (100)	6306733	380915	-	-	✓****	-	Located south of open pit	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-1 (150)	6308281	381105	-	-	✓****	-	Located south of open pit	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-2 (50)	6308090	380661	-	-	✓****	-	Located between overburden stockpile and Keewatin River	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-2 (100)	6308090	380661	-	-	✓****	-	Located between overburden stockpile and Keewatin River	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-2 (150)	6308090	380661	-	-	✓****	-	Located between overburden stockpile and Keewatin River	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-3 (50)	6308098	383034	-	-	✓****	-	Located adjacent to MRSA	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-3 (100)	6308098	383034	-	-	✓****	-	Located adjacent to MRSA	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
VWP-3 (150)	6308098	383034	-	-	✓****	-	Located adjacent to MRSA	Monitor water level in intermediate and deep bedrock. Required per conditions of EIS Decision Statement.
Summary Proposed Vibrating Wire Piezometers			0	0	9	0		

	NAD1983 UTM Zone 14N			Water Level				
Location ID	**Northings**	**Eastings**	**Total Daily Pumped Volume**	**Manual**	**Data Logger**	**Sample (General Chemistry, Nutrients, Dissolved Metals)**	**Location**	**Rationale**
Drive-Point Piezometers								
DPM-1 GW	6309936	385841	-	✓	-	-	Unnamed lake north of Minton Lake	Monitor groundwater-surface water interactions
DPM-1 SW	6309936	385841		✓	-	-	Unnamed lake north of Minton Lake	Monitor groundwater-surface water interactions
DPM-2 GW	6308225	380529	-	✓	✓	-	Keewatin River	Monitor potential changes in water level due to open pit dewatering. Data loggers will likely freeze in winter so may be removed from wells during freezing conditions to reduce potential for damage.
DPM-2 SW	6308222	380531	-	✓	✓	-	Keewatin River	Monitor groundwater-surface water interactions
DPM-3 GW	6307377	380283	-	✓	✓	-	Keewatin River	Monitor potential changes in water level due to open pit dewatering. Data loggers will likely freeze in winter so may be removed from wells during freezing conditions to reduce potential for damage.
DPM-3 SW	6307377	380283	-	✓	✓	-	Keewatin River	Monitor groundwater-surface water interactions
DPM-4 GW	6306242	380590	-	-	-	-	Keewatin River	Drive-point lost, likely destroyed by ice
DPM-4 SW	6306239	380585	-	-	-	-	Keewatin River	Drive-point lost, likely destroyed by ice
DPM-5	6307397	381363	-	-	-	-	East Pond	East Pond will be part of hydrology monitoring program and data collected as part of that program is sufficient.
DPM-6 GW	6308389	384629	-	✓	✓	-	Minton Lake	Monitor groundwater-surface water interactions
DPM-6 SW	6308389	384629	-	✓	✓	-	Minton Lake	Monitor groundwater-surface water interactions. Data loggers will likely freeze in winter so may be removed from wells during freezing conditions to reduce potential for damage.
DPM-7	6307119	381045	-	-	-	-	South of open pit	Shallow monitor adjacent to open pit, will not be useful for long term monitoring due to predicted drawdown of open pit
DPM-8 GW	6311101	383555	-	✓	✓	-	Payne Lake	Monitor groundwater-surface water interactions. Data loggers will likely freeze in winter so may be removed from wells during freezing conditions to reduce potential for damage.
DPM-8 SW	6311101	383555	-	✓	✓	-	Payne Lake	Monitor groundwater-surface water interactions
Summary Drive-Point Piezometers			0	10	8	0		
Mine Infrastructure								
Open Pit	-	-	✓	-	-	✓	Open pit	Confirm dewatering volumes with predicted volumes from EIS/EA, permitting, and/or subsequent iterations of the groundwater flow model
TMF/MRSA Sumps	-	-	✓	-	-	-	Within MRSA contact water collection ditches	To understand potential portion of collected groundwater seepage from the TMF and/or MRSA.
Summary Mine Infrastructure			2	0	0	1		

	NAD1983 UTM Zone 14N		Total Daily Pumped Volume	Water Level		Sample (General Chemistry, Nutrients, Dissolved Metals)		
Location ID	**Northings**	**Eastings**		**Manual**	**Data Logger**		**Location**	**Rationale**
Total Monitoring Points			2	99	41	33		
		✓	2	53	41	24		
		✓*	0	38	0	3		
		✓**	0	4	0	1		
		✓***	0	4	0	5		

Notes:
✓ Monitoring recommended as per rationale.
\- Monitoring not recommended.
* Monitor until decommissioning is required to support mine development.
** Monitor until well goes dry due to open pit dewatering, recommence monitoring in closure as open pit is flooded.
*** Monitor is typically dry or frozen at this location, monitoring will only occur if sufficient water in well.
**** Locations to be confirmed based on consultation with Alamos' geotechnical team for the Lynn Lake Gold Project.

Table B-3 Monitoring Well Completion Table for the Gordon Site

Well ID	Install Date	Status	Coordinates			Elevation			Stick-Up	Borehole Depth	Borehole Orientation		Well Diameter	Screened Interval				Screened Material	Screened Unit
			Northing	Easting	Source	Ground Surface	Top of Casing	Source			Dip	Azmuth		Top of Well Screen		Bottom of Well Screen			
						m AMSL	m AMSL		m AGS	m BGS	(Degrees)	(Degrees)	mm	m BGS	m AMSL	m BGS	m AMSL		
Monitoring Wells																			
MWF-01A	06-Jun-15	Monitoring Well	6308438	413213	(Stantec Survey, 2015)	327.70	328.65	(Stantec Survey, 2015)	0.95	6.71	90.00	n/a	51	3.60	324.10	6.70	321.00	Bedrock	Bedrock
MWF-01B	06-Jun-15	Monitoring Well	6308437	413214	(Stantec Survey, 2015)	327.78	328.64	(Stantec Survey, 2015)	0.86	2.30	90.00	n/a	51	1.40	326.38	2.30	325.48	Silty Sand	Sand Diamicton
MWF-02A	08-Jun-15	Monitoring Well	6308537	412096	(Stantec Survey, 2015)	322.05	323.02	(Stantec Survey, 2015)	0.97	14.33	90.00	n/a	51	11.30	310.75	14.30	307.75	Bedrock	Bedrock
MWF-02B	08-Jun-15	Monitoring Well	6308534	412094	(Stantec Survey, 2015)	322.18	323.11	(Stantec Survey, 2015)	0.93	9.10	90.00	n/a	51	5.20	316.98	8.20	313.98	Silty Sand, Boulders, Gravel	Glaciofluvial / Glaciolacustrine Nearshore
MWF-03A	09-Jun-15	Monitoring Well	6306322	412451	(Stantec Survey, 2015)	325.46	326.72	(Stantec Survey, 2015)	1.26	9.14	90.00	n/a	51	6.10	319.36	9.10	316.36	Bedrock	Bedrock
MWF-03B	09-Jun-15	Monitoring Well	6306330	412452	(Stantec Survey, 2015)	325.63	326.73	(Stantec Survey, 2015)	1.10	3.40	90.00	n/a	51	1.80	323.83	3.40	322.23	Silty Sand	Glaciolacustrine Nearshore
MWF-04A	10-Jun-15	Monitoring Well	6306123	411300	(Stantec Survey, 2015)	315.04	316.12	(Stantec Survey, 2015)	1.08	11.89	90.00	n/a	51	8.80	306.24	11.90	303.14	Bedrock	Bedrock
MWF-04B	10-Jun-15	Monitoring Well	6306118	411305	(Stantec Survey, 2015)	314.92	315.83	(Stantec Survey, 2015)	0.92	6.70	90.00	n/a	51	3.70	311.22	6.70	308.22	Sandy Clayey Silt, Silt and Sand, Boulders	Glaciolacustrine Offshore / Sand Diamicton
MWF-05A	05-Jun-15	Monitoring Well	6303751	411643	(Stantec Survey, 2015)	301.90	302.80	(Stantec Survey, 2015)	0.90	6.86	90.00	n/a	51	5.30	296.60	6.90	295.00	Bedrock	Bedrock
MWF-05B	05-Jun-15	Monitoring Well	6303750	411641	(Stantec Survey, 2015)	301.94	303.00	(Stantec Survey, 2015)	1.06	3.70	90.00	n/a	51	3.00	298.94	3.70	298.24	Sand, Cobbles and Boulders, Sandy Silt	Sand Diamicton
MWF-06	04-Jun-15	Monitoring Well	6300569	410977	(Stantec Survey, 2015)	300.63	301.58	(Stantec Survey, 2015)	0.95	5.18	90.00	n/a	51	2.00	298.63	5.20	295.43	Bedrock	Bedrock
MWF-07R	24-Apr-17	Monitoring Well	6307691	412264	(Golder, 2017c)	317.00	-	(Golder, 2017c)	-	31.27	90.00	n/a	51	29.14	287.86	30.66	286.34	Bedrock	Bedrock
MWF-07S	24-Apr-17	Monitoring Well	6307691	412264	(Golder, 2017c)	317.00	-	(Golder, 2017c)	-	11.58	90.00	n/a	51	10.06	306.94	11.58	305.42	Sand	Sand Diamicton
MWF-08R	09-May-17	Monitoring Well	6308244	412194	(Golder, 2017c)	314.08	-	(Golder, 2017c)	-	15.41	90.00	n/a	51	13.72	300.36	15.24	298.84	Bedrock	Bedrock
MWF-08S	09-May-17	Monitoring Well	6308244	412194	(Golder, 2017c)	314.08	-	(Golder, 2017c)	-	10.36	90.00	n/a	51	8.84	305.24	10.36	303.72	Silty Sand	Sand Diamicton
GBHF-01A	4-Jun-15	Monitoring Well	6307996	411979	(Stantec Survey, 2015)	316.04	317.02	(Stantec Survey, 2015)	0.98	8.84	90.00	n/a	51	5.79	310.25	7.32	308.73	Bedrock	Bedrock
GBHF-01B	4-Jun-15	Monitoring Well	6308001	411982	(Stantec Survey, 2015)	316.07	317.03	(Stantec Survey, 2015)	0.95	5.49	90.00	n/a	51	3.96	312.11	5.49	310.59	Silty Sand	Glaciolacustrine Nearshore
GBHF-02A	9-Jun-15	Monitoring Well	6307605	412483	(Stantec Survey, 2015)	321.37	322.44	(Stantec Survey, 2015)	1.07	6.25	90.00	n/a	51	4.57	316.80	6.25	315.12	Bedrock	Bedrock
GBHF-02B	9-Jun-15	Monitoring Well	6307602	412483	(Stantec Survey, 2015)	321.58	322.46	(Stantec Survey, 2015)	0.88	3.15	90.00	n/a	51	1.62	319.95	3.15	318.43	Sand	Glaciolacustrine Nearshore
GBHF-03	13-Jun-15	Monitoring Well	6307753	412833	(Stantec Survey, 2015)	314.80	315.70	(Stantec Survey, 2015)	0.90	4.88	90.00	n/a	51	2.90	311.90	4.88	309.92	Bedrock	Bedrock
GBHF-04A	6-Jun-15	Monitoring Well	6308100	412412	(Stantec Survey, 2015)	317.52	318.47	(Stantec Survey, 2015)	0.95	7.01	90.00	n/a	51	5.49	312.03	7.01	310.51	Bedrock	Bedrock

Well ID	Install Date	Status	Coordinates			Elevation			Stick-Up	Borehole Depth	Borehole Orientation		Well Diameter	Screened Interval				Screened Material	Screened Unit
			Northing	Easting	Source	Ground Surface	Top of Casing	Source			Dip	Azmuth		Top of Well Screen		Bottom of Well Screen			
						m AMSL	m AMSL		m AGS	m BGS	(Degrees)	(Degrees)	mm	m BGS	m AMSL	m BGS	m AMSL		
GBHF-04B	7-Jun-15	Monitoring Well	6308102	412416	(Stantec Survey, 2015)	317.77	318.72	(Stantec Survey, 2015)	0.95	4.88	90.00	n/a	51	3.35	314.41	4.88	312.89	Gravel	Glaciolacustrine Nearshore
GBHF-05A	5-Jun-15	Monitoring Well	6307806	412008	(Stantec Survey, 2015)	316.92	317.81	(Stantec Survey, 2015)	0.89	14.02	90.00	n/a	51	12.50	304.42	14.02	302.90	Bedrock	Bedrock
GBHF-05B	6-Jun-15	Monitoring Well	6307802	412008	(Stantec Survey, 2015)	316.95	318.05	(Stantec Survey, 2015)	1.10	10.67	90.00	n/a	51	9.14	307.81	10.67	306.28	Silty Sand	Glaciolacustrine Offshore
GBHF-07A	10-Jun-15	Monitoring Well	6307644	411608	(Stantec Survey, 2015)	318.81	319.72	(Stantec Survey, 2015)	0.91	6.40	90.00	n/a	51	4.88	313.93	6.40	312.41	Bedrock	Bedrock
GBHF-07B	10-Jun-15	Monitoring Well	6307645	411612	(Stantec Survey, 2015)	318.88	319.80	(Stantec Survey, 2015)	0.93	3.25	90.00	n/a	51	1.72	317.16	3.25	315.63	Clayey Silty Sand to Silty Sand	Sand Diamicton
GBHF-09A	14-Jun-15	Monitoring Well	6307200	412300	(Stantec Survey, 2015)	317.11	318.11	(Stantec Survey, 2015)	1.01	12.65	90.00	n/a	51	11.13	305.98	12.65	304.46	Bedrock	Bedrock
GBHF-09B	14-Jun-15	Monitoring Well	6307202	412302	(Stantec Survey, 2015)	317.13	318.28 (Before Aug. 2017)	(Stantec Survey, 2015)	1.15 (Before Aug. 2017)	9.09	90.00	n/a	51	7.57	309.56	9.09	308.04	Silty Sand	Sand Diamicton
							317.63 (After Aug. 2017) **	(Stantec Measurement, 2017)	0.71 ** (After Aug. 2017)		90.00	n/a							
GBHF-10A	17-Jun-15	Monitoring Well	6307203	411912	(Stantec Survey, 2015)	329.13	330.08	(Stantec Survey, 2015)	0.94	6.02	90.00	n/a	51	4.2	324.93	6.02	323.11	Bedrock	Bedrock
GBHF-10B	17-Jun-15	Monitoring Well	6307200	411911	(Stantec Survey, 2015)	329.12	330.02	(Stantec Survey, 2015)	0.90	3.04	90.00	n/a	51	1.52	327.60	3.05	326.07	Sand to Silty Sand	Sand Diamicton
GBHF-11A	12-Jun-15	Monitoring Well	6306854	412270	(Stantec Survey, 2015)	321.18	322.38	(Stantec Survey, 2015)	1.20	9.02	90.00	n/a	51	7.49	313.69	9.02	312.16	Bedrock	Bedrock
GBHF-11B	12-Jun-15	Monitoring Well	6306853	412274	(Stantec Survey, 2015)	321.27	322.38	(Stantec Survey, 2015)	1.11	7.10	90.00	n/a	51	4.57	316.70	6.10	315.17	Silty Sand	Glaciolacustrine Offshore
GBHF-12A	11-Jun-15	Monitoring Well	6306977	411458	(Stantec Survey, 2015)	324.54	325.81 (Before Aug. 2017)	(Stantec Survey, 2015)	1.27 (Before Aug. 2017)	7.77	90.00	n/a	51	6.25	318.29	7.77	316.77	Bedrock	Bedrock
							325.17 ** (After Aug. 2017)	(Stantec Measurement, 2017)	0.64 ** (After Aug. 2017)		90.00	n/a							
GBHF-12B	11-Jun-15	Monitoring Well	6306976	411461	(Stantec Survey, 2015)	324.50	325.73 (Before Aug. 2017)	(Stantec Survey, 2015)	1.23 (Before Aug. 2017)	4.60	90.00	n/a	51	2.13	322.37	3.66	320.84	Silty Sand	Sand Diamicton
							325.13 ** (After Aug. 2017)	(Stantec Measurement, 2017)	0.96 ** (After Aug. 2017)		90.00	n/a							
GBHF-13	16-Jun-15	Monitoring Well	6306357	411793	(Stantec Survey, 2015)	345.33	346.28	(Stantec Survey, 2015)	0.95	4.11	90.00	n/a	51	2.61	342.72	4.11	341.22	Bedrock	Bedrock
GBHF-16-01A	15-Jul-16	Monitoring Well	6307949	411967	(Golder, 2017b)	314.33	315.58	(Golder, 2017b)	1.25	10.67	90.00	n/a	51	7.62	306.71	9.14	305.19	Bedrock	Bedrock

Well ID	Install Date	Status	Coordinates			Elevation			Stick-Up	Borehole Depth	Borehole Orientation		Well Diameter	Screened Interval				Screened Material	Screened Unit
			Northing	Easting	Source	Ground Surface	Top of Casing	Source			Dip	Azmuth		Top of Well Screen		Bottom of Well Screen			
						m AMSL	m AMSL		m AGS	m BGS	(Degrees)	(Degrees)	mm	m BGS	m AMSL	m BGS	m AMSL		
GBHF-16-01B	15-Jul-16	Monitoring Well	6307951	411967	(Golder, 2017b)	314.73	315.83	(Golder, 2017b)	1.10	5.49	90.00	n/a	51	3.96	310.77	5.49	309.24	Peat, Silty Clay, Silty Sand and Gravel	Glaciolacustrine Offshore / Diamicton
GBHF-16-02A	19-Jul-16	Monitoring Well	6307618	412635	(Golder, 2017b)	313.19	314.29	(Golder, 2017b)	1.10	15.20	90.00	n/a	51	9.14	304.05	10.67	302.52	Bedrock	Bedrock
GBHF-16-02B	19-Jul-16	Monitoring Well	6307621	412635	(Golder, 2017b)	313.79	315.09	(Golder, 2017b)	1.30	4.88	90.00	n/a	51	3.35	310.44	4.88	308.91	Sand	Glaciolacustrine Nearshore
GBHG-17-01	08-May-17	Monitoring Well	6307933	412788	(Golder, 2017b)	296.56	-	(Golder, 2017b)	-	38.08	90.00	n/a	51	33.40	263.16	34.92	261.64	Bedrock	Bedrock
GBHG-17-02	24-Apr-17	Monitoring Well	6307750	412736	(Golder, 2017b)	309.73	-	(Golder, 2017b)	-	26.87	90.00	n/a	51	24.31	285.42	25.83	283.90	Bedrock	Bedrock
GPW-01	10-Aug-16	Test Well	6307736	412602	(Golder, 2017a)	316.83	317.58	(Golder, 2017a)	0.75	82.30	90.00	n/a	152	6.90	309.93	82.30	234.53	Bedrock	Bedrock
GPW-02	18-Aug-16	Test Well	6307707	412663	(Golder, 2017a)	316.33	316.93	(Golder, 2017a)	0.60	83.20	90.00	n/a	152	8.20	308.13	83.20	233.13	Bedrock	Bedrock
GPW-04	17-Aug-16	Test Well	6307946	411972	(Golder, 2017a)	315.66	316.26	(Golder, 2017a)	0.60	80.80	90.00	n/a	152	5.80	309.86	80.80	234.86	Bedrock	Bedrock
GGT21-01		VWP	63078241	4121666	(Golder 2022)	316.00	-	(Golder 2022)	-	152.51	-63.50	284.90	96	50.00	266.00	50.00	266.00	Bedrock	Bedrock
GGT21-01		VWP	63078241	4121666	(Golder 2022)	316.00	-	(Golder 2022)	-	152.51	-63.50	284.90	96	95.00	221.00	95.00	221.00	Bedrock	Bedrock
GGT21-02		VWP	63078669	4123133	(Golder 2022)	318.40	-	(Golder 2022)	-	170.34	-64.20	350.10	96	50.00	268.40	50.00	268.40	Bedrock	Bedrock
GGT21-02		VWP	63078669	4123133	(Golder 2022)	318.40	-	(Golder 2022)	-	170.34	-64.20	350.10	96	95.00	223.40	95.00	223.40	Bedrock	Bedrock
TW1-21	18-Aug-21	Test Well	6307874	412805	(Stantec 2021)	316.11	316.72	(Stantec 2021)	0.61	58.22	90.00	n/a	203	7.60	308.51	58.20	257.91	Bedrock	Bedrock
TW2-21	20-Aug-21	Test Well	6307811	412820	(Stantec 2021)	315.71	316.31	(Stantec 2021)	0.60	55.17	90.00	n/a	203	6.40	309.31	55.20	260.51	Bedrock	Bedrock
GPW-04	17-Aug-16	Test Well	6307946	411972	(Golder, 2017a)	315.66	316.26	(Golder, 2017a)	0.60	80.80	90.00	n/a	152	5.80	309.86	80.80	234.86	Bedrock	Bedrock
Boreholes																			
GBHF-06	14-Jun-15	Borehole	6307846	412845	(Golder, 2015)	-	-	-	-	8.38	90.00	n/a	-	-	-	-	-	-	-
GBHF-08	10-Jun-15	Borehole	6307486	412104	(Golder, 2015)	-	-	-	-	4.70	90.00	n/a	-	-	-	-	-	-	-
GBHF-14	16-Jun-15	Borehole	6306329	412210	(Golder, 2015)	-	-	-	-	6.25	90.00	n/a	-	-	-	-	-	-	-
GBHF-15	23-Jun-15	Borehole	6293688	410106	(Golder, 2015)	-	-	-	-	4.88	90.00	n/a	-	-	-	-	-	-	-
GBHF-16	23-Jun-15	Borehole	6294528	410017	(Golder, 2015)	-	-	-	-	4.98	90.00	n/a	-	-	-	-	-	-	-
GBHF-17	23-Jun-15	Borehole	6295233	409929	(Golder, 2015)	-	-	-	-	6.10	90.00	n/a	-	-	-	-	-	-	-
GBHF-18	23-Jun-15	Borehole	6296125	409772	(Golder, 2015)	-	-	-	-	1.07	90.00	n/a	-	-	-	-	-	-	-
GBHF-19	23-Jun-15	Borehole	6296888	409493	(Golder, 2015)	-	-	-	-	2.44	90.00	n/a	-	-	-	-	-	-	-
GBHF-20	21-Jun-15	Borehole	6297891	409140	(Golder, 2015)	-	-	-	-	5.33	90.00	n/a	-	-		-	-	-	-
GBHF-21	21-Jun-15	Borehole	6298823	409358	(Golder, 2015)	-	-	-	-	8.99	90.00	n/a	-	-	-	-	-	-	-
GBHF-22	21-Jun-15	Borehole	6299401	410040	(Golder, 2015)	-	-	-	-	1.83	90.00	n/a	-	-	-	-	-	-	-
GBHF-23	20-Jun-15	Borehole	6299952	410680	(Golder, 2015)	-	-	-	-	2.29	90.00	n/a	-	-	-	-	-	-	-
GBHF-24	20-Jun-15	Borehole	6301121	411097	(Golder, 2015)	-	-	-	-	2.44	90.00	n/a	-	-	-	-	-	-	-
GBHF-25	20-Jun-15	Borehole	6302063	411278	(Golder, 2015)	-	-	-	-	5.18	90.00	n/a	-	-	-	-	-	-	-
GBHF-26	18-Jun-15	Borehole	6303553	411610	(Golder, 2015)	-	-	-	-	8.76	90.00	n/a	-	-	-	-	-	-	-
GBHF-27	19-Jun-15	Borehole	6304754	411888	(Golder, 2015)	-	-	-	-	5.64	90.00	n/a	-	-	-	-	-	-	-
GBHF-28	19-Jun-15	Borehole	6305857	412146	(Golder, 2015)	-	-	-	-	3.05	90.00	n/a	-	-	-	-	-	-	-
GBHF-29	18-Jun-15	Borehole	6306920	412308	(Golder, 2015)	-	-	-	-	6.25	90.00	n/a	-	-	-	-	-	-	-
GTF-15-05*	07-Jun-15		6307785	412815	(Golder, 2015)	318.50	-	(Golder, 2015)	-	129.70	90.00	n/a	-	-	-	-	-	-	-
GBHF-16-03	21-Jul-16	Borehole	6307881	411999	(Golder, 2017b)	295.08	-	(Golder, 2017b)	-	7.42	90.00	n/a	-	-	-	-	-	-	-

Well ID	Install Date	Status	Coordinates			Elevation			Stick-Up	Borehole Depth	Borehole Orientation		Well Diameter	Screened Interval				Screened Material	Screened Unit
			Northing	Easting	Source	Ground Surface	Top of Casing	Source			Dip	Azmuth		Top of Well Screen		Bottom of Well Screen			
						m AMSL	m AMSL		m AGS	m BGS	(Degrees)	(Degrees)	mm	m BGS	m AMSL	m BGS	m AMSL		
GBHF-16-04	22-Jul-16	Borehole	6300022	410748	(Golder, 2017b)	295.69	-	(Golder, 2017b)	-	5.99	90.00	n/a	-	-	-	-	-	-	-
GBHF-16-05	23-Jul-16	Borehole	6299972	410703	(Golder, 2017b)	295.57	-	(Golder, 2017b)	-	6.07	90.00	n/a	-	-	-	-	-	-	-
GBHF-16-06	23-Jul-16	Borehole	6299954	410675	(Golder, 2017b)	297.09	-	(Golder, 2017b)	-	2.92	90.00	n/a	-	-	-	-	-	-	-
Drive-Point Piezometers																			
DP1-21	23-Aug-21	Piezometer	6307675	412833	Stantec 2021	-	-	-	0.58	-	90.00	n/a	25	0.41	-	0.71	-	-	-
DP2-21	26-Aug-22	Piezometer	6307938	411962	Stantec 2021	-	-	-	0.64	-	90.00	n/a	25	0.36	-	0.66	-	-	-
DPF-1	12-Jun-15	Piezometer	6308370	412609	(Stantec Survey, 2015)	316.85	317.66	(Stantec Survey, 2015)	0.81	1.72	90.00	n/a	25	1.29	315.556	1.72	315.13	-	-
DPF-2	12-Jun-15	Piezometer	6307890	411601	(Stantec Survey, 2015)	315.22	316.70	(Stantec Survey, 2015)	1.48	1.05	90.00	n/a	25	0.62	314.597	1.05	314.17	-	-
DPF-3	12-Jun-15	Piezometer	6307363	412589	(Stantec Survey, 2015)	313.10	314.52	(Stantec Survey, 2015)	1.42	1.11	90.00	n/a	25	0.68	312.42	1.11	311.99	-	-
DPF-4	12-Jun-15	Piezometer	6308433	412057	(Stantec Survey, 2015)	323.86	324.88	(Stantec Survey, 2015)	1.02	1.51	90.00	n/a	25	1.08	322.78	1.51	322.35	-	-
DPF-4 SW	01-Aug-15	Staff Gauge	n/a	n/a	n/a	n/a	n/a	n/a	0.48	-	90.00	n/a	-	-	-	-	-	-	-

NOTES:	
na	Not available
m AGS	Metres above ground surface
m BGS	Metres below ground surface
m AMSL	Metres above mean sea level
SW	Surface water measured from staff gauge
▨	Monitoring location destroyed or missing
	Northing and Easting Coordinates presented as UTM NAD 83 Zone 14
*	Borehole inclination of 60° and azmuth of 160°
**	Stick-up cut to accommodate groundwater sampling

Table B-4 Monitoring Well Completion Table for the MacLellan Site

Well ID	Install Date	Coordinates			Elevation			Stick-Up	Borehole Depth	Well Diameter	Screened Interval				Screened Material	Screened Unit
		Northing	Easting	Source	Ground Surface	Top of Casing	Source				Top of Well Screen		Bottom of Well Screen			
					m AMSL	m AMSL		m AGS	m BGS	mm	m BGS	m AMSL	m BGS	m AMSL		
Monitoring Wells																
MWM-01A	23-Jun-15	6311753	385129	(Stantec Survey, 2015)	343.40	344.08	(Stantec Survey, 2015)	0.68	15.2	51	11.90	331.50	13.40	330.00	Bedrock	Bedrock
MWM-01B	23-Jun-15	6311751	385128	(Stantec Survey, 2015)	343.43	344.14	(Stantec Survey, 2015)	0.71	5.5	51	2.40	341.03	5.50	337.93	Silt and Sand	Glaciolacustrine Nearshore
MWM-02A	19-Jun-15	6311074	383570	(Stantec Survey, 2015)	349.70	350.64	(Stantec Survey, 2015)	0.94	6.7	51	4.60	345.10	6.70	343.00	Bedrock	Bedrock
MWM-02B	19-Jun-15	6311072	383569	(Stantec Survey, 2015)	349.87	350.71	(Stantec Survey, 2015)	0.84	2.1	51	1.20	348.67	2.10	347.77	Sand and Silty Sand	Glaciolacustrine Nearshore
MWM-03	24-Jun-15	6308286	384213	(Stantec Survey, 2015)	330.57	331.73	(Stantec Survey, 2015)	1.16	16.8	51	7.00	323.57	8.50	322.07	Sand and Gravel and Boulders	Glaciolacustrine Nearshore / Glaciofluvial
						331.323 (after 23-Aug-22)		0.75								
MWM-04	20-Jun-15	6308330	380972	(Stantec Survey, 2015)	352.79	353.71	(Stantec Survey, 2015)	0.92	5.6	51	2.50	350.29	5.60	347.19	Bedrock	Bedrock
MWM-05A	17-Jun-15	6308081	380571	(Stantec Survey, 2015)	333.36	334.34	(Stantec Survey, 2015)	0.97	20.4	51	17.40	315.96	20.40	312.96	Bedrock	Bedrock
MWM-05B	17-Jun-15	6308084	380569	(Stantec Survey, 2015)	333.31	334.17	(Stantec Survey, 2015)	0.86	14.5	51	11.00	322.31	14.00	319.31	Silty Sand to Sand	Sand Diamicton
MWM-06A	13-Jun-15	6307845	380177	(Stantec Survey, 2015)	332.21	333.18	(Stantec Survey, 2015)	0.98	7.6	51	4.60	327.61	7.60	324.61	Bedrock	Bedrock
MWM-06B	13-Jun-15	6307848	380175	(Stantec Survey, 2015)	332.20	333.30	(Stantec Survey, 2015)	1.10	3.5	51	1.80	330.40	3.50	328.70	Sand	Glaciolacustrine Nearshore
MWM-07A	20-Jun-15	6307697	381187	(Stantec Survey, 2015)	340.99	341.79	(Stantec Survey, 2015)	0.79	6.7	51	3.60	337.39	6.70	334.29	Bedrock	Bedrock
MWM-07B	20-Jun-15	6307698	381189	(Stantec Survey, 2015)	340.93	342.24	(Stantec Survey, 2015)	1.31	2.0	51	1.00	339.93	2.00	338.93	Sand	Glaciolacustrine Nearshore
MWM-08	25-Jul-15	6307685	380812	(Stantec Survey, 2015)	352.63	353.53	(Stantec Survey, 2015)	0.91	9.1	51	6.10	346.53	9.10	343.53	Bedrock	Bedrock
MWM-09A	14-Jun-15	6307487	380634	(Stantec Survey, 2015)	342.40	343.34	(Stantec Survey, 2015)	0.93	9.1	51	6.00	336.40	9.10	333.30	Bedrock	Bedrock
MWM-09B	14-Jun-15	6307487	380632	(Stantec Survey, 2015)	342.33	343.18	(Stantec Survey, 2015)	0.86	4.6	51	3.00	339.33	4.60	337.73	Sand and Gravel	Glaciolacustrine Nearshore
MWM-10A	15-Jun-15	6306242	380596	(Stantec Survey, 2015)	326.45	327.34	(Stantec Survey, 2015)	0.89	12.2	51	9.10	317.35	12.20	314.25	Bedrock	Bedrock
						327.13 (After 10-Jul-22)		0.68								
MWM-10B	15-Jun-15	6306244	380597	(Stantec Survey, 2015)	326.49	327.65	(Stantec Survey, 2015)	1.16	6.7	51	5.00	321.49	6.60	319.89	Sand, Cobbles, and Boulders	Glaciolacustrine Nearshore / Glaciofluvial
						327.45 (After 10-Jul-22)		0.96								
MWM-11R	17-Mar-17	6307583	381188	(Golder, 2017c)	-	-	-	0.99	6.3	51	3.61	-	5.13	-	Bedrock	Bedrock

		Coordinates			Elevation						Screened Interval					
					Ground Surface	Top of Casing		Stick-Up	Borehole Depth	Well Diameter	Top of Well Screen		Bottom of Well Screen			
Well ID	**Install Date**	**Northing**	**Easting**	**Source**	**m AMSL**	**m AMSL**	**Source**	**m AGS**	**m BGS**	**mm**	**m BGS**	**m AMSL**	**m BGS**	**m AMSL**	**Screened Material**	**Screened Unit**
MWM-11S	17-Mar-17	6307583	381188	(Golder, 2017c)	-	-	-	1.00	3.7	51	1.52	-	3.05	-	Silty Sand to Gravelly Sand	Glaciolacustrine Nearshore / Glaciofluvial
MWM-12A	14-Feb-19	6310894	382748	(Alamos Survey, 2019)	349.22	350.08	(Alamos Survey, 2019)	0.87	15.5	51	12.50	337	15.54	333.68	Bedrock	Bedrock
MWM-12B	14-Feb-19	6310893	382748	(Alamos Survey, 2019)	349.26	350.04	(Alamos Survey, 2019)	0.79	5.5	51	3.96	345	5.49	343.77	Cobbles/Boulders	Glaciofluvial
MWM-13A	15-Feb-19	6310443	382150	(Alamos Survey, 2019)	348.00	348.78	(Alamos Survey, 2019)	0.78	11.7	51	8.61	339	11.66	336.34	Bedrock	Bedrock
MWM-13B	15-Feb-19	6310442	382150	(Alamos Survey, 2019)	347.36	348.25	(Alamos Survey, 2019)	0.90	5.5	51	3.96	343	5.49	341.87	Silty Clay and Clay	Glaciolacustrine Offshore
GBHM-01A	30-Jun-15	6307726	381419	(Stantec Survey, 2015)	334.98	336.08	(Stantec Survey, 2015)	1.09	21.5	51	18	316.98	21.05	313.93	Bedrock	Bedrock
GBHM-01B	30-Jun-15	6307726	381426	(Stantec Survey, 2015)	334.97	336.07	(Stantec Survey, 2015)	1.11	10.7	51	9.15	325.82	10.67	324.30	Silty Sand	Sand Diamicton
GBHM-02A	30-Jun-15	6307354	381313	(Stantec Survey, 2015)	334.32	335.31	(Stantec Survey, 2015)	0.99	7.7	51	5.51	328.81	7.04	327.28	Bedrock	Bedrock
GBHM-02B	30-Jun-15	6307354	381309	(Stantec Survey, 2015)	334.31	335.38	(Stantec Survey, 2015)	1.07	4.0	51	1.73	332.58	3.86	330.45	Organics and Clayey Silt	Organics / Glaciolacustrine Offshore
GBHM-03A	29-Jun-15	6307082	380699	(Stantec Survey, 2015)	336.67	337.81	(Stantec Survey, 2015)	1.14	9.4	51	7.22	329.45	8.74	327.93	Bedrock	Bedrock
GBHM-03B	29-Jun-15	6307076	380703	(Stantec Survey, 2015)	336.50	337.52	(Stantec Survey, 2015)	1.01	4.7	51	1.65	334.85	4.7	331.80	Silty Sand	Glaciolacustrine Nearshore
GBHM-04	27-Jun-15	6307063	380409	(Stantec Survey, 2015)	339.55	340.55	(Stantec Survey, 2015)	1.00	3.1	51	0.91	338.64	2.44	337.11	Bedrock	Bedrock
GBHM-05A	27-Jun-15	6307184	380313	(Stantec Survey, 2015)	332.20	333.10	(Stantec Survey, 2015)	0.90	9.1	51	7.62	324.58	9.14	323.06	Bedrock	Bedrock
GBHM-05B	27-Jun-15	6307186	380313	(Stantec Survey, 2015)	332.25	333.13	(Stantec Survey, 2015)	0.88	5.4	51	2.34	329.91	5.38	326.87	Sand and Silt	Sand Diamicton
GBHM-06A	27-Jun-15	6307643	380575	(Stantec Survey, 2015)	343.02	343.90	(Stantec Survey, 2015)	0.87	4.7	51	2.82	340.20	4.34	338.68	Bedrock	Bedrock
GBHM-06B	27-Jun-15	6307643	380573	(Stantec Survey, 2015)	342.94	343.82	(Stantec Survey, 2015)	0.88	1.5	51	0.76	342.18	1.52	341.42	Silty Sand	Sand Diamicton
GBHM-07	19-Jul-15	6309928	381518	(Stantec Survey, 2015)	344.76	345.93	(Stantec Survey, 2015)	1.16	18.0	51	4.58	340.18	6.10	338.66	Clayey Silt and Silty Sand	Glaciolacustrine Offshore / Diamicton
GBHM-08	18-Jul-15	6309118	382073	(Stantec Survey, 2015)	348.52	349.56	(Stantec Survey, 2015)	1.04	4.5	51	3.05	345.47	4.52	344.00	Bedrock	Bedrock
GBHM-09A	18-Jul-15	6308247	381463	(Stantec Survey, 2015)	347.80	348.67	(Stantec Survey, 2015)	0.86	5.0	51	3.51	344.29	4.73	343.07	Bedrock	Bedrock
GBHM-09B	18-Jul-15	6308246	381465	(Stantec Survey, 2015)	347.80	348.78	(Stantec Survey, 2015)	0.98	1.8	51	0.91	346.89	1.83	345.97	Sand and Gravel	Sand Diamicton
GBHM-10A	27-Jun-15	6307862	381351	(Stantec Survey, 2015)	339.46	340.45	(Stantec Survey, 2015)	0.99	7.9	51	4.57	334.89	7.62	331.84	Bedrock	Bedrock
GBHM-10B	27-Jun-15	6307861	381353	(Stantec Survey, 2015)	339.49	340.51	(Stantec Survey, 2015)	1.02	3.4	51	0.92	338.57	3.35	336.14	Silty Sand	Sand Diamicton

		Coordinates			Elevation						Screened Interval					
					Ground Surface	Top of Casing		Stick-Up	Borehole Depth	Well Diameter	Top of Well Screen		Bottom of Well Screen			
Well ID	**Install Date**	**Northing**	**Easting**	**Source**	**m AMSL**	**m AMSL**	**Source**	**m AGS**	**m BGS**	**mm**	**m BGS**	**m AMSL**	**m BGS**	**m AMSL**	**Screened Material**	**Screened Unit**
GBHM-11A	26-Jun-15	6307873	380660	(Stantec Survey, 2015)	345.23	346.20	(Stantec Survey, 2015)	0.98	5.3	51	3.58	341.65	5.11	340.12	Bedrock	Bedrock
GBHM-11B	26-Jun-15	6307874	380661	(Stantec Survey, 2015)	345.30	346.24	(Stantec Survey, 2015)	0.93	1.7	51	0.75	344.55	1.68	343.62	Sand	Glaciolacustrine Nearshore
GBHM-12	17-Jul-15	6309100	380946	(Stantec Survey, 2015)	339.92	340.95	(Stantec Survey, 2015)	1.04	7.6	51	4.57	335.35	7.62	332.30	Bedrock	Bedrock
GBHM-13A	10-Jul-15	6308726	383577	(Stantec Survey, 2015)	343.07	344.21	(Stantec Survey, 2015)	1.13	7.7	51	3.96	339.11	7.01	336.06	Bedrock	Bedrock
GBHM-13B	10-Jul-15	6308725	383580	(Stantec Survey, 2015)	343.08	344.17	(Stantec Survey, 2015)	1.09	3.1	51	1.50	341.58	3.10	339.98	Silty Clay, Silty Sand, Clayey Sand	Glaciolacustrine Offshore / Sand Diamicton
GBHM-14	16-Jul-15	6308614	384112	(Stantec Survey, 2015)	335.98	336.95	(Stantec Survey, 2015)	0.98	29.0	51	16.01	319.97	17.54	318.44	Silty Sand, Gravelly Sand	Sand Diamicton
GBHM-15	13-Jul-15	6308891	384758	(Stantec Survey, 2015)	339.47	340.42	(Stantec Survey, 2015)	0.96	6.6	51	3.51	335.96	6.55	332.92	Bedrock	Bedrock
GBHM-18	27-Jun-15	6311189	386027	(Stantec Survey, 2015)	340.17	341.11	(Stantec Survey, 2015)	0.94	19.8	51	16.76	323.41	19.81	320.36	Bedrock	Bedrock
GBHM-19	25-Jul-15	6311097	385143	(Stantec Survey, 2015)	346.88	352.98	(Stantec Survey, 2015)	6.10	6.1	51	3.05	343.83	6.10	340.78	Bedrock	Bedrock
GBHM-20	21-Jul-15	6310662	384056	(Stantec Survey, 2015)	351.19	352.19	(Stantec Survey, 2015)	1.00	5.0	51	1.98	349.21	5.03	346.16	Bedrock	Bedrock
GBHM-21	24-Jul-15	6309818	383724	(Stantec Survey, 2016)	353.02	353.96	(Stantec Survey, 2016)	0.94	4.6	51	1.52	351.50	4.58	348.44	Bedrock	Bedrock
GBHM-22A	15-Jul-15	6309582	384968	(Stantec Survey, 2016)	338.05	339.02 338.63 (after 23-Aug-22)	(Stantec Survey, 2016)	0.58	13.0	51	9.91	328.14	12.95	325.10	Bedrock	Bedrock
GBHM-22B	15-Jul-15	6309584	384966	(Stantec Survey, 2016)	338.01	339.01	(Stantec Survey, 2016)	1.00	7.9	51	3.88	334.13	7.90	330.11	Silty Sand	Glaciolacustrine Nearshore
GBHM-23A	16-Jul-15	6310353	384892	(Stantec Survey, 2016)	339.21	340.26	(Stantec Survey, 2016)	1.05	14.9	51	11.89	327.32	14.94	324.27	Bedrock	Bedrock
GBHM-23B	16-Jul-15	6310352	384895	(Stantec Survey, 2016)	339.23	340.26	(Stantec Survey, 2016)	1.03	9.5	51	6.45	332.78	9.45	329.78	Silty Sand	Glaciolacustrine Offshore / Sand Diamicton
GBHM-16-01R	24-Jul-16	6307421	380329	(Golder, 2017b)	330.90	332.10	(Golder, 2017b)	1.20	7.7	51	5.18	325.72	6.71	324.19	Bedrock	Bedrock
GBHM-16-01S	24-Jul-16	6307419	380328	(Golder, 2017b)	330.79	331.99	(Golder, 2017b)	1.20	3.7	51	1.68	329.11	3.20	327.59	Sand	Glaciolacustrine Nearshore
GBHM-16-02R	25-Jul-16	6307240	380313	(Golder, 2017b)	331.59	332.66	(Golder, 2017b)	1.07	10.6	51	8.53	323.06	10.06	321.53	Bedrock	Bedrock
GBHM-16-02S	25-Jul-16	6307236	380314	(Golder, 2017b)	330.82	331.81	(Golder, 2017b)	0.99	5.8	51	4.27	326.56	5.79	325.03	Sand	Glaciolacustrine Nearshore
GBHM-16-03R	24-Mar-17	6308741	384139	(Golder, 2017d)	362.69	-	(Golder, 2017d)	-	29.5	51	25.65	337.04	27.18	335.51	Bedrock	Bedrock
GBHM-16-03S	24-Mar-17	6308741	384139	(Golder, 2017d)	362.69	-	(Golder, 2017d)	-	13.6	51	11.89	350.80	13.41	349.28	Silty Sand	Sand Diamicton
GBHM-16-04R	23-Mar-17	6308989	384769	(Golder, 2017d)	342.39	-	(Golder, 2017d)	-	7.8	51	3.29	339.10	4.81	337.58	Bedrock	Bedrock

		Coordinates			Elevation						Screened Interval					
					Ground Surface	Top of Casing		Stick-Up	Borehole Depth	Well Diameter	Top of Well Screen		Bottom of Well Screen			
Well ID	Install Date	Northing	Easting	Source	m AMSL	m AMSL	Source	m AGS	m BGS	mm	m BGS	m AMSL	m BGS	m AMSL	Screened Material	Screened Unit
GBHM-16-04S	23-Mar-17	6308989	384769	(Golder, 2017d)	342.39	-	(Golder, 2017d)	-	2.3	51	0.69	341.70	1.60	340.79	Silty Sand	Glaciolacustrine Nearshore
GBHM-16-06	29-Sep-16	6310032	384937	(Golder, 2017b)	-	-	-	1.09	31.7	51	30.18	-	31.70	-	Bedrock	Bedrock
GBHM-16-08R	21-Apr-17	6308843	381448	(Golder, 2017b)	-	-	-		25.5	51	22.58	-	24.11	-	Bedrock	Bedrock
GBHM-16-08S	21-Apr-17	6308843	381448	(Golder, 2017b)	-	-	-		15.4	51	13.89	-	15.42	-	Sand to Gravelly Sand	Glaciolacustrine Nearshore / Glaciofluvial
GBHM-16-09	21-Apr-17	6308500	381488	(Golder, 2017b)	-	-	-		3.9	51	2.33	-	3.85	-	Bedrock	Bedrock
GBHM-17-01R	26-Mar-17	6305114	378631	(Golder, 2017c)	-	-	-	0.99	4.2	51	2.06	-	3.58	-	Bedrock	Bedrock
GBHM-17-02R	27-Mar-17	6304685	378489	(Golder, 2017c)	-	-	-	0.98	12.9	51	10.30	-	11.82	-	Bedrock	Bedrock
GBHM-17-02S	27-Mar-17	6304685	378489	(Golder, 2017c)	-	-	-	0.86	4.6	51	2.74	-	4.27	-	Sand	Glaciolacustrine Nearshore / Glaciofluvial
GBHM-17-03R	23-Mar-17	6306790	381276	(Golder, 2017c)	-	-	-	1.01	4.9	51	2.80	-	4.32	-	Bedrock	Bedrock
GBHM-17-04R	22-Mar-17	6306421	380953	(Golder, 2017c)	-	-	-	1.03	5.6	51	3.71	-	5.23	-	Bedrock	Bedrock
GBHM-17-05R	27-Mar-17	6306234	383261	(Golder, 2017c)	-	-	-	0.84	8.3	51	6.00	-	7.52	-	Bedrock	Bedrock
GBHM-17-05S	27-Mar-17	6306234	383261	(Golder, 2017c)	-	-	-	0.90	4.5	51	2.44	-	3.96	-	Silty Sand to Sand and Gravel	Glaciolacustrine Nearshore
GBHM-17-06R	28-Mar-17	6306365	383816	(Golder, 2017c)	-	-	-	0.89	9.0	51	6.83	-	8.36	-	Bedrock	Bedrock
GBHM-17-06S	28-Mar-17	6306365	383816	(Golder, 2017c)	-	-	-	0.90	4.9	51	3.05	-	4.57	-	Sand and Silt	Glaciolacustrine Nearshore
BH18-01B	12-Jan-19	6309029	381953	(Alamos Survey, 2019)	345.67	346.62	(Alamos Survey, 2019)	0.95	9.4	51	4.81	340.86	9.40	336.27	Bedrock	Bedrock
BH18-01S	12-Jan-19	6309030	381955	(Alamos Survey, 2019)	345.68	346.49	(Alamos Survey, 2019)	0.81	4.6	51	2.18	343.50	4.62	341.06	Sitly Sand and Gravel	Glaciolacustrine Nearshore
BH18-02	07-Feb-19	6309098	382812	(Alamos Survey, 2019)	358.29	358.95	(Alamos Survey, 2019)	0.66	6.2	51	1.60	356.69	6.17	352.12	Bedrock	Bedrock
BH18-03	10-Feb-19	6309360	383308	(Alamos Survey, 2019)	359.39	360.32	(Alamos Survey, 2019)	0.93	5.4	51	2.36	357.03	5.40	353.99	Bedrock	Bedrock
BH18-04B	08-Feb-19	6309902	383518	(Alamos Survey, 2019)	357.39	358.09	(Alamos Survey, 2019)	0.70	8.7	51	5.69	352	8.74	348.65	Bedrock	Bedrock
BH18-04S	08-Feb-19	6309902	383517	(Alamos Survey, 2019)	357.57	358.47	(Alamos Survey, 2019)	0.90	3.2	51	1.42	356	2.95	354.62	Sand to Sand and Gravel/Gravel	Glaciolacustrine Nearshore/Glaciofluvial
BH18-05	25-Jan-19	6310533	383638	(Alamos Survey, 2019)	358.82	359.81	(Alamos Survey, 2019)	0.99	6.3	51	1.75	357	6.32	352.50	Bedrock	Bedrock
BH18-06	18-Jan-19	6310674	383066	(Alamos Survey, 2019)	356.69	357.45	(Alamos Survey, 2019)	0.76	6.2	51	1.09	356	5.87	350.82	Bedrock	Bedrock
BH18-07	18-Jan-19	6310366	382425	(Alamos Survey, 2019)	366.27	367.31	(Alamos Survey, 2019)	1.04	6.3	51	1.22	365	5.79	360.48	Bedrock	Bedrock

		Coordinates			Elevation						Screened Interval					
					Ground Surface	Top of Casing		Stick-Up	Borehole Depth	Well Diameter	Top of Well Screen		Bottom of Well Screen			
Well ID	**Install Date**	**Northing**	**Easting**	**Source**	**m AMSL**	**m AMSL**	**Source**	**m AGS**	**m BGS**	**mm**	**m BGS**	**m AMSL**	**m BGS**	**m AMSL**	**Screened Material**	**Screened Unit**
BH18-08B	11-Jan-19	6308185	381900	(Alamos Survey, 2019)	335.91	336.90	(Alamos Survey, 2019)	0.99	6.4	51	3.86	332	6.35	329.56	Bedrock	Bedrock
BH18-08S	10-Jan-19	6308186	381903	(Alamos Survey, 2019)	335.85	336.78	(Alamos Survey, 2019)	0.93	3.1	51	1.54	334	3.12	332.73	Sand and Silt	Glaciolacustrine Nearshore
BH18-09B	11-Feb-19	6308504	382916	(Alamos Survey, 2019)	342.83	343.71	(Alamos Survey, 2019)	0.88	10.0	51	7.39	335	10.00	332.83	Bedrock	Bedrock
BH18-09S	11-Feb-19	6308505	382916	(Alamos Survey, 2019)	342.97	344.03	(Alamos Survey, 2019)	1.06	4.5	51	1.45	342	4.50	338.47	Silty Sand to Sandy Gravel	Sand Diamicton
Boreholes																
GBHM-24	04-Jul-15	6306637	381692	(Golder, 2015)	-	-	-	-	12.1	-	-	-	-	-	-	-
GBHM-25	02-Jul-15	6307069	381928	(Golder, 2015)	-	-	-	-	8.1	-	-	-	-	-	-	-
GBHM-26	03-Jul-15	6307376	381982	(Golder, 2015)	-	-	-	-	6.7	-	-	-	-	-	-	-
GBHM-27	01-Jul-15	6307660	381960	(Golder, 2015)	-	-	-	-	7.8	-	-	-	-	-	-	-
GBHM-28	08-Jul-15	6307199	381719	(Golder, 2015)	-	-	-	-	4.6	-	-	-	-	-	-	-
GBHM-29	06-Jul-15	6306761	381469	(Golder, 2015)	-	-	-	-	9.2	-	-	-	-	-	-	-
GBHM-30	6-Jul-15	6304947	382562	(Golder, 2015)	-	-	-	-	4.9	-	-	-	-	-	-	-
GBHM-31	6-Jul-15	6304835	382026	(Golder, 2015)	-	-	-	-	7.2	-	-	-	-	-	-	-
GBHM-32	7-Jul-15	6305404	381966	(Golder, 2015)	-	-	-	-	4.7	-	-	-	-	-	-	-
GBHM-33	7-Jul-15	6305673	381862	(Golder, 2015)	-	-	-	-	7.9	-	-	-	-	-	-	-
GBHM-35	3-Jul-15	6306501	381714	(Golder, 2015)	-	-	-	-	6.3	-	-	-	-	-	-	-
GBHM-36	3-Jul-15	6306853	381834	(Golder, 2015)	-	-	-	-	7.4	-	-	-	-	-	-	-
GBHM-37	4-Jul-15	6304636	377075	(Golder, 2015)	-	-	-	-	3.1	-	-	-	-	-	-	-
GBHM-38	4-Jul-15	6305260	378272	(Golder, 2015)	-	-	-	-	3.1	-	-	-	-	-	-	-
GBHM-39	4-Jul-15	6305964	378726	(Golder, 2015)	-	-	-	-	2.4	-	-	-	-	-	-	-
GBHM-40	4-Jul-15	6306774	379255	(Golder, 2015)	-	-	-	-	1.8	-	-	-	-	-	-	-
GBHM-41	4-Jul-15	6307372	379982	(Golder, 2015)	-	-	-	-	1.7	-	-	-	-	-	-	-
GBHM-42	4-Jul-15	6307881	380425	(Golder, 2015)	-	-	-	-	6.7	-	-	-	-	-	-	-
GTM-15-01*	18-Jun-15	6307554	380398	(Golder, 2015)	334	-	(Golder, 2015)	-	259.2	-	-	-	-	-	-	-
GTM-15-02*	7-Jul-15	6307053	380541	(Golder, 2015)	341	-	(Golder, 2015)	-	259.1	-	-	-	-	-	-	-

		Coordinates			Elevation						Screened Interval					
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Well ID	**Install Date**	**Northing**	**Easting**	**Source**	**m AMSL**	**m AMSL**	**Source**	**m AGS**	**m BGS**	**mm**	**m BGS**	**m AMSL**	**m BGS**	**m AMSL**	**Screened Material**	**Screened Unit**
GTM-15-03*	23-Jun-15	6307311	380298	(Golder, 2015)	331	-	(Golder, 2015)	-	132.0	-	-	-	-	-	-	-
GTM-15-04*	04-Jul-15	6307765	381436	(Golder, 2015)	336	-	(Golder, 2015)	-	129.5	-	-	-	-	-	-	-
GBHM-16-Q-01A	08-Aug-16	6306618	378540	(Golder, 2017c)	-	-	-	-	8.3	-	-	-	-	-	-	-
GBHM-16-Q-01B	09-Aug-17	6306527	378559	(Golder, 2017c)	-	-	-	-	9.6	-	-	-	-	-	-	-
GBHM-16-Q-02	08-Aug-16	6306398	378429	(Golder, 2017c)	-	-	-	-	9.0	-	-	-	-	-	-	-
GBHM-16-Q-07	07-Aug-16	6306763	380697	(Golder, 2017c)	-	-	-	-	18.0	-	-	-	-	-	-	-
GBHM-17-07	22-Mar-17	6305840	382028	(Golder, 2017b)	-	-	-	-	9.2	-	-	-	-	-	-	-
GBHM-17-08	21-Mar-17	6306029	381812	(Golder, 2017b)	-	-	-	-	9.1	-	-	-	-	-	-	-
GBHM-17-09	20-Mar-17	6306169	381632	(Golder, 2017b)	-	-	-	-	22.9	-	-	-	-	-	-	-
GBHM-17-10	19-Mar-17	6306309	381528	(Golder, 2017b)	-	-	-	-	18.5	-	-	-	-	-	-	-
GBHM-17-11	18-Mar-17	6306584	381516	(Golder, 2017b)	-	-	-	-	14.6	-	-	-	-	-	-	-
GBHM-17-Q-1	24-Apr-17	6306599	380716	(Golder, 2017c)	-	-	-	-	5.4	-	-	-	-	-	-	-
GBHM-17-Q-2A	09-May-17	6307603	382575	(Golder, 2017c)	-	-	-	-	7.5	-	-	-	-	-	-	-
GBHM-17-Q-2B	17-Mar-17	6307603	382575	(Golder, 2017c)	-	-	-	-	13.9	-	-	-	-	-	-	-
GBHM-17-Q-3	29-Mar-17	6307561	382696	(Golder, 2017c)	-	-	-	-	10.5	-	-	-	-	-	-	-
GBHM-17-Q-4	20-Apr-17	6309800	381869	(Golder, 2017c)	-	-	-	-	15.3	-	-	-	-	-	-	-
BB19-01	18-Feb-19	6307858	380412	(Stantec, 2019)	-	-	-	-	10.7	-	-	-	-	-	-	-
BB19-02	17-Feb-19	6307822	380470	(Stantec, 2019)	-	-	-	-	9.1	-	-	-	-	-	-	-
Drive-Point Piezometers																
DPM-1	13-Jun-15	6309936	385841	(Stantec Survey, 2016)	336.46	337.13	(Stantec Survey, 2016)	0.67	1.9	25	1.46	335.00	1.89	334.57	-	-
DPM-2	13-Jun-15	6308225	380529	(Stantec Survey, 2015)	332.80	333.56	(Stantec Survey, 2015)	0.76	1.8	25	1.37	331.43	1.80	331.00	-	-
DPM-2 SW	28-Jul-15	6308222	380531	(Stantec Survey, 2015)	331.87	332.65	(Stantec Survey, 2015)	0.78	-	-	-	-	-	-	-	-
DPM-3	13-Jun-15	6307377	380283	(Stantec Survey, 2015)	329.49	330.74	(Stantec Survey, 2015)	1.25	1.3	25	0.88	328.61	1.31	328.18	-	-
DPM-3 SW	28-Jul-15	-	-	-	n/a	n/a	n/a	0.42	-	-	-	-	-	-	-	-
DPM-4	13-Jun-15	6306242	380590	(Stantec Survey, 2015)	326.58	327.61	(Stantec Survey, 2015)	1.03	1.5	25	1.10	325.48	1.53	325.05	-	-

		Coordinates			Elevation						Screened Interval					
					Ground Surface	Top of Casing		Stick-Up	Borehole Depth	Well Diameter	Top of Well Screen		Bottom of Well Screen			
Well ID	**Install Date**	**Northing**	**Easting**	**Source**	**m AMSL**	**m AMSL**	**Source**	**m AGS**	**m BGS**	**mm**	**m BGS**	**m AMSL**	**m BGS**	**m AMSL**	**Screened Material**	**Screened Unit**
DPM-4 SW	28-Jul-15	6306239	380585	(Stantec Survey, 2015)	325.75	326.46	(Stantec Survey, 2015)	0.71	-	-	-	-	-	-	-	-
DPM-5	13-Jun-15	6307397	381363	(Stantec Survey,2016)	333.80	334.24	(Stantec Survey, 2016)	0.43	2.1	25	1.70	332.11	2.13	331.68	-	-
DPM-6	13-Jun-15	6308389	384629	(Stantec Survey, 2015)	330.10	331.31	(Stantec Survey, 2015)	1.21	1.4	25	0.92	329.18	1.35	328.75	-	-
DPM-7	13-Jun-15	6307119	381045	(Stantec Survey, 2015)	334.05	334.75	(Stantec Survey, 2015)	0.69	1.9	25	1.44	332.62	1.87	332.19	-	-
DPM-8	05-Jul-19	6311102	383556	(Alamos Survey, 2019)	348.39	349.81	(Alamos Survey, 2019)	1.42	1.3	25	0.87	347.52	1.30	347.09	-	-

NOTES:

na	Not available
m AGS	Metres above ground surface
m BGS	Metres below ground surface
m AMSL	Metres above mean sea level
SW	Surface water measured from staff gauge
▨	Monitoring location destroyed or could not be located
*	Borehole inclinlation of 60° and azimuth of 110° at GTM-15-01, 030° at GTM-15-02, 165° at GTM-15-03, and 180° at GTM-15-04
	GBHM-16, GBHM-17, and GBHM-34 were not installed due to poor access
	Northing and Easting Coordinates presented as UTM NAD 83 Zone 14

Table C-1 Predicted Concentrations of Groundwater Recharge from Project Components - Gordon Site

Parameter	Units	Regulatory Criteria			End of Construction		End of Operation				Closure (Pit Lake)			
		Drinking Water Criteria	Surface Water Criteria for the Protection of Aquatic Life	Groundwater Discharging to Surface Water	Historical North MRSA	Historical South MRSA	Historical North MRSA	Historical South MRSA	New MRSA (expected)	New MRSA (sensitivity)	Historical North MRSA	Historical South MRSA	New MRSA (expected)	New MRSA (sensitivity)
		GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3										
General Chemistry														
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	11	4.9	11	4.9	-	-	11	4.9	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.10	0.016	0.10	0.016	-	-	0.10	0.016	-	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.46	0.16	0.46	0.16	0.99	1.8	0.46	0.16	0.0000046	0.0000084
Calculated Un-ionized Ammonia (as N)	mg/L	n/v	0.19 *	n/v	0.00040	0.00014	0.00040	0.00014	0.00087	0.0016	0.00040	0.00014	0.0000000041	0.0000000074
Chloride	mg/L	250	120	1,800	5.5	9.1	5.5	9.1	-	-	5.5	9.1	-	-
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	-
Fluoride	mg/L	1.5	0.12	n/v	0.069	0.11	0.069	0.11	0.43	0.48	0.069	0.11	0.61	0.61
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	469	1,010	469	1,010	-	-	469	1,010	-	-
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	0.11	0.44	0.11	0.44	7.8	**43**	0.11	0.44	0.000036	0.00020
pH, Field	S.U.	7.0*-8.5**	6.5-9.0	n/v	**6.8**	7.2	**6.8**	7.2	-	-	**6.8**	7.2	-	-
Sulfate	mg/L	500	n/v	n/v	287	**624**	287	**624**	**706**	**1,091**	287	**624**	**1,814**	**3,320**
Dissolved Metals														
Aluminum	mg/L	0.1 *	0.1	n/v	0.015	0.0029	0.015	0.0029	0.079	0.083	0.015	0.0029	0.086	0.086
Antimony	mg/L	0.006	n/v	16	0.00011	0.00021	0.00011	0.00021	**0.0087**	**0.013**	0.00011	0.00021	**0.012**	**0.021**
Arsenic	mg/L	0.010	0.005 *	1.5	0.0012	0.00054	0.0012	0.00054	**0.071**	**0.079**	0.0012	0.00054	**0.10**	**0.10**
Barium	mg/L	1	n/v	23	0.095	0.063	0.095	0.063	0.13	0.20	0.095	0.063	0.31	0.56
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.0001	<0.0001	-	-
Boron	mg/L	5	1.5	36	0.023	0.040	0.023	0.040	0.38	0.59	0.023	0.040	0.70	1.3
Cadmium	mg/L	0.005	0.00036 ***	0.0021	0.0000057	0.000039	0.0000057	0.000039	0.000043	0.000067	0.0000057	0.000039	0.00012	0.00021
Chromium	mg/L	0.05	0.011 **	0.64	0.00029	<0.0001	0.00029	<0.0001	0.00039	0.00061	0.00029	<0.0001	0.0019	0.0035
Cobalt	mg/L	n/v	n/v	0.052	0.00012	0.00049	0.00012	0.00049	0.00079	0.0012	0.00012	0.00049	0.0019	0.0035
Copper	mg/L	1	0.0031 */***	0.069	0.00049	0.00029	0.00049	0.00029	0.0094	0.015	0.00049	0.00029	0.022	0.041
Iron	mg/L	0.3	0.3	n/v	**2.2**	0.19	**2.2**	0.19	0.058	0.090	**2.2**	0.19	0.13	0.23
Lead	mg/L	0.005 *	0.0049 **/***	0.02	<0.00005	<0.00005	<0.00005	<0.00005	0.00039	0.00061	<0.00005	<0.00005	0.00096	0.0018
Manganese	mg/L	0.02 *	n/v	n/v	**0.26**	**0.43**	**0.26**	**0.43**	0.0087	0.013	**0.26**	**0.43**	0.015	**0.027**
Mercury	mg/L	0.001	0.000026	0.0077	0.00000057	0.00000039	0.00000057	0.00000039	0.0000043	0.0000067	0.00000057	0.00000039	0.000011	0.000019
Molybdenum	mg/L	n/v	0.073	7.3	0.00084	0.0023	0.00084	0.0023	0.035	0.054	0.00084	0.0023	0.072	0.13
Nickel	mg/L	n/v	0.085 **/***	0.39	0.00054	0.0017	0.00054	0.0017	0.0055	0.0085	0.00054	0.0017	0.011	0.019
Phosphorus	mg/L	n/v	n/v	n/v	0.0521	0.0222	0.0521	0.0222	-	-	0.0521	0.0222	-	-
Selenium	mg/L	0.01 **	0.001	0.05	0.00013	0.00011	0.00013	0.00011	0.0035	0.0055	0.00013	0.00011	0.0058	**0.011**
Silver	mg/L	n/v	0.0001 **	0.0012	<0.00001	<0.00001	<0.00001	<0.00001	0.000043	0.000067	<0.00001	<0.00001	0.00012	0.00021
Sodium	mg/L	200	n/v	1,800	**45**	37	**45**	37	**241**	**372**	**45**	37	**396**	**725**
Thallium	mg/L	n/v	0.0008	0.4	0.000024	0.000013	0.000024	0.000013	0.00043	0.00067	0.000024	0.000013	0.0011	0.0019
Tungsten	mg/L	n/v	n/v	n/v	0.00017	0.00010	0.00017	0.00010	-	-	0.00017	0.00010	-	-
Uranium	mg/L	0.02	0.015	0.33	0.0013	0.0075	0.0013	0.0075	**0.030**	**0.046**	0.0013	0.0075	**0.051**	**0.094**
Vanadium	mg/L	n/v	n/v	0.2	0.00092	0.00024	0.00092	0.00024	-	-	0.00092	0.00024	-	-
Zinc	mg/L	5	0.03 *	0.89	<0.001	<0.001	<0.001	<0.001	0.0067	0.010	<0.001	<0.001	0.014	0.025
Zirconium	mg/L	n/v	n/v	n/v	0.0012	0.00023	0.0012	0.00023	-	-	0.0012	0.00023	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not estimated
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations of background groundwater quality
(expected)	Concentration data from Field Bin FLB-FL S5J, representing 55% of banded iron formation (BIF) waste rock, scaled up assuming normal climate year controls pore water volume and flows through MRSA.
(sensitivity)	Concentration data from Field Bin FLB-FL S5fi, representing 55% of banded iron formation (BIF) waste rock, scaled up assuming 25 year dry climate year controls pore water volume and flows through MRSA.

GCDWQ:	Guidelines for Canadian Drinking Water
MWQSOG-DW:	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL:	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL:	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3:	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)

Table C-2 Predicted Concentrations of Groundwater Recharge from Project Components - MacLellan Site

Parameter	Units	Regulatory Criteria			Baseline	End of Operation				Closure (Pit Lake)			
		Drinking Water Criteria	Surface Water Criteria for the Protection of Aquatic Life	Groundwater Discharging to Surface Water	Historical MRSA	MRSA (expected)	MRSA (sensitivity)	TMF (expected)	TMF (sensitivity)	MRSA (expected)	MRSA (sensitivity)	TMF (expected)	TMF (sensitivity)
		GCDWQ / MWQSOG-DW	CWQG-FAL / MWQSOG-FAL	GW3									
General Chemistry													
Dissolved Organic Carbon (DOC)	mg/L	n/v	n/v	n/v	7.8	-	-	-	-	-	-	-	-
Phosphorus, Dissolved	mg/L	n/v	0.02 *	n/v	0.0091	-	-	-	-	-	-	-	-
Ammonia (as N)	mg/L	n/v	4.84 *	n/v	0.065	1.7	1.5	7.1	7.1	0.061	0.055	3.9	0.061
Calculated Un-ionized Ammonia (as N)	mg/L	n/v	0.19 *	n/v	0.000017	0.00045	0.00041	0.0019	0.0019	0.000016	0.000015	0.0010	0.000016
Chloride	mg/L	250	120	1,800	<1	-	-	42	44	0.58	0.52	23	0.58
Cyanide (Total)	mg/L	0.2	n/v	0.052	<0.001	-	-	**4.8**	**4.8**	0.00051	0.00046	**1.6**	0.00051
Cyanide (Free)	mg/L	0.2	0.005	n/v	<0.001	-	-	0.014	0.014	0.00051	0.00046	0.015	0.00051
Fluoride	mg/L	1.5	0.12	n/v	<0.04	0.16	0.89	0.68	0.95	0.36	**2.4**	0.45	0.36
Hardness (as CaCO3)	mg/L	n/v	n/v	n/v	868	-	-	39	39	485	433	37	485
Nitrate + Nitrite (as N)	mg/L	10 **	n/v	n/v	0.24	**13**	**36**	1.0	1.0	0.27	0.24	0.55	0.27
pH, Field	S.U.	7.0*-8.5**	6.5-9.0	n/v	**6.4**	-	-	-	-	-	-	-	-
Sulfate	mg/L	500	n/v	n/v	**820**	**977**	**5,596**	**3,254**	**3,947**	**1,797**	**18,124**	**1,903**	**1,797**
Dissolved Metals													
Aluminum	mg/L	0.1 *	0.1	n/v	0.073	0.072	**0.17**	0.093	0.093	**0.18**	**0.20**	**0.10**	**0.18**
Antimony	mg/L	0.006	n/v	16	0.00046	**0.0092**	**0.050**	**0.049**	**0.049**	**0.0081**	**0.044**	**0.028**	**0.0081**
Arsenic	mg/L	0.01	0.005 *	1.5	**0.012**	**0.071**	**0.13**	**0.035**	**0.035**	**0.044**	**0.088**	**0.055**	**0.044**
Barium	mg/L	1	n/v	23	0.027	0.10	0.53	0.066	0.066	0.15	**1.2**	0.051	0.15
Beryllium	mg/L	n/v	n/v	0.053	<0.0001	-	-	-	-	-	-	-	-
Boron	mg/L	5	1.5	36	0.030	0.083	0.26	0.033	0.033	0.070	0.24	0.026	0.07
Cadmium	mg/L	0.005	0.00036 ***	0.0021	0.0020	0.000033	0.0021	0.000055	0.000055	0.0011	**0.0066**	0.000053	0.0011
Chromium	mg/L	0.05	0.011 **	0.64	0.00067	0.00018	0.0019	0.00012	0.00012	0.0014	0.0097	0.00010	0.0014
Cobalt	mg/L	n/v	n/v	0.052	0.026	0.0020	0.012	0.058	0.058	0.017	0.038	0.033	0.017
Copper	mg/L	1	0.0031 */***	0.069	0.0078	0.0033	0.017	0.028	0.028	0.011	0.028	0.021	0.011
Iron	mg/L	0.3	0.3	n/v	0.26	0.013	0.082	**0.65**	**0.65**	0.18	0.18	**0.62**	0.18
Lead	mg/L	0.005 *	0.0049 **/***	0.02	0.00088	0.00018	0.00083	0.00037	0.00037	0.0012	0.0025	0.00031	0.0012
Manganese	mg/L	0.02 *	n/v	n/v	**0.86**	**0.074**	**0.91**	**0.10**	**0.10**	**0.53**	**2.7**	**0.16**	**0.53**
Mercury	mg/L	0.001	0.000026	0.0077	0.00000062	0.0000010	0.0000055	0.0000094	0.0000094	0.0000018	0.000012	0.000017	0.0000018
Molybdenum	mg/L	n/v	0.073	7.3	0.00042	0.035	0.069	0.034	0.034	0.011	0.042	0.022	0.011
Nickel	mg/L	n/v	0.085 **/***	0.39	0.089	0.038	0.16	0.010	0.010	0.092	0.42	0.012	0.092
Selenium	mg/L	0.01 **	0.001	0.05	0.00014	0.00092	0.0091	0.0042	0.0042	0.0012	**0.020**	0.0025	0.0012
Silver	mg/L	n/v	0.0001 **	0.0012	0.000019	0.000014	0.000082	0.000025	0.000025	0.000055	0.00024	0.000023	0.000055
Sodium	mg/L	200	n/v	1,800	9.8	17	57	**1,207**	**1,207**	14	78	**661**	14
Thallium	mg/L	n/v	0.0008	0.4	<0.0001	0.000074	0.00050	0.000013	0.000013	0.00015	0.0011	0.000017	0.00015
Tungsten	mg/L	n/v	n/v	n/v	0.0014	-	-	-	-	-	-	-	-
Uranium	mg/L	0.02	0.015	0.33	0.00080	0.0064	0.016	0.0016	0.0016	0.0064	**0.024**	0.0011	0.0064
Vanadium	mg/L	n/v	n/v	0.2	0.00049	-	-	-	-	-	-	-	-
Zinc	mg/L	5	0.03 *	0.89	0.059	0.0022	0.052	0.0054	0.0054	0.037	0.16	0.0056	0.037
Zirconium	mg/L	n/v	n/v	n/v	0.00018	-	-	-	-	-	-	-	-

NOTES:

999	Parameter exceeds GW3
999	Parameter exceeds CWQG-FAL/MWQSOG-FAL
999	Parameter exceeds GCDWQ/MWQSOG-DW
n/v	No guideline value available
-	not estimated
*	the provincial and federal criteria differed so the more stringent federal criteria is presented
**	the provincial and federal criteria differed so the more stringent provincial criteria is presented
***	based on equation calculated based on mean concentrations of background groundwater quality
(predicted)	MRSA concentration data from Field Bin FLB-ML WR Ave, representing 100% of waste rock and TMF concentration data based on average first (operation) or last (closure) month concentrations out of four subaqueous columns, scaled up assuming normal climate year controls pore water volume and flows through MRSA amd TMF.
(sensitivity)	MRSA concentration data from Field Bin FLB-ML WR>1%S, representing 100% of waste rock and TMF concentration data based on average first (operation) or last (closure) month concentrations out of four subaqueous columns, scaled up assuming 25 year dry climate year controls pore water volume and flows through MRSA and TMF

GCDWQ	Guidelines for Canadian Drinking Water
MWQSOG-DW	Manitoba Water Quality Standards, Objectives, and Guidelines - Drinking Water
CWQG-FAL	Canadian Water Quality Guidelines - Protection of Freshwater Aquatic Life
MWQSOG-FAL	Manitoba Water QualityStandards, Objectives, and Guidelines - Protection of Freshwater Aquatic Life
GW3	Groundwater values protective of aquatic receptors (Ground Water and Sediment Standards for Use under Part XV.1 of the Ontario Environmental Protection Act)