Feasibility Study Update
NI 43-101 Technical Report
for the
Lynn Lake Project,
Lynn Lake, Manitoba, Canada

Prepared for

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Cautionary Note Regarding Forward-Looking Information

This report contains or incorporates by reference "forward-looking statements" and "forward-looking information" as defined under applicable Canadian and U.S. securities laws. All statements, other than statements of historical fact, which address events, results, outcomes or developments that Alamos Gold Inc. ("Alamos" or the "Company") expects to occur are, or may be deemed to be, forward-looking statements and are generally, but not always, identified by the use of forward-looking terminology such as "future", "expect", "assume", "believe", "anticipate", "intend", "potential", "proposed", "plan", "objective", "predict", "estimate", "continue", "ongoing", "likely", "forecast", "budget", "target" or variations of such words and phrases and similar expressions or statements that certain actions, events or results "may", "could", "would", "might" or "will" be taken, occur or be achieved or the negative connotation of such terms. Forward-looking statements contained in this report are based on information available to Alamos at the time of preparation of this report; expectations, estimates and projections as of the date of this report; assumptions, conditions and qualifications as set forth in the report; and data, reports and other information supplied to Alamos by third party sources.

Forward-looking statements in this report may include, without limitation, information as to strategy, plans, expectations or future financial or operating performance, pertaining to, or anticipated to result from, the Lynn Lake Gold Project ("LLGP" or the "Project"), such as expectations, assumptions, estimations and guidance regarding: the feasibility of the Project; construction decision and development of the Project; the extent of additional regulatory approvals and/or changes to the Project; Project designs; Project infrastructure; the method of mining the Project, location of centralized processing plant and tailings management facility and proposed plant design; expected nominal processing throughput of the processing plant; water management plan; power usage and supply; fuel supply, storage and distribution; timing of on-site pre-production period; camp infrastructure; size of operation and anticipated mining fleet size; mine management system; owner activities; mine life; mine plan; mine schedule; anticipated mining, processing, recovery and production rates; projected annual and cumulative gold production; timing of annual production and access to higher grades within overall mine life; anticipated average mill recoveries for gold and silver over the life of mine; exploration; gold and silver grades; mineralization; Mineral Reserves and Resources; Proven and Probable Mineral Reserves; Inferred Mineral Resources; the Project financial model; life of mine operating costs including mine-site all-in sustaining costs, initial capital costs (including main components of the initial capital spending) and life of mine capital costs (including sustaining capital and reclamation); economic analysis including anticipated after-tax net present value, internal rate of return, timing of payback and projected annual and cumulative after-tax cash flow; timing of payment of applicable taxes, total life of mine taxes and effective tax rate; gold price, other metal prices and foreign exchange rates; third-party royalty payments; liabilities; potential Project environmental interactions; potential mitigation and environmental management measures; closure plan; and other statements that express management's expectations or estimates of future performance, operational, geological or financial results.

Alamos cautions that forward-looking statements are necessarily based upon several factors and assumptions that, while considered reasonable by Alamos at the time of making such statements, are inherently subject to significant business, economic, technical, legal, political, and competitive uncertainties and contingencies. Known and unknown factors could cause actual results to differ materially from those projected in the forward-looking statements, and undue reliance should not be placed on such statements and information.

Such factors and assumptions underlying the forward-looking statements in this report include, but are not limited to: changes to current estimates of mineral reserves and mineral resources; conclusions of economic and geological evaluations; changes in Project parameters as plans continue to be refined; the speculative nature of mineral exploration and development; risks in obtaining and maintaining necessary licenses, permits and authorizations for the Company's development stage and operating assets, including the LLGP; operations may be exposed to new diseases, epidemics and pandemics, including any ongoing or future effects of COVID-19 (and any *related ongoing or future regulatory or government responses) and its impact on the broader market and the trading price of the Company's shares; provincial and federal orders or mandates (including with respect to mining operations generally or auxiliary businesses or services required for operations) in Canada, Mexico, the United States and Türkiye, all of which may affect many aspects of the Company's operations including the ability to transport personnel to and from site, contractor and supply availability and the ability to sell or deliver gold doré bars; changes in national and local government legislation, controls or regulations; failure to comply with environmental and health and safety laws and regulations; labour and contractor availability (and being able to secure the same on favourable terms); disruptions in the maintenance or provision of required infrastructure and information technology systems; fluctuations in the price of gold or certain other commodities such as, diesel fuel, natural gas, and electricity; operating or technical difficulties in connection with mining or development activities, including geotechnical challenges and changes to production estimates (which assume accuracy of projected ore grade, mining rates, recovery timing and recovery rate estimates and may be impacted by unscheduled maintenance); changes in foreign exchange rates (particularly the Canadian dollar, U.S. dollar, Mexican peso and Turkish Lira); the impact of inflation; employee and community relations; the impact of litigation and administrative proceedings (including but not limited to the application for judicial review of the positive Decision Statement issued by the Ministry of Environment and Climate Change Canada commenced by the Mathias Colomb Cree Nation (MCCN) in respect of the LLGP and the MCCN's corresponding internal appeal of the Environment Act Licenses issued by the Province of Manitoba for the Project) and any interim or final court, arbitral and/or administrative decisions; disruptions affecting operations; availability of and increased costs associated with mining inputs and labour; delays in the Phase 3+ Expansion at Island Gold; delays in construction decisions and any development of the LLGP; changes with respect to the intended method of mining and processing ore from the LLGP; inherent risks and hazards associated with mining and mineral processing including environmental hazards, industrial accidents, unusual or unexpected formations, pressures and cave-ins; the risk that the Company's mines may not perform as planned; uncertainty with the Company's ability to secure additional capital to execute its business plans; contests over title to properties; expropriation or nationalization of property; political or economic developments in Canada, Mexico, the United States, Türkiye and other jurisdictions in which the Company may carry on business in the future; increased costs and risks related to the potential impact of climate change; the costs and timing of exploration, construction and development of new deposits; risk of loss due to sabotage, protests and other civil disturbances; the impact of global liquidity and credit availability and the values of assets and liabilities based on projected future cash flows; risks arising from holding derivative instruments; and business opportunities that may be pursued by the Company.*

For a more detailed discussion of such risks and other factors that may affect Alamos' ability to achieve the expectations set forth in the forward-looking statements contained in this report, see Alamos' latest 40-F/Annual Information Form and Management's Discussion and Analysis, each under the heading "Risk Factors" available on the SEDAR website at www.sedar.com or on EDGAR at www.sec.gov. The foregoing should be reviewed in conjunction with the information, risk factors and assumptions found in this report.

Alamos disclaims any intention or obligation to update or revise any forward-looking statements whether as a result of new information, future events or otherwise, except as required by applicable law.

Cautionary Note to U.S. Investors

Alamos prepares its disclosure in accordance with the requirements of securities laws in effect in Canada. Unless otherwise indicated, all Mineral Resource and Mineral Reserve estimates included in this document have been prepared in accordance with Canadian National Instrument 43-101 - Standards of Disclosure for Mineral Projects ("NI 43-101") and the Canadian Institute of Mining, Metallurgy and Petroleum (the "CIM") - CIM Definition Standards on Mineral Resources and Mineral Reserves, adopted by the CIM Council, as amended (the "CIM Standards"). NI 43-101 is a rule developed by the Canadian Securities Administrators, which established standards for all public *disclosure an issuer makes of scientific and technical information concerning mineral projects. Mining disclosure in the United States was previously required to comply with SEC Industry Guide 7 ("SEC Industry Guide 7") under the United States Securities Exchange Act of 1934, as amended. The U.S. Securities and Exchange Commission (the "SEC") has adopted final rules, to replace SEC Industry Guide 7 with new mining disclosure rules under sub-part 1300 of Regulation S-K of the U.S. Securities Act ("Regulation S-K 1300") which became mandatory for U.S. reporting companies beginning with the first fiscal year commencing on or after January 1, 2021. Under Regulation S-K 1300, the SEC now recognizes estimates of "Measured Mineral Resources", "Indicated Mineral Resources" and "Inferred Mineral Resources". In addition, the SEC has amended its definitions of "Proven Mineral Reserves" and "Probable Mineral Reserves" to be substantially similar to international standards.*

Investors are cautioned that while the above terms are "substantially similar" to CIM Definitions, there are differences in the definitions under Regulation S-K 1300 and the CIM Standards. Accordingly, there is no assurance any mineral reserves or mineral resources that Alamos may report as "proven mineral reserves", "probable mineral reserves", "measured mineral resources", "indicated mineral resources" and "inferred mineral resources" under NI 43-101 would be the same had Alamos prepared the mineral reserve or mineral resource estimates under the standards adopted under Regulation S-K 1300. U.S. investors are also cautioned that while the SEC recognizes "measured mineral resources", "indicated mineral resources" and "inferred mineral resources" under Regulation S-K 1300, investors should not assume that any part or all of the mineralization in these categories will ever be converted into a higher category of mineral resources or into mineral reserves. Mineralization described using these terms has a greater degree of uncertainty as to its existence and feasibility than mineralization that has been characterized as reserves. Accordingly, investors are cautioned not to assume that any measured mineral resources, indicated mineral resources, or inferred mineral resources that Alamos reports are or will be economically or legally mineable.

Cautionary note regarding non-GAAP Measures and Additional GAAP Measures

In addition to disclosing results determined in accordance with generally accepted accounting principles (GAAP), Alamos may also disclose certain non-GAAP financial measures, which are presented in accordance with International Financial Reporting Standards (IFRS), including the following: total cash cost per ounce of gold sold; all-in sustaining cost per ounce of gold sold; mine-site all-in sustaining cost per ounce of gold sold; and mining cost per tonne of ore/cost per tonne of ore. The Company believes that these measures, together with measures determined in accordance with IFRS, provide investors with an improved ability to evaluate the underlying performance of the Company. Non-GAAP financial measures do not have any standardized meaning prescribed under IFRS, and therefore they may not be comparable to similar measures employed by other companies. The data is intended to provide additional information and should not be considered in isolation or as a substitute for measures of performance prepared in accordance with IFRS. Management's determination of the components of non-GAAP and additional measures are evaluated on a periodic basis influenced by new items and transactions, a review of investor uses and new regulations as applicable. Any changes to the measures are duly noted and retrospectively applied as applicable. A reconciliation of historical non-GAAP and additional GAAP measures are available in the Company's latest Management's Discussion and Analysis available online at www.alamosgold.com and on the SEDAR website www.sedar.com or on EDGAR at www.sec.gov.

The TSX and NYSE have not reviewed and do not accept responsibility for the adequacy or accuracy of this report.

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1 SUMMARY

1.1 Introduction

Worley Canada Inc. (Worley) and a group of engineering and environmental consultants were engaged by Alamos Gold Inc. (Alamos) to complete a 2023 Feasibility Study Update (FSU) for the Lynn Lake Gold Project (LLGP), located close to the Town of Lynn Lake, Manitoba.

The LLGP will be built as two conventional open pit mines with a centralized processing plant facility and a tailings management facility. The LLGP is composed of two properties: MacLellan and Gordon. The processing plant, located at MacLellan, has an expected nominal processing throughput of 8,000 t/d with an estimated 17-year production life.

The FSU responsibilities of the engineering consultants are as follows.

- Worley was commissioned by Alamos to manage and coordinate the work related to the FSU. In addition, Worley was engaged to develop the feasibility level design of the process plant and general infrastructure (MacLellan administration building, MacLellan mine truckwash building, MacLellan mine truckshop building, Gordon administration building, assay lab buildings, on-site roads, main substation, power line and site-wide power distribution). Worley reviewed the process plant design and costs as the previous internal study was undertaken in late Q3 2019, in which time there have been significant fluctuations in the price of labour, steel, copper, and wood.
- AGP Mining Consultants Inc. (AGP) was commissioned to design the open pit final limits, phase development and long-term mine plan. In addition, AGP selected the equipment type and size, developed estimates for open pit mine operating personnel, mine capital and operating costs for the life of the project, and estimated pre-production quantities for the mine development roads.
- Stantec Consulting Ltd. (Stantec) was commissioned to support environmental planning, assessment, licensing, and permitting.
- WSP Canada Inc. (WSP) was commissioned to complete the feasibility-level design of the tailings management facility (TMF) at the MacLellan site, provide slope design recommendations for the MacLellan and Gordon pits, waste dumps, and stockpiles, and complete the layout and sizing of water management structures for both sites. WSP was also responsible for undertaking various geotechnical and hydrogeological investigations to support the feasibility-level design and to aid in sourcing borrow materials for construction.
- All consultants were engaged to provide input and contributed to the development of the operating cost (OPEX) and capital and sustaining capital expenditures (CAPEX).
- Alamos reviewed and developed elements of the project related to geological setting and mineralization, Mineral Resources, market studies and contracts, and economic analysis.

Alamos is responsible for the Mineral Resource and Mineral Reserve estimates.

All costs are in Q4 2022 Canadian dollars unless otherwise stated.

1.2 Property Description

Located in Northern Manitoba, the LLGP consists of two primary sites, MacLellan and Gordon. These mine sites and their surrounding properties are within an easterly distance of 7 km and

37 km, respectively, of the Town of Lynn Lake. Presently, the LLGP's land portfolio consists of 361 dispositions, including 333 staked mining claims and nine (9) Crown mineral leases and nineteen (19) Crown surface leases. Alamos' wholly owned subsidiary, Carlisle Goldfields Limited (Carlisle), has a 100% recorded interest in the land portfolio. As of the effective date of this report, all mining claims and leases are active and in good standing.

1.2.1 MacLellan Property

Formerly operated as an underground gold and silver mine between 1986 and 1989, the MacLellan site and its surrounding property is accessible via a 4.6 km all-weather gravel road that traverses from the former mine site to Provincial Road (PR) 391 and approximately 3.4 km to the Town of Lynn Lake. The whole of the MacLellan Property, which includes the historical MacLellan mine site lands, covers an area of 3,248 ha by way of eighteen (18) mining claims, five (5) Crown mineral leases and nineteen (19) Crown surface leases, covering an area of 3,248 ha.

The historical MacLellan site has been in a "care and maintenance" phase since 1989 with very little reclamation having taken place. This site currently consists of an all-weather gravel access road, a bridge over the Keewatin River, a power transmission line (abandoned pole line), and infrastructure from the former underground mine, such as a head frame, hoist house, shaft, access ramp, maintenance and other storage buildings, core shack and racks, vent raise, and mine water settling ponds.

1.2.2 Gordon Property

The Gordon site, historically referred to as the Farley Lake open-pit mine, was operated as a two-pit open-pit gold mine from 1996 to 1999. Accessible by a 15 km all-weather gravel road leading from PR 391, the former mine site is located approximately 37 km east of the Town of Lynn Lake. The Gordon property consists of 73 mining claims and four (4) Crown mineral leases totalling 13,427 ha.

After closure of the historical mine (see Section 1.4), the Gordon site was reclaimed. The present site consists of the above-mentioned gravel access road, a bridge across the Hughes River, two mine rock storage areas and two overburden storage areas that have been capped, and two water-filled open pits. All buildings and infrastructure from the historical operations have been removed.

1.3 Accessibility, Climate, Local Resources, Infrastructure and Physiography

Private all-weather gravel access roads connect both the MacLellan and Gordon sites with PR 391. PR 391 is a provincial road connecting Lynn Lake to Leaf Rapids (105 km east) and Thompson (315 km southeast), under the authority of Manitoba Infrastructure, Region 5.

The Town of Lynn Lake is a former mining community. The privately operated Lynn Lake Airport accommodates chartered flights and has a 1,700 m paved runway.

The LLGP is located within a remote, rugged region of the Boreal Shield Ecozone, in a climatic region characterized by short, cool summers and long, cold winters. The terrain consists of mostly hilly, till-veneered bedrock, with intervening low areas of organic terrain ranging from level to moderately sloping (0-15%). Surface water features and peat generally occupy the topographic lows. Soils in the region are thin, poorly drained, and acidic, with organic soils typical in bogs and peat plateaus. Discontinuous permafrost is widespread.

The general area of the LLGP overlaps with the Paleoproterozoic Lynn Lake Greenstone Belt (LLGB) within the Churchill Structural Province of the Canadian Shield. The LLGB is comprised of volcanic rocks of the Wasekwan Group, sedimentary rocks of the Sickle Group, and plutonic intrusions. Overburden geology is characterized as glaciolacustrine sediments overlying either bedrock or a discontinuous regional sand till. Organic deposits consist of a thin veneer with thicker accumulations observed in low-lying areas. Isolated pockets of glaciofluvial sediments are also present. Sporadic and discontinuous permafrost is known to occur in the area. A series of bedrock valleys near the MacLellan site are present where overburden is greater than 28 m thick.

1.4 History

1.4.1 MacLellan Property

Exploration on the MacLellan area commenced in 1946 when Noranda Mines carried out magnetometer and geological surveys on the property. Numerous companies have explored the MacLellan Property and surrounding area between 1946 and 2023. SherrGold Ltd. and LynnGold Resources Inc. underground mined the MacLellan, Nisku, and Rainbow zones from 1986 to 1989 reportedly producing 111,600 oz of gold from 969,680 tonnes of ore grading 5.36 g/t (Chornoby P. , 1991). Alamos acquired 100% of the LLGP in 2016 and has been actively conducting exploration in the MacLellan area through 2022.

1.4.2 Gordon Property

Exploration in the Gordon area commenced in 1945, where gold was first discovered by Sherritt Gordon Mines Ltd. (Sherritt) in frost heaved boulders along the northwest shore of Farley Lake. Subsequent drilling in 1947 confirmed the mineralization which was referred to as the “Lind Zone”. Black Hawk Mining Inc. (Black Hawk) mined the East and Wendy Open Pits from 1996 to 1999 reportedly producing 214,800 oz of gold from 1,700,000 tonnes of ore (Blackhawk, 1996 to 1998). Alamos acquired 100% of the LLGP in 2016 and has been actively conducting exploration in the Gordon area through 2023.

1.5 Geological Setting and Mineralization

The Lynn Lake Greenstone Belt (LLGB) is located within the Paleoproterzoic Churchill Structural Province of the Canadian Shield. The LLGB, is divided into the North and South Belts, both of which are part of a larger litho-structural unit that extends in a north-easterly direction from the La Ronge Greenstone Belt in Saskatchewan. Rocks of the LLGP have undergone upper greenschist to upper amphibolite metamorphism.

Both the North and South Belts are comprised of steeply north-dipping mafic/ultramafic to felsic volcanic rocks, clastic sediments, oxide facies banded iron formation, and mafic to felsic plutonic rocks. The belts are separated and bounded to the north and south by large granitic batholiths.

The MacLellan property is located on the western portion of the North Belt. The MacLellan deposit is in the western portion of the North Belt and consists of multiple high grade ore zones contained within a package of northeast trending, hydrothermally altered, ultramafic flows, basalts and volcaniclastic rocks. The Gordon property is in the eastern portion of the North Belt. The Gordon deposit is characterized by a series of sulphidized, auriferous, moderating dipping veins hosted primarily by iron formation. The hydrothermally altered haloes adjacent to the veins in the iron formation are also mineralized. A second steeping deeply mineralization domain is present along the diorite intrusion to the south. The diorite intrusion itself, is host to discontinuous, mineralized quartz-carbonate veins.

1.6 Deposit Types

1.6.1 MacLellan

Both MacLellan and Gordon deposits can be considered as belonging to the class of gold deposits referred to as orogenic. The orogenic gold deposit model (Groves, Goldfarb, Gebre-Mariam, Hagemann, & Robert, 1998) characterizes structurally controlled gold occurrences formed during orogenesis by either metamorphic or deeply sourced magmatic fluids. The ore bodies typically form ore shoots of varying dimensions. All deposits are associated with an alteration halo characterized by proximal to distal carbonatization and proximal potassic alteration.

1.7 Exploration

Exploration programs by Alamos Gold since acquisition of the property comprise mapping and sampling, airborne magnetic and gravity surveys, soil and till sampling, and exploration drilling.

Over 3,500 diamond drill holes totalling over 550,000 m dating back to the 1940s have been completed within Alamos' Lynn Lake Project tenure. Much of this drilling was concentrated within and in proximity to the MacLellan and Gordon deposits. Drilling completed by Alamos from 2017-2022 has largely focused on greenfield and brownfields exploration outside of the MacLellan and Gordon resource areas.

1.8 Drilling

1.8.1 MacLellan

Drilling at the MacLellan deposit has been conducted over a series of campaigns dating back to 1955. A total of 1,571 surface and underground drill holes (223,939 m) have been completed within the MacLellan Resource area.

1.8.2 Gordon

Drilling within the Gordon deposit has been conducted over a series of campaigns dating back to 1985. A total of 595 surface drill holes (95,501 m) has been completed within the Gordon Resource area.

1.9 Sample Preparation, Analyses and Security

Since 2007, drill core samples from MacLellan and Gordon were submitted to accredited commercial laboratories and assayed for gold using industry-standard fire assay techniques. Since, 2015 all core handling, sample preparation and analyses have adhered to industry standard QAQC protocols. The resource database also includes drill core samples from prior to 2007. Laboratory assay certificates exist for the 654 series of drill holes drilled between 1985 and 1998 at the Gordon Project. Pre-2007 assays for drill holes at the Maclellan property (Sherritt, SherrGold, and LynnGold) were completed at the Sherritt site laboratory.

1.10 Data Verification

In 2016, Alamos staff compared the resource drill hole database and the original assay certificates from the Sherritt site laboratory for pre-2007 drill holes for MacLellan, and the 654 series of drill holes at Gordon that were drilled by Manitoba Mineral Resources (MMR) during the period of February 1985 to April 1995.

For MacLellan, 6,719 samples were checked, and 48 errors were identified and corrected. For Gordon, 3,872 samples were checked, with three errors identified and corrected.

In 2018 and 2019 a validation of surface drill hole collar locations at Gordon and Maclellan, respectively was completed by Alamos. Based on locating and accurately surveying select drillholes in the field, a collar location transformation was completed for 366 historic 654-series drill holes at Gordon. A validation of surface and underground drill hole collar locations at MacLellan resulted in the transformation of 326 surface and 28 underground drill hole collars from historic local grid coordinates to UTM coordinates. Additionally, 79 drill hole collars were added to the database.

The assay database at both Maclellan and Gordon has been validated but checking about 10% of the records against the original drill logs and assay certificates. The validation rate was greater than 99% lending a high degree of confidence to the historical assay database.

1.11 Metallurgical Testwork

1.11.1 Historical

A simple, whole ore leach process was used to treat MacLellan ore (SherrGold, 1980's) and Gordon ore (Black Hawk, 1990's) in the Sherritt copper-nickel concentrator, which was adapted for gold processing.

1.11.2 Test Programs

Alamos has conducted four phases of metallurgical testing since 2015, all at SGS Canada Inc. (SGS) in Lakefield, Ontario, using drill core composited into master, global, variability, reserve grade, and location-specific samples. Objectives for each of the four stages of metallurgical testwork were to:

1) Finalize flowsheet selection, optimize the main process parameters, determine comminution data, and assess metallurgical variability;
2) Obtain comminution data (using whole PQ core) and conduct metallurgical tests on the products of the comminution tests;
3) Assess the process behaviour with internal dilution and test additional samples from the far eastern end of the MacLellan deposit; and
4) Assess the comminution and process behaviour for samples from the initial three years of mine production for both deposits.

1.11.3 Mineralogy

For MacLellan ore, the gold occurs as a mix of native gold, electrum, and kustellite. The gold is fine grained, and predominantly liberated or exposed. Micro-probe mineralogy confirmed that some gold is associated with arsenopyrite as micro-encapsulations.

For Gordon ore, the gold was found almost exclusively as native gold and is almost completely found as liberated or exposed attachments to iron oxides.

Although the gold is fine grained, both deposits have some coarse gold (> 100 µm) at an apparent rate of 1 grain per 2 kg sample.

1.11.4 Comminution

The deposits are of average hardness from a grinding perspective but have a high to very high competency for SAG milling. The work indices from all tests were:

- Bond rod mill work index; average was 18.6 kWh/t; and
- Bond ball mill work index; average was 14.8 kWh/t from a range of 10-20 kWh/t.

The JK parameter Axb average was 28, with a range of 20-40.

Although similar in characteristics, the Gordon ore is more competent and harder than the MacLellan ore.

1.11.5 Extraction and Recovery

The optimum grind size determined for plant feed blends of MacLellan and Gordon ores was a P80 of 75 µm. This is based on grind sensitivity trends, specific power required per ore type, unit cost of power, and cyanide consumption with varying grind size. Gordon ore is strongly sensitive to grinding, while MacLellan ore is not, in the range of grind sizes considered.

The overall recovery from whole ore leaching was comparable to that from gravity plus leaching of the gravity concentrate. Overall recovery was not improved using flotation and leaching of reground flotation concentrate and flotation tails. The standard laboratory tests used a gravity stage ahead of leaching to improve reconciliation of calculated and assayed heads and to mitigate potential misinterpretation of the test results from spotty or higher-than-usual residue grades.

The gold recovery from tests on MacLellan ore-grade samples was 93%. The corresponding silver recovery was 50%.

Similarly, the gold recovery for Gordon ore-grade samples was 93%. No significant silver grades occur in Gordon ores.

Pre-aeration with oxygen at a nominal pH 10 prior to leaching was essential to improve extraction kinetics and reduce consumption of sodium cyanide in the downstream leaching circuit. Six hours was provided for pre-aeration based on oxygen uptake tests on various ore types, including high sulphur pyrrhotite and pyrite ores.

A total leach and adsorption time of 48 hours was suitable for these ores. Leach extraction is essentially complete ahead of six stages of counter-current, carbon-in-pulp adsorption, as confirmed by a series of simulations using proprietary modelling carried out by SGS Lakefield.

1.11.6 Detoxification and Environmental

Final leach/CIP tailings slurry is amenable to cyanide detoxification with the SO_2/air(O2)/Cu^{2+} process. The not-to-exceed concentration of 10 mg/L weak acid dissociable cyanide was achieved at normal reagent doses. Environmental tests (i.e., toxicity characteristic leaching procedure, shake flask extraction, acid base accounting, humidity cell tests, and sub-aqueous column tests) were completed on selected composite samples and leach products.

1.12 Mineral Resource Estimates

The open pit Mineral Resource estimate is based on data available from 2,316 drill holes drilled from surface and underground, comprising 221,371 m of assayed gold intervals.

Separate block models were constructed for the MacLellan and Gordon deposits and the Mineral Resource estimate was constrained by mineralized shapes, based on a 0.3 g/t and 0.5 g/t Au cut-off grades for MacLellan and Gordon respectively.

The Mineral Resources, as of June 30, 2023, for the Consolidated LLGP have been estimated by Alamos at 5,843 kt grading an average of 1.40 g/t gold classified as Measured and Indicated Mineral Resources; with an additional 4,243 kt grading an average of 0.98 g/t gold classified as Inferred Mineral Resources (Table 1-1). The Mineral Resources are stated above a 0.355 g/t Au equivalent cut-off for MacLellan and 0.621 g/t Au cut-off for Gordon, both contained within a potentially economically mineable open pit. Mineral Resources are exclusive of Mineral Reserves. The MacLellan and Gordon deposit block models have been depleted for historical underground and open pit mining, respectively see in Table 1-1.

Table 1-1 LLGP Mineral Resource Statement, June 30, 2023

Deposit	Resource Class	Tonnes (000's)	Grade		Contained Ounces	
			Au (g/t)	Ag (g/t)	Au (000's)	Ag (000's)
MacLellan	Measured	786	1.63	3.09	41	78
	Indicated	3,200	1.52	3.44	156	354
	Total Measured and Indicated	**3,986**	**1.54**	**3.37**	**197**	**432**
	Inferred	4,192	0.98	1.49	133	201
Gordon	Measured	571	0.84	-	15	-
	Indicated	1,286	1.20	-	50	-
	Total Measured and Indicated	**1,857**	**1.09**	**-**	**65**	**-**
	Inferred	51	0.98	-	2	-
Lynn Lake Gold Project	Measured	1,357	1.29	1.79	56	78
	Indicated	4,486	1.43	2.45	206	354
	Total Measured and Indicated	**5,843**	**1.40**	**2.30**	**262**	**432**
	Inferred	4,243	0.98	1.47	134	201

Notes:

- *Mineral Resources reported are consistent with the CIM Definition Standards for Mineral Resources and Mineral Reserves.*
- *The Mineral Resources are reported at an assumed gold price of US$1,600/oz, and an assumed silver price of US$23.00/oz.*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves.*
- *Open pit Mineral Resources are stated as contained within a potentially economic open pit above a 0.355 g/t AuEq cut-off for MacLellan and 0.621 g/t Au for Gordon and includes external dilution at zero grade outside the constraining Au solids.*
- *Contained Au and Ag ounces are in-situ and do not include metallurgical recovery losses. • Mineral Resources are exclusive of Mineral Reserves.*
- *Totals may not add up due to rounding.*
- *Jeffrey Volk, CPG, FAusIMM, Director of Reserves and Resources for Alamos Gold Inc is the Qualified Person for the Mineral Resource estimate. Mr. Volk is a Qualified Person within the meaning of Canadian Securities Administrator's National Instrument 43-101 ("NI 43-101").*

1.13 Mineral Reserve Estimate

The estimates of the Mineral Reserves were carried out based on the detailed open pit limit designs for the Gordon and MacLellan deposits and using the Measured and Indicated Mineral Resources of the block models of the two deposits. The estimates were carried out using cut-off grades of 0.796 Au g/t for Gordon and 0.355 Au g/t for MacLellan. These cut-offs were calculated based on project design parameters that include a gold price of US$1,250/Au oz for Gordon and $1,600/Au oz for MacLellan and an USD/CAD exchange rate of 0.75.

A mining dilution skin was applied at Gordon and MacLellan which combines 1-meter of an adjacent waste block with the ore mined. This dilution skin thickness was selected by considering the spatial nature of the mineralisation, proposed grade control methods, digging accuracy, and blast heave. The mining dilution is applied to the model grades. Total applied dilution is 19.7% at Gordon and 14.6% at MacLellan. No ore loss is applied to the Mineral Reserves.

The Mineral Reserves for the LLGP are listed in Table 1-2. The gold and silver grade estimates are based on the diluted grades of the block model.

Table 1-2 LLGP Mineral Reserve Statement, June 30, 2023

Deposit	Reserve Class	Tonnage (000's)	Grade		Contained Ounces	
			Au (g/t)	Ag (g/t)	Au (000's)	Ag (000's)
MacLellan	Proven	16,498	1.66	5.31	883	2,815
	Probable	23,240	1.12	3.55	834	2,650
	Total Proven & Probable	**39,738**	**1.34**	**4.28**	**1,717**	**5,464**
Gordon	Proven	3,502	2.63	-	296	-
	Probable	4,370	2.27	-	319	-
	Total Proven & Probable	**7,873**	**2.43**	-	**615**	-
Lynn Lake Gold Project	Proven	20,000	1.83	4.38	1,179	2,815
	Probable	27,610	1.30	2.98	1,153	2,650
	Total Proven & Probable	**47,610**	**1.52**	**3.57**	**2,332**	**5,464**

Notes:

- *Mineral Reserves reported are consistent with the CIM Definition Standards for Mineral Resources and Mineral Reserves.*
- *Mineral Reserves are reported to a cut-off grade of 0.796 Au g/t at Gordon and 0.355 Au g/t for MacLellan.*
- *The cut-off grades are based on a gold price of US$1,250/oz Au at Gordon, US$1,600/oz Au at MacLellan.*
- *Silver is not used in the cut-off grade calculation.*
- *Metallurgical Au recovery is 92.4% for Gordon and a feed grade-based formula for MacLellan.*
- *Totals may not add up due to rounding.*
- *Chris Bostwick, FAusIMM, Senior Vice President, Technical Services is the Qualified Person for the Mineral Reserve estimate. Mr. Bostwick is a Qualified Person within the meaning of Canadian Securities Administrator's National Instrument 43-101 ("NI 43-101").*

1.14 Mining Production Plan

The development of the Gordon and MacLellan deposits is planned as a conventional shovel truck operation, as both deposits outcrop and are amenable to open pit methods.

The mine plan production summary is listed in Table 1-3. Key characteristics of the life-of-mine (LOM) plan are as follows:

- Concurrent operations on Gordon and MacLellan are planned at start-up of operations. The development targets the early depletion of Gordon in Year 5, due to its higher grade. The mine life of MacLellan is 11 years, in addition to the two year pre-production period.
- The phased development of both open pits is planned.
- The LOM calls for peak mining rate of 16 Mt/a at Gordon and 33 Mt/a at MacLellan. The mine plan calls for total mining in the range of 4 to 49 Mt/a over the eleven year mine operating life of the open pits. Rate of vertical advance also limits the mine capacity in the final years of mining.

The selection of mining equipment type and size was influenced by the scale of the operation and site-specific operating conditions, such as operating in severe climatic conditions in the winter, the remoteness of the mine location, and operating around underground openings in MacLellan.

Blasthole drilling at MacLellan and Gordon will be completed with a combination of diesel and electric down the hole hammer (DTH) drills with 178 mm bits.   These drills provide the capability to drill patterns for 10 m bench heights.

Primary mining at MacLellan will be completed with 22 m^3 electric hydraulic shovels and 139 t rigid body trucks. Additional loading support will be provided by a 11.5 m^3 wheel loader and 6.7 m^3 hydraulic excavator when needed. Mining at Gordon consists of four 6.7 m^3 hydraulic excavators loading 63 t rigid body trucks.

The haulage of ore from the Gordon site to the process facility at MacLellan will utilize 43 t B-train side dump trailers. Total one-way haul distance is 53 km.

Highway haulage of ore from Gordon to MacLellan will be an owner activity.

Table 1-3 Summary of Key Quantities for Lynn Lake Gold Project Mine Plan

Quantity	Year																		Total
	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	
Gordon Tonnes Mined (kt)	-	4,395	15,000	16,000	16,000	10,301	3,446	-	-	-	-	-	-	-	-	-	-	-	-	65,142
MacLellan Tonnes Mined (kt)	4,237	13,451	24,000	33,000	33,000	33,000	33,000	33,000	33,000	31,691	20,375	10,557	4,367	-	-	-	-	-	-	306,679
Total Tonnes Mined (kt)	4,237	17,847	39,000	49,000	49,000	43,301	36,413	33,000	33,000	31,691	20,375	10,557	4,367	-	-	-	-	-	-	371,822
Gordon																				
Ore (kt)	-	6	790	1,631	2,946	1,679	817	-	-	-	-	-	-	-	-	-	-	-	-	7,869
Au Grade (g/t)	-	3.08	2.11	2.36	2.36	2.34	3.33	-	-	-	-	-	-	-	-	-	-	-	-	2.43
MacLellan																				
Ore (kt)	67	520	4,286	7,507	2,729	1,090	1,875	2,781	4,611	5,381	4,503	2,726	1,663	-	-	-	-	-	-	39,738
Au Grade (g/t)	0.92	0.92	1.38	1.41	1.31	1.02	1.04	1.20	1.28	1.26	1.36	1.70	1.79	-	-	-	-	-	-	1.34
Ag Grade (g/t)	2.95	2.95	5.25	4.49	3.69	3.30	2.89	3.22	3.59	4.17	4.83	5.19	5.49	-	-	-	-	-	-	4.28
Process Summary																				
Annual Mill Feed (kt)	-	-	2,259	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	1,548	47,607
Au Grade (g/t)	-	-	2.55	3.07	2.85	1.96	1.91	1.52	1.71	1.71	1.69	1.56	1.23	0.74	0.73	0.87	0.53	0.52	0.52	1.52
Ag Grade (g/t)	-	-	5.42	5.50	2.51	1.69	2.21	2.20	3.60	5.25	5.70	4.83	4.30	3.36	3.18	3.55	2.48	2.39	2.41	3.57
Au Recovery (%)	-	-	94.4%	94.4%	93.3%	92.9%	93.0%	93.7%	94.2%	94.3%	94.3%	94.1%	93.8%	93.3%	93.3%	93.4%	92.3%	92.0%	92.0%	93.7%
Ag Recovery (%)	-	-	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%
Au Produced (koz)	-	-	175	272	250	171	167	133	151	152	150	137	109	65	64	76	46	45	24	2,185
Ag Produced (koz)	-	-	189	248	113	76	99	99	162	236	257	218	194	151	143	160	112	108	58	2,623

Source: AGP (2023)

1.15 Recovery Process

The unit operations used to achieve plant throughput and metallurgical performance are well proven in the gold/silver processing industry. The flowsheet (Figure 1-1) incorporates the following major process operations:

- Two-stage crushing and storage bin;
- Semi-autogenous grinding (SAG);
- Ball mill grinding and classification;
- Pebble crushing (future, if needed);
- Leaching and carbon-in-pulp (CIP) adsorption;
- Desorption and gold room;
- Tailings detoxification and disposal;
- Fresh and reclaim water supply; and
- Reagent preparation and distribution.

Design throughputs for the following parts of the plant are:

- Crushing plant: 8,000 t/d or 481 t/h at 69% availability
- Process plant: 8,000 t/d or 362 t/h at 92% availability

Life-of-mine feed grade to the plant is 1.52 g/t Au and 3.57 g/t Ag. Average annual production over the life of the project is 135 Koz/a of gold and 160 Koz/a of silver. In the first ten years of mining, average annual gold production is 176 Koz/a of gold and 170 koz/a of silver.

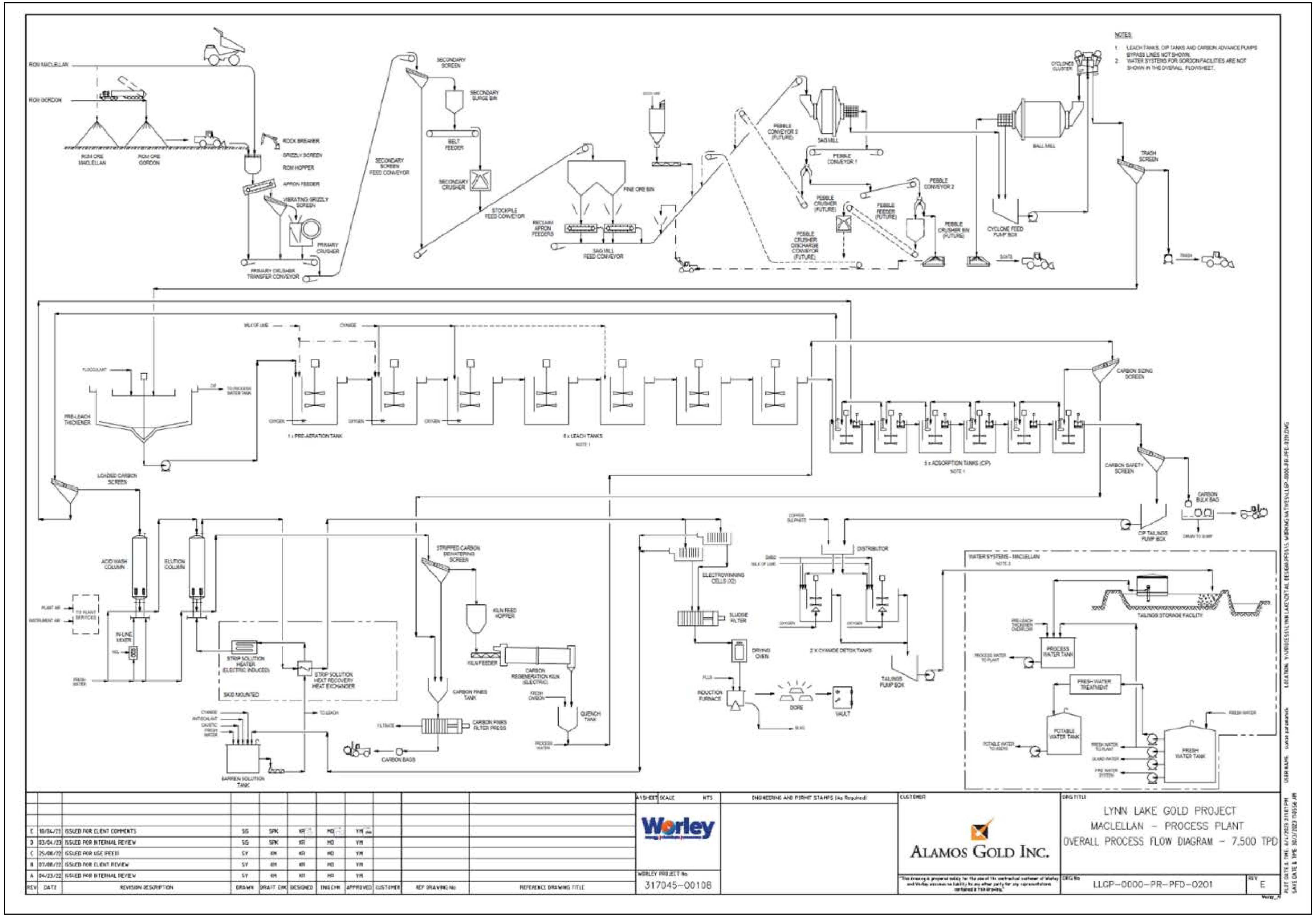


Figure 1-1 Overall Process Flow Diagram

Source: Worley (2022)

1.16 Infrastructure

1.16.1 Access

The MacLellan and Gordon sites are both connected to PR 391 via access roads. The existing 4.8 km access road to the MacLellan process plant site will be upgraded and resurfaced. The single-lane concrete bridge over Keewatin River on the existing Maclellan access road was removed in the spring of 2021 and was replaced with a new prefabricated, two-lane steel bridge to accommodate the increase in traffic to and from the site.

1.16.2 Water Management Plan

The overall water management concept for the MacLellan site is to divert non-contact water to reduce the amount of water managed at site, and to collect contact water for discharge to:

- The TMF, where water is stored for recirculation to the mill for use as process water or accumulated in the TMF pond; or
- A collection pond located near the process plant. If the mill process requirements cannot be met by the water volumes in the TMF, it will be taken from a collection pond. Excess water can then be treated (if necessary) prior to the release of water to the environment.

Water balance modelling was carried out to estimate the amount of water collected at the sites, the amount of water available in the TMF for reclaim, the discharge volumes to the environment (i.e., site excess water), and the operating volume requirements for TMF and collection pond sizing.

1.16.3 Tailings Management Facility

The site is located within the sporadic to discontinuous permafrost zone, where permafrost is typically found in 10-50% of the land area and in a relatively low seismic hazard region, known as the “stable central region”. The MacLellan TMF is located approximately 2 km northeast of the planned open pit and plant site areas, and about 2 km northwest of Minton Lake.

Geotechnical investigations indicated that the thickness of the overburden ranged from 0.61 m (BH18-03) to 4.62 m (BH18-01). The overburden thickness was less than 1 m for the majority of the boreholes. The overburden conditions consisted primarily of discontinuous surficial peat overlaying a non-cohesive, well-graded sand to gravel deposits.

The tailings are silty fine sand size with a specific gravity of 3.0. They are reported to be potentially acid generating (PAG), although they are not expected to produce acid rock drainage (ARD) during operations. The tailings have a high leaching potential for arsenic and a low leaching potential for metals, including copper, iron, chromium, and lead. The Mineral Reserve is 47.6 Mt to be processed over 17.0 years excluding pre-production. The tailings-to-ore ratio is 1 which will produce about 31.7 Mm^3 of tailings assuming a deposited void ratio (vol. voids / vol. solids) of 1.0.

The tailings deposition will begin from a starter dam in the East, South and West ends of the TMF to contain approximately about 1 year’s worth of tailings production. It is proposed to deposit tailings and raise the facility by the downstream method. The starter and ultimate dams are rockfill dams with a lined upstream slope using HDPE geomembrane liner to act as the main water retaining barrier since water and potentially acid generating tailings will be impounded against them during the deposition. All dams will be constructed on bedrock. A grout curtain will be considered in locations where the dam is founded on bedrock with poor conditions to limit foundation seepage. The emergency spillway has been designed to allow for safe routing of the IDF to maintain a minimum freeboard and prevent dam overtopping.

Water management of the TMF involves the following:

- Collection and storage of tailings water, TMF seepage and TMF runoff from precipitation for recirculation into the process plant.
- During the first two years of operation, all process water requirements will be taken from the Keewatin River, allowing accumulation of water in the TMF.
- No discharge of water from the TMF to the environment during operations under normal climatic or operating conditions.
- Under wet or EDF conditions, excess water will be routed through the Collection Pond and treated (if necessary) prior to discharge to the Keewatin River.
- Discharge through the emergency spillway under an extreme precipitation event that exceeds the design criteria for the TMF. Discharge from the spillway will report to the Keewatin River.

1.16.4 Power Supply

The operating load at MacLellan is calculated to be 19.8 MW, which will be supplied by Manitoba Hydro's Line 6 from Thompson via Laurier River. The system will require upgrades to operate at 138 kV. Two 21/28 MVA transformers will step down 138 kV incoming voltage to 34.5 kV at the Alamos Main Substation, located next to the Lynn Lake Copper Station. An Alamos-built 8.2 km 34.5 kV pole line will supply power to the Process Plant Substation from the Alamos Main Substation. Power to the project site facilities will be distributed at 13.8 kV.

A total of 2 MW of emergency power at 13.8 kV will be provided by a single diesel generator set connected to the 13.8 kV main bus through an automatic transfer switch at the process plant. In this way, a single generator set will supply standby power to all facilities using the normal power distribution system.

Running load at Gordon is 879 kW, which will be supported by two 1 MW diesel generators in duty/standby configuration. Power distribution will be at 6.9 kV.

1.16.5 Accommodation

A camp facility will be located north of the process plant at the MacLellan site. The camp will have 600 beds (500 purchased and 100 on a two-year lease) for the two-year pre-production period. The single camp facility will service both the MacLellan and Gordon sites.

A temporary 100-man construction camp will be leased for the first 6 months of construction to support site establishment and construction of the permanent camp. There is a cleared area within the process plant area footprint on site, approximately 40 m x 50 m for trailers (containing kitchen and ablution facilities) to house a crew of 15-50 to perform the site preparation activities required e.g., clearing and grubbing to set up the temporary initial camp.

1.17 Environmental Studies, Permitting and Social or Community Impact

Environmental baseline studies were initiated in March 2015 and were used to identify environmental constraints during the development of the Project layouts and designs.

There are several federal and provincial regulatory requirements that apply to the Project, including an environmental assessment (EA) and other environmental permitting obligations. A Project Description was submitted to the Canadian Environmental Assessment (CEA) Agency on July 4, 2017, to initiate the federal EA process under the Canadian Environmental Assessment Act (CEAA, 2012) and to inform the provincial EA process under The *Environment Act of Manitoba*. As per the transition provisions described in Section 181 of the new Impact Assessment Act (IAA), which came into effect on August 28, 2019, and given that the LLGP EA was started on September 1, 2017 and the project is a designated project under item 18(d) and 19(c) of the IAA, Alamos was advised by the Impact Assessment Agency of Canada (IAAC) that the EA of the project will continue in accordance with the CEAA 2012 process as if it had not been repealed. An Environmental Impact Statement (EIS) document, based on the 2019 Project design, was prepared, and submitted to IAAC on May 25, 2020, to satisfy federal and provincial EA requirements, and two separate Environment Act Proposal Summary Reports for the MacLellan and Gordon mine sites were submitted to the Environmental Approvals Branch of Manitoba Conservation and Climate on August 19, 2020, to satisfy provincial requirements.

On March 6, 2023, the Minister of Environment and Climate Change Canada issued a positive Statement for the Project and the Province of Manitoba issued Environment Act Licenses for the MacLellan and Gordon sites.

As at the date of this report, the positive statement for the project is subject to a federal judicial review and the Manitoba Environment Act licenses are being appealed by a proximate first nation. See *Cautionary Notes*.

The Project design, including implementing the identified mitigation measures, is not anticipated to cause significant adverse environmental effects, including effects from accidents and malfunctions, effects of the environment on the Project and cumulative effects. No issues have been identified to date that are expected to materially affect the ability of Alamos to extract minerals from the Project. This will be confirmed through the environmental assessment and permitting phases of the LLGP development and may require additional design modifications or mitigation measures to be implemented. It is expected that a Notice of Alteration to the Province of Manitoba as well as a Notification of Change to IAAC will be required in relation to the design changes discussed in this report, if they will be implemented. As discussions with agencies are still ongoing, the extent of additional regulatory approvals and/or changes to the Project cannot fully be captured in this report.

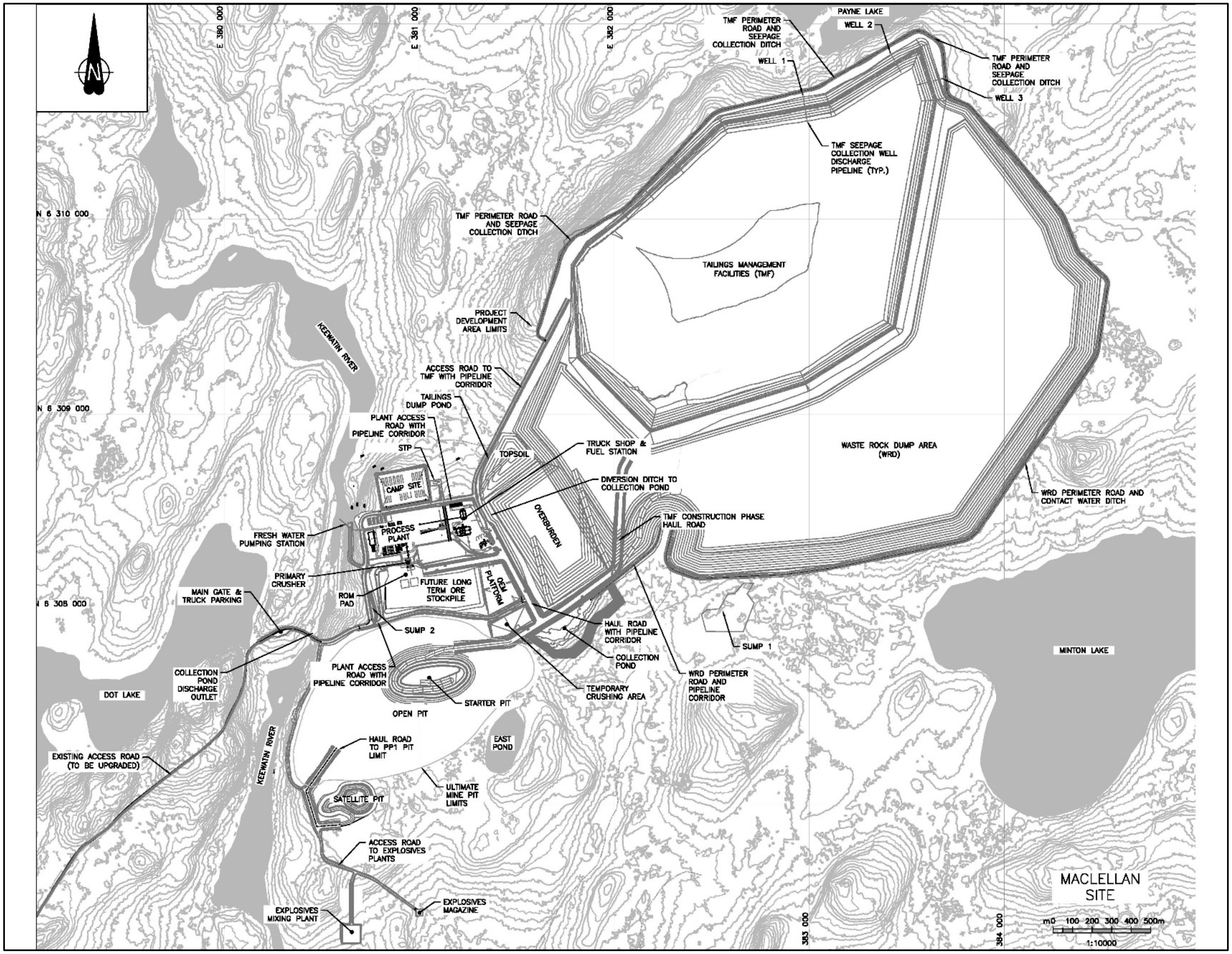


Figure 1-2 MacLellan Site Plan

Source: Worley (2023)

1.18 Capital Cost

The total LLGP capital cost is shown in Table 1-4. Initial direct and indirect capital costs by area are summarized in Table 1-5.

Table 1-4 Total Capital Cost

Facilities	Total Cost (C$M)	Total Cost (US$M)
Initial Capital	842.4	631.8
Sustaining Capital and Closure	267.6	200.7
Total Capital Cost	1,109.9	832.4

Table 1-5 Summary of Initial Capital Costs

Description	MacLellan Mine ($M)	Gordon Mine ($M)	Both Mines ($M)
Direct Cost:			
Mine Infrastructure	$68.1	$14.0	$82.1
Owner Pre-stripping	$20.1	$20.7	$40.8
Mining Initial Capital Lease Payment	$22.8	$10.2	$33.0
Process Plant	$189.0		$189.0
Utilities and Services	$40.5	$5.8	$46.3
Tailings Management	$51.3		$51.3
On-site Infrastructure	$90.6	$50.5	$141.2
Off-site Infrastructure:	$35.9		$35.9
Subtotal Direct Costs	**$518.3**	**$101.2**	**$619.5**
Indirect Cost:			
EPCM and Consulting Services			$18.6
Freight			$10.3
Temporary Construction Facilities and Utilities			$92.3
First Fills and Opening Stocks			$8.4
Subtotal Indirect Costs			**$129.6**
Subtotal Direct + Indirect			**$749.0**
Project Contingency			$70.7
Sub Total Directs + Indirects + Contingency			**$819.7**
Owner's Cost			$22.6
Total Initial Capital			**$842.4**

The cost estimate base date is Q4 2022, and the scope of work consists of direct costs, indirect costs, Owner's costs, and contingency, as follows:

- Direct costs: Costs of all permanent equipment and bulk materials and the installation costs for all permanent facilities, including contractor's supervision and management costs, contractor's travelling costs and contractor's administration and profits.
- Indirect costs: Costs of EPCM services, temporary construction facilities and services, construction equipment, freight, vendor erection supervision, commissioning, and start-up, first fills and spares.
- Owner's costs: Costs associated with owner's facilities and services during construction, owner's project management, ramp-up and general fees.
- Contingency: A construction contingency to cover necessary work within the defined scope of the project that cannot be identified or itemized at this stage but is expected to be incurred.

The major facilities (areas) covered in the capital cost estimate are as follows:

- Mine area;
- Process plant;
- Tailings management;
- On-site infrastructure; and
- Off-site infrastructure.

The estimate conforms to AACE Class 3 Guidelines for a feasibility study estimate with a -10% to +15% accuracy. Owner's costs include the following:

- Land;
- Owner's team including construction, start-up, and commissioning;
- Recruiting, training, and site visits;
- IT and communications; and
- Insurance, finance, legal, and Lynn Lake office.

1.19 Operating Cost

The overall LOM operating cost excluding pre-production is $2,105 M (US$1,579 M) or $44.21/t (US$33.16/t) of ore milled. Table 1-5 presents the total operating costs for the project.

Table 1-6 LOM Operating Cost Summary

Cost Centre	M$	$/t milled	% of Total
Mining	1,064.2	22.35	51%
Highway Haulage (Gordon hauled ore averaged over full mill tonnage)[1]	74.2	1.56	4%
Processing	682.0	14.33	32%
General and Administration	342.9	7.20	16%
External Refining	7.1	0.15	<1%
Subtotal	2,170.4	45.59	103%
Royalties and Silver Credits	-65.6	-1.38	-3%
Total Operating Costs	2,104.9	44.21	100%

Note:
1. Actual highway haulage operating cost is $9.43/t (excluding camp costs for personnel) applied to milled ore from Gordon only. Indicated $/t is averaged over total mill feed.

1.19.1 Mining Operating Cost

The estimate of the mine operating costs was based on information compiled from original equipment manufacturers and AGP's information and experience on projects of similar scope and size. This estimate assumes that all the equipment is owned and operated by Alamos, with a component exchange and rebuild program with the OEM suppliers as well as other parts suppliers in the vicinity of the operation.

The MacLellan mine costs include the cost of rehandling material from the long-term MacLellan stockpiles, as well as the Run-of-mine (ROM) stockpile at the primary crusher. ROM stockpile rehandling includes all the ore from Gordon, as well as a fraction of the MacLellan ore.

The LOM mine operating costs were estimated at $3.62/t mined for Gordon and $2.92/t mined for MacLellan. The mine operating costs by function are listed in Table 1-7. These costs exclude the pre-production period.

Table 1-7 Mine Operating Cost by Pit and by Area

Mining Cost by Area	Gordon			MacLellan			Total
	$/t	$M	(%)	$/t	$M	(%)	$M
General Mine and Engineering	0.47	28.6	13%	0.44	128.3	15%	156.9
Drilling	0.29	17.9	8%	0.29	84.5	10%	102.4
Blasting	0.34	20.4	9%	0.43	125.4	15%	145.8
Loading	0.41	24.8	11%	0.27	79.5	9%	104.3
Hauling	0.99	59.9	27%	0.86	250.0	30%	309.9
Support	0.90	54.6	25%	0.47	135.4	16%	190.0
Grade Control	0.15	8.9	4%	0.09	25.3	3%	34.3
Dewatering	0.08	4.8	2%	0.05	15.7	2%	20.6
Total	3.62	220.0	100%	2.92	844.2	100%	1064.2

1.19.2 Process Operating Cost

The LOM process operating cost is $682 M or $14.33/t milled. A breakdown of this value and its unit costs is presented in Table 1-8, note that this excludes transportation and refining costs for doré.

Table 1-8 LOM Process Operating Cost

Cost Centre	$M	$/t milled	% of Total
Labour (O&M)	176.4	3.71	26%
Power	86.6	1.82	13%
Operating Consumables:			
Reagents	241.8	5.08	35%
Steel Liners and Ball Media	76.2	1.60	11%
Utilities	7.6	0.16	1%
Maintenance	81.9	1.72	12%
Laboratory and Assays	11.4	0.24	2%
Total Process Operating Costs	**682.0**	**14.33**	**100%**

1.19.3 G&A / Accommodation Cost

The LOM G&A / accommodation cost is $343 M or $7.20/t milled. A breakdown of this value and its unit costs is presented in Table 1-9.

Table 1-9 LOM G&A/Accommodations Operating Cost Summary

Cost Centre	Years 1-11		Years 12-17		LOM	
	$ x 1,000	$/t	$ x 1,000	$/t	$ x 1,000	$/t
Salaries	56,626	1.80	21,638	1.34	78,264	1.64
Personnel Costs	944	0.03	484	0.03	1,428	0.03
Human Resources	3,146	0.10	1,615	0.10	4,761	0.10
Infrastructure	2,202	0.07	1,130	0.07	3,332	0.07
Site Admin, Maint & Security	2,517	0.08	1,292	0.08	3,809	0.08
Vehicles	944	0.03	484	0.03	1,428	0.03
Health and Safety	944	0.03	484	0.03	1,428	0.03
IT & Communications	11,954	0.38	6,136	0.38	18,090	0.38
Contract Services	18,875	0.60	9,689	0.60	28,564	0.60
Misc.	3,460	0.11	1,776	0.11	5,237	0.11
Camp Cost	71,854	2.28	9,797	0.61	81,651	1.72
Personnel Transportation	66,214	2.10	7,839	0.49	74,053	1.56
Community Engagement	25,245	0.80	15,574	0.96	40,818	0.86
Total	**264,925**	**8.42**	**77,939**	**4.83**	**342,863**	**7.20**

1.20 Economic Analysis

1.20.1 Taxes

The LLGP will be subject to provincial, federal, and mining taxes as follows:

- Manitoba Mining Tax: sliding scale with rates between 10% and 17%
- Manitoba Provincial Income Tax: 12%
- Federal Income Tax: 15%
- Manitoba Retail Sales Tax (“RST”): 7%

The rates above are current as of the date of this report and are subject to change. Based on these rates and the financial assumptions used in this report, the LLGP is expected to have payable income and mining taxes of $499.1 M (US$374.3 M) over its 17-year life.

1.20.2 Royalties

The LLGP is subject to a capped third-party royalty in the first few years of production from the Gordon pit. Total royalty included in the cash flow model is approximately $13.1 M (US$9.9 M)) and the project is expected to be unencumbered by third-party royalties for the majority of the mine life.

1.20.3 Economic Analysis

A summary of economic results is provided in Table 1-10. The project is economically viable with an after-tax internal rate of return (IRR) of 16.6% and an after-tax net present value at 5% (NPV5%) of $570.5 M (US$427.9 M).

Other economic factors and assumptions used in the economic analysis include the following:

- US$1,675/oz gold, US$22.50/oz silver and a $0.75 USD/CAD exchange rate were used in the cash flow model
- Discount rate of 5%;
- Closure cost of $36.0 M (US$27.0 M);
- No salvage assumed at the end of mine life;
- Working capital outflow of $10.0 M (US$7.5 M) in Year +1, offset by $10.0 M (US$7.5 M) total inflow at the end of mine life;
- Numbers are presented on a 100% ownership basis and do not include inter-company management fees or financing costs; and
- Exclusion of all pre-development and sunk costs (i.e., exploration and Mineral Resource definition costs, engineering fieldwork and studies costs, environmental baseline studies costs, etc.). However, pre-development and sunk costs are utilized in the tax calculations.

Table 1-10 Summary of Economic Results

Category	Unit	Value (C$)	Value (US$)
Net Revenues	$M	4,880.8	3,660.6
Operating Costs[1]	$M	2,104.9	1,578.7
Cash Flow from Operations	$M	2,276.8	1,707.6
Initial Capital Costs	$M	842.4	631.8
Sustaining Capital, Rehabilitation and Closure Costs	$M	267.6	200.7
Total Cash Cost	US$/oz		722
Mine Site All-In Sustaining Cost	US$/oz		814
Net After-Tax Cash Flow	$M	1,166.9	875.2
After-Tax NPV$^{5\%}$	$M	570.5	427.9
After-Tax IRR	%	16.6%	16.6%
After-Tax Payback	Years	3.7	3.7

Note:
1. *Operating Costs include mining, processing, G&A, royalties, transport and refining costs and silver credit.*

A sensitivity analysis was performed to test value drivers on the project's NPV using a 5% discount rate. The results of this analysis are demonstrated in Table 1-11 and Table 1-12. The project proved to be most sensitive to changes in metal price and foreign exchange, followed by operating and capital costs. A sensitivity analysis of the after-tax results was performed using various gold prices. The results of this analysis are demonstrated in Table 1-13.

Table 1-11 Sensitivity Analysis – After-Tax NPV5%

After-Tax NPV5%, millions of CAD					
	-10%	-5%	Base Case	+5%	+10%
Gold Price	$376.5	$469.6	**$570.5**	$671.1	$769.1
Canadian Dollar	$794.0	$677.6	**$570.5**	$473.1	$383.1
Capital Costs	$635.1	$603.7	**$570.5**	$538.4	$506.6
Operating Costs	$659.4	$616.1	**$570.5**	$526.1	$481.5

Table 1-12 Sensitivity Analysis – After-Tax IRR

After-Tax IRR					
	-10%	-5%	Base Case	+5%	+10%
Gold Price	12.7%	14.6%	**16.6%**	18.4%	20.2%
Canadian Dollar	20.6%	18.5%	**16.6%**	14.7%	12.9%
Capital Costs	19.0%	17.8%	**16.6%**	15.5%	14.5%
Operating Costs	18.2%	17.4%	**16.6%**	15.7%	14.9%

Table 1-13 Gold Price Sensitivity on NPV and IRR

Gold Price (US$)	After-Tax NPV (C$M)	After-Tax NPV (US$M)	After-Tax IRR (%)
$1,500	$367.4	$275.6	12.6%
$1,600	$480.3	$360.3	14.8%
$1,675	**$570.5**	**$427.9**	**16.6%**
$1,750	$661.1	$495.8	18.2%
$1,850	$777.9	$583.5	20.3%
$1,950	$893.7	$670.3	22.4%

1.21 Interpretations and Conclusions

This report confirms the technical feasibility and economic viability of the Lynn Lake Gold Project. The project has two properties, MacLellan and Gordon, and is based on conventional open-pit mining with a centralized processing plant facility and tailings management facility. The processing plant, located at MacLellan, has a design processing throughput of 8,000 t/d over the estimated 17-year mine life.

Capital costs were developed according to AACE Class 3 Guidelines for a feasibility study estimate with a -10% to +15% accuracy. The initial capital cost of the project, including processing, initial mine equipment lease payments and pre-production activities, infrastructure, spares, and other direct and indirect costs is $842.4 M (US$631.8 M). Sustaining capital cost is $267.6 M (US$200.7 M) and includes MacLellan and Gordon primary and support equipment lease payments, spare parts, additional TMF lifts, water management and closure costs. The total project capital cost including initial and sustaining capital is $1,109.9 M (US$832.4 M).

The overall operating cost for mining and haulage ($23.91/t milled, $1,138.4 M LOM), processing ($14.33/t milled, $682.0 M LOM), G&A/accommodation ($7.20/t milled, $342.9 M LOM) and external refining ($0.15/t milled, 7.1 M LOM) is $45.59/t milled or $2,170.4 M LOM. After adjusting for royalties and silver credits, the expected operating cost is $44.21/t milled or $2,104.9M LOM (US$1,578.7M).

Risk identification and mitigation was ongoing throughout the feasibility study update, and will continue through detailed engineering, construction, operations, and closure. Risks were identified and qualitatively ranked in the LLGP Risk Register. As the Project moves from feasibility into the execution phase, it will be necessary to update the Project risk register.

1.22 Recommendations

The following activities should be in place during the next phase of the project development:

- Prepare all equipment packages to go for tender;
- Prepare all construction packages to go for tender;
- Secure all remaining required environmental and construction permits beyond federal and provincial EIS approvals obtained in March 2023; and
- Manage and mitigate key risks and pursue opportunities to improve project economics.

A list of specific recommendations has been developed per area as shown in the sub-sections below. The cost to evaluate these recommendations is described below in Table 1-14.

Table 1-14 Proposed Budget Summary

	Cost (C$)
Drilling/Refine ARD Model	$300,000
Metallurgical Services	$110,000
Detailed Engineering & Procurement	$11,700,000
Tailings Management	$300,000
Environment	550,000
Total	**12,960,000**

1.22.1 Geology and Mineral Resource Estimate

Previous work by Carlisle has identified a sizable underground resource at MacLellan that has not been included in this study. Additional drilling is required to infill some gaps in the drilling data with the potential to evaluate the underground Mineral Resources and test the depth extensions of the gold mineralization.

The Burnt Timber and Linkwood deposits, located to the southwest of MacLellan represent an opportunity for additional future mill feed for the MacLellan processing plant. Additional drilling is required to convert Inferred Mineral Resources at these two deposits to Measured and Indicated Resources. Upon receipt of the required permits this higher grade material could potentially offset or postpone the processing of low grade stockpile material in Years 12 to 17.

1.22.2 Mineral Reserve Estimate Update

The work carried out to date on the LLGP has been done in accordance with industry standards, and with applicable risks related to the open pit mining and the estimate of the Mineral Reserves identified. This includes the pit limit optimizations, mine design and mine equipment selection.

The in-situ material value and cut-off grade models are expected to be updated and refined with each iteration of the mine plan. The Mineral Reserves were estimated using cut-off grades of 0.796 g/t Au for Gordon and 0.355 g/t Au for MacLellan. The cut-off grades were calculated based on the design parameters active at the time of the work.

1.22.3 Metallurgy and Process Plant

The following metallurgical work is recommended for the next phase of engineering:

- Confirm competency and hardness characteristics in which suitable samples are selected based on the most recent mine plan and which represent the initial two years of operation and up to about 50 m depth; and
- Operability review of the comminution circuit with respect to dust, materials handling, and cold climate.

1.22.4 Infrastructure

The following activities are recommended for the next phase of engineering:

- The administrative building and mine dry facility were sized based on feasibility level information. The actual size of the facility shall be optimized for actual / updated personnel needs;
- The FS design of the Truck shop facility includes concrete flooring and overhead cranes. The need for hard flooring and fixed crane shall be re-evaluated; and
- Considering the cold climate in the region, the use of precast concrete foundations shall be maximized across the site to improve the construction schedule.

1.22.5 Tailings Management

The current level of study for the LLGP is basic engineering. This will be followed by detailed design and the preparation of construction documents and specifications. This is an evolutionary process as the level of study and design progresses.

For the TMF, the following tasks should be considered for the next stage of engineering:

- Further development of the waste rock management plan with consideration of materials to be used for construction of the start-up dams that are non-acid generating and non-metal leaching;
- Further evaluate the potential borrow sources for dam construction in terms of quantity available and suitability;
- Finalize the tailings dam design incorporating additional geotechnical investigations; and
- Appropriate regulatory agencies must be consulted, and relevant permits and approvals will be acquired.

1.22.6 Environment

The following activities are recommended:

- Other environmental permitting and planning, mitigation, management and follow-up monitoring plans, and associated consultation/ engagement activities (required by federal and provincial project approvals) should proceed in line with the overall project schedule;
- Geochemical characterization should continue as the processing and mining plans are detailed, with modification to the mineral waste management plan as appropriate;
- Estimated closure and reclamation costs should be reassessed, and a complete Closure Plan developed in the next phase of development as more detailed engineering designs become available;
- Water modelling should be updated in the future based on operational conditions to allow any potential future water issues to be identified and proactively mitigated; and
- Active reclamation should be undertaken to the extent practical through operation.

2 INTRODUCTION

This Technical Report is a summation of the 2023 Feasibility Study Update prepared to provide Alamos Gold Inc. (Alamos) with sufficient information to determine the economic feasibility of developing the project.

In November 2014, AuRico Gold Inc. (AuRico) entered into a joint venture agreement with Carlisle Goldfields Ltd. (Carlisle), acquiring a 25% interest in the Lynn Lake Gold Project (LLGP) for an initial cash contribution of $5.0 M, with the option to earn up to a 60% interest by funding $20.0 M on the project over a three-year period and delivering a feasibility study. In January 2016, Alamos consolidated full ownership of LLGP through its acquisition of Carlisle. Throughout this report Carlisle, AuRico, and Alamos may be used interchangeably from the period of 2015 onward and can be collectively referred to as “the Company”.

Ausenco Engineering Canada Inc. (Ausenco) and a group of engineering and environmental consultants completed a Feasibility Study and a NI 43-101 Technical Report for the LLGP in January 2018. The same group of consultants were engaged by Alamos later in 2018 to complete a Feasibility Study Update (FSU) and an internal NI 43-101 Technical Report for the LLGP. Similarly in 2021 Alamos engaged the same group of consultants to do a Feasibility update exercise to obtain updated pricing for key packages and update the overall capital cost estimate.

The LLGP will be built as a conventional open pit mine with on-site processing plant facilities and tailings management facilities. The LLGP is composed of two properties, MacLellan and Gordon. The processing plant, located at MacLellan, has an expected nominal processing throughput of 8,000 t/d with an estimated 17-year production life.

The 2023 feasibility study responsibilities of the engineering consultants are as follows:

- Worley Canada Inc. (Worley) was commissioned by Alamos to manage and coordinate the work related to the FSU. In addition, Worley was engaged to develop the feasibility level design of the process plant and general infrastructure (MacLellan administration building, MacLellan mine truckwash building, MacLellan mine truckshop building, Gordon administration building, assay lab buildings, on-site roads, main substation, power line, and site-wide power distribution).
- AGP Mining Consultants Inc. (AGP) was commissioned to design the open pit final limits, phase development and long-term mine plan. In addition, AGP selected the equipment type and size, developed estimates for open pit mine operating personnel, mine capital and operating costs for the life of the project, and estimated pre-production quantities for the mine development roads.
- Stantec Consulting Ltd. (Stantec) was commissioned to support environmental planning, assessment, licensing, and permitting.
- WSP Canada Inc. (WSP)was commissioned to complete the feasibility-level design of the tailings management facility (TMF) at the MacLellan site, provide slope design recommendations for the MacLellan and Gordon pits and stockpiles, and complete the layout and sizing of water management structures for both sites. WSP was also responsible for undertaking various geotechnical and hydrogeological investigations to support the feasibility-level design and to aid in sourcing borrow materials for construction.
- All consultants were engaged to provide input and contributed to the development of the operating cost (OPEX) and capital and sustaining capital expenditures (CAPEX).
- Alamos reviewed and developed elements of the project related to geological setting and mineralization, Mineral Resources, market studies and contracts, and economic analysis.

2.1 Terms of Reference

All units of measurement are in metric, unless otherwise stated.

The monetary units are in Q4 2022 Canadian dollars, unless otherwise stated.

In some instances, the Gordon Property may historically be referred to as the Farley Property. The property name was changed from Farley to Gordon in 2016.

2.2 List of Qualified Persons

Table 2-1 sets out the Qualified Persons responsible for each section of this Technical Report.

2.3 Technical Report Site Visits

The following Qualified Persons (QPs) visited the Lynn Lake Property as indicated below:

- Jennifer Abols, P.Eng, Director, Projects, Alamos Gold Inc, has visited the site on numerous occasions during the previous years, with her last visit occurring on July 11th to 13th, 2023;
- Chris Bostwick, FAusIMM, Senior Vice President - Technical Services, Alamos Gold Inc. last visited the site November 4th, 2021;
- Michele Cote, M.Sc., P.Geo, Chief Exploration Geologist, Alamos Gold Inc, has visited the site on numerous occasions during the previous years, with her last site visit occurring August 18th to August 22nd, 2022;
- Jeffrey Volk, MSc., CPG, FAusIMM, Director, Reserves and Resources, Alamos Gold Inc., last visited the site, September 24th to 27th, 2018; and
- Colin Webster, P.Eng, Vice President – Sustainability and External Affairs, Alamos Gold Inc, last visited the site June 13th, 2023.

Ms. Abols, Mr. Bostwick, Ms. Cote, Mr. Volk, and Mr. Webster, being employees of Alamos Gold Inc, are not independent of the issuer.

Table 2-1 Section Qualified Persons

Section	Description	Qualified Person	Company
1	Summary	All in part	Alamos Gold Inc.
2	Introduction	Chris Bostwick	Alamos Gold Inc.
3	Reliance on Other Experts	Chris Bostwick	Alamos Gold Inc.
4	Property Description and Location	Chris Bostwick	Alamos Gold Inc.
5	Accessibility, Climate, Local Resources, Infrastructure and Physiography	Chris Bostwick	Alamos Gold Inc.
6	History	Michele Cote	Alamos Gold Inc.
7	Geological Setting and Mineralization	Michele Cote	Alamos Gold Inc.
8	Deposit Types	Michele Cote	Alamos Gold Inc.
9	Exploration	Michele Cote	Alamos Gold Inc.
10	Drilling	Michele Cote	Alamos Gold Inc.
11	Sample Preparation, Analyses and Security	Michele Cote	Alamos Gold Inc.
12	Data Verification	Michele Cote	Alamos Gold Inc.
13	Mineral Processing and Metallurgical Testing	Jennifer Abols	Alamos Gold Inc.
14	Mineral Resource Estimates	Jeffrey Volk	Alamos Gold Inc.
15	Mineral Reserve Estimates	Chris Bostwick	Alamos Gold Inc.
16	Mining Methods	Chris Bostwick	Alamos Gold Inc.
17	Recovery Methods	Jennifer Abols	Alamos Gold Inc.
18	Project Infrastructure	Jennifer Abols	Alamos Gold Inc.
19	Market Studies and Contracts	Chris Bostwick	Alamos Gold Inc.
20	Environmental Studies, Permitting and Social or Community Impact	Colin Webster	Alamos Gold Inc.
21	Capital and Operating Costs	Jennifer Abols / Chris Bostwick	Alamos Gold Inc.
22	Economic Analysis	Chris Bostwick	Alamos Gold Inc.
23	Adjacent Properties	Chris Bostwick	Alamos Gold Inc.
24	Other Relevant Data and Information	n/a	Alamos Gold Inc.
25	Interpretations and Conclusions	All in part	Alamos Gold Inc.
26	Recommendations	All in part	Alamos Gold Inc.
27	References	All in part	Alamos Gold Inc.

3 RELIANCE ON OTHER EXPERTS

This report has been prepared by Alamos Gold Inc. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to Alamos at the time of preparation of this report;
- Assumptions, conditions, and qualifications as set forth in this report; and
- Data, reports, and other information supplied to Alamos by third party sources.

Except for the purposes legislated under applicable securities laws, any use of this report by any third party is at that party's sole risk.

The QPs opinions contained herein are based on information provided by Alamos and others throughout the course of the study including those consultants set out below. The QPs have taken reasonable measures to confirm information provided by others (including the listed consultants) and take responsibility for the information.

The QPs used their experience to determine if the information from previous reports was suitable for inclusion in this technical report and adjusted information that required amending.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Introduction

The LLPG is situated in Northern Manitoba, approximately 820 km northwest of Manitoba's capital, Winnipeg, and involves the redevelopment of two historical gold mines, MacLellan and Gordon (collectively, the "Properties"). Respectively, the Properties are located approximately 7 km northeast and 37 km east of the Town of Lynn Lake. The straight line distance between the Gordon and MacLellan sites is approximately 30 km (Figure 4-1).

The overall Project lands are presently comprised of a portfolio of 361 dispositions including 333 mining claims, nine (9) Crown mineral leases and nineteen (19) Crown surface leases, all of which the recorded interest are held 100% by Carlisle, a wholly owned subsidiary of Alamos. All mining claims, mineral leases and surfaces leases are active and in good standing as of the effective date of this report.

The Company is in receipt of a title opinion dated February 1, 2023, as updated on July 17, 2023, for the lands comprising LLGP, prepared by Thompson Dorfman Sweatman LLP. Notwithstanding the foregoing, while the Company has carried out reviews of the recorded interests to its mining claims, mineral leases, and surface leases, this should not be construed as a guarantee that such recorded interests will not be challenged or impugned. Said mining claims, mineral leases, and surface leases may be subject to prior unregistered agreements or transfers or Indigenous land claims, and therefore such recorded interests may be affected by undetected defects.

4.2 Historical Overview of Property Acquisition

LLGP's property portfolio is comprised of gold and base metal mining claims and leases in the LLGB. Included in the overall land package are the former producing mines of Burnt Timber (which produced from 1993 to 1996), Farley Lake Open Pit Mine [now referred to as the Gordon Site] (which produced from 1996 to 1999) and the underground MacLellan mine [now referred to as the MacLellan Site] (which produced from 1986 to 1989). The present-day disposition of the property package has been achieved by assembling lands over time through grass-root staking activities, exercises of earn-ins under options and purchase acquisitions.

The Company also holds beneficial ownership interests in numerous mining claims located within LLGP's Nail-Franklin area (78.03%) and the Shoe-Lace area (50.31%). On December 31, 2005, Glencairn Gold Corporation (Glencairn), formerly known as Central Sun Mining Inc., entered into a Property Acquisition Agreement that sold certain mining leases and mining claims to AMPX, a private company. The agreement included properties referred to as the Lynn Lake Properties, a diverse group of gold exploration claims and leases in the LLGB of Northern Manitoba, covering approximately 20,000 ha, as well as the former producing underground MacLellan and Nisku mines.

AMPX completed an acquisition agreement with Glencairn in December 2006 that required AMPX to complete a minimum financing of $2.0 M and a 'Going Public Transaction' on or before December 31, 2006. In this regard, AMPX changed its name to "Carlisle" and obtained a stock exchange listing by having its final prospectus approved and accepted on December 28, 2006. As part of the process, Carlisle raised gross proceeds of $4.3 M by way of its initial public offering. Carlisle also met the requirement to incur expenditures on the properties of a minimum of $1.0 M on or before February 01, 2007, and thus earned its complete interest in the properties under terms of the agreement. Under the terms of agreement, a Net Smelter Return (NSR) Royalty Agreement dated December 31, 2005, was entered into, granting a 2% net smelter royalty on gold and silver products and for all other products produced from any of the Lynn Properties (the "NSR"). As the successor in interest to Glencairn, B2Gold Inc. (B2Gold) became the holder of this NSR which covered the MacLellan Property (save and except one mineral and surface lease parcel), a portion of the Gordon Property, and other areas of the LLGP land package. Pursuant to a NSR Royalty Purchase Agreement dated June 07, 2017, B2Gold's NSR interest was bought out by Alamos.

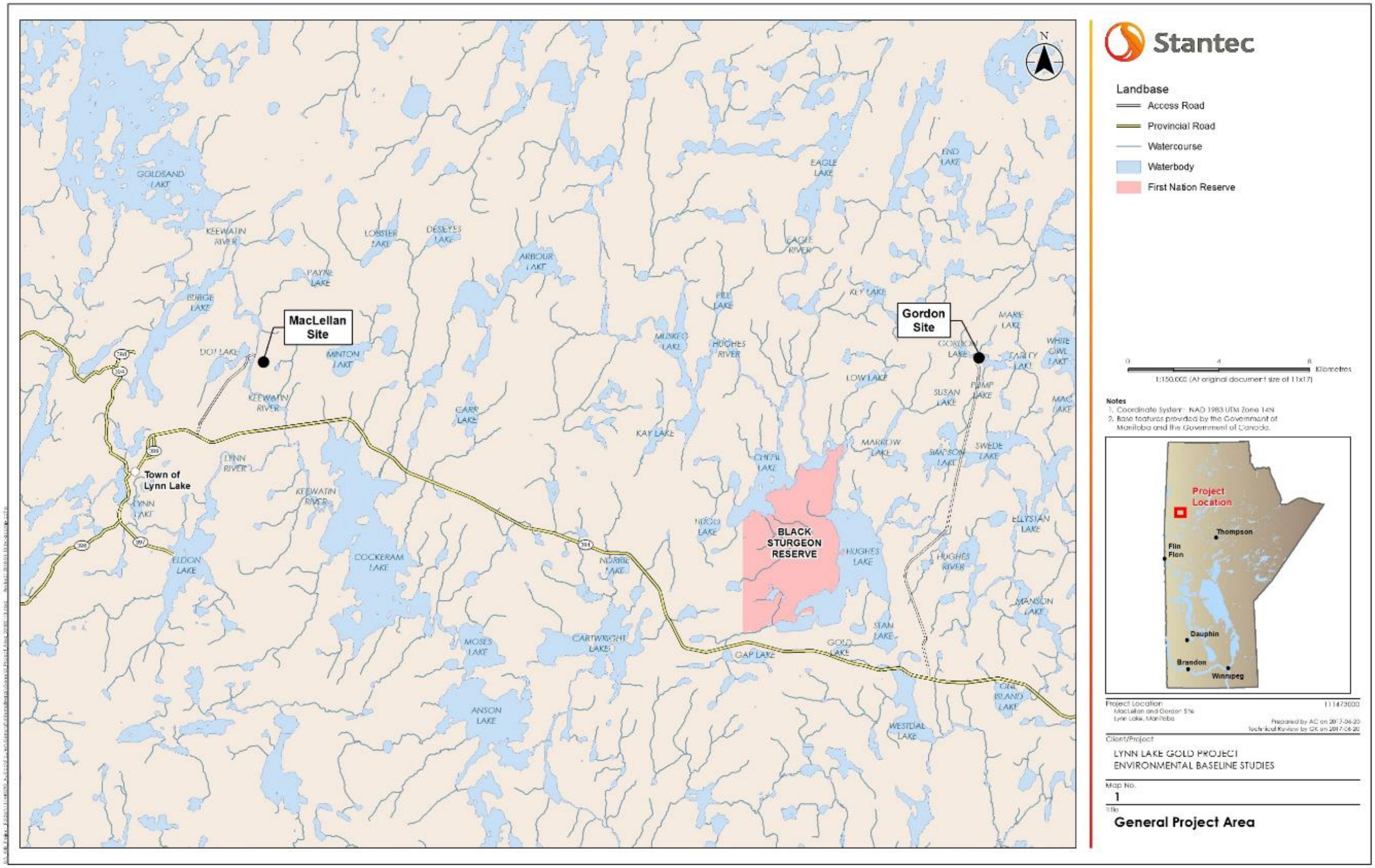


Figure 4-1 General Project Area

Source: Stantec (2023)

In 2013, following the conversion and re-staking of a majority of the then existing Crown mineral leases to mining claims for cost-saving purposes, based upon a clearer understanding of the regional geology, several mining claims were added to the property portfolio resulting in an increased geologic strategic land position in Lynn Lake. Examination of the Farley Lake area geology warranted the staking of 35 additional claims, totalling 7,306 ha, contiguous to the existing claim block adjacent to the former Farley Lake mine area. Similarly, an additional twelve contiguous claims were staked to the west of the Linkwood area, along the Johnson Shear, for an additional 2,476 ha.

On November 20, 2014, AuRico completed a $5.6 M private placement with Carlisle to take a 19.9% interest in the Company. In conjunction with the private placement, AuRico entered into a joint venture agreement on November 11, 2014, with respect to Carlisle's Lynn Lake Gold Camp, pursuant to which AuRico acquired a 25% interest in the properties for an initial cash contribution of $5.0 M. In April 2015, AuRico and Alamos announced that they had entered into a definitive agreement to combine their respective companies. AuRico and Alamos merged pursuant to Articles of Arrangement dated July 02, 2015, with the resulting amalgamated company continuing under the name Alamos Gold Inc. On January 07, 2016, Alamos completed the acquisition of Carlisle and its 100% ownership of the LLGP.

4.3 Access Rights and Permits

As the 100% recorded holder of the Crown lands comprising the LLGP, the Company is granted the exclusive right to prospect, explore, and develop the Crown minerals underlying the mining claims' lands. The Company has secured further access and rights to the project lands by having issued and maintaining Crown mineral leases and Crown surface leases. As a Crown mineral lease lessee, the Company has also been granted exclusive rights to the Crown minerals and mineral access rights to work, mine and erect buildings for the efficient mining and production of minerals. Under its' Crown surface leases, the Company's right has been defined to use the surfaces of its five (5) Crown mineral lease areas located at the MacLellan Property for the efficient and economical performance of its' mining operations.

All mining claims have been located by staking out on the ground as per *The Mines and Minerals Act*. Once recorded, a mining claim is in good standing for two years plus sixty days. Assessment work, in the amount of $12.50/ha for each of the 2nd to 10th years, and $25.00/ha for the 11th year and for each year thereafter, is required to be completed and/or filed annually on each mining claims. A mining claim will be renewed for an indefinite period so long as assessment filings/reportings are completed annually.

All Crown mineral leases held by the Company have been issued for a term of 21 years and are currently considered non-producing. Annual rental for mineral leases not in production is based upon $12.00/ha or fraction thereof, with the annual rent paid being not less than $200.00/a. On the 5th, 10th and 21st anniversaries of the mineral lease, a detailed statement of exploration work performed on the Crown mineral lease parcel must be filed.

The Company's Crown surface leases, which are located within the MacLellan Property, are renewable on an annual basis, for a term that cannot exceed the lease term of the underlying mineral disposition to which it relates. Annual rental for the surface lease is $5.00/ha or portion thereof, with a minimum annual rent to be paid of $100.00.

Although authority to enter the mining claim and mineral lease lands is pursuant to *The Mines and Minerals Act* (Manitoba), work permits are required to conduct fieldwork and other activities on Crown lands. Work permits are issued by Manitoba Sustainable Development (MSD). There are currently two (2) work permits issued for the LLGP, one (1) in support of mineral exploration and associated activities, and one (1) in support of activities related to environmental monitoring/surveying to support the environmental assessment, the particulars of which are as follows:

- Work Permit WP 2021-01-15-001 is a three-year permit issued February 28, 2022, and expiring April 30, 2025, under the authority of Section 7(1)(c) of *The Crown Lands Act* (Manitoba), authorizes the carrying out of an operation on Crown Lands located in the LLGP's MacLellan and Gordon (formerly Farley Lake) mine sites and areas surrounding the mine sites for the purposes of environmental studies, including monitoring/surveying to obtain data for and in support of Environmental Assessment. The permit notes that work conducted in accordance with this permit excludes the areas of Marcel Colomb First Nation's Black Sturgeon Reserve lands. Work Permit WP 2021-01-15-001 is eligible for a two-year extension past the April 30, 2025, expiry date.
- Work Permit WP 2022-01-01-006 is a multi-year permit issued May 1, 2022, and expiring April 30, 2025, that authorizes the carrying out of an operation on Crown Lands located within LLGP's Project lands, on those mining claims described in the work permit, for the purposes of mineral exploration and related activities.

As of the effective date of this report, the above work permits were in good standing.

To access mining claim and lease areas, Crown Land permits for road and/or trail access must be obtained through MSD's Real Estate Services Division (RESD). There are currently three (3) Crown Land permits issued in support of the LLGP in respect of 'all weather roads', as more particularly described below. Each permit is effective for a period of one year from January 01 to December 31, and is renewable annually on payment of the prescribed annual permit fee.

- Crown Land Permit No. GP 70394 authorizes the use of Crown Lands for an all-weather access road to the Burnt Timber mine site and adjoining claim group. The purpose of the Burnt Timber Access Road is to provide access to the mineral dispositions held by the Company. A condition of this issued permit is that the access road remain publicly accessible as a roadway utilized by resource users, and it is to be maintained as a safe, cleared right-of-way for public travel through the land.
- Crown Land Permit No. GP 70395 authorizes the use of Crown Lands for an all-weather road from PR 391 to the MacLellan site for a distance of 4.6 km with a 10 m right-of-way. The purpose of the MacLellan Mine Road is to access the MacLellan mine site and surrounding lands, from PR 391. A condition of this issued permit is that it provides access to Grey Owl Outfitters Inc.'s site located north of this access road's northern bend; and should Grey Owl Outfitters Inc. change hands or name, equal access rights must be granted to the new outfitter.
- Crown Land Permit No. GP 70396 authorizes the use of Crown Lands for an access road from PR 391 to Farley Lake (now Gordon site) site for a distance of 15.0 km with a 10 m right-of-way. The purpose of this Access Road is to access the Farley Lake (now Gordon site) Open Pit Mine while permitting and Feasibility Study work goes on; and if the project is feasible, the road will be used as a haul road to transport from this location to the proposed mill at the MacLellan site via PR 391.

As of the effective date of this report, these three (3) Crown Land permits were in good standing.

Also, the Company has received:

- On March 6, 2023, required Provincial Licence (Environment Act Licence [EAL 3390]) to construct and operate the LLGP at the Gordon Property's mine site in accordance with *The Environment Act* (Manitoba) pursuant to Section 11(1);

- On March 6, 2023, required Provincial Licence (Environment Act Licence [EAL] 3391) to construct and operate the LLGP at the MacLellan Property's mine site in accordance with *The Environment Act* (Manitoba) pursuant to Section 11(1); and
- On March 5, 2023, the Federal Decision Statement for the LLGP for both the MacLellan and the Gordon Properties' respective mine sites. The federal government, in accordance with paragraph 52(1)(a) of the *Canadian Environmental Assessment Act, 2012*, determined that the 'Designated Project' is not likely to cause significant adverse environmental effects referred to in subsection 5(1) of the *Canadian Environmental Assessment Act, 2012*.

4.4 MacLellan

4.4.1 Location and Property Description

Located 7 km northeast of the Town of Lynn Lake, the MacLellan Property's geographic coordinate for its' mine site (specifically the centroid for the proposed open pit) is (UTM Zone 14N): 380900 easting and 6307500 northing.

The MacLellan Property, which surrounds the historical MacLellan mine site, is situated on Crown lands that are currently comprised of eighteen (18) mining claims, five (5) Crown mineral leases and nineteen (19) Crown surface leases, covering an area of 3,248 ha. See Table 4-1 below. All mining claims, Crown mineral leases and Crown surface leases comprising the MacLellan Property are 100% held by the Company. The current disposition of identified lands for future development of the MacLellan site is five (5) mineral leases, nine (9) surface leases, and the surface rights of one (1) mining claim for which an application for a surface lease has been applied for.

Table 4-1 MacLellan Property Mineral and Surface Leases and Mining Claims

	Name	Disposition Number	Disposition Tenure	Area (ha)	Disposition Number Related To	Date Granted	Annual Expiry Date	Term Expiry Date
1	Mine Site	ML68	Mineral Lease	289	SL163	1992-04-01	2024-05-01	2034-04-01
2	Mine Site	ML299	Mineral Lease	21	SL175	1992-04-01	2024-05-01	2034-04-01
3	Mine Site	ML304	Mineral Lease	17	SL176	1992-04-01	2024-05-01	2034-04-01
4	Mine Site	ML305	Mineral Lease	27	SL177	1992-04-01	2024-05-01	2034-04-01
5	Mine Site	ML343	Mineral Lease	209	SL181	2023-02-24	2024-03-25	2044-02-24
6	Mine Site	SL163	Surface Lease	289*	ML68	2015-05-12	2024-06-11	2034-04-01
7	Mine Site	SL164	Surface Lease	31*	CB10340	2023-02-24	2024-02-24	N/A
8	Mine Site Access Road	SL165	Surface Lease	204*	MB10845	2023-02-24	2024-02-24	N/A
9	Mine Site Access Road	SL166	Surface Lease	254*	MB10846	2023-02-24	2024-02-24	N/A
10	Mine Site	SL167	Surface Lease	239*	MB10847	2023-02-24	2024-02-24	N/A
11	Mine Site Access Road	SL168	Surface Lease	226*	MB10848	2023-02-24	2024-02-24	N/A
12	Mine Site	SL169	Surface Lease	134*	MB11701	2023-02-24	2024-02-24	N/A
13	Mine Site	SL170	Surface Lease	149*	MB11702	2023-02-24	2024-02-24	N/A
14	Mine Site	SL171	Surface Lease	147*	MB11703	2023-02-24	2024-02-24	N/A
15	Mine Site	SL172	Surface Lease	222*	MB11710	2023-02-24	2024-02-24	N/A
16	Mine Site	SL173	Surface Lease	220*	MB11711	2023-02-24	2024-02-24	N/A
17	Mine Site	SL174	Surface Lease	116*	MB11712	2023-02-24	2024-02-24	N/A
18	Mine Site	SL175	Surface Lease	21*	ML299	2023-02-24	2024-02-24	2034-04-01
19	Mine Site	SL176	Surface Lease	17*	ML304	2023-02-24	2024-02-24	2034-04-01
20	Mine Site	SL177	Surface Lease	27*	ML305	2023-02-24	2024-02-24	2034-04-01
21	Mine Site	SL178	Surface Lease	28*	P5478E	2023-02-24	2024-02-24	N/A
22	Mine Site	SL179	Surface Lease	145*	P5484E	2023-02-24	2024-02-24	N/A
23	Mine Site	SL180	Surface Lease	192*	P5489E	2023-02-24	2024-02-24	N/A
24	Mine Site	SL181	Surface Lease	209*	ML343	2023-02-24	2024-02-24	2044-02-24
25	Rainbow 101	P5490E	Mining Claim	192	N/A	1985-09-16	2025-11-15	N/A
26	Rainbow 100	P5489E	Mining Claim	192	SL180	1985-09-16	2025-11-15	N/A
27	Rainbow 102	P5484E	Mining Claim	145	SL179	1985-10-10	2025-12-09	N/A
28	Mac 2	P5478E	Mining Claim	28	SL178	1985-09-16	2025-11-15	N/A
29	Shag	CB10340	Mining Claim	31	SL164	1980-01-21	2025-03-22	N/A
30	Mac 1 FR.	P5477E	Mining Claim	9	N/A	1985-09-16	2025-11-15	N/A
31	MAC10845	MB10845	Mining Claim	204	SL165	2013-03-28	2025-05-27	N/A
32	MAC10846	MB10846	Mining Claim	254	SL166	2013-03-28	2025-05-27	N/A
33	MAC10847	MB10847	Mining Claim	239	SL167	2013-03-28	2025-05-27	N/A
34	MAC10848	MB10848	Mining Claim	226	SL168	2013-03-28	2025-05-27	N/A
35	MAC10849	MB10849	Mining Claim	210	N/A	2013-03-28	2025-05-27	N/A
36	MAC10851	MB10851	Mining Claim	223	N/A	2013-03-28	2025-05-27	N/A
37	MAC10852	MB10852	Mining Claim	159	N/A	2013-03-28	2025-05-27	N/A
38	MAC10853	MB10853	Mining Claim	148	N/A	2013-03-28	2025-05-27	N/A
39	MAC10854	MB10854	Mining Claim	220	N/A	2013-03-28	2025-05-27	N/A
40	MAPLE	W47799	Mining Claim	160	N/A	1983-06-22	2025-08-21	N/A
41	TOAST	W47808	Mining Claim	25	N/A	1983-06-22	2025-08-21	N/A
42	FRENCH	W47809	Mining Claim	20	N/A	1983-06-22	2025-08-21	N/A

Note:

Dispositions with its Area (ha) marked with '': those stated hectares are excluded from the overall 'area' total of 3,248 ha for the MacLellan Property, as those excluded hectares are accounted for under a related Disposition.*

The MacLellan site was formerly operated as an underground gold and silver mine between 1986 and 1989 and was closed because of high operating costs and falling gold prices. This site currently consists of a 4.6 km gravel access road, bridge over the Keewatin River, power transmission line (abandoned pole line), infrastructure from the former underground mine, maintenance and other storage buildings, and former mine water settling ponds. Some of the existing infrastructure will be demolished during the Project construction phase; however, some demolition activities may be phased, depending on the location of the former infrastructure and its overlap with the footprint for the new mine infrastructure.

4.4.2 Environmental Liabilities

Alamos has not assumed any environmental liability regarding any of the off-site milling and processing operations conducted by prior owners of the MacLellan site. Tailings deposited elsewhere in Lynn Lake by former operators and other materials around the Lynn Mill from prior base metal operations, which have been rehabilitated but remain in place are the responsibility of others.

The environmental exposure assumed by Alamos is limited to the prior mining operations conducted on the acquired property. The mine was closed in 1989 and has been in a 'care and maintenance' phase since, with little reclamation completed. The Manitoba government is aware of the current state of the property and has identified no environmental concerns at this time.

4.4.3 Impact of Previous Mining Activities

The environmental baseline studies completed in support of the LLGP and discussed herein in Section 20 have considered both the natural environmental setting and the historical activities. The historical activities provide field-scale data on potential environmental effects that could result from future mining activities, even though the mining operations proposed are different than those previously undertaken.

4.5 Gordon

4.5.1 Location and Property Description

Located 37 km east of the Town of Lynn Lake, the geographic coordinate for the Gordon mine site (specifically the centroid for the proposed open pit) is 412400 easting and 6307800 northing (UTM Zone 14N).

The Gordon Property, which encompasses the Gordon mine site’s historic footprint, is situated on Crown land, and consists of seventy-three (73) mining claims and four (4) Crown mineral leases totalling 13,427 ha (Table 4-2). These mining claims and Crown mineral leases are 100% held by the Company. Presently, five (5) mining claims and four (4) Crown mineral leases comprise the current disposition of the lands identified for future development.

The Gordon site, historically referred to as the Farley Lake site, was operated as a two-pit open pit gold mine between 1996 and 1999. After closure, this site underwent a reclamation process. It currently has a 15 km gravel access road, bridge across the Hughes River, two mine rock storage areas and two overburden storage areas that have been capped, and two water-filled open pits. All buildings and infrastructure have been removed.

Table 4-2 Gordon Property Mineral Leases and Mining Claims

	Name	Disposition Number	Disposition Tenure	Area (ha)	Date Granted	Annual Expiry Date	Term Expiry Date
1	KEL11368	MB11368	Mining Claim	256	04/29/2013	2024-06-28	N/A
2	KEL11384	MB11384	Mining Claim	220	04/29/2013	2024-06-28	N/A
3	KEL11370	MB11370	Mining Claim	256	04/29/2013	2024-06-28	N/A
4	KEL11369	MB11369	Mining Claim	256	04/29/2013	2024-06-28	N/A
5	KEL11375	MB11375	Mining Claim	256	04/29/2013	2024-06-28	N/A
6	KEL11380	MB11380	Mining Claim	256	04/29/2013	2024-06-28	N/A
7	KEL11378	MB11378	Mining Claim	240	04/29/2013	2031-06-28	N/A
8	KEL11383	MB11383	Mining Claim	160	04/29/2013	2024-06-28	N/A
9	KEL11376	MB11376	Mining Claim	256	04/29/2013	2024-06-28	N/A
10	KEL11381	MB11381	Mining Claim	256	04/29/2013	2024-06-28	N/A
11	KEL11372	MB11372	Mining Claim	218	04/29/2013	2024-06-28	N/A
12	KEL11385	MB11385	Mining Claim	220	04/29/2013	2024-06-28	N/A
13	KEL11373	MB11373	Mining Claim	200	04/29/2013	2024-06-28	N/A
14	KEL11366	MB11366	Mining Claim	256	04/29/2013	2024-06-28	N/A
15	KEL11377	MB11377	Mining Claim	256	04/29/2013	2024-06-28	N/A
16	KEL11386	MB11386	Mining Claim	110	04/29/2013	2024-06-28	N/A
17	KEL11365	MB11365	Mining Claim	124	04/29/2013	2024-06-28	N/A
18	KEL11374	MB11374	Mining Claim	162	04/29/2013	2024-06-28	N/A
19	KEL11367	MB11367	Mining Claim	256	04/29/2013	2024-06-28	N/A
20	KEL11379	MB11379	Mining Claim	225	04/29/2013	2024-06-28	N/A
21	KEL11382	MB11382	Mining Claim	180	04/29/2013	2029-06-28	N/A
22	KEL11371	MB11371	Mining Claim	256	04/29/2013	2024-06-28	N/A
23	ROB 10837	MB10837	Mining Claim	130	12/18/2012	2029-02-16	N/A
24	LESS	CB11416	Mining Claim	65	07/11/1981	2028-09-09	N/A
25	CART #1	CB10335	Mining Claim	195	02/04/1980	2025-04-05	N/A
26		CB6036	Mining Claim	84	07/18/1977	2029-09-16	N/A
27		CB6031	Mining Claim	126	07/13/1977	2031-09-11	N/A
28	GORD 1	P8591E	Mining Claim	8	08/30/1985	2029-10-29	N/A
29	ROB 10842	MB10842	Mining Claim	145	12/18/2012	2031-02-16	N/A
30	FAR 7	P8597E	Mining Claim	160	04/25/1985	2025-06-24	N/A
31	ARBOUR 21	W48175	Mining Claim	16	06/03/1983	2029-08-02	N/A
32	RAINBOW 2	W45592	Mining Claim	223	02/15/1983	2028-04-15	N/A
33	ROB 10836	MB10836	Mining Claim	240	12/18/2012	2029-02-16	N/A
34	FAR 2	P8552E	Mining Claim	75	03/11/1985	2029-05-10	N/A
35	CAUSES	CB11418	Mining Claim	146	07/11/1981	2028-09-09	N/A
36		CB9238	Mining Claim	98	10/16/1978	2029-12-15	N/A
37	FAR 4	P8594E	Mining Claim	256	04/25/1985	2024-06-24	N/A
38	ROB 10840	MB10840	Mining Claim	240	12/18/2012	2031-02-16	N/A
39	FAR 6	P8596E	Mining Claim	256	04/25/1985	2025-06-24	N/A
40	FAR 1	P8551E	Mining Claim	78	03/11/1985	2030-05-10	N/A

	Name	Disposition Number	Disposition Tenure	Area (ha)	Date Granted	Annual Expiry Date	Term Expiry Date
41	SMOKING	CB11417	Mining Claim	98	07/11/1981	2028-09-09	N/A
42	ARBOUR 30	W46957	Mining Claim	20	09/26/1983	2031-11-25	N/A
43	ARBOUR 28	W46952	Mining Claim	254	09/26/1983	2031-11-25	N/A
44	FAR 5	P8595E	Mining Claim	128	04/25/1985	2024-06-24	N/A
45	ROB 10843	MB10843	Mining Claim	240	12/18/2012	2031-02-16	N/A
46	ARBOUR 23	W48177	Mining Claim	96	06/03/1983	2029-08-02	N/A
47	FIRES	CB11419	Mining Claim	195	07/11/1981	2028-09-09	N/A
48	FAR 11	P8593E	Mining Claim	128	04/25/1985	2024-06-24	N/A
49		CB6035	Mining Claim	195	07/13/1977	2025-09-11	N/A
50	ROB 10835	MB10835	Mining Claim	256	12/18/2012	2030-02-16	N/A
51	ROB 10839	MB10839	Mining Claim	125	12/18/2012	2030-02-16	N/A
52	ARBOUR 26	W48180	Mining Claim	80	07/20/1983	2029-09-18	N/A
53	FAR 3	P8553E	Mining Claim	35	03/11/1985	2029-05-10	N/A
54	ROB 10850	MB10850	Mining Claim	16	12/18/2012	2031-02-16	N/A
55	ROB 10834	MB10834	Mining Claim	256	12/18/2012	2030-02-16	N/A
56	ROB 10832	MB10832	Mining Claim	256	12/18/2012	2032-02-16	N/A
57	ROB 10838	MB10838	Mining Claim	106	12/18/2012	2032-02-16	N/A
58		CB6037	Mining Claim	146	07/18/1977	2031-09-16	N/A
59	ARBOUR 29	W46953	Mining Claim	96	09/26/1983	2024-11-25	N/A
60	FAR 12	P8592E	Mining Claim	192	04/25/1985	2024-06-24	N/A
61	ROB 10841	MB10841	Mining Claim	165	12/18/2012	2031-02-16	N/A
62		CB6034	Mining Claim	65	07/13/1977	2030-09-11	N/A
63	NICKEL 4	P8656E	Mining Claim	192	05/07/1985	2030-07-06	N/A
64	CARE	CB11420	Mining Claim	227	07/11/1981	2028-09-09	N/A
65	ROB 10833	MB10833	Mining Claim	256	12/18/2012	2032-02-16	N/A
66	FAR 17	P8937E	Mining Claim	120	01/16/1987	2024-03-16	N/A
67	FAR 16	P8936E	Mining Claim	220	01/16/1987	2024-03-16	N/A
68	RAINBOW 3	W45593	Mining Claim	160	02/15/1983	2025-02-15	N/A
69	FAR 10	P8600E	Mining Claim	224	04/25/1985	2025-06-24	N/A
70	FAR 9	P8599E	Mining Claim	256	04/25/1985	2025-06-24	N/A
71	NICKEL 1	P8653E	Mining Claim	160	05/07/1985	2030-07-06	N/A
72	ONE13352	MB13352	Mining Claim	256	2018-04-03	2024-06-02	N/A
73	ONE13353	MB13353	Mining Claim	256	2018-04-03	2024-06-02	N/A
74	Mine Site	ML327	Mineral Lease	208	03/09/2017	2024-04-08	2038-03-18
75	Mine Site	ML325	Mineral Lease	93	03/09/2017	2024-04-08	2038-03-18
76	Mine Site	ML326	Mineral Lease	122	03/09/2017	2024-04-08	2038-03-18
77	Mine Site	ML324	Mineral Lease	113	03/09/2017	2024-04-08	2038-03-18

4.5.2 Environmental Liabilities

The environmental exposure assumed by Alamos is limited to the prior mining operations conducted on the acquired property. After closure, the site underwent a reclamation process. The Gordon site is currently in compliance with closure plans approved by the Manitoba government.

4.5.3 Impact of Previous Mining Activities

After closure of the historical mine, the Gordon site underwent a reclamation process. The environmental baseline studies completed in support of the project (see Section 20 for details) have considered the environmental setting and historical activities. The historical activities provide field-scale data on potential environmental effects that could result from future mining activities, even though the mining operations proposed are different than those previously undertaken.

4.6 Property Encumbrance

As disclosed by the Province of Manitoba's Mines Branch official integrated mining and quarrying system (IMaQs), the Company's recorded interest in its mining claims is subject to the following encumbrances:

- Fifty-six (56) mining claims are subject to any rights that have or may be granted to Manitoba Hydro under the *Water Power Act* and the *Water Rights Act*. These statutory rights of Manitoba Hydro, as a Provincial Crown corporation, are quite extensive, and may include flooding and other rights;
- Two (2) mining claims are subject to the right-of-way of the Canadian National Railway (CN); and
- One (1) mining claim is subject to the right-of-way of PR 396, as a part of the provincial highway system.

The Company's recorded interest in the LLGP lands may also be subject to royalty and other agreements, as publicly disclosed as 'Permitted Encumbrances' in Schedule E of the Joint Venture Agreement between Carlisle and AuRico, effective as of November 10, 2014 (posted to www.sedar.com on November 19, 2014 and retrievable therefrom) and in Schedule C to the Arrangement Agreement between Alamos and Carlisle, dated October 15, 2015 (posted to www.sedar.com on October 23, 2015 and retrievable therefrom).

Despite efforts undertaken through investigations, searches, and disclosure received, it is not possible to exclude the possibility that other undisclosed or unrecorded agreements or instruments may exist.

4.7 Royalty Obligations

The LLGP is subject to a capped third-party royalty in the first few years of production from the Gordon pit. The project is expected to be unencumbered by third-party royalties for the majority of the mine life. The capped royalty is discussed in Section 22.7.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The Town of Lynn Lake is a former mining community and is accessible by provincial roads (PR) 391, 394, 396, 397 and 399, which are maintained by Manitoba Infrastructure Region 5. Paved road PR 391 connects the Town of Lynn Lake and the Black Sturgeon Reserve with the Town of Leaf Rapids (105 km east) and the City of Thompson (315 km southeast). Private all-weather gravel access roads connect both the MacLellan and Gordon sites with PR 391.

There is currently no rail service to the Town of Lynn Lake. The Sherridon rail line previously connected Lynn Lake to The Pas; however, passenger and freight service now run only as far north as Pukatawagan.

The Lynn Lake Airport has a 1,700 m long paved runway and an 835 m long turf runway. The airport was serviced by scheduled flights until 2013, after which the town began leasing it to YYL Airport Inc., a locally owned company. Currently there is currently no commercial flight travel to Lynn Lake; only periodic chartered service.

5.1.1 Accessibility – MacLellan

Access to the MacLellan site is by PR 391 and a 4.6 km gravel road.

5.1.2 Accessibility – Gordon

Access to the Gordon site is via PR 391 and a 15 km gravel road.

5.2 Proximity to Population Centre, and Transport

Northern Manitoba is a sparsely populated region with its population concentrated in a few communities, including, most notably, the City of Thompson and the towns of Lynn Lake and Leaf Rapids. Smaller numbers of people reside in reserves, settlements, and other small localities.

Lynn Lake is located approximately 315 km northwest of Thompson and 820 km northwest of Winnipeg. Transportation links to Lynn Lake are limited to roads and chartered aircraft.

5.3 Climate

The LLGP is located in a climatic region characterized by short, cool summers and long, cold winters. Long-term climate data (1981-2010) from the Lynn Lake Airport monitoring station (Climate ID: 5061646; Government of Canada, 2016) indicates that the mean annual air temperature is -3.2°C, ranging from an extreme maximum of 35°C (August 11, 1991) to an extreme minimum of -47°C (December 19, 1989). The minimum and maximum monthly mean temperatures measured at the Lynn Lake Airport monitoring station during 1981-2010 were -29°C for January and 22°C for June. On average, there are 98 frost-free days and 141 days with precipitation annually, with an average annual precipitation of 478 mm (318 mm as rain and 160 mm as snow water equivalent).

Table 5-1 provides temperature and precipitation details.

Table 5-1 Representative Climate Values

Parameter	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Mean Temperature	°C	-24.3	-20.3	-13.0	-3.1	5.6	12.9	16.2	14.7	7.7	-0.6	-12.5	-21.4	-3.2
Average Rainfall	mm	0.2	0.1	1.4	4.5	26.7	60.6	85.3	68.7	57.4	12.2	0.8	0.1	317.9
Average Snowfall	cm	27.6	23.5	24.6	23.9	10.4	1.3	0.1	0.1	3.5	31.3	36.0	26.0	208.1
Average Precipitation	mm	20.3	16.3	19.8	24.1	37.3	61.8	85.4	68.8	61.0	37.6	26.8	18.8	477.9

Source: Environment Canada, Lynn Lake Climate Data, 1981-2010.

5.4 Local Resources

With the closing of the Black Hawk Mining operation in 2001, the Town of Lynn Lake experienced a large decrease in employment opportunities and has been unsuccessful in developing strong secondary industries.

The Town has a current population of approximately 579 residents (2021 Census). Business in Lynn Lake is tied to the service industry and includes two motels, one restaurant, two trucking companies, a grocery and dry goods store, a garage, two gas stations, a mining company (Alamos), and an investment agency. Three lodges and two outfitters are also located in the region.

There are no businesses in the Black Sturgeon Reserve; a community store had previously operated but is now closed. Located in the Reserve are a water treatment plant and a band office.

Labour for the project is assumed to come from mostly Manitoba (e.g., Thompson, Flin Flon, and Winnipeg). Fly-in/fly-out workers will be housed in an owner-supplied accommodation camp managed by a third party.

5.5 Infrastructure

As previously mentioned, infrastructure at the MacLellan site consists of a 4.6 km gravel access road, bridge across the Keewatin River (removed and replaced with a temporary structure in 2021), power transmission line (abandoned pole line), and infrastructure from the former underground mine (head frame, hoist house, shaft, access ramp, maintenance and other storage buildings, core shack and racks, vent raise, and mine water settling ponds).

All buildings and infrastructure from the historical operations at the Gordon site have been removed. The only residual infrastructure includes the 15 km gravel access road, a bridge across the Hughes River, two capped mine rock storage areas, two capped overburden storage areas, and two water-filled open pits.

5.6 Physiography

The LLGP is located within a remote, rugged region of the Boreal Shield Ecozone. The general project area (Figure 5-1) supports peat-covered hummocky glacial deposits underlain by an expanse of Precambrian bedrock. The terrain consists of mostly hilly, till veneered bedrock, with intervening low areas of organic terrain that is level to moderately sloping (0-15%). Topography slopes from a high of 450 m above mean sea level in the west and northwest to a low of 260 m in the southeast.

Steep rocky ridges protrude 30 to 60 m above lakes and peat-filled depressions. Surface water features and peat generally occupy the topographic lows. Soils in the region are thin, poorly drained, and acidic, with organic soils typical in bogs and peat plateaus, and discontinuous permafrost is widespread.

The general project area overlaps with the Paleoproterozoic Lynn Lake Gold Belt (LLGB) within the Churchill Structural Province of the Canadian Shield. The LLGB is comprised of volcanic rocks of the Wasekwan Group, sedimentary rocks of the Sickle Group, and plutonic intrusions. Overburden geology is characterized as glaciolacustrine sediments overlying either bedrock or a discontinuous regional sand diamicton. Organic deposits were observed as a thin veneer with thicker accumulations observed in low-lying areas. Isolated pockets of glaciofluvial sediments are also present. A series of bedrock valleys near the MacLellan site are present where overburden is greater than 28 m thick.

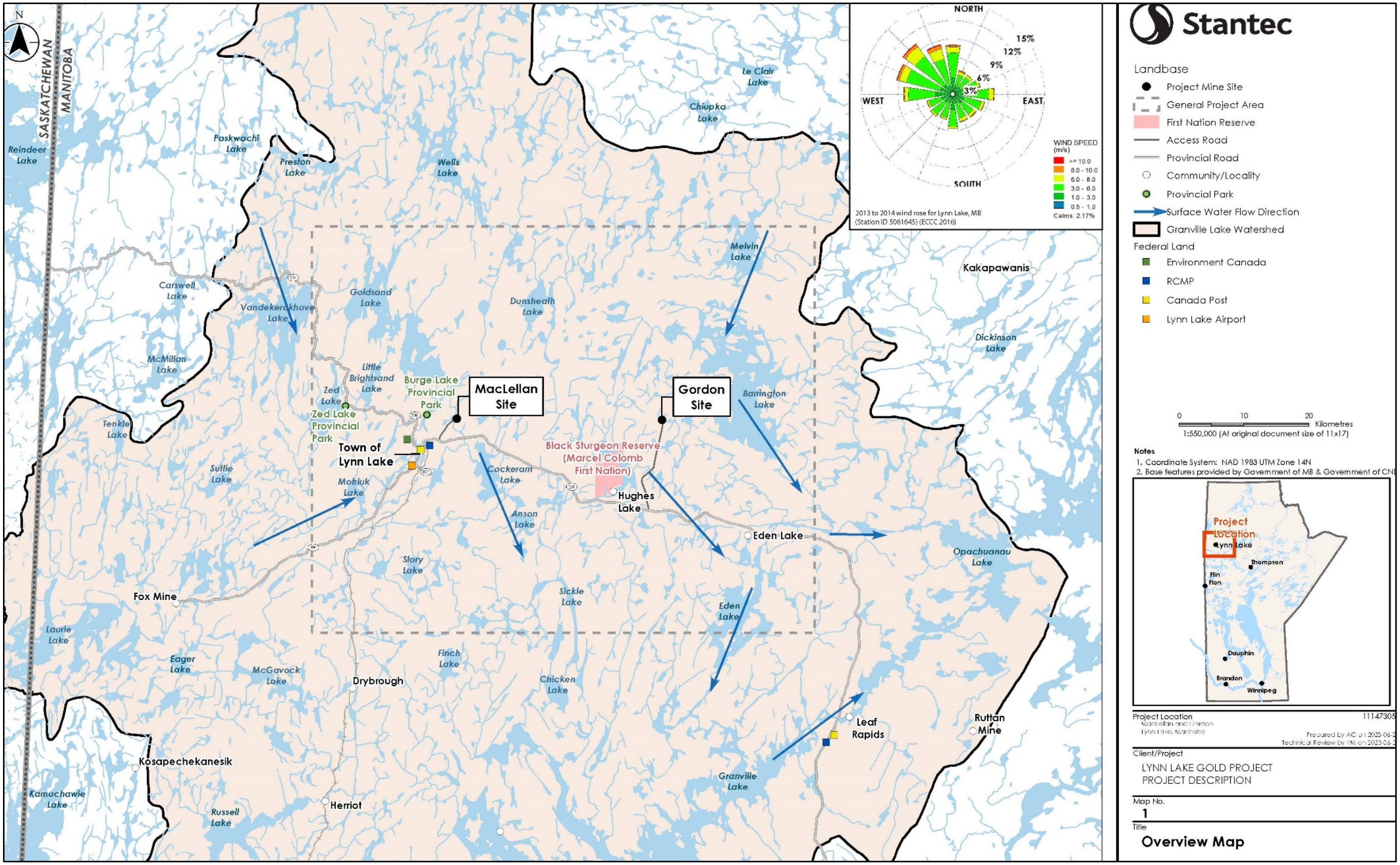


Figure 5-1 General Project Area

Source: Stantec (2023)

6 HISTORY

6.1 MacLellan

6.1.1 Historical Exploration

Exploration on the MacLellan area commenced in 1946 when Noranda carried out magnetometer and geological surveys on the property. Numerous companies have explored the MacLellan deposit area between 1946 and 2015. SherrGold and LynnGold operated an underground mine on the MacLellan, Nisku, and Rainbow zones from 1986 to 1989 and reportedly produced 111,600 oz of gold from 969,680 tonnes of ore grading 5.36g/t (Chornoby P. , 1991). Carlisle, as AMPX Corporation, acquired the MacLellan Property in 2005 and conducted exploration until 2015 at which time Alamos (initially through AuRico) acquired Carlisle and the Lynn Lake Property

A summary of the ownership and exploration conducted within and proximal to the MacLellan deposit from 1946 - 2022 is summarized in Table 6-1.

Table 6-1 Historical Exploration on the MacLellan Property

Year	Company	Exploration
1946-1950	Noranda	The JJ Group of claims was staked in 1946 by GG Suffel for Noranda. In 1947 geological mapping and magnetometer survey work conducted (GC Milligan, 1960) The claims lapsed in 1950
1950-1955	R. Rundle and J.W. Rundle	In 1950 a portion of the JJ Group of claims was restaked as the JR Group of claims by R and JW Rundle Trenches and pits were dug
1954	Eldorado Mining	Approximately 9,000-line miles of regional Lynn Lake airborne radiometric geophysics was flown
1955	Agassiz Mines	Claims purchased from R and JW Rundle Drilled 648 m to test magnetic anomalies DDH3 assayed up to 4.5% Zn, 2.5 g/t Au, and 11 g/t Ag. Electromagnetic (EM) survey
1956	Aumaque Gold Mines (Option)	Resistivity survey and a 25-drill hole program (3,373 m) to test EM anomalies.
1958	Central Manitoba Mines (Option)	6 MacLellan Mine area surface DDH (A58 Series) (1,110 m)
1959	Agassiz Mines	14 MacLellan Mine area surface DDH (A59 Series) (1,459 m)
1957-1961	Sherritt Gordon Mines	A regional Lynn Lake airborne aeromagnetic survey was flown
1965	Agassiz Mines	60 MacLellan Mine area surface DDH (A65 Series) (14,243 m)
1967	Sherritt Gordon Mines	6 MacLellan Mine area surface DDH (D59 Series) (1,439 m)
1969	Royal Agassiz Mines	Agassiz Mines renamed Royal Agassiz Mines A 488 ft (148.7 m) 3 compartment shaft was sunk, and 803 m of drifting completed on the 2nd and 3rd levels (referred to 1984 onward as the 100-meter level and 140-meter level respectively)
1969-1974	Royal Agassiz Mines	(1969) 47 MacLellan Mine area underground DDH (U2, U3 Series) (1,416 m) (1971) 5 MacLellan Mine area surface DDH (A71 Series) (1,229 m) (1973 – 1974) 126 MacLellan Mine area underground DDH (U73, U74 Series) (5,571 m)
1975	Royal Agassiz Mines/ Bulora Corp Option (50%)	4 MacLellan Mine area surface DDH (A75 Series) (569 m) Underground workings were flooded
1976	Bulora Corp	Royal Agassiz Mines transfers interest to Bulora Corp.
1977	Manitoba Department of Resources and	A regional Lynn Lake Government airborne INPUT survey was flown, outlining EM and MAG anomalies which catalyzed ground-truthing exploration in subsequent years

Year	Company	Exploration
	Environmental Management	
1979	Sherritt Gordon Mines	Sherritt Gordon Mines optioned the property
1980-1984	Sherritt Gordon Mines	189 MacLellan Mine area surface DDH (A80, D80, A82, AS83, AS84, D83 Series) (35,698 m) 131 MacLellan Mine area underground DDH (U82, AU84 Series) (20,493 m) on the 140-meter level and 240-meter level Shaft deepened to 850 feet (259 m)
1985-1986	SherrGold	Property transferred to subsidiary SherrGold 136 MacLellan Mine area underground DDH (AU85, MU Series) (17,425 m) drilled from the 240 meter level and 370 meter level Shaft deepened to 1,470 ft (448 m) Development of the 240 meter level to the Rainbow Zone and construction of the 330 meter level of the Rainbow Zone 34 MacLellan Mine area surface DDH (AX85, DOT85 to DOT87, MS, NX87, RBS87 Series) (11,201 m) 51 MacLellan Mine crown pillar surface RC drillholes (AT87 Series) (490 m) Mining commenced in late 1986
1987	SherrGold / LynnGold Resources	Portal and ramp started at Nisku 56 MacLellan Mine area underground DDH (MU, NU Series) (2,299 m) 25 MacLellan Mine area surface DDH (DOT87, MS, NX87, RBS87) (9,489 m) 51 MacLellan Mine crown pillar surface RC drillholes (AT87 Series) (490 m) Mag, VLF and IP Geophysics northeast of MacLellan Mine LynnGold Resources formed when Hayes Resources acquired a controlling interest (60%) in SherrGold (Northern Miner, May 4th, 1987)
1988-1989	LynnGold Resources	Mag, VLF and IP southwest of the Maclellan Mine extending west across the Keewatin River south of the K-Zones (AF71943, 71944, 72662) 26 MacLellan Mine area surface DDH (DOT88, RBS88, RBXX88 Series) (9,047 m) Change from cut-and-fill to long-hole open stoping Development of the 30-meter level, 45-meter level, 60-meter level, 80-meter level, 100-meter level and 140-meter levels at Nisku 338 MacLellan Mine area underground DDH (MU, NU, RU Series) (21,727 m) drilled from various mine levels including below the 370-meter level Declination ramp completed from the 370-meter level to a planned uncompleted 420-meter level Mine closure in late 1989. Production between 1986 – 1989 reported at 969,680 tonnes at 5.36g/t Au at an average mill rate of 900 t/d (Chornoby P. , 1991) LynnGold Resources filed for bankruptcy on Dec 8th, 1989 (Globe and Mail, December 15th, 1989)
1990-1993	DCC Equities	After LynnGold's bankruptcy, DCC Equities assumed control of the company's assets. In 1993 the assets were purchased by Black Hawk Mining as part of the Keystone Gold project
1992	Cazador Explorations	12 MacLellan Mine crown pillar surface DDH (MACCP92 Series) (360 m)
1994	Exploratus Elementis Diversis	6 regional MacLellan DDH (DS Series) (571 m) (AF72769)
1993-1997	Black Hawk Mining	No significant exploration was conducted at MacLellan The MacLellan Mill was reactivated and used for processing ore from Burnt Timber from 1993 to 1996 and from East and Wendy pits of the Farley Gold Project (Gordon deposit) from 1996 to 1999
1998-1999	Black Hawk Mining	In 1998, MacLellan crown pillar was trenched, mapped and 533 channel samples were cut and assayed

Year	Company	Exploration
		In 1999, 18 surface DDH on the MacLellan crown pillar (MAC99 Series) (815 m)
2003	Trans America Industries	3 large (8632 m^2) trenches were excavated, mapped and grab sampled east of MacLellan Goldak Airborne Surveys flew 2,538-line km of aeromagnetic and VLF geophysics at 100 m line spacing over MacLellan Mine through to Arbour Lake
2004	Trans America Industries	7 regional DDH (850 m) (T Series) east of MacLellan Mine in vicinity of the 3 trenches excavated in 2003
2006	Carlisle Goldfields	A magnetometer, radiometric and VLF geophysical survey was flown by Terraquest over the MacLellan Property
2007	Carlisle Goldfields	395 samples collected from 365 m of channeling on the MacLellan crown pillar 40 MacLellan Mine area DDH (TA, TAS, 100, 96, 99, MG07) (12,344 m) (TA, TAS Series twinned historical holes) (100, 96, 99 Series named in reference to spatial position on the MacLellan Metric Mine Grid)
2008	Carlisle Goldfields	21 MacLellan Mine area DDH (MG08 Series) (8,812 m)
2010-2011	Carlisle Goldfields	149.5-line km of conventional IP/Resistivity by Quantec Geoscience (AF64C12208, CA00772C) over MacLellan Mine and Dot Lake K Zones
2011	Carlisle Goldfields	34 MacLellan Mine area surface DDH (MG11 Series) (17,612 m) 20 Regional near mine surface DDH (MG11 Series) (10,453 m)
2012	Carlisle Goldfields	8 MacLellan Mine area surface DDH (MG12, GT12 Series) (2,761 m) 11 Regional near mine surface DDH (MG12 Series) (3,550 m)
2015	Alamos Gold	78 MacLellan Mine area surface DDH (MG15, GTM15, MMET15 Series) (17,541 m) 470-line km Lidar Survey by Stantec (AGI Project 15-1543)
2016	Alamos Gold	10 MacLellan Mine area surface DDH (16MCX, 16MCD Series) (7,271 m) 12 Regional near mine surface DDH (16MCX) (4,624 m) 16 near mine condemnation development surface DDH (16MCD) (3,078 m) 111.8-line km of conventional IP/resistivity by Quantec Geoscience (CA01049) over the East MacLellan Project
2017	Alamos Gold	28 MacLellan Mine area surface DDH (17MCX Series) (5,064 m) 7 Regional near mine surface DDH (17MCX) (2,766 m)
2018	Alamos Gold	2 MacLellan Mine area surface DDH (18MCX Series) (618 m) 8220.7-line km of Falcon Airborne Gravity Gradiometer and Aeromagnetic Survey by CGG over Alamos Gold mineral tenure
2019	Alamos Gold	12 MacLellan Mine area surface DDH (19MCX Series) (2,932 m)
2020	Alamos Gold	29 MacLellan Mine area surface DDH (20MCX Series) (7,399 m) 662-line km Triaxial Aeromagnetic Survey by Axiom over the MacLellan area
2021	Alamos Gold	16 MacLellan Mine area surface DDH (21MCX Series) (3,306 m) Lidar Survey by KBM over Alamos Gold mineral tenure with 15 cm or better vertical accuracy
2022	Alamos Gold	No work

Source: Alamos (2023)

6.2 Gordon

6.2.1 Historical Exploration

Exploration in the Gordon area commenced in 1945, where gold was first discovered by Sherritt Gordon Mines as frost heaved boulders along the northwest shore of Farley Lake. Subsequent drilling in 1947 confirmed the mineralization which was referred to as the “Lind Zone”. Black Hawk Mining mined the East and Wendy open pits from 1996 to 1999 reportedly producing 214,800 oz of gold from 1,700,000 tonnes of ore (Black Hawk Mining, 2020). A summary of exploration conducted on and in proximity to the Gordon deposit from 1945 to 2022 is summarized in Table 6-2. Alamos initiated exploration activities in 2015.

Table 6-2 Historical Exploration on the Gordon Property

Year	Company	Exploration
1945	Sherritt Gordon Mines	Regional mine area staked as the LIND Group of 22 Claims (G.C Milligan, 1960)
1947	Sherritt Gordon Mines	Diamond drillholes (DDH) FL1 to FL23 on claims LIND23, LIN29 on the Lind Zone, Pot Hole Lake and Pump Lake. Best intercept 0.42 opt Au / 10.7 ft (14.4 g/t Au / 3.26 m) at NW Farley Lake. The claims lapsed in 1976
1960	Selco Exploration	A regional Lynn Lake airborne EM survey was flown
1957-1961	Sherritt Gordon Mines	A regional Lynn Lake airborne aeromagnetic survey was flown (AF91622)
1970-1971	Hudson Bay Exploration & Development (HBED)	Regional Lynn Lake airborne radiometric and EM surveys were flown in 1970 with a campaign of 13 (JIT Series) holes drilled in 1971 regionally proximal to Gordon Mine (894 m)
1977	Manitoba Department of Resources and Environmental Management	A regional Government-sponsored airborne INPUT survey was flown over Lynn Lake, outlining EM and magnetic anomalies which catalyzed exploration around Gordon in subsequent years predominantly by MMR and HBED ground-truthing anomalies
1977-1984	HBED	Mine area restaked by HBED in 1977 In 1978 END and JIT grids established with ground EM and magnetics to groundtruth the 1977 INPUT survey In 1981 and 1983 campaign of 21 (JIT Series) (1,996 m) of DDH regionally proximal to Gordon Mine to test EM anomalies Bedrock sampling and geological mapping
1983-1984	Manitoba Mineral Resources (MMR)	Geological mapping, bedrock sampling, EM, and IP geophysical surveys
1984-1988	Sherritt Gordon Mines/ LynnGold Resources	Geological mapping, bedrock sampling and magnetometer, VLF, and IP geophysical surveys (1986-1988) 28 (FAR Series) DDH (4,608 m) south of Gordon, and east along strike in iron formation
1985-1986	MMR (Operator) and HBED	156 Gordon Mine area DDH (654-Series) (20,280 m) 86 shallow RC-holes within Gordon Mine area and regionally proximal for exploration IP, magnetometer and VLF geophysical surveys, geological mapping and lithogeochemical sampling
1987	MMR (Operator) & Mingold (HBED)	Mingold acquired HBED’s minority ownership in the JV. June 30th, 1987, Agreement stated ownership of Gordon Project as MMR (55.17%) and Mingold (44.83%).
1987-1990	MMR (Operator) & Mingold (HBED)	168 Gordon Mine area DDH (654-Series) (23,230 m) 335 shallow RC holes within deposit and regionally proximal for exploration and sterilization for planned infrastructure IP, magnetometer and VLF geophysical surveys, geological mapping and lithogeochemical sampling Metallurgical testing and feasibility studies were conducted, including a 10,000-tonne bulk sample Historical resource estimates were prepared by Strathcona Mineral Services and by Roscoe Postle Associates (RPA)
1992	MMR (Operator) & Golden Band Resources	Golden Band Resources optioned Mingold’s 44.83% interest in the project
1992-1993	MMR (Operator) & Golden Band Resources	23 Gordon Mine area DDH (654-Series) (5,327 m) (AF72685) IP, magnetometer, and VLF geophysical surveys Following option expiry in 1993 Mingold retained its prior interest

Year	Company	Exploration
1993-1995	Granduc Mining (Operator) & Mingold (HBED)	In late 1993 Granduc Mining acquired MMR's interest (55.17%), becoming the operator of the JV In 1995 as the Keystone Gold JV created between Granduc Mining (50%) and Black Hawk Mining (50%) who fulfilled an option with Mingold
1995	Keystone Gold JV	14 Gordon Mine area DDH (654-Series) (966 m)
1996-1999	Black Hawk Mining	In 1996 Granduc and Black Hawk Mining merged to form the "new" Black Hawk Mining. (Northern Miner, February 2, 1996)
2000-2001	Black Hawk Mining	$1.2 M was spent towards reclamation and rehabilitation programs, including treatment of effluent water in the holding ponds, and the clean up and shut down of the Lynn Mill. (Black Hawk Mining Inc., Annual Report 2000)
2005	Glencairn Gold	Dec 31st, 2005, Glencairn Gold Corporation sold mining leases and claims covering the Farley Lake Property to AMPX Corporation
2006	AMPX / Carlisle Goldfields	Effective December 28th, 2006, AMPX listed as Carlisle Goldfields with the stock exchange
2007-2011	Carlisle Goldfields	No significant exploration activities within the Gordon Mine area
2012	Carlisle Goldfields	In 2012 60.7-line km of conventional IP/Resistivity were performed by Quantec Geoscience within and to the east and west of the Farley Gold Project 25 Gordon Mine area DDH (FL12 Series) (7,502 m)
2013	Carlisle Goldfields	18 Gordon Mine area DDH (FL13 Series) (4,432 m)
2013	Ryan Gold Corp (Option)	80.0-line km of conventional IP/Resistivity were performed by Quantec Geoscience extending the CA00934C Survey further west and east regionally
2014	Carlisle Goldfields	1 Gordon Mine area DDH (FL14 Series) (200 m)
2015	Alamos Gold	84 Gordon Mine area DDH (FL15 Series) (12,949 m) 470-line km Lidar Survey by Stantec (AGI Project 15-1543) Regional DIGHEM and magnetic geophysical survey flown (Campbell & Walker Geophysics)
2016	Alamos Gold	11 Condemnation development DDH south of Gordon Mine. (16FCD Series) (1,719 m)
2017	Alamos Gold	5 Gordon Mine area DDH (17FLX Series) (1,551 m) 4 Regional near mine DDH (17FLX Series) (1,432 m)
2018	Alamos Gold	2 Gordon Mine area DDH (18FLX Series) (696 m) 8220.7-line km of Falcon Airborne Gravity Gradiometer and Aeromagnetic Survey by CGG
2019	Alamos Gold	7 Gordon Mine area DDH (19GDX Series) (1,794 m) 5 Regional near mine DDH (19LLX Series) (1,546 m)
2020	Alamos Gold	28 Gordon Mine area DDH (20GDX Series) (5,768 m)
2021	Alamos Gold	34 Gordon Mine area DDH (21GDX Series) (5,561 m) 7 Gordon Mine area DDH (GPT21, GGT21 Series) (971 m) Lidar Survey by KBM over Alamos Gold mineral tenure with 15 cm or better vertical accuracy
2022	Alamos Gold	7 Gordon Mine area DDH (22GDX Series) (1,126 m)

Source: Alamos (2023)

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Paleoproterozoic Lynn Lake greenstone belt (LLGB) is located within the Churchill Structural Province of the Canadian Shield. The LLGB comprises Paleoproterozoic arc-related ultramafic to felsic rock assemblages and represents a portion of the internal Reindeer zone of the Trans-Hudson Orogen. The LLGB is correlative with the La Ronge greenstone belt in Saskatchewan to the southeast (Figure 7-1). To the north, the LLGB is bound by the South Indian Domain, and to the south, it is separated from the Flin Flon greenstone belt by the Kisseynew Domain (Gilbert, Syme, & Zwanzig, 1980), (Beaumont-Smith & Böhm, 2004).

Rocks of the LLGB have undergone upper-greenschist to upper-amphibolite-facies metamorphism (Gilbert, Syme, & Zwanzig, 1980); (Glendennings, Gagnon, & Polat, 2015).

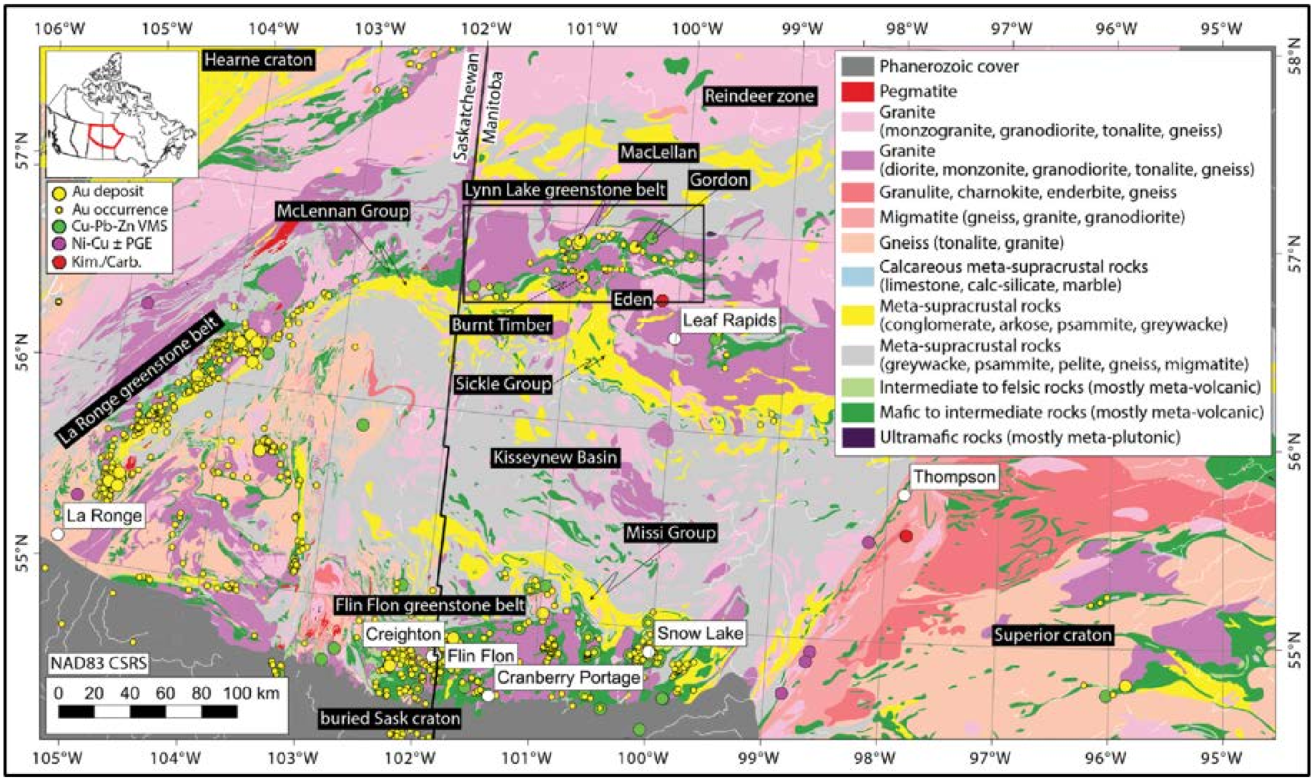


Figure 7-1 Regional Geological Map of Manitoba and Saskatchewan with Mineral deposits

Source: Lawley et al. (2020)

The LLGB has been subdivided into the following three sub-domains based on isotopic, geochemical and age differences (Beaumont-Smith & Bohm, 2003):

- North Belt;
- South Belt; and
- Fox Belt.

The timing of the amalgamation of the LLGB is constrained by the age of the Pool Lake igneous suite (1.89 – 1.87 Ga) (Turek, Woodhead, & Zwanzig, 2000), a collection of intrusive rocks which stitch together the North and South Belts (Figure 7-2), (Lawley, et al., 2020). The 1.85 Ga Burge

Lake intrusive suite is interpreted to have intruded the amalgamated LLGB (Beaumont-Smith, Machado, & Peck, 2006). The Sickle metasedimentary Group unconformably overlies the Wasekwan Group and Pool Lake igneous suite (Lawley, et al., 2020).

Both of Alamos' gold deposits, MacLellan and Gordon, are situated in the North Belt and are hosted by rocks assigned to the Wasekwan Group.

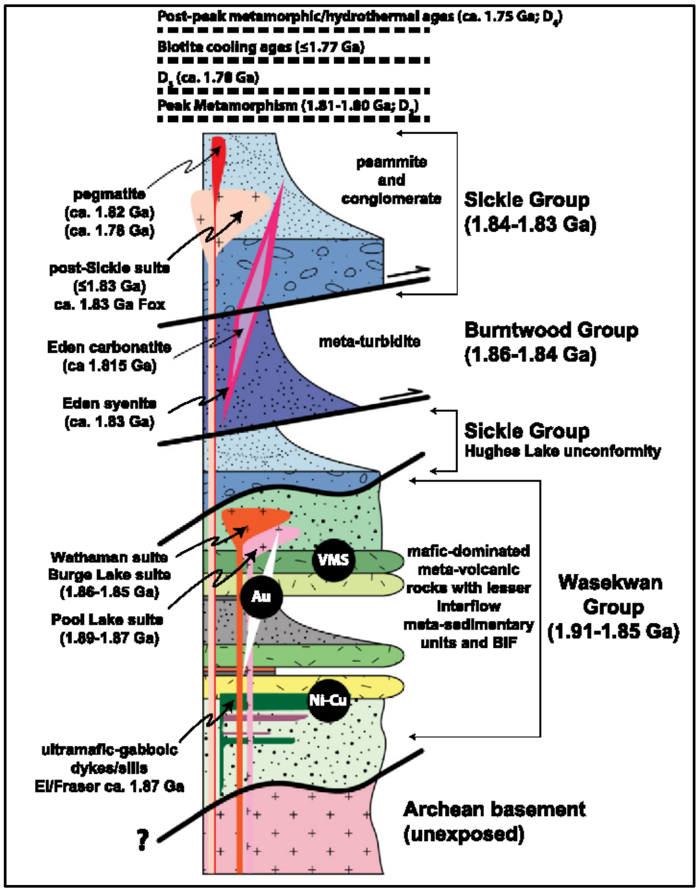


Figure 7-2 Schematic Stratigraphic Column of the LLGB

Source: (Lawley, et al., 2020)

7.2 Property Geology

In July 2019, the Manitoba Geological Survey released a digital bedrock compilation map of the Lynn Lake Greenstone Belt (NTS 64C10 to 16, 64B13) (Figure 7-3). The digital geological compilation map was created based on 1:50,000 scale maps GP80-1-1 to GP80-1-5 included in Geological Paper GP80-1: Geology of the metavolcanic and volcaniclastic metasedimentary rocks in the Lynn Lake area (Gilbert, Syme, & Zwanzig, 1980) and maps GR87-3-1 and GR87-3-3 included in Geological Report GR87-3: Geology of the Barrington Lake-Melvin Lake-Fraser Lake area (Gilbert H. , 1980). In addition, three 1:20,000 scale maps have been produced by the Manitoba Geological Survey for the areas around the MacLellan, Gordon, and Burnt Timber-Linkwood deposits (Yang & Beaumont-Smith, 2015; 2016; 2017). Alamos has also conducted more detailed geological mapping programs in specific target areas of interest within the LLGB.

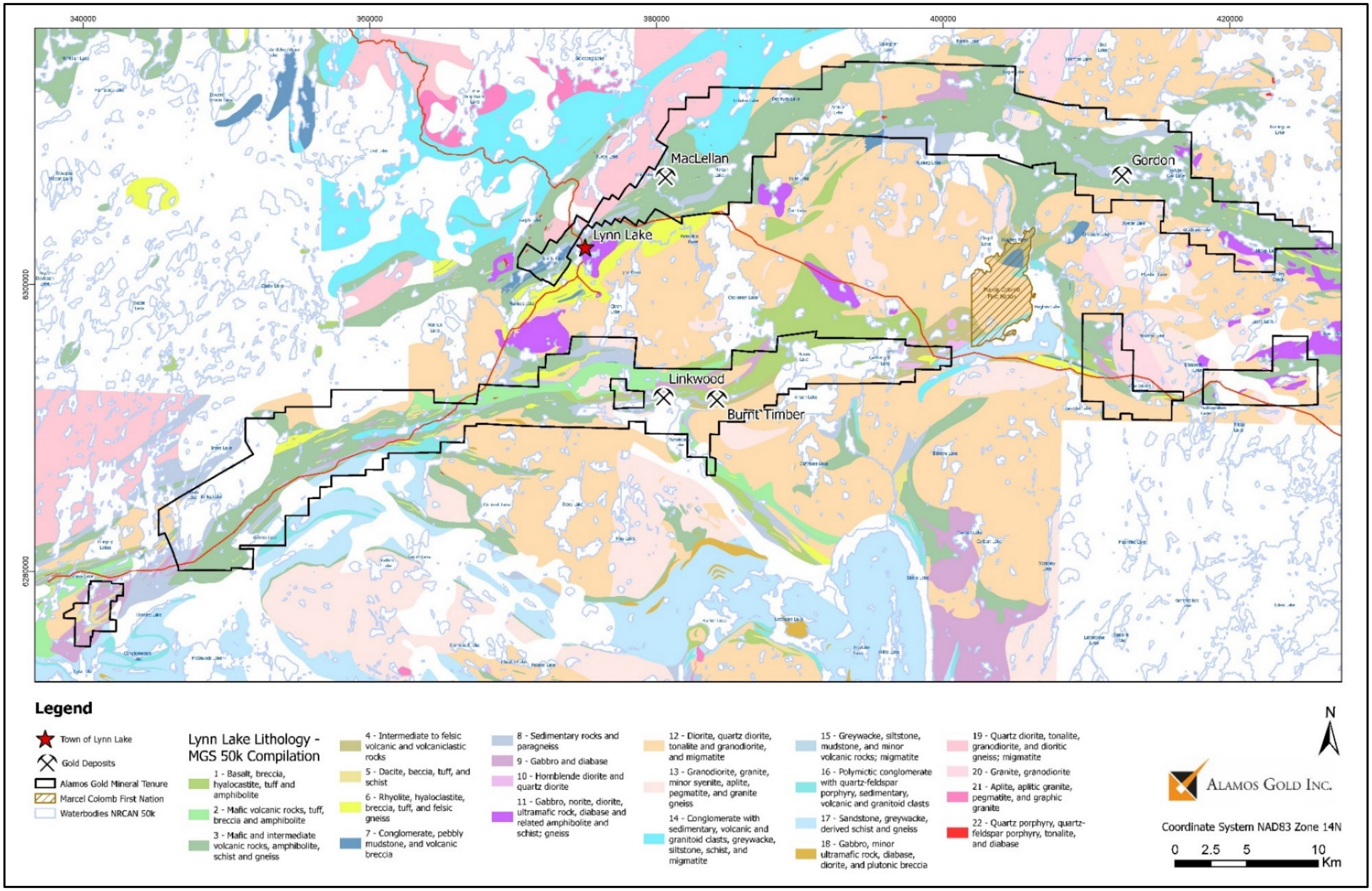


Figure 7-3 Regional Geology of the Lynn Lake Greenstone Belt and Alamos Properties

Source: Alamos (2023)

The North and South Belt are east-trending, steeply dipping belts comprised of supracrustal rocks of the Wasekwan Group and younger sedimentary rocks of the Sickle Group. Thought to occupy the upright limb of a north facing antiform, the North Belt is comprised of a steeply north-dipping, subaqueous sequence of volcanic rocks containing basalt, andesite, dacite, and rhyolite overlain by volcaniclastic rocks and epiclastic sediments, intruded by mafic to felsic plutonic rocks (Fedikow & Gale, 1982). A relatively narrow, stratigraphically and structurally distinct zone consisting of ultramafic flows, banded iron formations and associated exhalative and epiclastic rocks is spatially associated with both the MacLellan and Gordon deposits in the North Belt (Yang & Beaumont-Smith, 2016). Historically, this unit was termed the Agassiz metallotect in the MacLellan deposit area and the Nickel Lake shear zone in the Gordon deposit area (Fedikow & Gale, 1982).

The South Belt consists largely of tholeiitic to calcalkalic volcanic and volcaniclastic rocks. A major belt wide deformation zone termed the Johnson Shear trends east-west across the property and is spatially associated with several gold deposits and occurrences including the past-producing Burnt Timber mine.

7.2.1 MacLellan Deposit Geology

The MacLellan deposit is in the western portion of the North Belt and consists of multiple high grade ore zones contained within a package of northeast trending ultramafic flows, basalts and volcaniclastic rocks belonging to the Wasekwan Group (Figure 7-4). Mineralization has been traced over 500 m along strike and is concentrated in steeply plunging ore shoots interpreted to be controlled by tight folds in host stratigraphy. Hydrothermal alteration is consistent with that observed in most orogenic gold deposits. A wider iron carbonate alteration halo surrounds a narrow potassic alteration halo that consists of biotite replacement of chlorite in the mafic volcanic rocks. Early gold mineralization is associated with pyrite and pyrrhotite replacement of iron carbonate in iron carbonate plus quartz veins.

A second gold mineralization event is interpreted to have occurred during a late deformation event and is characterized by arsenopyrite, galena, and sphalerite. Where the two gold hosting structures intersect there is a noticeable increase in the tenor of gold and silver mineralization.

Lithologies in the MacLellan area exhibit evidence of mid-amphibolite facies metamorphic grade. Both chlorite and iron carbonate have been metamorphosed to amphibole prior to a retrograde greenschist metamorphic event.

7.2.2 Gordon Deposit Geology

The Gordon deposit is located within eastern portion of the North Belt (Figure 7-5) and is underlain by rocks belonging to the Wasekwan Group. Gold is associated with shallow to moderately south dipping sulphidized veins hosted by iron formation and lesser so in diorite dykes and mafic to intermediate volcanics. A second, steeply dipping, mineralization domain is associated with the contact of the supracrustal rocks and the diorite intrusion to the south. The diorite, dated at 1854 Ma (Lawley C. , 2018) is hydrothermally altered and is cut by quartz veins which locally host gold mineralization.

Lithologies in the Gordon area exhibit a mid-amphibolite facies metamorphic grade. Pervasive and domain controlled anthophyllite – grunerite alteration is variable within the iron formation and is associated with D_2 amphibolite metamorphism.

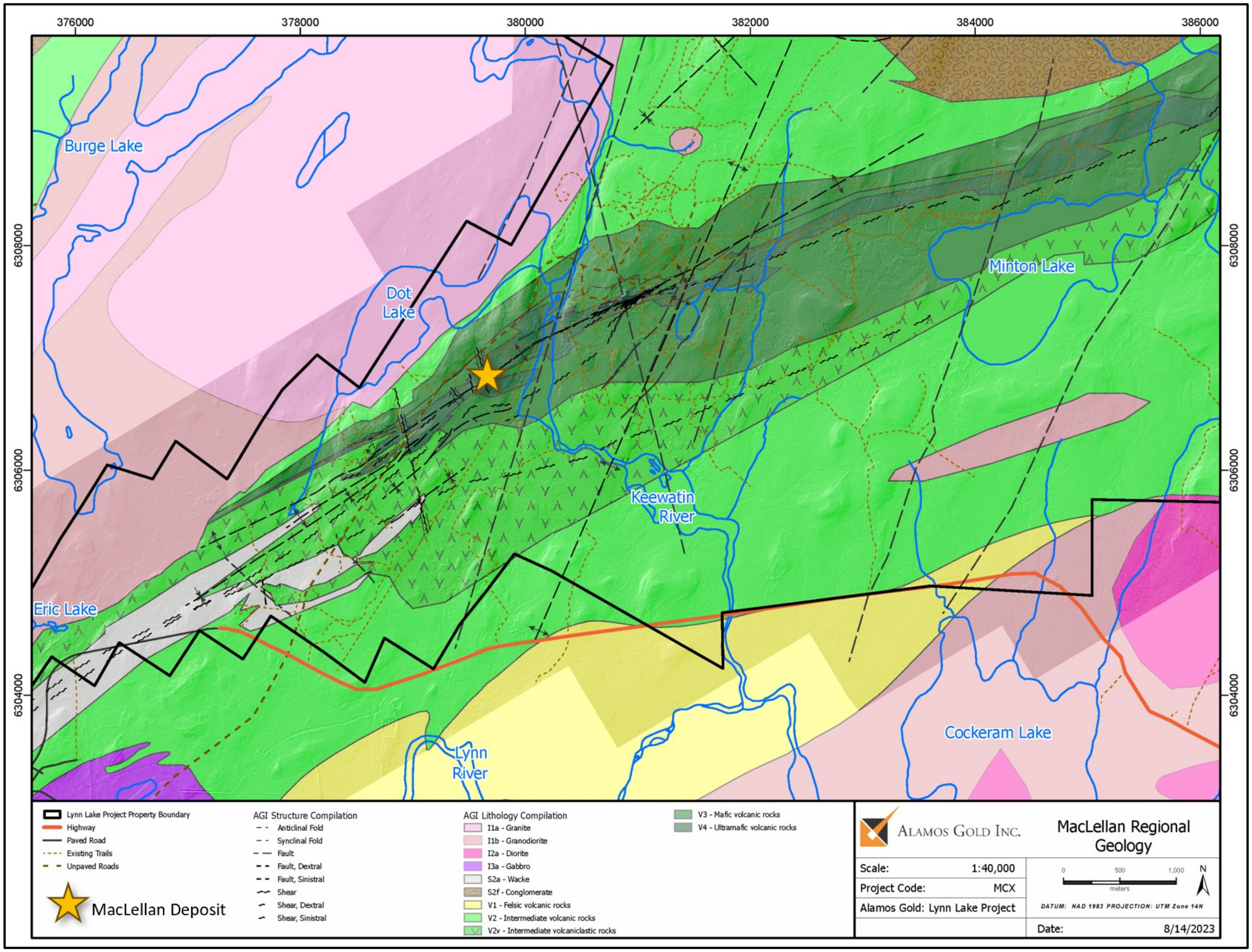


Figure 7-4 Property Geology of the MacLellan Area

Source: Alamos (2023)

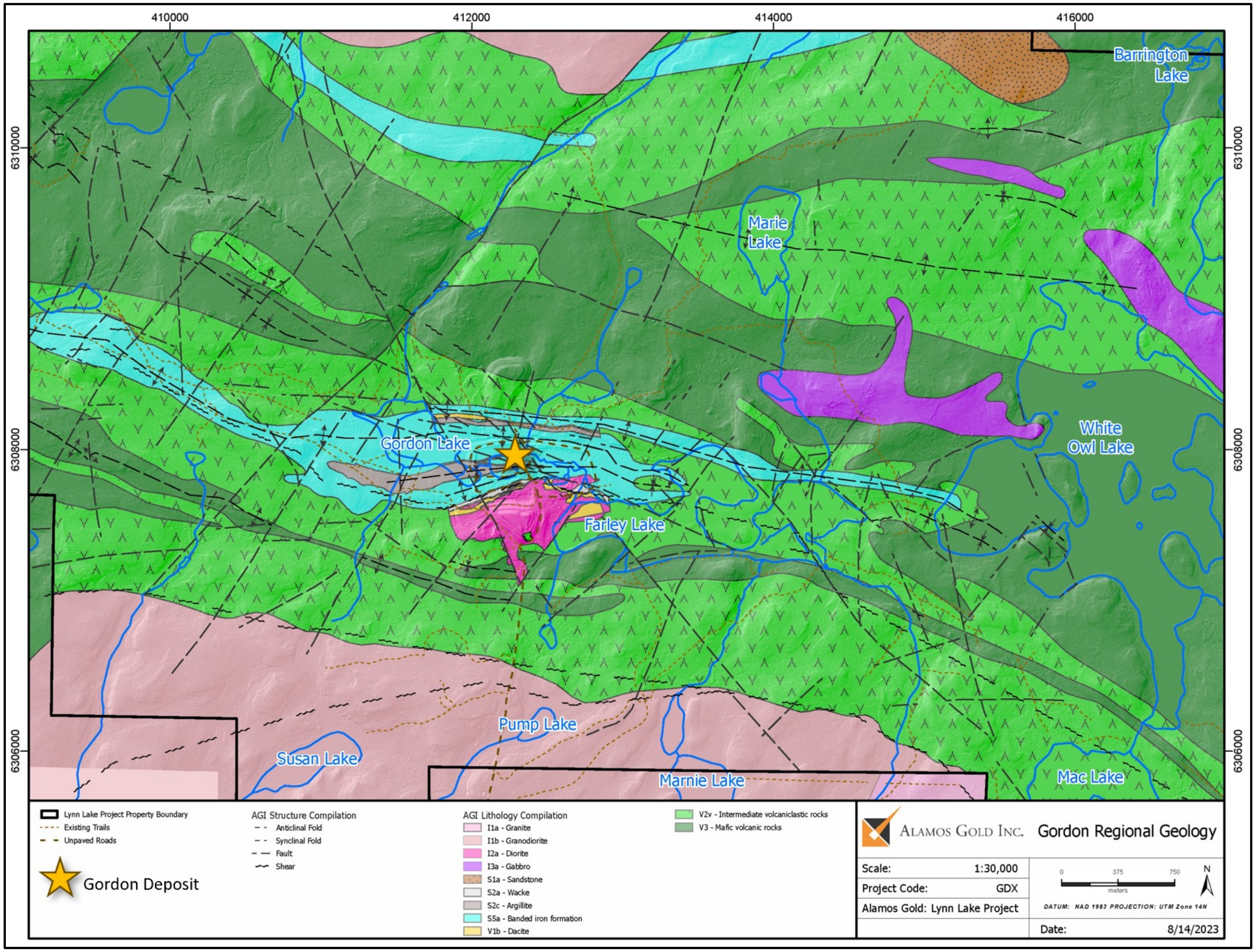


Figure 7-5 Property Geology of the Gordon Area

Source: Alamos (2023)

7.3 Structural Geology

Historic and recent mapping of the LLGB, identified a total of 6 deformational events (D_1 – D_6) (Gilbert, Syme, & Zwanzig, Geology of the metavolcanic and volcaniclastic metasedimentary rocks in the Lynn Lake area, 1980); (Beaumont-Smith & Bohm, 2002); (Beaumont-Smith & Böhm, 2004), described below:

- D_1 is generally overprinted or obscured by later fabrics; interpreted as post depositional fabric.
- D_2 is represented by tight isoclinal folds, a regional penetrative foliation and regional transcurrent shear zones that cut the Sickle group. Associated with formation of the belt wide east-west shear zones.
- D_3 is represented by northwest trending S-asymmetrical chevron folds and associated crenulation cleavages.
- D_4 is defined by northeast trending Z-asymmetrical chevron folds and associated crenulation cleavages as well as brittle faulting.
- D_5 is evidenced by large, kilometre-scaled open folds.
- D_6 is recorded by brittle reactivation of D_2 shear zones forming narrow pseudotachylite zones.

7.3.1 MacLellan Area Structural Geology

Around the MacLellan area, ductile D_2 structures dominate with a penetrative foliation and tight isoclinal folds, which increase in intensity within D_2 shear zones, near contacts, and in the ultramafic volcanic unit. S_2 is observed as steeply, northwest dipping foliation-schistosity striking northeast. Shear zones and schistosity exhibit dextral shear sense indicators throughout the MacLellan area. The North Shear (Figure 7-6) is a northeast trending shear zone that has a spatial association with the gold mineralization in the deposit area.

The main lithological units at MacLellan dip steeply to the northwest at 80-85°, parallel to the dominant S2 fabric. Structural data (minor folds) indicate that the central potion of the MacLellan deposit is also folded into a steep upright syncline with an axial plane that dips steeply to the north and a fold axis that plunges moderately to steeply towards the southwest parallel to the strike of the deposit.

Significant, brittle D4 structures are present around MacLellan. These are recorded within the komatiite basalt, as northeast 010° striking chevron folds and crenulations, and as brittle faults of varying scales outside of the schists. Brittle D6, pseudotachylite filled fractures and faults are observed on surface commonly sub-parallel to D2 shears.

Hastie, Gagnon, & Samson (2018) notes that the highest concentrations of Au-Ag within the deposit are where east-west trending dextral D2 shear zones intersect the NNE-SSW trending D4 brittle faults.

7.3.2 Gordon Area Structural Geology

At Gordon, D2 deformation is observed as an east-west trending, penetrative foliation and associated isoclinal folds with shallow plunging fold axes which steepen to subvertical within shear zones. Ductile D2 east-west striking shear zones are observed along lithological contacts as well as within mafic-intermediate volcanics and gabbroic intrusions. Of significance is the

Nickle Lake Shear Zone, which is laterally extensive and deforms intermediate-mafic volcanic rocks to the north, and post-Sickle intrusives to the south. Several parallel shear zones are observed closer to the Gordon mine, notably immediately south of Farley Lake, along the contact between mafic and intermediate volcanics.

Observed D3 structures are rare, observed as close-tight asymmetric S-folds and northwest trending, axial-planar crenulation cleavages. Northwest trending faults, presumed to be related to the D3 deformation event cut D2 shears and possibly have a control on later gold mineralization (Yang & Beaumont-Smith, 2016).

D4 structures are commonly observed as steeply plunging F4 folds, associated with steeply dipping northeast-striking axial planar crenulation cleavages (Yang & Beaumont-Smith, 2016). D5 is represented by mesoscopic conjugate folds, kink bands and crenulations. D6 is observed as brittle-ductile reactivation of D2 shear zones.

7.4 Mineralization

7.4.1 MacLellan

Gold and silver mineralization at the MacLellan deposit are synchronous with, and spatially associated with significant D_2 shear zones (Hastie, Gagnon, & Samson, 2018). The highest concentrations of Au-Ag within the MacLellan deposit are where east-west trending dextral D2 shear zones are intersected by NNE-SSW trending D_4 brittle faults. Figure 7-6 is a simplified cross section through the MacLellan Deposit showing the relationship between the komatiitic basalt host lithology, the North Shear, and the distribution of gold mineralization.

Two stages of gold mineralization at the MacLellan deposit were identified by Hastie (2018):

- Au-Ag mineralization associated with pyrrhotite and arsenopyrite replacement of iron carbonate veins parallel to D_2 ductile shearing. Biotite plus silica alteration are associated with this mineralization event; and
- Spatial association with the intersection of D_2 shear zones and D_4 faults. The gold mineralization is characterized by fracture-filling native gold, aurostibite, and Au-rich rims and fractures in arsenopyrite.

7.4.2 Gordon

At the Gordon deposit, a set of extensional and shear veins developed during D_2 deformation. The moderately south dipping (25°-45°) iron carbonate-quartz extension veins are preferentially developed in the iron formation, although they are observed in most lithological units. The shear veins are S_2 foliation parallel. Both vein orientations show pyrite and pyrrhotite replacement of iron carbonate within the veins and the host iron formation has sulphidized replacement halos peripheral to the veins. Gold is associated with the sulphides in both the veins and sulphidized iron formation. Figure 7-7 is a simplified cross section through the Gordon deposit showing the relationship between lithology and gold mineralization.

Weston (2014), conducted a detail investigation of high-grade intersections throughout the Gordon Deposit, concluding that:

- High grade mineralization is associated with shallow-dipping, sulphidized quartz-carbonate veins with an average wide of 9 cm.

- High-grade mineralization is also present within strongly sulphidized iron formation. The sulphide replacement zones average 2.4 m in width however range from 15 cm to 8.3 m wide and often display sharp visual contacts with weakly to non-mineralized iron formation.

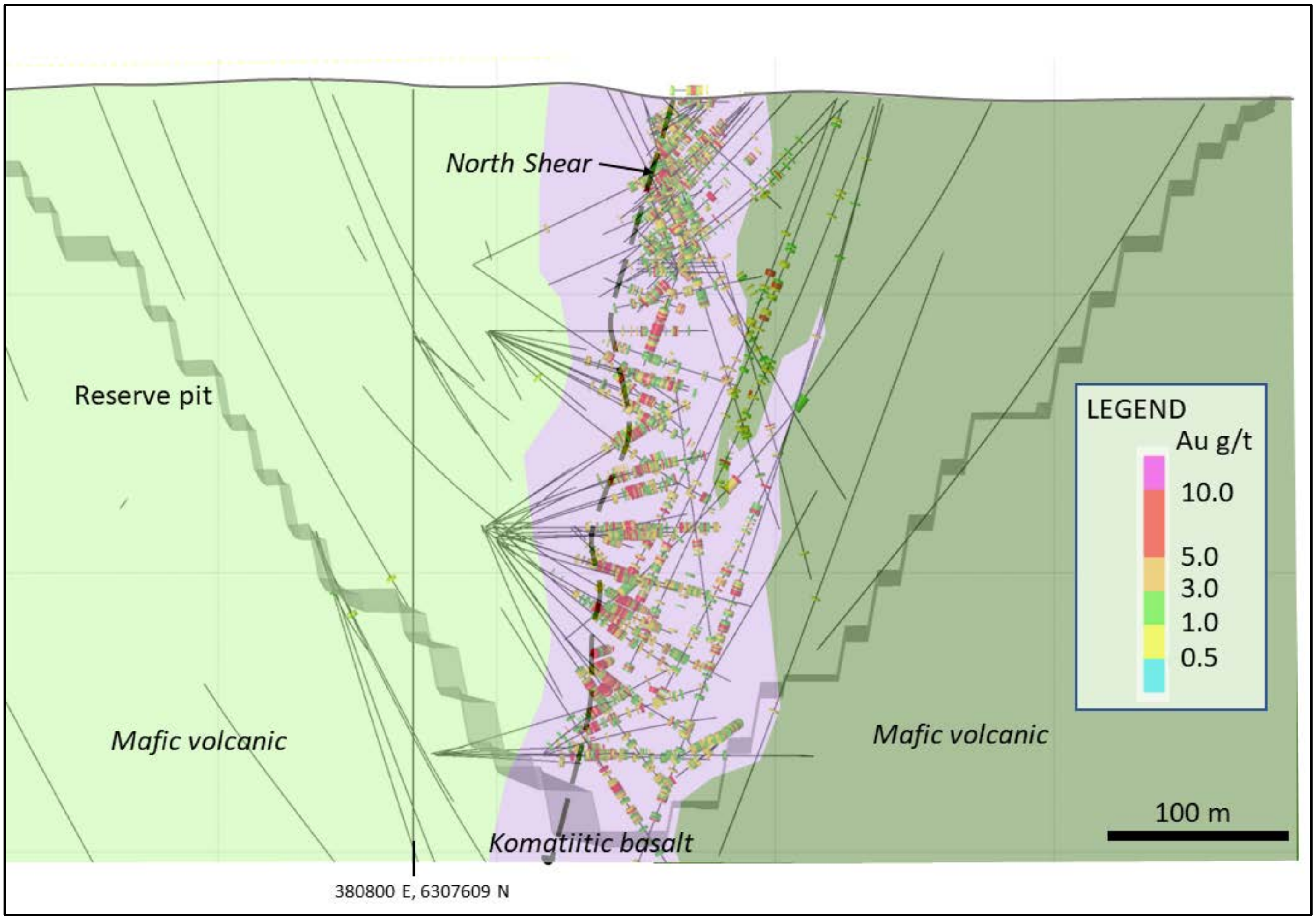


Figure 7-6 Simplified Cross Section through the MacLellan Deposit

Note:

- *Oblique section facing 068°, with a +/- 25 m window.*

Source: Alamos (2023)

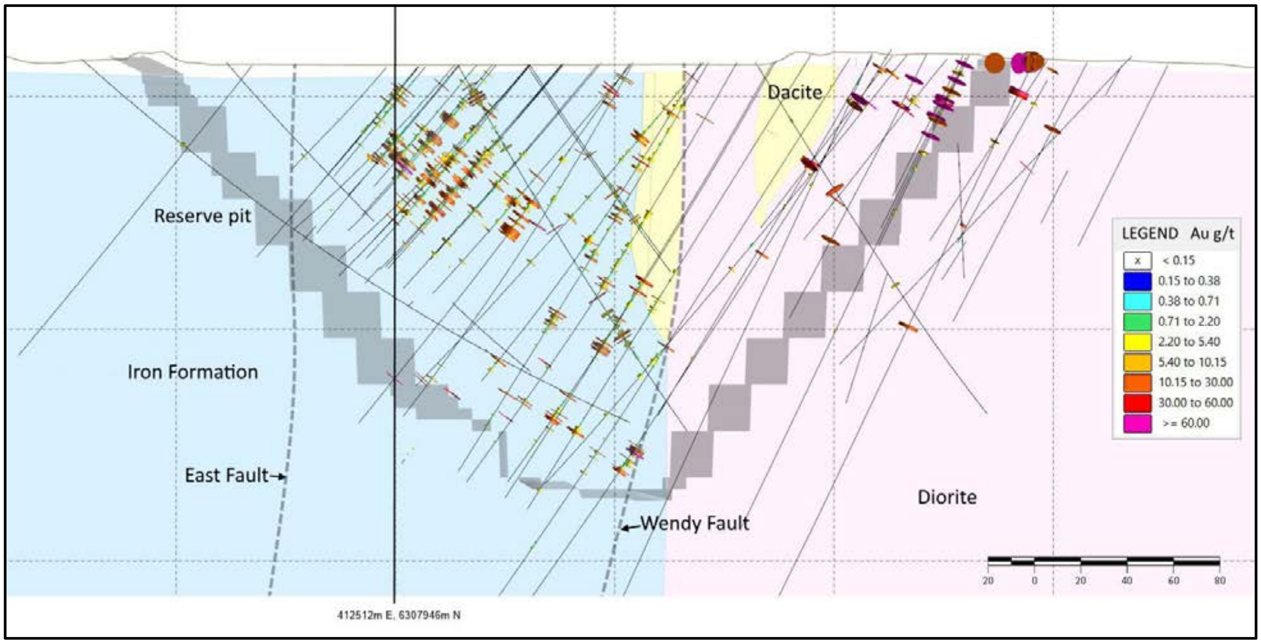


Figure 7-7 Simplified Cross Section through the Gordon Deposit

Note:

- *Oblique section facing east.*

Source: Alamos (2023)

8 DEPOSIT TYPES

8.1 Orogenic Gold Deposits

The MacLellan and Gordon deposits can be considered as belonging to the class of gold deposits referred to as orogenic. The orogenic gold deposit model (Groves, Goldfarb, Gebre-Mariam, Hagemann, & Robert, 1998) characterizes structurally controlled gold occurrences formed during orogenesis by either metamorphic or deeply sourced magmatic fluids (Figure 8-1).

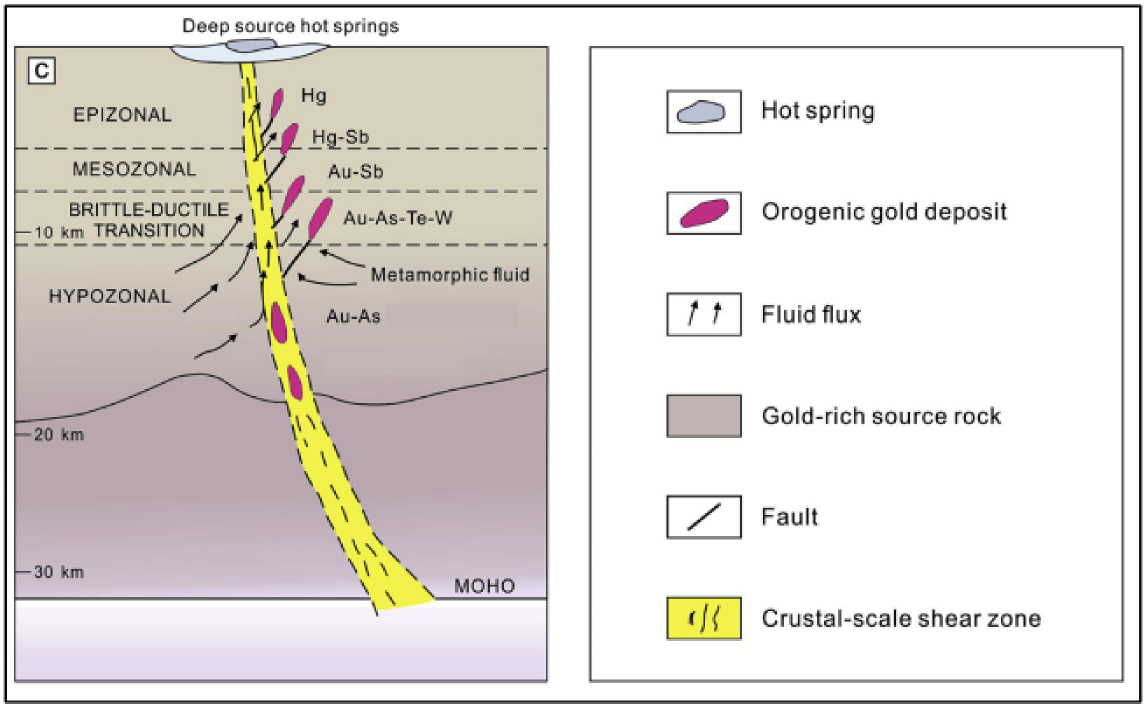


Figure 8-1 Schematic Representation of Crustal Environments of Orogenic Gold Deposits

Source: Groves et al. (2020)

These deposits are thought to have first-order tectonic controls, and are associated with crustal-scale faults, which tap sub-crustal source regions, although individual deposits are commonly situated in second-order structures (Groves, Goldfarb, & Santosh, 2016). This class of gold deposits is generally vertically extensive and form from low-salinity H_2O-CO_2 ore fluids at crustal depths from 2 km to 15 km (Groves, Santosh, & Zhang, 2020). Any rock type within a greenstone belt, including supracrustal rocks, dykes, or intrusions within the belt may host an orogenic gold deposit (Figure 8-2). There is strong structural control of mineralization at a variety of scales, but the favoured host is typically the locally most reactive and/or the most competent lithological unit. Most of the Precambrian deposits were formed during 2.70–2.60 Ga and 2.10–1.70 Ga and include world-class deposits of the Superior Province in Canada, the Yilgarn Craton in Western Australia, and the Birimian of West Africa. These epochs appear to be related to rapid crustal growth and accretionary stages of supercontinents.

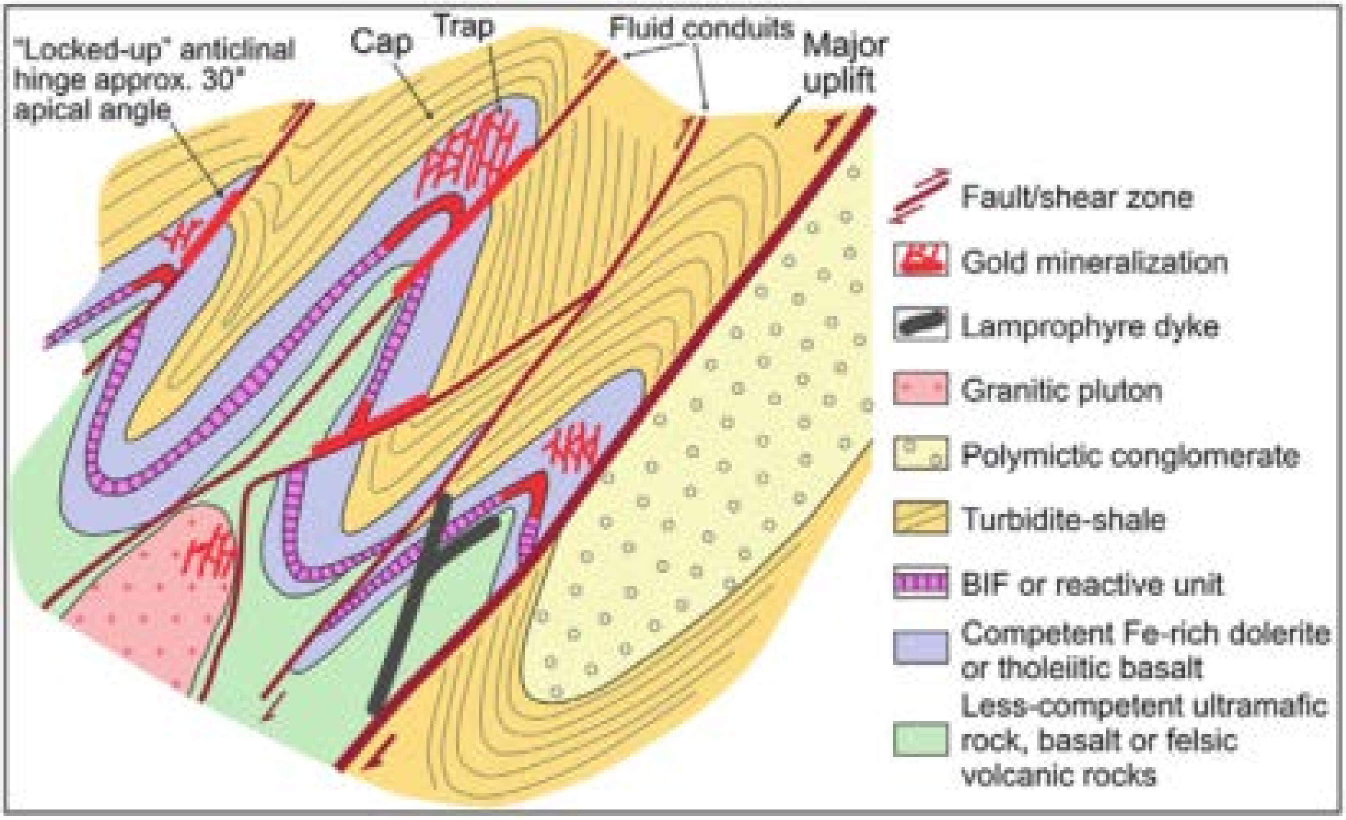


Figure 8-2 Idealized Sketch Illustrating Potential Host Environments for Orogenic Gold Deposits

Source: Groves, Goldfarb, & Santosh (2016)

The ore bodies typically form ore shoots. An ore body can vary between 0.5–50 m wide, 100's of meters long, and consists typically of a vein network, an en echelon vein swarm, or just of one single large vein. The depth extent of an ore body may well be much larger than its extent along strike.

All deposits are characterized by an alteration halo consisting of proximal to distal carbonatization and proximal potassic alteration. Elements enriched typically include arsenic, gold, potassium, rubidium, sulphur, antimony, tellurium, and tungsten; in some cases, also silver, boron, bismuth, cobalt, copper, and selenium are enriched.

9 EXPLORATION

9.1 Exploration

Exploration programs by Alamos since acquisition of the property comprise mapping and sampling, airborne magnetic and gravity surveys, soil and till sampling, and exploration drilling. Relevant exploration programs in the MacLellan and Gordon area are reported in this section.

9.1.1 Mapping and Sampling

The Company's land holdings in the LLGB are low lying with bedrock outcrop estimated to be under 5% exposure at surface. Geological mapping (1:20,000 scale) has been completed in the MacLellan area by both the Manitoba Geological Survey (Yang & Beaumont-Smith, 2015) and Alamos (Figure 7-4).

Geological mapping (1:20,000 scale) has also been completed in the Gordon area by the Manitoba Geological Survey (Yang & Beaumont-Smith, 2016) and Alamos (Figure 7-5). Between 2016-2022 Alamos has completed surface exploration trenching programs in the MacLellan and Gordon areas with the objective of extending mineralization along strike. At the MacLellan area 286 m of channel sampling was completed, while 54 m of channels were sampled in the Gordon area.

In 2019, the Manitoba Geological Survey released a 1:50,000 scale digital bedrock compilation map for the Lynn Lake Greenstone belt (NTS 64C10 to 16, 64B13), based on maps GP80-1-1 to GP80-1-5 (Gilbert, Syme, & Zwanzig, 1980), and maps GR87-3-1 AND GR87-3-3 (Gilbert, 1980) (Figure 7-3). From 2019-2022 Alamos conducted reconnaissance mapping and sampling in specific greenfield and brownfield target areas across the Lynn Lake Property (Table 9-1).

Table 9-1 Surface Samples 2019-2022

Year	Grab Samples	Till Samples	B-horizon Soil Samples
2019	898	125	1,304
2020	687	29	1,635
2021	1,744	0	1,727
2022	1,106	36	2,297

9.1.2 Geophysical Surveys

In 2018, the Company contracted CGG Canada Services Ltd. to complete a 100-m line-spacing high-sensitivity aeromagnetic survey (total magnetic field) and HeliFALCON® airborne gravity gradiometry (AGG) survey over its entire land package (totalling 8,220.7 line-kilometres). Data acquisition for both the aeromagnetic and gravity gradiometer surveys were completed concurrently.

The helicopter borne aeromagnetic survey was carried out at 100 m spaced flight lines using an airborne Caesium Scintrex CS-3 magnetometer with a noise envelope of 0.1 nT. The total magnetic intensity survey results are presented in Figure 9-1. The vertical gravity gradient product is shown in Figure 9-2.

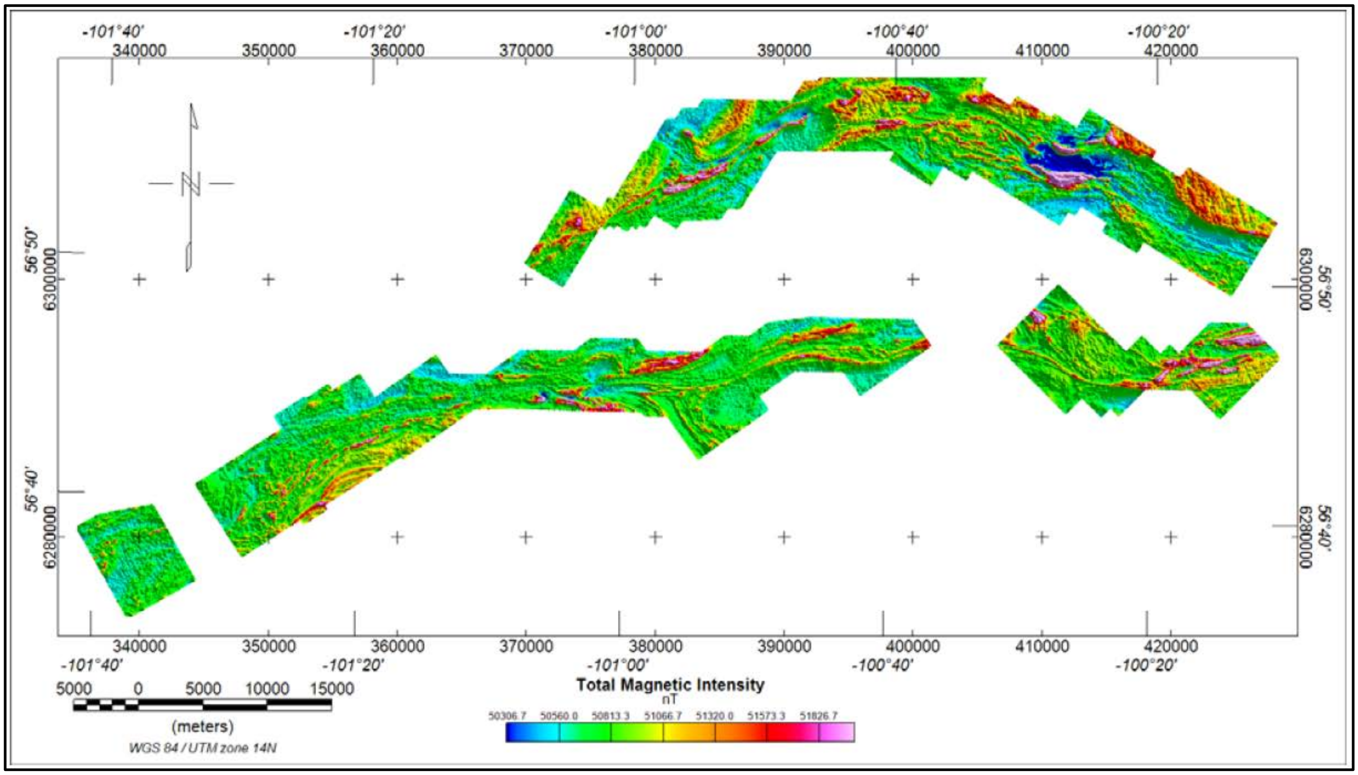


Figure 9-1 Total Magnetics Intensity

Source: Alamos (2023)

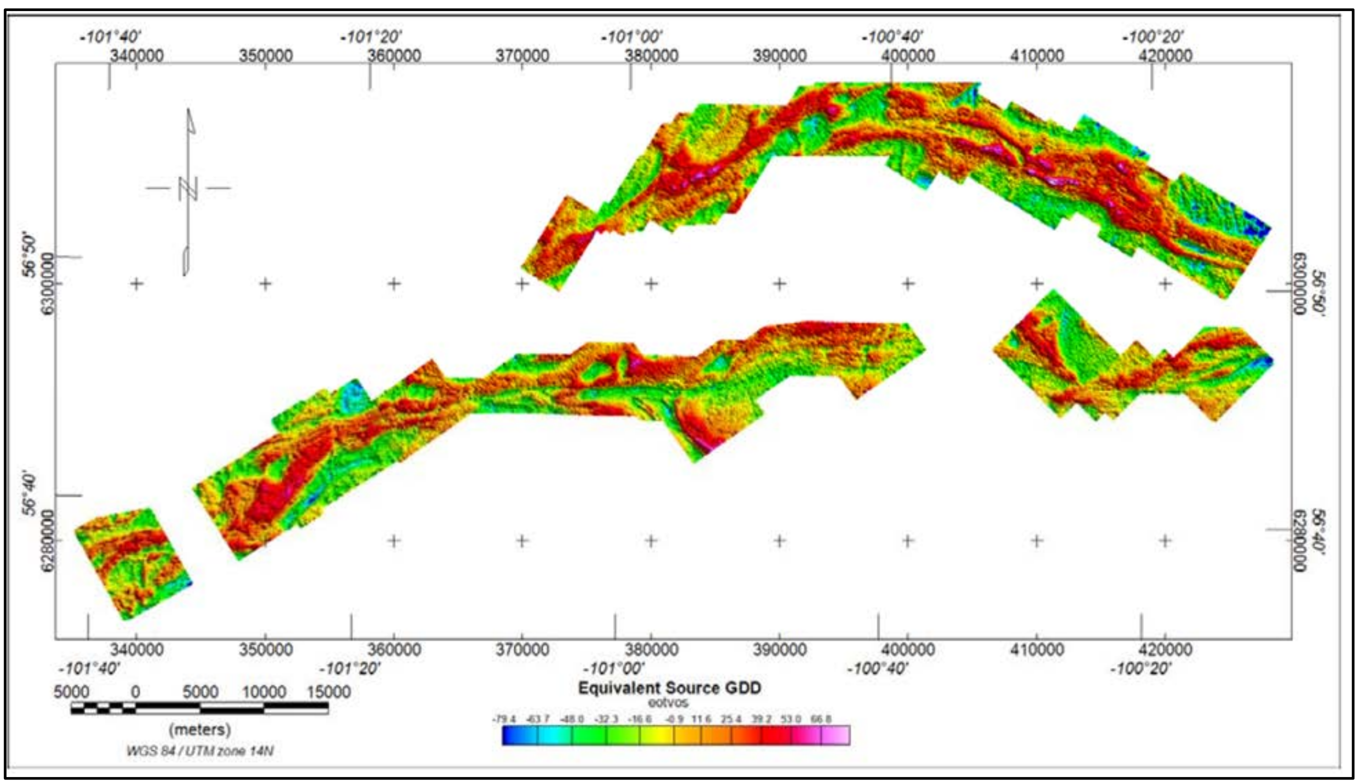


Figure 9-2 HeliFALCON Airborne Gravity Gradiometer – Vertical Gravity Gradient (GDD)

Source: Alamos (2023)

In 2021, KBM Resources Group completed a LiDAR and imagery survey over the property, surveying approximately 926 km^2. The LiDAR data has a relative vertical accuracy of 15 cm or better while the imagery has minimum 10 cm resolution (Figure 9-3).

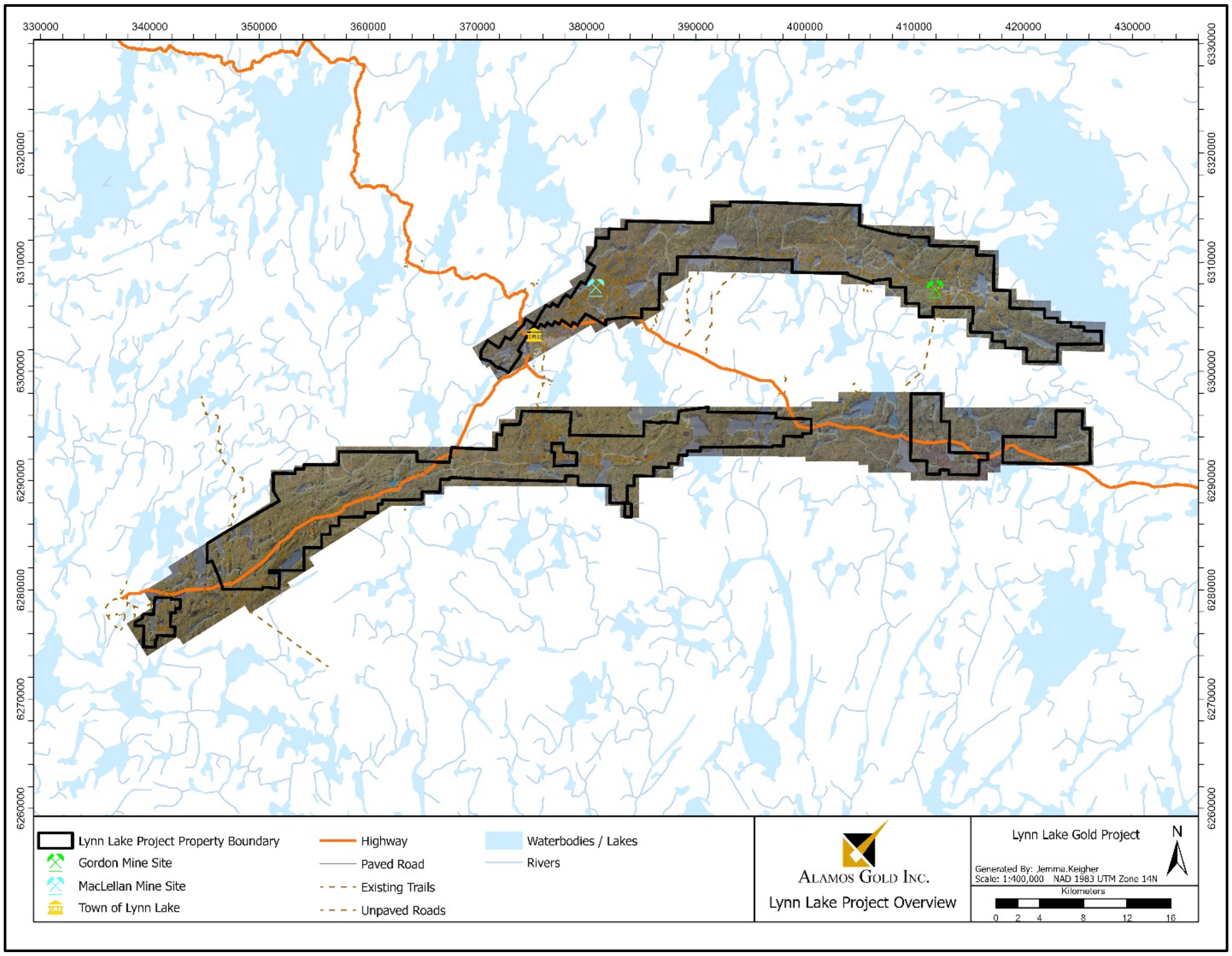


Figure 9-3 LiDAR Survey 2021

Source: Alamos (2023)

9.2 Exploration Diamond Drilling

Over 3,000 diamond drill holes totalling over 500,000 m dating back to the 1940s have been completed within Alamos' Lynn Lake Project tenure (Figure 9-4). Much of this drilling was concentrated within and in proximity to the MacLellan and Gordon Mineral Resource areas. Drilling completed by Alamos from 2017-2022 has largely focused on greenfield and brownfields exploration outside of the MacLellan and Gordon resource areas. All Mineral Resource infill and expansion drilling completed at Gordon and MacLellan is discussed in Section 10 of this report.

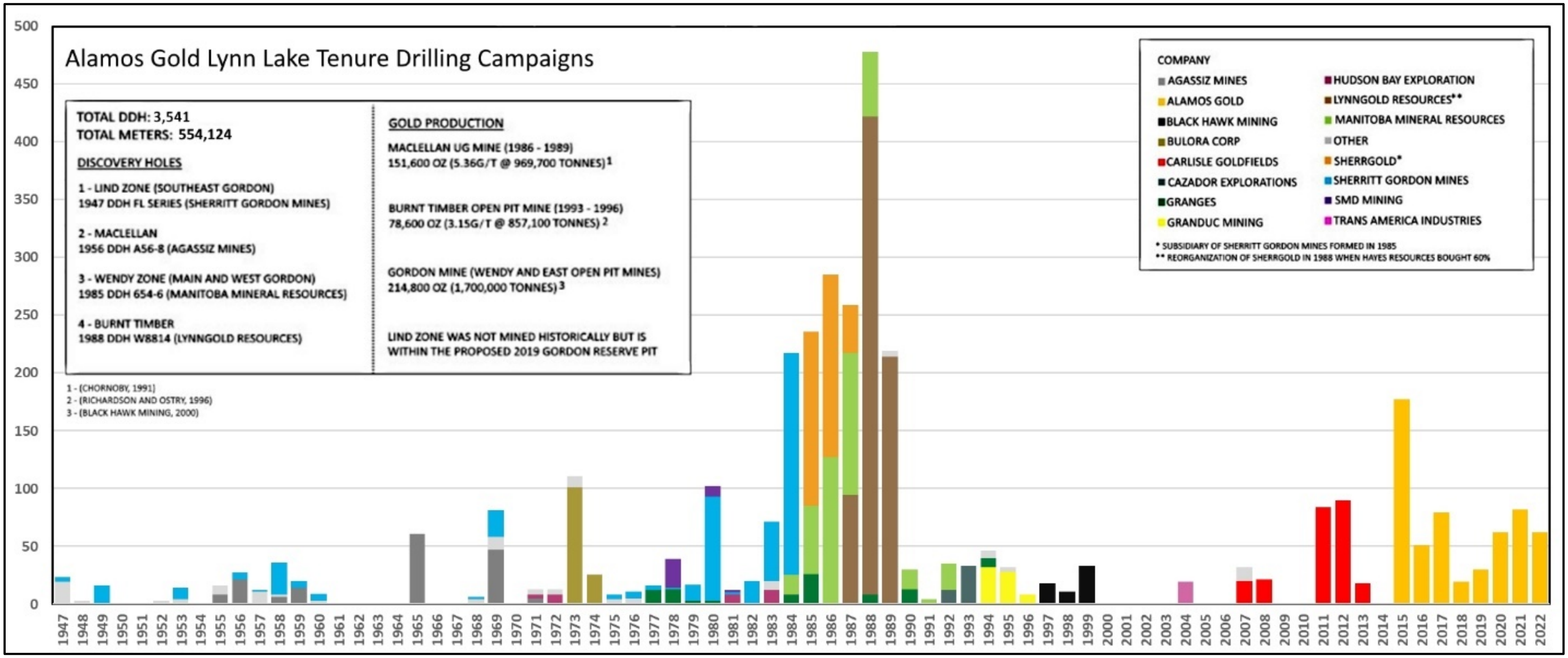


Figure 9-4 Lynn Lake Property – Historic Drilling Summary

Source: Alamos (2023)

10 DRILLING

Since 2015, Alamos has focussed its drilling programs at both the MacLellan and Gordon deposits as well as at regional targets in the north and south Lynn Lake greenstone belt. The objective of the multi-year drilling at MacLellan and Gordon has been to expand pit constrained resources while regionally, the company is systematically testing targets in its project pipeline.

10.1 Methodology and Core Logging Procedure

Since 2015, core drilling has been primarily performed with NQ size drill core (47.6 mm core diameter) using conventional surface drill rigs. The drilling programs have been carried out primarily by Dorado Drilling although Black Hawk Drilling Ltd. and Element Drilling Ltd completed some of the 2016 drilling.

From 2015-2019, each diamond drill hole collar location was spotted in the field with a Garmin 60-64 series GPS. The drill was aligned under the field supervision of an Alamos geologist or technician. The drills were aligned using an APS (Azimuth Pointing System) instrument.

From 2020 to present, each diamond drill hole collar location was spotted in the field with a GNSS receiver GPS (Trimble R2) using Trimble RTX correction services and each diamond drill hole was aligned using the north seeking DeviCo DeviAligner alignment system under the field supervision of an Alamos geologist or technician. From 2020 to present, the drills are initially aligned prior to casing. Once casing is in place, a second alignment is completed to ensure azimuth and dip are within acceptable deviation limits.

From 2015 to present all drill holes were completed with two phases of downhole orientation measurements. First, while drilling progresses by the drilling contractors, single shot measurements were completed under the supervision of the drill contractor. From 2015-2017, measurements were taken every 50 m using the RELFEX EZ-SHOT. From 2018 to present measurements were taken every 30 m using the RELFEX EZ-SHOT (2018-2019) and DeviCo DeviGyro (2020-present). Data was transferred to computers via a USB memory stick or through Bluetooth.

Following the completion of a drill hole a second phase of downhole orientation measurements are taken under the field supervision of an Alamos geologist or technician. These measurements are from the bottom to the top of the hole. From 2015-2018 multi-shot surveys were completed every 3 m using the REFLEX EZ-GYRO (2015) REFLEX EZ-SHOT (2016-2017), REFLEX EZ-GRYO (2018) and from 2019 to present, continuous surveys were completed using the REFLEX EZ-GYRO (2019) and DeviCo DeviGyro (2020-present). Data was transferred to computers via a USB memory stick or through Bluetooth.

From 2015-2017, core orientation was not completed. From 2018-2022, the Reflex ACT III Tool was used to orient core from all drill holes. The orientation instruments are operated by the drill crew and are used from the top to bottom of the hole orienting every 3 m run.

After the drill rig has been demobilized, the final collar coordinates are surveyed using the GNSS receiver GPS (Trimble R2) under the field supervision of an Alamos geologist or technician. The casings are either removed or covered with a steel cap and a wooden picket showing the collar identification. Casing is generally kept in place to allow future potential borehole surveys to take place. Holes drilled at the Lynn Lake project have not been required to be cemented or plugged. All information regarding casing, surveys and location of collars are in the drill hole database.

During drilling, the core is placed in standard wooden core boxes and every 3 m run is marked with a labelled wooden block. Each full core box is secured with a cover and labelled with the hole ID and a sequential box number. The core boxes are delivered by the drilling contractor twice a day after each shift (morning and evening) or during helicopter programs, once a day (morning) to the Alamos' core shack in Lynn Lake.

Once received, Alamos geologists or geotechnicians will review the core to ensure there are no block or meterage errors. The geotechnicians record core recovery, RQD, magnetic susceptibility, and specific gravity measurements. The core is aligned, and hole depth is written on the core every meter.

Core logging is performed by professional geologists or occasionally by geologists-in-training under the supervision of a qualified geologist. Geological observations including lithology, alteration, mineralization, structure, and veins are logged and intervals and descriptions are entered into a database following a documented procedure.

Photographs of the core are taken when logging is completed, and sample tags inserted. Core recovery is generally good averaging above 95%. Core is stored at the core storage facility at the MacLellan mine site.

10.2 Historical Drilling

10.2.1 MacLellan Deposit

Drilling at the MacLellan deposit has been conducted over a series of campaigns dating back to 1955. Prior to 2015, a total of 1,470 surface and underground drillholes (189,808 m) have been completed within the MacLellan Mineral Resource. A summary of drilling by year and company is provided in Table 10-1 and shown in Figure 10-1

Table 10-1 Summary of Historical Drill Programs at the MacLellan Deposit

Year	Diameter	Number of Drillholes	Meters	Max Length (m)	Min Length (m)	Hole Series	Type	Company
1955-1959	BQ	46	6,051	298	31	A55 - A59	Surface	Agassiz Mines (1956 Aumaque Gold Mines Option, 1958 - Central Manitoba Mines Option)
1965	BQ	60	14,243	582	58	A65	Surface	Agassiz Mines
1967	BQ	6	1,439	298	165	D59	Surface	Sherritt Gordon Mines
1969	AQ	47	1,416	169	7	U2, U3	Underground	Royal Agassiz Mines
1971	BQ	5	1,229	536	39	A71	Surface	Royal Agassiz Mines
1973-1974	AQ	126	5,571	308	7	U73, U74	Underground	Royal Agassiz Mines
1975	BQ	4	569	159	122	A75	Surface	Royal Agassiz Mines, Bulora Corp Option (50%)
1980	BQ	90	15,846	816	51	A80, D80	Surface	Sherritt Gordon Mines
1982	BQ	8	570	91	37	A82	Surface	Sherritt Gordon Mines
1982	AQ	8	2,364	532	182	U82	Underground	Sherritt Gordon Mines
1983	BQ	39	7,420	310	68	AS83, D83	Surface	Sherritt Gordon Mines
1984	BQ	60	10,068	319	33	AS84	Surface	Sherritt Gordon Mines

Year	Diameter	Number of Drillholes	Meters	Max Length (m)	Min Length (m)	Hole Series	Type	Company
1984-1985	AQ	223	32,618	444	72	AU84, AU85	Underground	Sherritt Gordon Mines/ SherrGold
1985	BQ	8	1,344	328	30	AX85, DOT85	Surface	SherrGold
1986	BQ	1	368	368	368	DOT86	Surface	SherrGold
1986	AQ	36	2,936	104	49	MU	Underground	SherrGold
1987	AIRTRAC	51	490	21	2	AT87	Surface	SherrGold
1987	BQ	25	9,489	624	92	DOT87, MS, NX87, RBS87	Surface	SherrGold
1987	AQ	56	2,299	110	11	MU, NU	Underground	SherrGold
1988	NQ	13	5,558	630	237	DOT88	Surface	LynnGold Resources
1988	AQ	211	13,337	186	2	MU, NU	Underground	LynnGold Resources
1988	BQ	13	3,489	493	84	RBS88, RBX88	Surface	LynnGold Resources
1989	AQ	127	8,390	152	17	RU, MU, NU	Underground	LynnGold Resources
1992	NQ	12	360	35	24	MACCP92	Surface	Cazador Explorations
1999	NQ	18	815	54	36	MAC99	Surface	Black Hawk Mining
2007	NQ	40	12,344	767	32	TA, TAS, 100, 96, 99, MG07	Surface	Carlisle Goldfields
2008	NQ	21	8,812	665	62	MG08	Surface	Carlisle Goldfields
2011	NQ	34	17,612	747	27	MG11	Surface	Carlisle Goldfields
2012	NQ	8	2,761	417	280	MG12, GT12	Surface	Carlisle Goldfields
2015	NQ	74	17,007	393	73	MG15, GTM15	Surface	Alamos Gold
2015	PQ	4	534	222	52	MMET15	Surface	Alamos Gold
2016	NQ	10	7,271	1311	150	16MCD, 16MCX	Surface	Alamos Gold
2017	NQ	28	5,064	401	42	17MGD, 17MCX	Surface	Alamos Gold
2018	NQ	2	618	318	300	18MCX	Surface	Alamos Gold
2019	NQ	12	2,932	318	81	19MCX	Surface	Alamos Gold
2020	NQ	29	7,399	17	459	20MCX	Surface	Alamos Gold
2021	NQ	16	3,306	51	381	21MCX	Surface	Alamos Gold
Total		1,571	223,939					

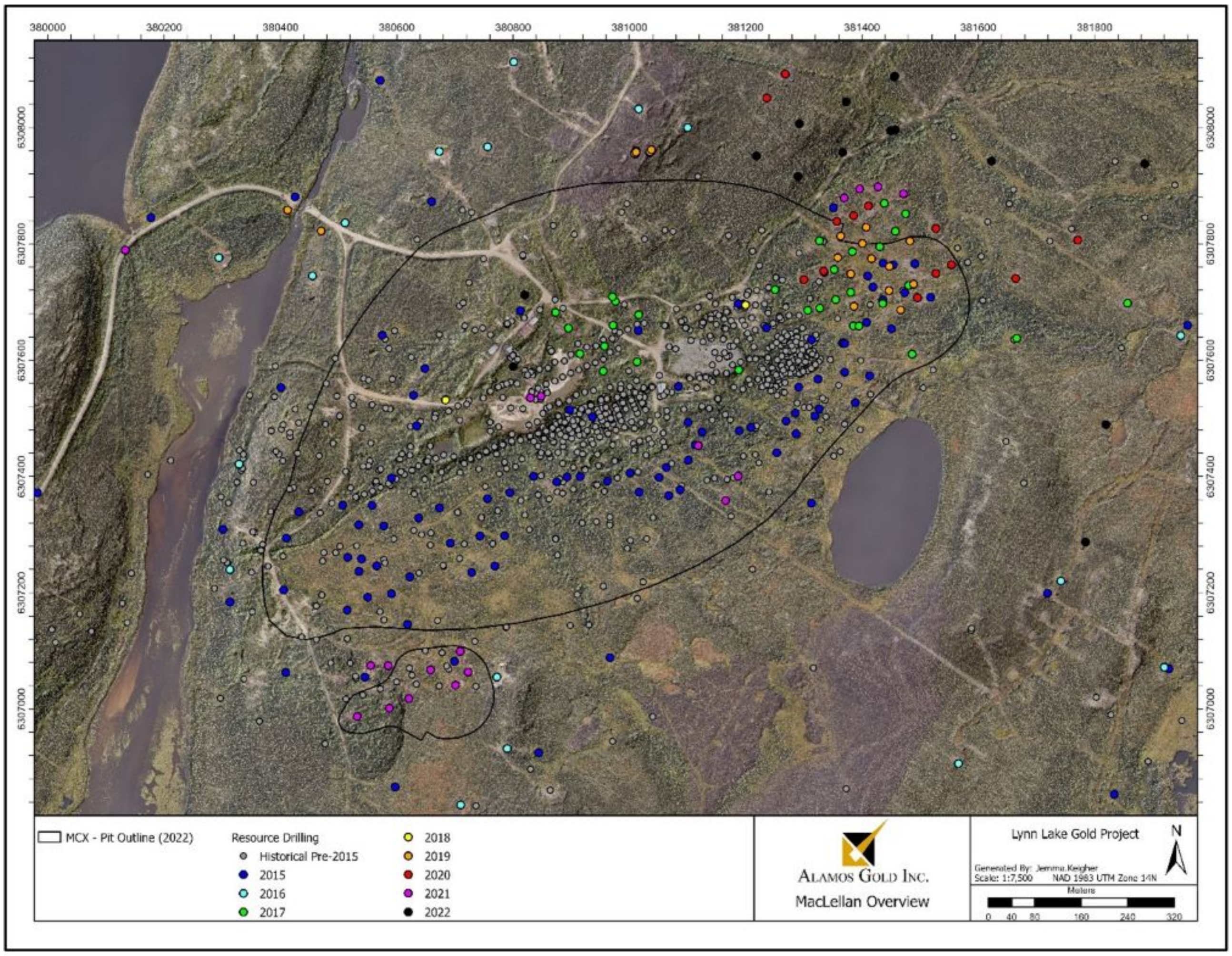


Figure 10-1 Plan View of MacLellan Drill Holes and 2023 Feasibility Reserve Pit

Source: Alamos 2023

10.2.2 Gordon Deposit

Drilling within the Gordon deposit has been conducted over a series of campaigns dating back to 1985. Prior to 2015, a total of 421 surface drill holes (65,085 m) had been completed within the Gordon Mineral Resource area. A summary of drilling by year and company is provided in Table 10-2 and shown in Figure 10-2.

Table 10-2 Summary of Historic Drill Programs at the Gordon Deposit

Year	Diameter	Number of Drillholes	Meters	Max Length (m)	Min Length (m)	Hole Series	Type	Company
1985	NQ	31	4,788	413	66	654	Surface	Manitoba Mineral Resources (MMR)(55.17%) & HBED (Hudson Bay Exploration and Development) (44.83%)
1986	BQ	80	10,146	244	68	654	Surface	MMR & HBED
1986	NQ	39	4,874	211	37	654	Surface	MMR & HBED
1987	NQ	114	16,540	462	50	654	Surface	MMR & Mingold (HBED)
1988	NQ	43	7,363	487	60	654	Surface	MMR & Mingold (HBED)
1990	NQ	11	1,327	154	81	654	Surface	MMR & Mingold (HBED)
1992	NQ	23	5,327	609	144	654	Surface	MMR (55.17%) & Golden Band Resources (44.83%)
1995	NQ	14	966	110	47	654	Surface	Keystone Gold JV (Black Hawk Mining (50%) and Granduc Mining (50%))
1996	NQ	8	991	141	116	654	Surface	Black Hawk Mining
1997	NQ	3	161	71	40	654	Surface	Black Hawk Mining
1998	NQ	11	468	100	16	654	Surface	Black Hawk Mining
2012	NQ	25	7,502	464	194	FL12	Surface	Carlisle Goldfields
2013	NQ	18	4,432	425	170	FL13	Surface	Carlisle Goldfields
2014	NQ	1	200	200	200	FL14	Surface	Carlisle Goldfields
2015	NQ	84	12,949	285	54	FL15	Surface	Alamos Gold
2017	NQ	5	1,551	327	285	17FLX	Surface	Alamos Gold
2018	NQ	2	696	396	300	18FLX	Surface	Alamos Gold
2019	NQ	7	1,794	333	159	19GDX	Surface	Alamos Gold
2020	NQ	28	5,768	93	366	20GDX	Surface	Alamos Gold
2021	NQ	41	6,532	52	375	21GDX, GPT21, GGT21	Surface	Alamos Gold
2022	NQ	7	1,126	138	183	22GDX	Surface	Alamos Gold
Total		595	95,501					

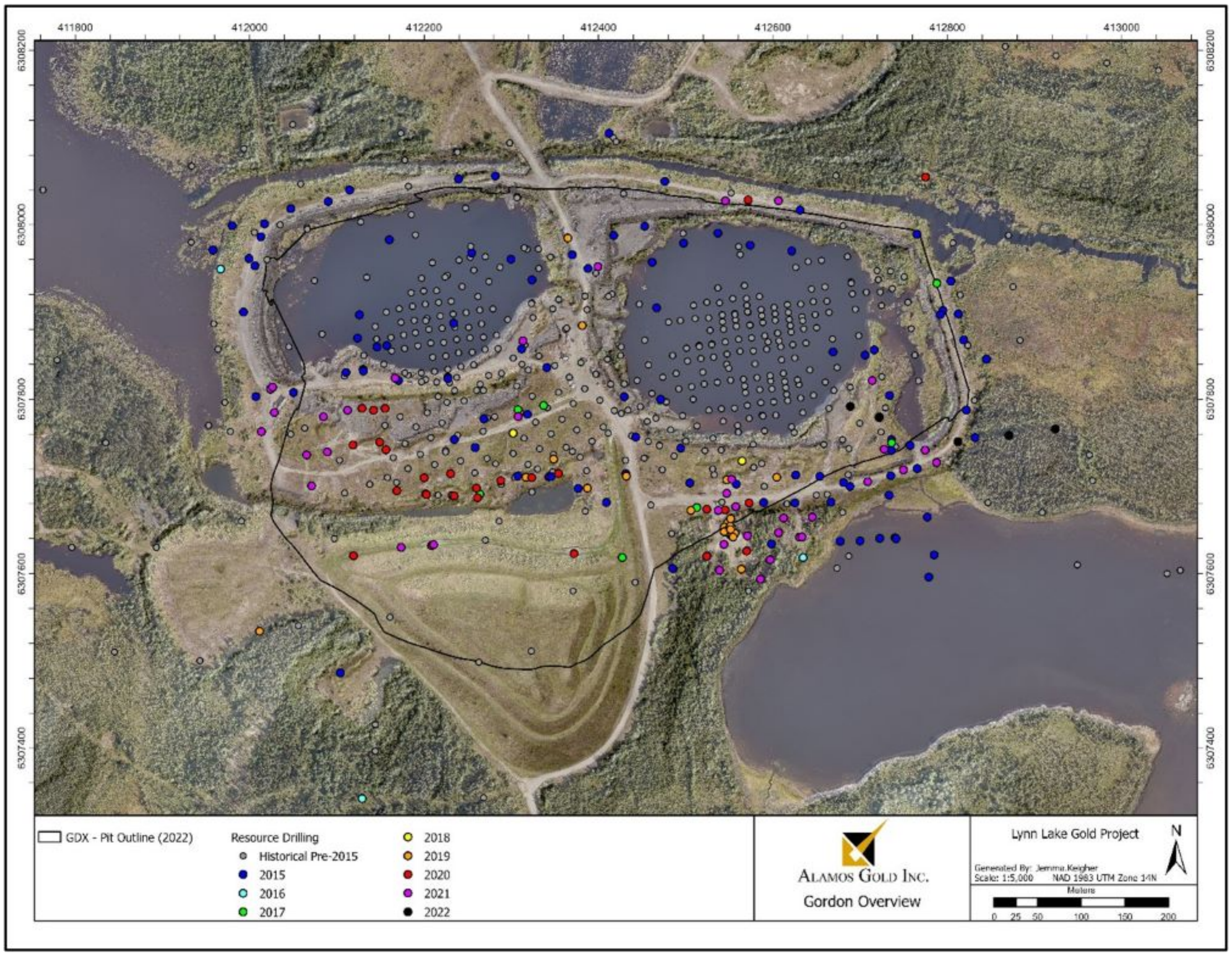


Figure 10-2 Plan View of Gordon Drill Holes and 2023 Reserve Pit

Source: Alamos (2023)

10.3 Alamos Gold Drilling

10.3.1 2015-2016 Drilling

In 2015, Alamos initiated work at both the MacLellan and Gordon deposits. The results of this drilling were incorporated into the Mineral Resource estimate and reported in the 2018 Feasibility Study (Ausenco, 2018).

The overall objectives of the 2015 drilling program were to:

- Provide verification of the historic drill data;
- To test targets outside of the pit designs from the Preliminary Economic Assessment (Tetra Tech, 2014); and
- Provide additional drill data density to areas with historical Mineral Resources to upgrade the classification for Mineral Resource estimation purposes.

The 2015 drilling program commenced in May of 2015 and concluded in July of 2015. A total of 78 core holes totalling 17,535 m were drilled at MacLellan and 12,891 m in 84 core holes were drilled at Gordon.

The objectives of the 2016 drilling program were to:

- Test IP anomalies from the condemnation geophysical IP grid completed in early 2016; and
- Sterilize areas for potential infrastructure development.

A total of 3,161 m were drilled in 17 holes at MacLellan and 1,715 m in 11 holes at Gordon.

10.3.2 2018 Drilling Program

In June 2018, the Company completed two NQ-diameter drillholes (696 m) at Gordon and two NQ-diameter drillholes (618 m) at MacLellan (Table 10-3 and Table 10-4).

The objectives of the 2018 drilling at Gordon and MacLellan were to:

- Provide complete geological sections through each deposit for detailed relogging from whole core, focusing on the controls on gold mineralization;
- Collect in-situ measurements of geological features from downhole optical televiewer (OTV) and acoustic televiewer (ATV) surveys to accurately determine the orientation of planar geological features including veining and foliation. Physical parameter measurements including magnetics, natural gamma, chargeability, and resistivity were also collected; and
- Provide additional drill data density to areas with historical Mineral Resources to upgrade the classification for Mineral Resource estimation purposes.

Table 10-3 2018 Gordon Drilling Results

Hole ID	Inclusion	From (m)	To (m)	Core Length (m)	Assay (Au g/t)	Cut Assay (Au g/t)[1]
18LFX010		65.10	68.40	3.30	4.78	4.78
		105.80	113.00	7.20	1.83	1.83
		122.65	131.30	8.65	4.88	4.88
		135.55	136.85	1.30	5.00	5.00
18FLX011		12.00	15.00	3.00	1.39	1.39
		145.50	147.64	2.14	5.14	5.14
	Including	146.95	147.64	0.69	14.20	14.20
		152.58	160.30	7.72	1.05	1.05
		183.57	184.50	0.93	3.04	3.04
		200.10	204.76	4.66	4.90	4.76
	Including	201.20	201.50	0.30	42.20	40.00
		211.67	212.50	0.83	5.80	5.80
		248.00	252.00	3.00	1.88	1.88
		344.00	351.00	7.00	1.04	1.04

Notes:
1. *Individual assays cut to 45 g/t Au.*

Table 10-4 2018 MacLellan Drilling Results

Hole ID	Inclusion	From (m)	To (m)	Core Length (m)	Assay (Au g/t)	Cut Assay (Au g/t)[1]
18MCX026		149.80	162.30	12.50	1.22	1.22
		168.10	179.00	10.90	1.61	1.61
		198.05	227.83	29.78	1.72	1.72
18MCX027		162.04	163.50	1.46	4.18	4.18
		170.00	176.20	6.20	2.93	2.93
		175.18	176.20	1.02	9.46	9.46
		184.00	188.00	4.00	1.99	1.99
		197.00	202.90	5.90	3.73	3.73
		223.00	226.00	3.00	3.08	3.08
		240.27	244.48	4.21	12.73	12.19
	Including	242.82	244.48	1.66	26.37	25.00
		255.30	259.00	3.70	3.34	3.34

Notes:
1. *Individual assays cut to 45 g/t Au.*

10.3.3 2019 Drilling

During the period of February to April 2019, the Company completed a total of 7 NQ-diameter drillholes at Gordon (1,794 m) and 12 NQ-diameter drillholes at MacLellan (2,932 m).

The objective of the 2019 drilling at Gordon was to:

- Infill and expand on the Gordon resource by testing exploration targets defined from the updated Gordon Geological Model completed in 2018.

The objective of the 2019 drilling at MacLellan was to:

- Infill and expand on the MacLellan Northeast gold mineralization defined from drilling completed in 2016.

Significant results from the 2019 drilling at Gordon are reported in Table 10-5, while significant results from MacLellan are reported in Table 10-6.

Table 10-5 2019 Gordon Drilling Results

Hole ID	Inclusion	From (m)	To (m)	Core Length (m)	Assay (Au g/t)	Cut Assay (Au g/t)[1]
19GDX001		65.80	66.10	0.30	39.50	39.50
19GDX002		9.00	12.00	3.00	4.26	4.26
		103.00	106.00	3.00	4.12	4.12
		202.00	218.00	16.00	5.22	3.88
	Including	214.00	217.00	3.00	55.41	11.45
19GDX003		52.50	55.40	2.90	6.15	6.15
		194.60	207.50	12.90	18.91	2.67
	Including	205.95	206.45	0.50	459.00	40.00
19GDX004		123.80	0.55	1.40	6.01	6.01
	Including	124.35	124.65	0.30	23.00	23.00
		163.00	173.20	10.20	1.28	1.28
19GDX005		216.45	218.45	2.00	18.59	12.11
		271.00	273.20	2.20	4.25	4.25
19GDX006		53.00	54.00	1.00	36.50	36.50
		180.60	200.17	19.57	3.42	2.94
	Including	192.12	193.40	1.28	18.85	15.69
		236.00	256.00	20.00	1.00	1.00

Notes:
1. *Individual assays cut to 40 g/t Au.*

Table 10-6 2019 MacLellan Drilling Results

Hole ID	Inclusion	From (m)	To (m)	Core Length (m)	Assay (Au g/t)	Cut Assay (Au g/t)[1]
19MCX028		112.00	143.00	31.00	3.24	3.24
19MCX029		182.40	194.30	11.90	3.99	3.99
19MCX030		118.27	120.00	1.73	8.79	8.79
		136.95	142.28	5.33	1.63	1.63
		147.53	164.50	16.97	1.50	1.50
19MCX032		40.18	54.75	14.57	2.29	2.29
19MCX033		59.30	98.50	39.20	0.96	0.96
19MCX034		93.30	138.00	44.70	0.71	0.71
19MCX035		143.00	151.35	8.35	1.22	1.22
19MCX036		50.70	66.60	15.90	3.85	3.85
19MCX037		9.70	29.80	20.10	11.49	8.98
	Including	22.00	27.00	5.00	41.74	31.63
19MCX038		207.00	218.10	11.10	1.09	1.09
19MCX039		199.00	218.00	19.00	2.29	2.29

Notes:
1. *Individual assays cut to 45 g/t Au.*

10.3.4 2020-2022 Drilling

Fifty-seven core holes were drilled at MacLellan (13,367 m) and 76 core holes (13,426 m) were drilled at Gordon between 2020 and 2022.

The objectives of the drilling at MacLellan during this period were to:

- Extend mineralization to the east in the Nisku and East Zones; and
- To test south of the 2018 resource area.

These campaigns were successful in extending mineralization down plunge from the existing reserves in the northeastern portion of the 2018 mineral reserve pit. Significant intersections are shown in Figure 10-3 and Table 10-7.

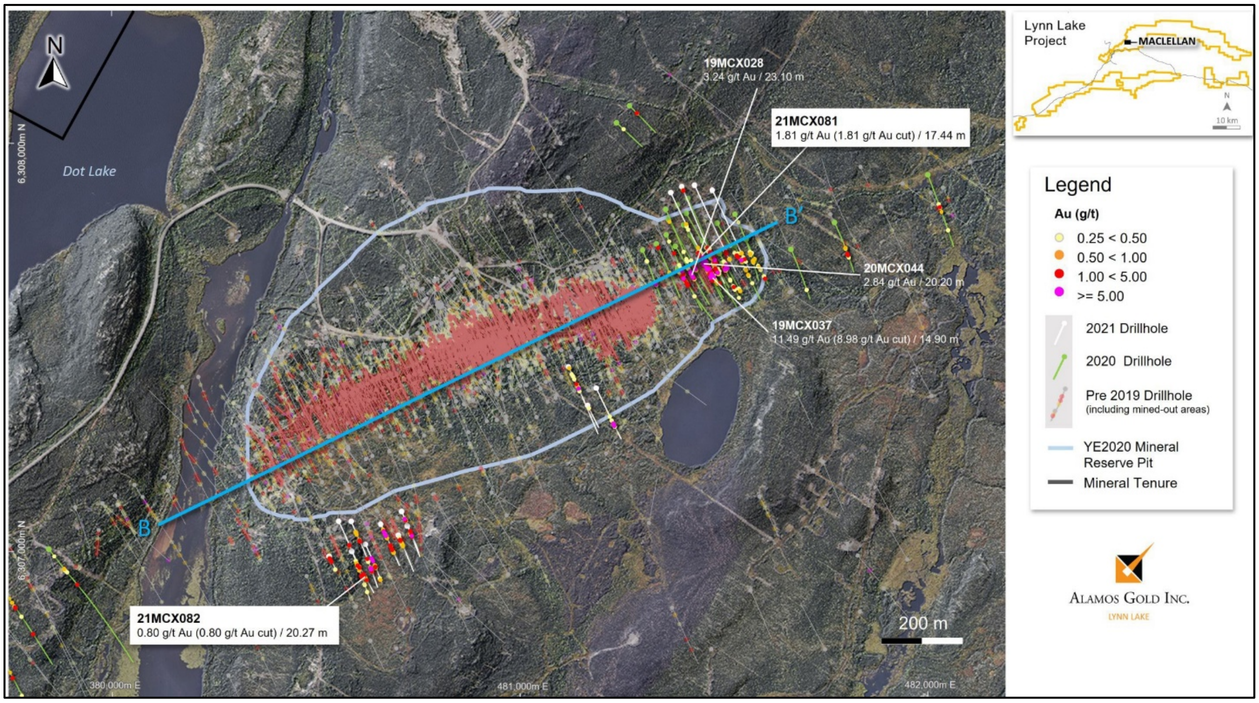


Figure 10-3 2020-2022 MacLellan Drilling Results

Source: Alamos (2023)

Table 10-7 2020-2022 MacLellan Drilling Results

Hole ID	Inclusion	From (m)	To (m)	Core Length (m)	Assay (Au g/t)	Cut Assay (Au g/t)[1]
20MCX044		217	243	20.02 TW[2]	2.84	2.84
21MCX081		257	278.43	21.43	1.81	1.81
21MCX082		85.70	110.80	20.27	0.80	0.80
22MCX089		442	449	7.00	0.86	0.86

Notes:

1. *Individual assays cut to 45 g/t Au.*
2. *TW: true width*

The objective of the drilling at Gordon was to add resources at the east end of the 2018 Mineral Reserve pit. Drilling tested two geological targets: mineralization along the diorite contact in the southwest at the southern extent of the 2018 Mineral Reserve pit, and veins in the diorite in the southeast portion of the 2018 Mineral Reserve pit. Significant gold mineralization was intersected in both targets. High grade, near-surface gold mineralization was intersected along the diorite-iron formation contact in a part of the reserve model which was classified as waste. Significant intersections are shown in Figure 10-4 and Table 10-8.

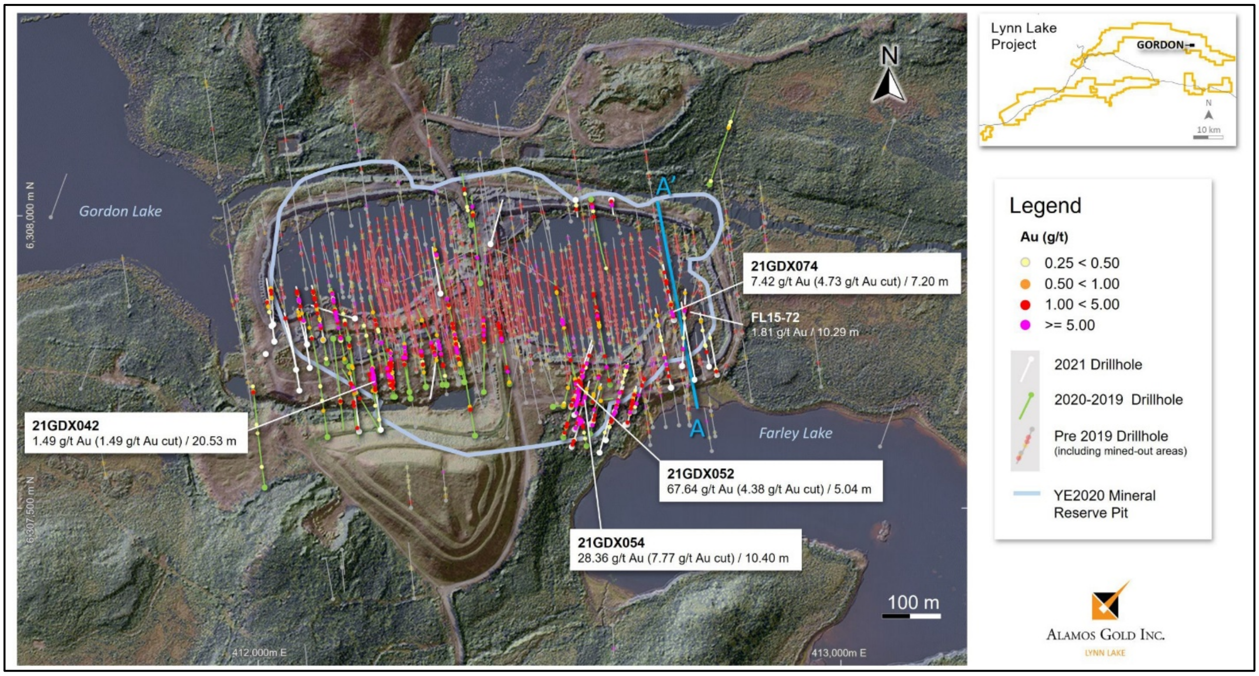


Figure 10-4 2020-2022 Gordon Drilling Results

Source: Alamos (2023)

Table 10-8 2020-2022 Gordon Drilling Results

Hole ID	Inclusion	From (m)	To (m)	Core Length (m)	Assay (Au g/t)	Cut Assay (Au g/t)[1]
21GDX042		164.10	196.00	31.90	1.49	1.49
	Including	166.80	167.40	0.60	6.77	
	Including	180.00	181.00	1.00	6.37	
	Including	195.00	196.00	1.00	10.05	
21GDX052		23.90	28.95	5.05	67.64	4.38
	Including	24.40	24.70	0.30	1105.00	
	Including	27.80	28.10	0.30	26.10	
21GDX054		15.05	30.00	14.95	28.36	7.77
	Including	20.30	20.65	0.35	302.00	
	Including	20.65	21.10	0.45	26.50	
	Including	21.60	21.90	0.30	372.00	
	Including	21.15	23.50	0.35	176.00	
	Including	23.50	23.88	0.33	73.30	
	Including	23.88	24.30	0.42	6.95	
	Including	29.00	30.00	1.00	96.20	
21GDX074		10.50	26.75	16.25	7.42	4.73
	Including	14.10	16.46	2.36	9.13	
	Including	14.70	15.00	0.30	11.90	
	Including	15.75	16.46	0.71	9.46	
	Including	22.90	23.50	0.60	12.25	
	Including	23.50	25.30	1.80	35.07	
22GDX077		86.00	91.30	5.30	3.37	2.87
	Including	86.50	86.80	0.30	48.70	
22GDX080		37.15	42.50	5.35	4.72	
	Including	37.75	39.80	2.05	5.46	
	Including	40.8	41.75	0.95	14.49	
		64.81	75.40	10.59	2.86	
	Including	64.81	65.11	0.30	15.25	
	Including	72.07	73.15	1.08	15.83	
22GDX081		76.55	101.65	25.1	2.51	
	Including	78.95	80.84	1.89	7.98	
	Including	99.45	101.00	1.55	12.6	
		130.15	135.90	5.75	0.89	
22GDX082		47.00	52.40	5.40	0.53	
		85.85	91.00	5.15	1.61	
	Including	89.60	90.05	0.45	18.05	
		95.80	107.07	11.27	10.35	
	Including	96.97	105.40	8.43	13.34	
		112.40	117.40	5.00	1.08	
	Including	115.40	116.00	0.60	8.75	

Notes:

1. *Individual assays cut to 40 g/t Au.*

11 SAMPLE PREPARATION, ANALYSES, AND SECURITY

This section describes the sample preparation, analysis, and security protocols for Alamos' current core drilling programs. These procedures have been in place since 2015. Between 2006 and 2015, Carlisle was the operator of the project. Prior to 2006, numerous operators drilled at the MacLellan and Gordon projects.

11.1 Core Handling, Sampling and Security

Core is placed in wooden boxes at the drill site and each box is labelled with the hole number and box number. Lids are placed on the boxes and closed with wire strapping or tape. The drill core is transported daily to the core shed by the drill contractor.

At the core shed, the core boxes are opened by a geologist or geotechnician and a quick log is completed, ensuring that the blocks marking individual core runs are correctly placed and labelled with proper hole depth.

At the core shed, the core undergoes geotechnical and geological logging as described in Section 10.1.

Following Alamos' Quality Assurance/Quality Control ("QA/QC") protocols, the geologist marks the interval for sampling using a red line on the core. Arrows at the end of the line indicate the start and end of a sample. A geologist or geotechnician inserts a sample label at the start of the sample interval. The hole number, box number, date and sample depth are recorded on the sample label. A cutting line is marked on the core. Assay samples do not cross lithological contacts and sample lengths are between 0.3 m and 1.3 m for NQ sized core, at the discretion of geologist.

Blanks and standards are inserted every tenth sample. The geologist chooses the standard that most closely represents the amount of expected mineralization in the drill hole. If visible gold is observed in a sample, an additional blank is inserted into the sample stream after the sample containing visible gold.

Each sample is cut along the cutting line taking care to stop each sample at the depth indicated. Half of the core is placed in a micropore sample bag which is prelabelled with the sample number. The other half of the core is placed back in the core box. If visible gold is present, then the core saw blade is cleaned after cutting the sample.

The samples are then placed in larger rice bags secured with zip ties. The larger bags are either palleted or crated, and then sealed with plastic wrap. Samples are typically dispatched weekly via road by Gardewine Transport to Thunder Bay, Ontario or to Winnipeg, Manitoba by exploration staff. A chain of custody procedure is strictly followed during transportation.

11.2 Laboratory Accreditation and Certification

From 2015 to June 2022, all samples were submitted to ALS Limited) (ALS) in Thunder Bay, Ontario for sample preparation and then forwarded to ALS in Vancouver, British Columbia for analysis. As of June 2022, samples have been submitted to ALS in Winnipeg, Manitoba for sample preparation and then forwarded to ALS in Vancouver, British Columbia for analysis. ALS is an accredited testing laboratory conforming with the requirements of ISO 17025: 2005

11.3 Laboratory Preparation, Assays and Measurements

The standard primary sample is a half-core sample. Since 2015, Alamos has used ALS as the primary laboratory. Between 2011 and 2015, Carlisle used TSL Laboratories Inc. (TSL) in Saskatoon as the primary laboratory.

The sample preparation and assay methods since 2011 are summarized in Table 11-1.

Table 11-1 Summary of Preparation and Assay Methods

Procedure	TSL Laboratories	ALS Global		
	2011 - 2015	2015	2016 - 2017	2017 - Present
Crushing	95% passing 2 mm	90% passing 2 mm		70% passing 2 mm
Pulverizing	250 g to 95% passing 106 microns	1000 g to 95% passing 106 microns		1000 g to 85% passing 75 microns
Gold Assay	30 g fire assay with inductively coupled plasma (ICP) finish and 0.005 g/t Au detection limit.	50 g fire assay with AAS finish and 0.01 g/t Au detection limit (method AA-26)		
Over Limit Gold Assay	30 g fire assay with gravimetric finish for over 10 g/t Au and 0.01 g/t detection limit	Screened metallics for over 10 g/t Au	50 g Au by fire assay and gravimetric finish (method Au - GRA22) for over 5 g/t Au	
Screened Metallics	Screening at 106 microns and fire assaying of fine and coarse fractions	Screening at 100 microns and fire assaying of fine and coarse fractions		
Multi-element	Silver only by AAS and 3:1 HCl + HNO3 digest	Aqua regia digest with 37 elements (method ME-ICP41)	Four Acid digest with ICP-AES finish (method ME-ICP61)	

11.4 Analysis

Drill core samples used for Mineral Resource estimation have been assayed for gold by standard fire assay methods. A 50 g aliquot was used at ALS and a 30 g aliquot was used at TSL.

The fire assay method is described by ALS as:

"A prepared sample is fused with a mixture of lead oxide, sodium carbonate, borax, silica, and other reagents as required. The flux and sample are mixed, then heated at high temperature (>1,000°C) to decompose rock lattices and allow gold within the sample to be collected into a lead button. The button is placed in a porous cupel and heated again in an oxidising environment to convert lead to lead oxide that is absorbed into the cupel, leaving the precious metals behind as a doré bead or prill. The gold content of the prill is then determined either gravimetrically or via aqua regia digestion and spectroscopy.

Screened metallic assays were requested when initial gold results are greater than 10 g/t or if visible gold is observed in a sample. Starting in 2016, gravimetric assays are requested on samples with initial gold results of >5 g/t.

11.5 Quality Assurance and Quality Control (Pre-2015)

No information has been compiled that describes the quality control (QC) procedures and results for the pre-2011 drilling programs. The main form of QC in the past would have been periodic re-assaying of anomalous samples.

Since 2011, drill core samples submitted by Carlisle were assayed using industry-standard fire assay techniques. Carlisle relied on the internal quality control procedures at TSL and did not submit QC materials to the laboratory.

11.6 Quality Assurance and Quality Control (Alamos 2015-2017)

Since 2015, Alamos has maintained a QA/QC program for drill core that includes:

- Insertion of blanks and reference materials with each batch of submitted samples;
- Creation of preparation duplicates.
- Collection of quarter core duplicates (2015 only); and
- Submission of pulps to a secondary laboratory for check assaying.

All of Alamos' samples were submitted to ALS Global (ALS) for sample preparation and analysis. The samples were prepared at the Thunder Bay, Ontario facility. The prepared sample pulps were forwarded to ALS in Vancouver, B.C. for analysis.

The 2015-2016 QC data was audited by Lynda Bloom of Analytical Solutions Ltd. (ASL). A summary of the 2015 and 2016 audit results is provided below.

Reference materials were inserted at a rate of 4% which is acceptable. A total of 1,084 blanks were inserted. Blanks were determined to have failed when they assayed more than 100 ppb gold. There is a very low failure rate for blanks and no evidence of systematic gold contamination.

Five different reference materials were inserted 1,089 times with samples for assaying. There were 108 QC failures identified. At least half of the failures were due to database errors and do not reflect poor performance by the laboratory. No significant biases are present in the data. The Feasibility Study (Ausenco, 2018) stated that *"laboratory performance, based on reference material results, is acceptable and analytical data are considered useable for Mineral Resource estimation".*

A total of 790 laboratory pulp duplicates were analysed for gold from the MacLellan property. The calculated precision is 56% for gold values greater than 0.1 g/t gold. The Feasibility Study (Ausenco, 2018) stated that "*precision for pulps is relatively poor due to the presence of free gold".*

Check assays are used to augment the assessment of bias based on reference materials. The same pulp that was assayed originally is submitted to a different laboratory for the same analytical procedures. Check assays were completed on 495 samples pulps. The sample pulps were submitted to TSL. Fifty-eight percent of the samples agree within ±25%. For additional details relating to QC from 2015 to May 2017, refer to the Feasibility Study for the Lynn Lake Gold Project (Ausenco, 2018)

11.7 Quality Assurance and Quality Control (2017-2022)

In 2017, Alamos standardized their data management practices across all exploration sites. The use of a database management system, a new QAQC module and a QC officer allows AGI to monitor assay quality in real time.

Following earlier protocols established before 2017, Alamos continues to use the same QAQC protocols for monitoring and correcting assay datasets; however, a new set of QC rules were documented and are implemented on site to approve/reject laboratory certificates before these are distributed (Table 11-2).

Table 11-2 QAQC Sample summary

Sample Type	Objective	Description	Default QC Fail Rule	Frequency
CRM/Standards	Monitor Accuracy	Certified Reference Material (CRM) in pulp form- with known Au concentrations (expected Means & Errors).	Outside 3 Standard Deviations	1:20
Coarse-Blank	Monitor Contamination	Pure quartz material prepared as 1-3 cm fragment size by AGI with Au concentrations below lower analytical detection limit of assay technique.	5 x Lower Detection Limit	1:20
Preparation Duplicates	Monitor Precision	Duplicate samples created by splitting the bulk sample after the crushing to -2 mm in the laboratory.	NA	1:20
Pulp Duplicates	Monitor Precision	Laboratory internal pulp duplicates (pulverization stage)	NA	1:20
Pulp Replicates	External Check	The fine (pulp) reject sample that is analyzed by a secondary laboratory.	NA	1:50

All original data as well as corrective actions taken by the QC officer are stored in the database allowing the information to be queried on demand. This allows Alamos to be transparent in reporting information during Mineral Resource modelling.

The number of standards, blanks, laboratory duplicates, and check assays are shown in Table 11-3.

Table 11-3 Summary of QAQC Results 2017-2022

Sample Type	Number of Samples (2017-2022)	Insertion Rate (%)	Number of Failures (>+/- 3SD)	Failure Rate (%)
CRM/Standards	4,575	4.72	117	2.56
Coarse-Blank	4,566	7.71	11	0.24
Pulp Duplicates	3,956	4.08	-	-
Check Assays	2,228	2.30	-	-

11.7.1 QAQC Monitoring

Data is validated upon reception from laboratory and on monthly basis. All corrective actions are then audited on semi-annual basis (Table 11-4).

Table 11-4 Summary of QAQC Monitoring Phases

Phase	Objective	Description	Responsible
By Batch	Monitor field sampling and CRM errors	QAQC procedures applied on each received certificate from laboratory.	QC officer
Monthly	Monitor Bias	This procedure is to identify minor and irregular problems that can only be identified by interpreting multiple certificates of analytical data.	QC officer
Semi-Annual	QAQC Audit	Validate corrective actions made by the QC officer and to determine if significant bias or differences between the primary and secondary laboratories exists.	External auditor

Established corrective actions are activated when errors are found within the received laboratory certificates. A certificate can be partially or fully rejected depending on the type of errors found. Corrective actions include the re-assay of certain pulps and/or coarse rejects. When this is requested, the original data is overwritten in the database and the original records are moved to a separate table.

11.7.2 Certified Reference Materials (Standards)

Reference Materials are submitted with samples for assay to identify:

- If there were assay problems with specific sample batches; and
- Possible long-term biases in the overall dataset.

The definition of a quality control failure is when:

- Assays for a reference material are outside ±three standard deviations or 10%; and
- Assays for two consecutive reference materials are outside ± two standard deviations.

When a standard fails, results are rejected for five samples on either side of the failed standard and the pulps are re-analyzed. Alamos uses OREAS certified reference material and CDN Resource Laboratory Ltd. reference materials.

Between 2017-2022, a total of 4,575 standards were dispatched for analysis. One hundred and seventeen samples failed the +/- 3SD test triggering partial batch re-runs (Figure 11-1, Table 11-3).

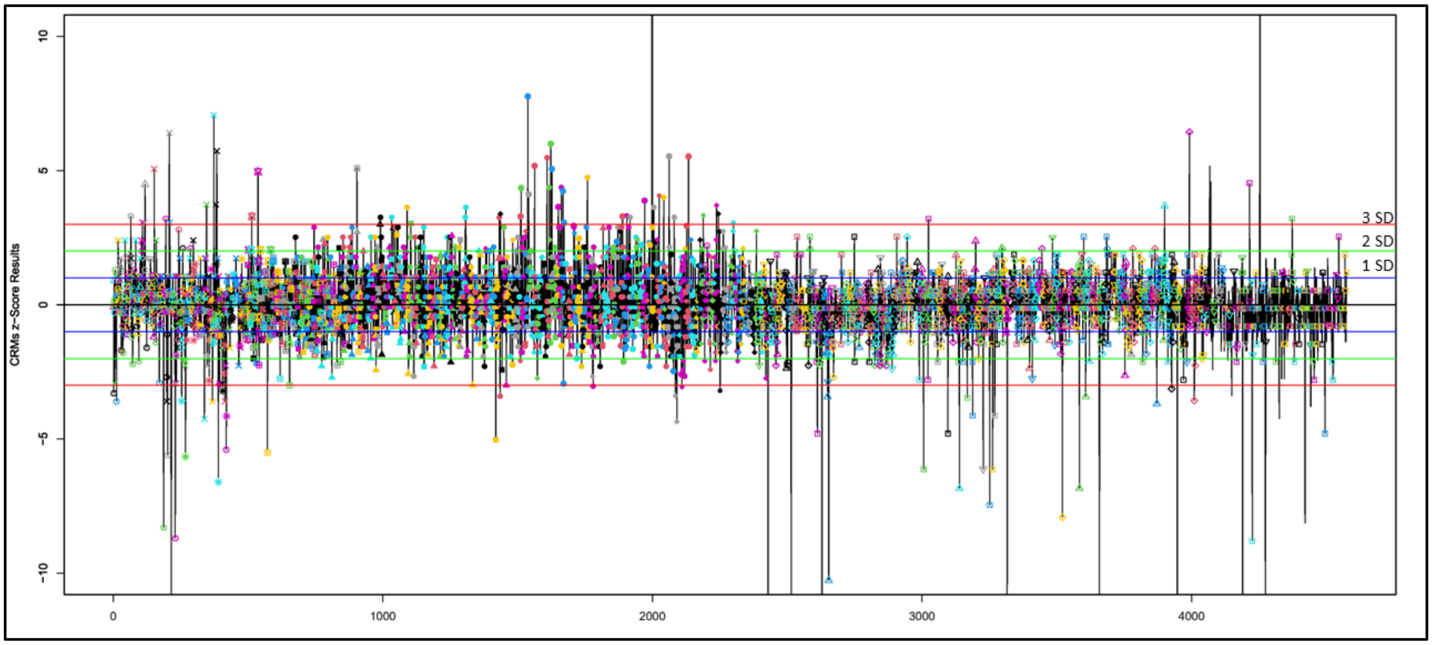


Figure 11-1 Z-score Plot for all Standards submitted for Fire Assay between 2017-2022

Source: Alamos (2023)

Laboratory performance, based on reference material results, is acceptable and analytical data are considered useable for Mineral Resource estimation.

11.7.3 Blank Samples

Potential contamination during preparation is monitored by the routine insertion of "blank" samples that follow the same preparation and analytical methods as drill core samples. Blank material is sourced from SITEC North America, a quarry supplying quartz material in Quebec, Canada.

For coarse blanks, five times the analytical method lower detection limit is allowed before a blank is deemed a failure. When a coarse blank is preceded by a high grade sample, 1% contamination is allowed from the previous sample.

Between 2017-2022, 4,566 blank samples were inserted into the sample stream and analyzed. Eleven failures triggered partial sample batch re-runs (Table 11-3). Figure 11-2 shows the performance of blank material submitted for fire assaying between 2017-2022.

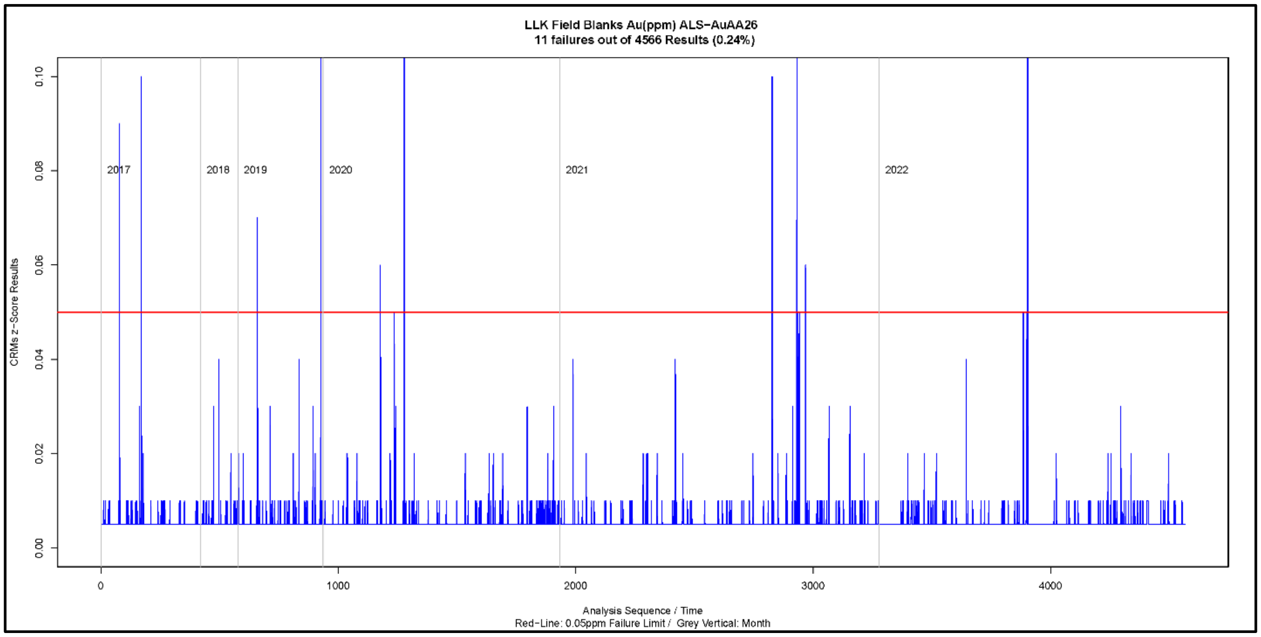


Figure 11-2 Blanks submitted for Fire Assay between 2017-2022

Source: Alamos (2023)

Laboratory performance, based on reference material results, is acceptable and analytical data are considered useable for Mineral Resource estimation.

11.7.4 Laboratory Pulp Duplicates

Laboratories routinely assay a second aliquot of the sample pulp for their internal quality control monitoring. The assays for pulp duplicates provide an estimate of the reproducibility related to the uncertainties inherent in the analytical method and the homogeneity of the pulps. The precision or relative percent difference calculated for the pulp duplicates indicates whether pulverizing specifications should be changed and/or whether alternative methods, such as screened metallics for gold, should be considered.

The original and duplicate assays are plotted in Figure 11-3.

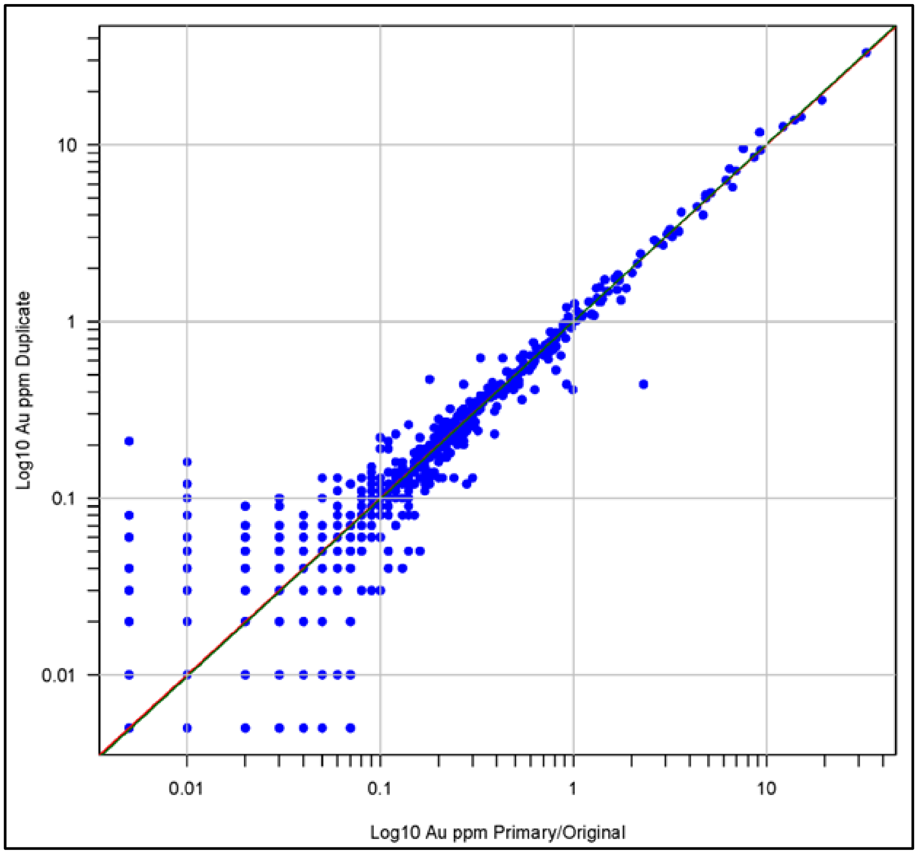


Figure 11-3 Laboratory Pulp Duplicates for Gold

Source: Alamos (2023)

11.7.5 Check Assays at Secondary Laboratory

Check assays are used to augment the assessment of bias based on the reference materials and in-house control samples. The same pulp that was assayed originally is submitted to a different laboratory for the same analytical procedures.

Check assays were completed by the company between 2017 and 2022. A total of 442 sample pulps were submitted to Bureau Veritas (BV) in Vancouver, B.C. BV is an ISO17025 accredited laboratory.

BV assayed the samples with fire assay – AA finish for samples with less than 10 g/t. For comparison, the primary lab, ALS, assayed all samples by fire assay with an AAS finish (AA26). Samples with gold greater than 10 g/t were also run with a gravimetric finish.

The scatterplot in Figure 11-4 shows a reasonable correlation between the ALS and BV gold assays.

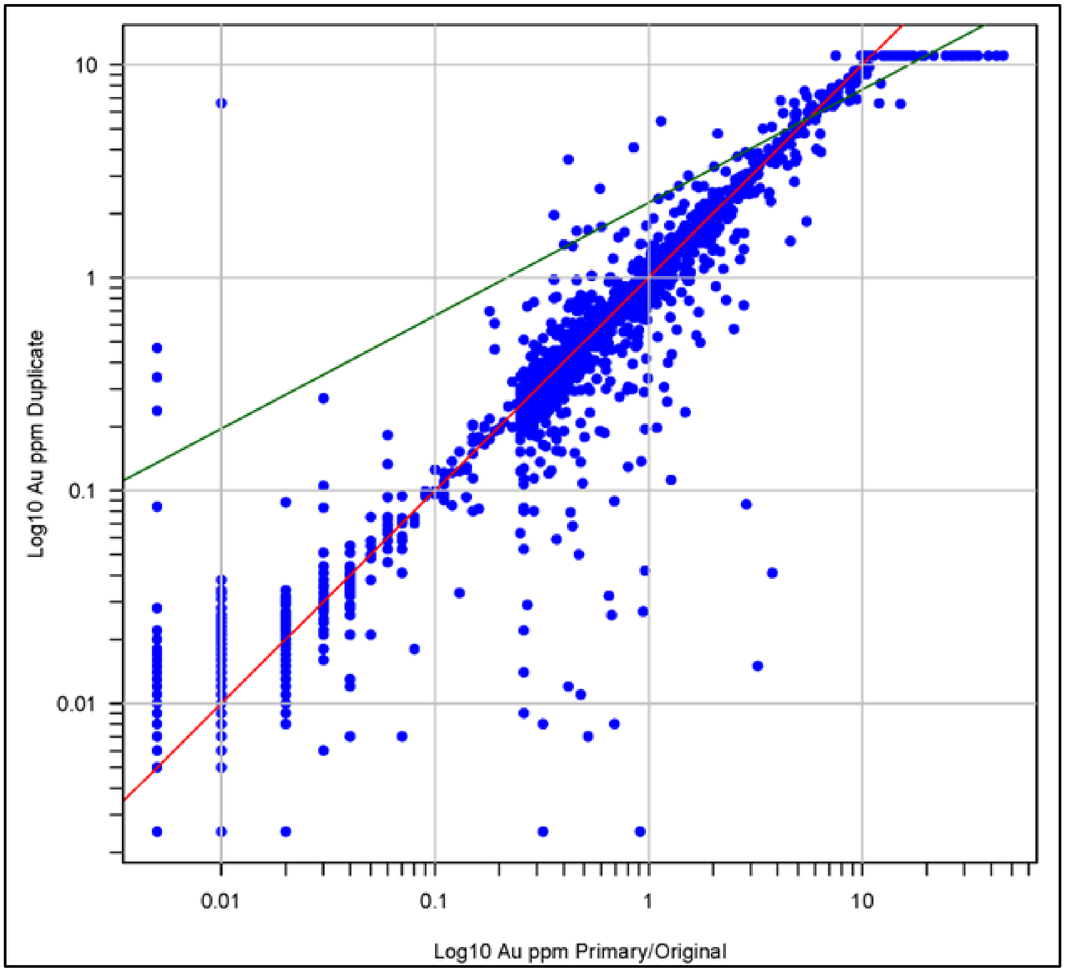


Figure 11-4 Scatterplot of Check Assays for Gold

Source: Alamos (2023)

11.8 Conclusion

The Company maintains a rigorous assay quality control for the Lynn Lake Project. Blanks and reference materials are inserted with drill core samples on a routine basis. Results are reviewed when received and non-conformities are discussed with the commercial laboratory. In addition, sample pulps are routinely submitted for check assays to an accredited commercial laboratory.

There was no evidence of assay bias or systematic contamination identified based on the quality control program.

The responsible QP is of the opinion that the Project maintains a QC program that meets or exceeds industry standards. Sample preparation, security, and analytical procedures are all industry-standard and produce analytical results for gold with accuracy and precision that is suitable for Mineral Resource estimation.

12 DATA VERIFICATION

Since acquisition of the project, Alamos has completed multiple database verification exercises with the aim of validating and correcting mistakes in the database of historical operators.

12.1 Alamos Collar Location Verification

12.1.1 Gordon Collar Verification

In 2018 a validation of surface drill hole collar locations at Gordon was completed by Alamos. Based on locating and accurately surveying select historical 654-series drillholes in the field, and georeferencing a detailed local grid map, a collar location transformation (W-1 mine grid to UTM Zone 14, NAD83 coordinates) was completed for 340 historic 654-series drill holes. A historic pre-disturbance topography map was also accurately georeferenced to provide accurate elevations for the 654-series drill holes.

In 2019, drill logs for an additional 14, 654-series drill holes were discovered during a systematic compilation exercise of historical data. The collar locations and elevations were transformed to UTM Zone 14, NAD83 coordinates and the holes were added to the database.

12.1.2 MacLellan Collar Verification

In 2019, historical MacLellan collar coordinates were validated. This exercised involved transforming the original mine grid coordinates to UTM Zone 14, NAD 83 coordinates. The process included surveying the location of 89 historical drill collars in the field using a differential GPS and establishing an accurate transformation formula. All historical holes were transformed to the UTM coordinate system and elevation data corrected if required.

During the 2019 systematic compilation exercise, 79 drill holes were added to the database, 6 holes were removed from the database as they could not be verified, and 14 hole numbers were renamed due to typographic errors.

The drill hole collar validation has ensured that the drill holes are suitable for use in Mineral Resource estimation.

12.2 Alamos Assay Database Verification

In 2016, Alamos conducted a comparison between the Mineral Resource drill hole database and the original assay certificates from the Sherritt site laboratory for pre-2007 drill holes for MacLellan, and the 654 series of drill holes that were drilled by MMR at Gordon during the period of February 1985 to April 1995. In 2019, Alamos completed a validation and correction of zero (“0”) values for gold in the drillhole assay database by comparing to the original drill logs and assay certificates.

12.2.1 MacLellan

The objective of the validation was to verify the gold assay results for at least 10% of the historic drilling at the MacLellan Property. The historic Mineral Resource drilling consists of several different generations of surface and underground drilling that took place prior to 2007.

The total number of samples validated was 6,767 samples out of a total number of 59,139 samples for the historic drilling on the MacLellan Property for a total of 11.4% of the samples.

In total 6,719 of the 6,767 samples were validated (99.3%) with 48 errors identified (Table 12-1). Several holes had data entry or conversion factor issues for the entire hole. A total of 25 holes were identified with errors. These errors were corrected and are reflected in the current drill hole assay database.

Table 12-1 Drill Hole Errors Identified – MacLellan Historic Assays

Grade Range (Au)	Total Au Errors	Au Higher Than Database	Au Lower Than Database
0-0.49 g/t	9	3	6
0.5-0.99 g/t	3	1	2
1.0-2.49 g/t	14	8	6
2.49-4.99 g/t	8	6	2
5.0-9.99 g/t	5	3	2
10+ g/t	9	2	7
Total	48	23	25

From the 99.3% validation rate, it was concluded that there is a high degree of confidence that the gold results in the Alamos database accurately reflect the original gold assay certificates for the historic drilling at the MacLellan Property, and that these data are suitable for use in Mineral Resource estimation.

In 2019, a validation of 1,884 gold assay sample records that contained a zero “0” value for gold was completed by referencing to the original drill logs and assay certificates. As a result, 600 gold assay records were updated in the database as they were found to be “not sampled intervals”.

12.2.2 Gordon

The objective of the validation was to verify the gold assay results for 10% of the historic drilling at Gordon. The historic Mineral Resource drilling consists of the 654 series of diamond drill holes that were drilled by MMR between February 1985 and April 1995.

The total number of samples validated was 3,875 samples out of a total number of 38,750 (10.0% total) for the 654 series boreholes. The samples validated represent 5,176 m of samples of a total of 50,300 m of drilling (10.3% total).

In total, 3,872 of the 3,875 samples were validated (99.9%) with only three errors identified. These errors were corrected in the current drill hole assay database.

From the 99.9% validation rate, it was concluded that there is a high degree of confidence that the results in the current Alamos database accurately reflect the original assay certificates for the 654 series of diamond drill holes drilled by MMR, and that these data are suitable for use in Mineral Resource estimation.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Testwork Program

13.1.1 Historical Operation and Testwork

The MacLellan deposit was mined in the 1980's by SherrGold, a subsidiary of Sherritt. The Gordon deposit was mined in the 1990's by Black Hawk Mining.

The ore was processed in Sherritt's Lynn Lake Cu-Ni concentrator, which was adapted for gold processing. A simple whole ore leach process was used. Historic operations reports and limited metallurgical testing reports were reviewed.

Approximately 1.0 Mt of MacLellan underground ore grading 5.3 g/t gold and 17 g/t silver was processed, with average recoveries of 86% and 47% for gold and silver, respectively (SherrGold, 1986 to 1989). Approximately 1.7 Mt of Gordon open pit ore was processed grading 4.2 g/t gold with an average recovery of 92% (Blackhawk, 1996 to 1998).

MacLellan metallurgical reports (Lakefield, 1982), (Sherritt, 1985), (Sherritt, 1987a), (Sherritt, 1987b), and (Sherritt, 1988) suggested the gold was closely associated with the sulphides and that some of the gold was either encapsulated or in solid solution with the pyrite, pyrrhotite and arsenopyrite. There was a notable negative relationship between arsenic head grade and gold recovery. The laboratory data also suggested that the ore might have been grind sensitive. Pre-production testing suggested that a recovery of 89% for gold should have been expected.

There were reports (Witteck, 1987) (Carre, 2014) that suggested that a high sulphide (pyrrhotite) zone of Gordon ore processed one summer caused extreme cyanide consumption which left the ore "cyanide starved" and resulted in poor gold recovery. The mill had no pre-aeration, and thus the likely oxidation of pyrrhotite during leaching was the cause of the problem.

Carlisle conducted two metallurgical test programs at SGS Vancouver in 2011 (SGS-Van, 2011) and 2012 (SGS-Van, 2013) on samples from the MacLellan deposit.

The first program was conducted in 2011 on 43 core samples composited together to represent the deposit and assayed 2.0 g/t gold, 3.6 g/t silver, 2.1% sulfur and 0.02% arsenic. Mineralogical examination found that pyrrhotite was the predominant sulphide and that amphibole was the predominant mineral phase. Grindability tests characterized the sample as medium hard. Cyanidation tests recovered up to 96% of the gold and 52% of the silver.

The second test program was conducted in 2012. Four samples were prepared:

- Composite (overall);
- Nisku;
- Main; and
- West.

Nisku was from the east end of the deposit, and Main from the central portion. The head assays ranged from 1.7 g/t to 4.7 g/t gold, 5.4 g/t to 27.5 g/t silver and 0.17% to 0.75% arsenic. The three variability samples had a similar response with gravity gold recovery from 40% to 47% and total gold recovery of 86% to 91%. Silver recovery varied from 37% to 67%.

The program also included cyanide destruction (CND) testing using the SO_2/air/Cu^{2+} process. The feed liquor had ~400 mg/L CN_{WAD} and ~1,400 mg/L CN_T. The liquor was heavily fouled with iron and thiocyanate (SCN) with minor levels of copper and zinc. The CND testing was able to reduce CN_{WAD} to less than 10 mg/L, but total cyanide (CN_T) remained high.

Carbon-in-Pulp (CIP) modelling was conducted. The modelling showed the circuit should achieve a gold loading on carbon of approximately 2,000 g/t and require a carbon transfer rate of 7 t/d for 5,000 t/d mill throughput. Solution gold losses were nominally 0.01 mg/L gold.

Limited environmental testing was conducted. The acid base accounting (ABA) test found that the Composite sample had 1.8 times more neutralizing potential than sulphide sulphur in the ore; hence, this would be considered unlikely to produce acid.

13.1.2 Testwork for the Feasibility Study, from 2015

Alamos has conducted four phases of testing at SGS Lakefield since 2015 (SGS-LR, 2015), (SGS-LR, 2016a), (SGS-LR, 2016b), and (SGS-LR, 2017).

The initial phase finalized flowsheet selection, optimized the main process parameters, determined comminution data, and assessed metallurgical variability.

The second phase, conducted on PQ core obtained for comminution data, also included metallurgical tests on the samples.

The third phase addressed the process behaviour with internal ore dilution and tested additional samples from the far eastern end of the MacLellan deposit. Samples were treated similar to the variability samples. The program also repeated some large-scale cyanidation tests from the initial phase for environmental testing. These tests used an extended pre-aeration time that reduced total cyanide consumption. The sample was subjected to CND testing to lower CN_T limits before undergoing environmental testing. Other gaps in the testing such as mercury levels through the process and final CIP modelling were addressed. Samples were also sent to Base Met Labs in Kamloops, British Columbia, to conduct oxygen uptake tests to determine pre-aeration time and oxygen addition rates for design.

The final phase of work assessed the response of samples from the initial three years of production. Samples in this phase of work were also sent to Jenike & Johanson in Mississauga, Ontario for material flow properties testing.

13.2 Sample Selection

13.2.1 Guidelines for Sample Selection

Gold deportment and association in minerals and their impact on metallurgical performance were identified from several sources: historical operating records, technical and production reports, communications with former operations personnel, communications with geological personnel from previous owners and developers of the properties (Ounpuu, 2016a).

The following were identified as key elements in selecting samples for characterization and variability testing from each of the two deposits:

At MacLellan:

- Gold versus arsenic relationship and occurrence in arsenopyrite;

- Gold versus sulphur (almost all as sulphide sulphur) relationship and occurrence in pyrite; and
- Mineralogy and diagnostic leach testing which indicated sub-micron gold and/or solid solution gold in the sulphide minerals.

At Gordon:

- Mineralogy examination indicated sub-micron gold locked in silicates was the main source of un-recoverable gold from cyanide leaching.

At MacLellan and Gordon:

- High and variable presence of pyrrhotite caused high to very high cyanide consumption and impacted leach performance (previous operations did not include or practice pre-aeration); and
- Presence of high graphite in some areas posed a potential risk to gold recovery due to preg-robbing (tested and threat subsequently discounted as this proved inert to cyanide leaching).

At Gordon, Carlisle geologists reported that the silica veining, dictated by weakness in the rock, allowed mineralized fluids to fill these fractured areas.

Specifically, no characteristic metallurgical response or performance was attributed to, or associated with, a geological feature or ore domain/type (e.g., lithology, alteration, and weathering). It was concluded that mineralization in the two deposits was attributed to a pervasive silica/sulphide vein system and controlled by structural events at these deposits (Hastie E. , 2014).

As part of this review, recovery characteristics within domains or trends by domains proved inconclusive. No practical correlation or relationship of recovery with ore types, domains or zones was identified (Ounpuu, 2016b).

The sample selection basis by ore grade and by spatial variability is considered appropriate for these deposits (Ausenco, 2016).

13.2.2 Drill Holes

Samples were taken from diamond drill core; no sample preparation or assay rejects were used.

MacLellan:

- Six diamond drill holes from Carlisle program (since 2008);
- Along full strike length, at approximately 200 m intervals and spatially taken to represent roughly equivalent parts of the Mineral Resource;
- Constraints were that some holes were near the wall of the proposed pit and in some cases contained mineralization from below the pit wall; and
- Mostly as half core, full core when available, minor amount of quarter core used.

Gordon:

- Six diamond drill holes from Carlisle program, in approximate grid pattern;
- From both Gordon pits: Wendy and East;
- All as half core;
- Most holes in iron formation and two holes partially through intrusive rocks; and
- One hole (to the northwest) contained “graphite”.

Drill hole distribution and sample selection guidelines for the deposits were considered appropriate.

13.2.3 Sample Preparation Protocols – Intervals

The 2014 / 2015 SGS laboratory test program was comprehensive in terms of samples selected and the extent of comminution and metallurgical testing. The interval selection basis for this program is summarized in Table 13-1.

Table 13-1 Preparation and Interval Selection Summary for 2014 / 2015 Test Program

Description	Units	MacLellan	Gordon
Mineral Resources (Tetra Tech, 2014)	Mine Plan (Mt)	18.6	8.4
	Gold Grade (g/t)	1.81	3.06
	Silver Grade (g/t)	3.04	-
Drill holes	DDH (number of)	6	6
Ore Grade (OG)	Total Length (m)	347	218
	Number of Intervals	20	16
	Gold Grade (g/t)	1.90	3.43
	Silver Grade (g/t)	5.0	0.7
Low Grade (LG)	Total Length (m)	140	67
	Number of Intervals	11	5
	Gold Grade (g/t)	0.45	0.53
	Silver Grade (g/t)	2.4	0.2
Benchmarks	ROM (Mt/DDH)	3.1	1.4
	Reserve (oz/interval)	35,000	39,000

The interval selection protocols were reviewed:

- About two-thirds of the intervals selected were 15-30 m continuous; the remainder were 5-10 m continuous. This is considered suitable assuming a bench height of 10 m will be used in the mine plan;
- In MacLellan, most of the intervals came from drill core depth of 100 to 450 m. Intervals from 25 to 100 m depth were less than 20% of the total used. This section is not as well represented, particularly as ore from less than 100 m provides most of the ore to the plant in the initial two years of operation;

- In Gordon, most of the intervals came from drill core depth of 90 to 200 m. Intervals from 20 to 100 m depth were about 25% of the total used. This section is not as well represented, particularly as ore from less than 90 m provides most of the ore to the plant in the initial two years of operation; and
- Although the sample distribution across the Mineral Resource is suitable for metallurgical investigations, ore from the surface to about 100 m is slightly under-represented.

13.2.4 Compositing

Sample compositing protocols were reviewed:

- Grades were consistent with the Mineral Reserve average;
- Total interval meters from MacLellan (487 m) and Gordon (285 m) were considered reasonable for the size of the deposits and nature of the mineralization;
- Each drill hole represents 3.1 Mt of mined ore from MacLellan and 1.4 Mt from Gordon. This tonnage per hole is reasonable for the range of annual mining rates of ore from these deposits: 0.9 to 2.6 Mt/y for MacLellan and 1.0 to 1.6 Mt/y for Gordon which are blended to 2.6 Mt/y feed to the plant; and
- Each interval selected represents 35,000 oz for MacLellan and 39,000 oz for Gordon. These are considered reasonable based on average annual production of about 140,000 oz Au/y.

Sample compositing protocols were considered acceptable.

13.2.5 Classifications

Two grade-based classifications of samples were prepared from the intervals selected: master composites and variability composites for each of the deposits and a Global Master Composite. The number of representative samples in each of these classifications is shown in Table 13-2.

Table 13-2 Number and Types of Samples for Metallurgical Program

Composite	Classification	MacLellan	Gordon	Global	Total
Master	Ore Grade (OG)	1	1	1	3
	Low Grade (LG)	1	1	0	2
	Total	2	2	1	5
Variability	Ore Grade (OG)	16	13	0	29
	Low Grade (LG)	8	4	0	12
	Total	24	17	0	41
Benchmark (for variability samples)	Mine Mt per sample	0.8	0.5	-	0.7
	Ounces per sample	45,000	49,000	-	47,000

The average head grades for each of these classifications are shown in Table 13-3. The ore grade master and variability composites compare well with the reserve average grades.

Table 13-3 Grades of Samples for Metallurgical Program

Composite	Classification	MacLellan Grades			Gordon Grades		
		Au g/t	Ag g/t	S^{2-} %	Au g/t	Ag g/t	S^{2-} %
Master	Ore Grade (OG)	1.72	5.4	1.53	2.32	0.5	1.93
	Low Grade (LG)	0.36	1.6	1.16	0.47	0.4	0.64
Variability	Ore Grade (OG)	1.72	6.5	1.45	2.91	<0.8	2.15
	Low Grade (LG)	0.34	1.3	1.11	0.5	< 0.5	0.78
Reserves	Life of Mine	1.63	4.4	-	2.42	-	-

13.2.6 Composite Types – Master Composites

Master composites were prepared using an equivalent weight per unit length based on the overall length of the intervals selected for the sub-composites. These were used in the main metallurgical test program for flowsheet development, process optimization, process criteria selection, and design parameter identification for the comminution and metallurgical unit processes, cyanide detoxification, environmental, tailings geotechnical, slurry rheology, and settling.

Four master composites by grade and one Mineral Resource-average Global Master Composite were considered reasonable for this deposit since there has been no evidence of dominant ore type or lithology-driven characteristic metallurgical responses. Grades are consistent with those of the Mineral Reserve grade.

13.2.7 Variability Composites

Variability samples were prepared from the intervals selected for the master composites into two main classes: ore grade (OG) and low grade (LG). Forty-one samples were prepared, 24 from MacLellan and 17 from Gordon. The variability samples were considered suitable as these represented 0.8 Mt and 0.5 Mt of mined ore, and 45,000 oz and 56,000 oz of gold per sample, respectively. The average grades of the variability samples were consistent with the Mineral Reserve grades (SGS-LR, 2016b)

13.2.8 PQ Core Samples

Whole core PQ holes, four from MacLellan and two from Gordon were used for comminution testing. These drill holes intersected mineralization closer to the surface through the heart of the deposits and along strike. Fifteen continuous intervals were prepared as composites for a suite of metallurgical tests including JK Drop Weight testing to provide calibration for the SMC testing.

Comminution competency and hardness characteristics were relatively consistent for the master and variability composites in both ore grade and low-grade classifications.

13.2.9 Additional Variability Composites

As part of the third phase of the feasibility study testwork, various gaps from the previous metallurgical programs were addressed. Samples of internal dilution between well-mineralized intervals were selected for testing. The intervals came from some of the existing holes previously selected for the initial phase of testing. Nine samples were selected from MacLellan and Gordon deposits. The geological team suggested that a sample from the Nisku end of the MacLellan deposit also be tested, as this mineralization was considered different. DDH MG15-38 was selected and six samples between 20 to 300 m depth in this hole were prepared. Testwork followed the same protocols for the variability samples.

The final phase of testing had four composites for each deposit, each representing a sample from the initial three years of production and pre-production. A continuous interval from three holes was used for each yearly composite. The intervals were selected to cover spatial considerations for each yearly composite. A total of 16 drill holes provided samples for this phase of testwork. Testwork followed the same protocols for the variability samples.

Figure 13-1 and Figure 13-2 show the locations for the drill holes used in the test program for the MacLellan and Gordon deposits.

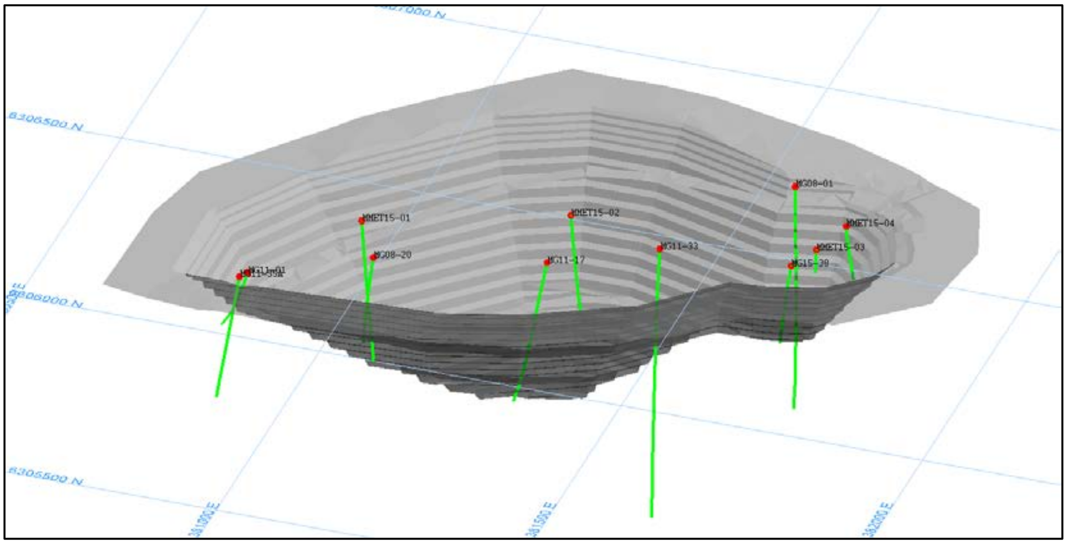


Figure 13-1 MacLellan Drill Hole Locations for Metallurgy Samples

Source: Alamos (2023)

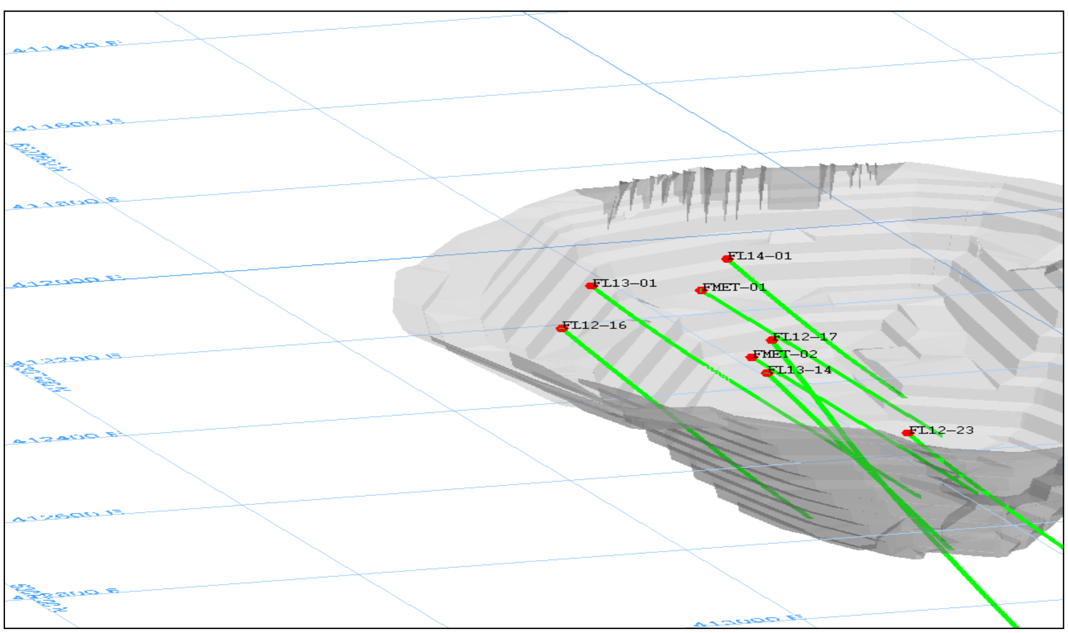


Figure 13-2 Gordon Drill Hole Locations for Metallurgy Samples

Source: Alamos (2023)

13.3 Mineralogy

13.3.1 Historic Mineralogy

Previous programs characterized the main gold deportment for the two deposits. At MacLellan, the gold was found in three metallic phases: native gold (< 20% gold), electrum (~35% gold) and kustellite (> 50% gold). Kustellite is a rare gold mineral.

Diagnostic leaching conducted at Sherritt in the 1980s identified a refractory component in the ore. Analysis of test data suggested that gold was intimately associated with both arsenopyrite and pyrite, and possibly to some extent, in pyrrhotite (Ounpuu, 2014). The gold was generally fine grained with > 90% of the observed grains finer than 20 µm (SGS-Van, 2013). At Gordon, the gold was almost exclusively as native gold. The gold had an average particle size of 4 µm with < 10% of the observed particles greater than 10 µm (Witteck, 1987). These examinations focused on panned/upgraded gravity concentrates with limited examination of the non-gravity gold.

13.3.2 Mineralogy on Metallurgical Products

Two mineralogical examinations were conducted in the latest metallurgical test program; both supported the metallurgical testwork. The first examination was conducted on flotation concentrates from both deposits then, expanded to include gravity concentrates. Flotation concentrates were examined since 93% of the gold was recovered to this product.

For MacLellan, 64% of the gold was as electrum and 36% as native gold. Eighty-seven percent of the gold was liberated or exposed. The gold grains had a maximum grain size of 12 µm (Terra Mineralogical, 2015a)

For Gordon, the gold was found almost exclusively as native gold. Ninety-eight percent of the gold was, almost equally, either liberated or as attachments to iron oxides (magnetite). There was minimal association with the sulphides. Almost all the gold was < 20 µm in equivalent diameter.

An examination made on an upgraded gravity concentrate from a MacLellan 10 kg test charge showed similar results. For Gordon, observations were similar.

Overall, the gold size distribution in the deposits was generally fine, with gold mostly < 20 µm. Examination of the total gravity concentrate from the 10 kg test found coarse gold (> 100 µm) in the deposits at a rate of 1 grain per 2 kg ore. These few coarser grains could account for 50% of the gravity gold recovered.

13.4 Head Assays

Five composites and 79 samples have been tested. All samples were submitted to characterize the sample by a full suite of assays, which included:

- Gold by screen metallic assay;
- Silver, copper, arsenic, antimony, and mercury by direct assay;
- Carbon (C_{Total}, $C_{Graphitic}$, $C_{Organic}$, CO_2, CO_3);
- Sulphur speciation (S_{Total}, Sulphide Sulfur (S=), SO_4, Acid Insoluble SO_4);
- Pyrite and pyrrhotite assay; and
- ICP scan for a further 28 elemental analysis.

Key assays for the composites tested are shown in Table 13-4 (SGS-LR, 2015).

Table 13-4 Summary of Head Assays

Element	Unit	MacLellan Ore Grade Master Composite	MacLellan Low Grade Master Composite	Gordon Ore Grade Master Composite	Gordon Low Grade Master Composite	Global Master Composite
Au (S.M.)	g/t	1.57	0.23	2.48	0.50	2.34
Ag	g/t	5.4	1.6	0.5	0.4	3.0
Cu	%wt	0.016	0.017	0.010	0.005	0.014
Zn	g/t	1100	314	63	87	617
Pb	g/t	485	52	< 20	5.3	257
Ni	g/t	417	515	< 30	47	227
As	%wt	0.160	0.013	< 0.001	0.002	0.093
Sb	%wt	0.002	-	<0.002	-	-
Hg	g/t	< 0.3	<0.3	<0.3	<0.3	<0.3
C_G	%wt	< 0.01	<0.01	0.11	0.23	0.02
C_{ORG}	%wt	0.14	0.09	0.09	0.30	0.08
CO_3	%wt	3.18	5.27	1.62	1.55	3.56
S_T	%wt	1.53	1.24	1.94	0.66	1.70
S=	%wt	1.53	1.16	1.93	0.64	1.61
Py (FeS_2)	%wt	0.71	0.60	1.65	0.7	1.38
Po ($Fe_{12}S_{13}$)	%wt	2.97	2.40	2.73	0.75	2.46

Note: Global Master Composite is from MCL-OG-MC ~58% and FL-OG-MC ~42%, by weight.

Observations from the head assay results:

- The samples tested had a range of gold assays from <0.1 g/t to > 25 g/t gold. Most of the samples tested were in range of 0.5 g/t to 3 g/t gold;
- The silver to gold ratio in MacLellan is variable but generally approximately 4:1;
- Minimal silver occurs in the Gordon deposit;
- Pyrrhotite is the predominant sulphide mineral for both deposits, with lesser pyrite and notable arsenopyrite in MacLellan;
- Almost all the sulphur occurs in sulphide minerals;
- Both deposits contain carbonate minerals, predominantly as calcite, but also as ankerite. MacLellan generally has more CO_3 than Gordon (~3% CO_3 versus 1% CO_3);
- Low levels of graphite and organic carbon were assayed for the Gordon deposit but testwork did not show any signs of preg-robbing due to carbonaceous material. This confirms the early observation by Witteck on the Gordon deposit;
- Low levels of copper, zinc, and nickel in the deposits were assayed. These can contribute to the cyanide consumption; and

- Mercury levels are generally very low. A few samples from MacLellan had detectable levels of mercury. Further analysis of mercury levels on carbon and in leach liquors showed very low levels of cyanide-soluble mercury (SGS-LR, 2016b). Correlation of elevated mercury with elevated zinc in samples indicated that mercury is likely to be associated with sphalerite.

13.5 Comminution

The objective of the comminution testing was to characterize the competency (coarser sizes) and hardness/grindability (fine sizes) of ore types from both deposits.

The testing for all samples (79) comprised the Bond Ball Mill Work Index test (BWI), the JK Drop Weight Test (DWT) and the Morrell SMC test (SMC). Samples from the PQ core series were subjected to a broader suite of tests including the Abrasion Index (Ai), full DWT, BWI and the Bond Low Energy Impact Test (CWI). All tests were conducted by SGS, primarily at the Lakefield location. Table 13-5 summarizes the results for the comminution tests for the various phases of testing. Figure 13-3 and Figure 13-4 present the cumulative frequency plots of the JK Axb and BWI data.

Test conditions and methodology were as follows:

- JK test results were interpreted and reported by JK Tech (JK Tech, 2016a), (JK Tech, 2016b), and (JK Tech, 2017);
- SMC tests were conducted on the 19 mm to 22 mm size fraction as NQ core was used. Minimal re-calibration of the SMC results was required once the JK DWT results were available; and
- Bond tests were conducted at a closing size of 200 mesh (75 µm) which typically results in a P_{80} of about 63 µm. This screen size was selected because historical information for both the MacLellan and Gordon deposit suggested a grind size P_{80} less than 75 µm. As the selected grind size following the testwork was P_{80} of 75 µm, the BWI data is considered suitable (slightly conservative) for design.

Table 13-5 Summary of Comminution Test Results by Phase of Testing

Sample Name	Relative Density			JK Parameters			Work Indices (kWh/t)			Ai
	DWT	SMC	CWI	Axb[1]	ta[1,2]	SCSE	CWI	RWI	BWI	(g)
Count	5	68	6	71	71	71	6	15	71	15
MCL-OG Average	-	2.96	-	28.2	0.25	12.7	-	-	14.9	-
MCL-LG Average	-	2.99	-	27.4	0.24	12.8	-	-	13.0	-
Gordon-OG Average	-	3.05	-	25.2	0.21	13.6	-	-	15.1	-
Gordon-LG Average	-	3.01	-	24.9	0.22	13.5	-	-	15.9	-
MCL PQ Average	2.95	2.93	2.97	29.4	0.26	12.4	13.2	16.6	15.3	0.19
Gordon PQ Average	3.18	3.04	3.06	32.9	0.28	11.9	14.4	20.0	16.4	0.35
MCL Internal Dilution Average	-	2.90	-	30.0	0.27	12.2	-	-	13.0	-
Gordon Internal Dilution Average	-	2.95	-	24.5	0.22	13.4	-	-	16.4	-
Nisko (MCL) Average	-	2.99	-	29.6	0.26	12.4	-	-	13.5	-
MCL Avg. – Early Production	-	2.95	-	28.3	0.25	12.5	-	-	13.8	-
Gordon Avg. - Early Production	-	3.08	-	25.3	0.21	13.7	-	-	14.5	-
Overall Average	**3.04**	**3.00**	**3.00**	**28.0**	**0.25**	**12.9**	**13.6**	**18.6**	**14.8**	**0.29**

Notes:

1. *Axb and ta from DWT when available, otherwise from SMC.*
2. *ta value from SMC test is an estimate.*

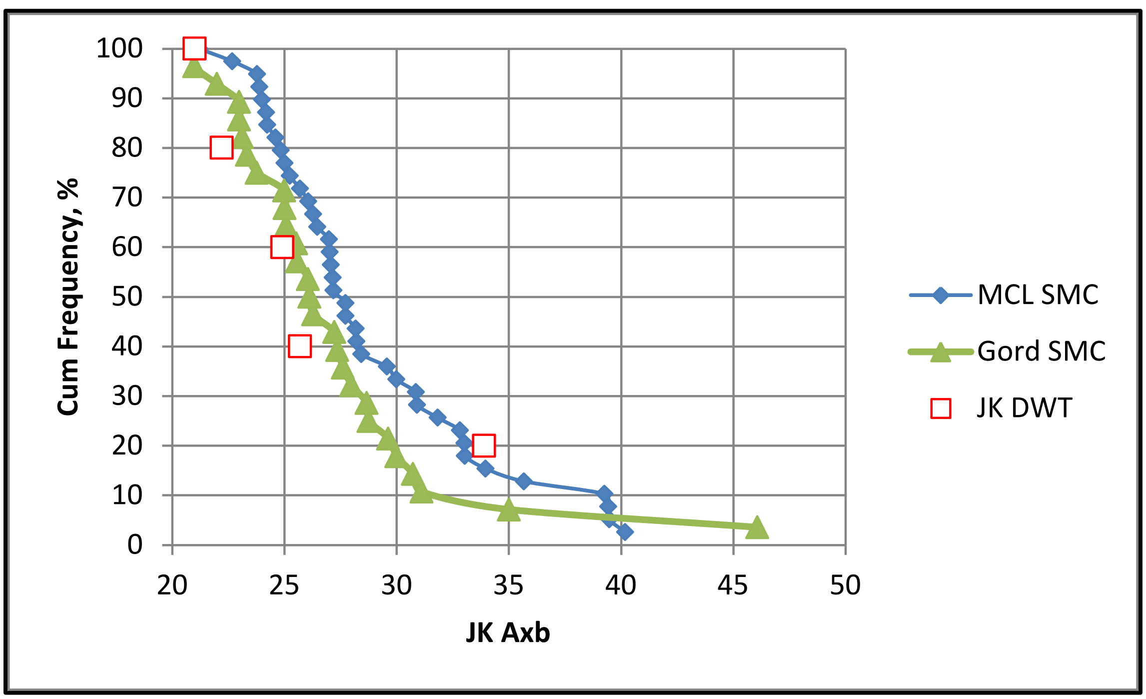


Figure 13-3 Cumulative Frequency Plot of JK Axb Data

Source: JK Tech (2016)

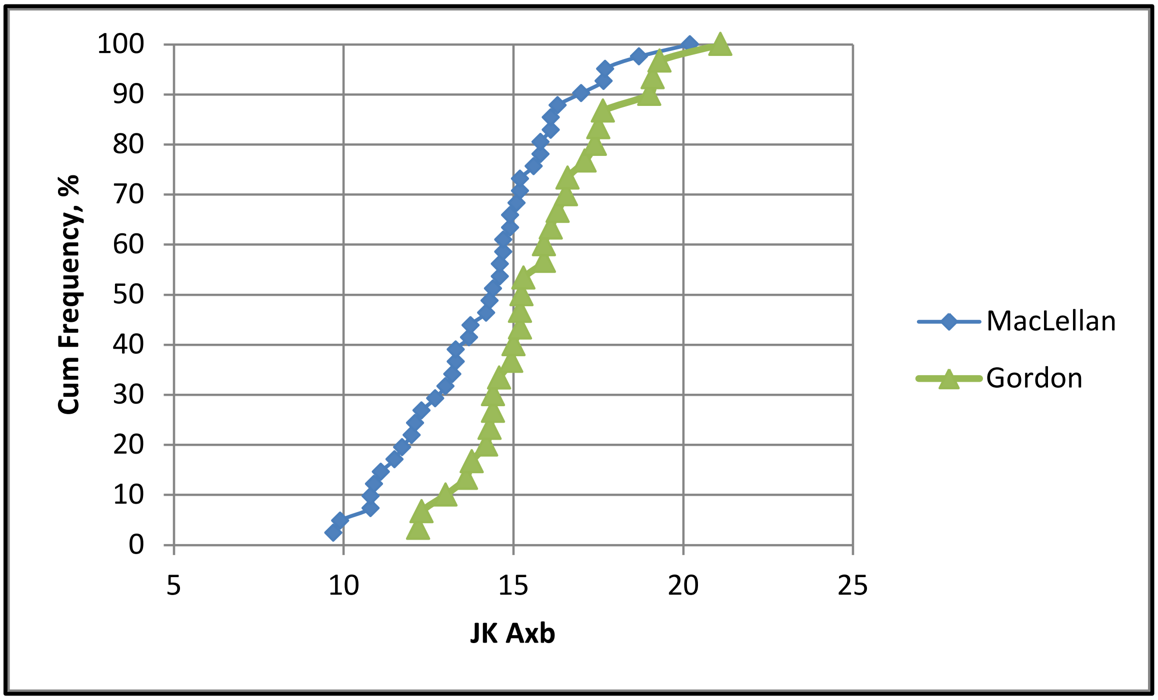


Figure 13-4 Cumulative Frequency Plot of BWI Data

Source: JK Tech (2016)

The results show a good level of consistency by phase of testing. Observations from the comminution testing are as follows:

- The Gordon deposit has a lower average JK Axb parameter (more competent) and a higher average BWI (harder) than the MacLellan deposit;
- The deposits are of average hardness from a BWI perspective but have a high to very high competency from an Axb perspective;
- The JK Axb data fell in a relatively tight distribution from 20 to 40. The BWI data had a broad range from 10 to 20, which needs to be taken into consideration for plant design;
- There is little difference in the results between ore grade, low grade, and dilution samples from each deposit. These three classifications of ore have similar comminution characteristics for the Axb parameter and the BWI; and
- The Gordon deposit has two lithologies: intrusive rocks from the south end of the pit and iron formation throughout the rest of the pit. The intrusive rocks have a more competent Axb (22) compared to iron formation (26) and a higher (harder) BWI (16.4) compared to iron formation (15.1).

The design parameters were established at the 75th percentile of the measured distributions. Bond ball and rod work indices used in design are 16.5 and 20.2 kWh/t respectively. Axb was established at the 25th percentile of the competency distribution at 24.6.

13.6 Gravity

13.6.1 Gravity Test Procedure

Most tests included gravity concentration as part of the process and flowsheet development. The procedure used these steps:

- Grind the ore to the target grind size;
- Single pass through a Knelson MD-3 laboratory concentrator; then
- Upgrade to a low-mass gravity concentrate on a Mozley C-800 Laboratory Mineral Separator.

The mass recovery to the Mozley separator concentrate was targeted for ~0.1% by weight. No GRG type tests were conducted. Tests ranged from 1 kg test charges to 100 kg bulk tests for downstream metallurgical testwork.

All tests showed some level of gravity recovery. Flakes greater than 100 µm were commonly observed. Because of the impact of this “nugget” effect, a gravity stage was included in the standard test procedure. Adding this stage will reduce the impact and influence of nuggets due to variable leach performance with grain size, difficulty in reconciliation of assayed and calculated heads, and the risk that test results would be masked due to a disproportionate increase in residue assay from nugget grains. In flotation testing, these coarser flake gold particles are unlikely to be amenable to efficient flotation. The nugget impact in an operating plant is significantly reduced due to the use of cyclones, which essentially prevent any nuggets from passing to the leach circuit.

13.6.2 Gravity Testing

Results from the gravity testwork are summarized in Table 13-6. Observations from the gravity testing are as follows:

- The average gravity gold recovery from the testwork was 42%. This was not weighted by number of tests, test mass, head grade;
- MacLellan had a higher gravity recovery of 47% compared to Gordon at 37%; and
- The LG and internal dilution samples show a comparable level of gravity recoverable gold.

Table 13-6 Summary of Gravity Gold Recovery Tests

Deposit	Sample	Test Size, wt.	Au Gravity Recovery, %
MacLellan	Initial, Flowsheet Dev.	~1 kg	35.2
	Initial, OG Variability	1 kg	32.3
	Initial, LG Variability	1 kg	39.4
Gordon	Initial, Flowsheet Dev.	~1 kg	24.1
	Initial, OG Variability	1 kg	37.3
	Initial, LG Variability	1 kg	30.9
MacLellan	OG Bulk	100 kg	52.7
	OG Bulk, repeat	80 kg	51.4
	LG Bulk	100 kg	49.9
Gordon	OG Bulk	100 kg	48.5
	OG Bulk, repeat	80 kg	53.0
	LG Bulk	60 kg	35.5
Global	OG Bulk	90 kg	49.9
MacLellan	PQ	10 kg	47.4
Gordon	PQ	10 kg	36.0
MacLellan	Internal Dilution	2 x 10 kg	44.5
Gordon	Internal Dilution	2 x 10 kg	27.6
MacLellan	Nisku	10 kg	67.7
MacLellan	Overall Test Average		46.7
Gordon	Overall Test Average		36.6
Overall	Overall Test Average		42.4

13.6.3 Mineralogy

A mineralogical examination conducted on a gravity concentrate (Terra Mineralogical, 2015a) from both deposits showed that most of the gold by occurrence was as relatively fine native gold or electrum particles (typically less than 50 µm). Even one or two larger gold grains account for a significant amount of the gold present in a gravity concentrate. A statistical assessment indicates that there may only be one larger grain of gold in every 2 kg of ore.

13.7 Flotation

Limited flotation testing was conducted. The primary purpose of the testing was to assess if a grind, float, regrind, and leach of the float concentrate and leach of the flotation tailings could achieve higher gold recovery than for whole ore cyanidation.

The results for these tests, compared with a (gravity + cyanidation) test are shown in Table 13-7.

Table 13-7 Comparison of Flotation + Cyanidation with Gravity + Cyanidation

Sample	Feed		CN Test	Feed Size µm	Gravity Recovery %		Flotation Recovery %	CN Recovery %	Overall Recovery %
MCL-OG-MC	F-3	Feed	2	59	66.9	-	78.9	-	93.0
		Conc	7	26	-	93.1	91.9	85.6	91.0
		Tail	8	59	-	6.9	78.8	5.4	-
FL-OG-MC	F-4	Feed	5	55	24.1	-	95.2	-	96.4
		Conc	9	16	-	91.7	98.2	90.0	97.1
		Tail	10	55	-	8.3	85.0	7.1	-

The results show little difference in overall recovery. The MacLellan sample shows 2% lower overall gold recovery while the Gordon sample had less than 1% increase in overall recovery when flotation was used. Since the flotation flowsheet showed minimal benefit in overall recovery, it was discontinued from further testing.

13.8 Leaching

13.8.1 Process Options with Leaching

The initial cyanidation test determined optimum process conditions and the standard flowsheet for the two deposits. The ore grade Master Composite for both deposits was the feed for these tests. The baseline conditions were:

- Grind P_{80} ~60 µm;
- 16 hour pre-aeration;
- 45% solids by weight;
- pH 10.5 with lime;
- 1 g/L of NaCN maintained; and
- 72 hour leach time with timed subsamples.

The grind size was adapted from the historical operations (80% to 85% passing 74 µm). Pre-aeration was added to mitigate high cyanide consumption. The extended time, which allowed overnight pre-aeration prior to adding cyanide, was considered more than adequate. The other test conditions were considered consistent with industry standards for successful leaching.

The initial tests compared the following processes:

- Whole ore leaching;
- Gravity and CIL;
- Gravity and leaching; and
- Flotation, regrind of the concentrate, leaching of both concentrate and tailings.

The results from these tests are summarized in Table 13-8.

Table 13-8 Summary of Initial Flowsheet Selection Testwork

Ore Zone	Sample	Test No.	Flowsheet	Recovery, %					
				Gravity		Flotation		Overall	
				Au	Ag	Au	Ag	Au	Ag
MacLellan	MCL-OG-MC	CN-1	Whole Ore Leach	-	-	-	-	89.9	66
		G-1 / CN-3	Gravity + CIL Leach	66.9	16.7	-	-	93.2	70.6
		G-1 / CN-2	Gravity + Leach	66.9	16.7	-	-	93.0	65.8
		F-3 / CN-7&8	Flotation + Leach (Regrind)	-	-	93.1	88.8	91.0	48.9
Gordon	FL-OG-MC	CN-4	Whole Ore Leach	-		-	-	97.4	43.1
		G-2 / CN-6	Gravity + CIL Leach	24.1	45.3	-	-	96.3	79.7
		G-2 / CN-5	Gravity + Leach	24.1	45.3	-	-	96.4	66.1
		F-4 / CN-9&10	Flotation + Leach (Regrind)	-	-	91.7	71.7	97.1	65.3

Observations from the testwork include:

- No significant difference was observed between any of these processes;
- Although the flotation-based flowsheet is the most complex, it showed no significant increase in recovery compared to the other processes;
- CIL offers no benefit in recovery compared to whole ore leaching;
- Gravity showed little if any significant benefit even though the gravity recovery in a separate program has been high at nominally 40% and represents 67% recovery in this test; and
- Both deposits showed a similar response to different flowsheets. The MacLellan sample achieved an average of about 92% gold and 65% silver recovery, whilst the Gordon sample achieved an average of 96% gold recovery.

13.8.2 Leaching and Grind Size

The next series of tests evaluated the effect of grind size. The two samples were subjected to different grinds to determine the effect on recovery and residue grade. The tests were a sub-set of a larger gravity test so that all leaching tests had a similar feed grade. The initial leach sequence tests were also included to assess consistency in response. The results are shown in Figure 13-5.

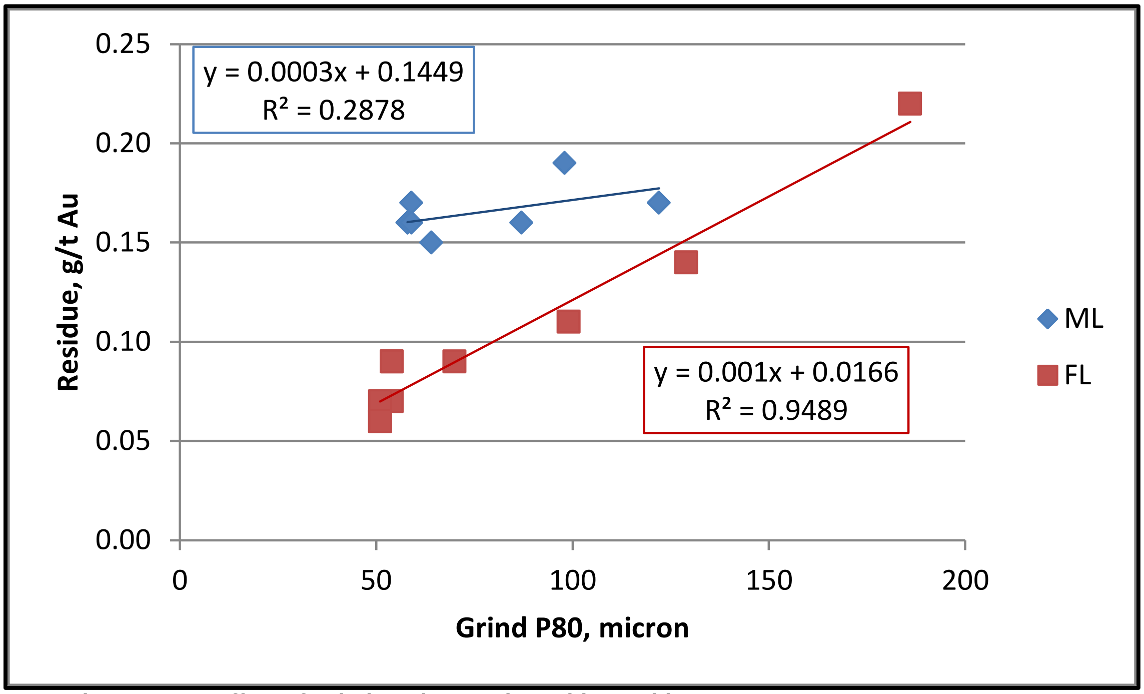


Figure 13-5 Effect of Grind on the Leach Residue Gold Assay

Source: Ounpuu (2015)

This shows that both deposits demonstrate leach effectiveness with grind size, and to varying extents:

- The MacLellan (ML) grind-leach residue response was relatively minor with a linear slope of 0.0003 g/t gold for each one micron change in grind size; that is, corresponded to 0.01 g/t gold increase for 30 µm increase in grind size; and
- The Gordon (FL) sample has a more significant response to grind size. The linear slope was 0.001 g/t gold for a 1 µm change in grind; that is, 0.01 g/t gold change for 6 µm increase in grind size.

Sodium cyanide (NaCN) consumption was also influenced by grind, as shown in Figure 13-6. Finer grinds contributed to higher NaCN consumption.

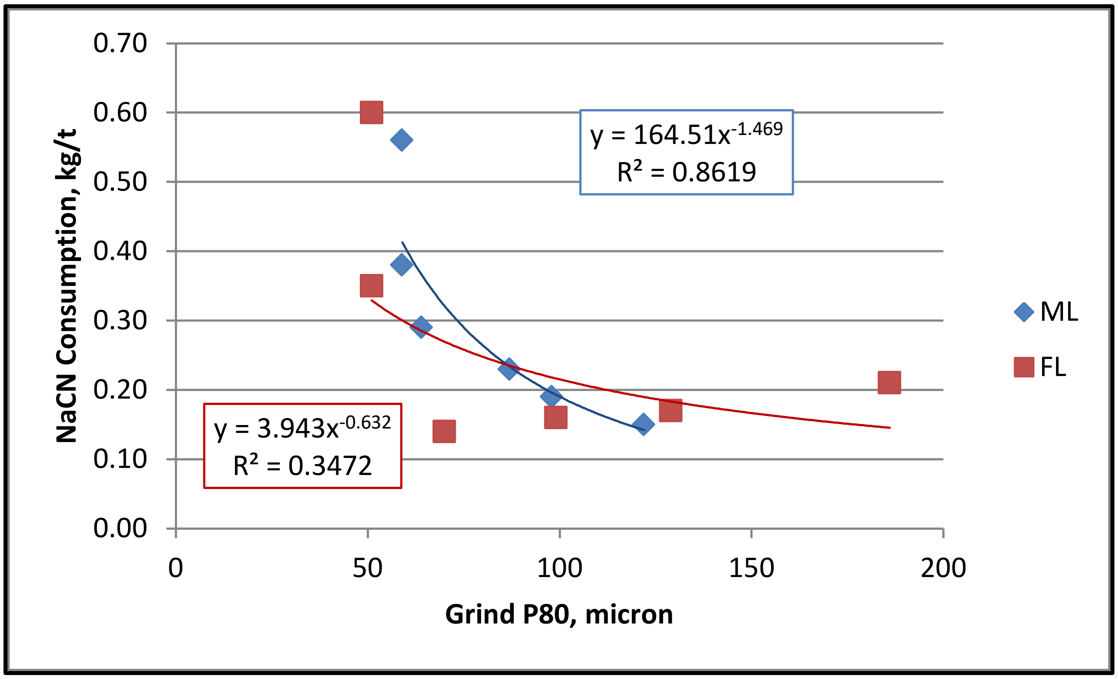


Figure 13-6 Effect of Grind on NaCN Consumption

Source: Ounpuu (2015)

13.8.3 Grind Size

To determine the optimum grind for these ores, a simple operating cost trade-off assessment was conducted in which the incremental cost of grinding finer was compared to the revenue gain from a lower residue assay (Ounpuu, 2015). The following assumptions were used:

- BWi of 15 kWh/t;
- Power cost of $0.025/kWh;
- Grinding media cost of $0.05/kWh;
- NaCN cost of $3.00/kg;
- Trend for impact of grind on residue assay in Figure 13-5;
- Trend for impact of grind on NaCN consumption in Figure 13-6; and
- Gold price = US$1,200/oz.

The results are shown in Figure 13-7 and are presented as the net change ($/t) from a base grind of P80 150 µm.

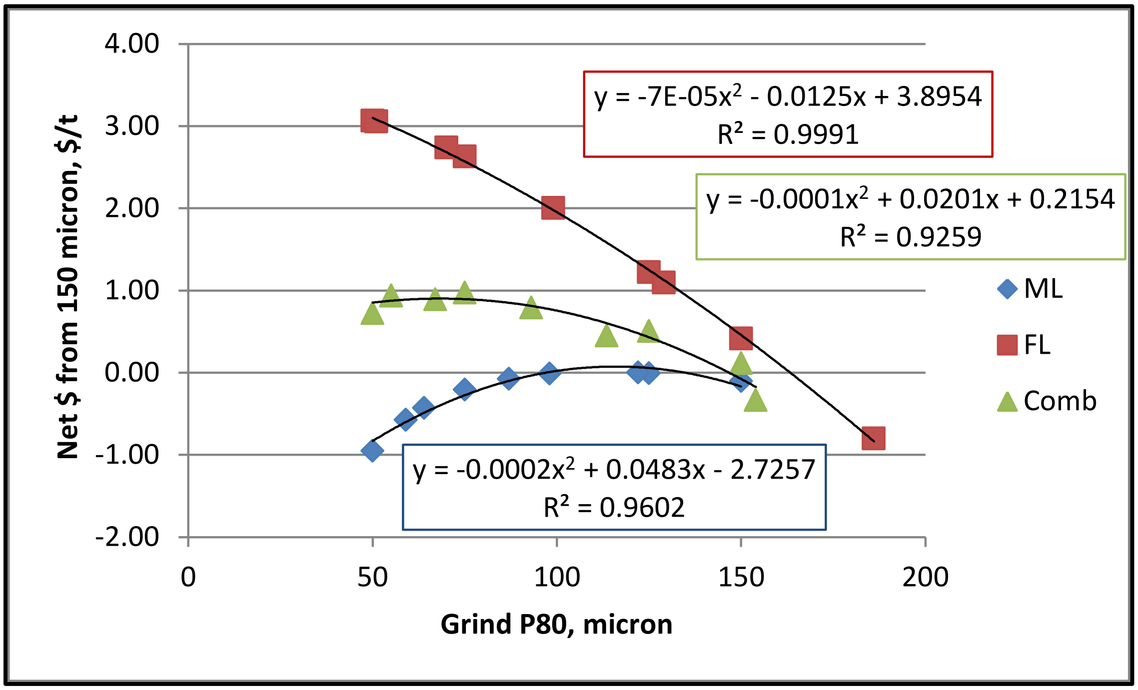


Figure 13-7 Net $/t Change From 150 µm Grind

Source: Ounpuu (2015)

This shows that the Gordon ore will benefit from a fine grind, and possibly even finer than 50 µm. The MacLellan ore shows little impact with grind size between 75 µm and 150 µm; finer than 75 µm shows a negative benefit. For the target grind selection, a calculated blend in the expected weighted ratio of ores from the two pits was carried out to assess the best common grind size for the two deposits.

The trend for the combined ore blend is shown in Figure 13-8. This indicated that the optimum grind is about P_{80} 70 µm and that there is little net difference for a grind between 50 µm and 75 µm. Grinding coarser than this range would have a negative benefit. Figure 13-8 shows the impact of power cost on the net gain from a 150 µm grind for the blended ore sample.

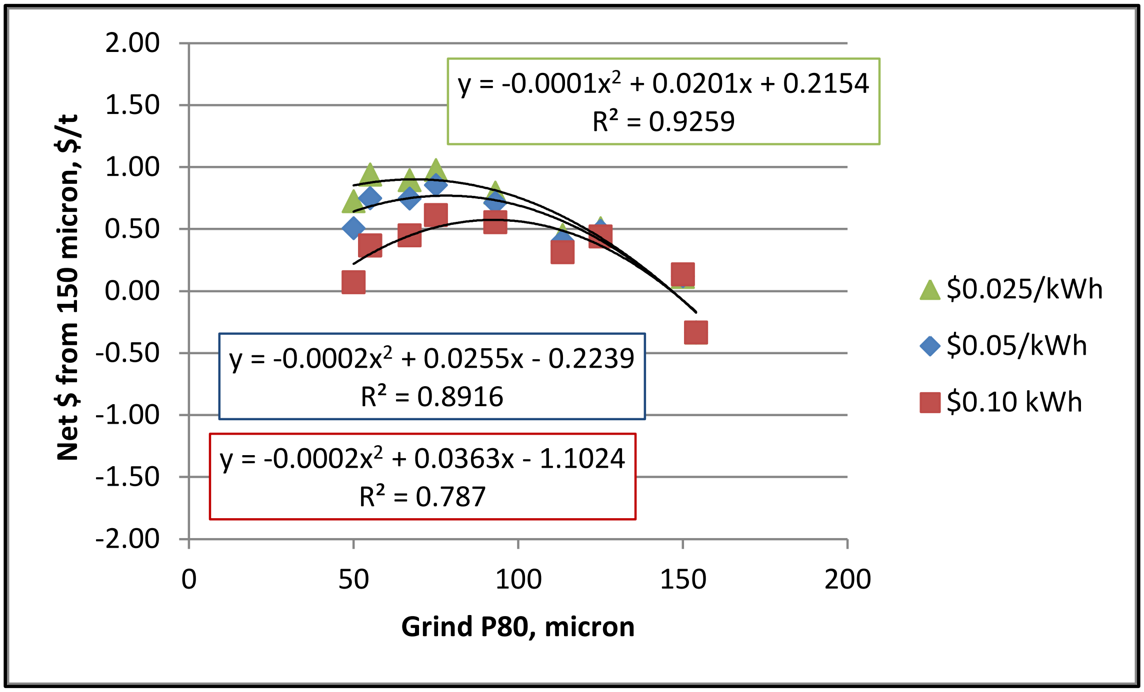


Figure 13-8 Effect of Power Cost on Optimum Grind

Source: Ounpuu (2015)

The impact from higher unit power costs was relatively small for coarser sizes and indicated that the gain from finer grinding the Gordon ore is the primary driver of the economics. At a power cost of $0.10/kWh, optimum grind is about 100 µm with generally little difference in net increment between 75 µm and 125 µm. At a power cost of $0.05/kWh, optimum grind is about 80 µm with little difference between 60 µm and 100 µm. A grind size of 75 µm was selected for the remainder of the test program and as the design grind size P80.

13.8.4 Pre-Leach Treatment

The next series of tests assessed pre-aeration, addition of lead nitrate ($PbNO_3$), use of oxygen and effect of NaCN dose. These test results are summarized in Table 13-9.

Observations from these tests showed:

- The tests achieved a similar level of gold extraction: on average MacLellan was 92% and Gordon was 96%;
- The Gordon tests showed that the coarser grind tests had higher residues and lower extractions, as expected; and
- Pre-aeration is beneficial. The two tests for each sample without any pre-aeration, but using $PbNO_3$ or oxygen during the leach, achieved a similar gold extraction as the tests with pre-aeration, but at considerably higher NaCN consumption.

Table 13-9 Summary of Cyanidation Tests Reviewing Pre-aeration and Additives

Test	Gravity	Pre-Aeration hours	NaCN g/L	Conditions	Grind P80 µm	NaCN kg/t	Overall Au Rec %	Residue g/t Au
MacLellan								
CN-1		16	1.0		59	0.37	89.9	0.20
CN-2	yes	16	1.0		59	0.38	93.0	0.17
CN-13	yes	16	0.5		87	0.23	91.6	0.16
CN-19		0	0.5	$PbNO_3$	58	0.76	92.1	0.16
CN-20		0	0.5	no pre-aeration	58	1.15	90.2	0.19
CN-21		0	0.5	O_2 12-16 ppm	58	1.18	93.6	0.16
CN-25	yes	1	0.5		75	0.39	91.7	0.15
CN-26	yes	1	0.5, decay		75	0.29	92.4	0.15
Average							**91.8**	
Gordon								
CN-4		16	1.0		51	0.34	97.4	0.06
CN-5	yes	16	1.0		51	0.35	96.4	0.07
CN-18	yes	16	0.5		70	0.14	94.1	0.09
CN-22		0	0.5	$PbNO_3$	54	1.32	97.4	0.07
CN-23		0	0.5	no pre-aeration	54	1.23	96.2	0.09
CN-24		0	0.5	O_2 12-16 ppm	54	1.05	96.5	0.09
CN-27	yes	1	0.5		75	0.27	95.8	0.10
CN-28	yes	1	0.5, decay		75	0.14	96.0	0.10
Average							**96.2**	

The effect of pre-aeration on leach kinetics for ore from each deposit is shown in Figure 13-9 and Figure 13-10.

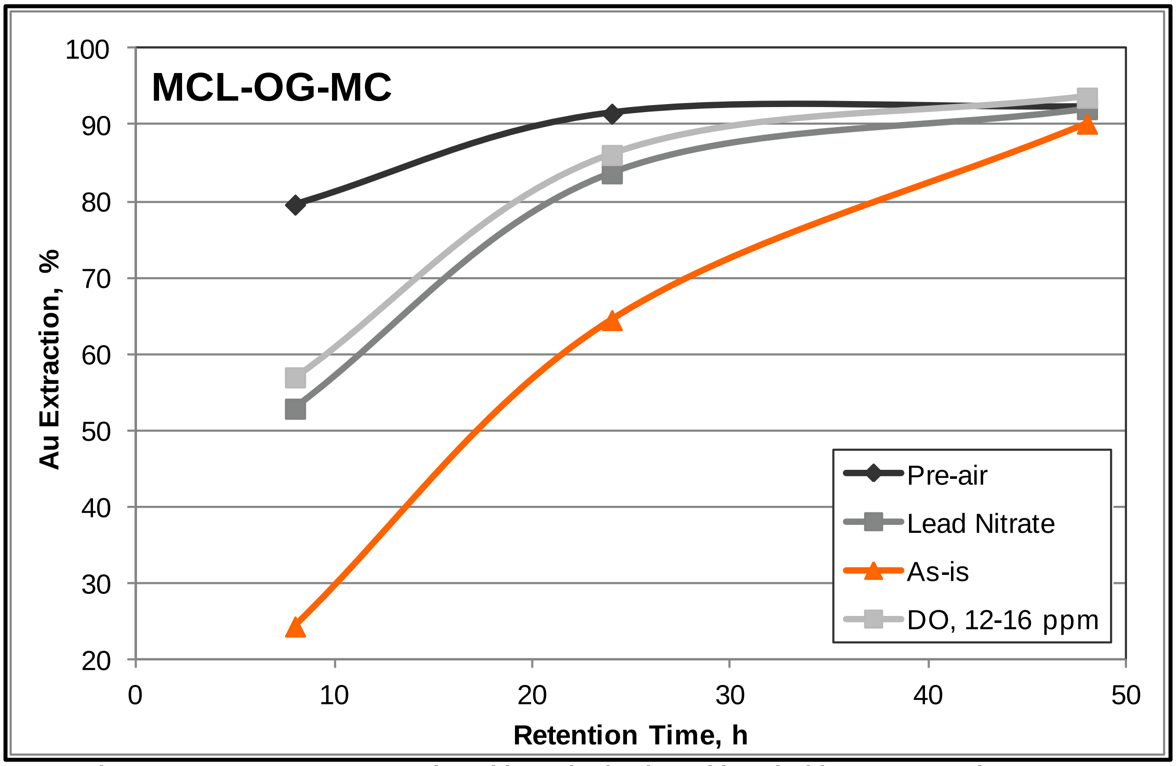


Figure 13-9 MCL-OG-MC Sample Gold Leach Kinetics, with and without Pre-Aeration

Source: SGS (2015)

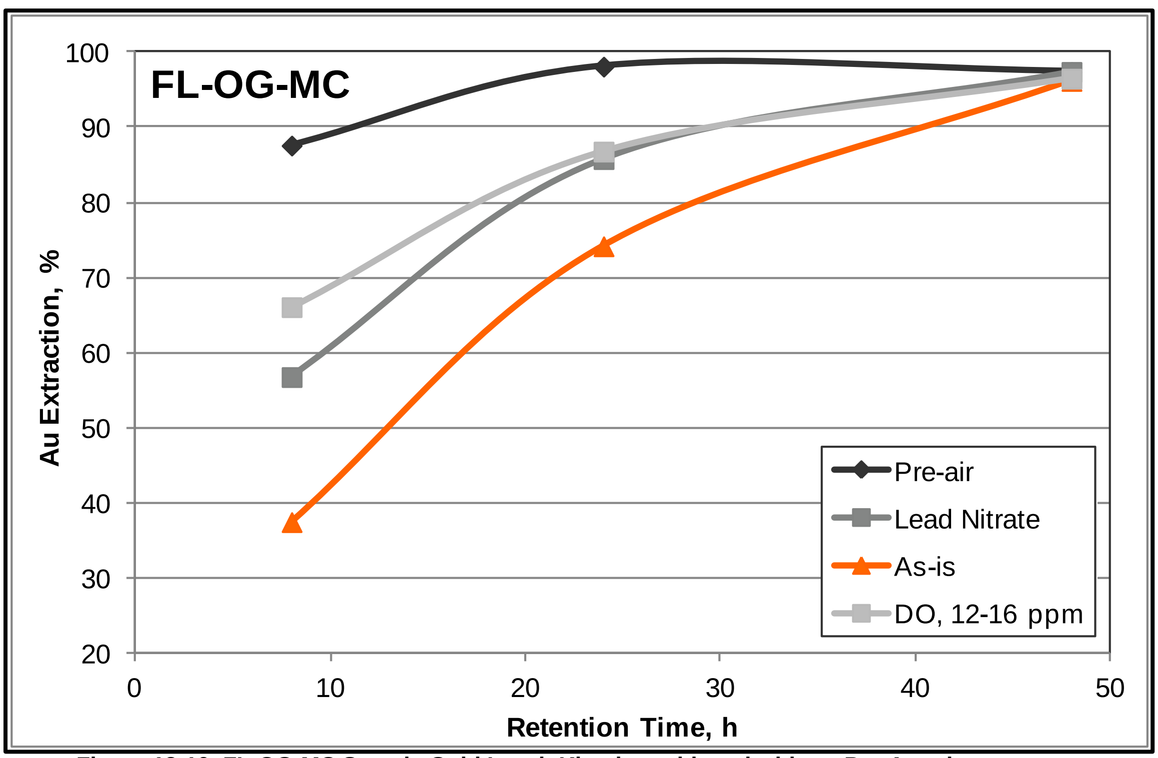


Figure 13-10 FL-OG-MC Sample Gold Leach Kinetics, with and without Pre-Aeration

Source: SGS (2015)

The test with pre-aeration has the best kinetics with leaching of that sample completed within 24 hours as shown in Figures 13-9 and 13-10, while other tests with no pre-aeration required close to 48 hours to complete the leaching. The use of $PbNO_3$ or O_2 improved the kinetics over the base case (as-is) with no pre-aeration.

As a result of this testwork the design pre-aeration residence time was established as 6 hours.

13.8.5 Oxygen Uptake

Oxygen uptake tests were conducted at Base Met Labs in Kamloops British Columbia (Base Met Labs, 2016). The basic procedure was to sparge O_2 into the pulp to a target of 15 ppm dissolved oxygen (DO) and periodically stop the sparging to measure the oxygen uptake by the pulp. The testing was conducted on the Ore Grade (OG) Master Composites (MC) from both MacLellan and Gordon, as well as a worst-case sample from each deposit (highest %S, pyrrhotite rich) and a high-pyrite, low-pyrrhotite sample from Gordon (FL-OG-11). Table 13-10 summarizes the samples tested. Figure 13-11 presents the results from these tests.

Table 13-10 Characteristics of Samples Tested at Base Met Labs

Sample	% S^{2-}	Pyrite % (FeS_2)	Pyrrhotite % ($Fe_{12}S_{13}$)	P_{80} µm
FL-OG-MC	1.93	1.65	2.73	65
FL-Comp 15	2.9	0.55	7.89	123
FL-OG-11	2.55	4.68	0.39	56
MCL-OG-MC	1.53	0.71	2.97	64
MCL-OG-5	2.65	0.64	5.95	74

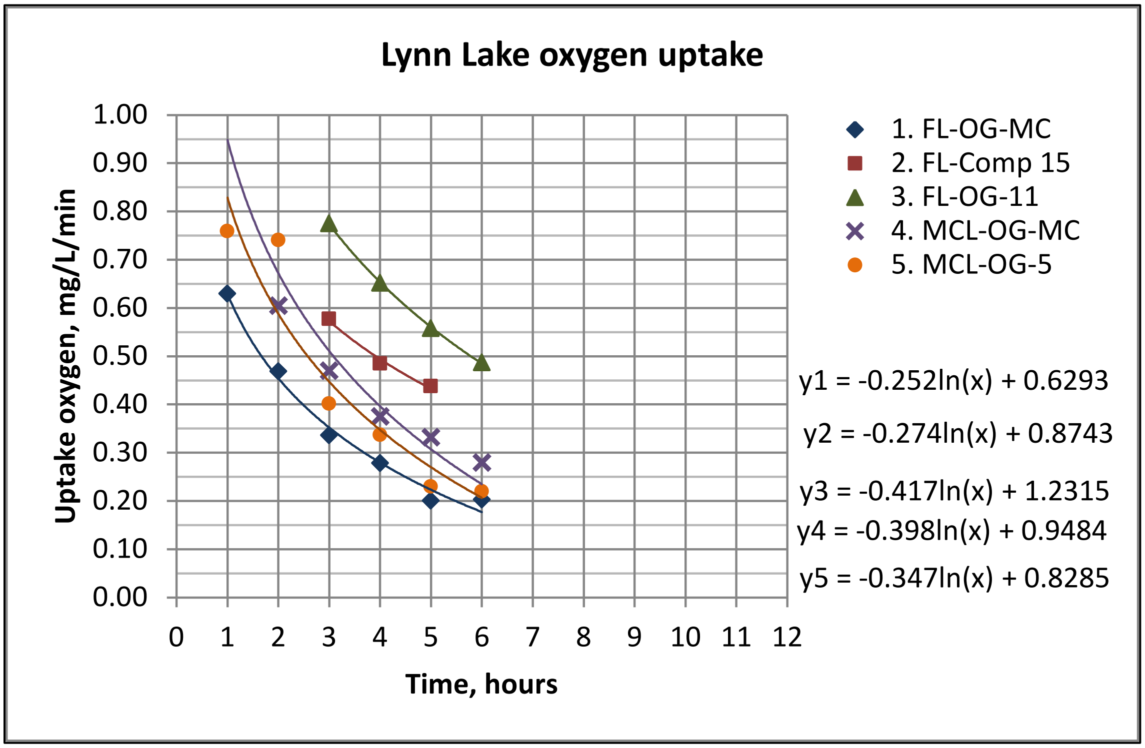


Figure 13-11 Oxygen Uptake Results from Base Met Labs

Source: Base Met (2016)

The tests show the characteristic negative logarithmic decay in the oxygen uptake with time. Initial uptake values were high at >1 mg/L/min. The uptake stabilized at about six hours and the final 24 hours uptake was 0.14 mg/L/min.

13.8.6 Leaching of Variability Samples

All the variability samples (79) were submitted for a standard batch test of gravity plus cyanidation of the gravity tailings. The base conditions for these tests were:

- 75 µm grind P80;
- Gravity concentrate upgraded to < 0.1% by weight;
- One hour of pre-aeration at 1 L/min air for 1 kg test charge;
- 0.5 g/L NaCN through an initial eight hours, then decay;
- pH 10.5 with lime; and
- 48 hour leach time with timed samples, at 45% solids by weight.

The MacLellan ore grade variability composites gravity gold recovery averaged 32.4% and the gold extractions ranged from 44.2% to 97.0%, with an average overall gold recovery of 89.4% (16 composites). The average cyanide and lime consumptions were 0.32 kg/t NaCN and 0.48 kg/t calcium oxide (CaO), respectively. The MacLellan low-grade variability composites gravity gold recoveries averaged 39.4% and gold extractions ranged from 64.8% to 90.8% (eight composites). Overall gold recovery averaged 86.0%. The average cyanide and lime consumptions were similar to the OG composites, averaging 0.35 kg/t NaCN and 0.50 kg/t CaO, respectively. Overall silver recoveries averaged 49.6% and 40.0% for the MCL-OG and MCL-LG composites, respectively.

The Gordon ore grade composites average gravity gold recovery was 37.3% and average gold extraction was 88.6%. The overall gold recoveries ranged from 84.9% to 97.6%, averaging 92.7% (13 composites). The average cyanide and lime consumptions were 0.33 kg/t NaCN and 0.70 kg/t CaO, respectively. The four Gordon low-grade composites had an average gravity gold recovery of 30.9%, an average gold extraction of 81.9%, and an average overall gold recovery 88.0%. Average cyanide and lime consumptions were lower than the OG composites, 0.13 kg/t NaCN and 0.54 kg/t CaO, respectively.

The FL-LG-01 sample was flagged as from the northwest area of the Gordon pit with a lithology labelled as Graphitic Argillite and with an elevated graphite assay (0.72% $C_{Graphitic}$). The test results were inferior for this sample and the residue higher than for the other Gordon-LG samples. It is not clear if this sample shows any genuine preg-robbing issues.

The results from the PQ Core samples, the internal dilution samples, the Nisku samples, and the early production samples essentially confirmed the results from the initial variability results. Some issues were encountered with the PQ core testing. These tests used 10 kg and the pre-aeration was insufficient for some of the samples (low DO, high NaCN consumption, low residual CN_{free}). These tests were repeated with longer pre-aeration time, which improved the results on two of the four samples. This problem was more prevalent for the Gordon samples. Two tests from the Gordon early production years were repeated due to coarse grind. Normal results were achieved at the correct grind size, which further demonstrates that the Gordon deposit is grind sensitive.

Figure 13-12 and Figure 13-6 present the gold recovery as a function of the head assay for the MacLellan and Gordon samples. Both show a typical logarithmic trend of higher recoveries from higher head grades, with the recovery flattening out at average to high head grades. However, five samples for MacLellan and four samples for Gordon did not respond as well as would be expected based on these recovery-head grade relationships.

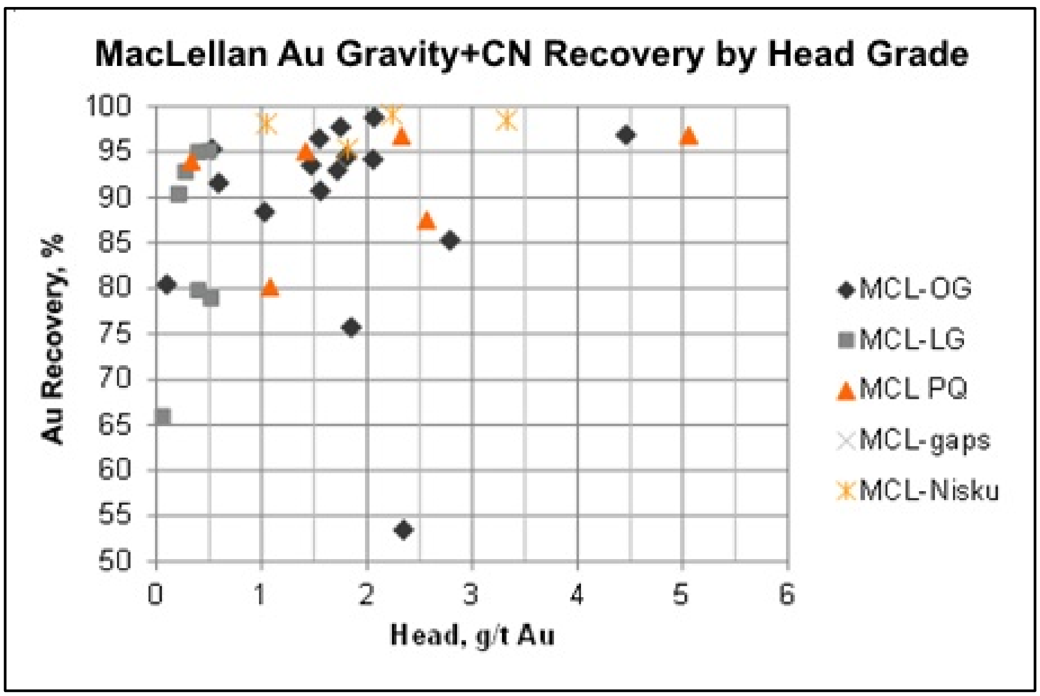


Figure 13-12 Overall Gold Recovery vs. Calculated Head Grade – MacLellan

Source: SGS (2015)

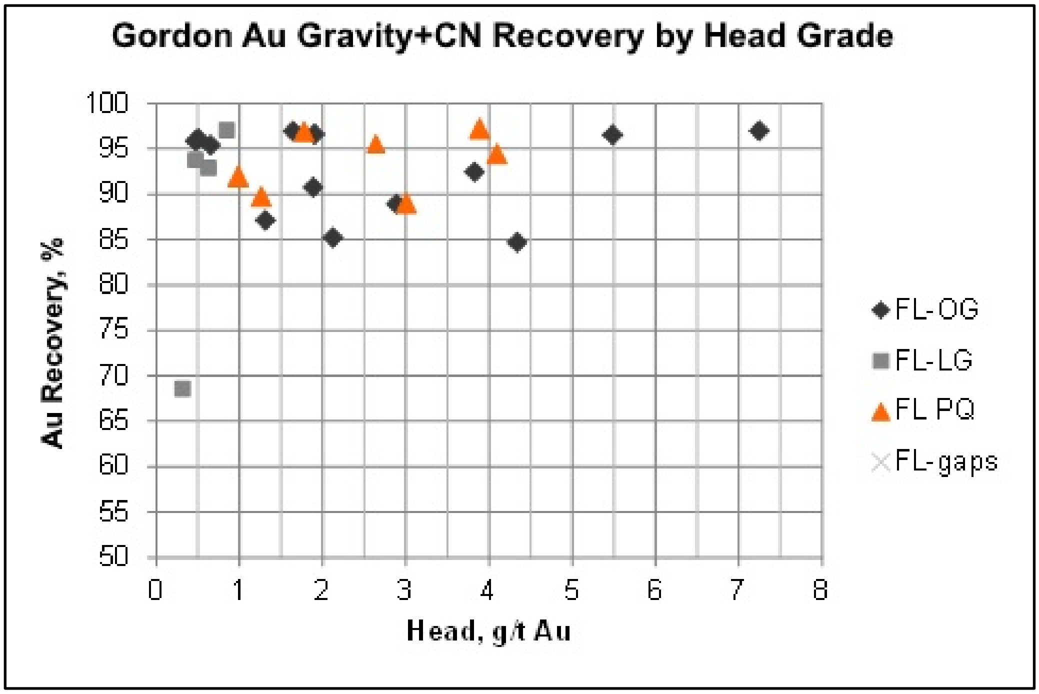


Figure 13-13 Overall Gold Recovery vs. Calculated Head Grade – Gordon

Source: SGS (2015)

13.8.7 Mineralogy

One high gold residue sample from each of the Gordon and MacLellan testing was submitted for mineralogy to find out why the residue was higher than expected. The residue from the Gordon deposit was observed to have small (2 µm) native gold grains locked within larger silicate particles (Terra Mineralogical, 2015b). This finding supports the previous observation that the Gordon deposit is grind sensitive for gold recovery. The residue from the MacLellan deposit did not find very much gold, yet the residue was about 1 g/t gold. The examination was extended to laser ablation micro probe testing. This found that the arsenopyrite contained gold (Terra Mineralogical, 2015b). The ablation profile suggests that the gold in arsenopyrite is not as a solid solution but most likely as micro-encapsulation of gold grains in arsenopyrite. There was little gold associated with the pyrite and pyrrhotite. Most of the gold losses in this sample were due to the gold in the arsenopyrite.

A second sample from MacLellan was also submitted as a reference point. The sample had a similar arsenic head grade to the poor responding sample, but with a low residue gold assay. This sample was also found to have some gold associated with arsenopyrite, but at a much lower level. This indicates that gold is associated with the arsenopyrite to a variable degree.

13.9 CIP Modelling

CIP modelling was conducted by SGS to assist with the design of the CIP circuit and to confirm the plant will perform as expected. SGS has adopted the semi-empirical models developed by Mintek in the 1980s. For CIP modelling in the laboratory, the ore is first leached to completion, and the leached pulp is then treated in a batch reactor with activated carbon to extract the gold cyanide. The rate of extraction is determined by taking samples at timed intervals and analyzing them for gold. Values for the constants k (kinetic constant) and K (equilibrium constant) are then determined using best-fit parameters derived from a non-linear, least squares fit of the batch kinetic data.

A total of 18 simulations were conducted. This testing indicates that with normal CIP conditions, a target-final solution assay < 0.02 mg/L gold will be achieved with a six stage CIP circuit and carbon loading of 2,000 g/t Au.

The CIP modelling was conducted in late 2016 when the plant throughput and base design was known (SGS-LR, 2016a). The results showed acceptable circuit performance under the specified parameters. Final solution losses in this model were 0.013 mg/L gold for the maximum gold and silver grades used. The model indicated loaded carbon could be processed in a 6 tonne elution and regeneration circuit at a rate of one carbon strip per day. This required that 46% of the carbon per stage be advanced daily from the specified 25 g/L carbon density in the CIP tanks.

13.10 Cyanide Detoxification

CND design testwork was conducted on Global Master Composite leached pulp (CN-77). The objective of the testwork was to obtain optimized CND circuit conditions and produce treated pulp containing < 10 mg/L residual weak acid dissociable cyanide (CN_{WAD}) using the SO_2/air/Cu^{2+} detoxification process. The barren leach solution from test CN-77 was assayed prior to CND testwork and the analysis is presented in Table 13-11 (Ounpuu, 2015).

Table 13-11 CND Design Feed Analysis, Global Master Composite CN-77

Analysis, mg/L										
Au	Ag	Cu	Fe	CN_T	CN_{WAD}	CN_F[1]	CN_O	CN_S	CN_T (calc.)[2]	CN_{WAD} (calc.)[3]
< 0.01	< 0.08	12	36	161	61	30	7	250	162	42

Notes:

1. *CN_F (Calculated from CN final titration).*
2. *CN_T = CN_{WAD} + Fe(2.8).*
3. *(CN_{WAD} = CN_F = Cu.*

The Lynn Lake pulp responded well to the treatment using the SO_2/air/Cu^{2+} process. A series of batch tests were conducted to optimize the retention time, SO_2 addition rate, along with the hydrated lime and copper sulphate addition. The final test, CND1-4, was determined to be the optimized design and the reagent additions were 3.60 grams equivalent SO_2, 2.45 grams hydrated lime and 1.41 grams copper per gram CN_{WAD} in the feed to achieve the < 10 mg/L CN_{WAD} target.

The design test conditions were used as a starting point for the bulk CND environmental testwork that was completed using each master composite sample. Continuous CND tests were conducted on the five Master Composite samples and a sixth test was added onto the Global Master Composite to produce a higher CN_{WAD} target of 30 mg/L for environmental ageing tests. A one hour residence time was used. The results from these tests are given in Table 13-12. All tests achieved their respective target CN_{WAD} level with reagent additions that matched the expected levels. The first three tests had elevated levels of CN_T (> 50 mg/L) and were subjected to a polishing stage whereby $CuSO_4$ is added to remove iron and CN_T from solution. This was the action that was taken with the CND-4 test, as there was essentially no CN_{WAD} to remove. The polishing stage was successful in reducing both the iron and CN_T levels.

It was noted that the bulk cyanidation tests which prepared the feed for the above tests did not get the appropriate degree of pre-aeration which resulted in elevated levels of CN_S, iron and hence CN_T in solution and low levels of CN_{Free} at the end of the test. The MCL-OG and FL-OG samples were repeated through the cyanidation and CND testing to produce a nominal concentration of < 10 mg/L CN_T and < 1 mg/L CN_{WAD}. The cyanidation pre-aeration step used three times the aeration rate and twice the time used in the initial tests, which was successful in reducing the iron and CN_S in solution, and hence the overall cyanide consumption. The results for these CND tests are given in Table 13-12 (SGS-LR, 2016b). The one-hour residence time was adequate to achieve the target with the adjusted reagent additions. The product solutions were notably better than from the initial series of tests. The second set of tests required about double the SO_2 and lime addition per tonne of ore than the initial tests. The $CuSO_4$ addition was similar. The final additions used were ~1 kg/t SO_2, 0.45 kg/t lime, and 0.10 kg/t copper added as $CuSO_4.5H_2O$.

Table 13-12 Summary of Initial Continuous CND Tests

Sample	Test	Sub-Sample	Solution Analysis, mg/L				Reagent Addition, g/g CN_{WAD}		
			CN_T	CN_{WAD}	Cu	Fe	SO_2	Lime	Cu
Global Master Composite	CND-2	Feed	182	28	5.4	56			
		Product	119	0.02	10.8	57	3.25	0.07	5.2
MCL-OG-MC	CND-3	Feed	157	42	9.4	44			
		Product	51	5.6	20	35	3.6	0.54	2.8
FL-OG-MC	CND-4[1]	Feed	195	2	0.3	110			
		Product	0.2	<1	15.6	0.2	0	0	210
MCL-LG-MC	CND-5	Feed	189	49	10	36			
		Product	17	5	21.5	8	6.45	3.2	3.5
FL-LG-MC	CND-6	Feed	245	140	5	30			
		Product	8	4.3	14.6	4.3	3	1.3	0.65
Global Master Composite	CND-7	Feed	124	119	12	14			
		Product	36	15	37	15	2.4	0.94	0.09

Notes:
1. CND-4 did not need CN_{WAD} removal but was treated with copper to remove iron and CN_T.

Table 13-13 Summary of the Second Set of Continuous CND Test Results

Sample	Test	Sub-Sample	Solution Analysis, mg/L				Reagent Addition, g/g CN_{WAD}		
			CN_T	CN_{WAD}	Cu	Fe	SO_2 equiv.	Lime	Cu
MCL-OG-MC	CND-1	Feed	150	125	24	8			
		Product	0.36	0.13	0.8	< 0.1	7.6	3.9	0.31
FL-OG-MC	CND-2	Feed	162	94	6	16			
		Product	0.24	< 0.1	0.5	0.2	8.3	2.4	0.88

As a result of this test program, the total cyanide detoxification residence time was selected at 2 hours to achieve a not to exceed CN_{WAD} of 10 mg/L at a pH of 8.5. The detox circuit will be fed with 6.5 grams SO_2 per gram of CN_{WAD} and supplemented with 25 ppm Cu^{2+}.

13.11 Materials Handling

13.11.1 Ore Flow Characteristics

Samples from both the MacLellan and Gordon deposits were sent to Jenike and Johanson, Mississauga, Ontario for ore flow characterization (Jenike & Johanson, 2017). The samples were rejects from the PQ core shipped to SGS. The testing found:

- Both samples were cohesive and will need to be handled in mass flow;
- The samples were both sensitive to impact pressure and it is recommended that a low drop height be used;
- The angle of repose was 35° to 45°;
- The draw down angle was 60° to 65°; and
- The Comp 4 MacLellan sample, fines with 8% w/w moisture content, was the worst case for flowability. The higher moisture content (10% w/w moisture) showed less friction (i.e., better flow), so there are no concerns with rain/snow melt causing flowability issues.

The results are considered relatively consistent with other gold ores.

13.11.2 Settling and Thickening

The Global Master Composite was submitted for a complete solid/liquid separation and rheology test program. The sample was ground to a P80 of 80 µm and pH adjusted to 10.6 with lime prior to testing to represent a pre-leach thickener sample.

The results of the flocculant scoping and static settling tests indicated that the Global Master Composite pre-leach sample responded well to BASF Magnafloc 333 flocculant, a very high molecular weight non-ionic polyacrylamide flocculant.

The optimized dynamic thickening conditions of the Global Master Composite pre-leach sample are summarized in Table 13-14 (SGS-LR, 2015). These results were produced at 10% w/w feedwell density at a dosage of 25 g/t BASF Magnafloc 333 flocculant and 1.14 hour residence time (dry equivalent volume of feed solids versus underflow volume).

The overflow total suspended solids (TSS) was 49 mg/L and the underflow solids content averaged 60.5% w/w solids under these conditions. A thirty-minute period of extended underflow thickening, without feed, resulted in increased underflow solids density to 66.5% w/w solids. This corresponded to an increased underflow yield stress of 103 Pa versus the pre-extended thickening yield stress of 21 Pa. The results are considered typical for a gold ore.

Table 13-14 Dynamic Thickening Results Summary - Optimum Conditions

Description[1,2]	Units	Value
Dosage Flocculant	g/t	25
Undiluted Feed[3]	% w/w solids	44
Diluted Feed[4]	% w/w solids	10
U/F[5]	% w/w solids	60.4
UF[6] Extended	% w/w solids	66.5
TUFUA[7]	$m^2/t/day$	0.1
THUA[8]	$m^2/t/day$	0.007
Net Rise Rate	$m^3/m^2/day$	88.2
Solids Loading	$t/m^2/h$	0.42
Net Hydraulic Loading	$m^3/m^2/day$	3.67
Residence Time Solid vs. UF	h	1.14
Overflow Visual		Hazy
TSS[9]	mg/L	49

Notes:
1. *All values were calculated without a safety factor.*
2. *Common conditions: Flocculant: BASF Maganfloc 333 flocculant. Internal feed dilution using recycled overflow, liquor density: ~1000 g/L, underflow raking, ambient temperature.*
3. *Sample Density Prior to Thickener Feed Dilution (note: this density may not represent the actual discharge density of the preceding process stream).*
4. *Auto-diluted Thickener Feed Density.*
5. *Underflow (UF) Density.*
6. *Underflow (UF) Density after 30 minutes of extended thickening (raked, no feed).*
7. *Thickener Underflow Unit Area.*
8. *Thickener Hydraulic Unit Area.*
9. *Total Suspended Solids (TSS) contained in the overflow.*

13.11.3 Underflow Rheology

The underflow from the above testing was submitted for rheological characterization.

The underflow sample displayed insignificant inter-particle interactions meaning that the dry solids specific gravity was comparable to their densities in the slurry phase. The rheology test measurement data allowed for Bingham modelling and subsequent interpretation, particularly with respect to the solids density rheological profile. The critical solids density (CSD) was ~65.5% w/w solids, displaying a yield stress of 25 Pa under unsheared flow condition and 7 Pa under sheared conditions.

A certain degree of thixotropic tendency was displayed by the sample at, or above, a density of 61.1% w/w solids. Thixotropic response is a “flow-friendly” behaviour whereby the resistance to flow decreases due to constant shearing. These results are considered typical for a hard rock gold ore. The expected leach feed of 55 %w/w solids should present no issues for settling or rheology based on the above data.

13.12 Environmental Testing

An environmental testing program was carried out using samples from the metallurgical test program to assess the geochemical, acid rock drainage (ARD), and contaminant release potential associated with the samples over time. The acute effects of aged process water on freshwater aquatic species were also investigated.

The environmental testing and the outcomes from this work are discussed in relevant parts of Section 18. The work on the metallurgical samples included:

- Elemental analyses;
- Toxicity characteristic leaching procedure (TCLP);
- Shake flask extraction (SFE);
- Analyses and ageing tests of decant solutions;
- Modified acid base accounting and net acid generation tests;
- Humidity cell tests; and
- Sub-aqueous column tests.

Environmental tests were conducted on 52 samples from the metallurgical test program at SGS in Lakefield, Ontario: five ore samples (master composites), 41 cyanide (CN) residues (variability samples), and six cyanide destruction (CND) residues. Selected samples of CND residues were subjected to eight humidity cell tests and four sub-aqueous column tests.

13.13 Testwork Conclusions

A summary of results from the metallurgical test programs is provided in the following sub-sections.

13.13.1 Grade Classifications for Ore Types

Two grade-based classifications of samples prepared for metallurgical and physical testing on master composites and variability composites for each of the deposits were OG and LG. The grades of the representative ore grade MC samples for each of the deposits compare well with the corresponding LOM average grades:

- MacLellan:
  - MC head grade, 1.57 g/t gold, 5.4 g/t silver; and
  - LOM average, 1.63 g/t gold, 4.4 g/t silver.
- Gordon:
  - MC head grade, 2.48 g/t gold, 0.5 g/t silver; and
  - LOM average, 2.42 g/t gold, negligible silver.

13.13.2 Comminution

The average results from tests carried out for the JK parameter (Axb), work index (WI), and abrasion index (Ai) tests are summarized in Table 13-15. The ball mill work index tests (BWi) were carried out with a closing screen size of 200 mesh (75 µm).

Table 13-15 Summary MacLellan and Gordon Comminution Tests

Sample Name	JK	Work Indices (kWh/t)			Abrasion
	Axb	CWi	RWi	BWi	Ai (g)
MCL-OG, average	28	-	-	14.9	-
Gordon-OG, average	25	-	-	15.1	-
MCL PQ, average	29	13.2	16.6	15.3	0.19
Gordon PQ, average	33	14.4	20.0	16.4	0.36
Average, all tests; includes low grade, early production, Nisko (MCL), dilution	28	13.6	18.6	14.8	0.29

In summary:

- The Gordon deposit has a lower average JK Axb parameter (more competent) and a higher average BWi (harder) than the MacLellan deposit;
- The deposits are of average hardness from a BWi perspective. The range of values from BWi testing was 10 to 20 kWh/t; and
- The deposits have a high to very high competency from an Axb perspective. The JK parameters occurred in a relatively tight distribution from 20 to 40.

13.13.3 Gravity

Gravity concentration tests comprised grinding to the target grind size, a single pass through a Knelson MD-3 laboratory concentrator, followed by upgrading to a low mass (target ~0.1% w/w solids) on a Mozley C-800 Laboratory Mineral Separator. Low grade and internal dilution tests showed similar gravity response to the ore grade samples. The average (unweighted) gravity gold recovery from each deposit was:

- MacLellan: 47%; and
- Gordon: 37%.

Although flakes of gold greater than 100 µm were observed in tests, mineralogical examination showed that in both deposits, most of the gold by occurrence was as relatively fine native gold or electrum particles (typically less than 50 µm).

A gravity stage was included in the standard test procedure to reduce the impact and influence of coarser gold particles in leach performance, to improve reconciliation of assayed and calculated heads, and to reduce anomalous test results due to increases in residue assay from the coarser gold particles.

13.13.4 Intensive Cyanidation

The gravity plus 48 hour leach results reported by SGS include a requirement for intensive cyanidation of the gravity concentrate. It is therefore important to consider additional potential losses that would occur in intensive cyanidation. In testing, approximately 30% of the gold and 10% of the silver reported to the gravity concentrate.

The recoveries obtained during intensive cyanidation are summarized below in Table 13-16. The insoluble component of the gravity concentrate is low for gold and higher for silver, with 99.5% of gold and 86.1% of silver recovered on average.

Table 13-16 Intensive Cyanidation Recovery

Composite	Extraction Au%		Extraction Ag%		Calc. Head, g/t	
	24 hours	48 hours	24 hours	48 hours	Au	Ag
Global Comp	98.3	99.5	94.8	80.9	2,817	837
MCL-Ore Grade	97.2	98.7	77.2	77.1	1,816	895
MCL-Low Grade	96.0	99.3	78.9	79.3	635	281
FL-Ore Grade	98.5	100.0	99.9	98.2	3,869	<570
FL-Low Grade	98.7	99.9	87.1	89.8	427	<98.1
Average	**-**	**99.5**	**87.6**	**86.1**	**-**	**-**

13.13.5 Flotation

The overall recovery from leaching the reground float concentrate and leaching the flotation tailings was compared to the standard gravity/leaching test on each of the Master Composites.

As the overall gold recovery from the flotation-based circuit, compared to the standard leaching circuit, was 2% lower for MacLellan and negligible a difference for Gordon, and this was accompanied by a more complex and capital-intensive circuit, flotation showed no benefit to the project and was discontinued from further testing.

13.13.6 Pre-Leach Treatment

A series of pre-leach tests assessed the effect of pre-aeration, addition of lead nitrate ($PbNO_3$), use of oxygen, and sodium cyanide concentration on leach efficiency for both ore types.

Although each of the pre-treatment options produced similar leach extractions and gold grades in leach residue after 48 hours, tests with pre-aeration using oxygen proved the most beneficial:

- Considerably lower cyanide consumption at 0.2-0.4 kg/t NaCN compared to 1.0-1.3 kg/t for tests without pre-aeration; and
- In the fastest leaching tests with the best kinetics, leaching was completed within 24 hours, while tests with no pre-aeration required close to 48 hours to achieve similar extraction.

Reactive iron sulphide minerals (notably pyrrhotite) that were responsible for the high cyanide consumption and the high oxygen demand were effectively passivated ahead of leaching by sufficient pre-aeration.

13.13.7 Oxygen Demand

Standard oxygen uptake tests, in which oxygen was periodically sparged into the pulp to a target 15 mg/L dissolved oxygen (DO) and the decay rate measured, were carried out on ore-grade Master Composite samples from both MacLellan and Gordon, as well as on high-sulphur pyrrhotite-rich and pyrite-rich samples from both deposits.

The tests showed characteristic negative logarithmic decay in the oxygen uptake with time, with a high initial uptake of 0.5-1.0 mg/L/min in the initial two hours, stabilizing after about six hours, and less than 0.2 mg/L/min after 24 hours.

13.13.8 Grind Size

A series of leach tests were carried out over a range of grind sizes to assess extraction, residue grade, and cyanide consumption for ores in each of the deposits. These showed that for leach extraction in the range P80 50 µm to 125 µm:

- Gordon ore is sensitive to grind;
- MacLellan ore has minor grind sensitivity; and
- Finer grinds contributed to higher cyanide (NaCN) consumption in both samples, particularly finer than P80 100 µm.

An economic analysis of the incremental cost of grinding at finer grind sizes, accounting for power consumption, unit power cost, media wear, and cyanide consumption, showed that:

- Gordon ore benefited from finer grinds to nominally P80 50 µm; and
- MacLellan ore showed no marginal benefit with grind size between P80 75 µm and 150 µm but had a negative economic benefit for grinds finer than 75 µm.

Using the expected weighted blend of ores from the two pits, the analysis concluded that little net difference in economic benefit occurred for the following grind sizes:

- Between P80 50 µm and 75 µm at the base case power cost of $0.025/kWh; and
- Between P80 60 µm and 10 µm if the base case power cost doubled.

A grind size of P80 75 µm was selected for the test program.

13.13.9 Flowsheet Options

Test results for four flowsheets, carried out using the same baseline conditions, on the Master Composite sample for both deposits are summarized in Table 13-17.

- Whole ore leaching;
- Gravity and carbon-in-leach (CIL);
- Gravity and leaching; and
- Flotation, regrind of the concentrate, leaching of both concentrate and tailings.

Table 13-17 Summary Flowsheet Options

Deposit	Flowsheet	Recovery, % Au	Recovery, % Ag
MacLellan	Whole ore leach	90[1]	66
	Gravity + CIL	93	71
	Gravity + leach	93	66
	Flotation + leach	91	49
Gordon	Whole ore leach	97	43
	Gravity + CIL	96	80
	Gravity + leach	96	66
	Flotation + leach	97	65

Notes:

1. *Higher grade residue than normal; assay not checked/repeated. Recovery is possibly 2-3% higher.*

Both deposits achieved similar gold recoveries for the four flowsheet options: MacLellan at approximately 92% gold and Gordon at 96% gold. Silver recovery from the three leach-based flowsheets was similar and higher than that from the float/leach flowsheet for MacLellan. No significant silver grades are present in the Gordon deposit.

The ores are not preg-robbing as there is no difference in gold recovery between CIL and whole ore leaching or gravity/leach flowsheets.

The selection of leach/CIL as opposed to whole ore leach was intended to minimize carbon inventory, improve loaded carbon grades, as well as to manage variable silver to gold ratios in the expected mill feed. Leaching testwork did not indicate the presence of carbonaceous material and so it was concluded that there would be minimal difference in final recovery of both circuit styles. As a result, leach/CIL was selected.

Although significant gravity recoverable gold was produced in these tests, the gold recovery from whole ore leaching is comparable to that with gravity included.

13.13.10 Leaching

Variability samples from both deposits were submitted for standard batch tests (79 samples) of gravity plus cyanidation of the gravity tailings. The average recoveries and reagent consumptions are summarized in Table 13-18.

Table 13-18 Samples, Gravity/Leach Standard Test

Sample	Recovery, % Au	Recovery, % Ag	NaCN, kg/t	CaO, kg/t
MacLellan, ore grade	89.4	49.6	0.32	0.48
MacLellan, low grade	86.0	40.0	0.35	0.50
Gordon, ore grade	92.7	-	0.33	0.70
Gordon, low grade	88.0	-	0.13	0.54

Results from standard tests on PQ core samples, the internal dilution samples, the Nisku samples, and the early production samples were essentially consistent with the results from the initial variability tests.

13.13.11 Adsorption Modelling

CIP modelling conducted by SGS, using semi-empirical models developed by Mintek and applying k (kinetic constant) and K (equilibrium constant) best-fit parameters from testwork to describe a range of operating conditions, concluded that the target final solution assay of < 0.02 mg/L gold would be achieved with a six-stage CIP circuit.

Final modelling, when updates for plant throughput, mine plan and design parameters were available, showed acceptable circuit performance for the specified parameters and for the range of gold and silver grades. The simulations estimated a six tonne elution and regeneration system would be required to operate at one strip per day.

13.13.12 Detoxification

Cyanide destruction (CND) continuous testwork conducted on leached pulp samples demonstrated that residual weak acid dissociable cyanide (CN_{WAD}) of < 10 mg/L using the SO_2/air/Cu^{2+} detoxification process was achieved. Reagent additions on a weight/weight basis to CN_{WAD} were 3.6 equivalent SO_2, 2.5 hydrated lime and 1.4 copper in the feed to achieve the target concentration.

Continuous CND tests conducted on five Master Composite samples and a Global Composite sample for CND environmental work all achieved respective target CN_{WAD} levels with reagent additions that matched the expected levels from the previous baseline and optimization testwork. Where elevated levels of CN_T were present, a polishing stage in which $CuSO_4$ was added successfully removed the iron-cyanide species from solution.

13.13.13 Thickening

A comprehensive solid/liquid separation, dynamic thickening and rheology test program was carried out on the Global Master Composite sample at the grind size, pulp density, and pH conditions representing the pre-leach thickener. This sample responded well to BASF Magnafloc 333 flocculant.

At a diluted 10% w/w feed well density and a flocculant dosage of 25 g/t, the underflow achieved 60% w/w solids with less than 50 mg/L total suspended solids (TSS) in the overflow. The solids loading unit rate under these conditions was 0.42 t/m²/h.

13.13.14 Gold Recovery

The test data, as reported in four SGS reports focuses on gravity concentration and leach tests at various residence times. The gravity plus 48 hour leach data was used as the basis for this analysis. Although a gravity circuit is not included in the flowsheet, it is expected that the 48 h leach recoveries will exhibit similar performance to the gravity plus 48 hour leach tests results. This assumption is supported by actual plant residue.

For MacLellan, a simple liner regression is used to estimate gold leach recovery from the gold grade.

Recovery (%) = 0.97 (gold grade g/t) + 92.5

A recovery of 94.2% is estimated at the LOM average ore grade.

For Gordon, a fixed gold leach recovery of 93% is recommended, as there is only a minor trend between gold grade and recovery.

The development of these models is described below. They are derived from test results on five composites which were prepared for the 2015 SGS test program as follows; two MacLellan (ore grade and low grade), two Gordon (ore grade and low grade) and a Global composite which was a blend of the two ore grade composites.

13.13.14.1 *MacLellan*

As described in the SGS testwork report (SGS-LR, 2015), the MacLellan Ore Grade Master Composite gave a gravity plus 48 hour leach recovery of gold of 92.4%. The average recovery obtained from the sixteen samples used to make the composite was 89.4%. However, two of the sixteen tests had an anomalously low recovery (75% and 53%). When those values are removed, the average was 93%, similar to the composite. The average ore grade composite grade is close to the plant feed grade and the average P80 was 70 microns.

There is a dependence of recovery on gold grade as demonstrated by the linear regression shown in Figure 13-14. Results from samples < 0.5 g/t gold were not considered, as these would be below the estimated mill feed grade.

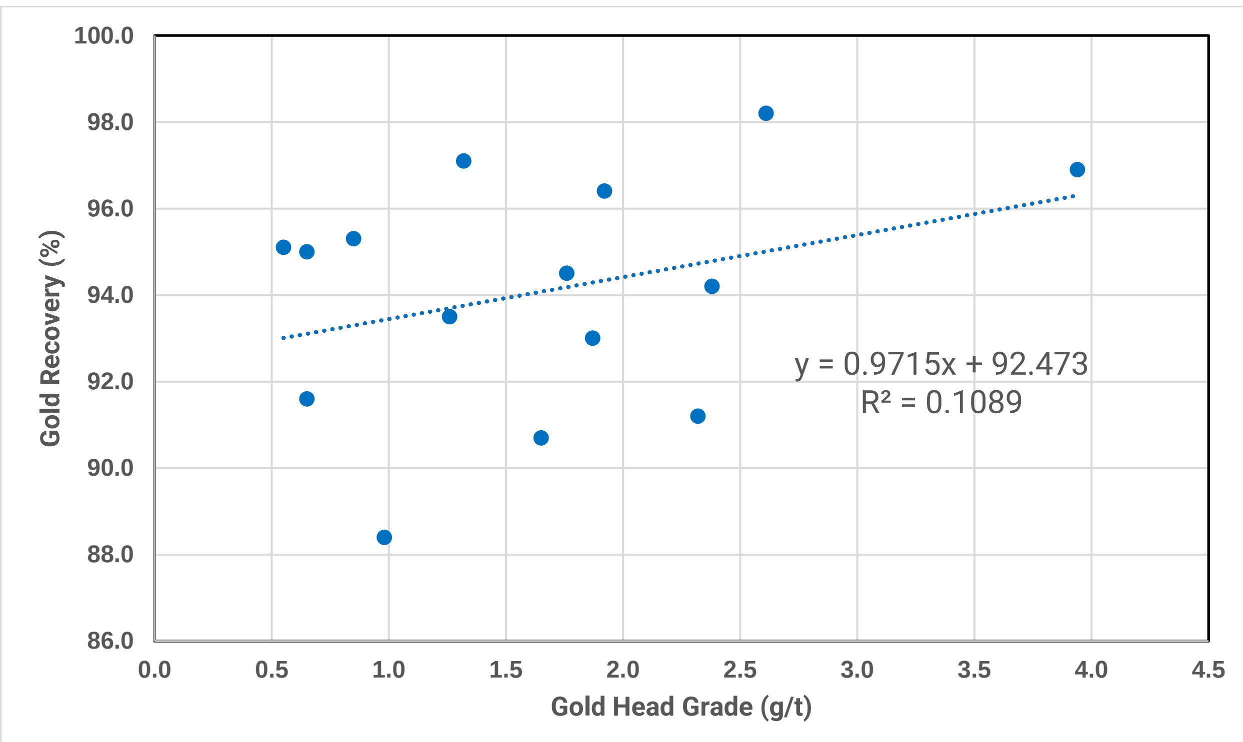


Figure 13-14 MacLellan Gold Recovery vs. Head Grade, > 0.5 g/t gold samples

Source: **(Walton, 2021)**

For MacLellan, a simple liner regression is used to estimate gold leach recovery from the gold grade.

Recovery = 0.97 (gold grade g/t) + 92.5

The recovery from the Global Composite, which is a 58%/42% MacLellan/Gordon blend by weight, was 93.8%. Similar results were obtained in the subsequent SGS reports on MacLellan

Composites. High average recoveries > 96.5% were obtained from Nisku (MacLellan East End) and reported in the 2016 SGS report.

These gold leach recovery estimates should be reduced by 0.6% to account for insolubles in the gravity concentrate produced in testing and the soluble gold losses in CIP.

Reflecting the 0.6% reduction an average recovery of 93.7% is estimated for the LOM.

13.13.14.2 *Gordon*

The SGS testwork report (SGS-LR, 2015) shows the gold recovery obtained from the Gordon Ore Grade Master Composite was 96%. The average recovery obtained from the samples used to make the Ore Grade Master Composite was 93%. There is very little relationship between ore grade and recovery as shown by the trendline included in Figure 13-15 below. The average composite grade is close to the plant feed grade and the average P80 was 74 microns.

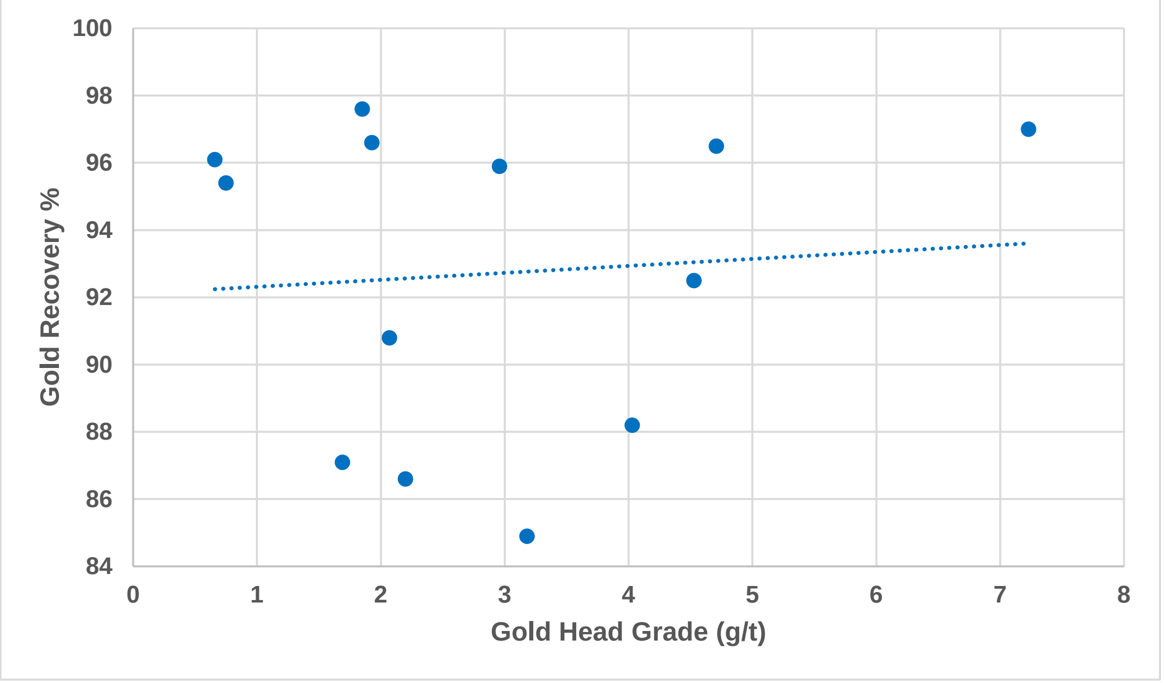


Figure 13-15 Gordon Gold Recovery vs. Head Grade

Source: **(Walton, 2021)**

The gold leach recovery estimate of 93% should be reduced by 0.6% to account for insolubles in the gravity concentrate produced in testing and the soluble loss in CIP.

Reflecting the 0.6% reduction, a recovery of 92.4% is used for the LOM.

13.13.15 Silver Recovery

Although silver grades are typically low, some value exists.

13.13.15.1 *MacLellan*

The MacLellan Ore Grade Master Composite gave a gravity plus 48 hour leach silver recovery of 53%. The average silver recovery obtained from the samples used to make the composite was 50%. The Global composite which is a 58%/42% MacLellan/Gordon blend by weight was 54%.

It is recommended to use a 50% silver recovery for MacLellan, reduced by 2% to 48% to account for insolubles in the gravity concentrate produced in testing and the soluble silver loss in CIP.

13.13.15.2 *Gordon*

The Gordon Ore Grade Master Composite gave a gravity plus 48 hour leach silver recovery of 69%. The average silver recovery obtained from the samples used to make the composite was 54%. The Global composite which is a 58%/42% MacLellan/Gordon weight gave a silver recovery of 54%.

For Gordon, it is recommended to use a 54% silver recovery, reduced by 3.5% to 50.5% to account for insoluble and soluble silver losses.

Given the very low grades, silver was not modeled within the Gordon Mineral Resource.

13.14 Additional Testwork

No additional testwork has been conducted for the 2023 Feasibility Study Update or for basic engineering. The testwork data available was sufficient to evaluate the process conditions for the design and perform the calculations that needed to be done in the later stages of the project.

14 MINERAL RESOURCE ESTIMATES

The updated Mineral Resource estimates for the MacLellan and Gordon Mine deposits were prepared by Jeff Volk, M.Sc., CPG, FAusIMM using all available information through February 2022. Grade estimation methodology and Mineral Resource classification has not been modified materially from previous mineral resource estimates. The effective date of the Lynn Lake Mineral Resource estimate is June 30th, 2023.

14.1 MacLellan

14.1.1 Drill Hole Database

Alamos has conducted an updated Mineral Resource estimate of the MacLellan deposit, which incorporates all drilling data from Alamos and predecessor drilling programs conducted through February 25, 2022. A database was compiled using data from 1,691 drill holes, with collar, survey, geological and assay information, and containing a total of 155,531 m of assayed gold intervals. Of these data, 88,035 m (897 holes) are surface drilling, and 67,496 m (794 holes) were drilled from underground. Historic drilling conducted by historic operators was included where data could be verified.

14.1.2 Topography

Existing topography is based on a 2014 LiDAR survey conducted by LiDAR Services International Inc. (LSI) and was used to code the Mineral Resource model. Alamos has reviewed the topography surface in cross-sections, comparing elevation between the drillhole collars and the topography surface, and found close agreement between the two.

14.1.3 Coordinate System

All data is in UTM Zone 14, NAD 83. The local mine coordinate system utilized a translated and rotated version of the above coordinate system during historic mining operations. Several pre-2015 drill hole collars (89) were located by Barnes and Duncan Land Surveying and Geomatics, Winnipeg MB (Barnes and Duncan) in a December 2014 survey and were found to be accurately located in the digital drill hole collar database.

14.1.4 Lithology and Grade Modeling

A 0.30 g/t Au grade indicator solid was constructed using Leapfrog modeling software and manually edited to eliminate small volume solids and outlier tonnages. A northwest-southeast cross-section showing the resultant solid is provided in Figure 14-1.

A generalized lithologic model was also constructed using Leapfrog modeling software and was utilized to assign specific gravity (SG) to the model blocks. A total of eight generalized lithologies were modeled:

- Argillite;
- Banded Iron Formation (BIF);
- Chert/Quartzite;
- Felsic Intermediate Schist;
- Intrusive;
- Mafic/Ultramafic;

- Mafic Schist; and
- Quartz-Carbonate Veins.

SG assignments based on these modeled lithologies are described in a subsequent section of this report.

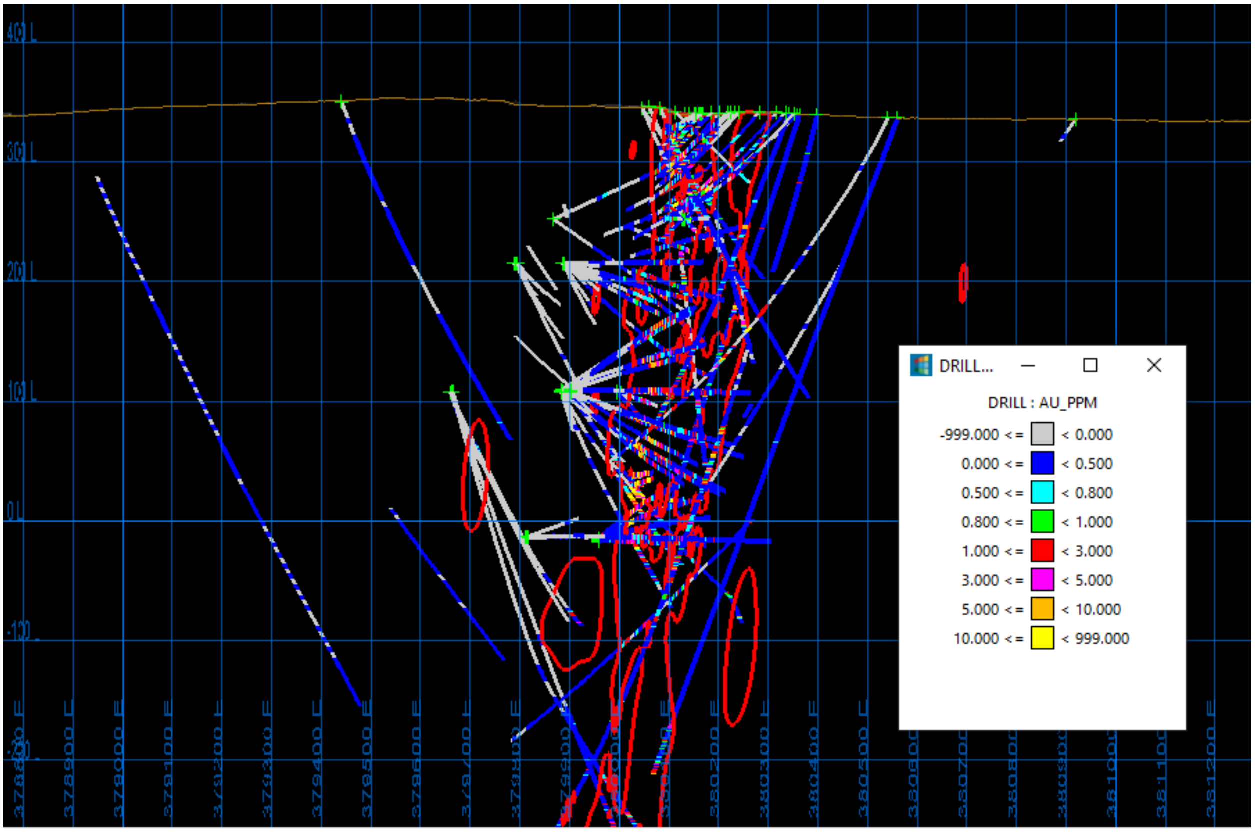


Figure 14-1 WSW - ENE Cross-Section Viewed to the North Showing 0.30 g/t Au Solid

Source: Alamos (2023)

14.1.5 Exploratory Data Analysis

Exploratory data analysis (EDA) was conducted using the raw gold assays from the MacLellan Property. These data were analyzed above both global and incremental cut-offs to assess the distribution and grade ranges of the assays internal and external to the 0.30 g/t Au solid. Basic statistics for the raw gold assays are provided in Table 14-1. It can be observed that on a grade-thickness basis, a minor amount of metal above potentially economic cut-off resides external to the 0.30 g/t solid. Most of the intervals external to the grade solid are not of minable width; however, this demonstrates that gold occurs external to the main lode system. Statistically, the 0.30 g/t Au solid envelops ~89% of the raw assay data in the model area above a 0.30 g/t Au cut-off.

Table 14-1 Summary Statistics – MacLellan Raw Gold Grades by Domain

Domain	Au Cut-off (g/t)	Statistics above Cut-off						
		Total Meters	Incremental Pct	Max Grade (Au g/t)	Mean Grade (Au g/t)	Grade Thickness (g/t*m)	Standard Deviation	Coeff. of Variation
All Data	0.01	140,188	66.72%	1,307.77	0.75	105,158	4.77	6.36
	0.30	46,656	20.54%		2.18	101,655	8.08	3.71
	1.00	17,865	7.73%		4.95	88,449	12.57	2.54
	3.00	7,022	5.01%		10.08	70,795	18.92	1.88
Internal to 0.3 g/t Au Solid	0.01	63,054	34.38%	1,307.77	1.59	100,076	6.99	4.40
	0.30	41,377	37.98%		2.38	98,432	8.52	3.58
	1.00	17,429	16.61%		5.00	87,205	12.66	2.53
	3.00	6,954	11.03%		10.08	70,065	18.93	1.88
External to Au Grade Solid	0.01	77,134	93.16%	187.50	0.07	5,082	0.63	9.53
	0.30	5,279	6.28%		0.61	3,223	2.33	3.81
	1.00	437	0.48%		2.85	1,244	7.74	2.72
	3.00	69	0.09%		10.62	729	17.54	1.65

14.1.6 Specific Gravity Analysis

Company geology personnel conducted 2,531 specific gravity tests, using the water immersion method, on diamond drill core from the property during the 2015 drilling program. In addition, analyses were conducted by TSL during the 2007-2012 Carlisle drilling campaigns. A summary of SG determinations by rock type is provided in Table 14-2.

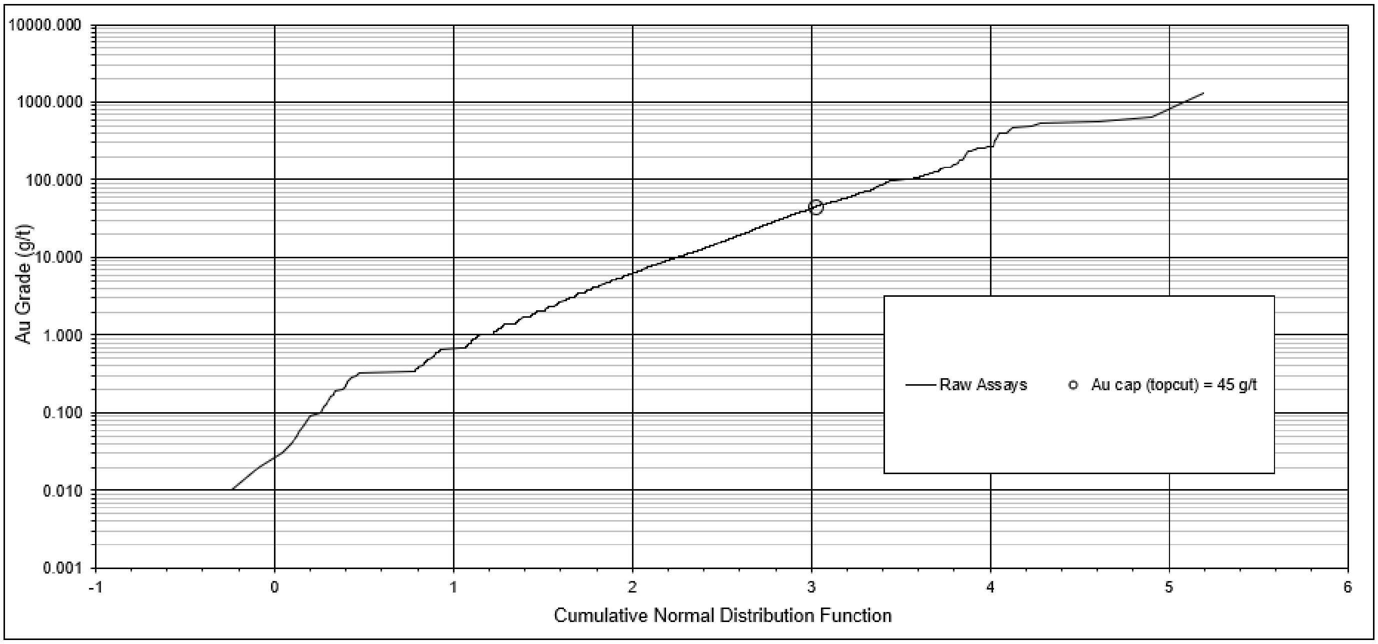
A default SG value of 2.94 was assigned to modeled lithologies that did not receive any SG determinations.

Table 14-2 SG Results for MacLellan Samples

Rock Type	Lithology Code	Number of Samples	Min SG	Max SG	Avg SG
Argillite	1	0			2.94
BIF	2	5	2.79	3.18	2.94
Chert/Quartzite	3	0			2.70
Felsic Intermediate Schist	4	379	2.65	3.81	2.91
Intrusive	5	5	2.78	3.10	2.90
Mafic/Ultramafic	6	994	2.41	4.26	3.00
Mafic Schist	7	42	2.69	3.12	2.97
Quartz-Carbonate Veins	8	1	2.70	2.70	2.70
All Data		2,531	2.41	4.26	2.96

14.1.7 Evaluation of Outlier Data

The raw drill hole gold assay dataset was inspected globally using log cumulative probability plots to assess for the presence of high-grade outlier values that could adversely impact grade estimation. For this analysis, the datasets both external and internal to the 0.3 g/t Au grade solid were combined, as they are one contiguous deposit. After review of log probability plots, all raw gold assays were capped at 45.0 g/t Au prior to compositing (Figure 14-2). This assay cap (top cut) affects 166 meters of sample, and results in a reduction of 6.87% of gold metal on a grade-thickness (GT) basis. The capped data shows a reduction in the coefficient of variation (CV) to 3.73 as compared to 6.36 for the uncapped data.



Untransformed Au Statistics

	Au Cutoff = 0.01 g/t		Au Cutoff = 0.50 g/t		Au Cutoff = 3.00 g/t		Au Cutoff = 45.00 g/t		Log Normal Approximation Model		
	Meters	Au (g/t)	Meters	Au (g/t)	Meters	Au (g/t)	Meters	Au (g/t)	Mean	Standard Deviation	Third Parameter
Raw Assays	140,188	0.750	27,427	3.463	7,022	10.081	174	85.933	-1.12	0.90	0.00
incr. % and grade	80.4%	0.090	14.6%	1.185	4.9%	8.153	0.1%	85.933			
low cut	0.10		45 g/mt percentile		GT lost by capping		percent of GT >= 1308 g/mt				
			99.71%		6.87%		0.19%				
Au cap (topcut)	45.00		percent of GT >= 45 g/mt		CV uncapped		CV capped				
			14.41%		6.36		3.73				

Figure 14-2 Cumulative Probability Plot: MacLellan Raw Gold Assays

Source: Alamos (2023)

14.1.8 Compositing

All capped raw data were composited into 5 m downhole intervals. Composites were back-flagged by the model blocks to assign percentage of composite internal to the 0.3 g/t Au wireframe. Only composites with a wireframe percentage ≥10% were retrieved for use in grade estimation. All composites were length weighted during the grade estimation process.

14.1.9 Variogram Analysis

Pairwise relative variograms were constructed for gold in Sage2001© software using the 5 m capped composite data. The resulting variograms exhibited high nuggets and relatively short ranges overall. The resultant fitted variograms for the major, semi-major and minor axes are provided in Figure 14-3, Figure 14-4, and Figure 14-5. A summary of variogram parameters is provided in Table 14-3. These variograms generally reflect geologic field observations, and due to the extremely high nugget observed in the sample variograms, search orientations were ultimately defined based on directions of geologic continuity and observed ore controls.

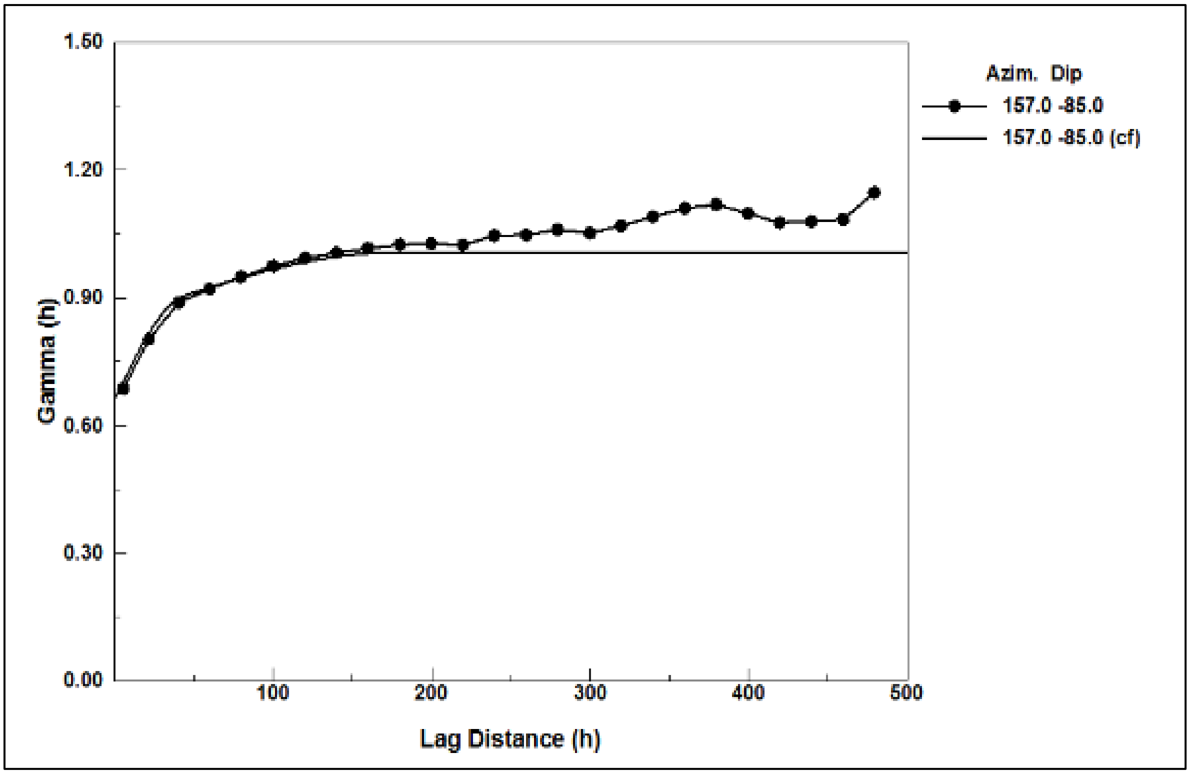


Figure 14-3 MacLellan Pairwise Relative Variogram and Model: Major Axis

Source: Alamos (2023)

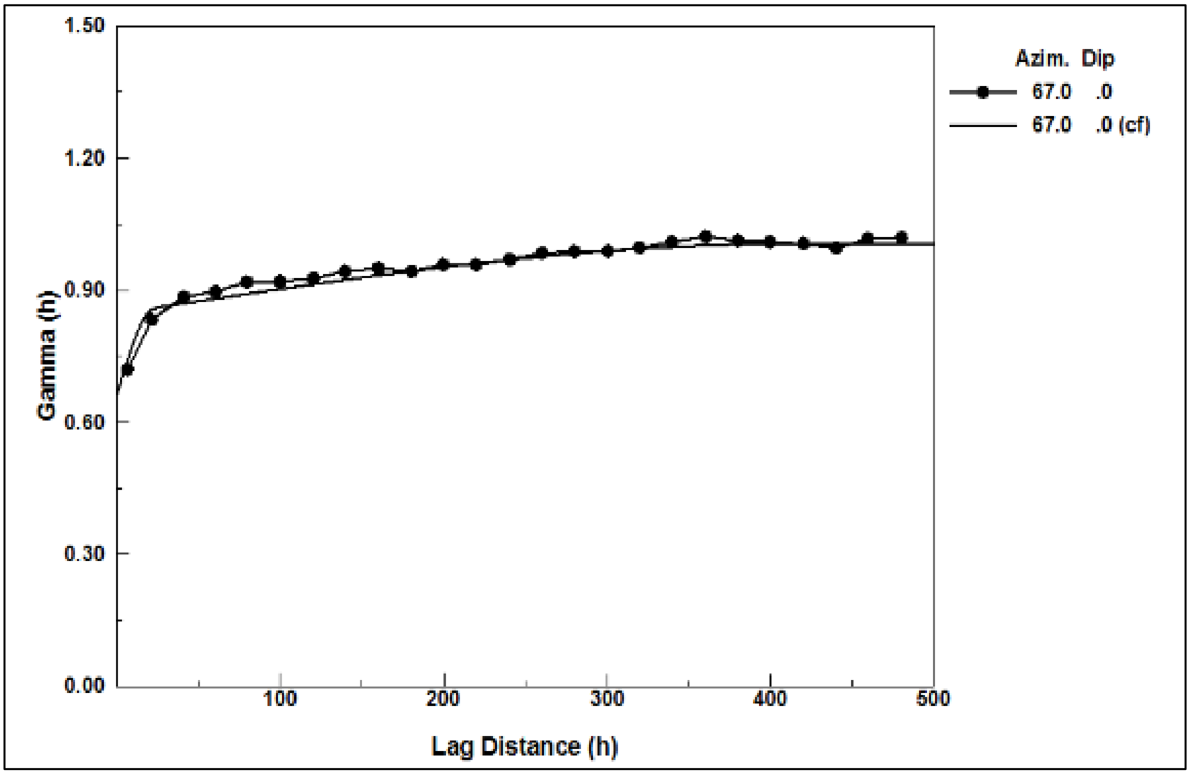


Figure 14-4 MacLellan Pairwise Relative Variogram and Model: Semi-major Axis

Source: Alamos (2023)

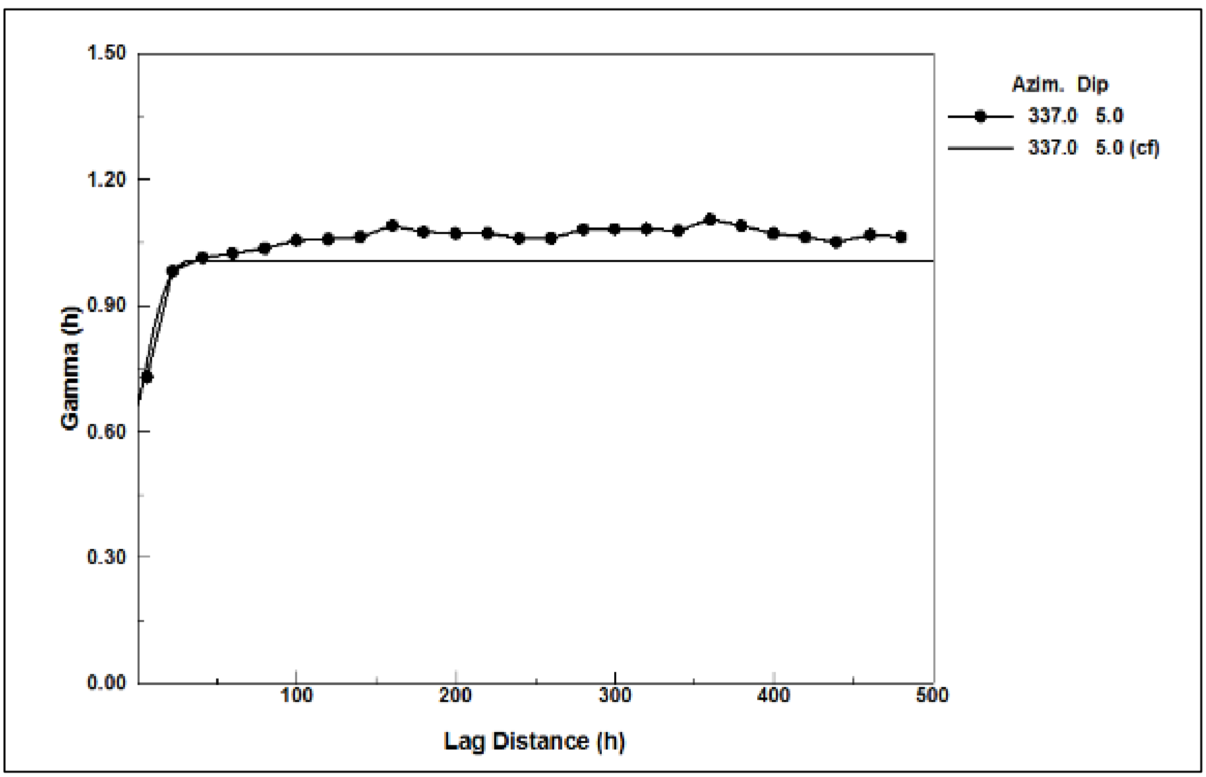


Figure 14-5 MacLellan Pairwise Relative Variogram and Model: Minor Axis

Source: Alamos (2023)

Table 14-3 Maclellan Pairwise Relative Variogram Model Parameters for Au: 5 m Composites

MacLellan: Variogram Results (Spherical Model)			
Parameters (First Structure)	**Principal**	**Minor**	**Semi-Major**
Azimuth (deg)	216	**152**	**62**
Dip (deg)	89	-1	1
Parameters (Second Structure)	**Principal**	**Minor**	**Semi-Major**
Azimuth (deg)	100	10	68
Dip (deg)	-1	-1	89
Nugget Effect C0	0.719		
1st Structure C1	0.138		
2nd Structure C2	0.151		
1st Range A1 (m)	58	19	51
2nd Range A2 (m)	436	34	314

14.1.10 Block Model Construction

A block model was constructed in Vulcan™ for the MacLellan deposit using the model limits and extents provided in Table 14-4. Block model construction utilized a constant block size of 5.0 x 5.0 x 5.0 m.

Table 14-4 MacLellan Model Limits and Extents

Mine Grid Origin[1]	Min. (m)	Max. (m)	Block Size (X)	Block Size (Y)	Block Size (Z)	No. of Blocks
East	380,290	382,295	5.0	5.0	5.0	401
North	6,306,440	6,307,940	5.0	5.0	5.0	300
Elevation	-500	505	5.0	5.0	5.0	201

Notes:
1. *All blocks are rotated 65° about model origin.*

14.1.11 Block Model Grade Estimation

The Mineral Resource estimate was undertaken using Maptek Vulcan™ software employing the inverse distance weighting method (ID^3) and nearest neighbour (NN) method for use in model validation. In addition to gold, silver grades were estimated.

Model blocks were assigned a percentage of the block internal to the 0.30 g/t Au wireframe and only blocks whose volumes were ≥10% internal to the wireframe were available for grade estimation. Model blocks were also "mined" using the historic underground mining solids and both mined tonnage and grade were zeroed out for the final Mineral Resource tabulation.

A summary of the search parameters utilized is presented in Table 14-5. Model block grades were diluted to account for all volume external to the 0.30 g/t Au wireframe with this material assumed at a zero g/t gold and silver grade. Additional estimates were performed for neutralization potential (NP) and acid potential (AP) to assist in the overall waste rock chemistry studies related to mine planning. The methodology used for these latter estimates are described in more detail in subsequent sections of this report.

Table 14-5 Search Parameters for the MacLellan Model – Gold and Silver

Pass Number	Search Orientation[1] (degrees)			Search Distance (m)			Min Comps	Max Comps	Max per DDH
	Bearing (Z)	Plunge (Y)	Dip (X)	Major Axis	Semi-Major Axis	Minor Axis			
1	67	0	-85	20	20	5	3	8	1
2	67	0	-85	45	45	10	2	8	1
3	67	0	-85	100	100	20	1	8	1

Notes:
1. *Vulcan rotations.*

14.1.12 Block Model Validation

Various measures have been utilized to validate the resultant Mineral Resource block model. These measures include the following:

- Visual comparison of drill hole composites with Mineral Resource block grade estimates by zone, both in plan and section;
- Statistical comparisons between block and composite data using histogram and cumulative frequency distribution analysis;
- Generation of a comparative NN model; and
- Swath plot analysis (drift analysis) comparing the ID^3 model with the NN model.

In addition to internal model validation work, SRK conducted an audit of the Mineral Resource models for the MacLellan and Gordon deposits in September 2022, (SRK, 2022). SRK concluded that the AGI resource models were slightly conservative based on SRK check models using different assay capping and changes to composite length.

14.1.12.1 *Visual Inspection*

Visual comparisons between the block grades and the underlying composite grades in plan and section show close agreement, which would be expected considering the estimation methodology employed. An example of a northwest-southeast cross-section and longitudinal section is provided Figure 14-6 and Figure 14-7, respectively. The figures display block and composite gold grades, 0.30 g/t Au grade solid outlines, US$1,600 Mineral Resource pit (brown) and existing underground development (brown).

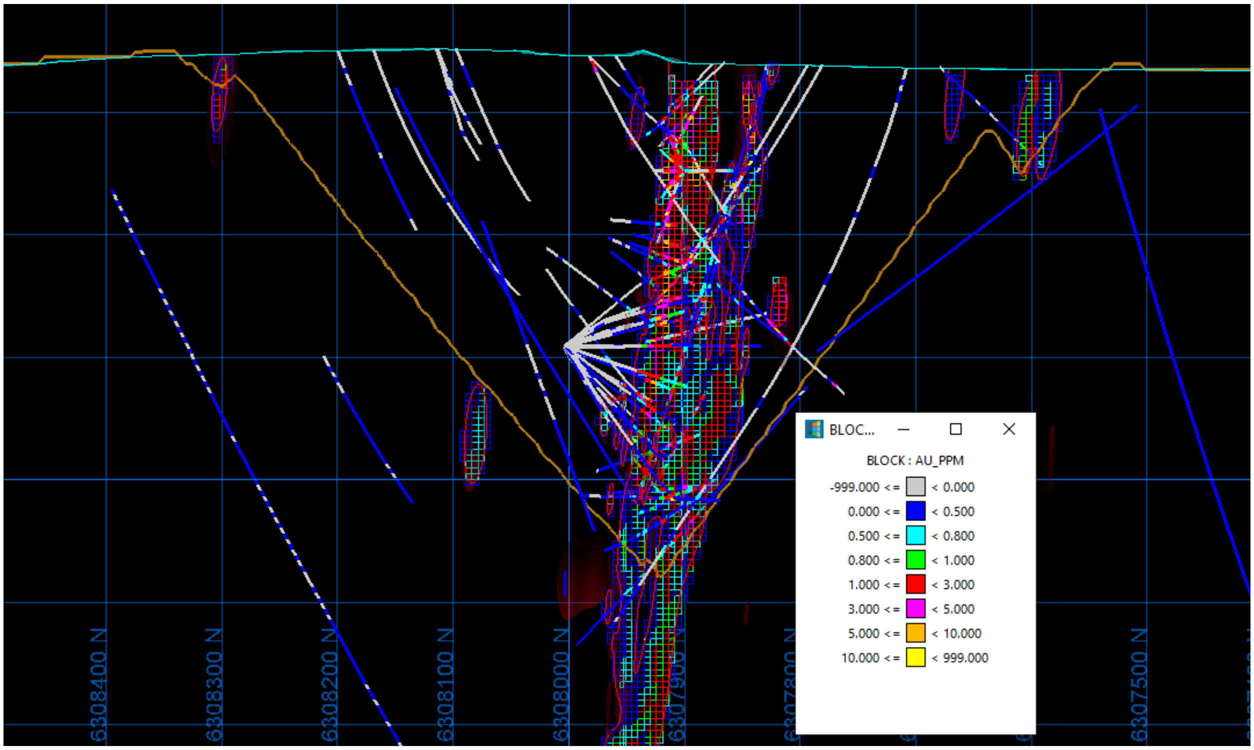


Figure 14-6 Example MacLellan NW-SE Cross-Section Viewed to East Showing Model Block Grades

Notes:

- *0.30 g/t Au grade solid (magenta)*
- *$1,600 Mineral Resource pit (brown)*

Source: Alamos (2023)

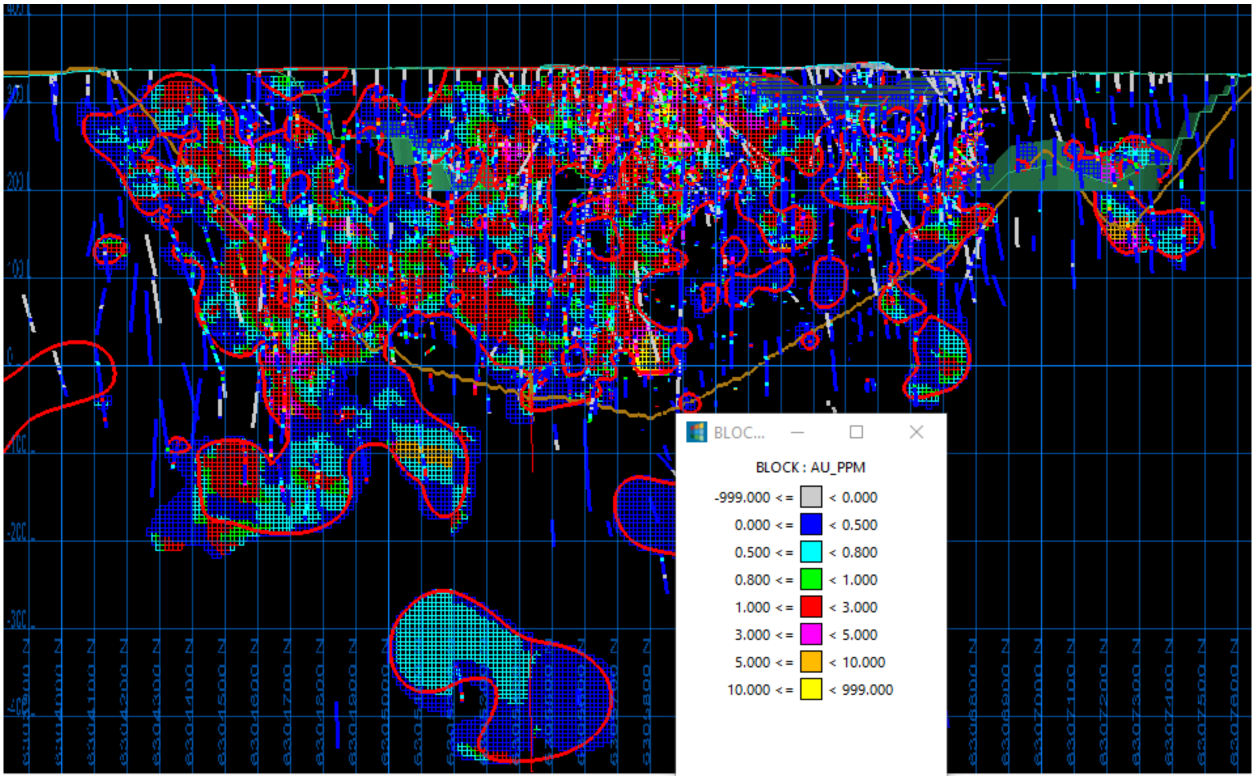


Figure 14-7 Example MacLellan W-SW - E-NE Long Section Showing Model Block Grades

Notes:

- *0.30 g/t Au grade solid (magenta)*
- *$1,600 Mineral Resource pit (brown)*

Source: Alamos (2023)

An example level plan displaying block and composite gold grades, 0.30 g/t Au grade solid outlines and US$1,600 Mineral Resource pit (brown) are provided in Figure 14-8.

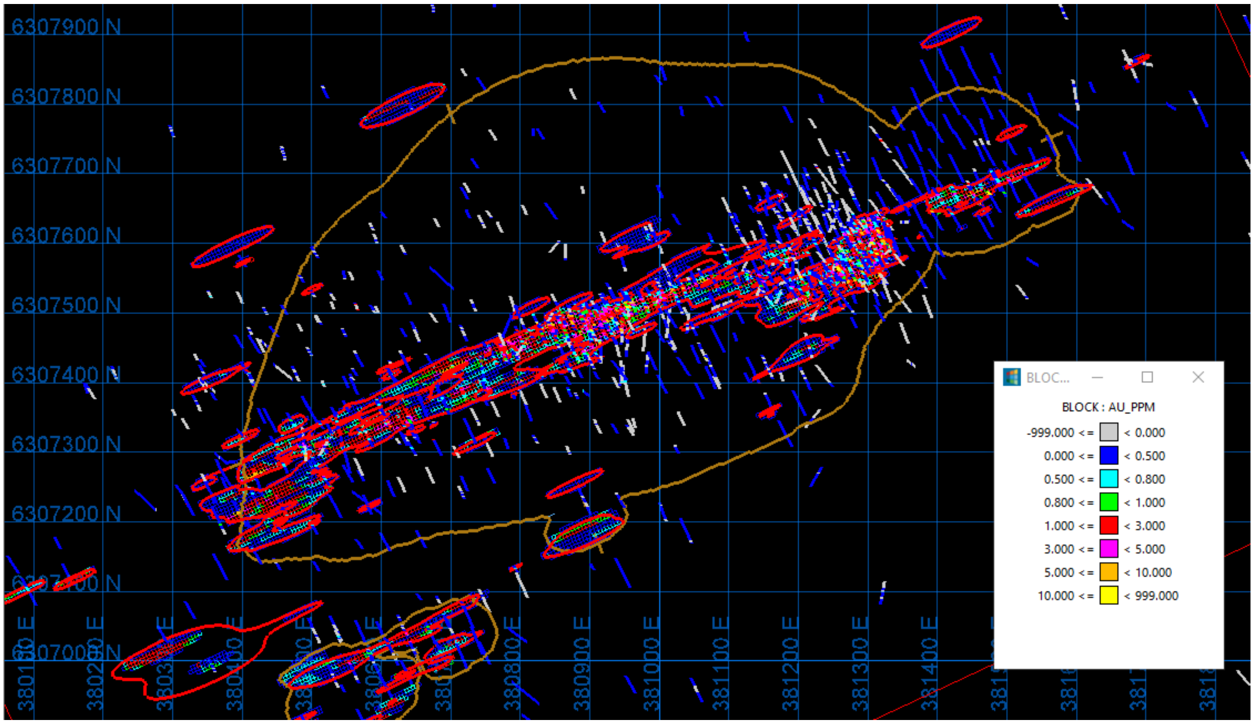


Figure 14-8 Example MacLellan Level Plan 200 m Elevation Showing Model Block Grades

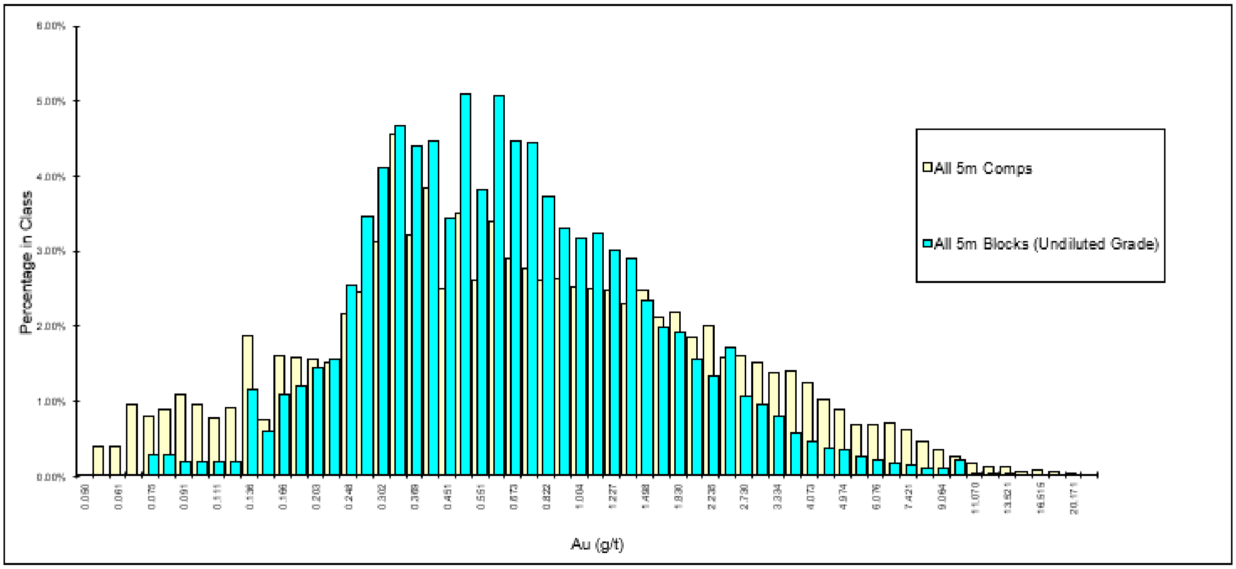
Notes:

- *0.30 g/t Au grade solid (red)*
- *$1,600 Mineral Resource pit (brown)*

Source: Alamos (2023)

14.1.12.2 *Block-Composite Histogram Comparison*

Alamos also conducted statistical comparisons between the grades of the Measured, Indicated, and Inferred ID^3 blocks contained within the 0.30 g/t Au solid and the underlying gold composite grades. A histogram comparison between block and composite gold grades at MacLellan is provided in Figure 14-9.



	Au Cutoff = 0.100 g/t		Au Cutoff = 0.300 g/t		Au Cutoff = 1.00 g/t		Au Cutoff = 5.00 g/t	
	meters/tonnes	Au (g/t)	meters/tonnes	Au (g/t)	meters/tonnes	Au (g/t)	meters/tonnes	Au (g/t)
All 5m Comps	62,079	1.488	50,904	1.773	24,582	3.080	3,673	8.102
incr. % and grade	18.0%	0.189	42.4%	0.552	33.7%	2.197	5.9%	8.102
All 5m Blocks (Undiluted Grade)	157,978,227	1.020	135,084,344	1.158	48,749,501	2.209	2,795,329	7.651
incr. % and grade	14.5%	0.206	54.6%	0.565	29.1%	1.877	1.8%	7.651

Figure 14-9 MacLellan Histogram Comparison between Block and Composite Grades: Gold

Source: Alamos (2023)

Overall, this comparison shows that the model grade distribution for gold is appropriately smoothed when compared with the underlying composite distribution, and that the comparison of average grades and percentages above geologic absolute and incremental cut-offs show good agreement.

14.1.12.3 *Comparison of Interpolation Methods*

For comparative purposes, additional grades were estimated using NN interpolation methods. The results of the NN model are compared to the ID^3 model at a 0.0 g/t Au cut-off grade for the Measured and Indicated blocks in Table 14-6 and Table 14-7 for all Inferred blocks. These comparisons confirm the conservation of metal at a zero cut-off and shows close agreement on both a tonnage and grade basis within the deposit area.

Table 14-6 MacLellan ID^3 vs. NN Tonnage – All Measured and Indicated Model Blocks

Category	Model	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
M&I	ID^3	95,015	1.12	3,412
M&I	NN	95,015	1.13	3,458
Difference		***0.00%***	***-1.36%***	***-1.36%***

Table 14-7 MacLellan ID^3 vs. NN – All Inferred Model Blocks

Category	Model	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
Inferred	ID^3	71,388	0.79	1,806
Inferred	NN	71,388	0.79	1,824
Difference		***0.00%***	***-1.03%***	***-1.03%***

14.1.12.4 *Swath Plots (Drift Analysis)*

A swath plot is a graphical display of the grade distribution derived from a series of bands, or swaths, generated in several directions through the deposit. Grade variations from the ID^3 model are then compared (using the swath plot) to the distribution derived from the NN grade model.

On a local scale, the NN model does not provide reliable estimations of grade, but on a larger scale, it represents an unbiased estimation of the grade distribution based on the underlying data. Therefore, if the ID^3 model is unbiased, the grade trends may show local fluctuations on a swath plot, but the overall trend should be like the NN distribution of grade.

Swath plots have been generated in three orthogonal directions for the distribution of gold in the model area. Swath plots for gold along the east-west, north-south and vertical directions are shown in Figure 14-10, Figure 14-11, and Figure 14-12.

There is good correspondence between all models in all orthogonal directions. The degree of smoothing in the ID^3 model is evident in the peaks and valleys shown in the swath plots, however, this comparison shows close agreement between the ID^3 and NN models in terms of overall grade distribution as a function of X, Y and Z location.

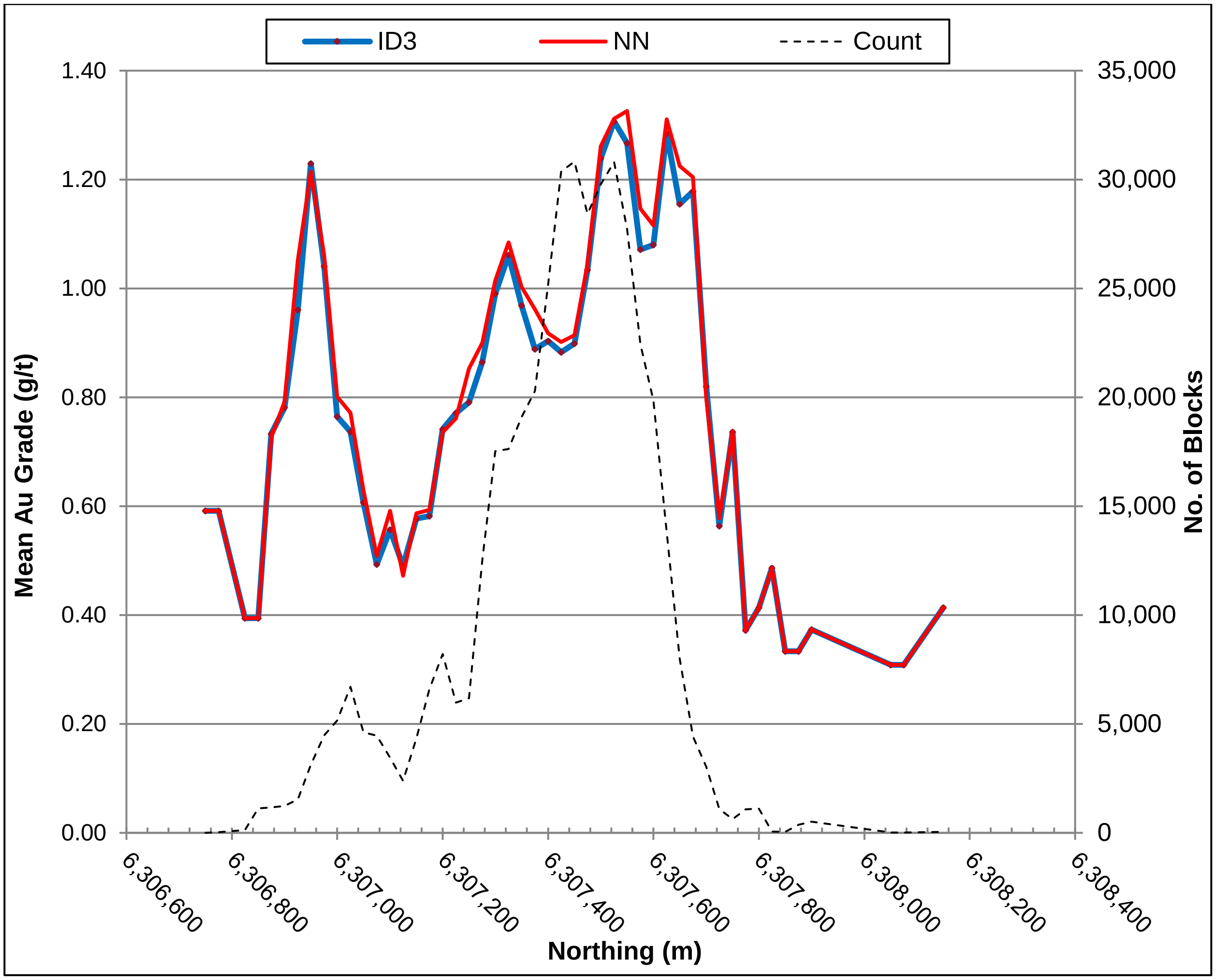


Figure 14-10 MacLellan E-W Swath Plot, Comparing ID³ and NN Model Gold Grades

Source: Alamos (2023)

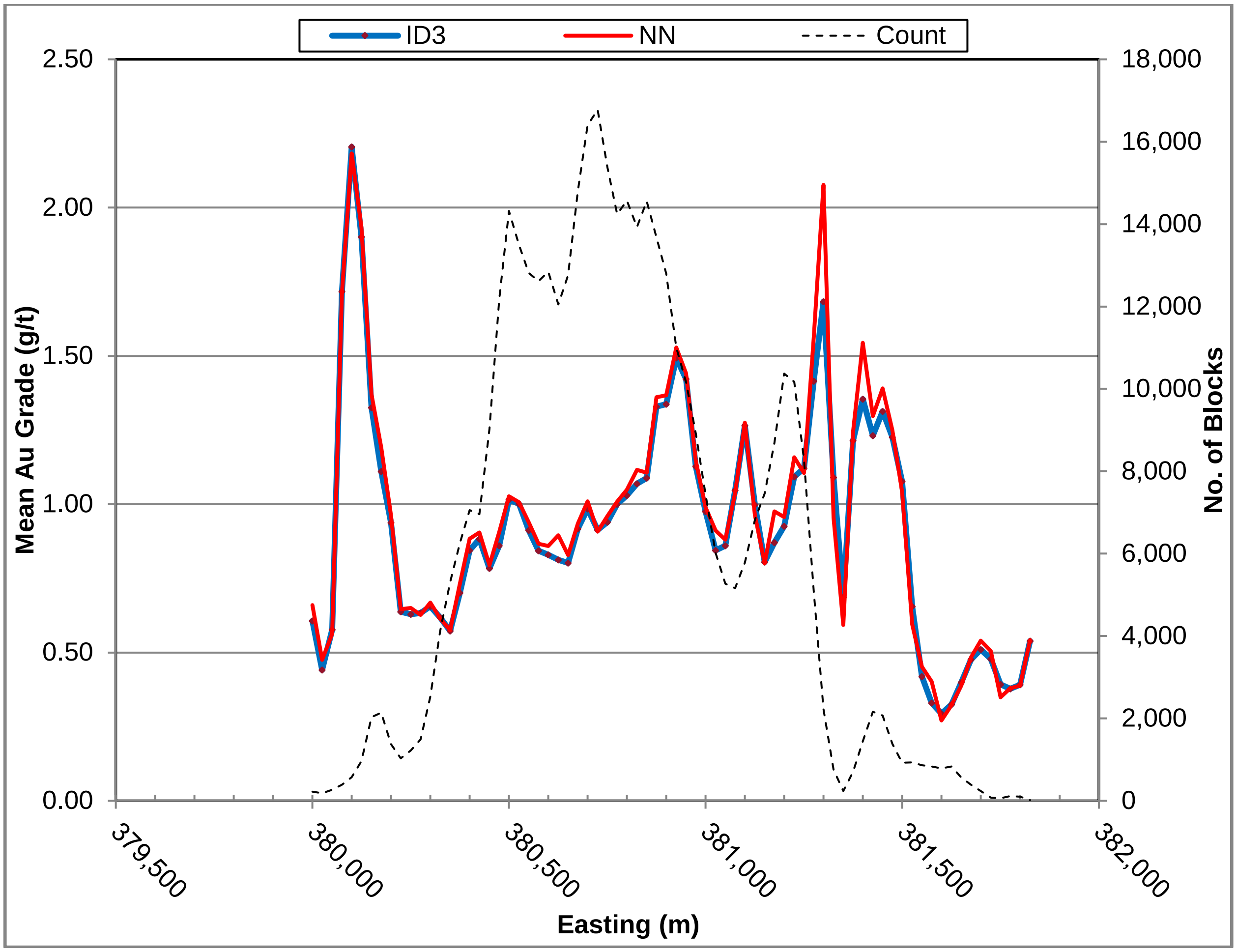


Figure 14-11 MacLellan N-S Swath Plot, Comparing ID^3 and NN Model Gold Grades

Source: Alamos (2023)

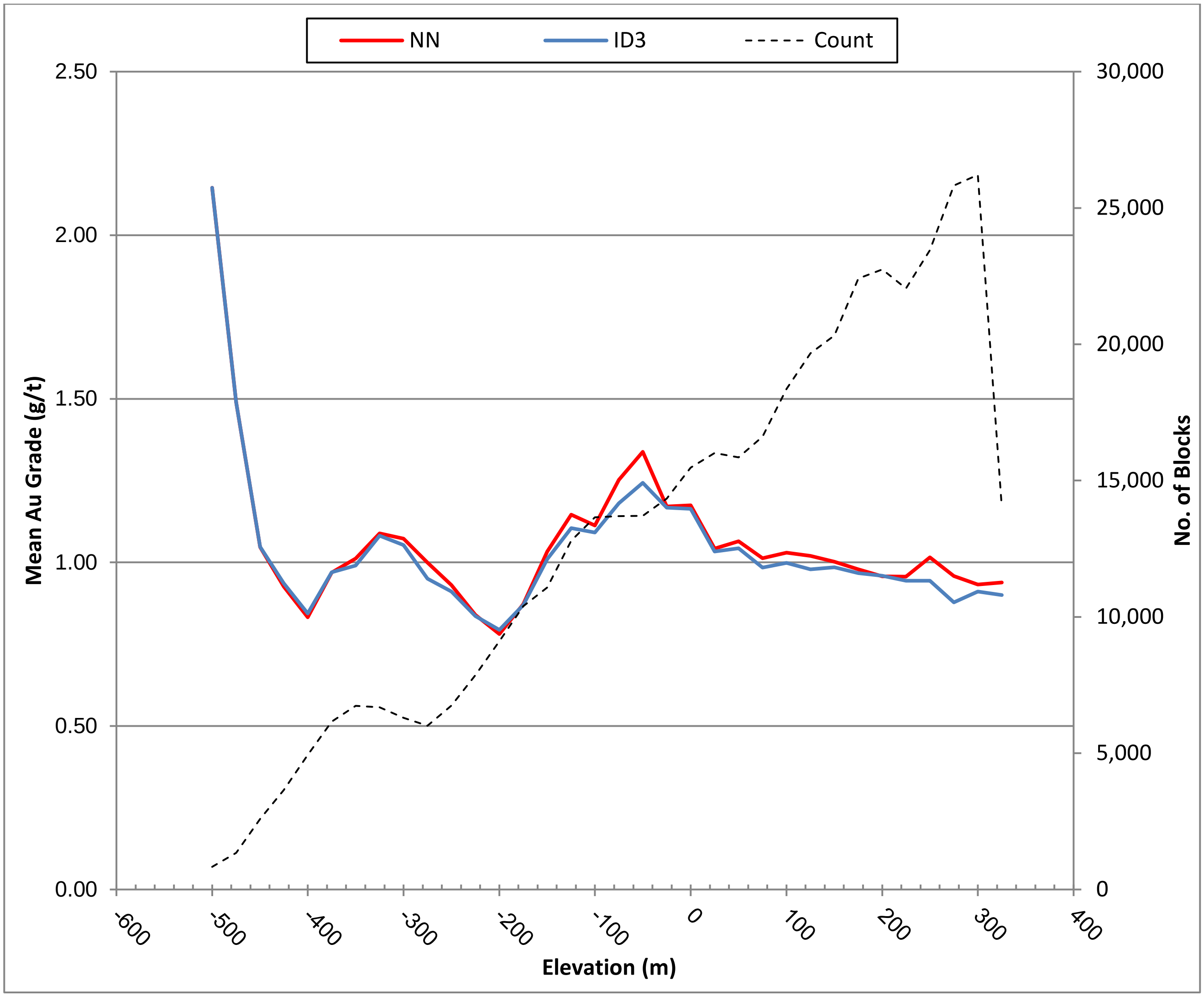


Figure 14-12 MacLellan Vertical Swath Plot, Comparing ID^3 and NN Model Gold Grade

Source: Alamos (2023)

14.1.13 Mineral Resource Sensitivity

To assess the sensitivity of the Mineral Resource to changes in gold cut-off grade, Alamos has summarized diluted tonnage and grade above cut-off for all estimated blocks, at a series of increasing gold cut-offs by Mineral Resource category. The cut-off grade sensitivity analysis for all Measured and Indicated blocks (depleted for past mining and inclusive of Mineral Reserves) within the MacLellan deposit are provided in Table 14-8. The cut-off grade sensitivity analysis for Inferred blocks within the MacLellan deposit are provided in Table 14-9. It can be observed that the Mineral Resource, on a contained ounce basis, is reasonably insensitive to cut-off grades in the increment between 0.30 g/t and 0.40 g/t Au, which is likely the grade range of the ultimate open pit cut-off grade. Note that these summaries are constrained by the $1,600 Mineral Resource pit.

Table 14-8 MacLellan Cut-off Gold Grade Sensitivity – All Measured and Indicated Blocks

Au Cut-off Grade (g/t)	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
>=0.20	49,055	1.24	1,962
>=0.30	43,984	1.36	1,921
>=0.40	38,381	1.51	1,858
>=0.50	33,809	1.65	1,792
>=0.60	30,055	1.79	1,726
>=0.70	26,793	1.92	1,658
>=0.80	23,985	2.06	1,590

Notes:

- *Contained within the $1,600 Mineral Resource Pit*
- *Inclusive of Mineral Reserves*

Table 14-9 MacLellan Cut-off Gold Grade Sensitivity – All Inferred Blocks

Au Cut-off Grade (g/t)	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
>=0.20	6,450	0.74	152
>=0.30	5,064	0.87	141
>=0.40	3,829	1.04	128
>=0.50	3,184	1.16	119
>=0.60	2,538	1.31	107
>=0.70	2,148	1.43	99
>=0.80	1,810	1.56	91

Notes:

- *Contained within the $1,600 Mineral Resource Pit*

14.1.14 Mineral Resource Classification

The Mineral Resources for the MacLellan deposit are classified under the categories of Measured, Indicated and Inferred according to the guidelines as defined by the "CIM Guidelines for Mineral Resources & Mineral Reserves Best Practice Guidelines", prepared by the CIM Standing Committee on Reserve Definitions and adopted by CIM Council on November 29, 2019.

Classification of the Mineral Resources reflects the relative confidence of the grade estimates. This is based on several factors including; sample spacing relative to geological and geostatistical observations regarding the continuity of mineralization, mining history, specific gravity determinations, accuracy of drill collar locations, quality of the assay data and other factors which can influence the confidence of the mineral estimation.

The classification parameters are defined in relation to the number of drill holes used to estimate the block grades and the block-composite separation distance. These classification criteria are intended to encompass zones of reasonably continuous mineralization.

The following classification parameters were applied to the MacLellan block model:

14.1.14.1 *Measured Mineral Resources*

Blocks in the model that are within the 0.30 g/t Au solid that were informed by a minimum of three drill holes on the first estimation search pass. (20 m x 20 m x 5 m)

14.1.14.2 *Indicated Mineral Resources*

Blocks in the model that are within the 0.30 g/t Au solid that were informed by a minimum of two drill holes on the second estimation search pass (45 m x 45 m x 10 m).

14.1.14.3 *Inferred Mineral Resources*

Blocks in the model that do not meet the criteria for Measured or Indicated Resources and have been informed by a minimum of one drill hole on the third estimation search pass (100 m x 100 m x 20 m).

14.1.15 MacLellan Mineral Resource Statement

The Mineral Resources for the MacLellan deposit have been estimated by Alamos at 3,896 kt grading an average of 1.54 g/t Au classified as Measured and Indicated Mineral Resources; with an additional 4,192 kt grading an average of 0.98 g/t Au classified as Inferred Mineral Resources. The Mineral Resources are stated above a 0.355 g/t Au equivalent cut-off and are contained within a potentially economically mineable open pit. Mineral Resources are exclusive of Mineral Reserves.

The Mineral Resources are reported in accordance with NI 43-101 and have been classified in conformity with generally accepted CIM “Estimation of Mineral Resource and Mineral Reserves Best Practices” guidelines. The Mineral Resource estimate was completed by Mr. Jeffrey Volk, CPG, FAusIMM, Director of Reserves and Resources for Alamos. Mr. Volk is a Qualified Person within the meaning of Canadian Securities Administrator’s National Instrument 43-101 (NI 43-101)

The effective date of this Mineral Resource estimate June 30, 2023, and is based on drilling data finalized in February 2022. The Mineral Resource statement for the MacLellan Property is presented in Table 14-10.

Table 14-10 MacLellan Mineral Resource Statement, June 30, 2023

Category	Tonnes (000's)	Au Grade (g/t)	Ag Grade (g/t)	Au Oz (000's)	Ag Oz (000's)
Measured	786	1.63	3.09	41	78
Indicated	3,200	1.52	3.44	156	354
M&I	***3,986***	***1.54***	***3.37***	***197***	***432***
Inferred	4,192	0.98	1.49	133	201

Notes:

- *The Mineral Resources are reported at an assumed gold price of US$1,600/oz, and an assumed silver price of US$23.00/ounce.*
- *The Mineral Resource estimate was completed by Mr. Jeffrey Volk, CPG, FAusIMM, Director of Reserves and Resources for Alamos Gold Inc.*

- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves.*
- *Open pit Mineral Resources are stated as contained within potentially economically open pit above a 0.355 g/t AuEq cut-off and includes external dilution at zero grade outside the 0.30 g/t Au solid.*
- *Totals may not add due to rounding.*
- *Contained Au and Ag ounces are in-situ and do not include metallurgical recovery losses.*
- *Mineral Resources are exclusive of Mineral Reserves.*

14.2 Gordon

14.2.1 Drill Hole Database

Alamos conducted a Mineral Resource estimate of the Gordon deposit, which incorporates all drilling data from the Alamos and predecessor drilling programs conducted through April 9, 2022. A database was compiled using data from 625 drill holes, with collar, survey, geological and assay information, containing a total of 65,840 m of assayed gold intervals. Historic drilling conducted by previous operators was included where data could be verified.

14.2.2 Topography

Existing topography is based on a 2014 LiDAR survey conducted by LSI and was used to code the Mineral Resource model. Alamos has reviewed the topography surface in cross-sections comparing elevation between the drill hole collars and the topography surface and found close agreement between the two.

14.2.3 Coordinate System

All data is in NAD 83 Zone 14 geodetic Datum. The local mine coordinate system utilized several translated and rotated versions of the above coordinate system during historic mining operations. Several pre-2015 drill hole collars (28) were located by Barnes and Duncan in a December 2014 survey and were found to be accurately located in the digital drill hole collar database. In addition, 5 historic (654 series) holes were located and georeferenced to NAD83 as detailed in a previous section of this report.

14.2.4 Lithology and Grade Modelling

A 0.50 g/t Au grade solid was constructed for the dominantly shallow-dipping mineralization using Leapfrog modeling software and manually edited to eliminate small volume solids and outlier tonnages. A northwest-southeast cross-section showing the resultant solid is provided in Figure 14-13.

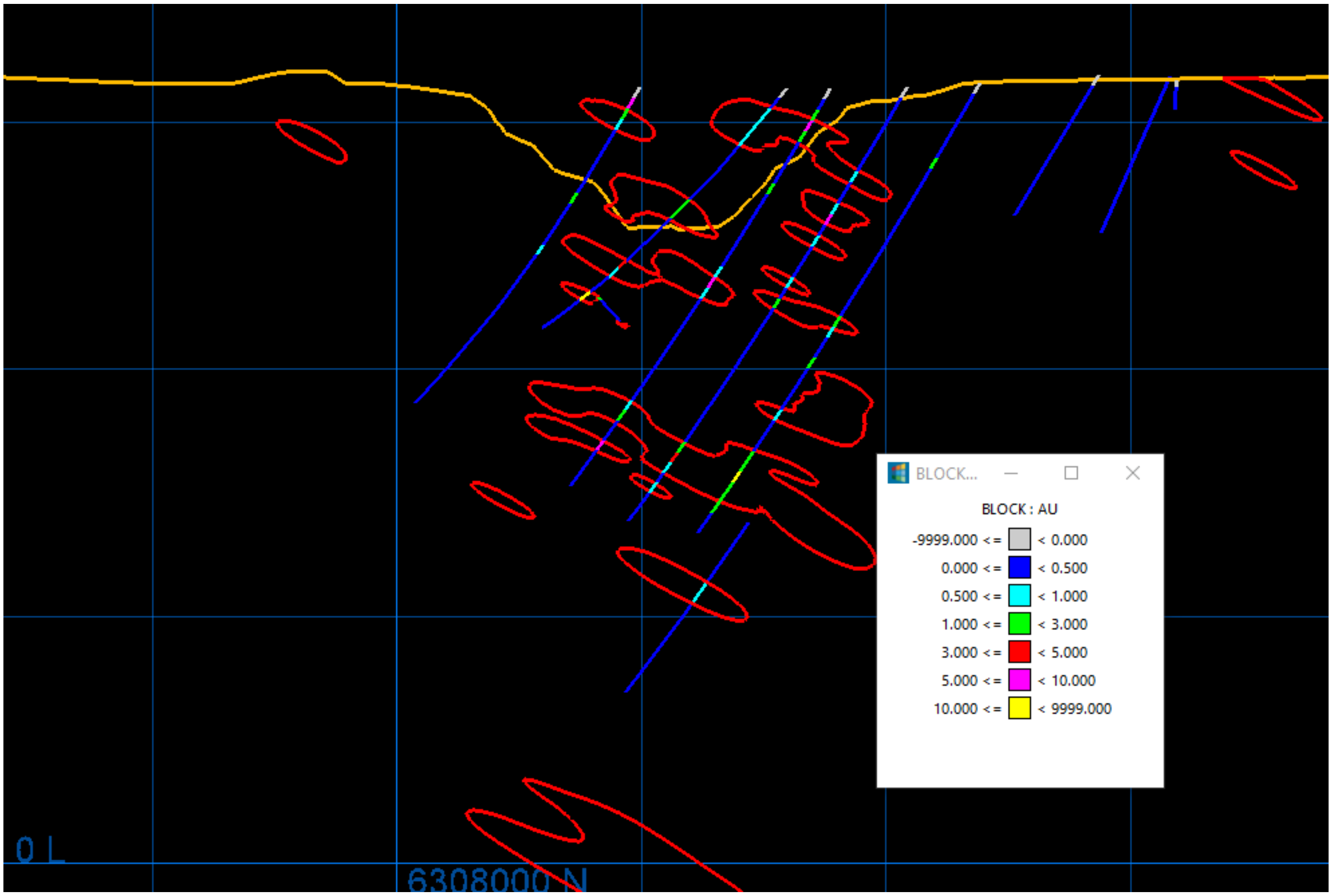


Figure 14-13 Gordon NW-SE Cross-Section Viewed to the North

Notes:

- *Shallow-dipping 0.50 g/t Au solid (magenta)*
- *Historic mining (brown)*

Source: Alamos (2023)

A generalized lithologic model was manually constructed in cross-section based on a detailed geologic/structural relogging program conducted after the 2017 Feasibility Study. A total of six generalized lithologies were modeled: Magnetite Facies Iron Formation (MIF);

- Silicate Facies Iron Formation (SIF);
- Dacite (DAC);
- Diorite (DIO);
- Mafic Metavolcanics (MMF); and
- Argillite (ARG).

SG assignments based on these modeled lithologies are described in a subsequent section of this report.

14.2.5 Exploratory Data Analysis

EDA was conducted using the raw gold assays from the Gordon Property. These data were analyzed above both global and incremental cut-offs to assess the distribution and grade ranges of the assays internal and external to the 0.50 g/t Au solids. Basic statistics for the raw gold assays are provided in Table 14-11. It can be observed that on a grade-thickness basis, a minor amount of metal above potentially economic cut-off resides external to the 0.50 g/t solid. Most of the intervals external to the grade solid are not of minable width; however, this demonstrates that gold occurs external to the main lode system. Statistically, the 0.50 g/t Au solids envelops ~85% of all the raw assay data in the model area above a 0.50 g/t Au cut-off.

Table 14-11 Summary Statistics – Raw Gold Grades by Domain

Domain	Au Cutoff (g/t)	Statistics above Cut-off						
		Total Meters	Incremental Pct	Max Grade (Au g/t)	Mean Grade (Au g/t)	Grade Thickness (g/t*m)	Standard Deviation	Coeff. of Variation
All Data	0.01	65,840	85.91%	1,105.00	0.73	48,011	5.14	7.05
	0.50	9,278	4.27%		4.87	45,181	12.94	2.66
	1.00	6,465	4.61%		6.68	43,173	15.15	2.27
	3.00	3,429	5.21%		11.05	37,882	19.80	1.79
Internal to 0.5 g/t Au Solid	0.01	20,637	59.94%	1,105.00	2.19	45,161	8.98	4.11
	0.50	8,266	10.81%		5.29	43,696	13.62	2.58
	1.00	6,036	12.97%		6.97	42,094	15.60	2.24
	3.00	3,359	16.27%		11.12	37,363	19.96	1.79
External to 0.5 g/t Au Solid	0.01	45,203	97.76%	57.26	0.06	2,850	0.46	7.27
	0.50	1,012	1.29%		1.47	1,485	2.68	1.83
	1.00	429	0.79%		2.51	1,079	3.88	1.54
	3.00	70	0.16%		7.38	519	7.89	1.07

14.2.6 Specific Gravity Analysis

Company geology personnel conducted 680 specific gravity tests using the water immersion method, on diamond drill core from the property during the 2015 drilling program, as well as analyses conducted by TSL during the 2007-2012 Carlisle drilling campaigns. A summary of specific gravity (SG) determinations by rock type is provided in Table 14-12.

A default SG value of 2.90 was assigned to modeled lithologies that did not receive any SG determinations.

Table 14-12 SG Results for Gordon Samples

Type	Number	Length (m)	Min. SG	Max. SG	Avg. SG
MIF	301	54.97	2.08	3.68	3.12
SIF	38	7.36	2.71	3.64	3.04
DAC	106	23.52	2.65	3.81	2.82
DIO	291	60.12	2.17	3.65	2.83
MMS	12	3.18	2.76	3.38	2.95
ARG	46	8.38	2.71	2.96	2.78
unflagged	183	24.03	1.07	3.57	2.92
All	977	181.56	1.07	3.81	2.94

14.2.7 Evaluation of Outlier Data

The raw drill hole gold assay dataset was inspected globally using log cumulative probability plots to assess for the presence of high-grade outlier values that could adversely impact grade estimation. For this analysis, the datasets both external and internal to the 0.50 g/t Au grade solid were combined, as they are one contiguous deposit. After review of log probability plots, all raw gold assays were capped at 40.0 g/t Au prior to compositing (Figure 14-14). This assay cap (top cut) affects 66 meters of sample, and results in a reduction of 7.16% of gold metal on a grade-thickness (GT) basis. The capped data shows a reduction in the CV to 4.00 as compared to 7.05 for the data.

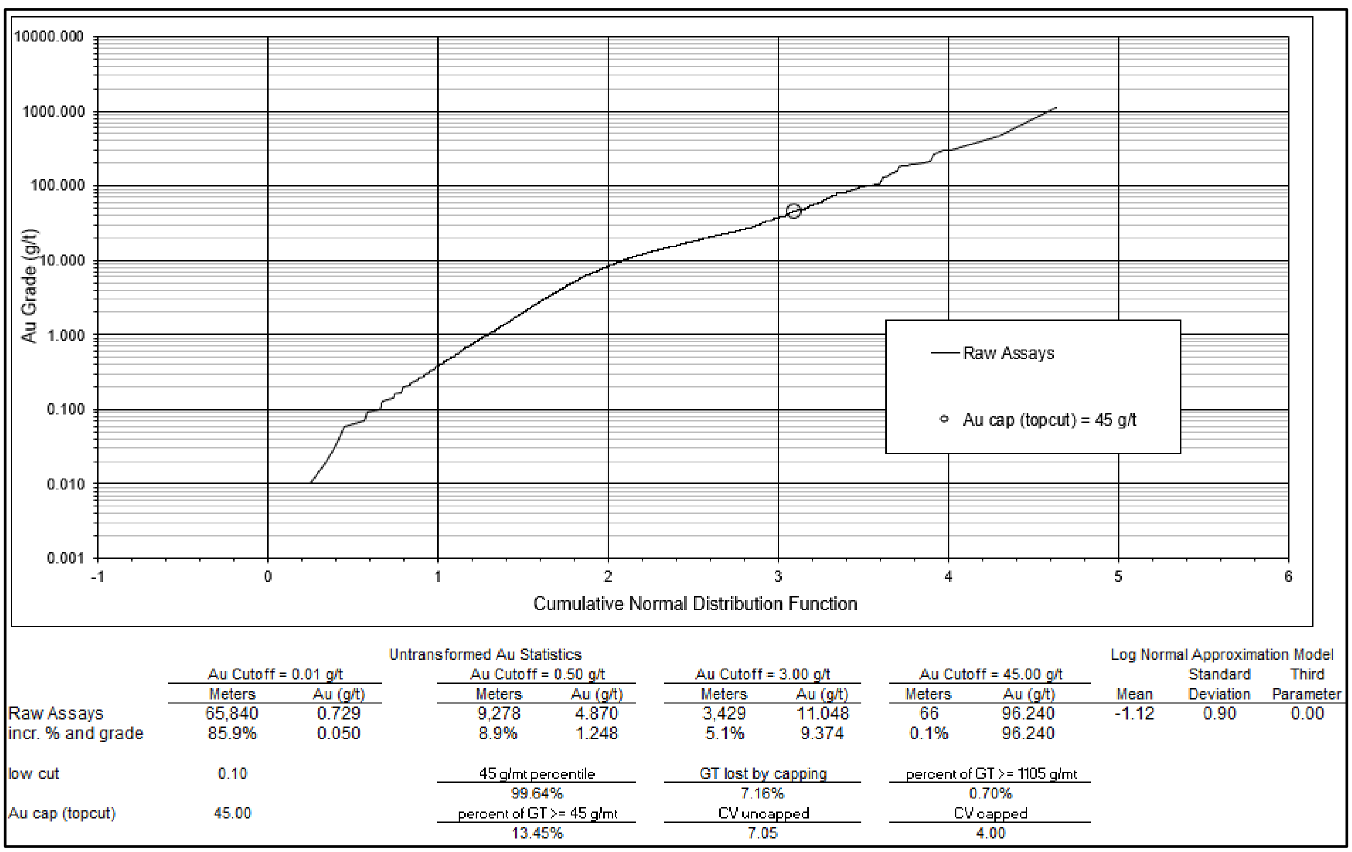


Figure 14-14 Gordon Cumulative Probability Plot: Raw Gold Assays

Source: Alamos (2023)

14.2.8 Compositing

All capped raw data were composited into 5 m downhole intervals. Composites were back-flagged by the model blocks to assign percentage of composite internal to the 0.3/0.5 g/t Au wireframes. Only composites with a wireframe percentage ≥10% were retrieved for use in grade estimation. All composites were length weighted during the grade estimation process.

14.2.9 Variogram Analysis

Directional correlograms were constructed for gold grades in Sage2001© software using the 5 m capped composite data for the shallow dipping domain. The resulting variograms exhibited moderately high nuggets and moderate ranges overall. The resultant fitted variograms for the major, semi-major and minor axes are provided in Figure 14-15, Figure 14-16 and Figure 14-17, respectively. A summary of variogram parameters is provided in Table 14-13. No interpretable variograms could be derived for the steeply dipping domain due to a paucity of data. The search orientations were based on the dominant strike and dip of interpreted mineralization.

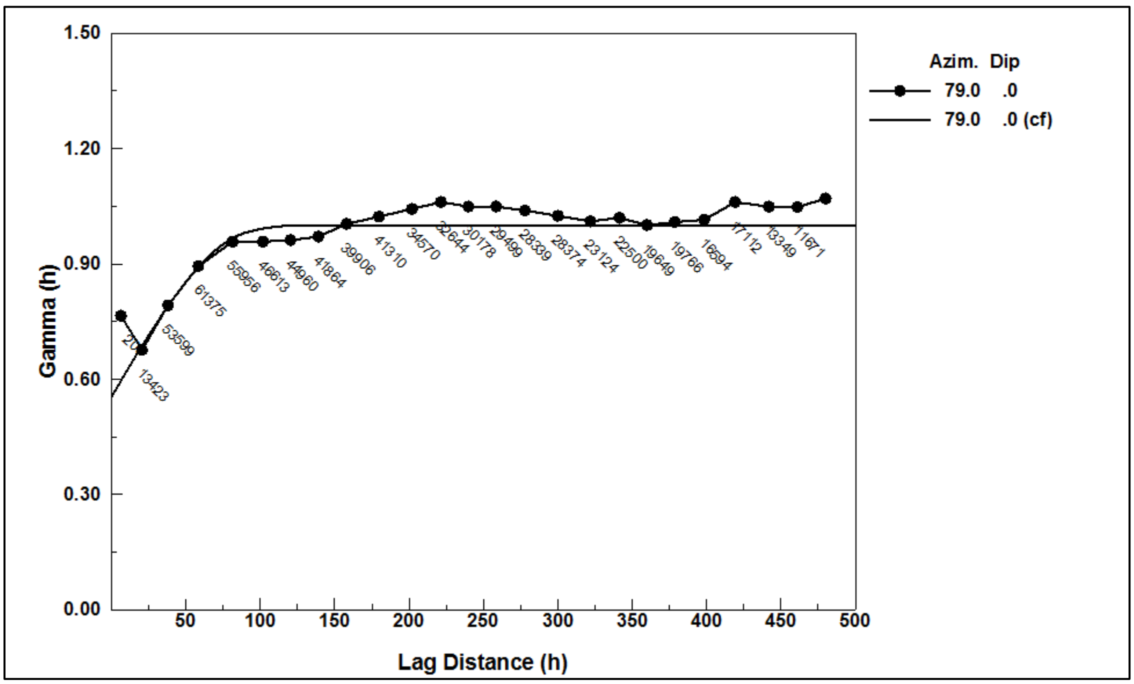


Figure 14-15 Gordon Correlogram and Model – 5 m Composites: Principal Axis

Source: Alamos (2023)

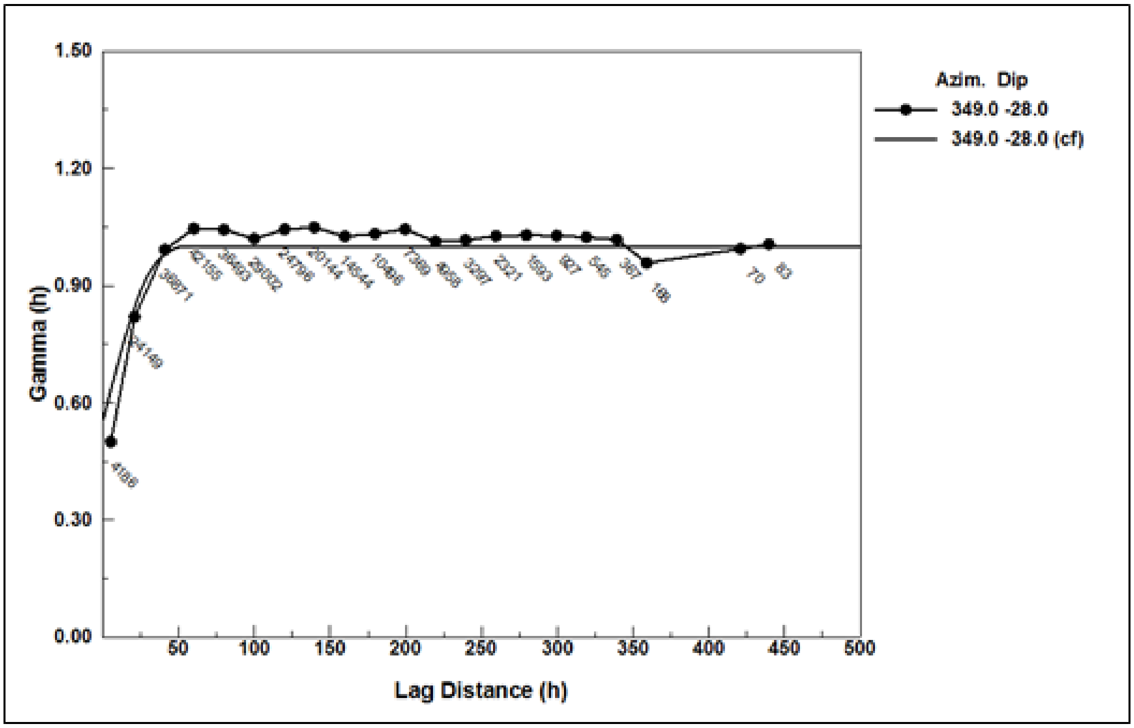


Figure 14-16 Gordon Correlogram and Model – 5 m Composites: Semi-Major Axis

Source: Alamos (2023)

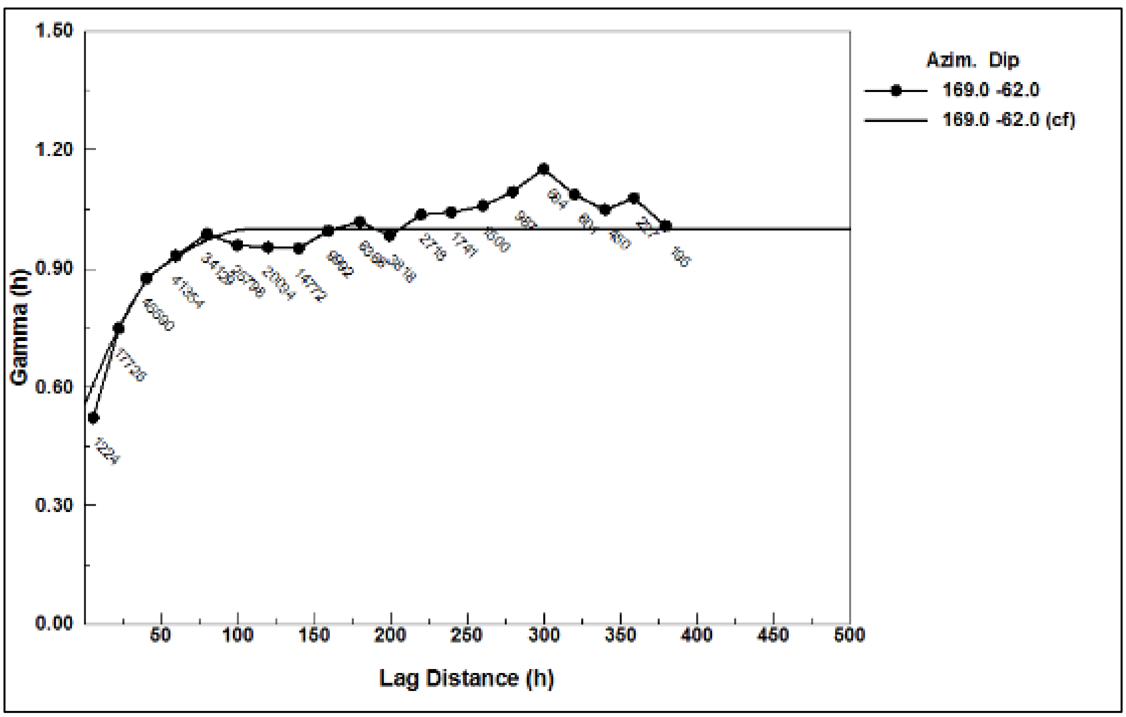


Figure 14-17 Gordon Correlogram and Model – 5 m Composites: Minor Axis

Source: Alamos (2023)

Table 14-13 Correlogram Model Parameters for Au: 5 m Composites

Gordon: Variogram Results (Spherical Model)			
Parameters (First Structure)	**Principal**	**Minor**	**Semi-Major**
First Structure			
Azimuth (deg)	346	199	90
Dip (deg)	38	47	17
Parameters (Second Structure)	**Principal**	**Minor**	**Semi-Major**
Azimuth (deg)	90	1	328
Dip (deg)	6	-10	78
Nugget Effect C0	0.555		
1st Structure C1	0.258		
2nd Structure C2	0.187		
1st Range A1 (m)	209	46	118
2nd Range A2 (m)	170	36	53

14.2.10 Block Model Construction

A block model was constructed in Vulcan™ for the Gordon deposit using the model limits and extents provided in Table 14-14.

Block model construction utilized a constant block size of 5.0 m x 5.0 m x 5.0 m.

Table 14-14 Gordon Model Limits and Extents

Mine Grid Origin[1]	Min. (m)	Max. (m)	Block Size (X)	Block Size (Y)	Block Size (Z)	No. of Blocks
East	411,904	413,204	5.0	5.0	5.0	204
North	6,307,344	6,308,179	5.0	5.0	5.0	167
Elevation	-174	426	5.0	5.0	5.0	120

Notes:
1. *All blocks are rotated 79.4° about model origin.*

14.2.11 Block Model Grade Estimation

The Mineral Resource estimate was undertaken using Maptek Vulcan™ software employing the inverse ID^3 and NN method for use in model validation. Model blocks were assigned a percentage of the block internal to the 0.50 g/t Au wireframes and only blocks whose volumes were ≥10% internal to the wireframe were available for grade estimation. A summary of the search parameters utilized is presented in Table 14-15. Model blocks grades were diluted to account for all volume external to the 0.50 g/t Au wireframe at a zero grade. Additional estimates were performed for NP and AP to assist in the overall ABA studies related to mine planning. The methodology used for these latter estimates are described in more detail in subsequent sections of this report.

Table 14-15 Search Parameters for the Gold Domains in the Gordon Model

Pass Number	Search Orientation[1] (degrees)			Search Distance (m)			Min Comps	Max Comps	Max per DDH
	Bearing (Z)	Plunge (Y)	Dip (X)	Major Axis	Semi-Major Axis	Minor Axis			
1	79.4	0	-28	20	20	5	3	8	1
2	79.4	0	-28	45	45	10	2	8	1
3	79.4	0	-28	100	100	20	1	8	1

Notes:
1. *Vulcan rotations.*

14.2.12 Block Model Validation

Various measures have been utilized to validate the resultant Mineral Resource block model. These measures include the following:

- Visual comparison of drillhole composites with Mineral Resource block grade estimates by zone, both in plan and section;
- Statistical comparisons between block and composite data using histogram and cumulative frequency distribution analysis;
- Generation of a comparative NN model; and
- Swath plot analysis (drift analysis) comparing the ID^3 model with the NN model.

14.2.12.1 *Visual Inspection*

Visual comparisons between the block grades and the underlying composite grades in plan and section show close agreement, which would be expected considering the estimation methodology employed.

A representative north-northwest – south-southeast cross-section and level plans displaying block and composite gold grade, mineralized Au grade solids outlines, US$1,600 Mineral Resource pit are provided in Figure 14-18, and Figure 14-19 respectively.

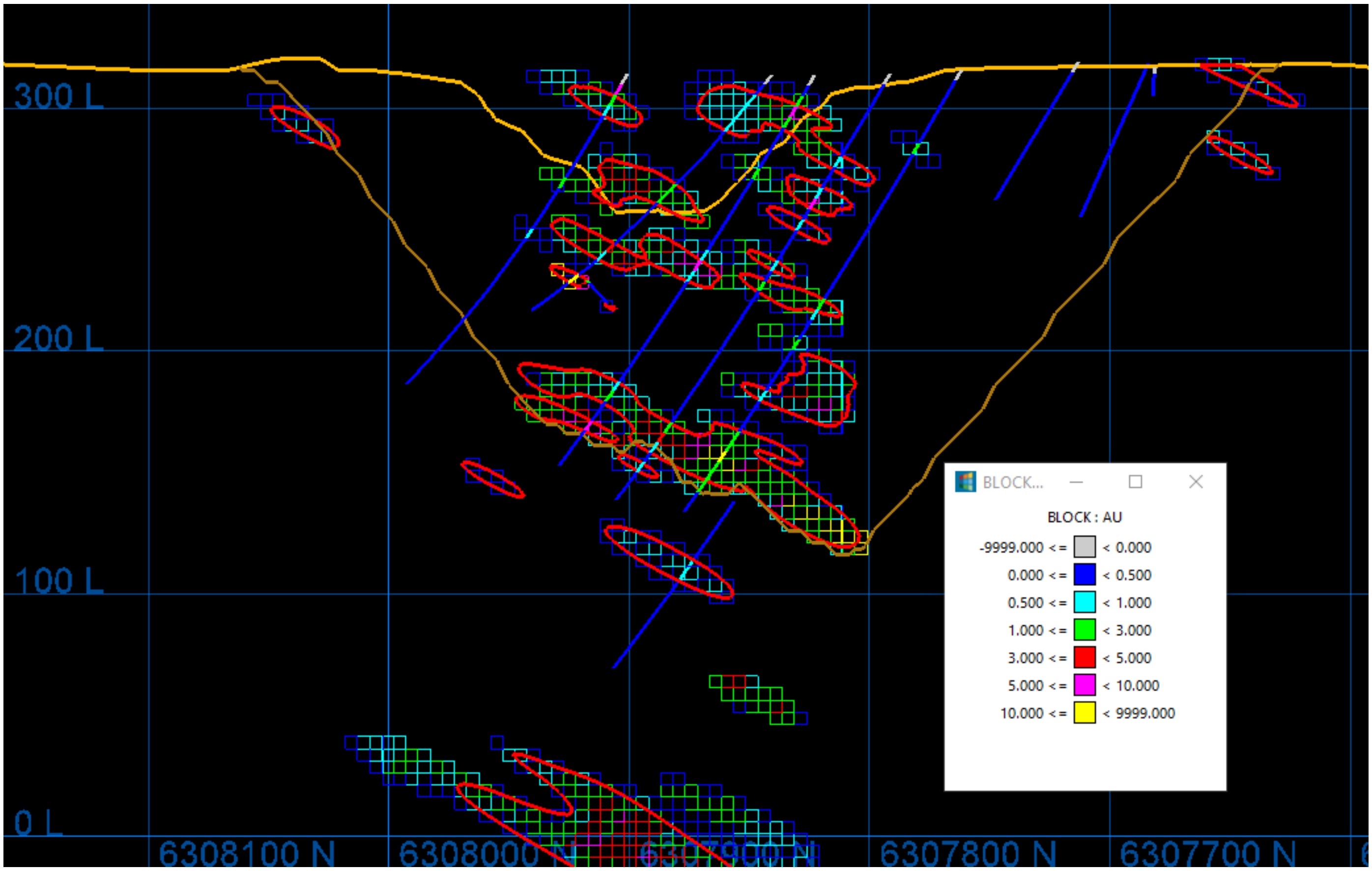


Figure 14-18 Example N-NW – S-SE Cross-Section Viewed to East Showing Model Block Grades

Notes:

- 0.50 g/t Au wireframe (magenta)
- $1,600 Mineral Resource pit (brown)

Source: Alamos (2023)

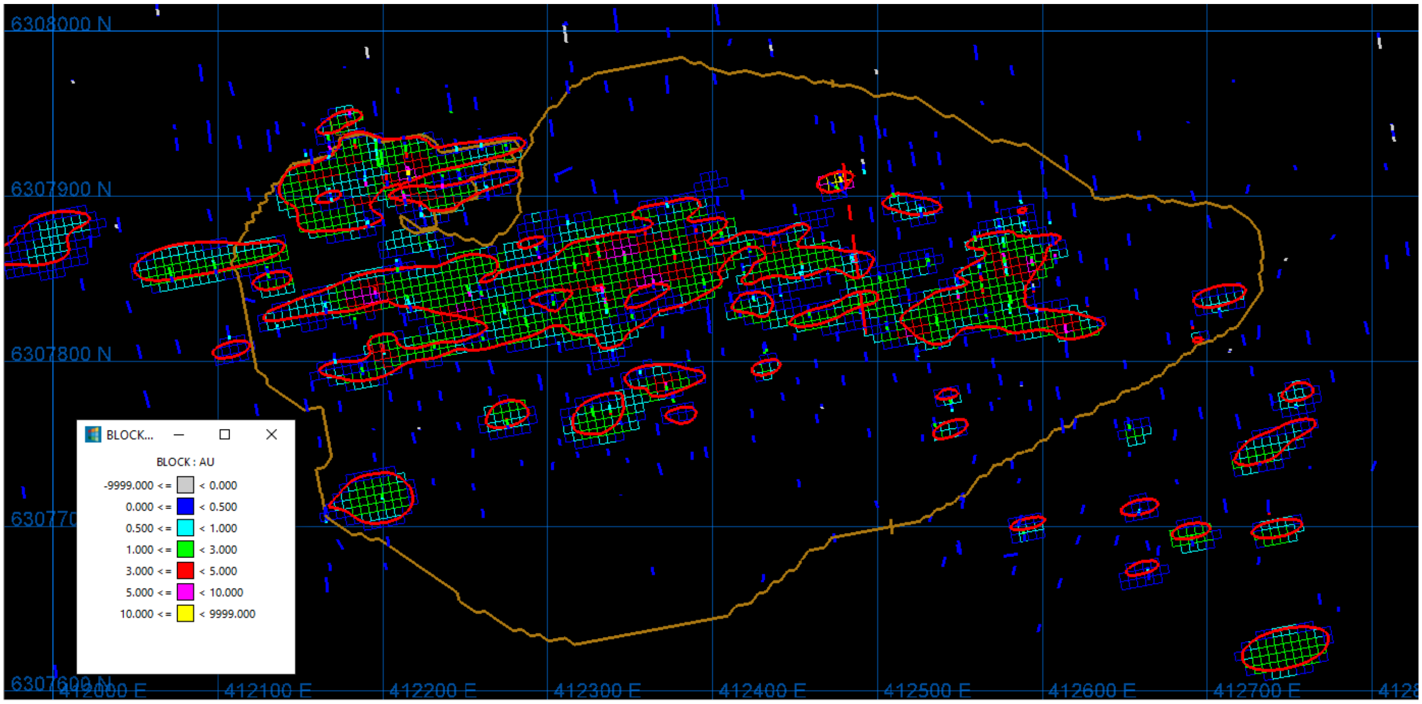


Figure 14-19 Example Level Plan (230 m) Showing Model Block Grades

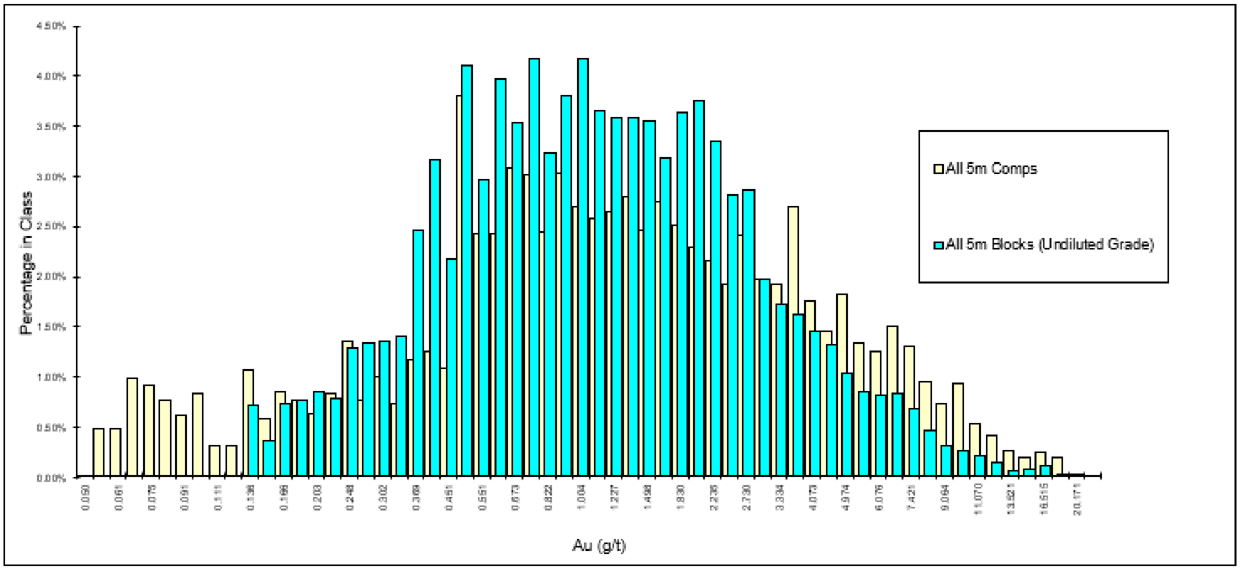
Showing:

- *0.50 g/t Au wireframe (magenta)*
- *$1,600 Mineral Resource Pit (brown)*

Source: Alamos (2023)

14.2.12.2 *Block-Composite Histogram Comparison*

Alamos also conducted statistical comparisons between the grades of the Measured, Indicated, and Inferred ID^3 blocks contained within the mineralized Au solid and the underlying 5 m gold composite grades. A histogram comparison between block and composite gold grades at the Gordon Property is provided in Figure 14-20.



Untransformed Au Statistics

	Au Cutoff = 0.100 g/t		Au Cutoff = 0.500 g/t		Au Cutoff = 1.00 g/t		Au Cutoff = 5.00 g/t	
	meters/tonnes	Au (g/t)	meters/tonnes	Au (g/t)	meters/tonnes	Au (g/t)	meters/tonnes	Au (g/t)
All 5m Comps	17,419	2.490	14,378	2.961	10,213	3.877	2,461	8.728
incr. % and grade	17.5%	0.261	23.9%	0.714	44.5%	2.338	14.1%	8.728
All 5m Blocks (Undiluted Grade)	18,680,568	1.758	15,067,038	2.103	10,157,352	2.773	1,141,332	7.839
incr. % and grade	19.3%	0.319	26.3%	0.717	48.3%	2.132	6.1%	7.839

Figure 14-20 Histogram Comparison between Block and Composite Grades: Gold

Source: Alamos (2023)

Overall, this comparison shows that the model grade distribution for gold is appropriately smoothed when compared with the underlying composite distribution, and that the comparison of average grades and percentages above geologic absolute and incremental cut-offs show reasonably close agreement.

14.2.12.3 *Comparison of Interpolation Methods*

For comparative purposes, additional grades were estimated using NN interpolation methods. The results of the NN model are compared to the ID^3 model at a 0 g/t Au cut-off grade for the Measured and Indicated blocks in Table 14-16, and for all Inferred blocks in Table 14-17. These comparisons confirm the conservation of metal at a zero cut-off and shows close agreement on both a tonnage and grade basis within the deposit area.

Table 14-16 Gordon ID^3 vs. NN Tonnage – All Measured and Indicated Model Blocks

Model	Tonnes (000's)	Au Grade (g/t)	Au Oz (0000's)
ID^3	26,144	2.03	1,707
NN	26,144	2.05	1,725
Difference	***0.00%***	***-1.02%***	***-1.02%***

Table 14-17 Gordon ID^3 vs. NN – All Inferred Model Blocks

Model	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
ID^3	7,404	1.25	297
NN	7,404	1.12	268
Difference	***0.00%***	***9.82%***	***9.82%***

14.2.12.4 *Swath Plots (Drift Analysis)*

A swath plot is a graphical display of the grade distribution derived from a series of bands, or swaths, generated in several directions through the deposit. Grade variations from the ID3 model are then compared (using the swath plot) to the distribution derived from the NN grade model.

On a local scale, the NN model does not provide reliable estimations of grade, but on a larger scale, it represents an unbiased estimation of the grade distribution based on the underlying data. Therefore, if the ID3 model is unbiased, the grade trends may show local fluctuations on a swath plot, but the overall trend should be like the NN distribution of grade.

Swath plots have been generated in three orthogonal directions for the distribution of gold in the model area. Swath plots for gold along the east-west, north-south and vertical directions are shown in Figure 14-21, Figure 14-22, and Figure 14-23.

There is good correspondence between all models in all orthogonal directions. The degree of smoothing in the ID3 model is evident in the peaks and valleys shown in the swath plots, however, this comparison shows close agreement between the ID^3 and NN models in terms of overall grade distribution as a function of X, Y and Z location.

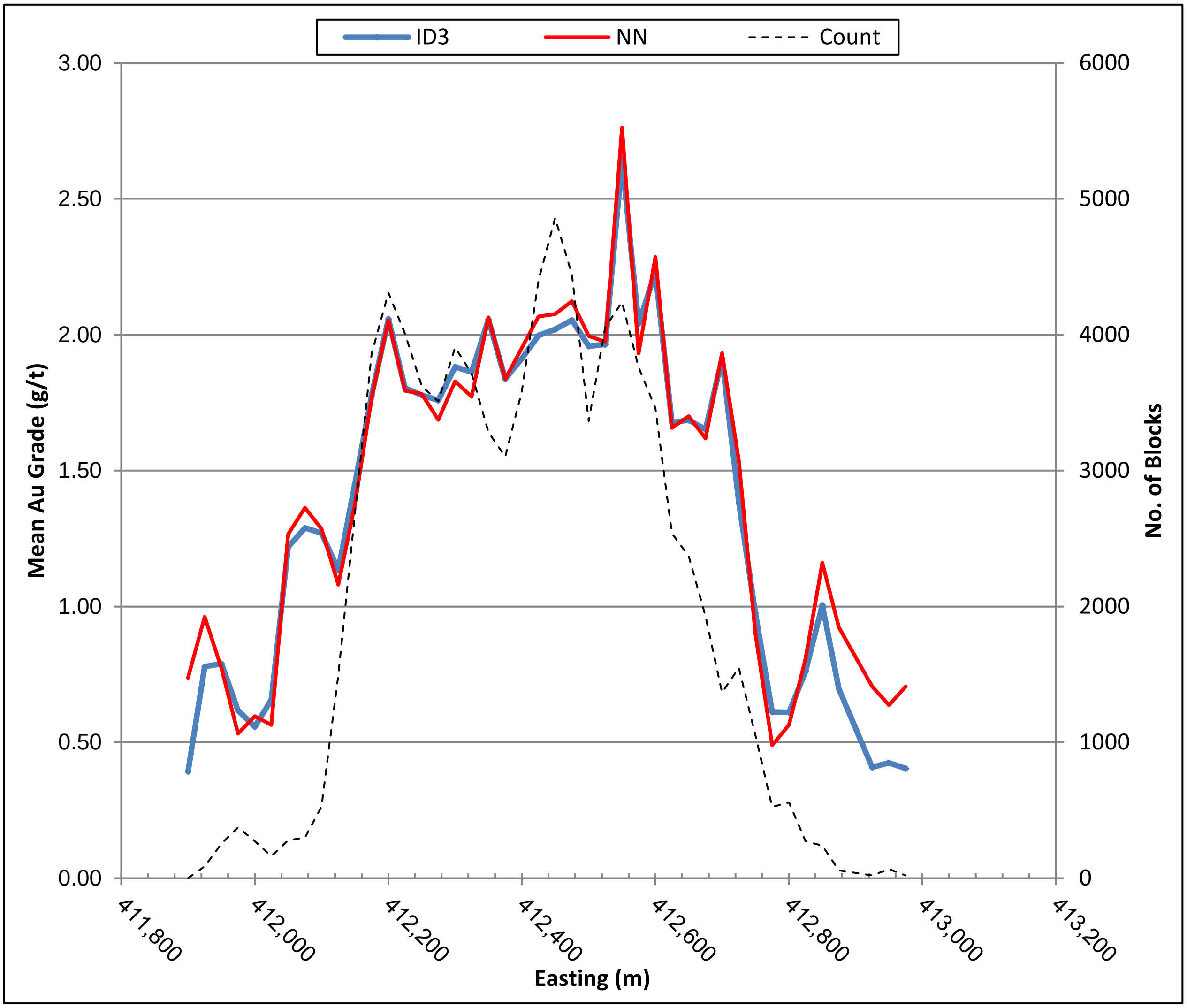


Figure 14-21 Gordon E-W Swath Plot, Comparing ID^3 and NN Model Gold Grades

Source: Alamos (2023)

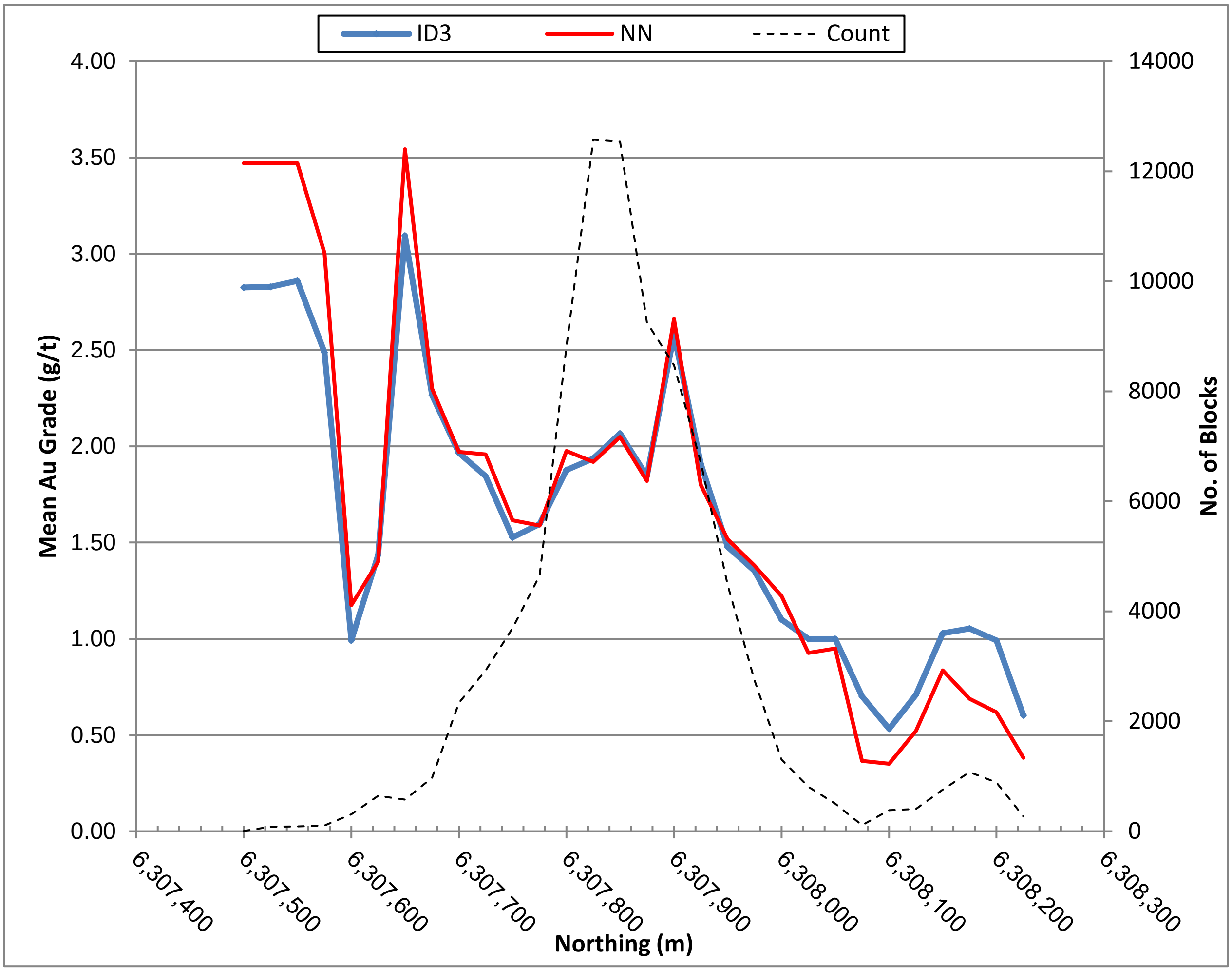


Figure 14-22 Gordon N-S Swath Plot, Comparing ID³ and NN Model Gold Grades

Source: Alamos (2023)

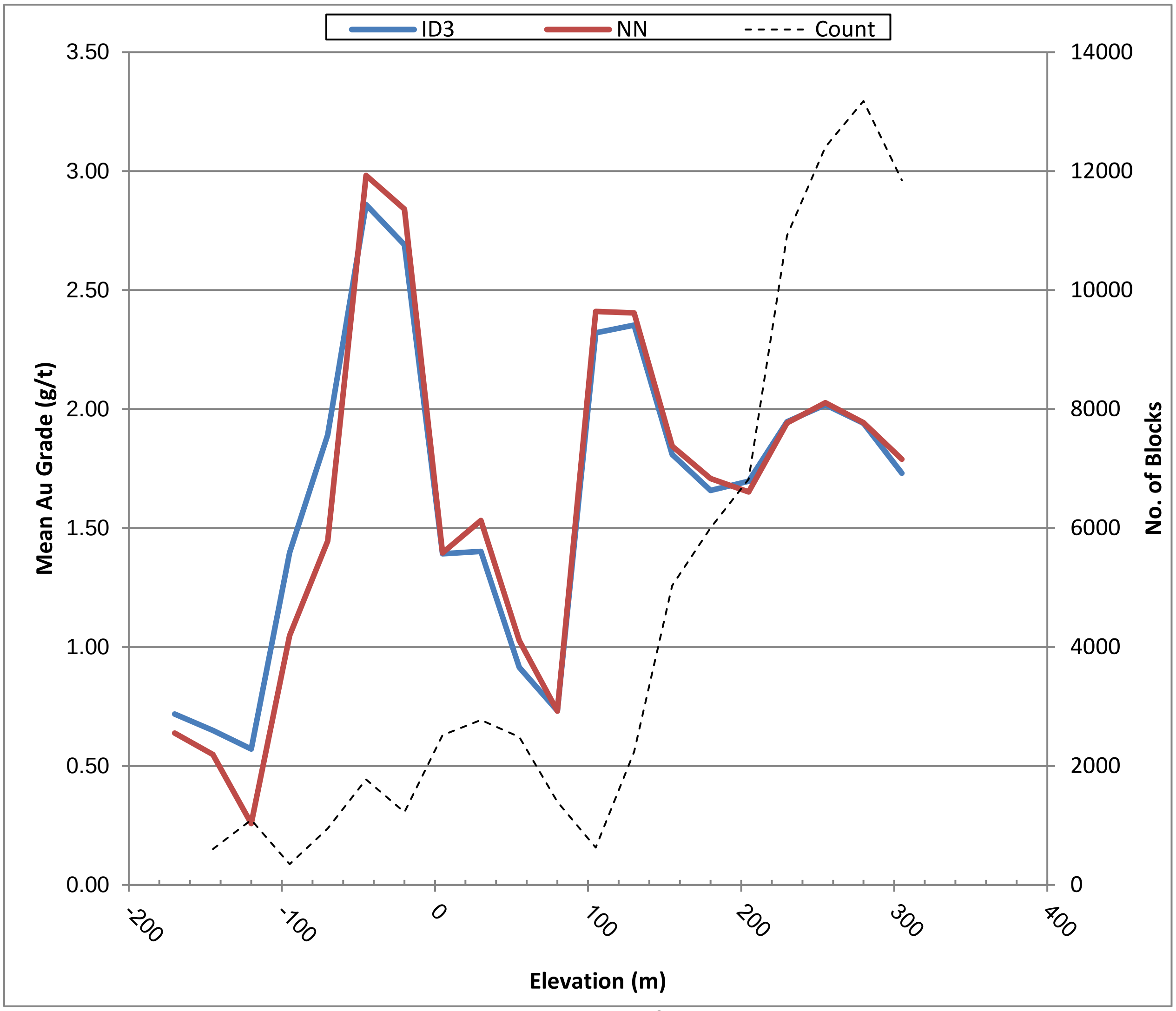


Figure 14-23 Gordon Vertical Swath Plot, Comparing ID^3 and NN Model Gold Grade

Source: Alamos (2023)

14.2.13 Mineral Resource Sensitivity

To assess the sensitivity of the Mineral Resource to changes in gold cut-off grade, Alamos has summarized tonnage and grade above cut-off for the fully diluted blocks, at a series of increasing gold cut-offs by Mineral Resource category. The cut-off grade sensitivity analysis for all Measured and Indicated blocks within the Gordon deposit are provided in Table 14-18. The cut-off grade sensitivity analysis for Inferred blocks within the Gordon deposit are provided in Table 14-19. It can be observed that the Mineral Resource is reasonably insensitive to cut-off grades in the increment between 0.60 g/t and 0.70 g/t Au, which is likely the grade range of the ultimate open pit cut-off grade. Note that these summaries are constrained by the $1,600 Mineral Resource pit.

Table 14-18 Gordon Cut-off Gold Grade Sensitivity – All Measured and Indicated Blocks

Au Cut-off Grade (g/t)	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
>=0.20	12,854	1.90	784
>=0.30	11,996	2.02	777
>=0.40	11,227	2.13	769
>=0.50	10,525	2.24	759
>=0.60	9,804	2.37	746
>=0.70	9,116	2.50	731
>=0.80	8,473	2.63	716

Notes:

- *Contained within the $1,600 Mineral Resource Pit*
- *Inclusive of Mineral Reserves*

Table 14-19 Gordon Cut-off Gold Grade Sensitivity – All Inferred Blocks

Au Cut-off Grade (g/t)	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
>=0.20	227	1.11	8
>=0.30	203	1.21	8
>=0.40	177	1.34	8
>=0.50	156	1.45	7
>=0.60	138	1.57	7
>=0.70	120	1.71	7
>=0.80	103	1.87	6

Note:

- *Contained within the $1,600 Mineral Resource Pit*

14.2.14 Mineral Resource Classification

The Mineral Resources for Gordon are classified under the categories of Measured, Indicated and Inferred according to the guidelines as defined by the CIM “Estimation of Mineral Resources & Mineral Reserves Best Practice Guidelines”, prepared by the CIM Standing Committee on Reserve Definitions, and adopted by CIM Council on November 29, 2019.

Classification of the Mineral Resources reflects the relative confidence of the grade estimates. This is based on several factors including; sample spacing relative to geological and geo-statistical observations regarding the continuity of mineralization, mining history, specific gravity determinations, accuracy of drill collar locations, quality of the assay data and other factors that can influence the confidence of the mineral resource estimate.

The classification parameters are defined in relation to the number of drill holes used to estimate the block grades and the block-composite separation distance. These classification criteria are intended to encompass zones of reasonably continuous mineralization.

The following classification parameters were applied to the Gordon block model:

14.2.14.1 *Measured Mineral Resources*

Blocks in the model which are within the 0.50 g/t Au solid that were informed by a minimum of three drill holes on the first estimation search pass. (20 m x 20 m x 5 m).

14.2.14.2 *Indicated Mineral Resources*

Blocks in the model which are within the 0.50 g/t Au solid that were informed by a minimum of two drill holes on the second estimation search pass (45 m x 45 m x 10 m).

14.2.14.3 *Inferred Mineral Resources*

Blocks in the model that do not meet the criteria for Measured or Indicated Resources and have been informed by a minimum of one drill hole on the third and fourth estimation search passes (100 m x 100 m x 20 m).

14.2.15 Gordon Mineral Resource Statement

The Mineral Resources for the Gordon deposit have been estimated by Alamos at 1,857 kt grading an average of 1.09 g/t Au classified as Measured and Indicated Mineral Resources, with an additional 51 kt grading an average of 0.98 g/t Au classified as Inferred Mineral Resources. The Mineral Resources are stated above a 0.621 g/t Au cut-off and are contained within a potentially economically mineable open pit. Mineral Resources are exclusive of Mineral Reserves.

The Mineral Resources are reported in accordance with NI 43-101 and have been classified in conformity with generally accepted CIM "Estimation of Mineral Resource and Mineral Reserves Best Practices" guidelines. The Mineral Resource estimate was completed by Mr. Jeffrey Volk, CPG, FAusIMM, Director of Reserves and Resources for Alamos. Mr. Volk is a Qualified Person within the meaning of Canadian Securities Administrator's National Instrument 43-101 (NI 43-101).

The effective date of this Mineral Resource estimate is June 30, 2023, and is based on drilling data finalized in April 2022. The Mineral Resource statement for the Gordon Property is presented in Table 14-20.

Table 14-20 Gordon Mineral Resource Statement, June 30, 2023

Category	Tonnes (000's)	Au Grade (g/t)	Au Oz (000's)
Measured	571	0.84	15
Indicated	1,286	1.20	50
M&I	***1,857***	***1.09***	***65***
Inferred	51	0.98	2

Notes:

- *The Mineral Resources are reported at an assumed gold price of US$1,600/ounce, and an assumed silver price of US$23.00/ounce;*
- *The Mineral Resource estimate was completed by Mr. Jeffrey Volk, CPG, FAusIMM, Director of Reserves and Resources for Alamos Gold Inc.;*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves;*

- *Open pit Mineral Resources are stated as contained within potentially economically open pit above a 0.621 g/t Au and includes external dilution at zero grade outside the mineralized solids;*
- *Totals may not add due to rounding;*
- *Contained Au and Ag ounces are in-situ and do not include metallurgical recovery losses; and*
- *Mineral Resources are exclusive of Mineral Reserves.*

14.3 Consolidated Project Mineral Resource Statement

The Mineral Resources, as of June 30, 2023, for the Consolidated LLGP have been estimated by Alamos at 5,843 kt grading an average of 1.40 g/t gold classified as Measured and Indicated Mineral Resources; with an additional 4,243 kt grading an average of 0.98 g/t gold classified as Inferred Mineral Resources. The Mineral Resources are stated above a 0.355 g/t Au equivalent cut-off for MacLellan and 0.621 g/t Au cut-off for Gordon, both contained within a potentially economically mineable open pit. Mineral Resources are exclusive of Mineral Reserves.

Table 14-21 Consolidated LLGP Mineral Resource Statement, June 30, 2023

Deposit	Resource Class	Tonnes (000's)	Grade		Contained Ounces	
			Au (g/t)	Ag (g/t)	Au (000's)	Ag (000's)
MacLellan	Measured	786	1.63	3.09	41	78
	Indicated	3,200	1.52	3.44	156	354
	Total Measured and Indicated	**3,986**	**1.54**	**3.37**	**197**	**432**
	Inferred	4,192	0.98	1.49	133	201
Gordon	Measured	571	0.84	-	15	-
	Indicated	1,286	1.2	-	50	-
	Total Measured and Indicated	**1,857**	**1.09**	**-**	**65**	**-**
	Inferred	51	0.98	-	2	-
Lynn Lake Gold Project	Measured	1,357	1.29	1.79	56	78
	Indicated	4,486	1.43	2.45	206	354
	Total Measured and Indicated	**5,843**	**1.4**	**2.3**	**262**	**432**
	Inferred	4,243	0.98	1.47	134	201

Notes:

- *Mineral Resources reported are consistent with the CIM Definition Standards for Mineral Resources and Mineral Reserves.*
- *The Mineral Resources are reported at an assumed gold price of US$1,600/oz, and an assumed silver price of US$23.00/oz.*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves.*
- *Open pit Mineral Resources are stated as contained within a potentially economic open pit above a 0.355 g/t AuEq cut-off for MacLellan and 0.621 g/t Au for Gordon and includes external dilution at zero grade outside the constraining Au solids.*
- *Contained Au and Ag ounces are in-situ and do not include metallurgical recovery losses. • Mineral Resources are exclusive of Mineral Reserves.*
- *Totals may not add up due to rounding.*
- *Jeffrey Volk, CPG, FAusIMM, Director of Reserves and Resources for Alamos Gold Inc is the Qualified Person for the Mineral Resource estimate. Mr. Volk is a Qualified Person within the meaning of Canadian Securities Administrator's National Instrument 43-101 ("NI 43-101").*

14.4 Acid Rock Drainage Modeling

To aid in waste rock management for mine planning, acid rock drainage (ARD) models were developed for both the MacLellan and Gordon Properties. Stantec performed ABA analysis on 187 drill core samples from MacLellan and 179 samples from Gordon.

The ABA testing included the following analyses of samples:

- Paste pH was measured by inserting a combination pH electrode into a sample paste using a ratio of 1:2, water-to-solid solution.
- Total sulphur was analyzed by the Leco induction furnace (Leco) with an infrared detector at or above 1,650°C.
- AP was determined from measurement of all Sulphur species in a sample. Sulphate-sulphur was extracted by a 15% hydrochloric acid (HCl) digestion method and the leachate was measured by gravimetric method.
- Total Inorganic Carbon (TIC) was analyzed by the conversion of carbonate minerals to carbon dioxide using dissolution in hydrochloric acid and measured using colorimetric titration. Carbonate carbon was calculated from a concentration of TIC using conversion for molecular weight.
- Neutralization Potential (NP) was determined using the modified-Sobek method, with the addition of HCl over 24 hours at room temperature to maintain the pH between 1.5 and 2.0. The extract was then filtered and treated with hydrogen peroxide (H_2O_2) to oxidize ferrous iron to ferric iron prior to back titration with sodium hydroxide (NaOH).

Samples were submitted to ALS for an ICP + ICPMS analytical method referred to as MS41L. The digestion method is the same as for Alamos drilling programs but there are a few additional elements reported (such as zirconium) and detection limits are lower for some elements.

NP was calculated as follows:

$$NP\ (kg\ CaCO_3/t) = TIC\ (wt\%) \times 80.71$$

AP was conservatively calculated from total Sulphur as follows:

$$AP\ (kg\ CaCO_3/t) = Total\ sulphur\ (wt\%) \times 31.25$$

The ABA tests showed that S total and S total-SHCl (S by HCl digestion) are comparable for MacLellan samples (Analytical Solutions, 2017).

The predicted values for AP and NP were composited into 5 m downhole intervals and were utilized to estimate AP and NP in both the MacLellan and Gordon block models. Neutralization Potential Ratios (NPR) were then calculated on a block-by-block basis using the formula NPR = NP_{pred}/AP_{pred}. The model results were then provided to both Stantec and AGP for use in mine planning and waste rock management planning.

15 MINERAL RESERVE ESTIMATES

The Lynn Lake Gold Project (LLGP) is planned to be an open pit operation using conventional mining equipment. No underground mining is considered.

The Mineral reserve estimate is based on the mine designs and mine plans generated by AGP.

The Mineral Reserves consist of Measured and Indicated blocks above a cut-off of 0.796 Au g/t at Gordon and 0.355 Au g/t at MacLellan and contained within the ultimate pit design. Pits were designed in accordance with geotechnical recommendations, waste contact dilution, and economic calculations based on metal prices, costs, and recoveries.

15.1 Lynn Lake Gold Mine – Mineral Reserve Estimate

The Mineral Reserves for the LLGP are listed in Table 15-1 with the gold and silver grade estimates based on the diluted grades in the block model.

Table 15-1 Proven and Probable Reserves - Summary for Lynn Lake Gold Project

Deposit	Reserve Class	Tonnage (000's)	Grade		Contained Ounces	
			Au (g/t)	Ag (g/t)	Au (000's)	Ag (000's)
MacLellan	Proven	16,498	1.66	5.31	883	2,815
	Probable	23,240	1.12	3.55	834	2,650
	Total Proven & Probable	**39,738**	**1.34**	**4.28**	**1,717**	**5,464**
Gordon	Proven	3,502	2.63	-	296	-
	Probable	4,370	2.27	-	319	-
	Total Proven & Probable	**7,873**	**2.43**	-	**615**	-
Lynn Lake Gold Project	Proven	20,000	1.83	4.38	1,179	2,815
	Probable	27,610	1.30	2.98	1,153	2,650
	Total Proven & Probable	**47,610**	**1.52**	**3.57**	**2,332**	**5,464**

Notes:
- *Mineral Reserves reported are consistent with the CIM Definition Standards for Mineral Resources and Mineral Reserves.*
- *Mineral Reserves are reported to a cut-off grade of 0.796 Au g/t at Gordon and 0.355 Au g/t for MacLellan.*
- *The cut-off grades are based on a gold price of US$1,250/oz Au at Gordon, US$1,600/oz Au at MacLellan.*
- *Silver is not used in the cut-off grade calculation.*
- *Metallurgical Au recovery is 92.4% for Gordon and a feed grade-based formula for MacLellan.*
- *Totals may not add up due to rounding.*
- *Chris Bostwick, FAusIMM, Senior Vice President, Technical Services is the Qualified Person for the Mineral Reserve estimate. Mr. Bostwick is a Qualified Person within the meaning of Canadian Securities Administrator's National Instrument 43-101 ("NI 43-101").*

15.2 Block Models

The resource models for the Gordon and MacLellan deposits were received from Alamos and are used for all mine design work. The model block size is 5 m x 5 m x 5 m for both deposits.

Relevant information from the Mineral Resource block models includes the following:

- Gold grade (g/t) (estimated & diluted);
- Silver grade (g/t) (estimated & diluted) (MacLellan only);
- Mineral Resource classification (Measured, Indicated, Inferred);
- Adjusted block density (t/m^3);
- Acid neutralization potential; and
- Acid producing potential.

Block density was adjusted to account for previous mining at MacLellan and is based on the fraction of the block inside a mined stope. At Gordon, the lithology assigned block density was adjusted for the mined-out East and Wendy pits and the backfill dumped into the Wendy pit.

The Mineral Reserve block models for Gordon and MacLellan include relevant information from the Mineral Resource model with added items for mine planning purposes including, geotechnical slope sectors, waste contact dilution, and metal recovery.

15.3 Mine Recovery and Dilution

AGP applied a mining dilution skin at Gordon and MacLellan which combines 1-meter of an adjacent waste block with the ore mined. The adjacent waste blocks are typically mineralized and include some grade that is used in the dilution calculation. This dilution skin thickness was selected by considering the spatial nature of the mineralisation, proposed grade control methods, digging accuracy, and blast heave. The mining dilution is applied to the model grades. Total applied dilution is 19.7% at Gordon and 14.6% at MacLellan. No ore loss is applied to the Mineral Reserves.

15.4 Wall Slope Angles and Bench Configuration

The Feasibility Study geotechnical investigation for the LLGP has been conducted by WSP-Golder (WSP) and is discussed further in Section 16. The wall slope design parameters used to determine the overall slopes for the pit optimization are based on the recommendations in the geotechnical study. Parameters for the pit designs include bench height, stack height, face angles, berm widths, inter-ramp slope angles, with adjustments as required.

15.5 Cut-off Grade

The Mineral Reserve cut-off grades for the Gordon and MacLellan deposits are calculated at 0.796 g/t Au and 0.355 g/t Au respectively, excluding the Ag credit at MacLellan.

15.6 Economic Pit Shell Development and Detailed Design

The final pit designs are based on pit shells using the Lerchs–Grossmann (LG) procedure in Hexagon MinePlan software. The LG algorithm is used to define blocks that can be mined at a profit. The initial step is to develop an economic value for each Measured and Indicated open pit Mineral Resource block. The value calculation is based on the parameters in Table 16-4. Geotechnical parameters for slope design sectors were coded into the Mineral Reserve model based on a geotechnical assessment of previous pit designs. An offset from the highwater mark of natural water bodies was applied as a pit limit restriction at both Gordon and MacLellan. Economic pit shells were generated using the block values, pit slope criteria, and associated mining, process, and G&A costs. For the purposes of the pit limit determination and design, only blocks classified as Measured and Indicated were used. Inferred blocks were considered as waste.

Pit designs developed for the MacLellan and Gordon sites are based on the $1250/Au oz LG shells. A bench height of 10 m and triple benching with a berm every 30 m was used in fresh rock at MacLellan. A 10 m operating bench and double benching in the fresh rock with a berm every 20 m is used at Gordon. The ramp gradient is 10% with a 28.5 m ramp width at MacLellan and 20 m ramp width at Gordon. Four phases are designed at MacLellan and Gordon has a single phase. Detailed open pit phases designs were created and re-assessed for geotechnical stability by WSP-Golder. A revised geotechnical assessment based on new wall orientations was issued and the final pit designs were subsequently updated.

15.7 Mine Schedule

The mine schedule plans to deliver 47.6 Mt of mill feed grading 1.52 g/t gold and 3.57 g/t silver to the process facility and ore stockpiles. The mine life includes two years of pre-stripping and 11 years of mining. The waste tonnage from all pits, totalling 324 Mt, will be placed into either potentially acid-generating (PAG) or non-PAG waste destinations. The overall strip ratio is 6.8:1. Processing of stockpiled ore will continue for seven years after mining is complete.

A detailed mine production schedule was developed using diluted Mineral Reserves and costed to support the financial evaluation of the project.

16 MINING METHODS

16.1 Overview

The Lynn Lake Gold Project, located in Northern Manitoba, consists of the MacLellan and Gordon sites which are located 7 km and 37 km, respectively, from the Town of Lynn Lake. The MacLellan property operated as an underground gold and silver mine between 1986 and 1989. The Gordon property operated as open pit gold mine from 1996 to 1999 and consisted of two small pits, the East pit and the Wendy pit.

Both the MacLellan and Gordon deposits are planned to be developed using conventional open pit mining methods. The process facilities will be located at the MacLellan site and ore from Gordon will be transported via highway trucks to the MacLellan site for processing. Underground mining was not considered for this study.

The mine schedule for open pit mining consists of 47.6 Mt of mill feed grading 1.52 g/t gold, and 3.57 g/t silver over a processing life of 17 years. Open pit waste tonnage totals 321 Mt and will be placed into waste storage areas.

The current mine life includes two years of pre-production followed by 11 years of production mining. Mill feed is stockpiled during the pre-production years and reaches a peak stockpile capacity of 18.7 Mt at the MacLellan site near the end of Year 8. Stockpiled material at Gordon reaches 2.5 Mt in Years 3 to 5. Stockpiled ore will provide mill feed for seven years after mining ends.

16.2 Planning Model

16.2.1 Geological Model Importation

Mineral Resource block models for the Gordon and MacLellan sites were provide to AGP from Alamos in ASCII format. The Mineral Resource models were imported into Hexagon MinePlan® block model format for open pit mine planning. The mine planning block models created by AGP in MinePlan include additional items for mine planning purposes. The block model dimensions are shown in Table 16-1 while Table 16-2 and Table 16-3 include block model item descriptions for MacLellan and Gordon, respectively.

Table 16-1 LLGP Planning Model Properties

	MacLellan	Gordon
MinePlan file 10 (control file)	MacL10.dat	Gord10.dat
MinePlan file 15 (model file)	MacL15.pln	Gord15.pln
X origin (m)	380,290	411,904
Y origin (m)	6,306,440	6,307,344
Z origin (m) (max)	505	426
Rotation (Azimuth)	335	349
X block size (m)	5	5
Y block size (m)	5	5
Z block size (m)	5	5
X number of blocks	401	260
Y number of blocks	300	200
Z number of blocks	201	120

Table 16-2 MacLellan Planning Block Model Item Descriptions

Item	Min	Max	Precision	Units	Description
AU	-9	50	0.0001	g/t	Gold grade estimated
AG	-9	100	0.0001	g/t	Silver grade estimated
AUDG	0	50	0.0001	g/t	Gold grade diluted (Au* wf_pct)
AGDG	0	100	0.0001	g/t	Silver grade diluted (Ag* wf_pct)
RCLAS	0	5	1	-	1=Measured; 2=Indicated; 3=Inferred
TOPO	0	100	0.0001	%	Percentage of block below topography
SGLIT	0	4	0.0001	g/cm^3	SG assigned by lithology wireframes
UMINE	0	500	0.0001	t	Unmined block tonnes
WFPCT	0	1	0.0001	factor	Percentage of block inside Au grade wireframe
AUEQD	0	50	0.0001	g/t	Au Equivalent Grade
BTONE	0	500	0.0001	t	Total in-situ block tonnes
DENSE	0	4	0.0001	g/cm^3	Adjusted density for mined out volume
OBPCT	0	1	0.0001	factor	Percentage of block inside overburden solid
NPE	-9	1000	0.0001	-	Estimated NP (acid neutralization potential)
APE	-9	500	0.0001	-	Estimated AP (acid producing potential)
NPR	-9	600	0.0001	-	NPR (NPE/APE)
NPAG	0	5	1	-	Flag 0 =PAG : 2= assumed PAG : 4 =non-PAG
XMINE	0	1	1	-	Mined out (0 = unmined; 1= mined out)
LITH	0	100	1	-	Wireframe assigned lithology
SLPCD	0	10	1	-	Geotechnical slope sector codes
NSR1	0	1000	0.01	C$/t	NSR -Not Used
NSR2	0	1000	0.01	C$/t	NSR -Not Used
MINED	0	5	1	-	Code for dilution script, air, or rock
BLOKT	0	500	0.0001	t	Non-diluted block tons
OWFG	0	2	1	-	Ore: waste Flag; if >0.355 Au cut-off(MI) =1
DTON	0	500	0.0001	t	Diluted block tonnes from dilution script
DDEN	0	8	0.0001	g/cm^3	Density from dilution script
AUD	0	50	0.0001	g/t	Diluted Au grade from dilution script
AGD	0	100	0.0001	g/t	Diluted Ag grade from dilution script
TEMP	0	50	0.001		Extra item
DLFLG	0	5	1	-	Dilution Flag
OVB	0	5	1	-	Defunct OVB See RKTYP
OWFNL	0	5	1	-	Ore: waste Flag; >0.355 Au after dilution
RKTYP	0	50	1	-	OVB + PAG/NPAG Flag PAG= <2 NPR
RTYPE	0	50	1	-	OVB + PAG/NPAG Flag PAG= <4 NPR
SLOP2	0	10	1	-	Revised slope sector code - WSP
AURCV	0	100	0.001	%	Gold recovery on AUD grade
AGRCV	0	100	0.001	%	Silver recovery on AGD grade
AUDR	0	50	0.0001	g/t	Recoverable Gold AUD*AURCV
AGDR	0	100	0.0001	g/t	Recoverable Silver AGD*AGRCV

Table 16-3 Gordon Planning Block Model Item Descriptions

Item	Min	Max	Precision	Units	Description
APE	-9	500	0.0001	-	Estimated AP (acid producing potential)
AUDG	0	50	0.0001	g/t	Gold grade diluted (Au* wireframe percent)
AUEG	-9	50	0.0001	g/t	Gold grade estimated
RCLAS	0	5	1	g/t	classification: 1=measured, 2=indicated, 3= inferred, 4= unknown
BTONE	0	500	0.0001	t	Total in-situ block tonnes
BFPCT	0	1	0.0001	factor	percentage of block internal to in pit fill (SG = 2.0)
HPIT	0	1	0.0001	g/cm^3	% of block mined by Wendy and East pits
LITH	0	100	1	-	Wireframe assigned lithology
NPE	-9	300	0.0001	factor	Estimated NP (acid neutralization potential)
NPR	-9	500	0.0001	-	NPR (NPE/APE)
NPAG	0	5	1	-	Flag 0 =PAG : 2= assumed PAG : 4 =non-PAG
OBPCT	0	1	0.0001	factor	Percentage of block inside overburden solid
TOPO	0	100	0.0001	factor	Percentage of block below topography
WFPCT	0	1	0.0001	factor	Percentage of block inside Au grade wireframe
SGLIT	0	4	0.0001	g/cm^3	SG assigned by lithology wireframes
WFTON	0	500	0.0001	-	Not used
DENSE	0	10	0.0001	g/cm^3	Imported density from geology / fill adj. to 2.2
SLPCD	0	10	1	-	Geotechnical slope sector codes
AUE	0	50	0.0001	g/t	Gold grade estimated
AUD	0	50	0.0001	g/t	Diluted Au grade from dilution script
AGD	0	200	0.0001	g/t	Not used- report matching with MacLellan
DTON	0	800	0.0001	t	Diluted block tonnes from dilution script
DDEN	0	12	0.0001	g/cm^3	Density from dilution script
OWFG	0	5	1	-	Ore: waste Flag; if >0.796 Au cut-off (MI) =1
MINED	0	5	0.0001	-	Code for dilution script, air, or rock
BLOKT	0	1000	0.0001	t	Non-diluted block tons
DLFLG	0	5	1	-	Dilution Flag
WRD	0	5	1	-	Existing waste dump code 1= dump
RKTYP	0	50	1	-	OVB + PAG/NPAG Flag PAG= <2 NPR
RTYPE	0	50	1	-	OVB + PAG/NPAG Flag PAG= <4 NPR
SLOP2	0	10	1	-	Revised slope sector code - WSP
AURCV	0	100	0.001	%	Gold recovery on AUD grade
AGRCV	0	100	0.001	%	Not used- report matching with MacLellan
AUDR	0	50	0.0001	g/t	Recoverable Gold AUD*AURCV
AGDR	0	100	0.0001	g/t	Not used- report matching with MacLellan

16.3 Geotechnical and Pit Wall Slopes

The pit slope angles used in the pit optimization and designs are based on set of reports from WSP Golder (formally Golder Associates Ltd.). A feasibility level pit slope geotechnical study for the planned open pits at MacLellan and Gordon was completed by Golder Associates in March

2016. In January 2022, revised pit slope design recommendations for the Gordon pit based on the geotechnical investigation program completed during the summer of 2021 was published.

In September 2022, WSP performed a design conformance review on the preliminary pit designs which resulted in slight revision of the slope sectors based on updated wall orientation (dip direction). The revised slope sectors along with WSP recommendations are incorporated in the final pit designs.

The pit optimization and initial pit designs are based on these reports. The overall slope angles used in the optimization and pit design parameters are detailed in Table 16-6 and Table 16-7 for MacLellan and Gordon, respectively. Primary sources used for geotechnical and slope angle determinations include WSP and Q'Pit documents that are included in the references (Golder, 2016a), (Q'Pit, 2021) (WSP-Golder, 2022a), and (WSP-Golder, 2022b).

16.3.1 Geotechnical Investigations

A field investigation program was conducted in 2015 as part of the Feasibility Study of rock slopes. A total of five inclined deep rock boreholes (four at the MacLellan Property, and one at the Gordon Property) were advanced to depths ranging from 150 m to 300 m. To improve the bedrock characterization, televiewer surveys were conducted in eight exploration boreholes (five at the MacLellan Property, and three at the Gordon Property). A total of nearly 1,500 m of borehole wall data was collected to expand on the geotechnical borehole data set.

The overburden slope Feasibility Study was completed in three phases of investigation, in 2015, 2016, and 2017. In 2015, a total of 18 geotechnical overburden boreholes were drilled (12 at the Gordon Property, and six at the MacLellan Property) to characterize overburden, historical dam fill materials, and shallow bedrock in the open pit areas. The borehole depths ranged from 3 m to 21 m, depending on overburden thickness.

In 2016, a total of four geotechnical overburden boreholes were drilled around the open pit areas (two at Gordon, and two at the MacLellan Property). The borehole depths ranged from 8 m to 15 m, depending on the overburden thickness.

In 2017, two additional boreholes were drilled along the northeast end of the Gordon pit to further characterize the hydraulic conductivity of the shallow bedrock along an identified east-west trending fault zone.

In 2021 a geotechnical investigation program was completed at the Gordon site. The investigation targeted geotechnical logging, acoustic televiewer data collection, laboratory strength testing, hydrogeologic in-situ packer testing, and the installation of vibrating wet piezometers for tracking pore pressure readings in-situ.

Hydrogeology characterization was completed in overburden and shallow and deep bedrock around the ultimate pit areas by means of slug testing and packer testing. Short-term pumping test programs were conducted at MacLellan and Gordon Properties in 2015. Based on the short-term pumping test results, a long-term pumping test study was conducted at the Gordon Property in 2016. Results are summarized in Section 18.3.1.

In general, the geotechnical analyses (structural, strength, rock mass quality, and hydrogeology) indicate relative agreement with the limited historical data from the Project site, providing confidence in the current characterization.

16.3.2 Overburden

In general, the surficial geology at both sites consists of a thin layer of organic peat deposits in low lying areas, overlying marginal glacio-lacustrine glacio-fluvial and alluvial deposits and till sediments consisting primarily of silty sands to sandy silt and sand and gravel deposits.

Overburden in the MacLellan pit area varies in thickness and is characterized by a generally northeast-southwest trending overburden trough (up to 17 m thick near the northeast edge of the pit). The overburden thickness thins out moving to the north and south of the pit. Permafrost conditions were noted along the east and south edges of the pit to depths of 1 m and 9 m, respectively.

In the Gordon pit area, the overburden is generally thin and ranges from 2 m to 11 m thick according to the overburden and topographic surfaces provided by Alamos and the previous drilling completed by Golder and Tetra Tech.

Based on the soil materials, the recommended slope configuration is 2H:1V for both MacLellan and Gordon Properties. A 10 m wide berm is recommended at the overburden-bedrock interface to collect any sloughing material and allow access for slope maintenance and drainage control.

The stability of the overburden slopes would be reduced by increased pore pressures, in particular from the nearby water bodies at both pit areas. Therefore, it will be important to maintain adequate drainage, and to take the necessary measures to prevent potential erosion or piping on the slope face.

16.3.3 Rock

The MacLellan pit area is characterized by mafic to intermediate volcanics, granodiorite, and mafic to intermediate schist units. The main rock masses that will be exposed on the final pit walls in both pit areas are estimated to be strong (UCS > 50 MPa) and of good to very good quality (typical RMR 70-80), with anticipated localized poor to fair (RMR 35 – 55) quality zones due to minor faults and shears. As a result, large-scale deep seated rock mass failure is not anticipated and the main consideration for rock slope failure on the planned pit walls would be kinematic controlled, due to toppling and planar failure along foliation. The Keewatin River, located to the west of the pit area, may influence the groundwater pressures exerted on the pit walls.

The E-W fault zone currently identified at the MacLellan pit appears to be healed as breccias and favourably oriented with respect to the planned pit shell. Occurrences of other large-scale fault zones have not been interpreted for the proposed pit areas. In addition, intervals with significant broken core and/or fault gouge have not been observed based on the available drill core investigations.

Local instabilities may occur in zones of decreased rock quality, such as where the mineralized contact zone and/or the argillite banded iron formation daylights on the pit walls, or where blasting damage is concentrated. The recommended slope configurations, as outlined in Table 16-6 and Table 16-7 aim to limit the risk due to kinematic controls, and berm widths are planned to catch small scale failures due to planar, toppling, and wedge blocks.

The Gordon pit area is predominantly characterized by banded iron formation, with minor units including mafic to intermediate intrusives, and argillite iron formation. The intensity and lower frictional strength of the foliation in the iron formation rocks at Gordon lead to higher risk of planar failures along the foliation-parallel north and south pit walls. The proposed Gordon pit is surrounded by lakes and wetlands that may influence pore pressure and seepage into the pit, including Farley Lake to the east and Gordon Lake to the west.

Based on the structural assessment, the two pit areas have unique (though similar) structural characterizations and were considered as separate structural domains. Based on the pit geometries, MacLellan pit was subdivided into eight design sectors and Gordon pit was subdivided into seven design sectors.

Though the rock mass is generally of good quality and strong, the influence of groundwater can exert pore pressures that may lead to pit slope instabilities, particularly from the influence of nearby water bodies. Slope stability modelling showed stable results for the recommended set-back distance of 45 m from the surface water bodies. However, the Slide® model showed saturated slope conditions due to the proximity of the surface water bodies, which will require dewatering and seepage control measures.

The pumping test results provided estimates of relatively low inflows into the MacLellan pit, suggesting groundwater control may be achieved through typical sump pump operations, with opportunity to utilize the current underground mining infrastructure in the early phases of pit development. At the Gordon Property, the pumping test results provided relatively high estimates of inflows in the proposed pit. To control groundwater at Gordon, a grouting program has been recommended to limit seepage.

Excavation of the MacLellan pit will intersect previous underground workings along the pit floor, with some of the historical drifts, stopes, and the shaft being at or near the pit walls. In instances where it is suspected that the pit walls and/or floor is near the underground workings, probe holes should be drilled in advance of blasting to confirm the size and thickness of the workings. It is anticipated that some of the openings may be collapsed with controlled blasting or backfilled from the pit floor.

16.3.4 Pit Wall Design Slope Review

WSP completed a design conformance review for the Gordon and MacLellan initial pit design. Based on the conformance review the following recommendations were incorporated into the pit designs.

For the 2022 Gordon pit, the overburden slope angle design was brought back to 26° in areas where the overburden slope was steeper than recommended. A 10 m wide bench at the overburden/rock contact was added to the design.

At MacLellan, the boundaries of design sector IV and IVA have been revised due to pit wall orientation as shown in Figure 16-1 and Figure 16-2. The MacLellan pit design was updated with the new design sectors. The geotechnical berm in sector IV was extended and a berm added to the pit bottom where the vertical bench separation exceeded 30 m.

The final designs are shown in section 16.4.8 Pit Designs.

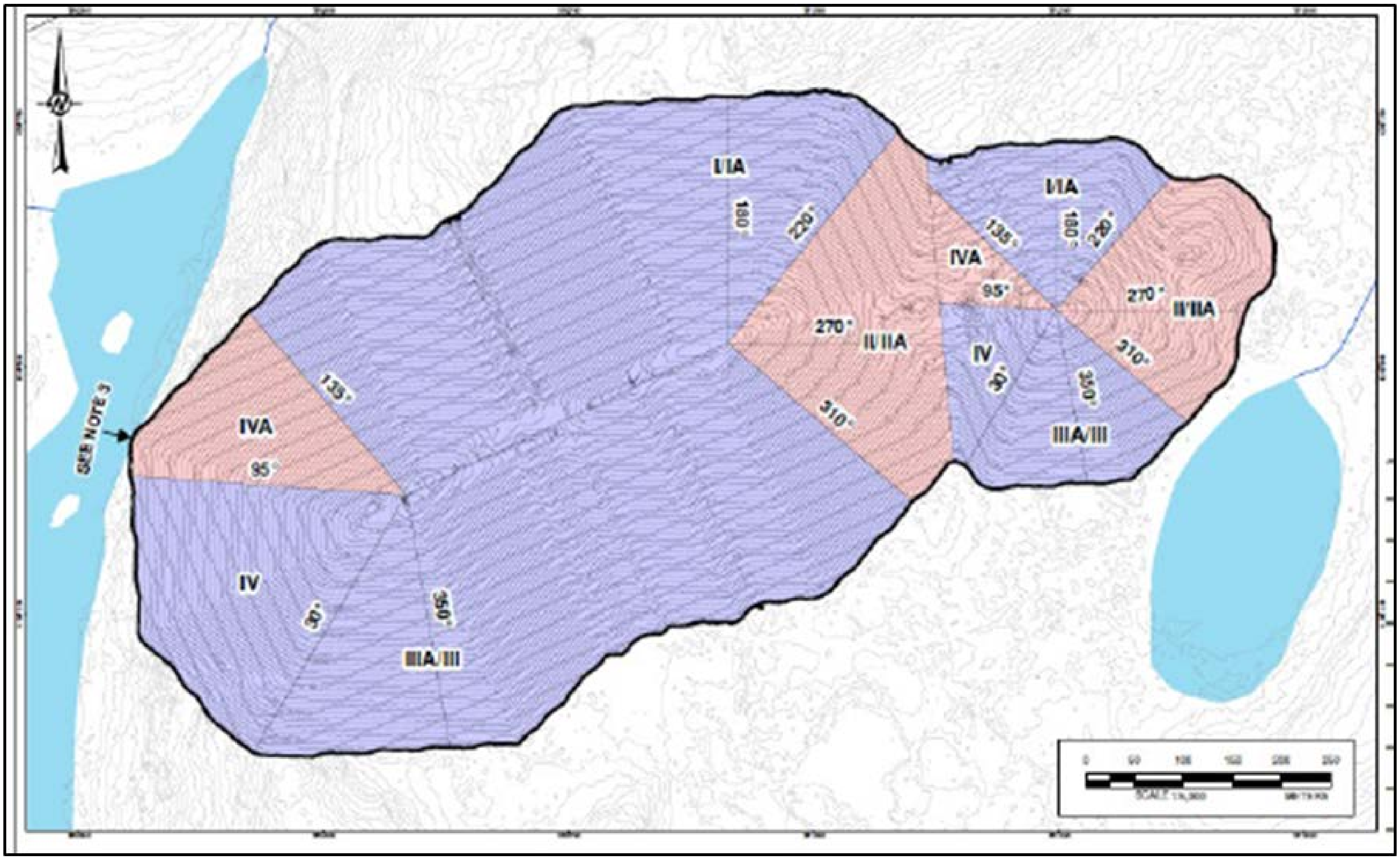


Figure 16-1 MacLellan 2016 Design Sectors

Source: WSP (2022)

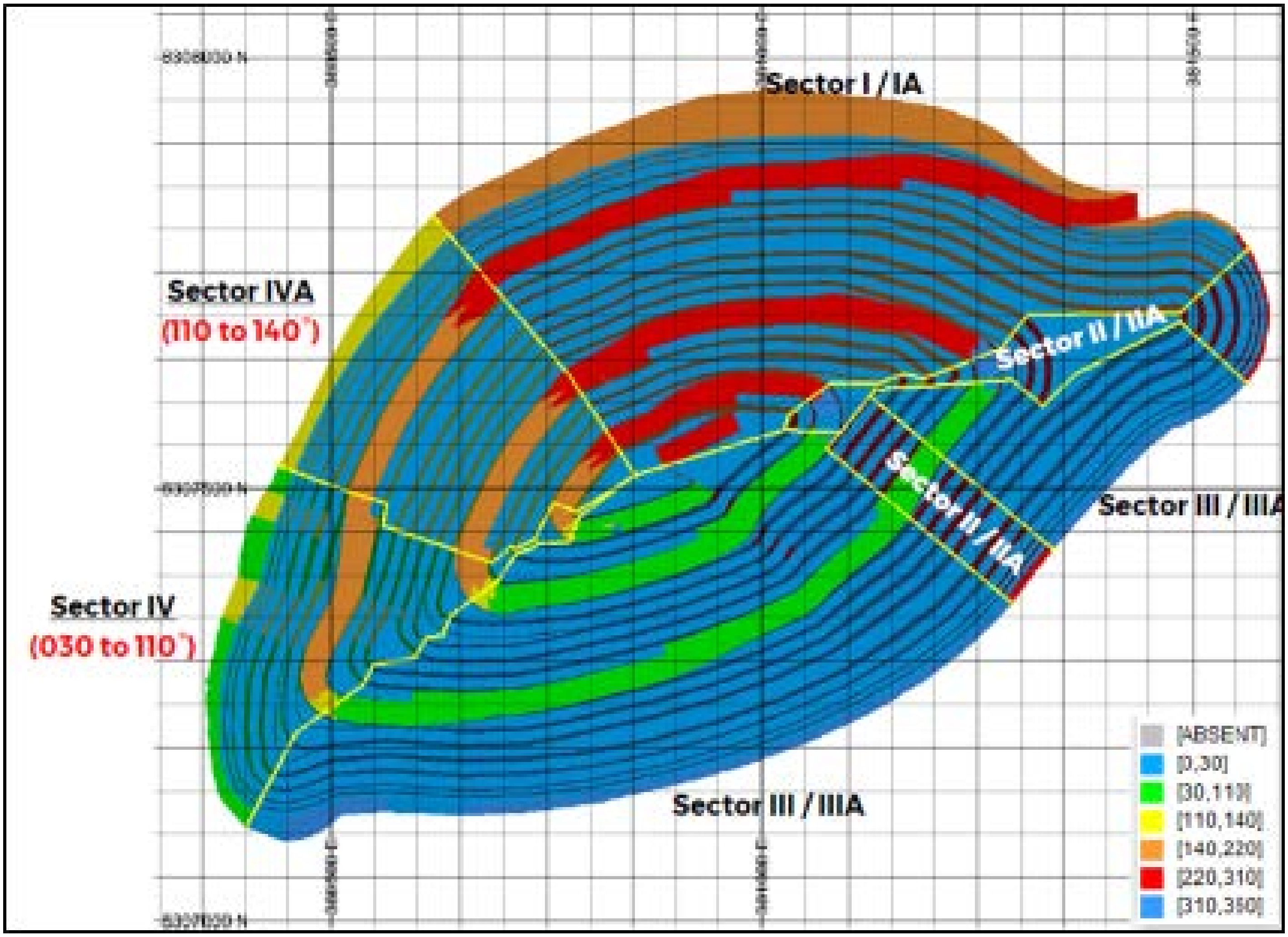


Figure 16-2 MacLellan 2022 Design Sectors

Source: WSP (2022)

16.4 Open-Pit Optimization

The open pit ultimate size and phasing requirements were determined with various input parameters including estimates of the expected mining, processing and general and administrative (G&A) costs, as well as metallurgical recoveries, pit slopes and reasonable long-term metal price assumptions. The costs estimates are based on the 2021 internal technical report costs and escalated 4% for inflation. The mining costs represent what is expected as a blended cost over the life of the mine for all material types to the various dump locations. G&A costs are included in the process cost. The cost to transport ore from the Gordon site to the process facilities at the MacLellan site was updated with current vendor budgetary pricing haulage services including consumables and maintenance.

16.4.1 Pricing and Cost parameters used in Pit optimization.

Table 16-4 includes the pit optimization parameters used for the MacLellan and Gordon deposits. Pit shells were run using the MinePlan software package from Hexagon Mining.

Table 16-4 Pit Optimization Cost and Recovery Parameters for Pit Optimization

Description		Units	Gordon	MacLellan
Exchange Rate	USD to CAD		0.75	0.75
Metal Prices	Gold Price	USD/oz	$1250	$1250
	Silver Price	USD/oz	n/a	$15.00
	Royalty		2.50%	2.50%
Dore	Payable	%	100	100
	Selling Cost	USD/oz	$3.38	$3.38
Metallurgical	Gold Recovery	%	Formulas -See Below	
	MacLellan[1,2]	(1 – (0.03 + 0.0587 x AUD) / AUD) x 100 – 0.9		
	Gordon[1,2]	(1 – (0.0978 + 0.0835 x ln (AUD)) / AUD) x 100 – 0.9		
	Silver Recovery	%	n./a	49%
Mining		C$/t	$3.28	$3.38
Processing	Process Cost	C$/t	$22.20	$22.20
	Highway Haul	C$/t	$16.82	$0.00

Notes:
1. *AUD = Mill Feed Gold Grade g/t*
2. *Recovery formulas for the production schedule differ from optimization recovery formulas.*

16.4.1.1 *Recovery Formula Update*

Metal recovery assumptions were updated prior to running the final mine production schedules. The updated recoveries at McLellan are.

Gold Recovery (%) = 0.97 * Au grade g/t + 92.5 - 0.6/100
Silver Recovery (%) = 48

The updated gold recovery at Gordon is.

Gold Recovery (%) = 93 - 0.6

16.4.2 Ore Loss and Dilution considerations

Two types of dilution are used for the Gordon and MacLellan deposits. The first dilution is an internal model dilution. Model blocks that do not fall completely inside the interpolation grade shell were discounted based on the percentage of the block that falls outside the grade shell. The Mineral Resource models received from Alamos include the internal model dilution. Mining dilution occurs when material below the cut-off grade cannot be selectively separated from the ore during mining and results in the mixing of waste along the perimeter of the ore due to blasting and overmining. AGP applied a dilution skin at Gordon and MacLellan which combines 1-meter of an adjacent waste block with the ore mined. The added tonnage and metal content from the 1-

m skin of the adjacent waste block is included in the overall ore tonnage. Total dilution, tonnes and gold ounces added by mining dilution in the preliminary $1250/Au oz pit shells are outlined in Table 16-5.

Table 16-5 Model Dilution

Deposit	Ore and Metal Added-Skin Dilution			Dilution Applied - Model + Skin		
	Tonnes	g/t	Au ozs	Model	Skin	Total
Gordon	850,323	0.411	11,228	14.2%	5.5%	19.7%
MacLellan	4,611,132	0.307	45,519	5.6%	9.0%	14.6%

No ore loss is applied, and ore recovery is assumed to be 100% for all ore material.

16.4.3 Slopes Angle Recommendations

The overall slope angle is determined by the inter-ramp slope angle and the projected number of ramps that pass-through a given slope sector. The overall slope may include a 20 m geotechnical step out that is recommended in place of the typical bench for every 140 m vertical height not intersected by a ramp. Previous pit designs were used to estimate the number of ramps and geotechnical berms required in each sector. The overall slope parameters used in the optimization package include the necessary ramps and geotechnical berms within each sector to accurately reflect the final wall slope configuration and minimize the variance between the optimized shapes and the actual design.

Overburden slope configuration is recommended at 2H:1V. At Gordon a 10 m wide berm is recommended at the overburden-bedrock interface to collect any surface sloughing and to allow access for slope maintenance and drainage control. At Gordon Slope Sector 1 represents the overburden and Slope Sector 2 represents fractured rock and is estimated as the first 20 m below the overburden surface.

Based on the geotechnical assessment, the open pit rock slope design recommendations for MacLellan and Gordon are given in Table 16-6 and Table 16-7 respectively. Note that the vertical bench separation is 30 m (triple benching) at MacLellan while Gordon has a vertical bench separation of 20 m (double benching). The deeper MacLellan pit also requires geotechnical step outs in some sectors.

Additional support by use of backfill may be required when encountering historic underground openings while advancing the MacLellan open pit.

Table 16-6 MacLellan Slope Angles by Sector for Pit Optimization and Design

Zone	Haul Roads		Geotech. Berms		Face Angle (°)	Bench Height (m)	Stacked Height (m)	Berm Width (m)	Overall Slope Angle (°)
	#	(m)	#	(m)					
Sector 1	-	-	-	-	26.56	10	10	-	26
Sector 2	-	-	-	-	75	10	10	6.0	49
Sector 3	2	28.5	1	8.0	80	10	30	12.0	53
Sector 4	2	28.5	1	8.0	75	10	30	12.0	50
Sector 5	2	28.5	1	8.0	80	10	30	12.0	53
Sector 6	2	28.5	-	-	80	10	30	12.0	54
Sector 7	2	28.5	1	8.0	75	10	30	12.0	50

Table 16-7 Gordon Slope Angles by Sector for Pit Optimization and Design

Zone	Haul Roads		Geotech. Berms		Face Angle (°)	Bench Height (m)	Stacked Height (m)	Berm Width (m)	Overall Slope Angle (°)
	#	(m)	#	(m)					
Sector 1	-	-	-	-	26.56	10	10	10	18
Sector 2	-	-	-	-	90	10	10	6.0	49
Sector 3	2	28.5	-	20.0	90	10	20	12.5	50
Sector 4	2	28.5	-	20.0	90	10	20	13.5	48
Sector 5	1	28.5	-	20.0	90	10	20	12.5	50
Sector 6	1	28.5	-	20.0	90	10	20	12.5	53
Sector 7	2	28.5	-	20.0	90	10	20	12.5	49

16.4.4 Pit Restrictions

An offset from the highwater mark of natural water bodies was applied as a pit limit restriction at Gordon and MacLellan. Pit restrictions include a 50 m offset from the Keewatin River and a 30 m offset from East Lake at MacLellan. Figure 16-3 and Figure 16-4 show the MacLellan optimized pit perimeter at different distances from the Keewatin River and East Lake, respectively.

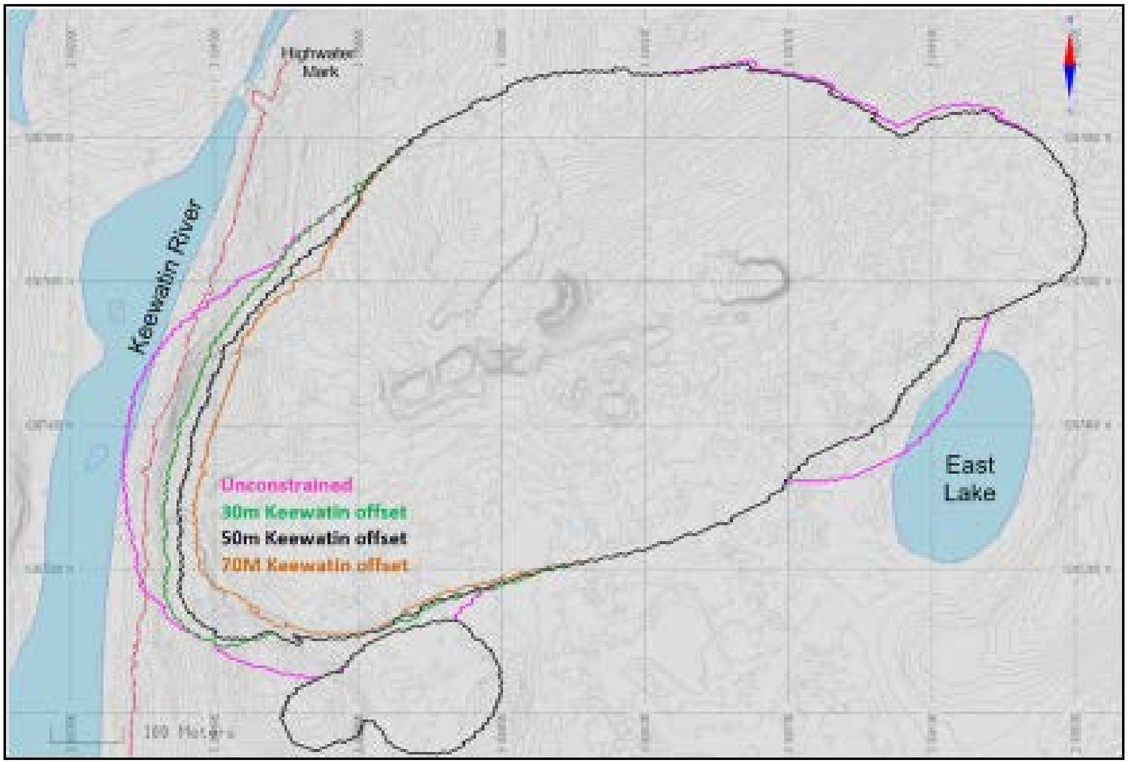


Figure 16-3 MacLellan Pit Restrictions - Keewatin River

Source: AGP (2023)

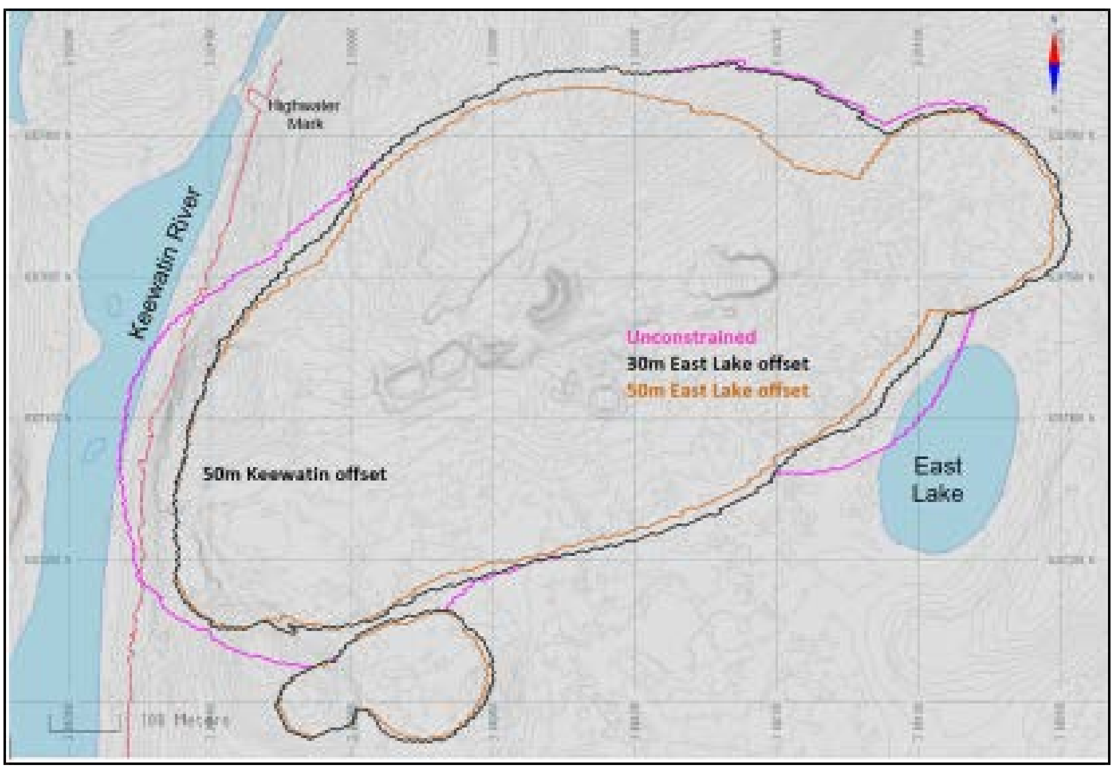


Figure 16-4 MacLellan Pit Restrictions - East Lake

Source: AGP (2023)

Gordon has a 50 m offset from both Gordon and Farley lakes as well as a boundary to restrict the pit from mining into the water diversion ditch to the north (Figure 16-5).

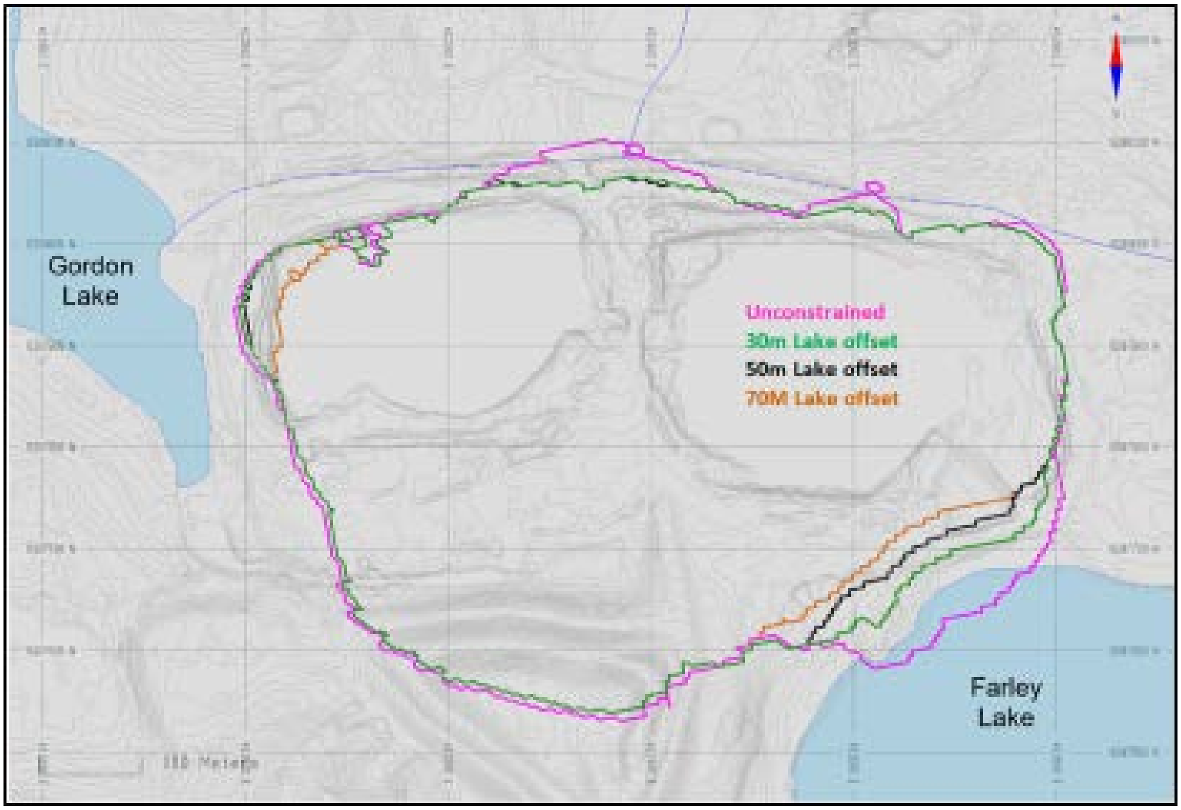


Figure 16-5 Gordon Pit Restrictions - Gordon and Farley Lakes

Source: AGP (2023)

16.4.5 Underground Voids

The underground openings in MacLellan will be encountered in Phase 2 three years after the startup of mining operations and a year after startup of processing operations. A shaft with dimensions of 3 m by 6.5 m will first be mined with Phase 2 and will continue to be mined with subsequent benches through Year 9 when the shaft pierces the final pit wall in Phase 3. Care should be taken in Phase 1 as it mines near or at the uppermost underground workings.

Additional support by use of backfill may be required when encountering historic underground openings while advancing the MacLellan open pit. Most mining levels will encounter underground development drifts and stopes. Stopes are reportedly sand filled. The MacLellan underground operations are relatively recent, and stopes and drifts were well mapped during operations and confirmed by exploration drilling. Safe operating procedures for void detection, delineation and backfill will be required when mining through the historical underground development openings and voids. Figure 16-6 shows the extents of underground workings within Phase 2 and Phase 3 of the MacLellan pit.

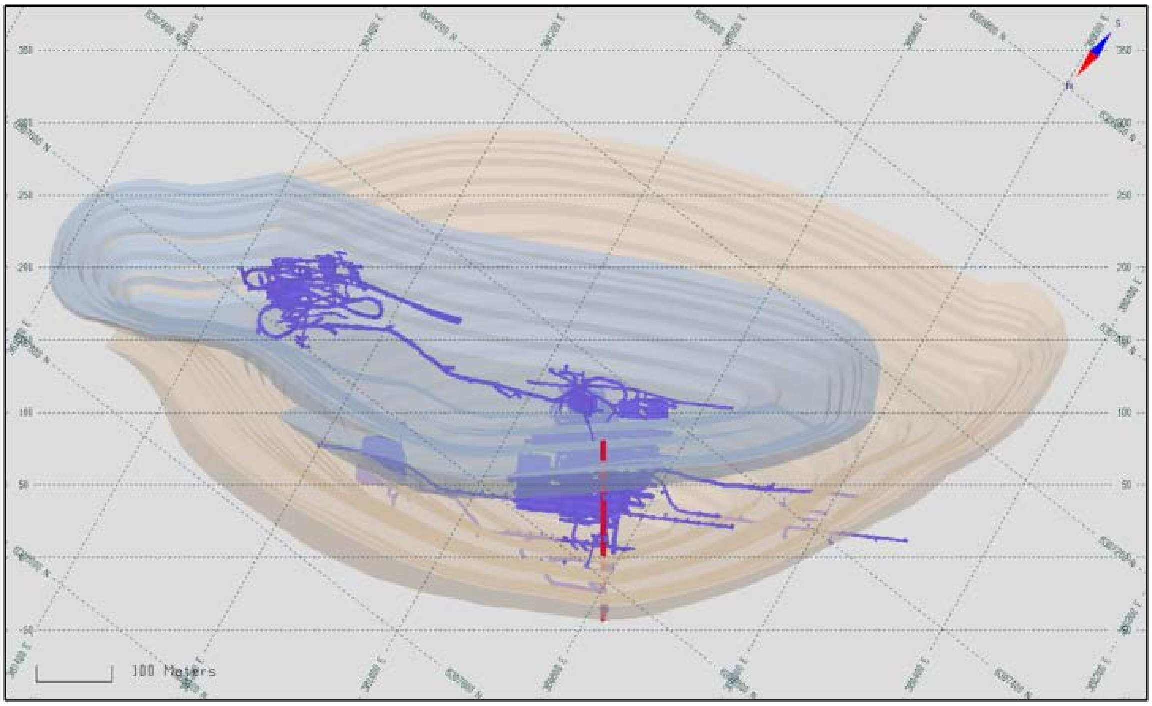


Figure 16-6 Underground Workings within the MacLellan Pit

Source: AGP (2023)

16.4.6 Topography

Topographic information for the MacLellan and Gordon sites was received from Stantec in the NAD1983 UTM Zone 14N datum. The topography was received as 0.5 m contours.

The previously mined East Pit and Farley pits are currently filled with water and the Gordon topography was modified to include the mined-out surface as well as the backfill dumped into the Farley Pit. A density of 2.0 t/m^3 was applied to the backfill material.

16.4.7 Price shells

Pit optimization was run using incremental gold price to generate a set of nested pit shells to US$ 1,500 /oz. gold. The incremental price shells guide the selection for final pit extents along with pushbacks leading to the final pit.

The MacLellan price shells are shown in Figure 16-7. The $1,250/oz shell was selected as a guide for the final pit design at MacLellan. The MacLellan pit is bound by the Keewatin River and East Lake mining restrictions which limit the growth of the price shells.

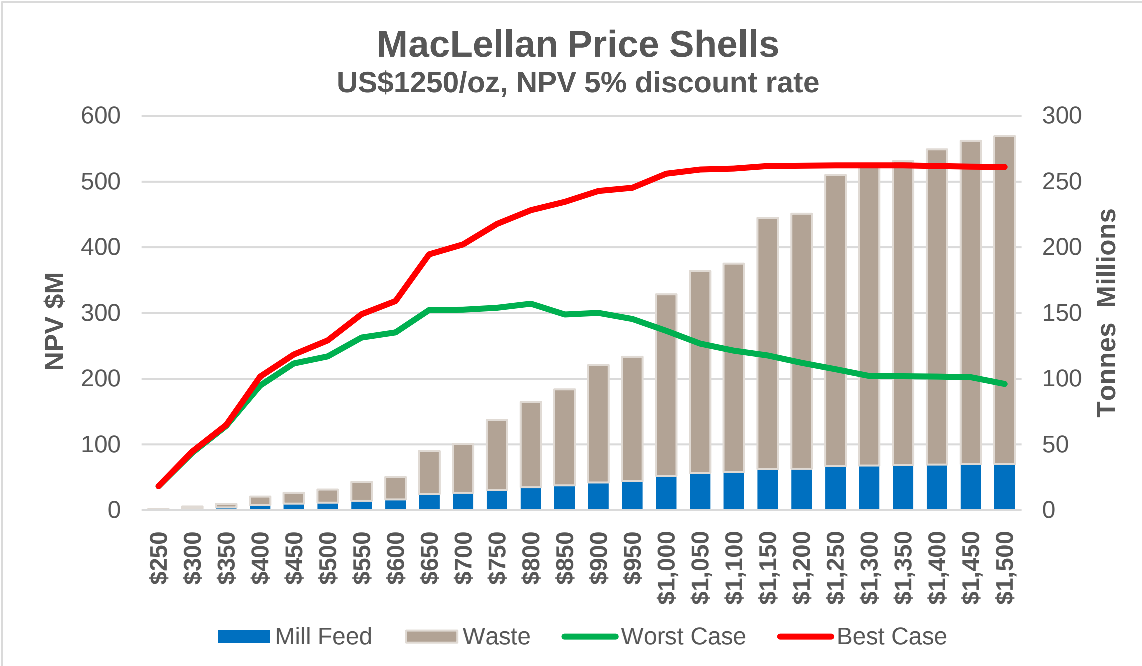


Figure 16-7 MacLellan Price Shells

Source: AGP (2023)

Gordon price shells are shown in Figure 16-8. Like MacLellan, the $1,250/oz shell was selected as a guide for the final pit design and is constrained on east and west sides by Gordon and Farley lakes respectively.

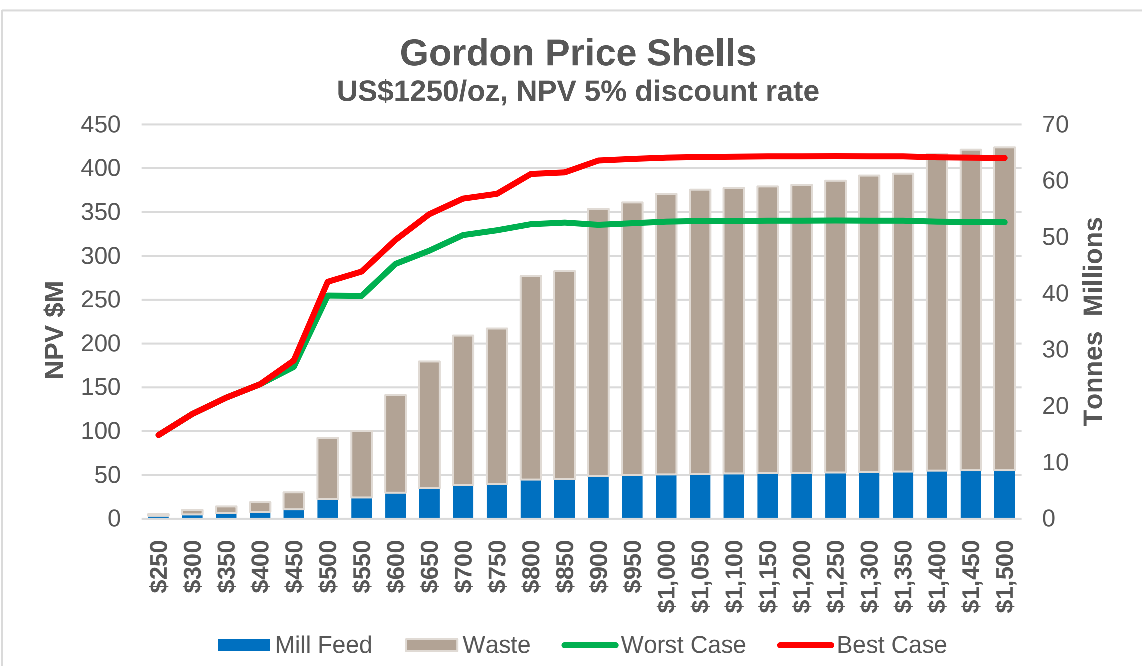


Figure 16-8 Gordon Price Shells

Source: AGP (2023)

16.4.8 Pit Designs

A conventional open-pit, truck-and-shovel mining method will be used for the Lynn Lake Gold Project. Haul truck sizing varies between sites with MacLellan using 144 t rigid-frame haul trucks while 64 t rigid-frame haul trucks will be used at Gordon. A comparison of mining the Gordon deposit with the larger 144 t trucks was completed and showed that the loss of gold ounces and revenue due to increased ramp width outweigh the lower mining costs of using larger trucks.

The MacLellan main pit will consist of three phases, plus the small satellite pit located south of the main MacLellan pit. The operating bench height is 10 m and ramp width is 28 m at a 10% grade. The last seven benches in the MacLellan final design have a 24.5 m ramp width.

The Gordon pit will be developed with a single phase. The operating bench height is 10 m and ramp width is 20 m at a10% grade.

The pit optimization shells used to determine the ultimate pits were also used to outline areas of higher value for targeted early mining and phase development. The rate of maximum vertical advance was limited to 10 operating benches per phase per annum for the MacLellan and Gordon pits. The working bench height of 10 m is based on the equipment selection and dilution control. General ramp criteria are shown in Table 16-8.

Table 16-8 Ramp Design Criteria

Ramp Attribute	MacLellan Pit	Gordon Pit
Double Ramp width (m)	28.5	20.0
Single Ramp width (m)	24.5	17.1
Ramp Gradient (%)	10%	10%
Switchback design	Flat	Flat

16.4.8.1 *MacLellan Pit*

The MacLellan open pit is located to the east of the Keewatin River. The final pit is restricted by a 50 m offset from the Keewatin River high watermark and by a 30 m offset from East Lake on the southeast side. The location of the primary site access is planned to be from the southwest side of the pit. The waste dump, overburden storage and ore stockpiles are located to the north of the open pit. The proposed open pit limit at MacLellan encompasses part of the historical underground mining workings.

A double lane road width of 28.5 m (2.5 times the operating width plus berm and ditch) is used in the MacLellan design. The ramp width at MacLellan is based on the use of 144 t rigid-frame haul trucks that have an operating width of 6.9 m.

Phase 1 (Figure 16-9) at MacLellan is principally an in-pit borrow source that is mined starting at the beginning of pre-production (Year -2) to provide rock for the construction of the initial roads, infrastructure, and tailings management facility (TMF). Ore encountered during the pre-production period will be stockpiled and processed after mill startup. The initial phase was designed for the purpose of providing sufficient non-PAG waste material to support infrastructure construction. Table 16-9 has the breakdown of PAG/non-PAG waste material mined at MacLellan during the construction period.

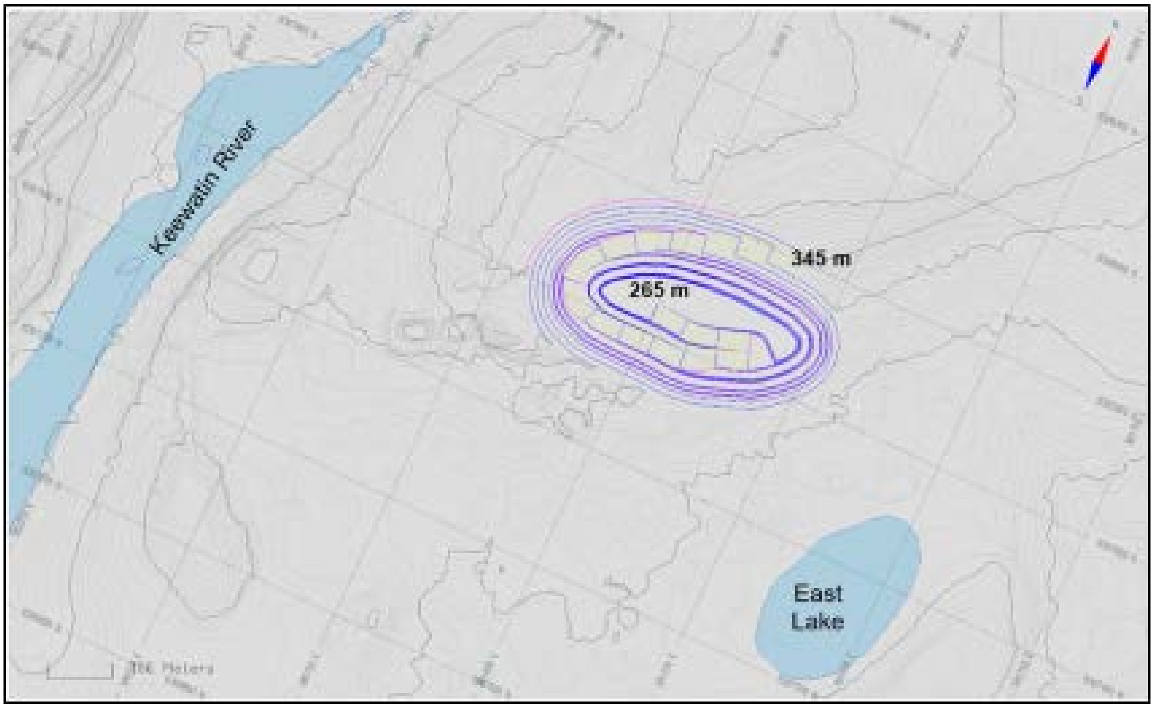


Figure 16-9 MacLellan Phase 1

Source: AGP (2023)

Initial mining is scheduled to be performed by the construction contractor and switches to the owner mining fleet midway through the second year of the pre-production period. Ramp widths in Phase 1 are designed to accommodate the larger 141 t haul trucks.

Table 16-9 MacLellan Phase 1 Waste Rock for Construction

Period	PAG (kt)	Non-PAG (kt)	Overburden (kt)
PP-2	562	1,603	1,938
PP-1	2,262	6,406	2,470

MacLellan Phase 2 (Figure 16-10) is a high-grade low strip pushback that provides higher grade mill feed during the early years of the project. Phase 2 uses the upper ramp system of Phase 1 and expands the pit laterally to a depth of 145 m. Phase bench elevations range from 345 masl to 200 masl. 35% of the MacLellan ore comes from Phase 2 while mining only 15% of the total mined material from MacLellan. Higher grade ore is directly fed to the mill and lower grade material is stockpiled to be processed later in the project life. Phase 2 starts mining after the last two months of the pre-production period and is mined through Year 3 of the project.

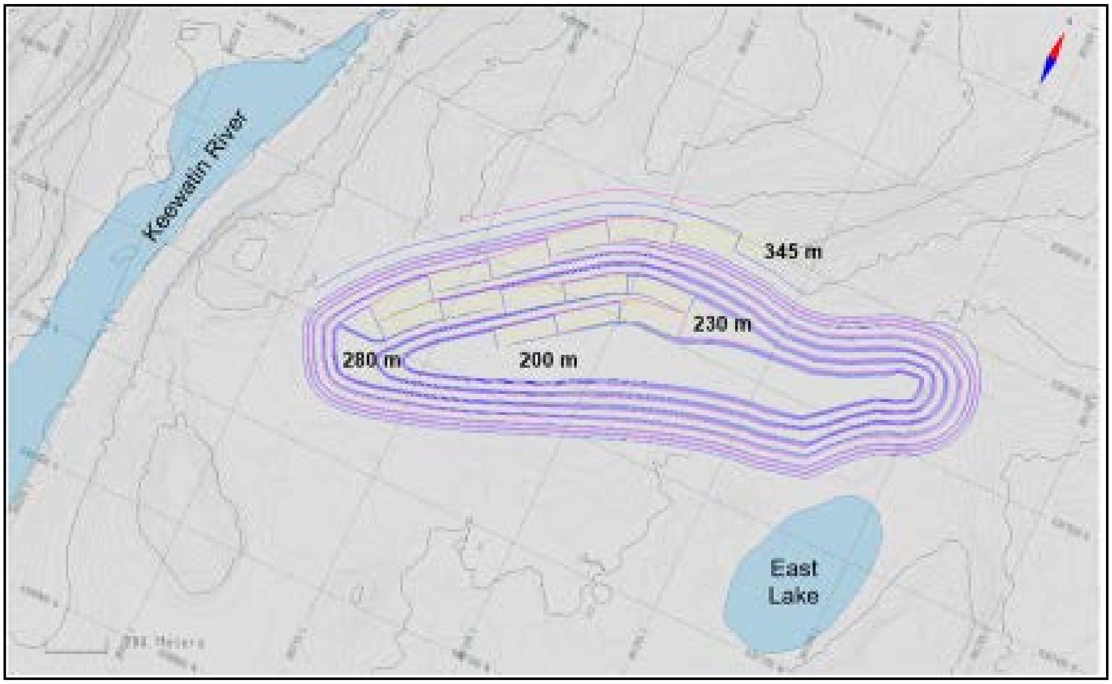


Figure 16-10 MacLellan Phase 2

Source: AGP (2023)

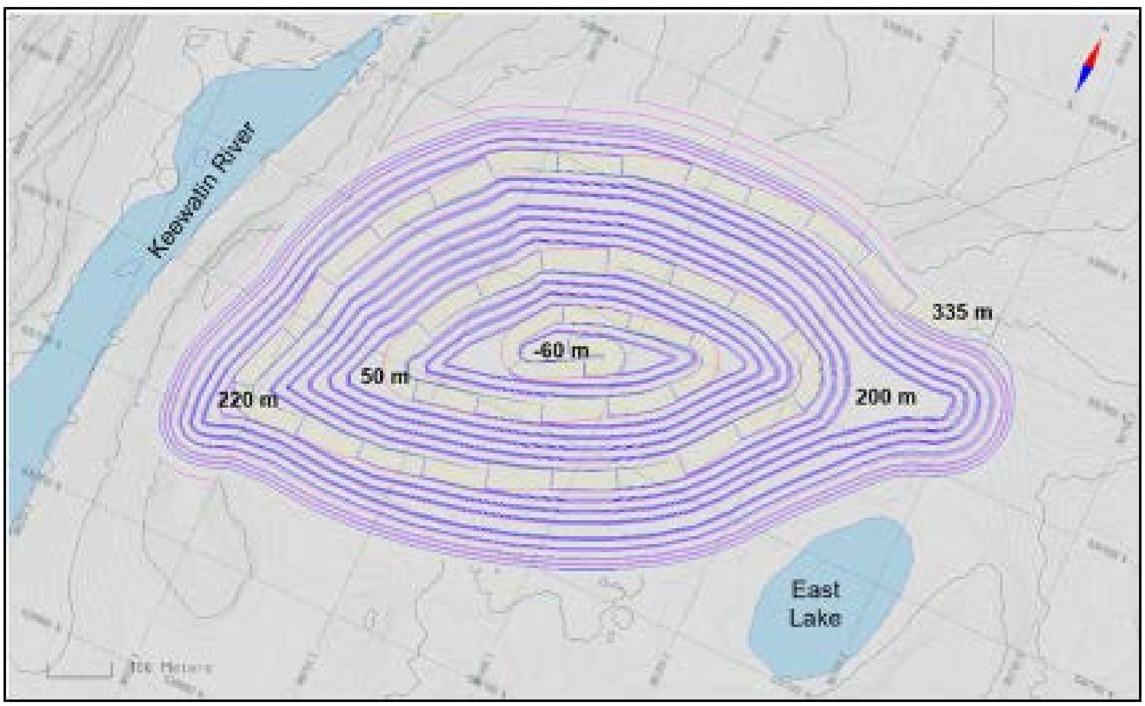


Figure 16-11 MacLellan Phase 3

Source: AGP (2023)

Phase 3 (Figure 16-11) is the final phase mined in the main pit and has a depth of nearly 400 m. Phase bench elevations range from 335 masl to -60 masl. Phase 3 is a large phase that is mined from Year 1 into Year 11. 77% of all material mined at MacLellan is contained in Phase 3. Two

20 m geotechnical berms are included in the design at the 260 m bench elevation on the south wall and the 200 m bench elevation on the north wall.

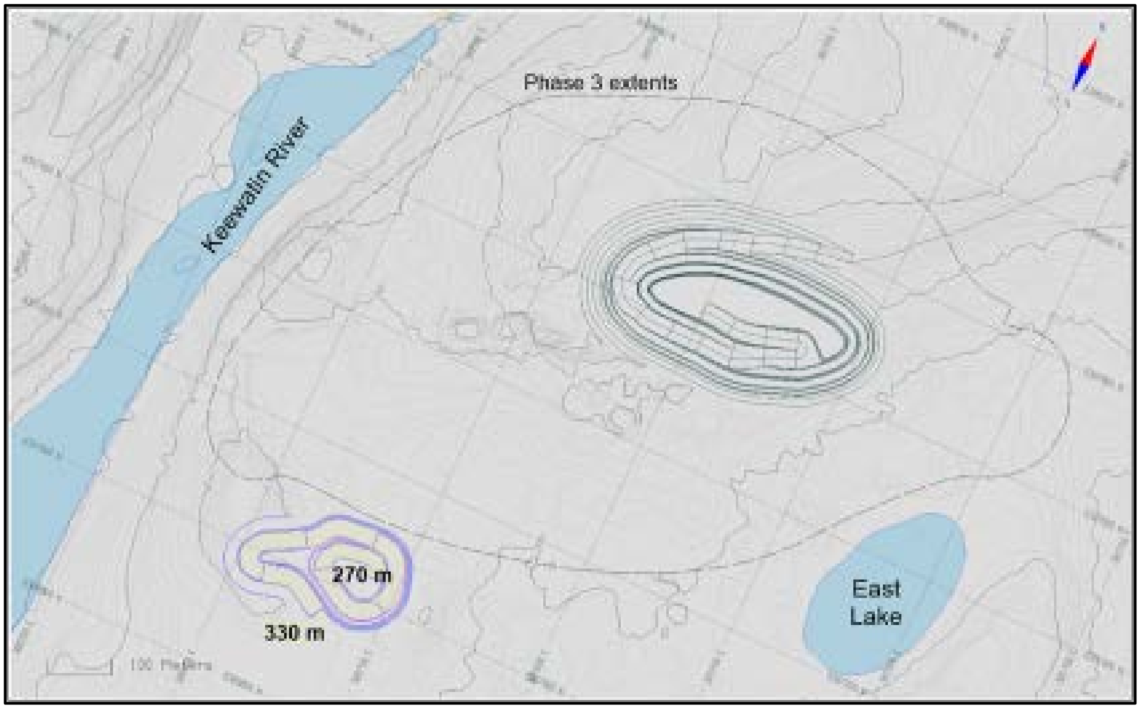


Figure 16-12 MacLellan Phase 4

Source: AGP (2023)

MacLellan Phase 4 (Figure 16-12) is a small, shallow pushback located south of the main pit. This small pit did not appear in previous studies. Phase 4 is mined mainly during pre-production Year -1. The phase provides additional material for construction purposes and ore mined from Phase 4 during the pre-production period is stockpiled.

Tonnes and grade for the final pit designs are reported in Table 16-10 using the diluted tonnes and grade from the model. Only Measured and Indicated Mineral Resources were included in the mill feed summary.

Table 16-10 Phase Tonnes and Grade Summary

Phase	Mill Feed (Mt)	Au (g/t)	Ag (g/t)	Waste (Mt)	Total Tons (Mt)	Strip Ratio (w:o)	Au (koz)	Ag (koz)
Gordon Phase 1	7.87	2.43	-	57.27	65.14	7.28	626.7	-
MacLellan Phase 1	0.13	0.88	6.44	11.21	11.34	87.5	3.6	0.03
MacLellan Phase 2	13.66	1.40	4.62	40.41	54.07	2.95	613.7	2.03
MacLellan Phase 3	25.48	1.32	4.13	209.11	243.06	8.21	1084.3	3.38
MacLellan Phase 4	0.47	1.01	1.93	3.27	3.74	7.04	15.1	0.03

16.4.9 Waste Rock and Stockpile Storage

The Gordon site consists of a Waste Rock Management Facility (WRMF) along with overburden and topsoil stockpiles. A low/medium grade ore stockpile is also located adjacent to the facility that loads the Gordon ore into highway trucks for haulage to the MacLellan site for processing. The layout of the mine facilities at Gordon is shown in Figure 16-13.

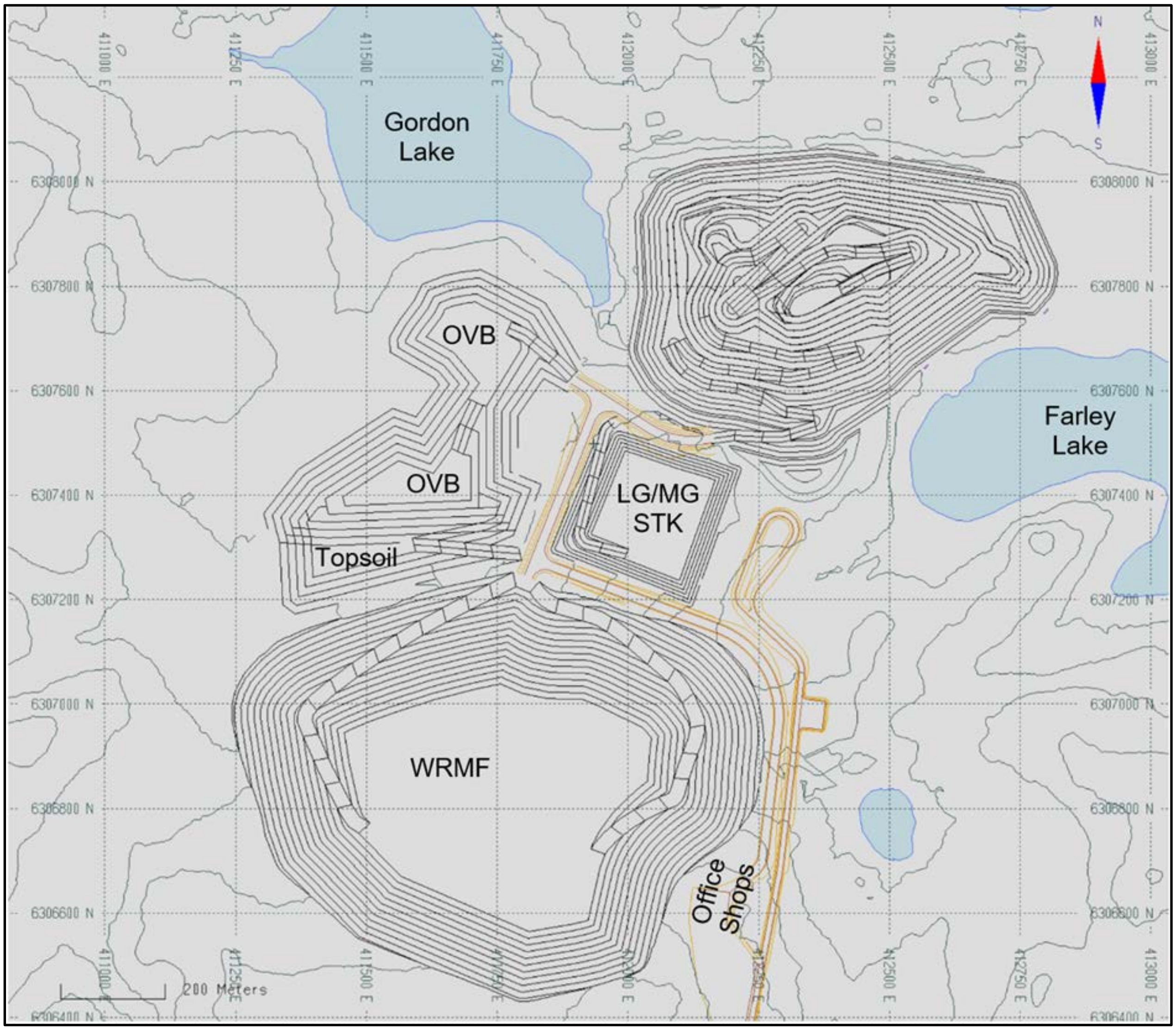


Figure 16-13 Mine Facilities Gordon Site

Source: AGP (2023)

The MacLellan site (Figure 16-14) includes the process facilities and the tailings storage facility (TSF). The MacLellan WRMF abuts the TSF and forms a buttress on the south and east sides of the TSF. PAG ore stockpiles and a low-grade ore stockpile are located on the Run-of-mine (ROM) pad near the primary crusher and runoff from the PAG stockpiles will be contained. Overburden and topsoil are stored in separate stockpiles near the WRMF and TSF for reclamation purposes. A low grade non-PAG ore stockpile is located on top of the WRMF's southwest side for processing at the end of the mine life. PAG and non-PAG material can be co-mingled internally in the WRMF with the exposed side slopes composed of non-PAG waste.

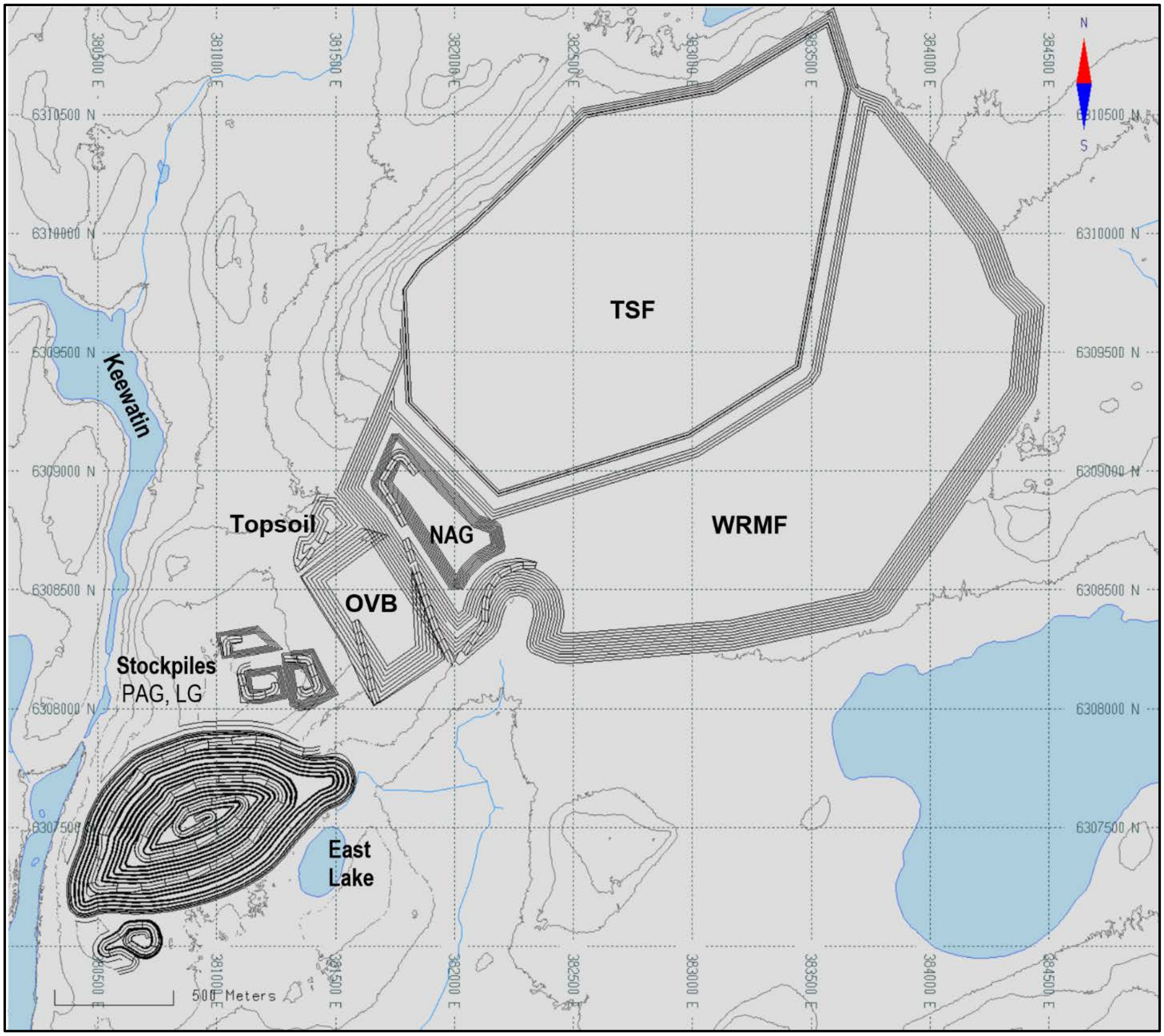


Figure 16-14 Mine Facilities MacLellan Site

Source: AGP (2023)

The waste rock and ore storage stockpile design parameters and capacities are shown in Table Table 16-11 and Table 16-12.

Table 16-11 Waste Rock and Stockpile Parameters

Facility	Side Slope (H:V)	MacLellan Ramp (m)	Gordon Ramp (m)	Design Bench (m)
WRSF	2.5:1	28	25	5
OVB	3.0:1	28	25	5
Ore Stockpiles	37° repose	28	25	5

Table 16-12 WRMF and Stockpile Capacities

Facility	MacLellan (Mt)	Gordon (Mt)
WRSF	264.5	54.4
OVB	9.5	5.6
LG Stockpile	1.0	3.0
Topsoil	0.6	1.6
PAG Ore Stockpile	2.5	
NAG Ore Stockpile	10.2	

16.5 Lynn Lake Life of Mine Plan

The mine schedule plans to deliver 47.6 Mt of mill feed, grading 1.52 g/t gold and 3.57 g/t silver, over a mine life of 11 years plus an additional 7 years of stockpile processing. Waste tonnage from all pits totalling 324 Mt will be placed into either non-PAG or PAG waste destinations. The overall strip ratio is 6.8:1.

Table 16-13 Combined Mine Production

	Mill Feed (Mt)	Au (g/t)	Ag (g/t)	Waste (Mt)	Total Tons (Mt)	Contained Au (Moz)
Gordon	7.87	2.43	-	57.27	65.14	0.62
MacLellan	39.74	1.34	4.28	266.94	306.69	1.72
LLGP Total	47.61	1.52	3.57	324.22	371.82	2.33

The detailed mine schedule is shown in Table 16-14. The MacLellan mine life includes two years of pre-stripping and 11 years of mining. The Gordon mine schedule has one year of pre-production followed by five years of mining. Ore is stockpiled during the pre-production years. Mine production from Gordon is accelerated in the mine schedule to bring the higher-grade ore to the mill earlier in the project life. Stockpiled material is processed for six years after mining stops. The stockpile balance at the end of each year is shown in Figure 16-16.

Mine production peaks in Years 2 and 3 with 49 Mt/a of material mined in each year, of which 33 Mt/a is mined at MacLellan and 16 Mt/a at Gordon. The mine schedule by destination is shown in Table 16-15.

The production schedule assumes a constant mill feed rate of 2.92 Mt/a (8,000 t/d) will be sent to the process facility. The Year 1 ramp up schedule limits mill feed to 2.26 Mt as the mill is commissioned. Figure 16-15 shows the combined mill feed over the life of mine by source and gold grade. All the Gordon ore including stockpiled material is processed by the end of Year 7 in the production schedule.

16.5.1 Mine Sequencing

The Gordon pit contains ore of higher grade. As a result, it is desirable to develop and mine this pit early to enhance project economics. The Gordon pit is completely mined out in approximately 5.5 years including pre-stripping. The cost of carrying two mining operations is also reduced by mining Gordon as quickly as possible.

Pre-production mining is required to provide construction rock for the infrastructure at the MacLellan site and access sufficient ore for plant commissioning. The mining rate remains steady after ramping up in Year 1 at 33 Mt/a with the higher-grade ore sent directly to the mill and lower grade ore to stockpiles.

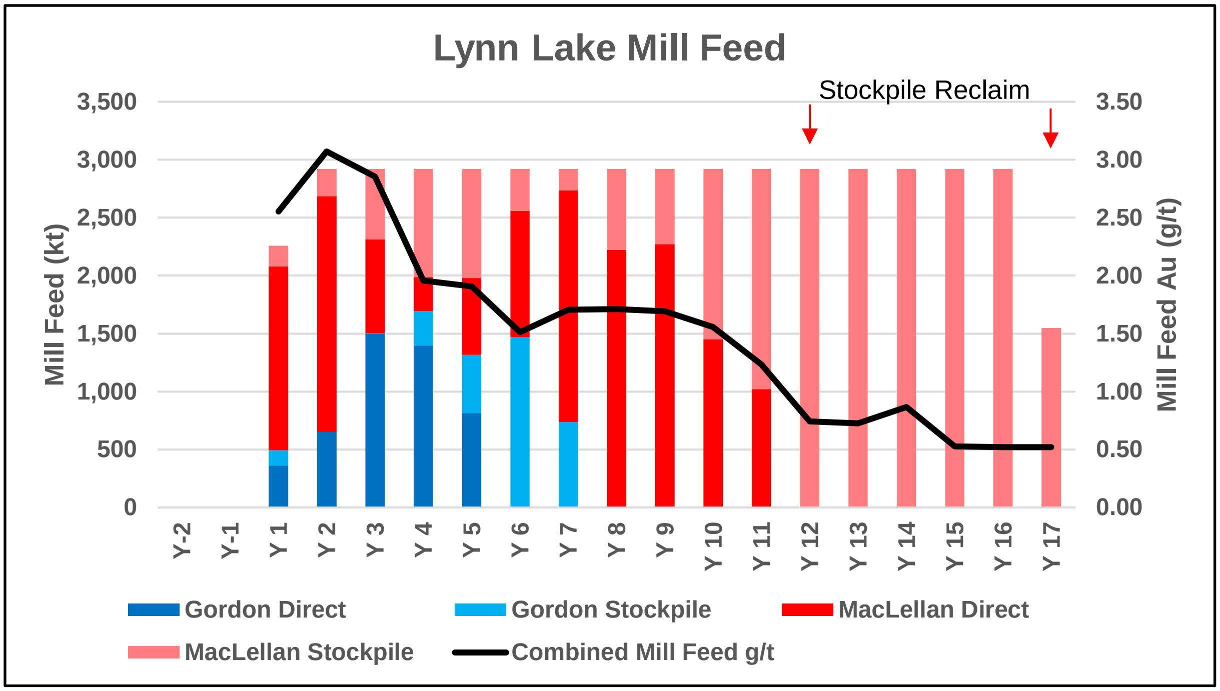


Figure 16-15 Mill Feed by Source and Au Grade Profile

Source: AGP (2023)

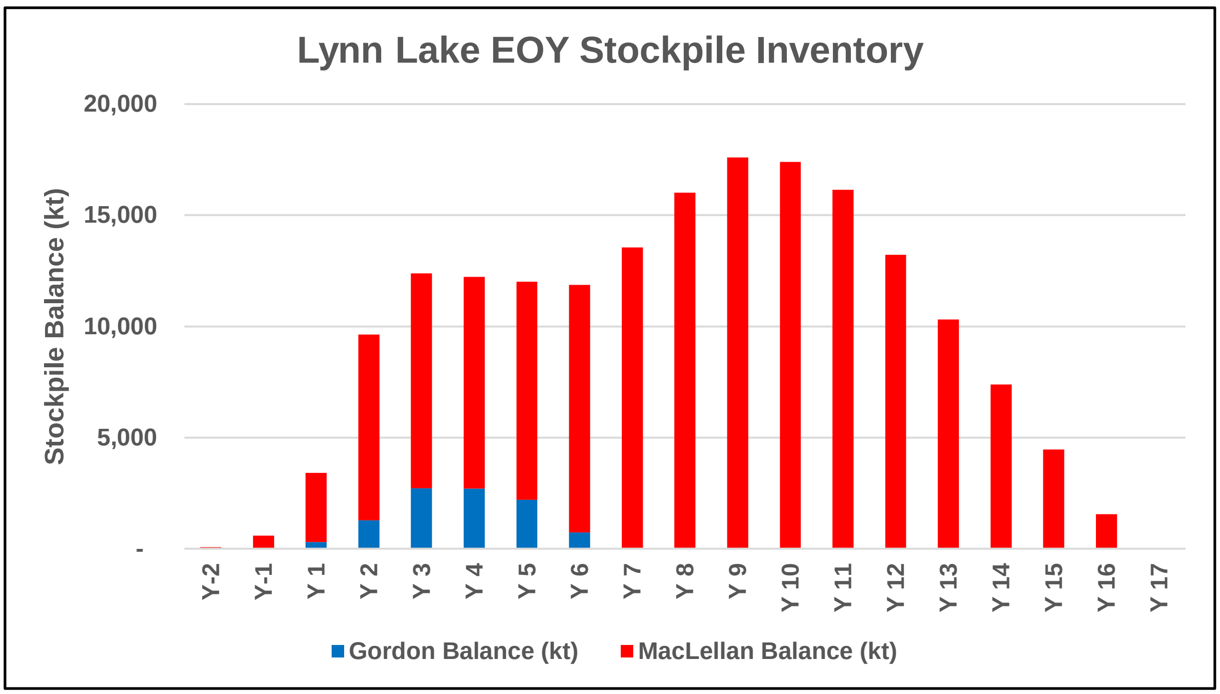


Figure 16-16 Lynn Lake Stockpile Balance

Source: AGP (2023)

Table 16-14 Lynn Lake Gold Project Mine Schedule

		Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Total
Gordon	Overburden (kt)	-	2,343	3,057	-	-	-	-							5,400
	Non-PAG Waste (kt)	-	1,353	6,295	8,365	7,454	4,698	1,138							29,303
	PAG Waste (kt)	-	693	4,857	6,004	5,600	3,925	1,458							22,537
	Total Waste (kt)	-	4,389	14,210	14,369	13,054	8,623	2,628							57,273
	Mined Ore (kt)	-	6	790	1,631	2,946	1,679	817							7869
	Au g/t	-	3.08	2.11	2.36	2.36	2.34	3.33							2.43
	Ag g/t	-	-	-	-	-	-	-							-
	Total Mined (kt)	-	4,395	15,000	16,000	16,000	10,302	3,445							65,142
MacLellan	Overburden (kt)	1,985	1,755	4,161	2,818	2,313									13,032
	Non-PAG Waste (kt)	1,292	8,003	8,019	12,037	16,672	20,043	19,844	18,770	16,144	14,465	9,232	3,985	1,260	149,766
	PAG Waste (kt)	893	3,173	7,534	10,638	11,286	11,867	11,281	11,449	12,245	11,845	6,641	3,847	1,444	104,143
	Total Waste (kt)	4,170	12,931	19,714	25,493	30,271	31,910	31,125	30,219	28,389	26,310	15,873	7,832	2,704	266,941
	Mined Ore (kt)	67	520	4,286	7,507	2,729	1,090	1,875	2,781	4,611	5,381	4,503	2,726	1,663	39,738
	Au g/t	0.92	0.92	1.38	1.41	1.31	1.02	1.04	1.20	1.28	1.26	1.36	1.70	1.79	1.34
	Ag g/t	2.95	2.95	5.25	4.49	3.69	3.30	2.89	3.22	3.59	4.17	4.83	5.19	5.49	4.28
	Total Mined (kt)	4,237	13,451	24,000	33,000	33,000	33,000	33,000	33,000	33,000	31,691	20,375	10,557	4,367	306,679
Combined	Overburden (kt)	1,985	4,098	7,218	2,818	2,313									
	Non-PAG Waste (kt)	1,292	9,356	14,314	20,402	24,126	24,741	20,982	18,770	16,144	14,465	9,232	3,985	1,260	179,069
	PAG Waste (kt)	893	3,866	12,391	16,642	16,886	15,792	12,739	11,449	12,245	11,845	6,641	3,847	1,444	126,680
	Total Waste (kt)	4,170	17,320	33,924	39,862	43,325	40,533	33,753	30,219	28,389	26,310	15,873	7,832	2,704	324,215
	Mined Ore (kt)	67	526	5,076	9,138	5,675	2,769	2,692	2,781	4,611	5,381	4,503	2,726	1,663	47,607
	Au g/t	0.92	0.94	1.49	1.58	1.86	1.82	1.73	1.20	1.28	1.26	1.36	1.70	1.79	1.52
	Ag g/t	2.95	2.91	4.44	3.69	1.77	1.30	2.01	3.22	3.59	4.17	4.83	5.19	5.49	3.57
	Total Mined (kt)	4,237	17,846	39,000	49,000	49,000	43,302	36,445	33,000	33,000	31,691	20,375	10,557	4,367	371,822

Table 16-15 Mine Production by Destination

		Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Total
Gordon	Overburden (kt)	-	2,343	3,057	-	-	-	-	-	-	-	-	-	-	5,400
	Rock Waste (kt)	-	2,046	11,152	14,369	13,054	8,623	2,596	-	-	-	-	-	-	51,840
	Mine to Mill (kt)	-	-	361	652	1,500	1,396	813	-	-	-	-	-	-	4,722
	Au g/t	-	-	3.17	4.04	3.44	2.63	3.34	-	-	-	-	-	-	3.25
	Ag g/t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine to Stock (kt)	-	6	429	978	1,446	283	4	-	-	-	-	-	-	3,146
	Au g/t	-	2.67	1.21	1.24	1.24	0.89	0.83	-	-	-	-	-	-	1.21
	Ag g/t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Mined (kt)	-	4,395	15,000	16,000	16,000	10,302	3,445	-	-	-	-	-	-	65,142
MacLellan	Overburden (kt)	1,985	1,755	4,161	2,818	2,313	-	-	-	-	-	-	-	-	13,032
	Rock Waste (kt)	2,185	11,176	15,553	22,675	27,958	31,910	31,125	30,219	28,389	26,310	15,873	7,832	2,704	253,909
	Mine to Mill (kt)	-	-	1,585	2,033	812	291	661	1,089	1,997	2,221	2,272	1,452	1,022	15,435
	Au g/t	-	-	2.56	2.92	2.61	2.02	1.83	2.11	2.08	2.02	1.97	2.46	2.43	2.29
	Ag g/t	-	-	7.15	7.28	5.36	4.91	3.85	4.62	4.92	5.87	6.38	6.81	6.87	6.07
	Mine to Stock (kt)	67	521	2,701	5,475	1,917	799	1,214	1,692	2,614	3,160	2,231	1,274	641	24,306
	Au g/t	0.96	1.00	0.68	0.85	0.76	0.65	0.61	0.62	0.66	0.72	0.74	0.84	0.76	0.74
	Ag g/t	7.39	2.35	4.14	3.46	2.98	2.71	2.36	2.31	2.57	2.97	3.25	3.35	3.29	3.14
	Total Mined (kt)	4,237	13,451	24,000	33,000	33,000	33,000	33,000	33,000	33,000	31,691	20,375	10,557	4,367	306,679

16.6 Mine Equipment Selection

The mining equipment selected to meet the required production schedule is conventional mining equipment, with additional support equipment to maintain each site.

Blasthole drilling at MacLellan and Gordon will be completed with a combination of diesel and electric down the hole hammer (DTH) drills with 178 mm bits. These drills provide the capability to drill patterns for 10 m bench heights.

Primary mining at MacLellan will be completed with 23.5 m^3 electric hydraulic shovels and 139 t rigid body trucks. Additional loading support will be provided by a 11.5 m^3 wheel loader and 6.7 m^3 hydraulic excavator when needed. Mining at Gordon consists of four 6.7 m^3 hydraulic excavators loading 63 t rigid body trucks.

The support equipment fleet will be responsible for the usual road, pit, and dump maintenance requirements, but due to the climate conditions expected, will have a larger role in snow removal and water management. Snowplows and additional graders were included in the fleet. In addition, smaller road maintenance equipment is included to keep drainage ditches open and sedimentation ponds functional.

The number of units are determined by the mine schedule and the operating cost estimate for required operating hours. These were balanced over periods of time so if there are fluctuations in the hours from period to period, or year to year, they are distributed for the entire equipment fleet to balance the hours.

Replacement times for the equipment are average values from AGP's experience. Options around rebuilds and recertification of equipment like track dozers are not considered, nor is used equipment, although that should be considered during the purchase of the mine fleet.

The balancing of equipment units based on operating hours is completed for each major piece of mine equipment. The smaller equipment was based on number of units required, based on operational experience. This includes such things as pickup trucks (dependent on the field crews), lighting plants, mechanics trucks, etc.

The most significant pieces of major mine equipment are the haulage trucks. At MacLellan, the peak of mining is Year 5 and the haulage fleet is 16 units of 139 t size which are necessary to maintain mine production. The maximum hours per truck per year are set at 6,000. There are periods where the maximum hours per unit are below what the maximum possible can be. In those cases, the hours required are distributed evenly across the number of trucks within the fleet.

The other major mine equipment is determined in the same manner. Therefore, in some instances the smaller production loaders have a longer period of life (same number of hours between replacements) due to the sharing of hours with the other units in the fleet.

The support equipment is usually replaced on a number of year's basis. For example, pickup trucks are replaced every four years, with the older units possibly being passed down to other departments on the mine site, but for capital cost estimating new units are considered for mine operations, engineering, and geology.

The timing of equipment purchases by mining area, initial and sustaining, are shown in Table 16-16, Table 16-17, Table 16-18, and Table 16-19.

Table 16-16 MacLellan – Major Equipment Fleet Size

Equipment	Unit Life (hrs)	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11+
Diesel Drill (178 mm)	25,000		2	3	3	3	3	3	3	3	3	3	3	-
Electric Drill (178 mm)	45,000		2	2	2	2	2	2	2	2	2	2	2	-
Hydraulic Shovel (22 m^3)	65,000		1	2	2	2	2	2	2	2	2	2	2	2
Loader (11.5 m^3)	35,000		1	1	1	1	1	1	1	1	1	1	1	-
Excavator (6.7 m^3)	35,000		1	1	1	2	2	2	2	2	2	2	2	1
Truck (139 t)	65,000		5	9	12	13	13	16	16	16	16	16	16	16
Truck (63 t)	50,000		-	-	-	-	-	-	-	-	-	-	-	-
Truck (40 t)	7 years		2	2	2	2	2	2	2	2	2	2	2	2
Crusher Loader (11 m^3)	35,000		1	1	1	1	1	1	1	1	1	1	1	1
Transfer Loader (7.5 m^3)	25,000		-	-	-	-	-	-	-	-	-	-	-	-
Tracked Dozer	35,000		4	5	5	5	5	5	5	5	5	5	5	2
Grader	20,000		2	2	2	2	2	2	2	2	2	2	2	2

Table 16-17 MacLellan – Major Equipment Purchases

Equipment	Unit Life (hrs)	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11
Diesel Drill (178 mm)	25,000		2	1										
Electric Drill (178 mm)	45,000		2											
Hydraulic Shovel (22 m^3)	65,000		1	1										
Loader (11 m^3)	35,000		1									1		
Excavator (6.7 m^3)	35,000		1			1								
Truck (139 t)	65,000		5	4	3	1		3						
Truck (63 t)	50,000													
Truck (40 t)	7 years		2											
Crusher Loader (11 m^3)	35,000		1											
Transfer Loader (7.5 m^3)	25,000													
Tracked Dozer	35,000		4	1									2	
Grader	20,000		2						1	1				

Table 16-18 Gordon – Major Equipment Fleet size

Equipment	Unit Life (hrs)	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11+
Diesel Drill (178 mm)	25,000		2	2	2	2	2	2	2	-	-			
Electric Drill (178 mm)	45,000		-	-	-	-	-	-	-	-	-			
Hydraulic Shovel (22 m^3)	65,000		-	-	-	-	-	-	-	-	-			
Loader (11 m^3)	35,000		-	-	-	-	-	-	-	-	-			
Excavator (6.7 m^3)	35,000		2	4	4	4	4	4	4	2	2			
Truck (139 t)	65,000		-	-	-	-	-	-	-	-	-			
Truck (63 t)	50,000		4	8	12	12	12	12	12	4	4			
Truck (40 t)	7 years		1	1	1	1	1	1	1	1	1			
Crusher Loader (11 m^3)	35,000		-	-	-	-	-	-	-	-	-			
Transfer Loader (7.5 m^3)	25,000		1	1	1	1	1	1	1	1	1			
Tracked Dozer	35,000		3	4	4	4	4	4	4	2	2			
Grader	20,000		2	2	2	2	2	2	2	1	1			

Table 16-19 Gordon – Major Equipment Purchases

Equipment	Unit Life (hrs)	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11+
Diesel Drill (178 mm)	25,000		2											
Electric Drill (178 mm)	45,000													
Hydraulic Shovel (22 m^3)	65,000													
Loader (11.5 m^3)	35,000													
Excavator (6.7 m^3)	35,000		2	2										
Truck (139 t)	65,000													
Truck (63 t)	50,000		4	4	4									
Truck (40 t)	7 years		1											
Crusher Loader (11 m^3)	35,000													
Transfer Loader (7.5 m^3)	25,000		1											
Tracked Dozer	35,000		3	1										
Grader	20,000		2											

A rock crusher is purchased for Year -2 for use at MacLellan. It will be employed by the construction team to generate crushed material during construction. In the mine production phase, the mine operations team will operate the crusher. Material produced at MacLellan will also be used at the Gordon site utilizing the backhaul from the highway ore haul to MacLellan. The crusher will be operated by the road crew and generate material for tailings filters, road construction, road maintenance, and stemming for blastholes.

16.6.1 Pre-Production Mining

Mining at MacLellan starts in Year -2 but is undertaken by contractors involved in the development of the project site. They will prepare the mine area for the larger proposed equipment for use at MacLellan. Those costs are covered in the earthwork costs in other areas.

The mine operations team will start mining in Year -1 at MacLellan and are scheduled to move 8.3 Mt of total material comprised of 8.1 Mt of waste for road widening, dump development, and tailings construction. The remaining 0.2 Mt of ore will be stockpiled beside the primary crusher. All costs associated with the mining of this material are capitalized. In addition, the contractor will mine 4.8 Mt of waste and 0.3 Mt of ore in Year -1.

The Gordon pit is developed solely by the mine operations team. Mining will be completed with the smaller and separate Gordon mine equipment fleet. In Year -1 a total of 4.4 Mt of material will be mined comprised of 4.4 Mt of waste to the waste dump and surface infrastructure construction. Ore to the stockpile is 6,000 t of the overall total mining. All costs for this work are capitalized.

16.6.2 Mine Equipment

Spare buckets for loading units or beds for the haulage trucks are accounted for as a line item in the capital cost estimate. A spare bucket per two shovels is included. Truck bed spares are based on four trucks per spare bed.

Initial drill purchases at MacLellan are diesel powered. Drills purchased later are electrically powered. This allows the mine to advance while the project is being electrified. The diesel drills also have more mobility in areas where this is required such as preshear hole drilling.

The hydraulic shovels at MacLellan will have 22 m^3 buckets to load the 139 tonne haul trucks efficiently. Supporting the loading shovels is an 11.5 m^3 front end loader.

At the primary crusher, another 11.5 m^3 front end loader will be maintaining the crusher full. It will also assist with stockpiling and tramming of Gordon mill feed material as the ore haulage team delivers it to MacLellan.

In the pit at MacLellan will be two 6.5 m^3 excavators to help with ore control and working around old mine workings. Additional support equipment includes track dozers, graders, and water trucks.

A separate road/pump crew will have smaller loaders, compactors, and dump trucks at their disposal. Beyond ensuring that ditches, berms, and settling ponds are maintained in proper repair, they will also handle all pit dewatering activities and seasonal crusher operation. A separate crew will be responsible for each area.

The Gordon pit mining equipment will have similar support equipment but has smaller primary loading and hauling tools than those employed at MacLellan. The loading will be completed by four 6. 7 m^3 excavators loading a fleet of twelve 63 tonne trucks. The drills will be smaller, more mobile units like the unit in use at MacLellan for preshear and backup drilling.

16.6.3 Dewatering Infrastructure

Dewatering infrastructure needs vary by pit area due to their respective geometries.

The MacLellan pit will deal with in pit seepage and pumping from old mine workings. These old workings will initially act as sumps and conduits for mine dewatering. The dewatering cost estimate includes the electric pumps and piping necessary to pump 0.6 Mm^3/yr rising to 1.2 Mm^3/yr of water from the pit. The system will have an in-pit component to lift the water to the pit rim, then a horizontal component to send the water to the settling ponds. Regular replacement of pumps and pipes have been included in the capital cost estimate.

Horizontal drainholes are part of the dewatering strategy in the pits. These would be drilled from the working bench and assist in reducing pore pressure. Annual campaigns of horizontal drilling has been included in the capital cost for each pit area. These holes represent the largest cost associated with the MacLellan dewatering cost.

The Gordon pit dewatering cost considers only the pit portion of the mine, not the perimeter well system. In a similar manner to MacLellan, the Gordon dewatering system will utilize in-pit pumps lifting the water to the pit rim and then pumps to push the water to the settling ponds horizontally. The pumps will be diesel powered at Gordon as electrical power has not been brought to the site.

The Gordon pit pumping requirements range from 0.9 Mm^3/year to 1.2 Mm^3/year.

16.6.4 Labour

Labour cost estimates were based on discussion with Alamos and their other operating and recent salary surveys at mines in Manitoba. Shift schedules are 12-hour shifts with a 4 days on/4 days off schedule. The burden rate varies between 25% and 65% depending on position and has been applied to all the rates. Mine positions are shown in Table 16-20. The Gordon pit staff will share the technical team with MacLellan for various functions including mine engineering, maintenance, and operations.

Table 16-20 Open Pit Mine Staffing Requirements (Year 4)

Staff Position	MacLellan Employees	Gordon Employees	Total Employees
Maintenance Superintendent	1	-	1
Maintenance General Supervisor	1	-	1
Maintenance Shift Supervisor	4	4	8
Maintenance Planner/Mechanical Engineer	2	-	2
Administrative Assistant	1	-	1
Subtotal	**9**	**4**	**13**
Mine Operations Superintendent	1	-	1
Mine Operations General Supervisor	1	-	1
Mine Shift Supervisor	4	4	8
Drill and Blast Supervisor	2	-	2
Training Supervisor	2	-	2
Administrative Assistant	1	-	1
Subtotal	**11**	**4**	**15**
Technical Services Superintendent	1	-	1
Chief Engineer	1	-	1
Senior Engineer (LTP)	1	-	1
Intermediate Mining Engineer (STP)	2	-	2
Junior Mining Engineer (D&B)	2	2	4
Mining Technician (D&B)	-	2	2
Senior Geotechnical Engineer	1	-	1
Dispatch Engineer	2	-	2
Dispatch Technician	4	-	4
Senior Surveyor/Mining Technician	2	2	4
Surveyor	2	2	4
Subtotal	**18**	**8**	**26**
Chief Geologist	1	-	1
Senior Geologist	1	2	3
Production Geologist	2	-	2
Grade Control Geologist/Modeler	2	-	2
Grade Control Field Technician	4	-	4
Subtotal	**10**	**2**	**12**
Total Mine Staff	**48**	**18**	**66**

The mine staffing levels remain consistent for the mine life at MacLellan after the initial recruitment in the pre-production period. In Year 10 the positions are trimmed as mining slows and the mine is in stockpile recovery mode.

The Gordon mine also remains consistent until Year 5 then also drops off as the mining ceases and stockpile rehandle is completed.

Hourly employee labour force levels in the mine operations and maintenance departments fluctuate with production requirement. A snapshot of the labour makeup for Year 4 is shown in Table 16-21.

Table 16-21 Hourly Employee Requirements (Year 4)

Hourly Position	MacLellan Employees	Gordon Employees	Total Employees
General/Substitute Equipment Operator	8	-	8
Road/Pump Crew	4	8	12
Mobile Crusher Operator	8	4	12
General Subtotal	**20**	**12**	**32**
Driller	20	8	28
Blaster	2	2	4
Blasters Helper	2	2	4
Loader Operator	4	-	4
Hydraulic Shovel/Excavator Operator	8	12	20
Haul Truck Driver	48	65	113
Dozer Operator	12	17	29
Grader Operator	6	7	13
Transfer Loader Operator	4	4	8
Snowplow/Water Truck	8	6	14
Operations Subtotal	**114**	**123**	**237**
Heavy Duty Mechanic	22	24	46
Light Duty Mechanic	4	-	4
Welder	14	13	27
Electrician	14	2	16
Apprentice	6	7	13
Tire Maintenance	4	-	4
Lube Truck Driver	4	4	8
Maintenance Subtotal	**68**	**50**	**118**
Total Mine Staff	**202**	**185**	**387**

Labour costs are based on an owner operated scenario. The mine is responsible for the maintenance of the equipment with its own employees.

Over seeing all the mine operations, engineering, and geology functions is a Mine Operations Superintendent. This person would have the Mine Maintenance Superintendent, Mine General Supervisor, and Technical Superintendent reporting to them. The Mine Operations Superintendent would report to the Mine General Manager.

The Mine General Supervisor would have the Shift Supervisors report directly to them from each of the pit areas.

The mines have four mine operations crews, each with a Mine Shift Supervisor who is responsible for the crew which includes a road crew responsible for roads, drainage, and pumping around the mines. The Training Supervisor would also be a backup Mine Shift Supervisor.

The Chief Engineer reports to the Technical Services Superintendent but has one Senior Engineer, two Intermediate Engineers and four Junior Engineers reporting to them. Two of the Junior Engineers are responsible for the Gordon Pit. The Junior Engineers will be responsible for drill and blast design. The Intermediate Engineers will have the short range planning role with the Senior Engineer coordinating the long range mine plans. The Geotechnical Engineer would cover all aspects of the wall slopes and waste dumps and share the surveyors/mine technicians with the short range team. The surveyors/mine technicians will assist in the field with staking, surveying, and sample collection with the geology group.

In the Geology department, there is one Senior Geologist reporting to the Chief Geologist. There are also two Grade Control Geologists/Modellers; one will be in short range and grade control drilling, and the other will be in long range/reserves. There are a further two Production Geologists to assist in the field. Four grade control field technicians will mark off ore in the field and assist as required with sampling.

The Mine Maintenance Superintendent has the Maintenance General Supervisor reporting to them. Eight Mine Maintenance Shift Supervisor will report to the Maintenance General Supervisor, and they will cover both pit areas. As well, there are two Maintenance Planners/Mechanical Engineers and an Administrative Assistant.

The hourly labour force includes positions for the light duty mechanic, tire changing and lube truck drivers. These positions all report to a Maintenance Supervisor. There are generally one of each position per crew at MacLellan and one lube truck driver per crew at Gordon. Other general labour includes apprentices.

The drilling labour force is based on one operator per drill, per crew while operating. This, on average, is five drillers per crew at MacLellan and two drillers per crew at Gordon.

Shovel and loader operators average twelve at MacLellan and sixteen at Gordon. Gordon tapers off from Year 3 until Year 5 when the pit is complete. MacLellan maintains its average until Year 10 then tapers off as mining is completed. Haulage truck drivers peak at 68 in Year 8 at MacLellan and then taper off to the end of the mine life. At Gordon the number of truck drivers peaks at 81 in Year 3 then drops until the end of the mine life.

Maintenance factors are used to determine the number of heavy-duty mechanics, welders and electricians required and are based on the number of drill operators, shovel operators, truck drivers, etc. Heavy duty mechanics work out to 0.20 mechanics required for each drill operator. Welders are 0.20 per drill operator and electricians are 0.1 per drill operator. This method of estimating maintenance requirements is used for each category of the mine operating cost and is summarized in Table 16-22.

Table 16-22 Maintenance Labour Factors (Maintenance per Operator)

Maintenance Job Class	Drilling	Loading	Hauling	Mine Operations Support
Heavy Duty Mechanic	0.20	0.20	0.20	0.20
Welder	0.20	0.20	0.20	0.20
Electrician	0.10	1.00	-	-
Apprentice	-	-	-	0.20

The number of loader, truck, and support equipment operators is estimated using the projected equipment operating hours. The maximum number of employees is four per unit to match the mine crews.

16.6.5 Equipment

Drilling in the open pit will be performed using conventional down the hole (DTH) blasthole rigs with 178-mm bits. The pattern size was the same for ore and waste and patterns are blasted with recognition that the rock is competent, and finer material improves productivity and reduces maintenance costs as well as improved plant performance. The pattern size for Gordon is slightly smaller than MacLellan due to the smaller loading units and trucks. The drill pattern parameters are shown in Table 16-23.

Table 16-23 Drill Pattern Specifications

Specification	Unit	Ore/Waste - MacLellan	Ore/Waste - Gordon
Bench Height	m	10	10
Sub-Drill	m	0.9	0.9
Blasthole Diameter	mm	178	178
Pattern Spacing – Staggered	m	5.4	5.3
Pattern Burden – Staggered	m	4.7	4.6
Hole Depth	m	10.6	10.9

The sub-drill was included to allow for caving of the holes in the weaker zones, avoiding re-drilling of the holes, or short holes that would affect bench floor conditions and thereby increase tire and overall maintenance costs.

The drill productivity was estimated as shown in Table 16-24 below. The smaller drill needs to add steel for the depth but is more mobile and suited for pre-shear holes and horizontal drainholes as required.

Table 16-24 Drill Productivity Calculation

Drill Activity	Unit	Small Drill	Large Drill
Pure Penetration Rate	m/min	0.55	0.55
Hole Depth	m	10.9	10.9
Drill Time	min	19.82	19.82
Move, Spot, and Collar Blasthole	min	3.00	3.00
Level Drill	min	0.50	0.50
Add Steel	min	0.50	0.00
Pull Drill Rods	min	1.50	1.00
Total Setup/Breakdown Time	min	5.50	4.50
Total Drill Time per Hole	min	25.3	24.3
Drill Productivity	m/h	25.8	26.9

An emulsion product will be used for blasting to provide water protection. With the wet conditions expected, it is believed that a water-resistant explosive will be required. The powder factors used in the explosives' calculation are shown in Table 16-25.

Table 16-25 Design Powder Factors

	Unit	Ore/Waste - MacLellan	Ore/Waste - Gordon
Powder Factor	kg/m^3	0.90	0.94
Powder Factor	kg/t	0.31	0.30

The blasting cost is estimated using quotations from a local vendor. The mine is responsible for guiding the loading process, including placement of boosters/Nonels, and stemming and firing the shot.

Total monthly cost in the service of delivering the explosives to the hole is $252,000/month for the vendor's pickup trucks, pumps, and labour is also applied and covers the cost of the explosives plant. The explosives vendor also leases the explosives and accessories magazines to Lynn Lake as part of that cost.

Ore and waste loading costs were estimated using the front-end loaders and hydraulic shovels as the only loading units. The shovels are the primary loaders for ore and waste, with the front-end loaders being used as backup. The average percentage of each material type that the various loading units at MacLellan are responsible for is shown in Table 16-26. At Gordon, the loading will be completed solely with hydraulic excavators.

Table 16-26 Loading Parameters – Year 4

	Unit	Front-End Loader	Hydraulic Shovel
Bucket Capacity	m^3	11	22
Waste Tonnage Loaded	%	12	88
Ore Tonnage Mined	%	11	89
Bucket Fill Factor	%	95	84
Cycle Time	seconds	45	38
Trucks Present at the Loading Unit	%	90	90
Loading Time	minutes	5.2	2.6

The trucks present at the loading unit refers to the percentage of time a truck is available to be loaded. To maximize truck productivity and reduce operating costs, it is more efficient to slightly under-truck the loader or shovel. The single largest operating cost item is haulage and minimizing this cost by maximizing truck productivity is crucial to lower operating costs. The value of 90% comes from the idle time shovels typically encounter due to a lack of trucks.

Haulage profiles were determined for each pit phase for the primary crusher or the waste rock management facility destinations. Cycle times were generated for the appropriate period tonnage by destination and phase to estimate the haulage costs. Maximum speed on trucks is limited to 50 km/h for tire life and safety reasons. Calculation speeds for various segments are shown in Table 16-27.

Table 16-27 Haulage Cycle Times – By Pit

	Flat (0%) on Surface	Flat (0%) Inpit, Crusher, Dump	Slope Up (8%)	Slope Up (10%)	Slope Down (8%)	Slope Down (10%)	Acceleration or Deceleration
MacLellan							
Loaded (km/h)	50	40	22.5	13	16	12	20
Empty (km/h)	50	40	43	28	37	28	20
Gordon							
Loaded (km/h)	50	40	20	18	22	15	20
Empty (km/h)	50	40	37	37	45	23	20

Support equipment hours and costs are determined using the percentages shown in Table 16-28.

Table 16-28 Support Equipment Operating Factors

Mine Equipment	Factor	Factor Units
Track Dozer	30%	Of haulage hours to a maximum of 5 dozers
Grader	15%	Of haulage hours to a maximum of 2 graders
Crusher Loader	40%	Of loading hours to maximum of 1 loader
Support Backhoe	40%	Of loading hours to maximum of 2 backhoe
Water Truck	10%	Of haulage hours to a maximum of 2 trucks
Lube/Fuel Truck	8	h/d
Mechanic's Truck	14	h/d
Welding Truck	8	h/d
Blasting Loader	8	h/d
Blaster's Truck	8	h/d
Integrated Tool Carrier	4	h/d
Compactor	2	h/d
Lighting Plants	12	h/d
Pickup Trucks	8	h/d
Dump Truck – 20 ton	4	h/d

These percentages resulted in the need for five track dozers, two graders, and two support backhoes. Part of this is due to the spread-out nature of the pit and dump areas which landlocks some of the equipment for periods of time. Their tasks include cleanup of the loader faces, roads, dumps, and blast patterns. The graders will maintain the ore and waste haul routes. In addition, water trucks have the responsibility for patrolling the haul roads and controlling fugitive dust for safety and environmental reasons. The support backhoes will assist on dilution control on ore/waste separation especially around the old mine workings. A small backhoe will be responsible for cleaning out sedimentation ponds and water ditch repairs together with the two small dump trucks. It may be equipped with a rock hammer to reduce oversize to manageable levels in the pit or at the primary crusher.

These hours are applied to the individual operating costs for each piece of equipment. Many of these units are minor support equipment so no direct labour force is allocated to them due to their function.

16.6.6 Grade Control

Grade control will be completed with a separate fleet of reverse circulation (RC) drill rigs. They will drill the deposit off on a 10 m x 5 m pattern in areas of known mineralization, taking samples each metre. The holes will be inclined at 60 degrees.

In areas of low-grade mineralization or waste the pattern spacing will be 20 m x 10 m with sampling over 5 m. These holes will be used to delineate undiscovered veinlets or pockets of mineralization. The wider pattern is expected to be used 25% of the material to be mined.

Blast hole sampling will be evaluated for PAG delineation during operations. The grade control drilling is expected to provide addition information for the void delineation of existing stopes and underground development drifts.

Over the life of the mine, a total of 286,000 m of drilling are expected to be completed for grade control work at MacLellan and 54,000 m at Gordon.

16.6.7 Pit Dewatering

Pit dewatering is an important part of mining at both MacLellan and Gordon. Dewatered slopes may allow a reduction in the strip ratio by permitting steeper inter-ramp angles that would also be inherently safer.

At MacLellan it is estimated that 1.2 Mm^3/year on average will need to be pumped from within the pit. From there, it will need to be pumped to the required discharge point near the settling ponds. Storm events have the potential to impact mining operations, and additional pump capacity is included in the estimate as it may be required for a short period of time to recover from one of these storm events. The capital cost estimate has considered this in the calculation for the number of pumps required on site to handle such an event. In addition, the stockpiles at MacLellan should ensure the process facility has sufficient feed material during any potential unavailability of ore from the pit.

The dewatering system includes the pumps, sumps, and pipelines responsible for moving water from the pit to the discharge points. Labour for this is already included in the General and Mine Engineering category of the mine operating cost. The mines have a dedicated pump crew.

Additional dewatering in the form of horizontal drain holes is also part of the dewatering capital costs. These holes will be drilled in annual campaigns and capitalized. The design concept is a series of holes 50 m in length, angled up slightly and drilled into the highwalls. They will allow the water behind the wall to drain freely and prevent pore water pressure buildup particularly during freezing conditions.

16.7 Highway Haulage

The haulage of ore from the Gordon site to the process facility at MacLellan will utilize 43 t B-train side dump trailers. Total one-way haul distance is 53 km.

Highway haulage will be an owner activity.

16.8 End of Period Maps

Plans maps of the annual end of period positions for the pit of the waste dumps are shown in Figure 16-17 to Figure 16-35.

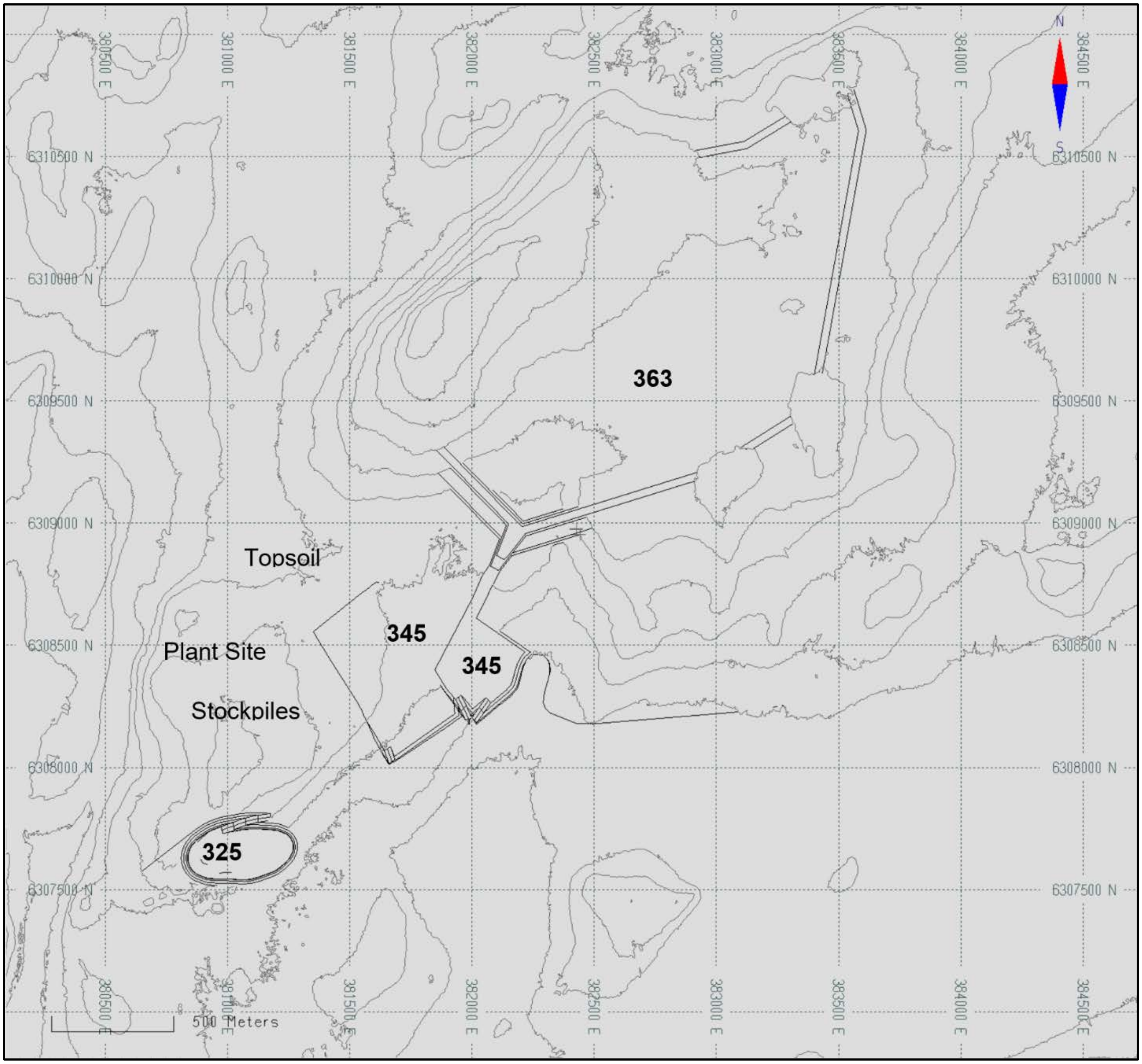


Figure 16-17 MacLellan Pre-production Period -2

Source: AGP (2023)

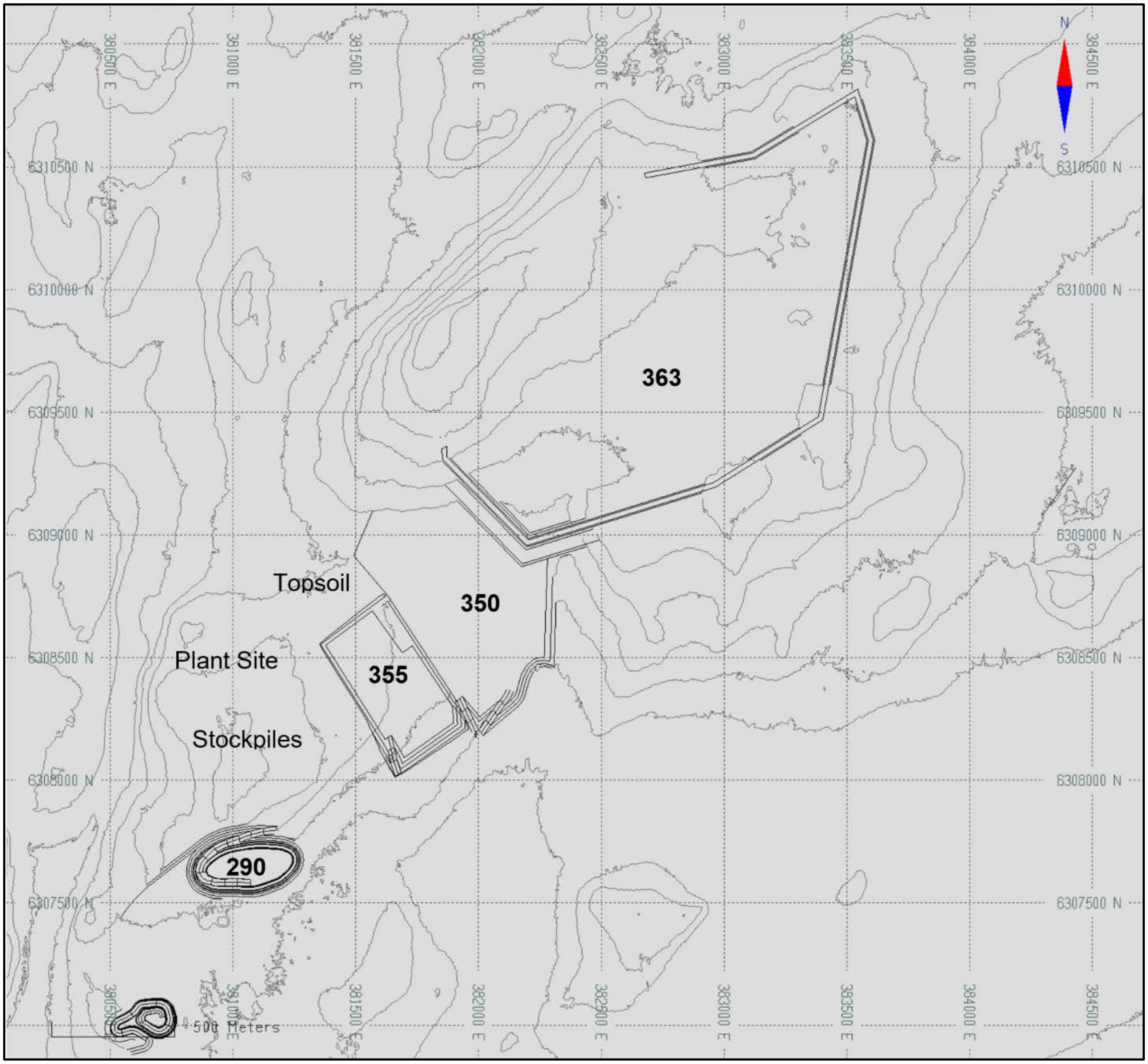


Figure 16-18 MacLellan Pre-production Period -1

Source: AGP (2023)

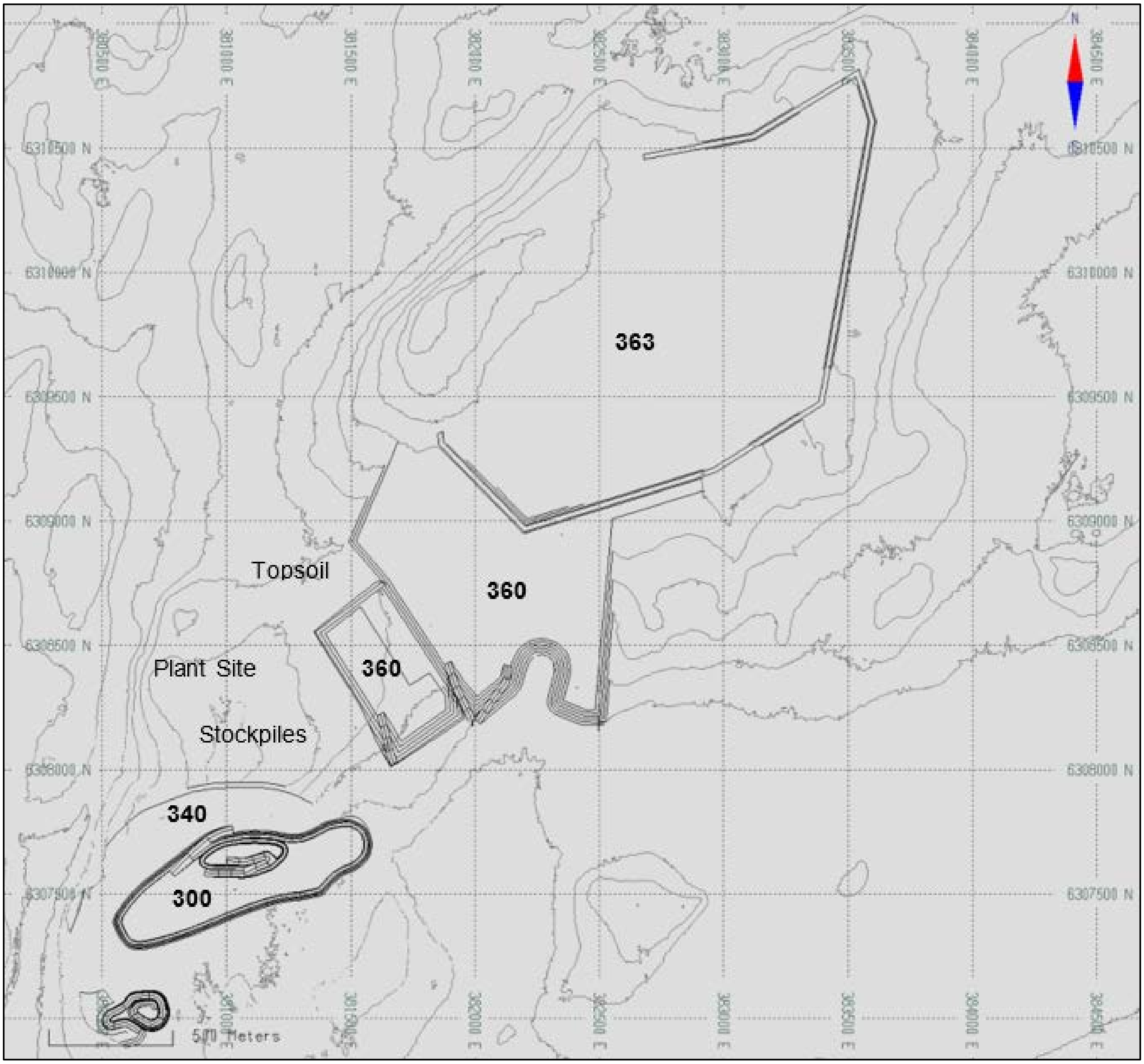


Figure 16-19 MacLellan Year 1

Source: AGP (2023)

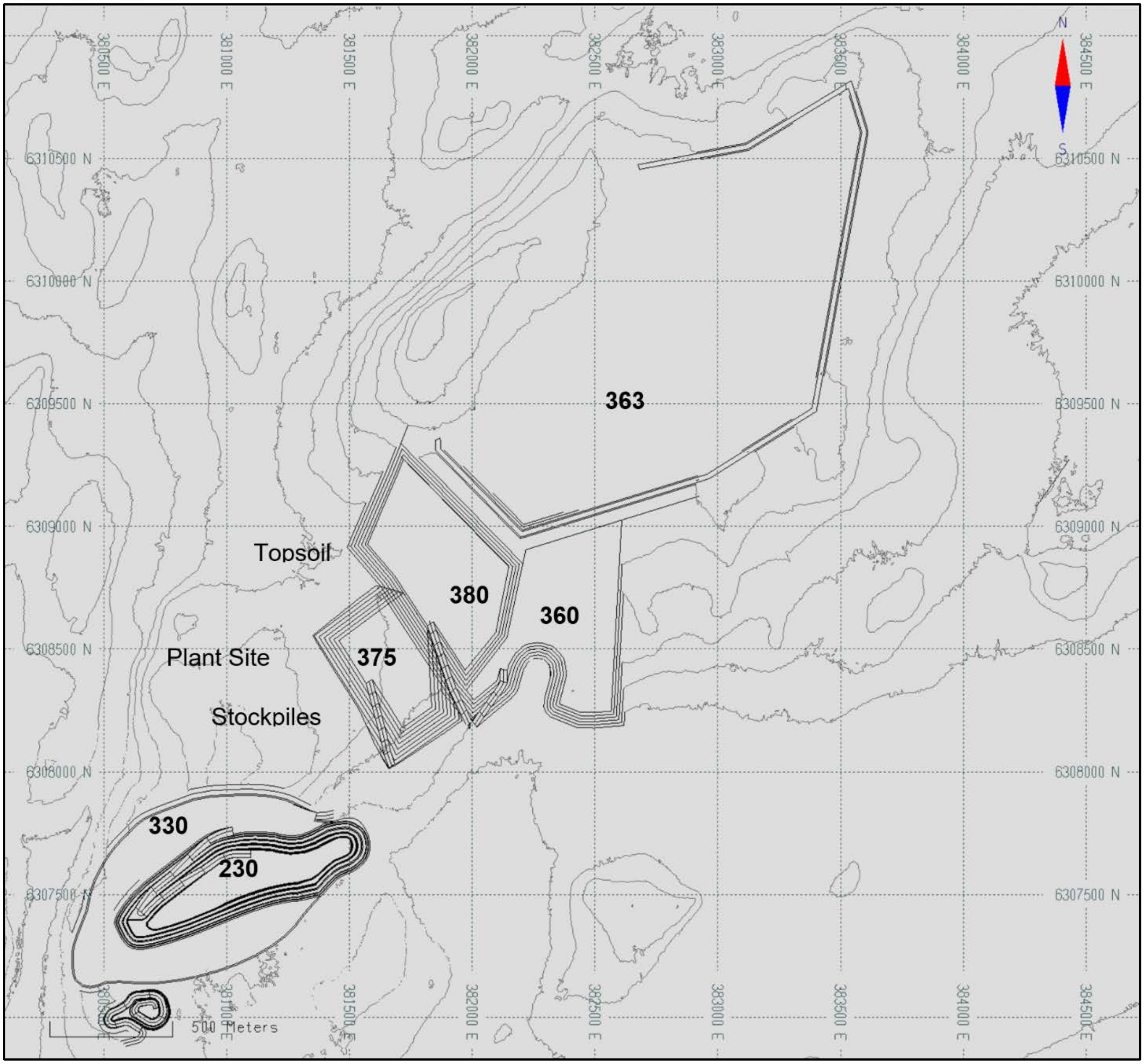


Figure 16-20 MacLellan Year 2

Source: AGP (2023)

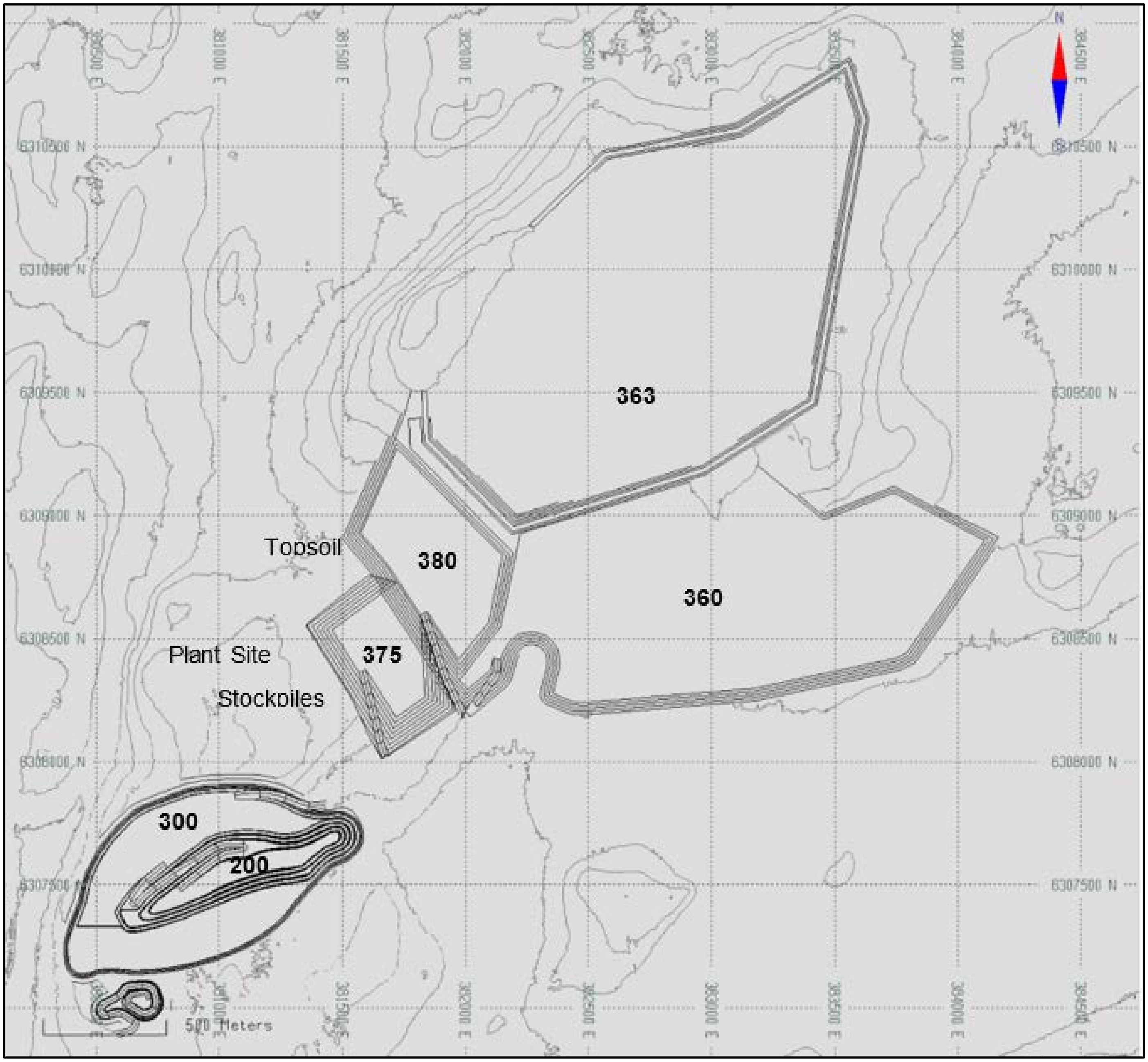


Figure 16-21 MacLellan Year 3

Source: AGP (2023)

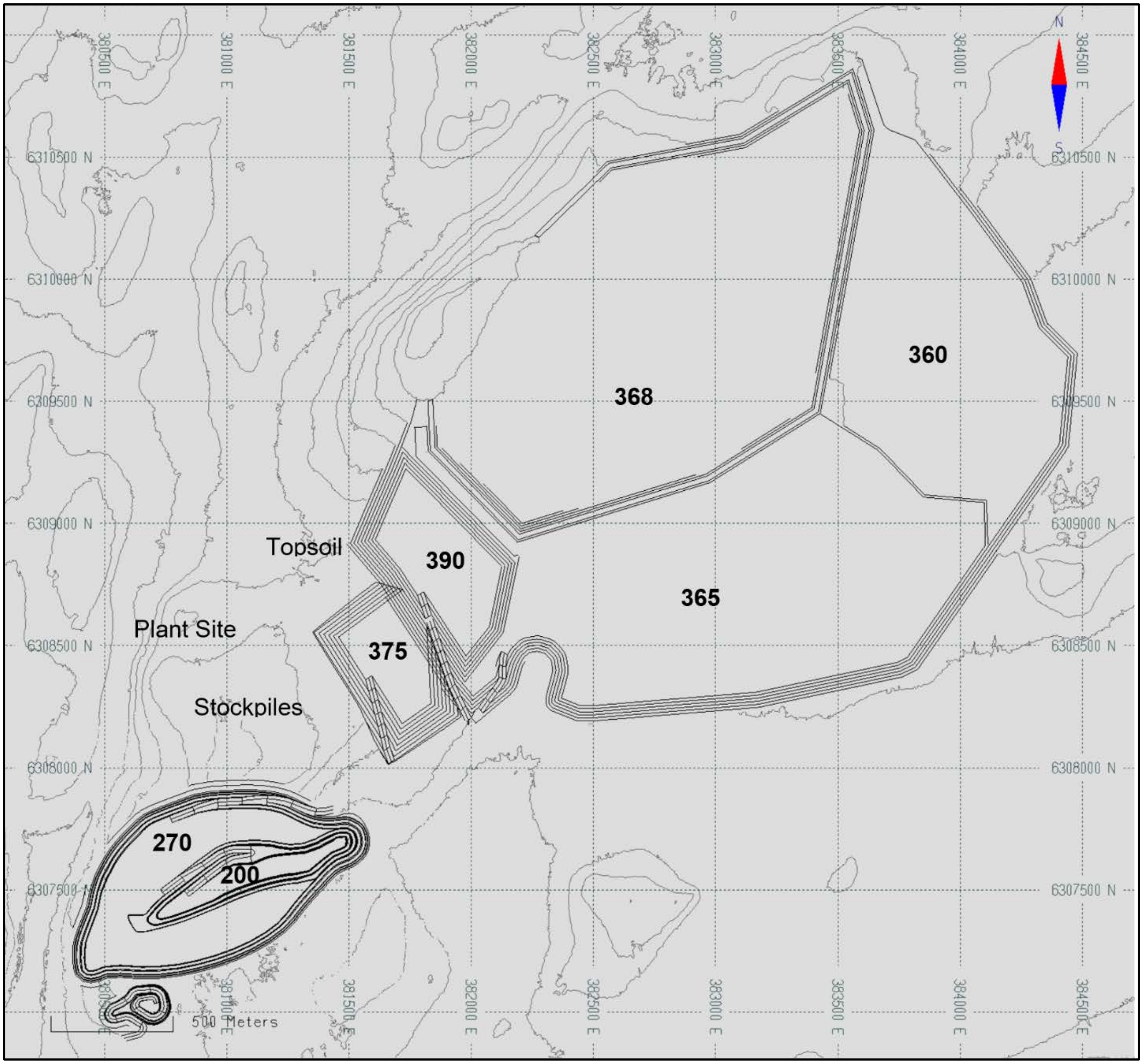


Figure 16-22 MacLellan Year 4

Source: AGP (2023)

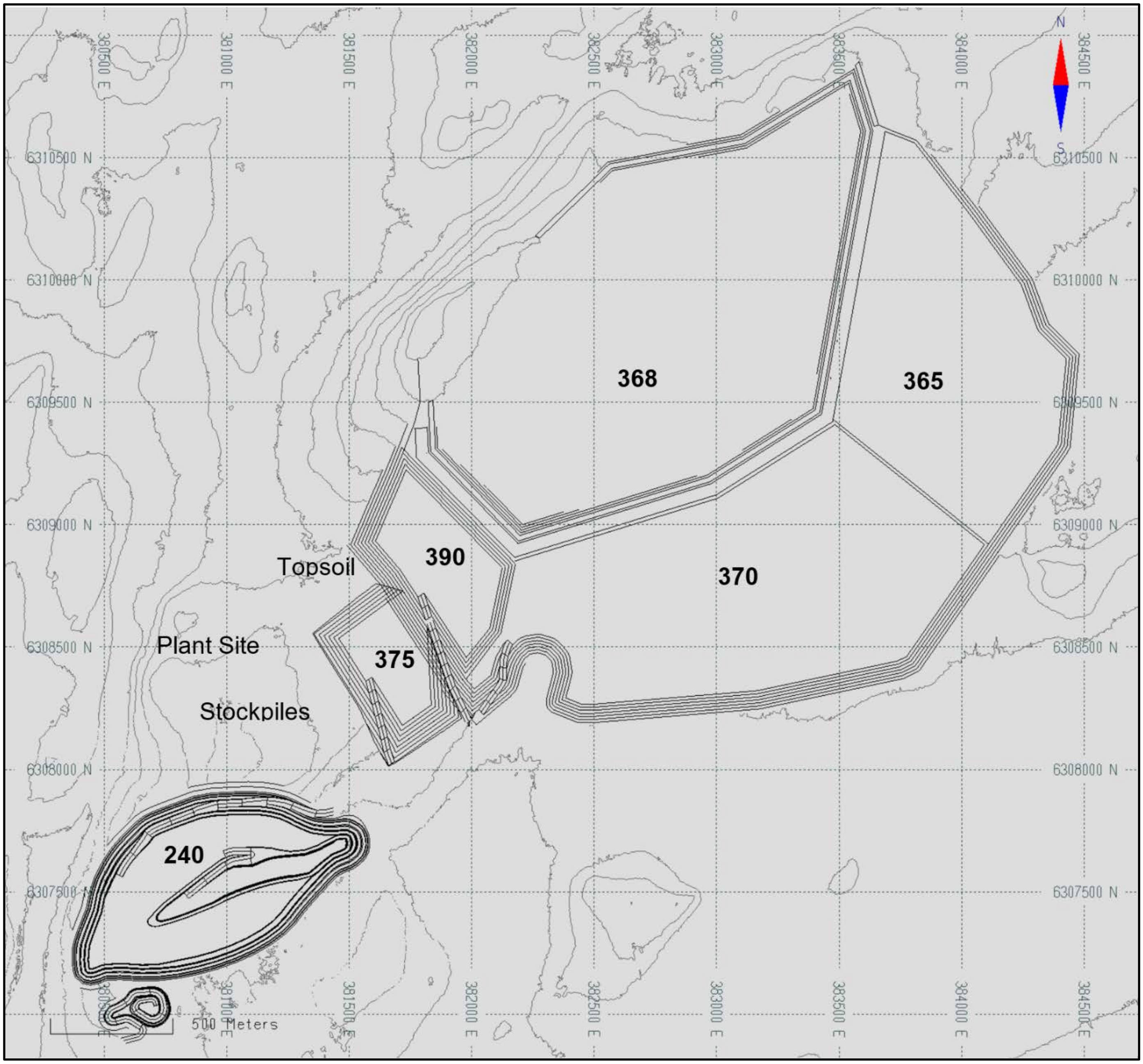


Figure 16-23 MacLellan Year 5

Source: AGP (2023)

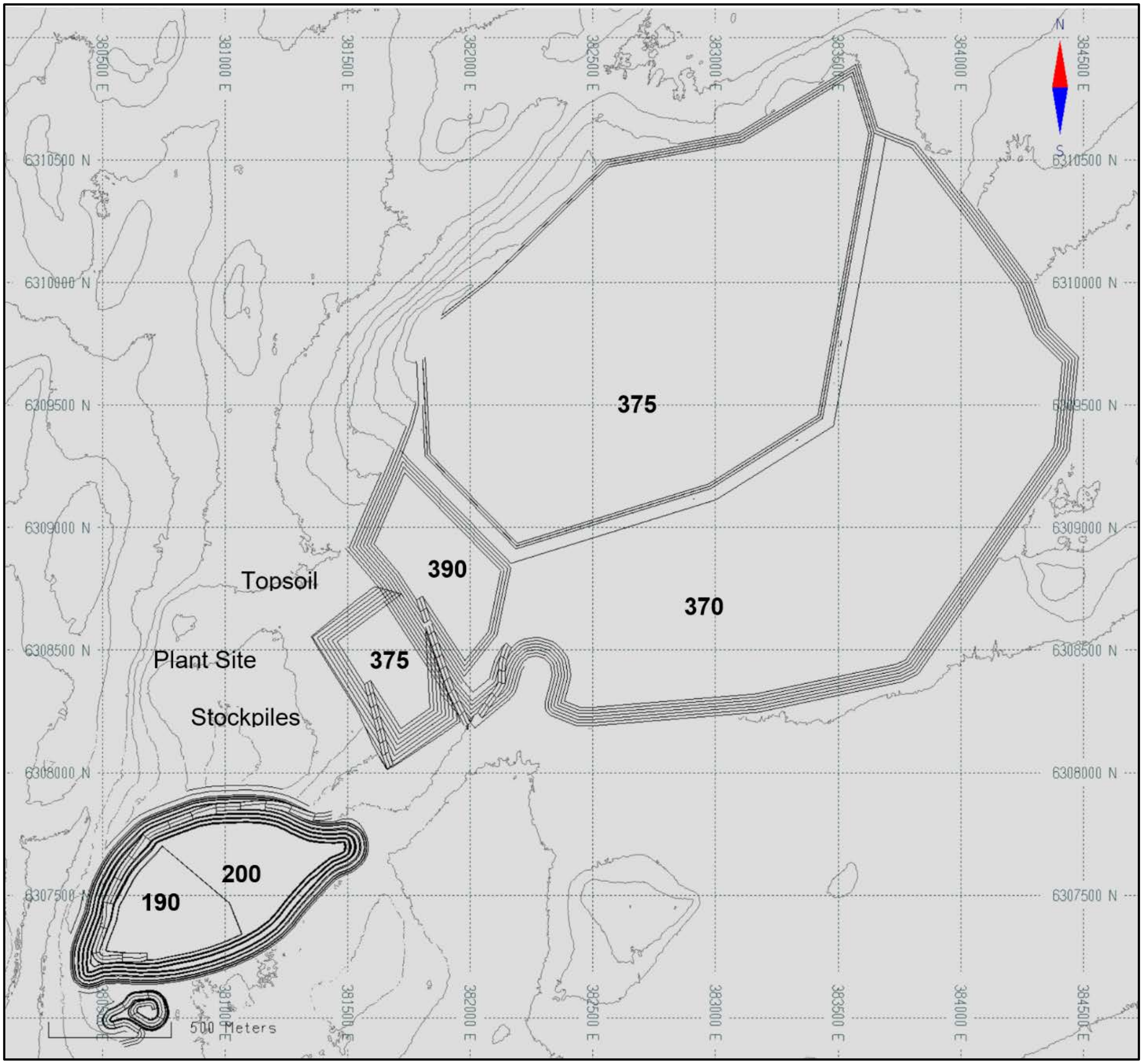


Figure 16-24 MacLellan Year 6

Source: AGP (2023)

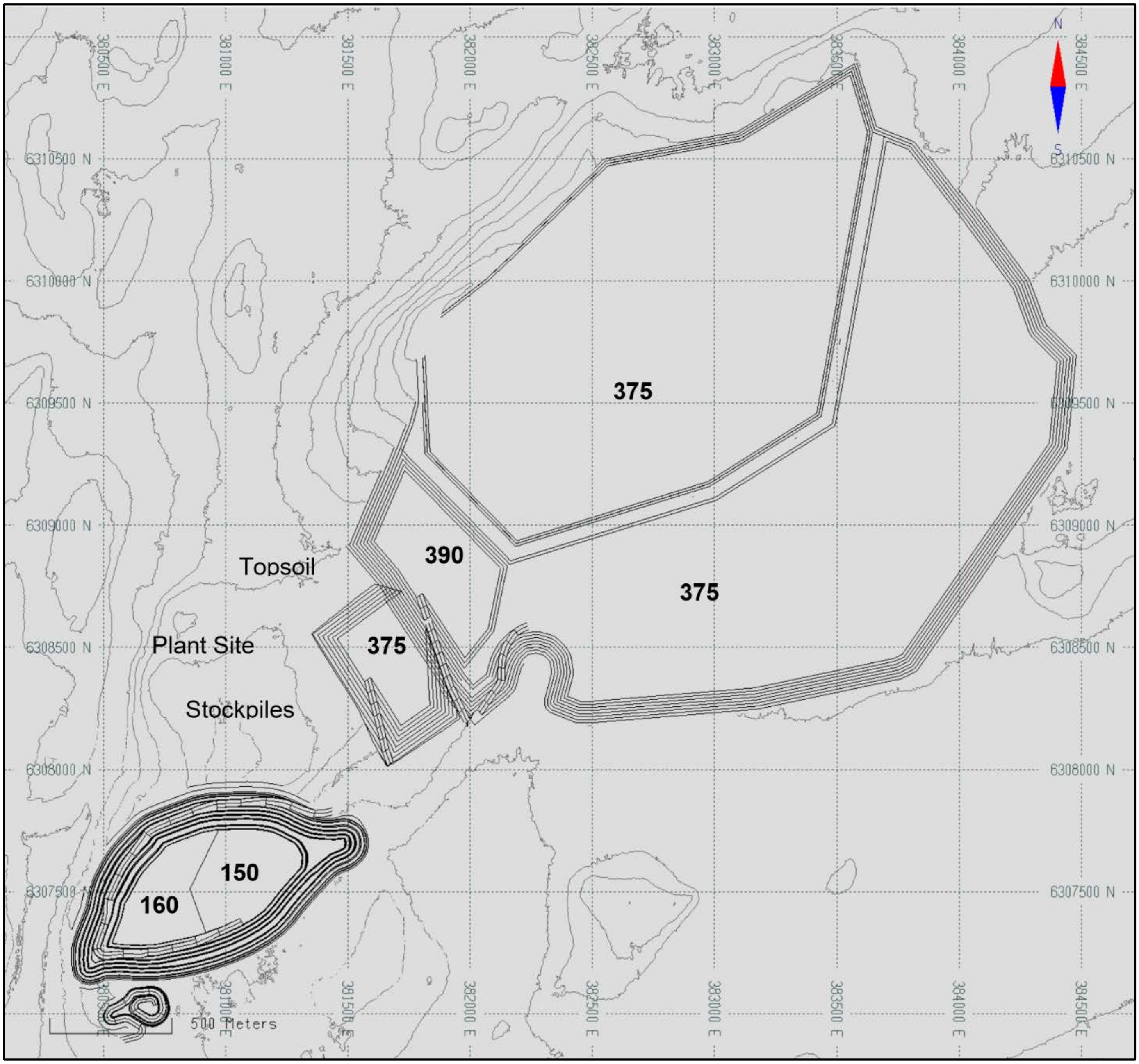


Figure 16-25 MacLellan Year 7

Source: AGP (2023)

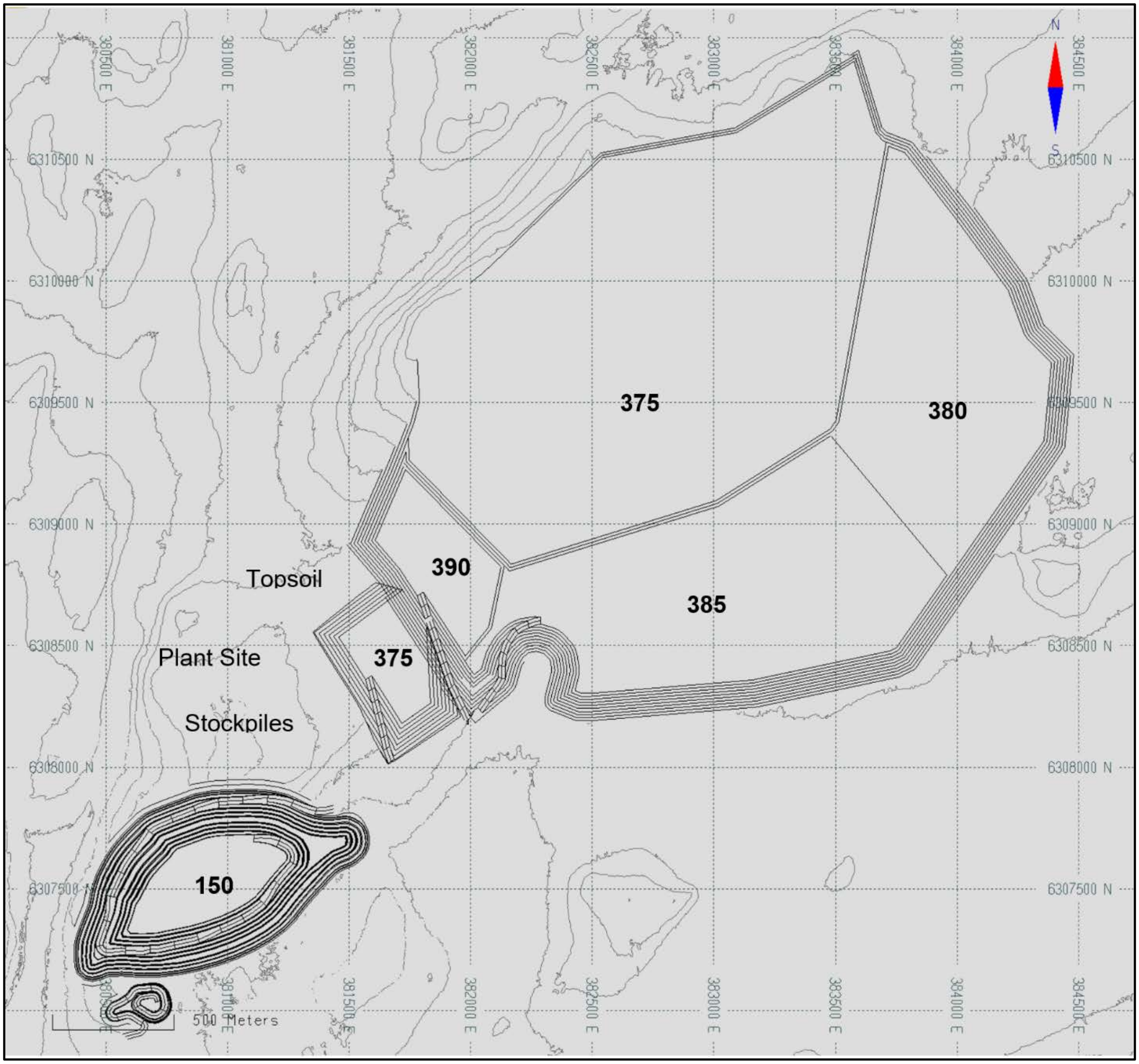


Figure 16-26 MacLellan Year 8

Source: AGP (2023)

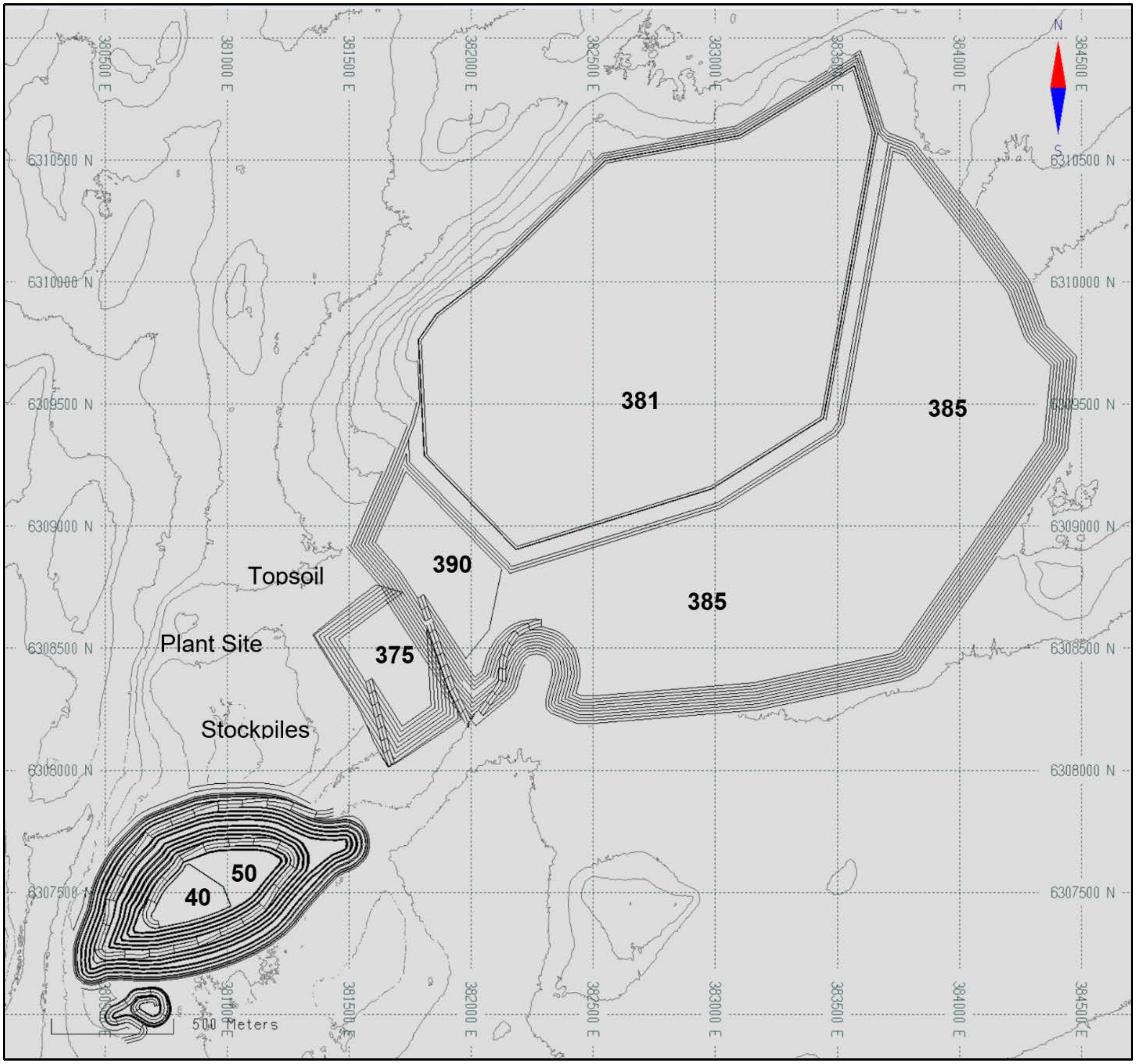


Figure 16-27 MacLellan Year 9

Source: AGP (2023)

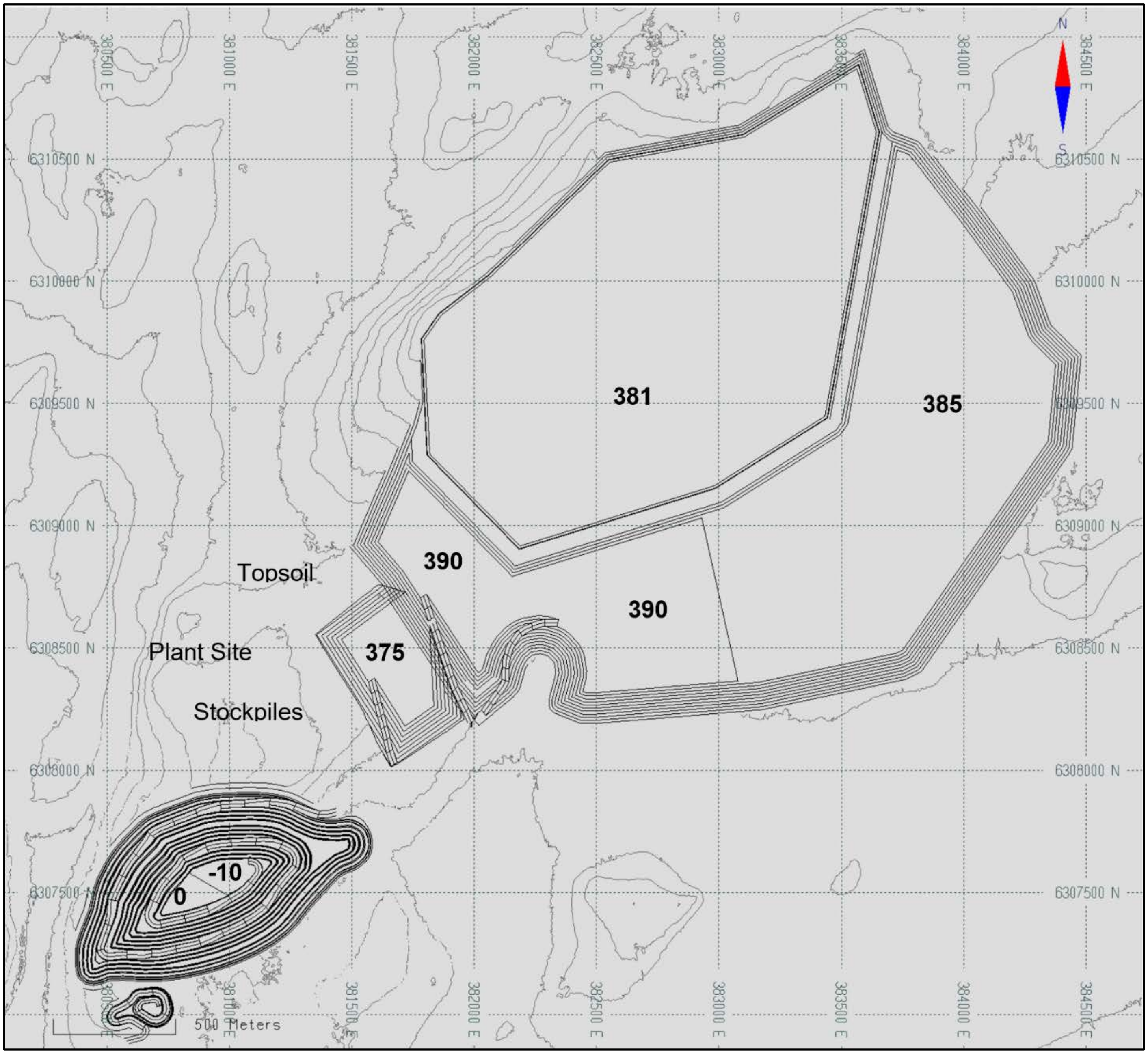


Figure 16-28 MacLellan Year 10

Source: AGP (2023)

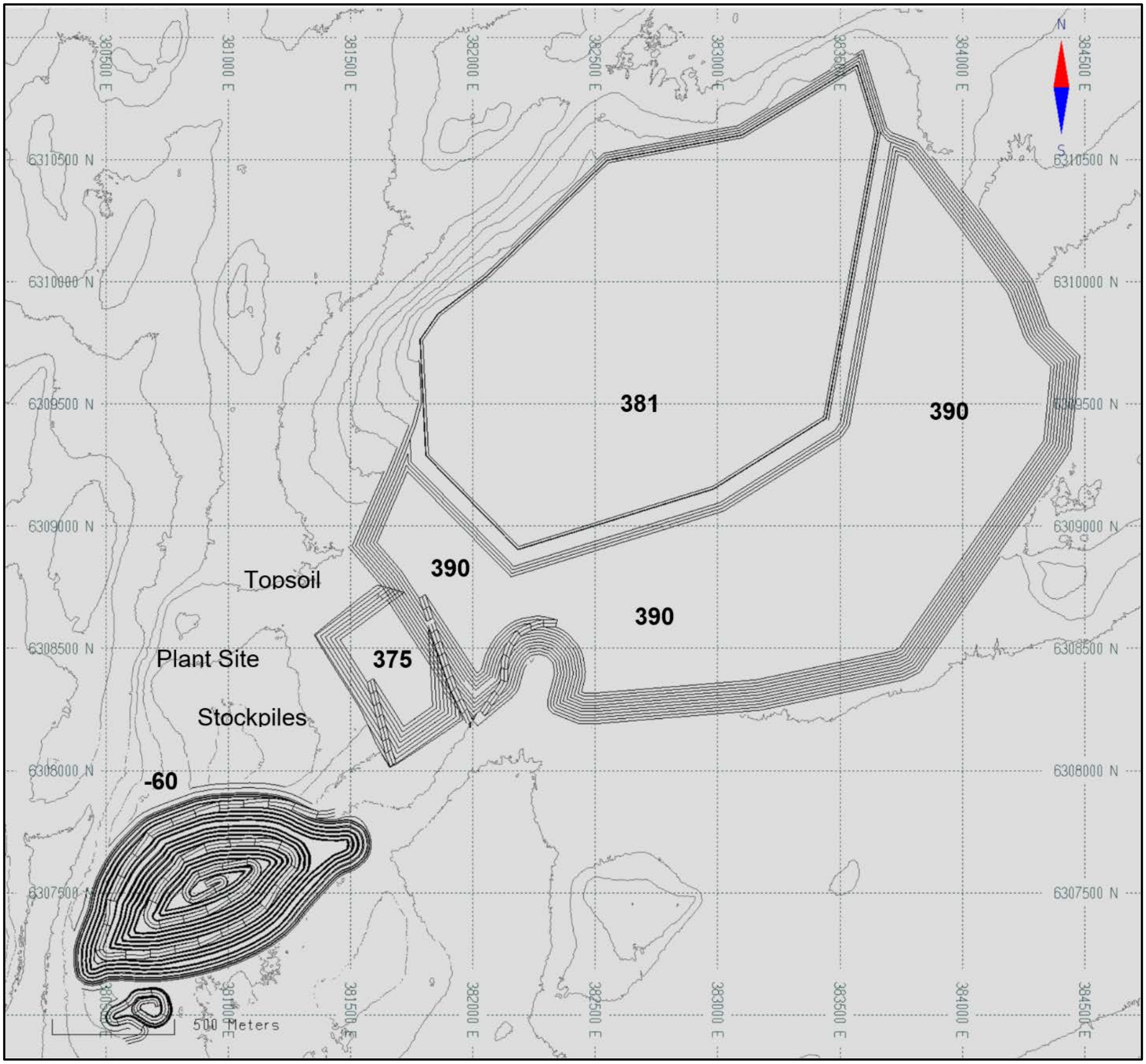


Figure 16-29 MacLellan Year 11

Source: AGP (2023)

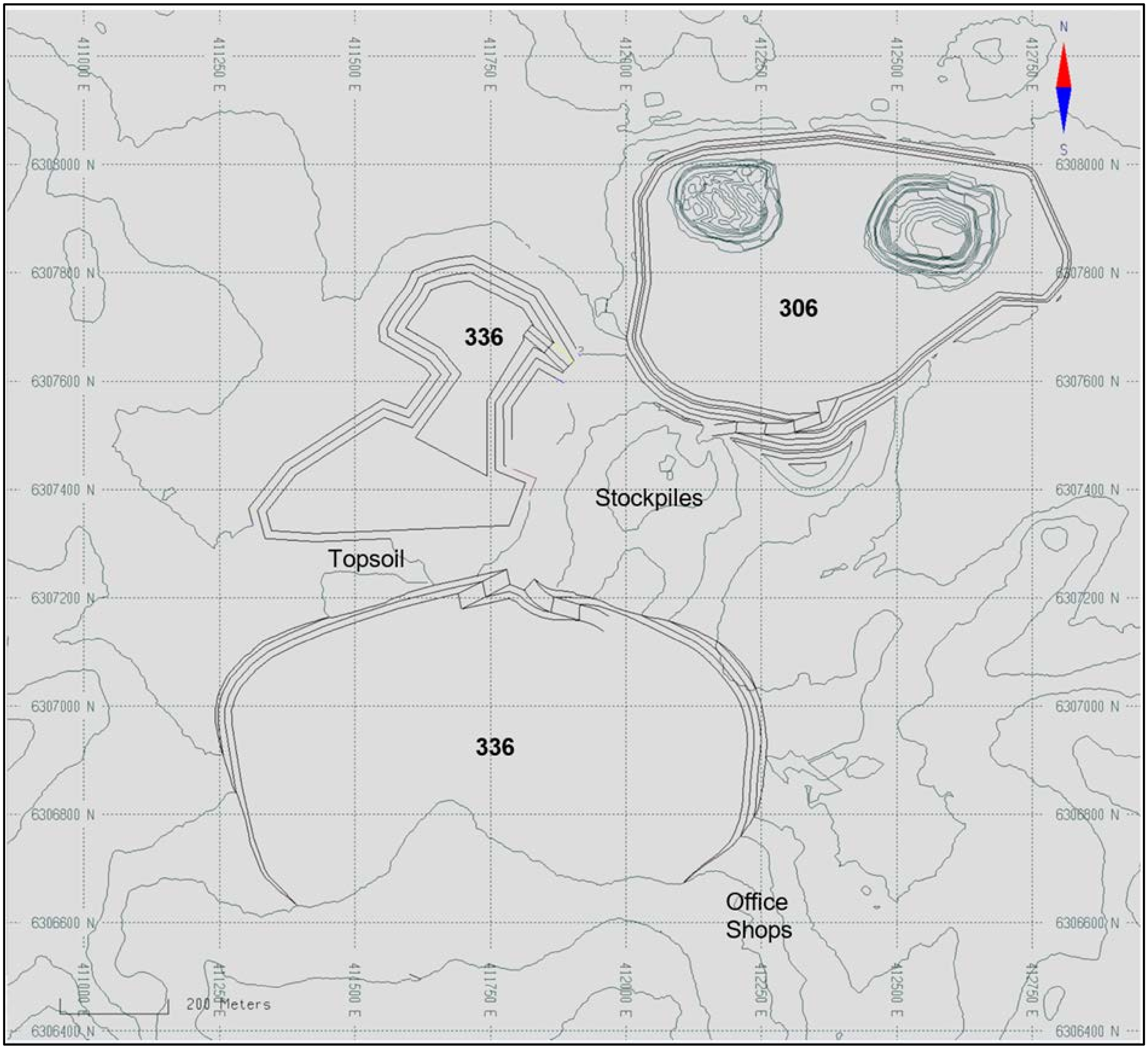


Figure 16-30 Gordon Pre-production Period -1

Source: AGP (2023)

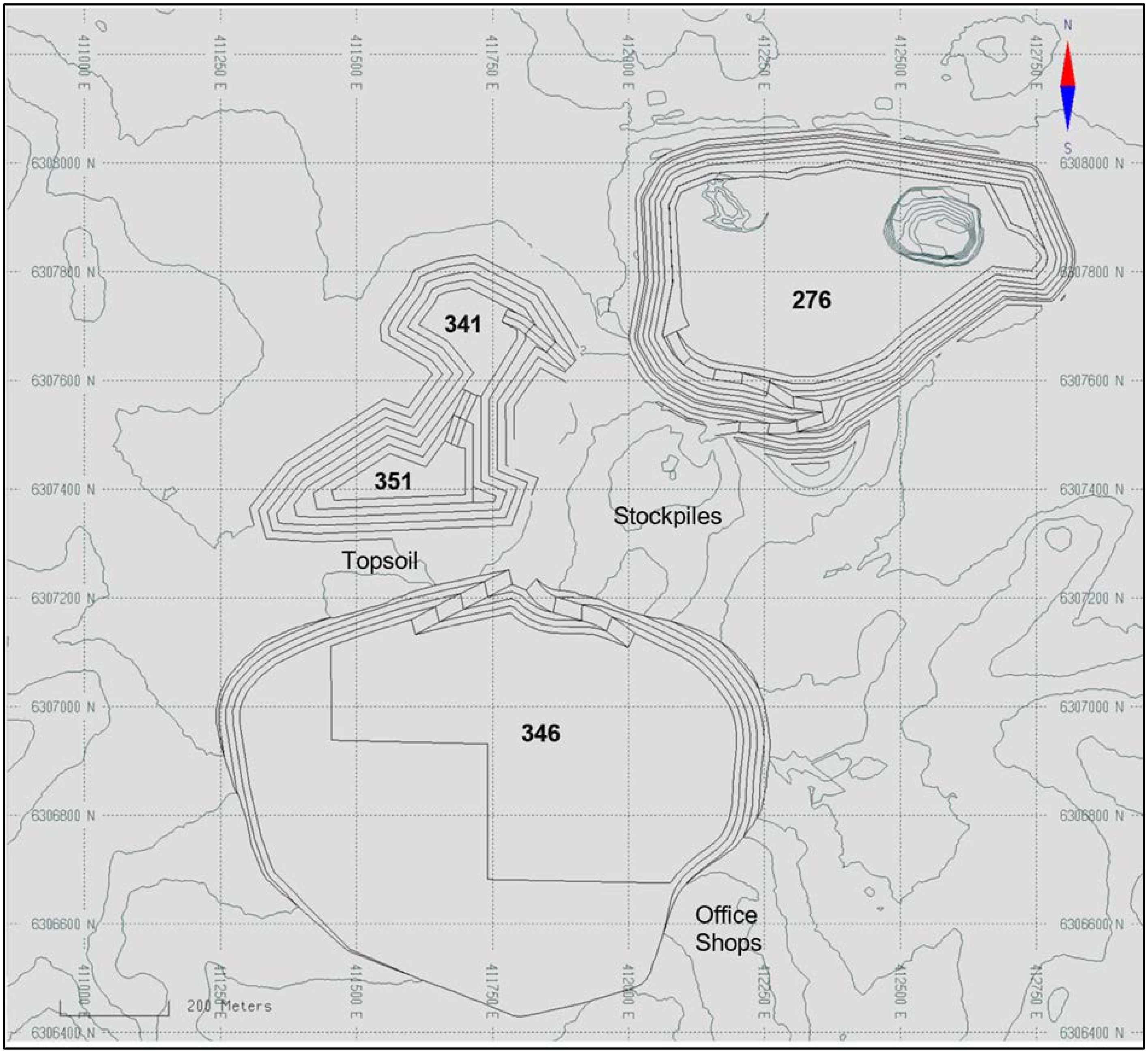


Figure 16-31 Gordon Year 1

Source: AGP (2023)

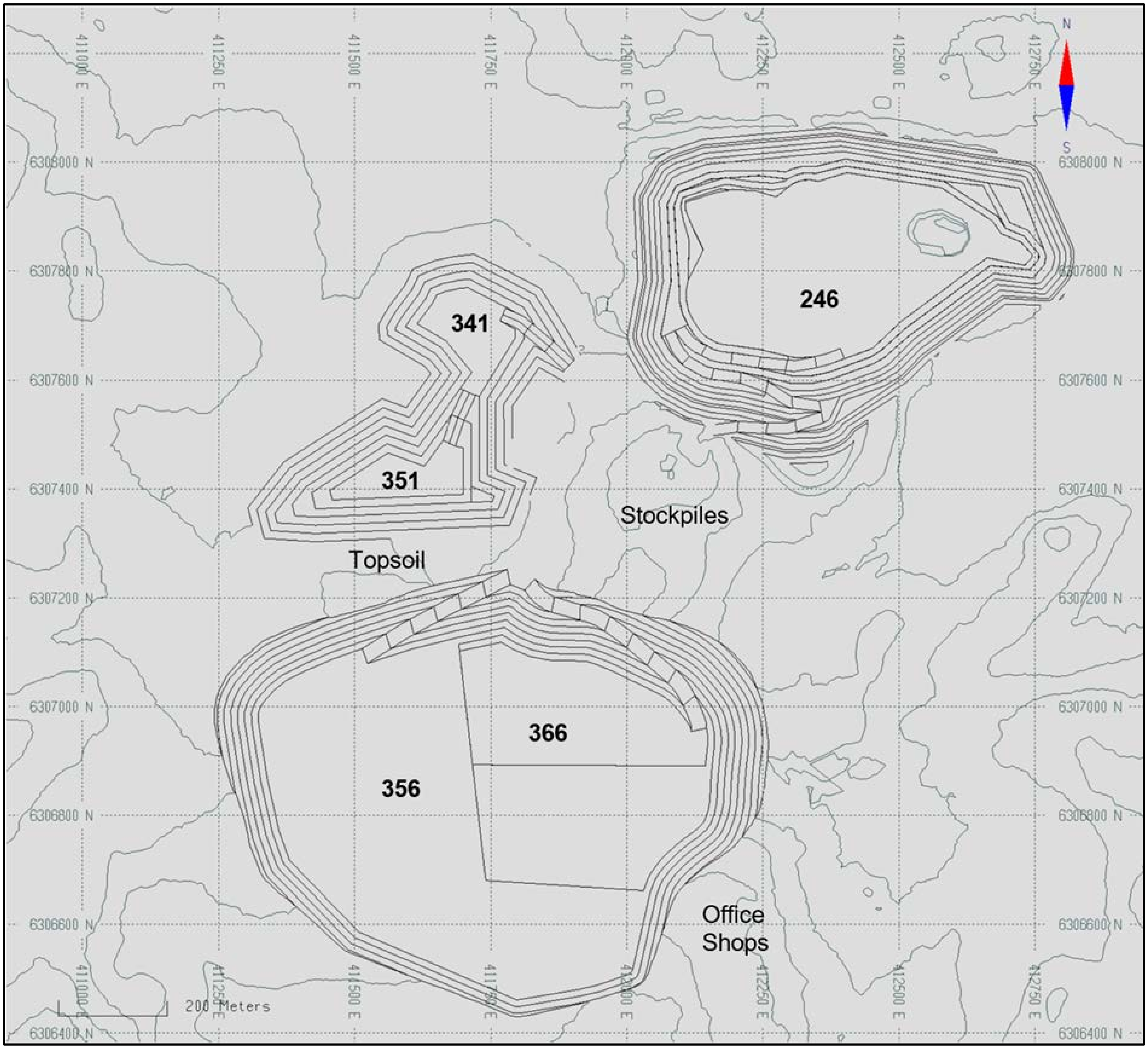


Figure 16-32 Gordon Year 2

Source: AGP (2023)

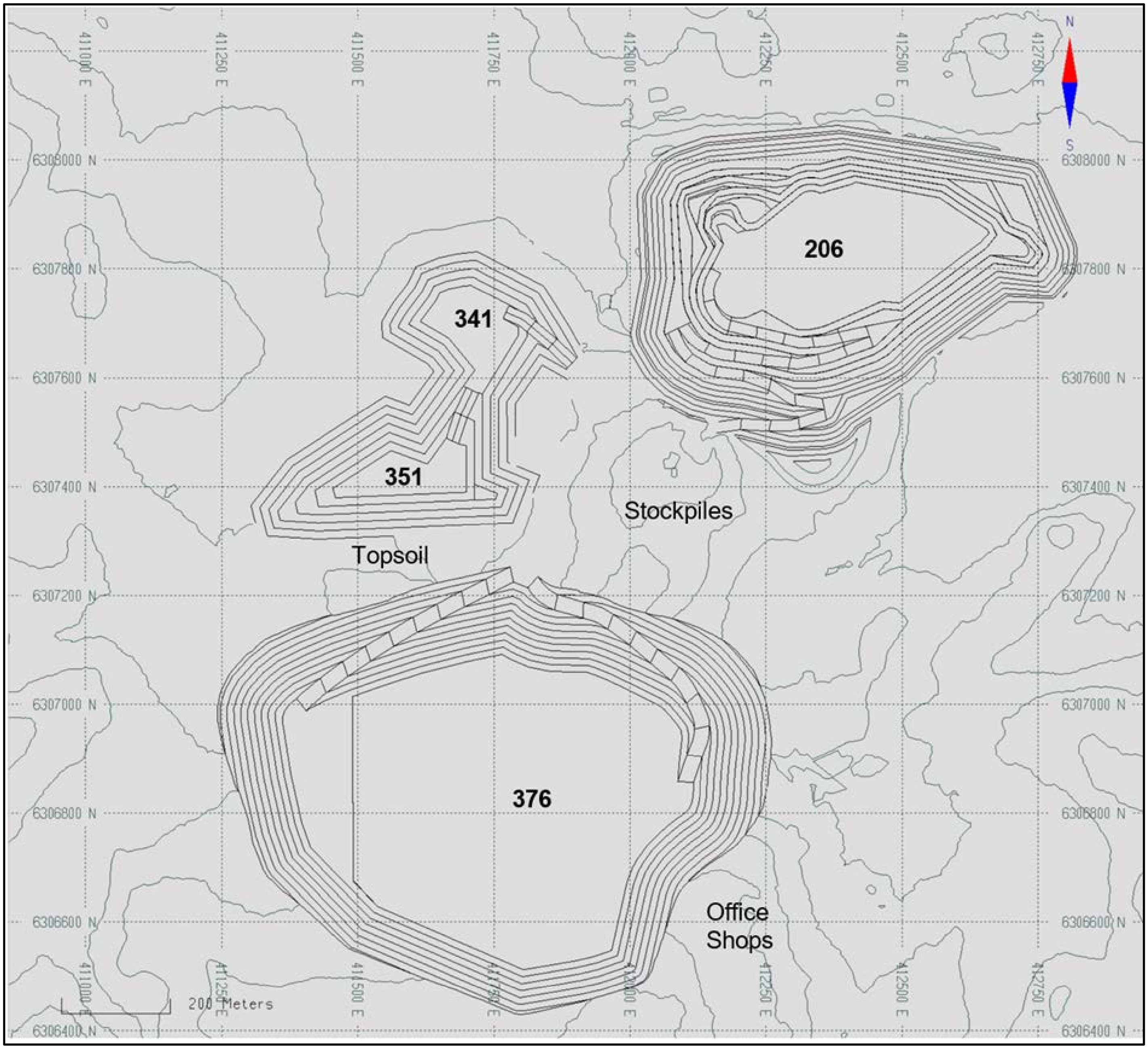


Figure 16-33 Gordon Year 3

Source: AGP (2023)

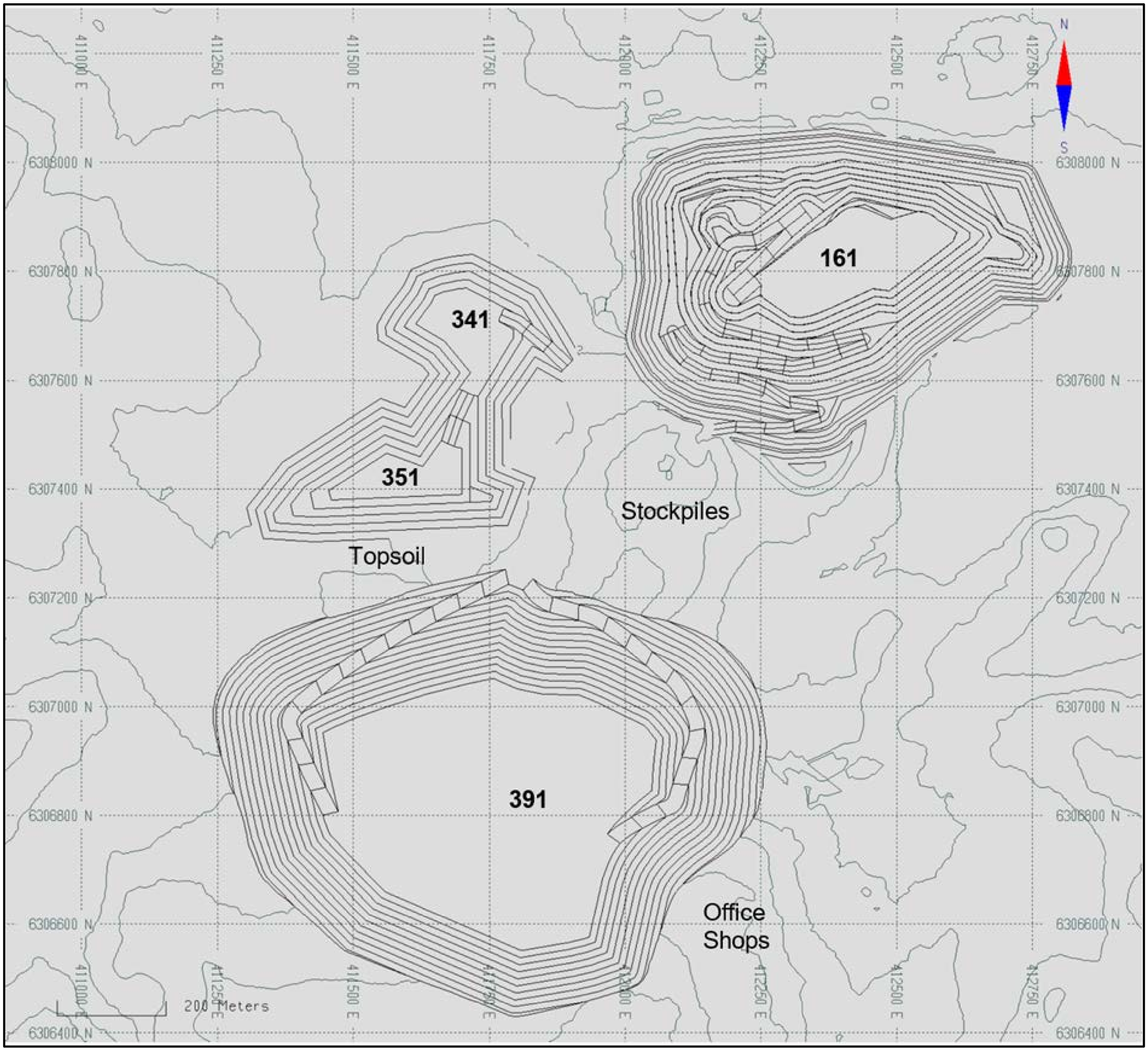


Figure 16-34 Gordon Year 4

Source: AGP (2023)

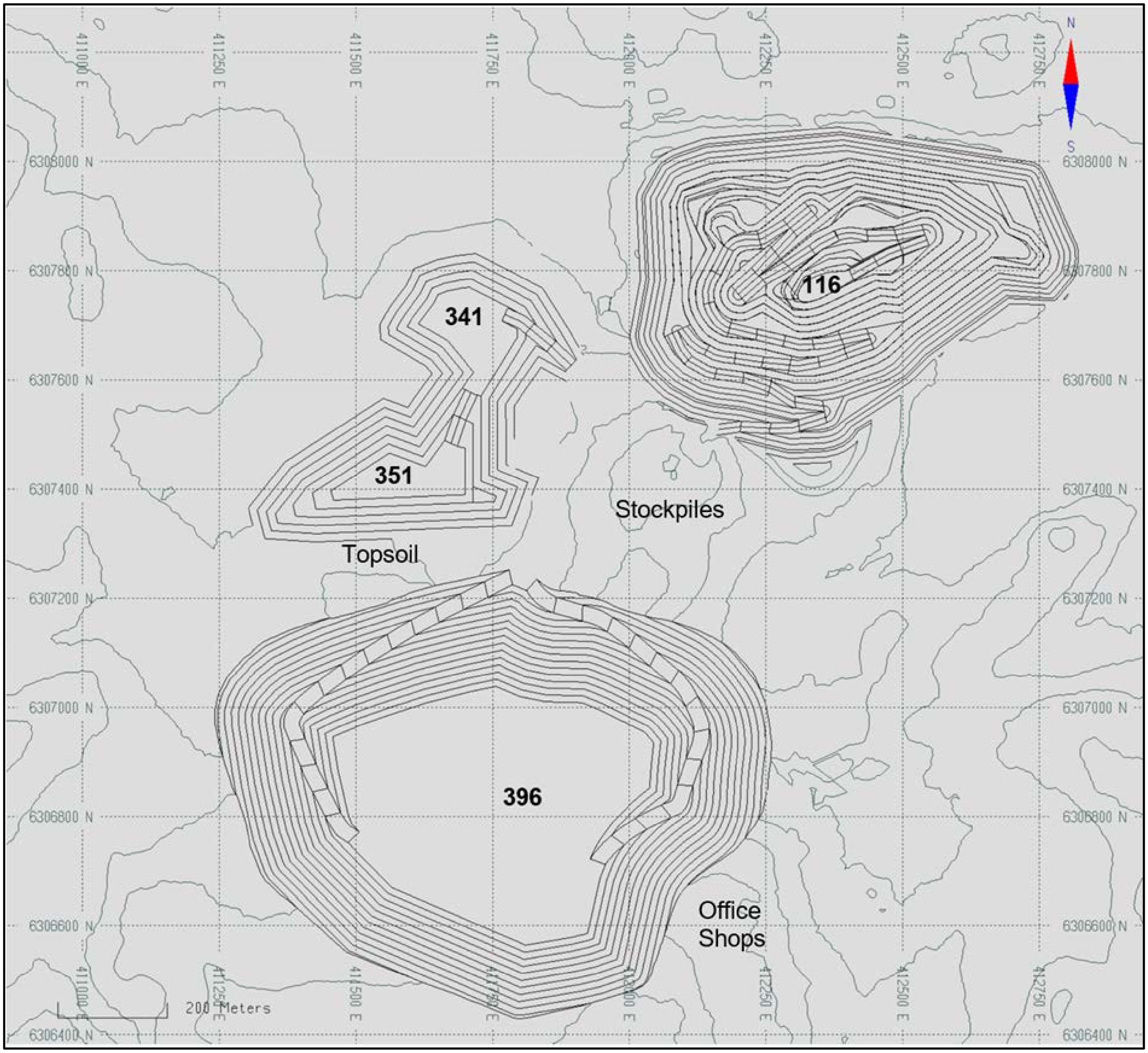


Figure 16-35 Gordon Year 5Source: AGP (2023)

Source: AGP (2023)

17 RECOVERY METHODS

17.1 Proposed Process Flowsheet

The unit operations used to achieve plant throughput and metallurgical performance are well proven in the gold/silver processing industry. The Lynn Lake flowsheet incorporates the following major process operations:

- Two-stage crushing and storage;
- Semi-autogenous grinding (SAG);
- Pebble crushing (future if needed);
- Ball mill grinding and classification;
- Leaching and conventional carbon-in-pulp (CIP) adsorption;
- Desorption and gold room;
- Tailings detoxification and disposal;
- Fresh and reclaim water supply; and
- Reagent preparation and distribution.

The overall process plant flowsheet is shown in Figure 17-1.

The solids throughput rates of the plant are:

- Crushing plant is 8,000 t/d or 481 t/h at 69% availability; and
- Process plant is 8,000 t/d or 362 t/h at 92% availability.

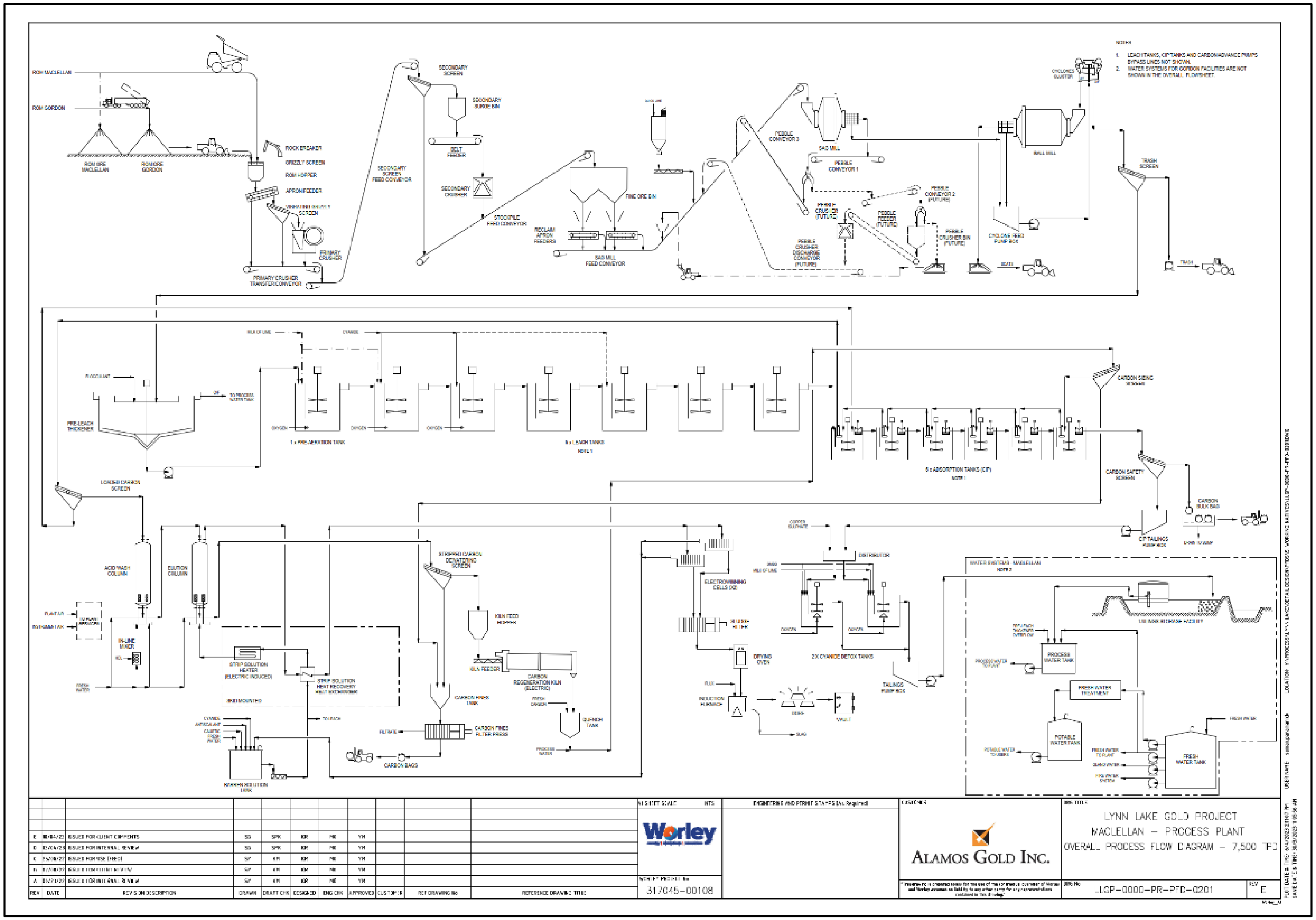


Figure 17-1 Overall Process Flow Diagram

Source: Worley (2022)

17.2 Process Design Criteria

The process design criteria summary is provided in Table 17-1.

Table 17-1 Process Design Criteria Summary

Description	Units	Value
Ore Throughput	Mt/a	2.92
Plant Throughput, Average	t/d	8,000
Crushing Plant Availability	%	69
Crushing Plant Design Throughput	t/h	481
Process Plant Availability	%	92
Process Plant Design Throughput	t/h	362
Gordon Ore Gold Grade, LOM Average	g/t	2.43
MacLellan Ore Gold Grade, LOM Average	g/t	1.34
MacLellan Ore Silver Grade, LOM Average	g/t	4.28
Gordon, Overall Recovery Gold After Losses	%	92.6
Gordon, Overall Recovery Silver After Losses	%	n/a
MacLellan, Overall Recovery Gold After Losses	%	93.5
MacLellan, Overall Recovery Silver After Losses	%	48
Maximum Production, Gold (Year 2)	koz Au	263
Maximum Production, Silver (Year 9)	koz Ag	245
Crushing (Two Stage):		
Primary Crusher	type	Single Toggle Jaw Crusher
Secondary Crusher	type	Cone Crusher
Fine Ore Stockpile	h	15
Grinding:		
Primary Grinding (with pebble return to SAG)	type	SAG Mill
Secondary Grinding (closed circuit with cyclones)	type	Ball Mill
Product Particle Size, at 80% passing (P80)	µm	75
Pre-leach Thickener:		
Net Solids Loading	$t/m^2/h$	0.42
Underflow Pulp Density	% w/w	55
Pre-aeration, Leaching and Adsorption:		
Pre-aeration Residence Time, design	h	6
Gordon Oxygen Uptake Pre-aeration	mg/L	8.2
MacLellan Oxygen Uptake Pre-aeration	mg/L	6.4
Leaching Residence Time, design	h	40
Gordon Oxygen Uptake Leaching	mg/L	1.4
MacLellan Oxygen Uptake Leaching	mg/L	0.8
Total Adsorption Residence Time, design	h	8
Desorption and Regeneration:		
Desorption Process	Type	Pressure Zadra
Carbon Batch Size	t	6
Acid Wash and Elution Cycles per Day	#	1
Acid Wash and Elution Operating per Week	days/week	7
Cyanide Destruction:		
Method		$O_2/SO_2/Cu^{2+}$
Residence Time	h	2
CN_{WAD} (not to exceed)	mg/L	10

17.3 Process Plant Description

17.3.1 Crushing and Storage Bin

Run-of-mine (ROM) ore from the MacLellan open pit is discharged to the ROM ore hopper by haul trucks. The ROM from Gordon is delivered by highway trucks and stockpiled. The Gordon ore is then dumped into the crusher hopper by front-end-loader. The McLellan ore can be stockpiled if required for blending. The ROM ore hopper incorporates a horizontal static grizzly with 800 mm x 800 mm aperture to screen out lump oversize. The static grizzly oversize is crushed by a fixed rock breaker. The static grizzly undersize discharges into the ROM ore hopper. Ore is reclaimed at a controlled rate by an apron feeder and discharged onto a vibrating grizzly screen.

The oversize from the vibrating grizzly enters the single toggle 48" x 44" primary jaw crusher powered by a 160 kW motor. The jaw crusher close size setting (CSS) is 130 mm. The vibrating grizzly undersize, jaw crusher product, and apron feeder fines combine and discharge onto the primary crusher transfer conveyor. A tramp magnet removes steel trash from the primary crushed ore as it transfers by conveyor to the secondary screen and crusher. A metal detector is also installed to detect metallic trash.

The secondary crusher feed is scalped by a secondary screen and only the oversize reports to the cone crusher. The cone crusher is sized for a duty of 351 t/h with CSS of 35 mm and a 315 kW motor. It is located inside the secondary crushing area. A surge bin with fifteen minutes' retention time, located above the crusher, ensures choke feed conditions. A belt feeder extracts ore from the surge bin to feed the secondary crusher. The fine ore product with a P_{80} of 37 mm is conveyed by a bin feed conveyor to the fine ore bin (FOB). A weightometer measures the fine ore rate produced from the crushing circuit.

The FOB has a live volume of approximately 5,000 tonnes, providing 15 hours of mill feed. Two variable speed reclaim apron feeders provide two live draw-down pockets. The feeders provide duty/duty mill feed service whereby either one can handle nominal mill feed demand if the other unit is offline. The FOB maintenance is carried out by a 5 tonne crane.

17.3.2 Grinding and Classification

The grinding circuit consists of one single pinion 7.3 m x 3.7 m SAG mill followed by one double pinion 6.1 m x 9.1 m ball mill. The ball mill operates in closed circuit with a hydrocyclone cluster. The final product from the grinding circuit (cyclone overflow) has a target P_{80} of 75 µm. The SAG mill is equipped with a single 3.5 MW low speed induction motor with variable frequency drive (VFD) to operate between 61% and 79% of critical speed. The ball mill is equipped with two 3.5 MW low speed induction motors with variable frequency drives (VFDs) to operate between 61% and 79% of critical speed.

The reclaimed fine ore is conveyed by a covered SAG mill feed conveyor from the two FOB reclaim feeders under the bin to the SAG mill feed chute. The recycled pebbles from the SAG mill trommel oversize chute are re-introduced to the SAG mill via a divertor and two conveyors that discharges onto the SAG mill feed conveyor. The divertor will be used to divert materials to a future pebble crusher. A weightometer, after the bin reclaim, measures the amount of fresh mill feed ore entering the SAG mill and a second weightometer at the first pebble conveyor measures the amount of pebbles. The pebble recirculating load is a maximum of 15% by weight of fresh feed. Quicklime is metered to the SAG mill feed conveyor using a screw feeder to raise the pH of the slurry to 10.5. For both mills, process water is added at a controlled rate into the feed chutes to achieve a nominal pulp density of 70-72% w/w solids. The grinding media is added to the SAG mill through the media feed chute using a ball kibble.

The SAG mill is fitted with 20 mm discharge grates to allow slurry to pass through the mill and prevent pebble build-up in the mill. The SAG mill discharge product is screened on the SAG mill trommel which has 15 x 45 mm apertures. Oversize from the SAG mill trommel is conveyed back to the SAG mill feed conveyor using a series of pebble conveyors. A provision is made in the layout to accommodate a future pebble crusher. SAG mill trommel undersize gravitates to the cyclone feed pump box, where it is combined with the ball mill discharge slurry from the ball mill trommel undersize.

Ball mill slurry discharge overflows onto a rubber-lined trommel screen with trommel oversize discharging to a bunker for regular collection and disposal by a skid steer loader. The trommel undersize gravitates to the cyclone feed hopper where the slurry is diluted with process water and pumped with cyclone feed pumps (one duty and one stand-by) to the cyclone cluster. A density meter monitors and controls the amount of process water required to produce a target density to the cyclones. The cluster consists of eight cyclones with six on duty and two on standby.

SAG and ball mill grinding media (steel balls) supplied in trucks are unloaded into two ball storage compartments, each holding a specific diameter steel ball. A ball-loading magnet (moving through an overhead ball bin crane) attracts and transports a collection of balls from the compartments to individual storage bins. From each storage bin, the balls are discharged into a dedicated 1 tonne ball kibble, which in turn discharges to the mills to maintain the desired ball loads and power draw. The ball kibble is lifted by a 50-tonne bridge crane and emptied into the mill feed chute.

The cyclones produce a ground overflow product of P_{80} 75 µm, which gravitates to a linear trash screen. Oversize debris that is removed falls to a trash bin at ground level. The trash screen underflow is sampled by a metallurgical sampler (two stage) before it gravitates to the pre-leach thickener feed box outside the south wall of the building. Cyclone underflow gravitates back to the ball mill feed box for further grinding.

Spillage in the grinding area is contained within a full concrete slab and bunded area. Two grinding area sump pumps are provided at low points in the bunded area to reclaim spillage and return this to the cyclone feed hopper. Two cameras monitor the sumps and cyclone pump box levels for operator intervention.

17.3.3 Leach and Adsorption

Trash screen undersize is thickened from approximately 33% to 55% w/w solids in a 33 m diameter high-rate thickener in preparation for downstream pre-aeration, leaching, and carbon-in-pulp (CIP). Flocculant is metered to the thickener feedwell as required to accelerate the settling rate of particles.

Thickener overflow gravitates to the process water tank and is recycled for plant use while the underflow slurry is pumped with variable speed pumps (one duty and one stand-by) to the pre-aeration tank for slurry conditioning prior to leaching. The thickener is located outdoors, sharing a common secondary containment area with the process water tank. The thickener bund is combined with the pre-aeration and leach tanks bund. This containment area will contain the total slurry volume from the thickener (110% of the thickener volume).

Thickener underflow is pumped to the pre-aeration tank. Hydrated lime slurry can be added to the pre-aeration tank and first leach tank to raise the slurry pH if required. Oxygen supplied by an oxygen plant is added to the tank via spargers. Pre-aeration and leach tanks are equipped with a dual impeller mechanical agitator to ensure uniform mixing of slurry and oxygen. The pre-aeration tank overflows to the first leach tank or can be by-passed to the second leach tank.

The leach tank circuit consists of six tanks in series. Total live volume is 16,500 m^3, which allows 40 hours of residence time for a 362 t/h solids feed rate at the operating feed solid's pulp density of approximately 55% w/w solids by weight to the first leach tank. The tanks are located outdoors to the west of the pre-leach thickener in a bunded area. Any tank can be removed from service using a bypass line. Slurry from the last tank in the leach train flows by gravity to the first CIP tank in the adsorption circuit or can be bypassed to the second CIP tank.

The pH is measured with probes installed in the leach tanks and hydrated lime slurry can be added as required. An online leach cyanide analyser measures the free cyanide concentration in the first two leach tanks. Dissolved oxygen is also measured with oxygen probes.

The CIP circuit consists of six adsorption tanks in series, each with a live volume of 580 m^3. The tanks are located inside the process building in a dedicated bunded area serviced by a CIP area sump pump. Pulp flows continuously from the first to the last adsorption tank, while carbon is pumped counter–currently, in pre-set intervals, from the last to the first tank. Loaded carbon is recovered from the first adsorption tank; stripped and regenerated carbon enters the adsorption circuit at the last tank. Bypass lines have been added to CIP tanks 2 and 5 if the first or last tanks are out for service.

The CIP tanks are arranged with the tops of all tanks at the same elevation. Mechanically swept, inter-tank pumping screens are used to move slurry to the next downstream tank, while preventing activated carbon from flowing with the slurry to the next CIP tank. Each tank is equipped with a dual impeller mechanical agitator to ensure uniform mixing of slurry and carbon. Any tank can be removed from service using a bypass line. Target carbon concentration in each of the tanks is 25 g/L.

An overhead crane removes the screens to a dedicated bay/stand area for maintenance, routine cleaning, and agitator maintenance. A spare inter-tank screen is available to allow rapid screen changeover.

Following elution (desorption) of the loaded carbon and thermal regeneration, the barren carbon is screened over the 0.84 mm square aperture barren carbon sizing screen and reports to the last CIP tank in the adsorption train. Fine carbon is recovered to the carbon fines tank and further dewatered by a filter press. The carbon fines recovered on the filter are collected in a bulk bag that can be manually transferred for gold recovery.

The secondary containment for the CIP circuit provides for a minimum of one tank volume.

At the west side of the CIP area, the tailings slurry from the final CIP tank gravitates to the vibrating carbon safety screen to recover any carbon in the event of damage, wear, or other issues with the CIP inter-tank screen. Carbon recovered on the 0.84 mm square screen is collected in a bulk bag that can be manually transferred for re-use. Tailings discharging from the carbon safety screen undersize gravitates to the CIP tailings pump box. From here, the tailing stream is pumped to the cyanide detoxification feed box where the flow is equally split to two parallel cyanide detoxification tanks located outside close to the leach tanks (south of the mill building).

A HCN gas detector detects any potential hydrogen cyanide gas in this area.

17.3.4 Cyanide Detoxification

The cyanide detoxification circuit reduces weak acid dissociable cyanide (CN_{WAD}) to a target value of 5 ppm and a not-to-exceed value of 10 mg/L for disposal. The detoxification process uses the conventional $O_2/SO_2/Cu^{2+}$ process.

Slurry from the carbon safety screen undersize is pumped to two 580 m^3 cyanide detoxification tanks in parallel. The slurry residence time in the detoxification tanks is 2 hours. For operational flexibility, these can operate in series if needed, or if one reactor is offline, there is 60 minutes residence time available. Increasing the sulphur dioxide (SO_2) addition rate offsets the temporary reduction in detoxification residence time. The sulphur dioxide is provided by addition of sodium metabisulfite (SMBS).

Oxygen for the detoxification reaction is supplied via a dispersion cone mounted to the bottom of each tank. The tanks utilize high shear agitators to enhance oxygen dissolution in the slurry to meet the oxygen demand of the cyanide destruction process. SMBS solution is introduced into the tanks. Providing SO_2 as an oxidizing agent is required for the process. Copper sulphate solution is dosed into both tanks, providing the catalyst for the cyanide detoxification process. Acid generated as a by-product is neutralized with lime slurry, added from a ring main to each tank.

Two-stage sampling is used to take a representative tailings sample after the slurry has been detoxified and prior to entering the tailings hopper.

A CN_{WAD} analyser automatically monitors slurry cyanide concentration. The detoxified slurry stream gravitates to the tailings pump box from where it is pumped through a single pipeline to the TMF by four variable speed tailings pumps (two duty, two standby). The tailings slurry is then discharged at outlet points around the periphery of the facility. Pipe runs are designed to be self-draining to avoid dead legs. The HDPE tailings pipeline runs for approximately 2 km before reaching the TMF.

17.3.5 Desorption

Loaded carbon is processed in the desorption circuit comprising the acid wash column, elution column, and regeneration kiln. The pregnant solution from elution is pumped through electrowinning cells. The barren eluate from the electrowinning cells is returned to the barren solution tank in the elution circuit and recycled through the elution column. Gold/silver sludge from the cathode wash and cell floor clean-up is filtered, dried, and then smelted to produce doré for sale.

Loaded carbon from the CIP tanks is recovered on the loaded carbon screen (oversize) and directed to an acid wash column with a 6 tonne carbon capacity.

Carbon is washed with dilute hydrochloric acid (HCl). Concentrated acid (HCl at 32% w/w) is diluted with potable water in an in-line mixer to provide the required acid wash solution concentration of 3% w/v HCl.

Following acid solution contact, the carbon is rinsed with freshwater to remove residual acid. The diluted acid solution is discharged to the tailings pump box. Washed carbon is then transferred to the elution column.

A separate, acid-proofed concrete bund is provided in the acid wash column area to ensure that all spillage is captured and kept separate from other process streams. A dedicated, acid-resistant sump pump is located at the low point of this bund. Spillage from this area is pumped using the acid area sump pump to the tailings pump box. Transfer and fill operations of the acid wash column are controlled manually. All other aspects of the acid wash and the pumping sequence are automated.

A 6 tonne standard pressure Zadra elution circuit has been selected for the stripping of gold and silver from loaded carbon.

In the Zadra process a 2.0% w/v sodium hydroxide and 0.5% w/v sodium cyanide solution at 135°C is used to desorb gold and silver from the carbon. Gold and silver are recovered from the pregnant strip solution by electrowinning. The gold/silver depleted solution is then re-heated and recycled to elution.

The Zadra elution system comprises an elution column, barren solution tank, barren solution pump, two-speed positive displacement water pump, and a strip solution heater package. This equipment operates in a closed loop with two electrowinning cells located inside the gold room.

17.3.6 Regeneration

After completion of the elution process, stripped carbon is transferred to the stripped carbon dewatering screen. The screened carbon (screen oversize) is fed into the carbon regeneration kiln feed hopper. The screen undersize gravitates to the carbon fines tank. The carbon is then fed to the carbon regeneration kiln. This electrically powered kiln is a horizontal, rotary unit designed to regenerate 100% of the stripped carbon and operates nominally 20 hours per day.

Pre-drying of carbon occurs when warm kiln off-gas is drawn through the carbon pre-dryer. Non-process gases from the regeneration kiln are used to dry the feed carbon in the carbon pre-dryer hopper and are extracted to the atmosphere via the carbon regeneration kiln exhaust fan. The kiln operates at temperatures of 650–700°C. Carbon is heated to 700°C and held at this temperature for 15 minutes to allow reactivation to occur. Regenerated carbon discharges from the kiln to a quench tank to cool down from where it is pumped to the carbon sizing screen.

The sizing screen oversize returns carbon to the last CIP tank in the train, while the quench water and fine carbon from the undersize are combined with the stripped carbon dewatering screen undersize in the carbon fines tank. Water overflows from this tank to the carbon fines area sump pump. When enough carbon has been accumulated in the tank, it is filtered by a filter press.

17.3.7 Gold Room

Two operations are carried out in the secure gold room area: electrowinning and smelting. Gold and silver recovery from pregnant solution is achieved by electrowinning. Two electrowinning cells are located on the mezzanine within the gold room. Each electrowinning cell houses 23 cathodes and is built in stainless steel with a polypropylene liner. The 2500 Amp rectifier associated with each electrowinning cell backs onto the gold room wall allowing easy access for operations and maintenance outside the secure area of the gold room. Fumes from the electrowinning cells are vented to atmosphere via a demister to collect any mist prior to release.

Upon completion of the electrowinning cycle, the cell covers are removed, and gold and silver sludge is washed off the cathodes at the bottom of the cell with a hand-held high pressure washer.

Cathode wash material, and any accumulated cell sludge, are drained from the electrowinning cell and collected in an electrowinning sludge filter feed tank and filtered by a plate-and-frame filter.

Excess water overflows to the floor sump whilst the cell sludge is filtered. The filter cake (gold/silver sludge) is manually loaded from the filter into trays on the electrowinning sludge trolley. The trays slide into the gold room drying oven, which heats the sludge to about 100°C to dry this material before smelting.

The cooled sludge is combined with fluxes (silica, nitre, borax, and sodium carbonate) in the flux mixer. The fluxes are weighed according to a pre-determined recipe and manually added to the flux mixer. The sludge-flux mix is smelted in an electric induction furnace. The fluxes react with base metal oxides to form a low viscosity, free flowing slag whilst gold and silver remain as molten metals.

The melt is poured from the furnace into a cascade pouring table of doré moulds. The barren slag is separated from the precious metals and collected in slag trays at the bottom of the cascade tables. The doré in the moulds solidifies and is quenched in water, cleaned to remove slag, weighed, stamped for identification, sampled for analysis, and stored in a safe while awaiting dispatch to a commercial refinery.

17.4 Major Process Equipment

The major process equipment is summarized Table 17-2.

Table 17-2 Major Process Equipment, Lynn Lake Project

Area	Item	Description
Primary Crushing	Jaw Crusher	48" x 44" 51" x 40", 160 kW, CSS 130 mm
Secondary Crushing	Cone Crusher	315 kW, CSS 35 mm
Fine Ore Bin	Apron Feeders	Two feeders, each capable of feeding 100% of full milling throughput of 340 t/h
Grinding Classification	SAG Mill	3.5 MW, 7.3 m diameter with 3.7 m effective grinding length (EGL)
	Ball Mill	6.5 MW, 6.1 diameter with 9.1 m EGL, in closed circuit with hydrocyclones, grinding to a P_{80} of 75 µm
	Hydrocyclone	8 Hydrocyclones (6 duty, 2 stand-by)
Pre-Leach Thickening	Thickener	33 m diameter high-rate thickener
Pre-aeration and leaching	Agitated Tanks	Seven 2,800 m^3 (live volume) carbon steel agitated tanks, 14.9 m diameter and 16.4 m height, with 160 kW rubber-lined dual impeller agitator each
Gold Adsorption	Agitated Tanks	Six 580 m^3 (live volume) carbon steel agitated tanks, 8.8 m diameter and 9.8 m height, with 45 kW rubber-lined dual impeller agitator each
Gold Desorption	Acid Wash and Pressure Zadra System	Batch type, 6 tonne circuit with one acid wash and one elution column, elution at 135°C and 650 kPa
Carbon Regeneration	Electrical Kiln	680 kW electrical kiln, 300 kg/h batch process, 700°C
Electrowinning	Electrowinning Cells	Two cells, each with 23 x 1.0 m x 1.0 m cathodes
Cyanide Detoxification	Agitated Tanks	Two parallel 580 m^3 (live volume) carbon steel agitated tanks, 8.8 m diameter and 9.8 m height, with 75 kW rubber-lined dual impeller agitator each
Oxygen Production	Oxygen Plant	Vacuum pressure swing adsorption (VPSA), 420 Sm^3/h, 220 kW installed power

Table 17-3 shows the summary of the proposed installed power by area, total installed power, and normal/average operating demand for both the MacLellan and Gordon sites. Power for the MacLellan site will be supplied by Manitoba Hydro; power for the Gordon site will be supplied by diesel generators. Average power consumption has been derated from the running power consumption to represent nominal process conditions and power use for the purpose of operating cost estimation.

Table 17-3 Summary of Required Installed, Running and Average Power by Area

WBS	Area Description	Installed kW	Demand kW	Running kW
MacLellan Site				
1315	Site Services	184	156	138
1320	Infrastructure (including Road Truck Service Facility)	2,497	2,112	1,860
1360	Freshwater System	147	59	52
1400	Utilities and Services	21	6	1
1411	Oxygen Plant	341	290	256
1412	Air Systems	332	141	125
1420	Water Systems	633	259	229
1460	Mine Electrification Units	5,475	4,654	4,106
1600	Plant Makeup Units	1,340	1,332	328
1610	Crushing and Reclaim	3,236	2,328	1,451
1620	Grinding	12,694	10,569	9,534
1630	Thickening	475	166	143
1640	Pre-aeration and Leaching	1,837	1,278	894
1650	Desorption and Regeneration	2,142	2,046	507
1660	Electrowinning and Gold Room	1,204	862	310
1670	Detox & Tailings Pumping	2,188	826	729
1680	Reagents (including building MAU and unit heaters)	880	720	253
1730	Tailings Decant System	160	68	60
	Subtotal MacLellan	**35,850**	**27,922**	**21,029**
	Total with Contingency	**37,642**	**29,318**	**22,008**
Gordon Site				
2400	Gordon Site	1,235	1040	819
	Total with Contingency	**1,297**	**1092**	**860**

17.5 Reagents and Consumables

Reagents will be mixed in a separate contained building to the west end of the process plant. Bunded areas control any spillage. Tank storage capacity has been generally sized based on reagent consumption rates to supply the process without any interruption, or according to available delivery volumes.

Dry reagent storage will be housed in the reagent mixing building. Reagents are transported by forklift to the reagent make-up area.

Reagent consumptions are based on project specific testwork or industry operating practice. Reagent costing is supported by recent vendor quotations. A summary of the estimated reagents and steel media rates are shown in Table 17-4.

Table 17-4 Lynn Lake Estimated Reagent Consumption (average)

Reagents	Form	Unit	Specific Consumption
Activated Carbon	Solid, granular, coconut	g/t feed	40
Sodium Cyanide	Solid, briquettes	kg/t feed	0.35
Quicklime	Solid, pebbled (90% purity)	kg/t feed	1.46
SMBS	Solid	kg/t feed	1.53
Copper Sulphate	Crystalline granules solid	kg/t feed	0.03
Flocculant	Granular powder	g/t feed	25
Sodium Hydroxide	Liquid (50% w/w), solution	kg/t feed	0.04
Hydrochloric Acid	Liquid (32% w/w), solution	kg/strip	1052
Sulphamic Acid	Solid, crystals or powder	g/t feed	5
Borax	Powder	kg/smelt	24
Silica	Powder	kg/smelt	12
Sodium Nitrate (Nitre)	Powder	kg/smelt	2
Sodium Carbonate	Powder	kg/smelt	2
Grinding Media – SAG Mill	100 mm balls	kg/t feed	0.19
Grinding Media – Ball Mill	65 mm balls	kg/t feed	0.52

17.6 Services

17.6.1 Process Water

Two (one duty, one standby) horizontal centrifugal pumps supply process water to the various consumers throughout the plant site, but predominantly to the grinding circuit. Both pumps are fed from the process water tank. The process water tank is constructed from mild steel and has a live volume ensuring 45 minutes of residence time. The reticulation pipework is heat-traced and thermally insulated where required.

In the case where the tailings return water flow is temporarily reduced, the freshwater pumps can supplement the process demand.

Plant site run-off water will be collected in the collection pond and pumped into the return water pipeline, which will direct it to the process water tank as makeup water or to the TMF.

17.6.2 Gland Water

Two (one duty, one standby) positive displacement pumps are fed from the freshwater tank. The pumps are located within the water services pumphouse and supply gland water to the various slurry pumps throughout the plant site.

17.6.3 Oxygen

Oxygen is supplied to the pre-leaching tank, the first two tanks in the leaching circuit and the detoxification area by a vendor-supplied vacuum pressure swing adsorption (VPSA) oxygen plant. There are two off-takes for oxygen supply; one to the leach area and the second to the detoxification circuit. The oxygen is reticulated at a pressure of 460 kPag.

17.6.4 SMBS

SMBS is supplied to the plant in super sack bags and mixed with water and pumped to the SMBS dosing tank. The SMBS is pumped by dosing pump to the detoxification tanks.

17.6.5 Tailings Disposal

Tailings reclaim water and run-off water from precipitation collected in the TMF are pumped to the process water tank located next to the pre-leach thickener. The sections of the tailings and decant pipelines running between the plant site and the TMF run in HDPE lined trenches. Where the pipelines run along the dam crest wall, single pipes, located on a bench running along the upstream slope of the dam are used such that any leakage will drain into the dam.

17.7 Process Control Philosophy

17.7.1 General

The process control philosophy for the LLGP is similar to many gold processing operations.

Field instrumentation provides input to programmable logic controllers (PLC), which are monitored by the Process Control System (PCS). The PCS system is configured to provide outputs to alarms, to control the function of selected process equipment, and to provide advisory comment to the plant operators. In addition, logging and trending functions are available to assist in analysis of the operating plant data.

The plant is provided with a central control room from which the status of major electrical and mechanical equipment can be monitored, and major regulatory control loops can be monitored and adjusted via the operator control station (OCS).

Critical safety and equipment protection interlocks are hardwired. Control of process variables is via the OCS or discrete controllers in the field.

All drives can be stopped in the field at the local control station (LCS) located adjacent to the drive. The LCS will also have a remote–maintenance selector switch. Either selection allows the operator to stop or start the drive in the field; however, in maintenance mode, the process interlocks are over-ridden. (The safety interlocks are still active in this mode) This provides flexibility for testing duties.

All electrical drives, which can be started via an OCS, have three faceplate operational modes.

During normal operation, operators will have a choice of cascade, auto or manual mode. Cascade mode allows the drive control variable to be set by another controller. This mode allows cascading control loops to function. Auto mode allows for automated sequence control of the drive where control setpoints can be entered by the operator. Manual mode does not allow drives to be started in a sequence but can still be started via the OCS. Process and safety interlocks are active for all modes.

PLCs are utilized to accept status signals from the electrical switchgear for monitoring drive status conditions on an OCS.

17.7.2 Control Philosophy

The general control strategy for the project is outlined below:

- Control by the PCS for all areas where equipment requires remote start and stop, sequencing, and process interlocking;
- Motor controls for starting and stopping drives at LCSs using the PCS or hard wired, depending on the drive classification; all drives can always be stopped from the local control station; local and remote starting is dependent on the drive type and control mode;
- Vendor PLCs for areas or items that are supplied as complete vendor packages; the vendor PLC communicates alarms and status information to the PCS for recording and monitoring;
- Monitoring of operations on the PCS and recording of selected information for data logging and/or trending;
- Control loops in the PCS, except where the vendor's PLC directly controls the vendor package;
- Trip and alarm inputs to the PCS are fail-safe in operation (i.e., the signal reverts to the de-energized state when a fault occurs);
- Hard-wired safety interlocks for personnel safety;
- Software interlocks for process safety and equipment protection start and stop sequences for certain groups of equipment;
- Automation of critical process components and a high level of monitoring to minimize the possibility of human error;
- Uniform architecture, hardware, and software configuration throughout all non-vendor-controlled equipment;
- A main plant control room with two operator control stations (OCSs);
- An additional control room at the primary crushing station with a single OCS
- An OCS in the plant metallurgist's office with process viewing and data trending capabilities only; and
- Closed-circuit television (CCTV) monitoring of key areas or transfer points.

17.8 Process Plant Layout

The LLGP process plant has been designed with approximate dimensions of 41 m (wide) x 107 m (long) and provides indoor space for grinding, adsorption, desorption and carbon regeneration, refining, and reagents areas. It also houses electrical rooms, a control room and metallurgical laboratory. The pre-leach thickener, pre-aeration tank, cyanide leaching tanks, cyanide detoxification tanks, and water services tanks are located outdoors near the process plant. The offices and assay laboratory are housed in separate buildings to the south of the process plant. The warehouse is located to the south of the process plant. The main electrical substation is located to the north of the plant area. The oxygen plant is adjacent to the leach tank area.

Figure 17-2 and Figure 17-3 show the Lynn Lake process plant general arrangement. Figure 17-4, Figure 17-5, Figure 17-6, Figure 17-7, and Figure 17-8 illustrate the process plant area 3D model.

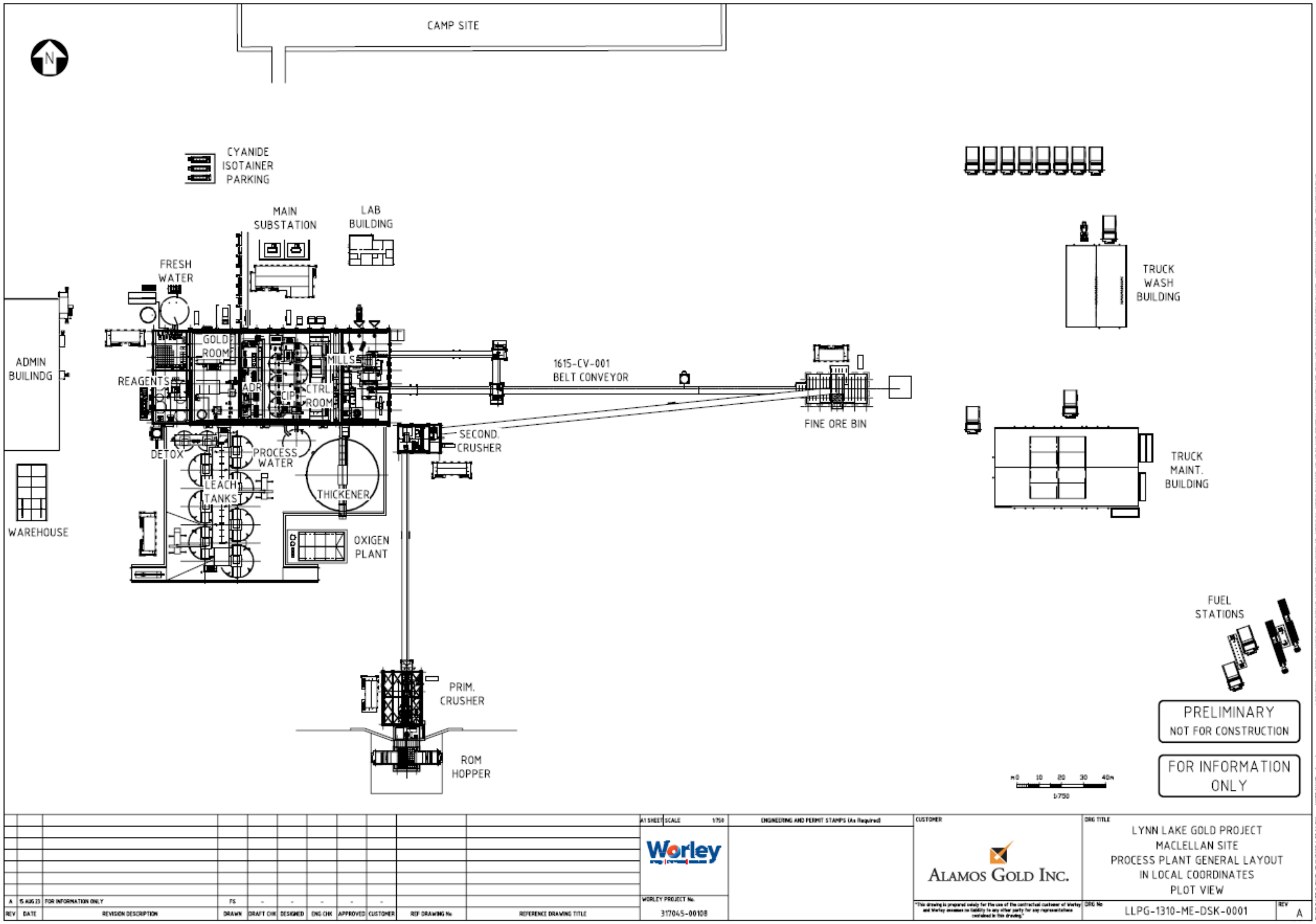


Figure 17-2 Lynn Lake Process Plant Site Arrangement

Source: Worley (2023)

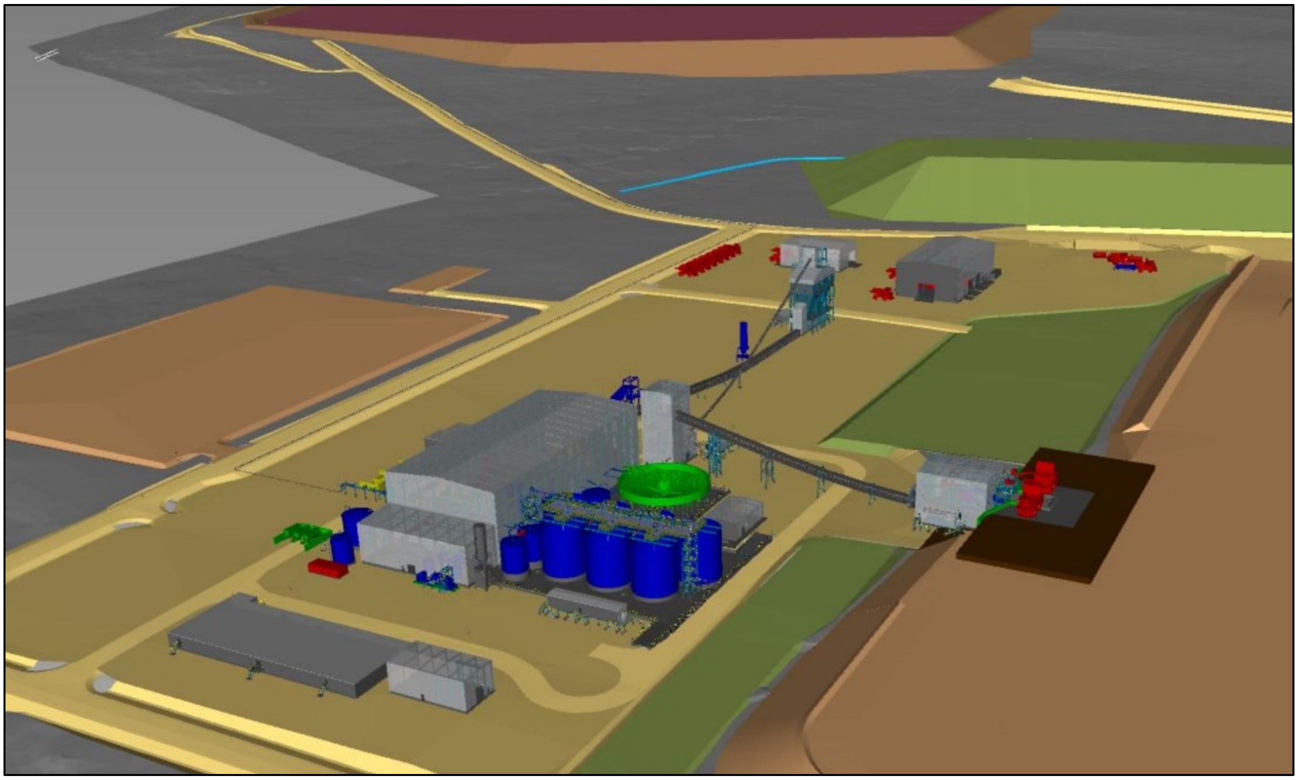


Figure 17-3 Lynn Lake Process Plant Site Arrangement – 3D Model

Source: Worley (2022)

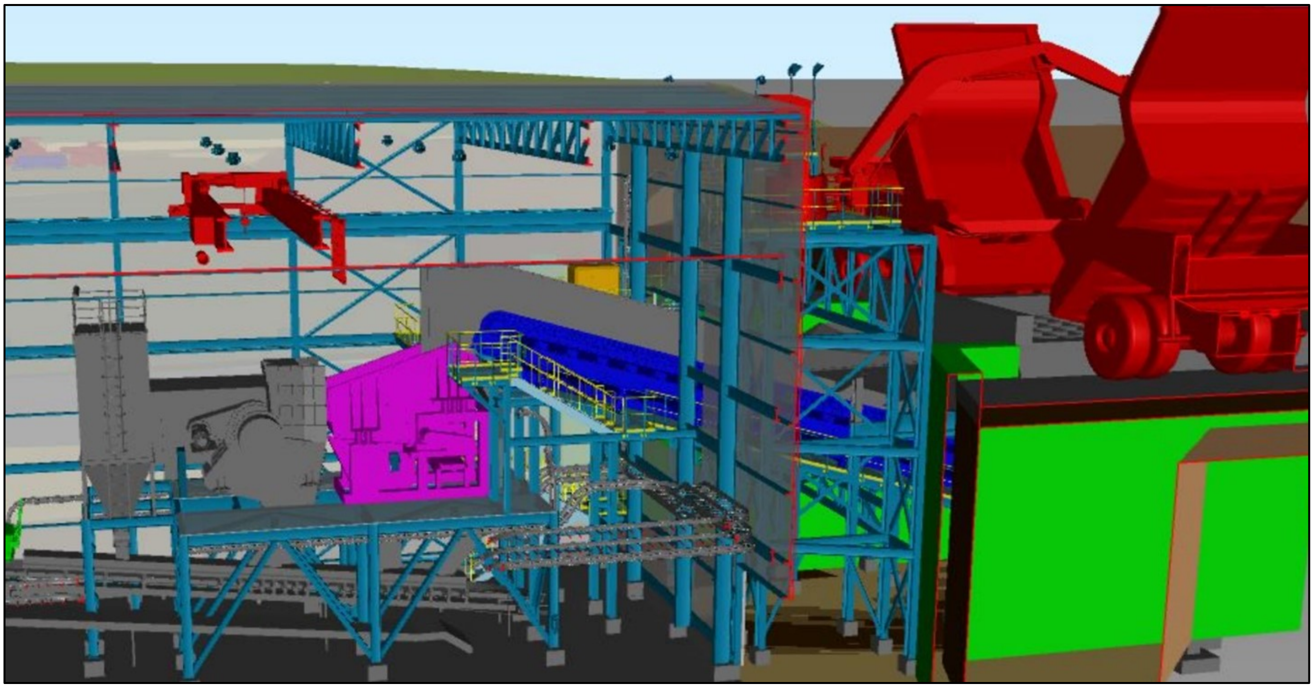


Figure 17-4 Primary Crushing Plant – 3D Model

Source: Worley (2022)

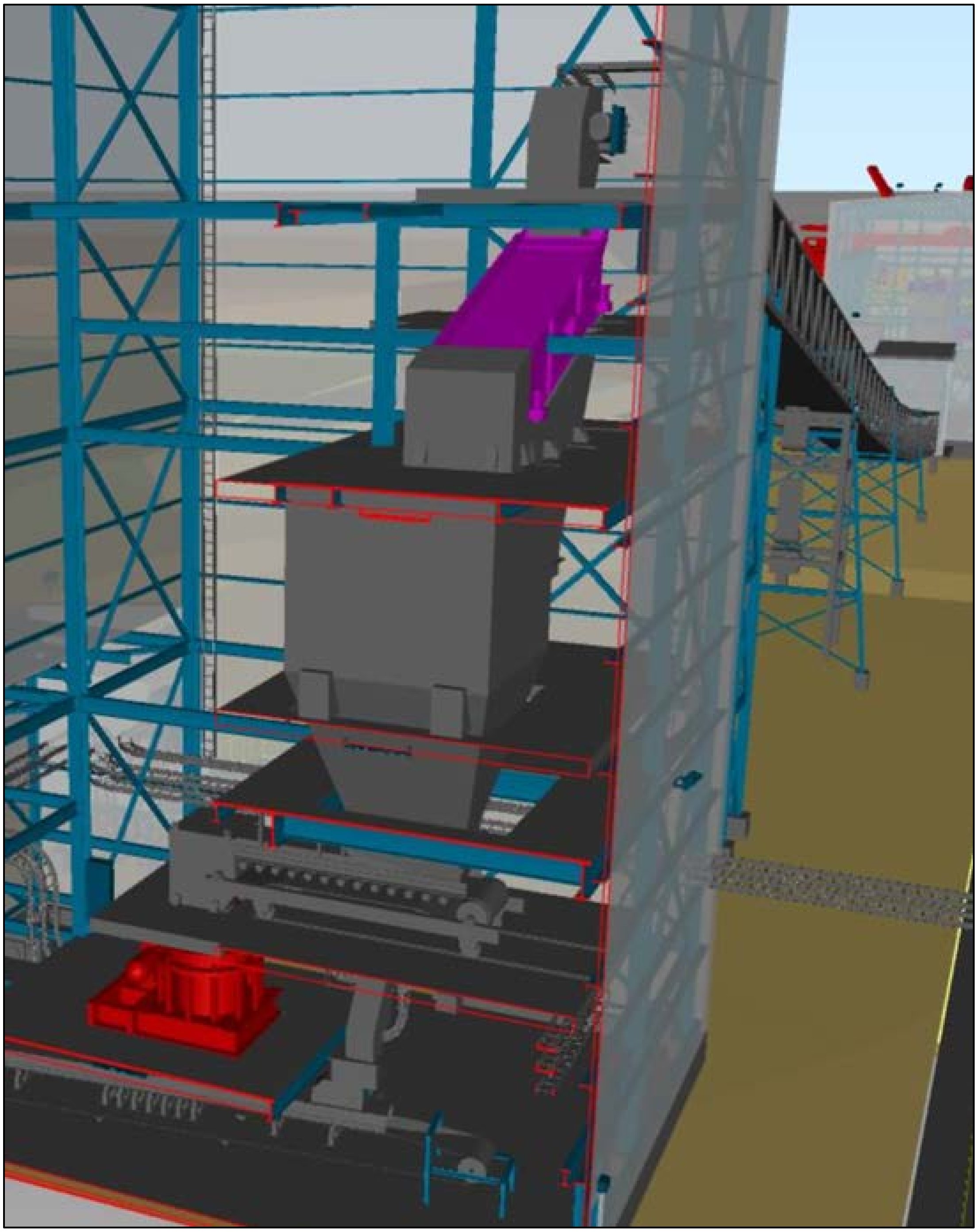


Figure 17-5 Secondary Crusher and Screen – 3D Model

Source: Worley (2022)

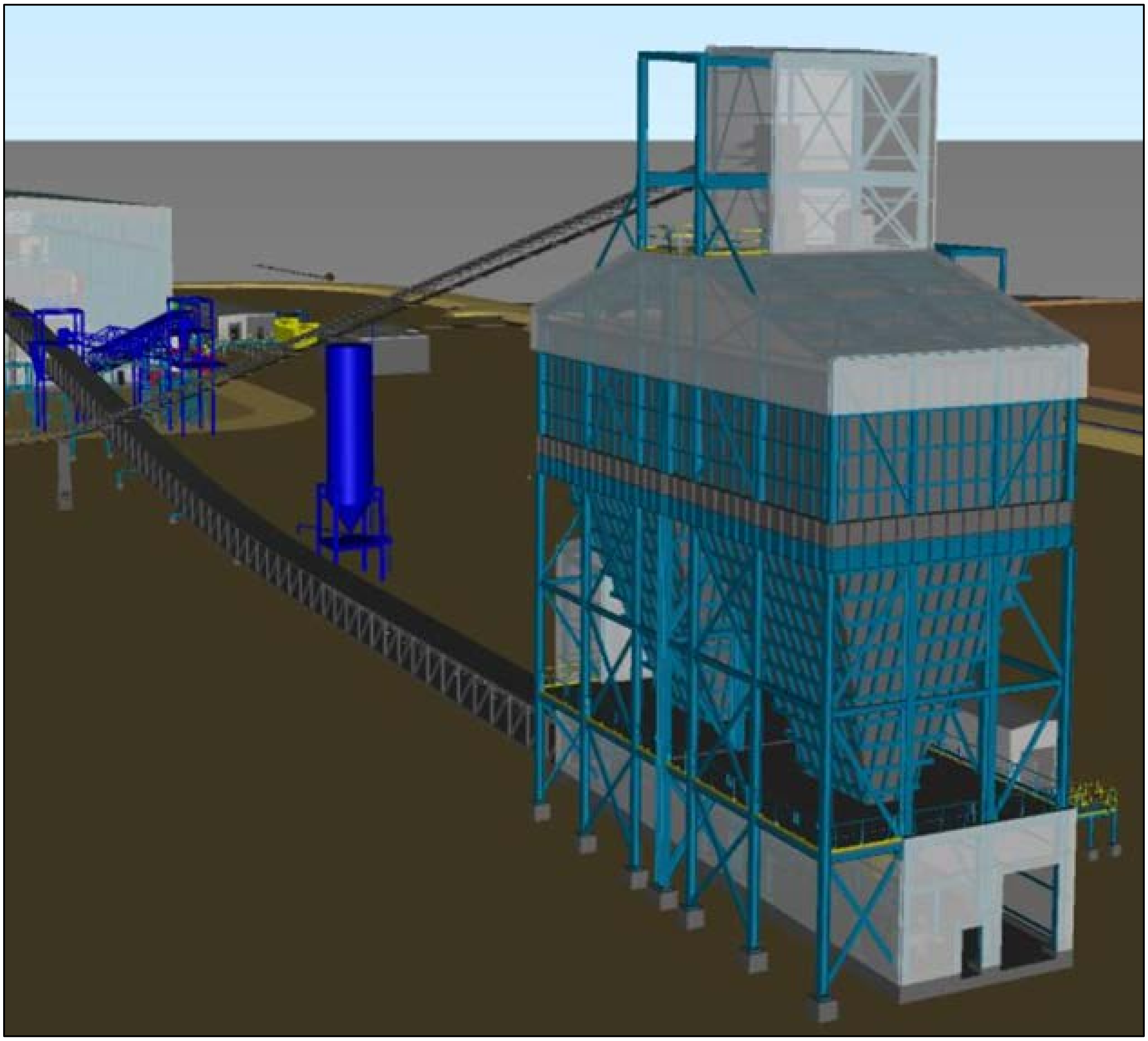


Figure 17-6 Storage Bin, Quicklime Silo and SAG Mill Conveyor – 3D Model

Source: Worley (2022)

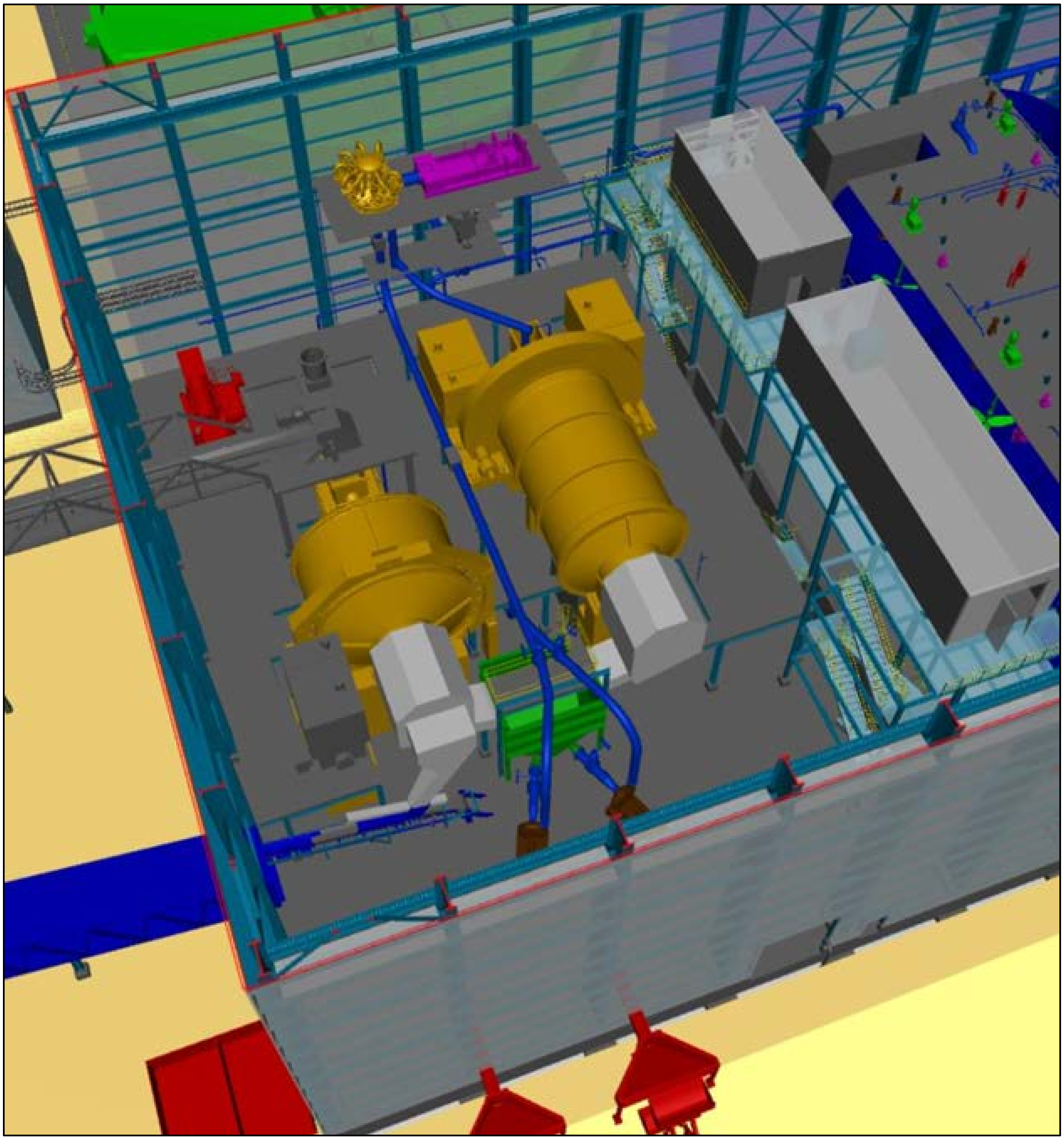


Figure 17-7 Grinding Area – 3D Model

Source: Worley (2022)

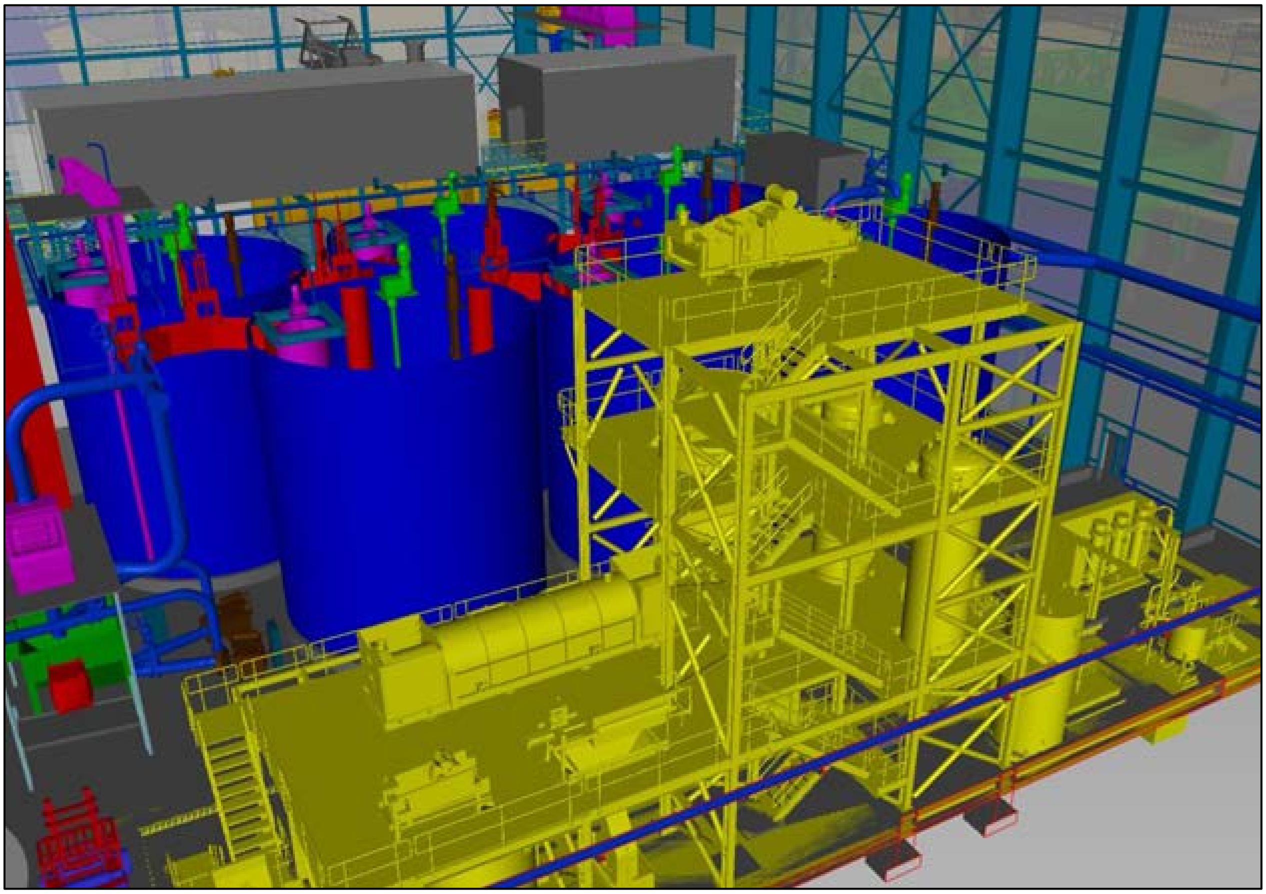


Figure 17-8 CIP Tanks and Elution Plant – 3D Model

Source: Worley (2022)

17.9 Production Forecast

The forecast metal production for each year of operation was based on the recovery equations described in Section 13 which were provided to the mine plan consultants and applied against the forecast mill feed by deposit. The recovery equations for gold are summarized below:

MacLellan, recovery Au % = (0.97 * Au Feed Grade in g/t + 92.5)/100% - 0.6%

Gordon, recovery Au % = 93% - 0.6%

These equations include a fixed value of gold insoluble and soluble losses of 0.6%. Maximum recovery for MacLellan was limited to 98% regardless of feed grade.

Silver recovery assumed a fixed average extraction of silver due to the highly variable results in leach tests with no apparent trend, less plant soluble losses and other losses. As no significant silver is present in Gordon ores, silver was not accounted for in its production forecast.

MacLellan, recovery Ag % = 50% - 2%

Gordon, recovery Ag % = N/A

The MacLellan silver recovery formula includes a 2% allowance for soluble and insoluble losses of silver.

AGP calculated period-by-period process recoveries from mine blocks on a weighted average basis in their mine plan. For each block in the model, a recovered grade was calculated using the formulas provided. For every period, the grades used in the mine plan were weighted averages based on the sum-product of the block tonnage and the grade divided by the total tonnage of the material mined in that period. AGP Mining Consultants (AGP) completed the mine plan for the FEED and detailed engineering phases.

Forecast production by year based on the weighted average of recovered grades in the AGP mine model are summarized in Table 17-5 and graphically presented in Figure 17-9.

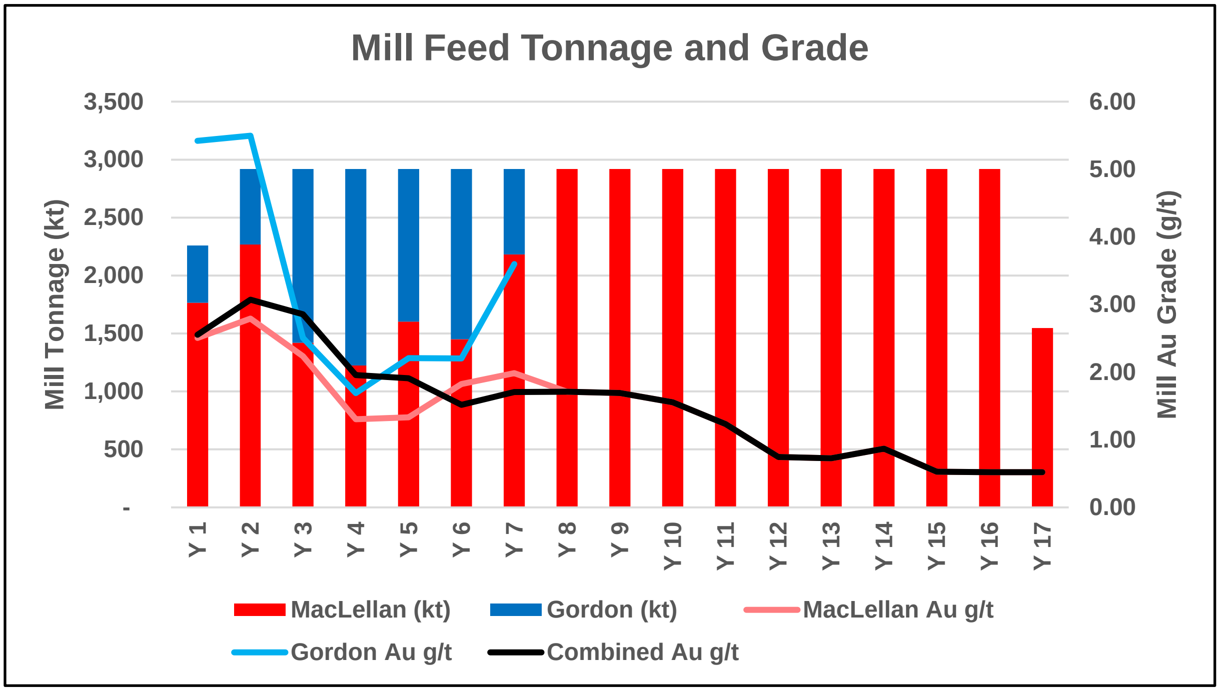


Figure 17-9 Lynn Lake Ore Tonnage and Grade over Life of Mine

Source: AGP (2023)

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Table 17-5 Annual Gold and Silver Production

Pit	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
Gordon																			
Mill Feed	kt	495	653	1,501	1,696	1,318	1,469	738	0	0	0	0	0	0	0	0	0	0	**7,868**
Gold Feed Grade	g/t	2.73	4.04	3.44	2.43	61	1.21	0.88	0	0	0	0	0	0	0	0	0	0	**2.43**
MacLellan																			
Mill Feed	kt	1,764	2,267	1,419	1,224	1,602	1,451	2,182	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	1,548	**39,738**
Gold Feed Grade	g/t	2.50	2.79	2.23	1.31	1.33	1.82	1.99	1.71	1.69	1.56	1.23	0.74	0.73	0.87	0.53	0.52	0.52	**1.34**
Silver Feed Grade	g/t	6.94	7.08	5.16	4.03	4.02	4.43	4.82	5.25	5.70	4.83	4.30	3.36	3.18	3.55	2.48	2.39	2.41	**4.28**
Total Mill Feed																			
Mill Feed	kt	2,259	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	2,920	1,548	**47,606**
Gold Feed Grade	g/t	2.55	3.07	2.85	1.96	1.91	1.52	1.71	1.71	1.69	1.56	1.23	0.74	0.73	0.87	0.53	0.52	0.52	**1.52**
Silver Feed Grade	g/t	5.42	5.50	2.51	1.69	2.21	2.20	3.60	5.25	5.70	4.83	4.30	3.36	3.18	3.55	2.48	2.39	2.41	**3.57**
Gold Production	kOz	175	272	250	171	167	133	151	152	150	137	109	65	64	76	46	45	24	**2,185**
Silver Production	kOz	189	248	113	76	99	99	162	236	257	218	194	151	143	160	112	108	58	**2,623**

18 PROJECT INFRASTRUCTURE

18.1 Site Selection and Site Earthworks

The process plant is located immediately north of the MacLellan deposit, on relatively natural high ground. Figure 18-1 shows the approximate location of the process plant and associated administration offices and workshops.

The site selected is a natural, elevated area on competent soil/bedrock away from watersheds. The run-of-mine (ROM) pad is as close to the open pit as possible to minimize haul distance and keep ROM pad activities downwind of the administration area.

The factors considered for layout and site selection are listed below:

- Locate the process plant in an area safe from flooding;
- Locate the heavy equipment foundation on competent bedrock and utilize rock anchoring for foundations design;
- Utilize existing access road and bridge to reach the site and avoid building new access road;
- Place mining, administration and processing plant staff offices close together to limit walking distances between them (important during extreme cold weather);
- Locate the ROM pad near the open pit;
- Utilize the natural high ground for the ROM pad;
- Separate heavy mine vehicle traffic from non-mining light-vehicle traffic;
- Locate the change house as close as possible to the gatehouse to limit walking distance from the bus drop-off point; and
- Locate the ready line close to the change house.

Figure 18-2 shows the overall general arrangement for the Gordon site.

18.2 General Access and On-Site Roads

18.2.1 Public Roads

PR 391 is a provincial road that provides access to the MacLellan and Gordon sites from the Town of Lynn Lake and the City of Thompson, Manitoba. Figure 18-3 shows PR 391 and the access roads.

18.2.2 MacLellan Access Road

The MacLellan Access Road is an existing two-lane, 6.4 km, gravel-surfaced road connecting the plant site to PR 391, immediately west of Keewatin River. The access road will be upgraded for mine operations. This road will be used to ship Gordon ROM ore and supply material to the MacLellan mine operation. It will also be used by plant and mine staff to commute to site.

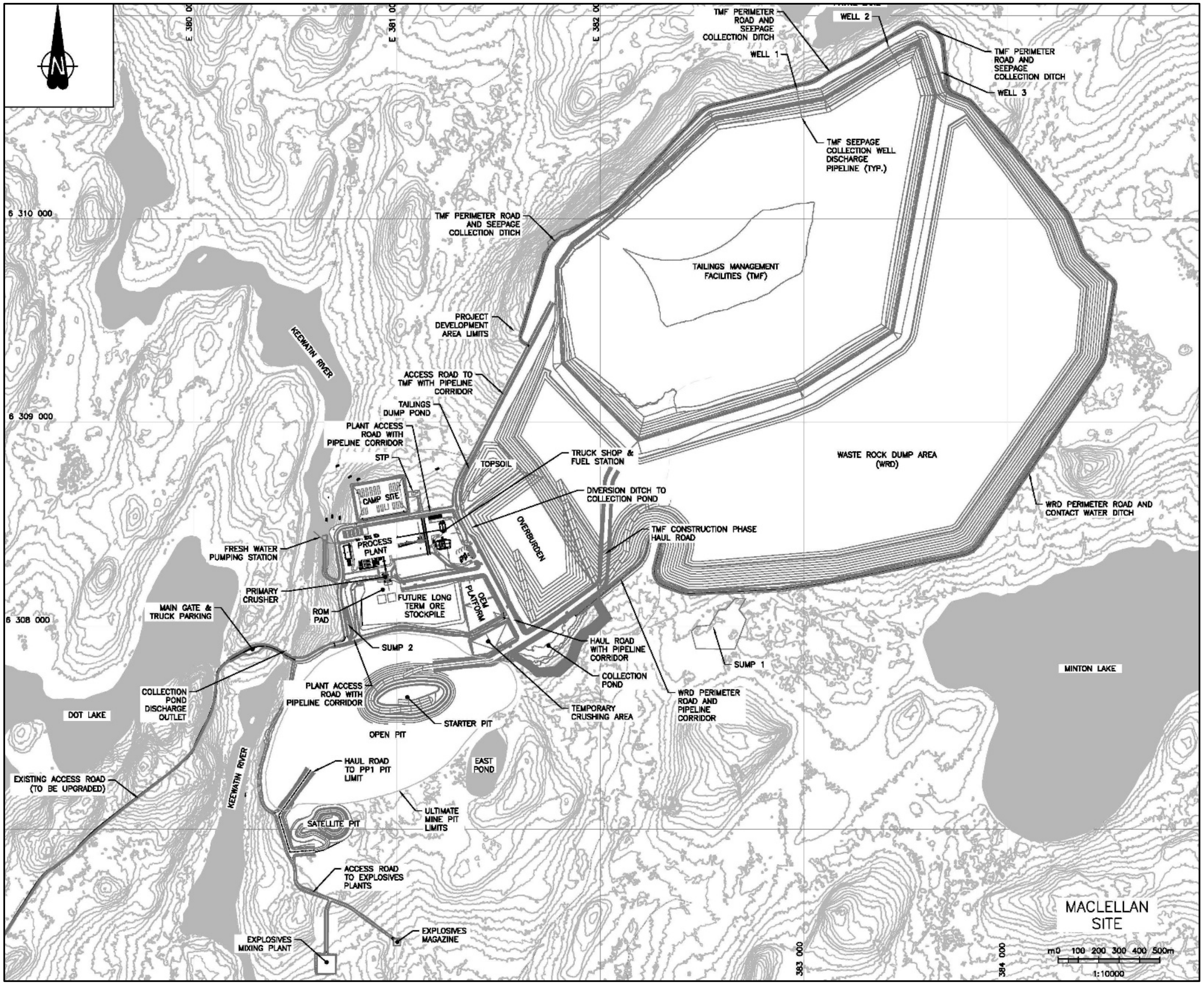

Figure 18-1 Overall MacLellan Site General Arrangement

Source: Worley (2023)

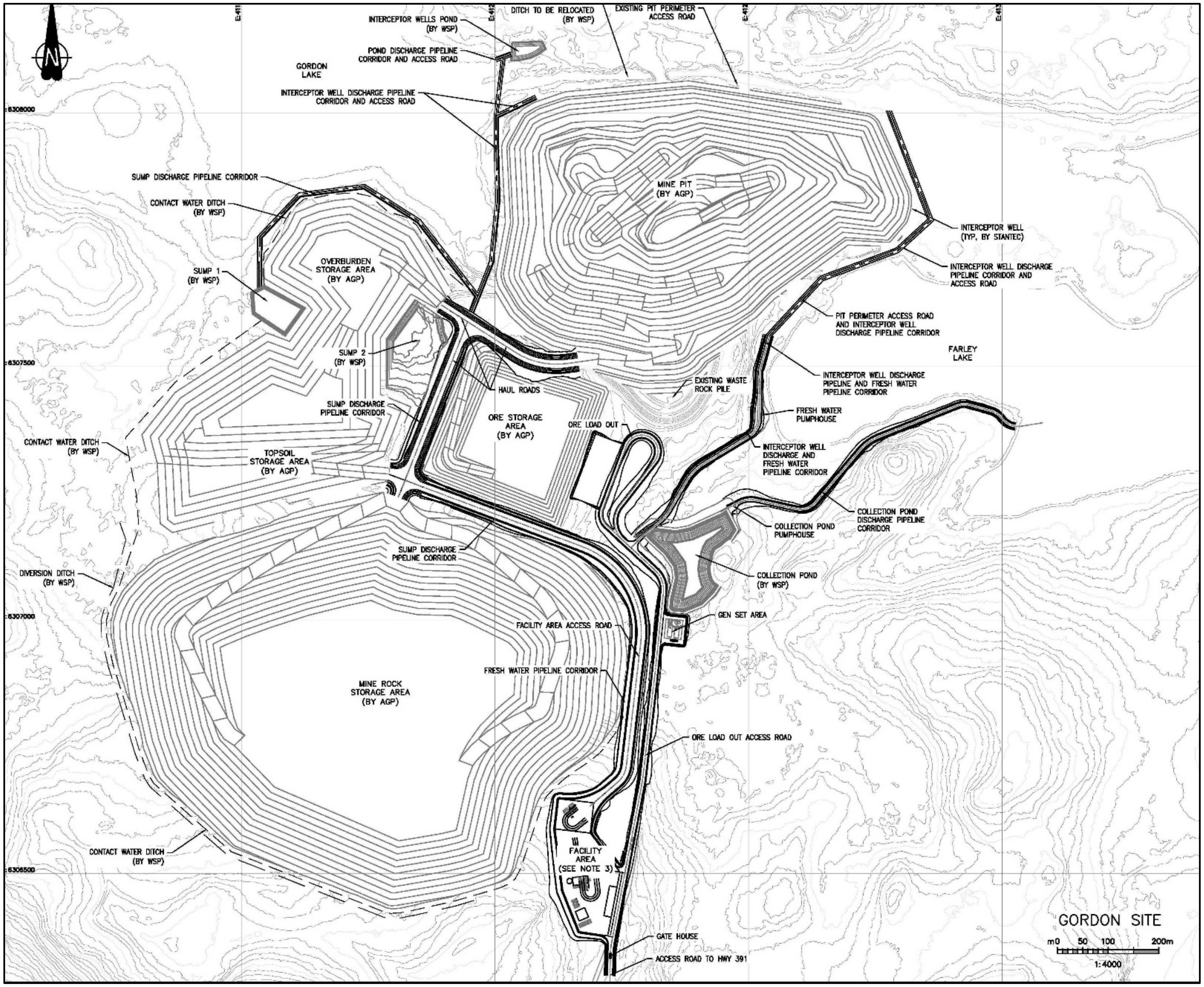

Figure 18-2 Overall Gordon Site General Arrangement

Source: Worley (2023)

18.2.3 Gordon Access Road

The Gordon access road is an existing two-lane gravel road that will be upgraded for the mine operation period. This road will be used to haul ROM ore from the Gordon site to the MacLellan process plant for six years. The length of site access roads from Hwy 391 are 4.52 km and 14.73 km for MacLellan and Gordon, respectively. The distance between the Gordon and MacLellan access roads on PR391 is 36.8 km.

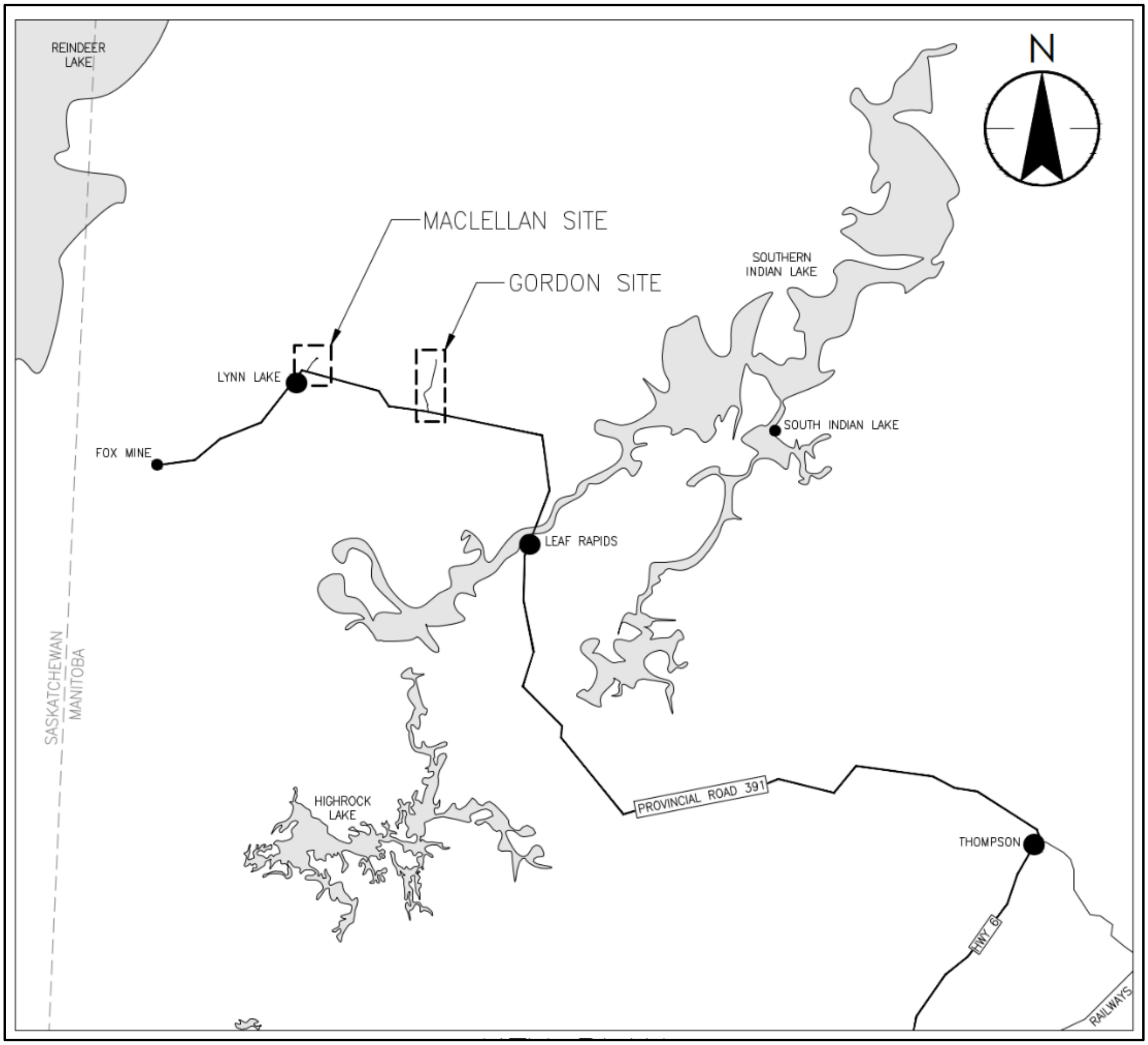

Figure 18-3 PR 391 and Access Roads

Source: Stantec (2021)

18.2.4 Mine Haul Roads

Material haulage from the Gordon open pit to stockpile and MacLellan open pit to the MacLellan ROM pad will be undertaken with off-highway mine trucks.

Mine haul roads are 25 m wide with 1.7 m high protection berms on each side, designed for mine trucks operating at both the MacLellan and Gordon mines.

Haulage of ore material from the Gordon stockpile to the MacLellan ROM pad will be via Manitoba Provincial Road PR 391. The road haul trucks will be side dumping B Trains with 33 m^3 capacity (approximately 59 tonnes at 1.8 tonne/m^3 bulk density).

18.2.5 Service Roads

Gravel service roads that are 5 m wide will be used to access site facilities (such as drainage sumps, reagent delivery, electrical substations, administration building, sewage treatment, explosive magazines, etc.).

18.3 Water Management

18.3.1 Hydrogeology

18.3.1.1 *MacLellan Hydrogeology*

Groundwater levels have been monitored at 32 monitoring well nests and eight drive-point piezometers across the MacLellan site, with continuous water level data collected at 20 monitoring well nests. Groundwater flow is strongly influenced by topography, resulting in an overall flow direction from northwest to southeast across the site. In the area of the proposed Tailings Management Facility (TMF), groundwater flows from a high of 365 m masl in the northwest portion of the site near Payne Lake to a low of 330 m masl in the southeast portion of the site near Minton Lake and several unnamed lakes. Existing groundwater flow in the proposed open pit area is radial, resulting in a groundwater flow divide extending south of the proposed open pit. Flow to the west is directed toward the Keewatin River; flow to the east is directed toward a tributary of the Keewatin River that is associated with a diffuse surface water drainage area west of Minton Lake. Artesian conditions (i.e., water levels above ground surface) were observed at eight of the bedrock monitoring wells and two overburden wells. Seasonal groundwater-level variations were observed to vary from negligible to up to 4 m for the wells monitored.

The hydraulic conductivity of the overburden and bedrock at the MacLellan site was assessed by single well response tests at 21 monitoring wells in the overburden, 54 monitoring wells in shallow bedrock since 2014, and short-term pumping tests conducted in 13 exploration boreholes in 2015. Results of the pumping tests were assessed with additional results from the packer testing conducted at four boreholes as part of the geotechnical investigation program.

The estimated hydraulic conductivity of the bedrock ranges from approximately 10^{-9} to 10^{-4} m/s, with the upper 50 m of fractured bedrock showing higher conductivity than lower units. The shallow (upper 50 m) bedrock ranges from 10^{-8} to 10^{-4} m/s conductivity, while the lower bedrock ranges from 10^{-9} to 10^{-7} m/s. The distribution of hydraulic conductivity measured in bedrock is shown on Figure 18-4.

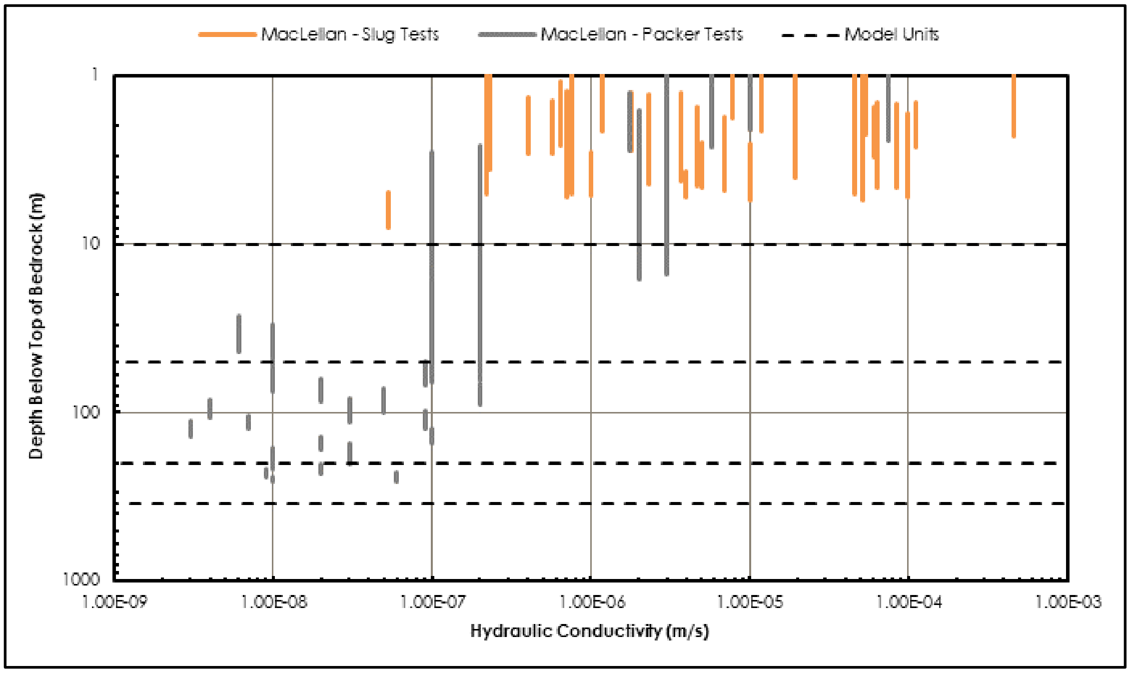

Figure 18-4 MacLellan Bedrock Hydraulic Conductivity Results

Source: Stantec Consulting Ltd., 2022.

The overburden was found to have hydraulic conductivity ranging from 10^{-7} to 10^{-5} m/s. Based on the initial groundwater modelling, it is anticipated that groundwater inflows may be adequately controlled by pumping from sumps within the open pit. The overburden trough (a northeast-southwest trending bedrock valley, where overburden thickness is increased) may require additional controls to divert the groundwater away from the pit crest.

18.3.1.2 *Gordon Hydrogeology*

Groundwater levels have been monitored at 17 monitoring well nests and four drive-point piezometers across the Gordon site, with continuous water level data collected at 12 monitoring well nests. Groundwater flow is strongly influenced by topography, which results in radial flow from the topographic high located south of the proposed open pit. Existing groundwater flow from this topographic high is radial with a portion of groundwater flow directed towards Susan Lake in the south, Pump Lake in the east, Farley and Gordon lakes in the north, and a tributary of Gordon Lake in the west. Groundwater flow converges from the north and south in the area of the proposed open pit and Gordon and Farley lakes.

The Gordon site is characterized by zones of high hydraulic conductivity, as initially investigated by others. The results of the 2015 geotechnical investigation packer testing completed by Golder provided input for short term pumping tests which were subsequently conducted later in 2015. Based on the results of these studies, a further long-term pumping test program was carried out at the Gordon site in 2016. Golder oversaw the drilling and installation of four pumping wells: two near Gordon Lake, and two near Farley Lake. Additional packer testing of the upper 100 m of bedrock was completed by Golder in 2021 and Stantec completed two 72-hour pumping tests at that same time within the shallow bedrock (upper 50 m) between the historical pits and Gordon and Farley lakes.

The estimated hydraulic conductivity of the bedrock ranges from approximately 10^{-9} to 10^{-4} m/s, with the upper 50 m of fractured bedrock showing higher conductivity than the lower units. The hydraulic conductivity of the bedrock in the vicinity of the lakes was estimated to be approximately an order of magnitude higher than the surrounding shallow bedrock. The upper 50 m of fractured bedrock generally has higher hydraulic conductivity than the bedrock below 50 m. The overburden was found to have hydraulic conductivity ranging from 10^{-7} to 10^{-5} m/s. Figure 18-5 provides a summary plot of the hydraulic conductivity results for the bedrock at Gordon.

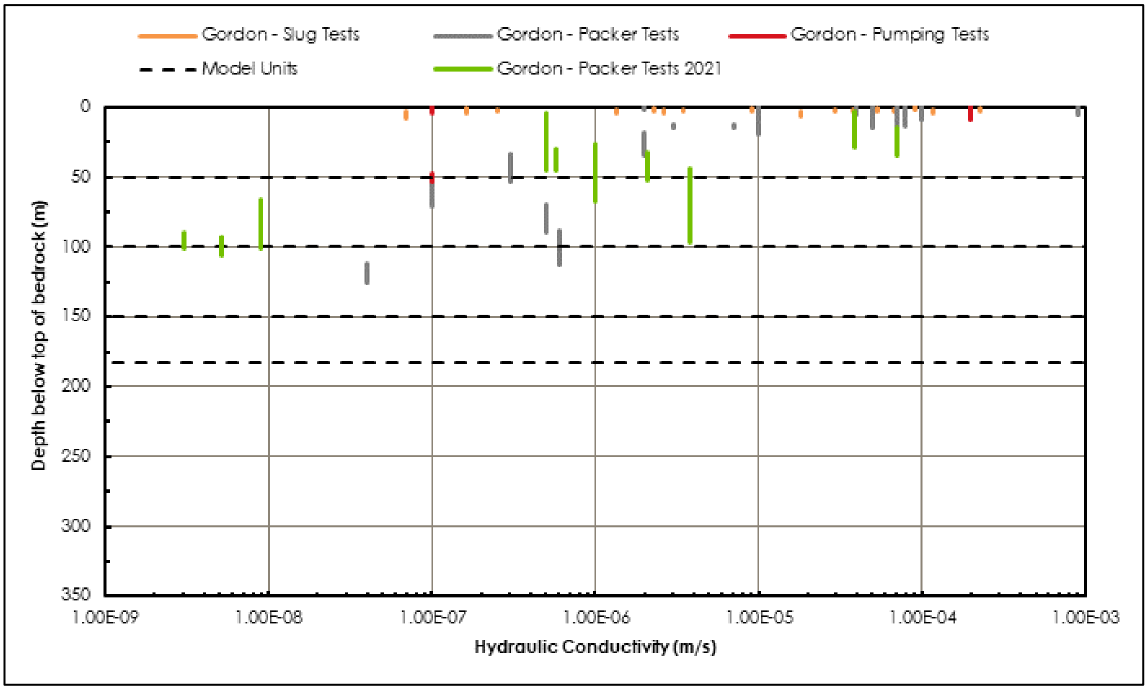

Figure 18-5 Gordon Bedrock Hydraulic Conductivity Results

Source: (Stantec, 2022)A preliminary 2D HydroGeoSphere numerical model was used by Golder to simulate the steady-state groundwater and surface water flow systems that could be expected to develop around the pits by assuming subsurface material properties and distributions, and model boundary conditions that were derived and conceptualized from the field investigation program. A 3D FEFlow model was used by Stantec to simulate the steady-state operation of the open pit including the use of shallow (i.e., 50 m deep) dewatering wells, which have been proposed to mitigate pit inflows from Farley and Gordon lakes. Discharge from the dewatering wells is assumed to be directed toward Gordon and Farley lakes.

18.3.2 MacLellan Site Water Balance

Water balance modelling was carried out for the operations stage to estimate the amount of water collected at the site, the amount of water available in the TMF and collection pond for reclaim, the discharge volumes to the environment (i.e., site excess water), and the storage volume requirements for sizing the TMF and collection pond. The water balance was developed on linked Microsoft Excel spreadsheets to simulate the site-wide water balance for the MacLellan site.

The water balance simulates the transfer of water between the various mine facilities of the MacLellan site monthly over the life of mine. The inflows to the system are the run-off from precipitation, flows associated with processing the ore, and seepage (i.e., groundwater inflow) into the MacLellan open pit. Evaporation from pond surfaces and water retained in the deposited tailings are accounted for as losses to the system. The model integrates flows across the site to quantify net inflows, pumping requirements, and discharge volumes to the environment for the purpose of feasibility study level design.

The water balance flow logic (Figure 18-6) was set up based on the water management concept described in Section 18.3.10. In addition, the following was considered in the development of the MacLellan site water balance:

- The quality of water collected in the proposed site collection pond meets the standards for direct discharge to the environment. Only total suspended solids (TSS) settling is required prior to discharge;
- There is no discharge of water from the TMF to the environment under normal climatic and operating conditions. The TMF has sufficient capacity to temporarily store water during periods of time when the TMF inflows exceed the water losses and the amount of water reclaimed to the mill under the range of operating and climatic conditions modelled. In the event that volumes in the TMF approach its capacity, treatment, and discharge of the TMF water may be required;
- The discharge of water from the site collection pond to the environment only takes place during non-winter months;
- All seepage through the TMF dams is assumed to be collected and pumped back to the TMF (i.e., no net seepage loss);
- Tailings water pumping to the TMF and reclaim water from the TMF to the mill occurs year-round;
- In the winter a volume of water stored in the tailings pond is trapped in the form of ice and therefore unavailable for reclaim to the mill; and
- The TMF is the primary source of reclaim water for the mill. In the event the water volume in the TMF is insufficient to meet mill requirements (a) water can be transferred from the Collection Pond to the TMF, or (b) make-up water may be pumped to the mill from the Keewatin River.

The modelling results under average precipitation conditions are summarized in Table 18-1 for the life of mine, as annual inflows and outflows associated with the TMF. The results presented correspond to the annual results for the TMF dam raises (as described in Section 18.13).

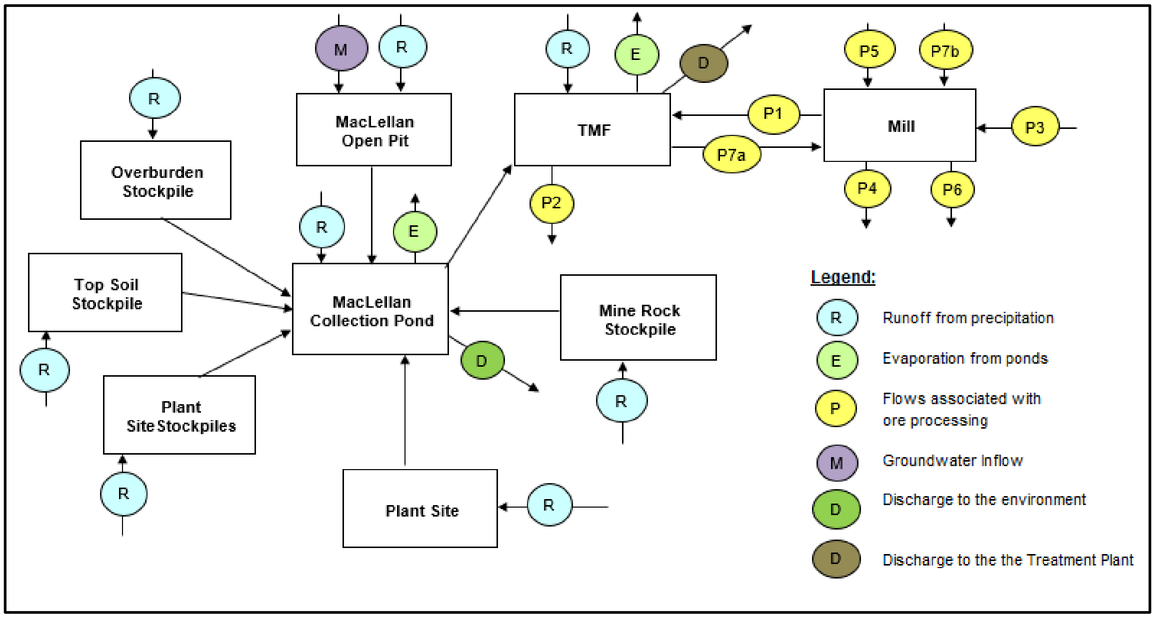

Figure 18-6 MacLellan Site Water Balance Flow Logic Diagram

Note:

- *Although discharge from the TMF to treatment has been considered, model results indicate it is not necessary.*

Source: WSP-Golder (2022)

Table 18-1 Tailings Management Facility Water Balance Summary (Average Climate Conditions)

Flows		Stage 1	Stage 2	Stage 3	Ultimate (Stage 4)
		Annual Volume (Mm³/a)			
TMF Inflows	Water in Tailings Slurry	2.33	2.83	2.83	2.83
	Run-off from Tailings Surface	0.61	0.75	0.82	0.90
	Total Inflows	**2.94**	**3.58**	**3.64**	**3.73**
TMF Outflows	Water Retained in Deposited Tailings	0.80	0.97	0.97	0.97
	Evaporation	0.25	0.28	0.28	0.31
	Total Outflows	**1.05**	**1.25**	**1. 25**	**1.28**
Net Inflow before Reclaim (Mm^3/yr)		**1.89**	**2.33**	**2.39**	**2.45**
Reclaim Requirements (Mm^3/yr)		**2.55**	**2.55**	**2.55**	**2.55**
Transfer Requirements from Collection Pond (Mm^3/yr)		**0[1]**	**0.23**	**0.16**	**0.11**
Make-up Water Requirements from the Keewatin River (Mm^3/yr)		**0.66**	**0**	**0**	**0**

Note:

1. *In year 1, reclaim requirements will be supplied by the Keewatin River. Therefore, no transfer is required.*

The water balance results under all precipitation conditions modelled (100-year dry to 100-yr wet) indicate that the water in the tailings flow and runoff from the TMF surface is not sufficient to meet reclaim water requirements. Under average conditions, the average net annual inflow before reclaim is approximately 1.89-2.45 Mm^3 while the annual reclaim requirement is 2.55 Mm^3. This deficit is typically reached at the end of the winter. To offset this deficit, the TMF pond should have a volume of approximately 500,000 m^3 by the beginning of November to meet winter process requirements. This volume can be maintained by transferring water from the Collection Pond to the TMF.

At Start-up, all process water requirements will be taken from the Keewatin River (up to 0.86 Mm^3/yr). After Start-up, from 0.05 to 0.43 Mm^3/yr (based on climate conditions) may have to be transferred from the Collection Pond to the TMF prior to winter in order to meet process plant requirements. Under average precipitation conditions it is expected that up to 0.23 Mm^3/yr may be required. Because these volumes can be supplied from the Collection Pond, no additional make-up water is required from another source under the range of climate conditions modelled.

The modelling results for the MacLellan collection pond under average precipitation conditions are summarized in Table 18-2 as annual inflows and outflows associated with the site collection pond through the project life as the project footprint expands.

Table 18-2 MacLellan Collection Pond Water Balance Summary (Average Climate Conditions)

Flows		Stage 1	Stage 2	Stage 3	Ultimate (Stage 4)
		Annual Volume (Mm^3/a)			
Inflows	Run-off	1.48	1.28	1.28	1.28
	Mine Dewatering	0.88	1.10	1.10	1.10
	Total Inflows	2.36	2.38	2.38	2.38
Outflows	Evaporation	0.03	0.03	0.03	0.03
	Transfer to TMF	0	0.23	0.16	0.11
	Discharge to Environment	2.33	2.12	2.19	2.2.24
	Total Outflows	2.36	2.38	2.38	2.38

18.3.3 Gordon Site Water Balance

Water balance modelling was carried out for the operations stage to estimate the amount of water collected at the site, pumping requirements and discharge volumes to the environment, and the storage volume requirements for sizing the collection pond. The water balance for the Gordon site was developed on linked Microsoft Excel spreadsheets and includes a mass balance model. The model was used to estimate solids settled in the collection pond prior to discharge to the environment.

The flow model simulates the transfer of water between the various mine facilities at the Gordon site monthly over a one-year period. The inflows to the system are the run-off from precipitation and seepage (i.e., groundwater inflow) into the Gordon open pit. Evaporation from the pond surface is accounted for as a loss to the system.

The site-wide water balance simulated the ultimate configuration of the site under three precipitation conditions: mean annual (i.e., average year), 100-year wet annual, and 100-year dry annual.

The water balance flow logic (Figure 18-7) was set up based on the water management concept described in Section 18.3.12. In developing the Gordon site water balance, it was assumed that the discharge from the collection pond to the environment (i.e., to Farley Lake) takes place throughout the year (as pit inflows are expected to continue during the winter), and that the mine water quality meets standards for direct discharge to the environment. Therefore, water treatment is not required prior to discharge, with settling of TSS being the main function of the collection pond.

The modelling results are summarized in Table 18-3 as annual inflows and outflows associated with the site collection pond.

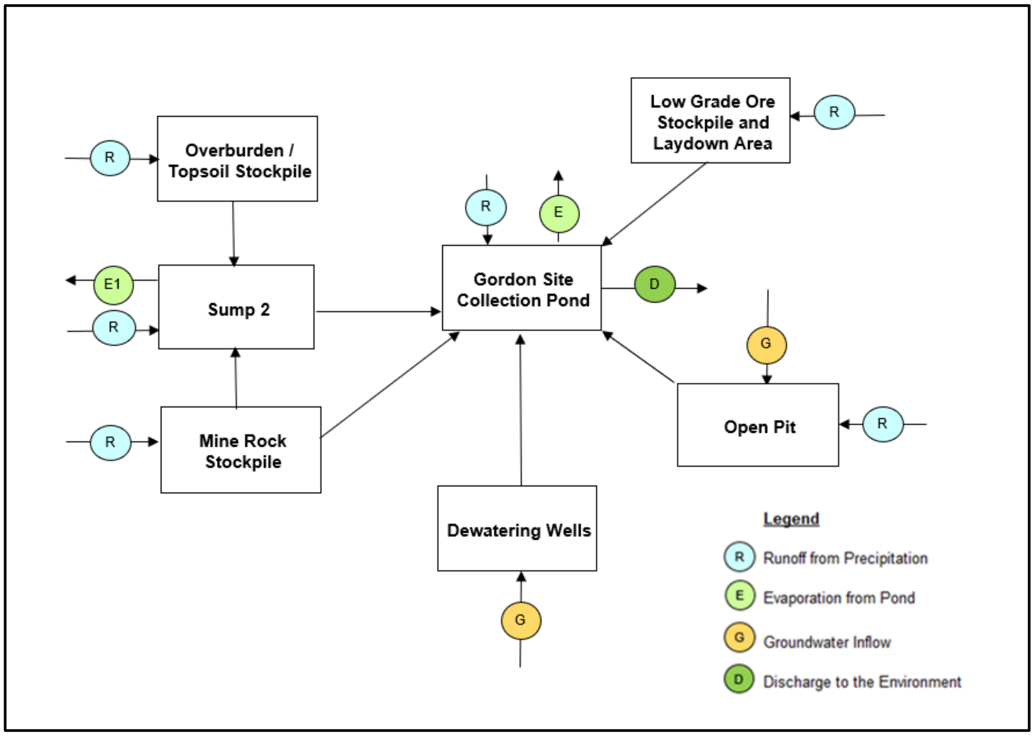

Figure 18-7 Gordon Site Water Balance Flow Logic Diagram

Source: WSP-Golder (2022)

Table 18-3 Gordon Collection Pond Water Balance Summary

Flows		Annual Precipitation Conditions		
		100-year Dry	Mean	100-year Wet
		Annual Volume (Mm^3/a)		
Inflows	Run-off	0.35	0.52	0.73
	Mine Dewatering	2.89	2.89	2.89
	Total Inflows	3.24	3.41	3.62
Outflows	Evaporation	0.01	0.01	0.01
	Water Discharged	3.23	3.39	3.61
	Total Outflows	3.24	3.41	3.62

18.3.4 MacLellan Freshwater Supply and Distribution

The freshwater for the processing facilities will be pumped via two pumps, each capable of pumping 40 m^3/h (one duty, one standby), from the Keewatin River through an on-ground traced 0.5 km 250 mm HDPE pipeline to the fresh/fire water tank located within the plant site. The storage tank is constructed from mild steel and has a total live volume of 1,460 m^3. A portion, corresponding to two-hour retention time, is utilized as the fire water reserve and the remaining portion has an eight-hour capacity to feed the various freshwater pumps. Two (one duty, one standby) horizontal centrifugal pumps supply freshwater to various consumers throughout the plant site (such as reagent mixing). Two (one duty, one standby) additional horizontal centrifugal freshwater pumps feed freshwater to the gland seal water distribution system. A fifth horizontal centrifugal freshwater pump supplies water to the freshwater treatment plant producing potable water to all the project installations. The reticulation pipework is heat-traced and thermally insulated where required. Maximum water requirements at MacLellan will be 312 m^3/h for plant start-up and the first year of operation which will be provided from both the Keewatin River and surface runoff collected in the TMF. Normal freshwater requirements will be 47.6 m^3/h once enough water is available from the TMF for reclaim.

18.3.5 Gordon Freshwater Supply and Distribution

The Gordon site freshwater supply is pumped via two horizontal centrifugal pumps (one duty, one standby) from Gordon Lake through an on-ground traced 100 mm HDPE pipeline to the fresh/fire water tank located at the site. The pipeline is buried to prevent freezing. The storage tank is constructed from mild steel and has a live volume of 700 m^3. A portion, equivalent to a two-hour live volume, is utilized as fire water reserve and the remaining portion has a one-hour capacity to feed the freshwater pumps. Two (one duty, one standby) horizontal centrifugal pumps supply freshwater to various consumers. The reticulation pipework is heat-traced and thermally insulated where required. Normal freshwater requirements for truckshop and truckwash makeup water will be 10 m^3/h.

18.3.6 MacLellan Potable Water System

Potable water supply will be provided for the processing plant by treating filtered freshwater. A vendor-supplied potable water treatment plant is used to generate the potable water. Freshwater is pumped through an ultra-violet unit for sterilization and filters for removal of contaminants and particles not acceptable in water for human consumption. The plant capacity will be 225 m^3/d.

Two (one duty, one standby) horizontal centrifugal pumps are fed from a 295 m^3 insulated potable water tank and supply safety showers and main distribution lines throughout the plant site.

18.3.7 Gordon Potable Water System

Two (one duty, one standby) horizontal centrifugal pumps will be fed from a covered 10.8 m^3 tank and supply safety showers and the main distribution lines throughout the Gordon site. The tank is filled via tanker truck from the MacLellan potable water treatment facility.

18.3.8 Reclaim Water

The main sources of process water will be reclaim water from the TMF. Water will be reclaimed with two (one duty, one standby) submersible return water pumps located on a single floating barge. Reclaim water is transferred through a single 200 mm HDPE pipeline to the process water tank at the main plant. The reclaim water pipeline will be a buried to prevent freezing. Normal reclaim water flow will be 330 m^3/h.

A tee with automatic valves in the pipeline directs excess water back to the TMF when the process water tank becomes full or there is plant site run-off bleed-off required. The tee is located near the barge end of the pipeline.

18.3.9 Sewage Collection

In general, sanitary sewage from the MacLellan site buildings will report to dedicated buried storage tanks. Sewage will be trucked from the storage tanks to the modular rotating biological contactor sewage treatment plant which is sized for 170 m^3/d (500 people). This plant will be located to the east of the camp at MacLellan.

The collected sewage from the Gordon site buildings will be conveyed by gravity through buried PVC piping to two septic tanks at the truckshop and administration building. It will then be trucked to MacLellan for processing at the MacLellan sewage treatment plant.

18.3.10 MacLellan Surface Water Management

The overall water management concept is to minimize the contact water the must be managed at the MacLellan site. Contact water is conveyed to:

- the TMF, where water is temporarily stored for recirculation to the mill or accumulated in the TMF pond; or
- the collection pond located near the open pit. Flows collected here are either pumped to the mill to meet process requirements or discharged to the environment.

Figure 18-8 shows the ultimate footprints of the mine facilities and the water management infrastructure located at the MacLellan site. The water management infrastructure includes contact water collection ditches, sumps, culverts, and the site collection pond.

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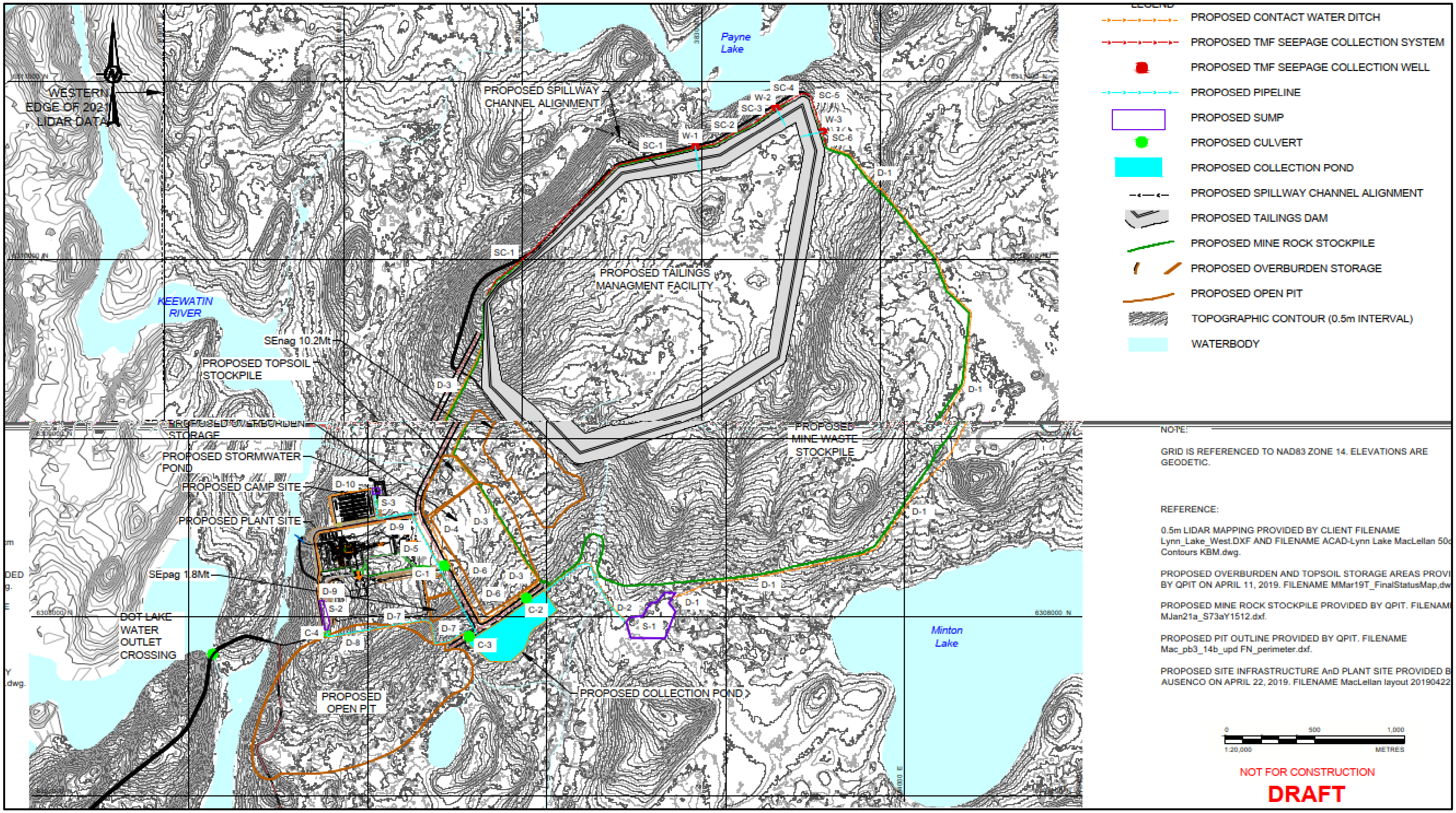


Figure 18-8 MacLellan Site General Arrangement and Water Management Infrastructure for Ultimate Stage

Source: WSP-Golder (2022)

The site contact water includes the following:

- Mine water – dewatering flows from the MacLellan open pit;
- Tailings water from the process plant;
- TMF water – comprised of direct precipitation on the tailings pond, surface run-off from the tailings beach, and seepage through the TMF dams; and
- Site runoff water - comprised of surface runoff from the process plant area, mine rock storage area, and stockpiles, as well as seepage resulting from infiltration of precipitation through the stockpile surfaces.

Dewatering flows from the MacLellan open pit will be pumped to the collection pond.

General site surface run-off from disturbed areas will be allowed to drain naturally to collection ditches that will convey the water to collection sumps. The water from the plant site stockpiles, topsoil stockpile, overburden stockpile, and mine rock storage area will be pumped from the collection sumps to the collection pond for storage prior to use in mill or discharge to the environment (towards the Keewatin River). Water collected in the TMF will be stored for recirculation to the mill. There will be no discharge of water from the TMF to the environment during operations under normal climatic or operating conditions.

The water collection ditches are designed to convey the peak flow resulting from the 1-in-25-year rainfall storm event. The collection sumps are sized to manage the peak flow resulting from the 1-in-25-year rainfall storm event through a combination of water storage and pumping while maintaining a minimum freeboard of 0.3 m.

Culverts are required around site to convey flows under access roads. The culverts are sized to convey the peak flow resulting from the 1-in-100-year rainfall storm event.

The TMF is equipped with an emergency spillway to allow safe routing of the design precipitation event to maintain a minimum freeboard and prevent dam overtopping. The design event was selected as the probable maximum flood (PMF).

The collection pond at the MacLellan site was sized with the following considerations:

- Minimum pond depth for operational purposes (0.5 m assumed);
- Active pond volume based on a 7-day retention period for 100-year wet precipitation conditions; and
- Storage for the environmental design flood (EDF).

Based on the above, the required pond volume is approximately 270,000 m^3. Settling may be required through mitigation techniques, such as flocculation or physical methods (e.g., silt curtains and/or baffles), to avoid exceeding the discharge limits set under the Metal and Diamond Mining Effluent Regulations (MDMER, 2022) for TSS concentrations.

18.3.11 MacLellan Water Treatment

Water treatment during the construction phase is not required as the water quality of the initial dewatering sites do not exceed MDMER limits based on the baseline monitoring program. During operation, preliminary results of run-off from mine rock, overburden, and ore stockpiles and dewatering from the open pit sump also do not suggest any MDMER exceedances. No discharge is anticipated during operation of the TMF.

By the time of mine closure, material from the ore bin will have been removed and processed. The MacLellan open pit will be flooded to avoid acid rock drainage (ARD) and metal leaching (ML) related to the open pit surfaces. PAG and non-PAG mine rock will be blended at MacLellan during operation to avoid ARD at closure. Monitoring of run-off and groundwater associated with historical mine rock and overburden storage do not show MDMER exceedances or signs of acidification after approximately 30 years of storage. Accordingly, no treatment of discharge from overburden and mine rock is anticipated for the MacLellan site during closure and post-closure. Any discharge from the TMF will be directed to the open pit during closure. The tailings surface will be covered as part of the mine closure, which will limit ARD/ML and is expected to improve TMF pond quality to levels acceptable for direct discharge to the environment. After improvement of water quality in the TMF pond, the pit lake will be permanently stratified and filled. When the pit lake is full, the discharge chemistry is expected to be calcium, magnesium, and sulphate rich with some elevated metal concentrations (e.g., iron, manganese, copper, and lead); similar to the water quality currently observed in the existing MacLellan shaft and deep bedrock exploration boreholes. Additional polishing can be done by discharging the water from any mine components through engineered or natural wetlands, which will provide passive treatment.

18.3.12 Gordon Surface Water Management

The overall water management concept is to minimize the contact water that must be managed at the Gordon site. Contact water is conveyed to the collection pond where sediment control can be provided prior to the release of water to the environment. Figure 18-9 shows the ultimate footprint of the mine facilities located at the Gordon site and the water management infrastructure, including the non contact water diversion ditch, contact water collection ditches, sumps, culverts, and the site collection pond.

A diversion ditch is proposed to divert non-contact water from flowing to the mine rock stockpile from the south. The ditch is designed to convey the peak flow resulting from the 1-in-25-year rainfall storm event.

Contact water collection includes the following:

- Mine water, comprised of dewatering flows from the Gordon open pit and the dewatering wells around the pit;
- Dewatering wells will be installed around the pit perimeter to reduce the inflow of water to the pit. Water from these wells will be discharged to Gordon and main collection ponds.
- The Gordon open pit will be pumped to the main collection pond throughout the year;
- Site run-off water, comprised of surface run-off from the stockpiles and seepage resulting from infiltration of precipitation through the stockpile surfaces; and
- General site surface run-off from disturbed areas will be allowed to drain naturally to collection ditches that will convey the water to collection sumps. Collection Sump 2 (located within the overburden stockpile footprint) will provide settling of runoff from the Mine Rock and Overburden stockpiles. The water will then be pumped to the main collection pond for prior to discharge to the environment.

The water collection ditches are designed to convey the peak flow resulting from the 1-in-25-year rainfall storm event. The collection sumps are sized to manage the peak flow resulting from the 1-in-25-year rainfall storm event through a combination of water storage and pumping while maintaining a minimum freeboard of 0.3 m.

Six culverts are required to convey flows under access roads. The culverts are sized to convey the peak flow resulting from the 1-in-100-year rainfall storm event.

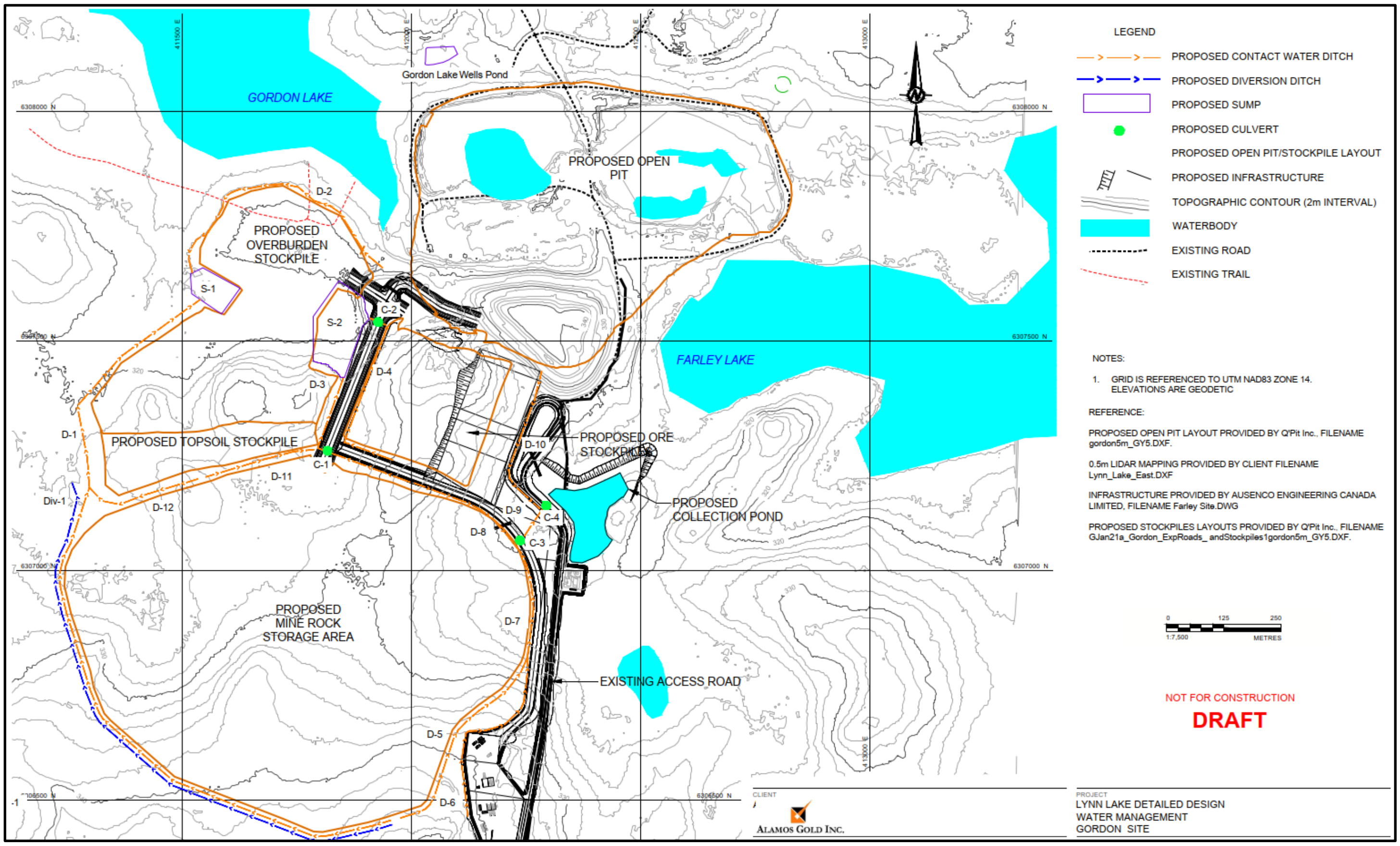


Figure 18-9 Gordon Site General Arrangement and Water Management Infrastructure

Source: WSP-Golder (2022)

The main collection pond at the Gordon site was sized with the following considerations:

- Minimum pond depth for operational purposes (1.0 m assumed);
- Active pond volume based on a 7-day retention period for 100-year wet precipitation conditions; and
- EDF storage.

Both Sump 2 (within the overburden stockpile footprint) and the Gordon collection pond are sized to retain water for suspended solids deposition. Based on the above, the required pond volumes are 39,000 m^3 and 61,000 m^3, respectively. Additional settling may be required through mitigation techniques such as flocculation or physical methods (e.g., silt curtains and/or baffles) to avoid exceeding the discharge limits set under the Metal Mining Effluent Regulations (MDMER, 2022) for TSS concentrations.

18.3.13 Gordon Water Treatment

During construction, discharges from the dewatering of the existing pit lakes will be required. Dewatering wells will also be installed to divert water from entering the existing pits. Current water quality in the existing pit lakes and surrounding groundwater environment do not exceed MDMER limits. Accordingly, there is no apparent requirement for treatment prior to discharge to the environment.

During operation run-off from the mine waste rock, overburden, ore stockpiles, and from the Gordon open pit sumps will be directed to a collection pond. Kinetic testing does not show any exceedances of MDMER limits in leachates from mine rock, overburden, or ore. The ARD onset time for portions of PAG ore and PAG mine rock is beyond the current expected period of operation at the Gordon site. Preliminary water quality modelling results indicate that concentrations in the collection pond will not exceed MDMER limits during operation. On this basis, treatment of discharge from the Gordon site collection pond is not expected to be required.

By the time of mine closure, material from the ore stockpile will have been removed and processed. The Gordon open pit will be flooded to avoid potential ARD/ML associated with the pit surfaces. The water quality in the resulting pit lake is not expected to exceed MDMER based on observed concentrations in the existing (historical) pit lakes. During operation, PAG and non-PAG mine rock will be blended to avoid ARD. Monitoring of run-off and groundwater near the historical mine rock and overburden storage does not show MDMER exceedances or signs of acidification after approximately 20 years of storage. Accordingly, no treatment of discharges from the pit lake, overburden, and mine rock at the Gordon site is anticipated to be required during closure and post-closure.

18.3.14 MacLellan Pit Dewatering

Groundwater at the MacLellan open pit will be primarily managed by sump pumps. If localized seepage were to occur, then sub-horizontal drains may be installed. This will minimize the potential build-up of pore pressure behind the slope faces. Groundwater levels will be monitored by vibrating wire piezometers. This water will be primarily pumped to the collection pond to allow for settling of solids prior to discharge.

A conventional sump pump dewatering system will be in operation at the MacLellan open pit. The system includes three diesel driven pumps and HDPE piping running on the wall surface, anchored, and buried at bench and road crossings. The dewatering includes inflow water from pit walls and storm water run-off, the quantities of which depend on the stage of pit development and will increase to a maximum rate of 126 m^3/h at the final stage of pit development.

18.3.15 Gordon Pit Dewatering

Dewatering measures, by means of pumping wells, will be employed at the Gordon open pit perimeter in close proximity to the adjacent lakes to reduce the groundwater inflow into the pit. A total of 13 dewatering wells will be installed to a depth of 50 m, with a nominal well spacing of 100 m, to intercept both groundwater flows and near surface flows from both Gordon Lake and Farley Lake. The easternmost system consists of seven pumping wells, each pumping at 14 L/s, while the westernmost system consists of six pumping wells, each pumping at 7 L/s.

A combination of drawdown wells and direct pit dewatering sump pumps in stages will be in operation at Gordon open pit.

The open pit dewatering pumping system includes two diesel driven pumps and HDPE piping running on the wall surface, anchored and buried at bench and road crossings. The dewatering includes inflow water from pit walls and storm water run-off, the quantities of which depend on the stage of open pit development and will increase to a maximum rate of 330 m^3/h at the final stage of pit development.

18.4 Power Supply and Distribution

18.4.1 Electrical Power Source

20 Mega-Volt-Amps (MVA) of hydro-electrical power will be required at the MacLellan site as all process facilities and major infrastructure buildings are situated there. The MacLellan site is located approximately 8.2 km northeast of the Town of Lynn Lake. The electrical power to Lynn Lake is supplied by Manitoba Hydro via Manitoba Hydro Line 6 which is terminated at the Lynn Lake Copper Substation. Line 6 runs from the Laurie River Generating Station to Lynn Lake. At the present time this line is being operated at 69 kV.

Through consultation with Manitoba Hydro, it has been determined that there is a weak power supply source for Line 6 at the 71.5 km mark at Copper Substation in town of Lynn Lake. For this reason, large ball and SAG mill motors must be started with soft starting systems to minimize the anticipated voltage drop on the line during motor start-up. This is discussed further in Section 18.4.7.

After completing a load interconnection study in 2019, Manitoba Hydro indicated that the Lynn Lake Gold Project will require the following changes to Manitoba Hydro Line 6 to supply the required amount of electrical power to the MacLellan mine site:

- Convert Line 6 (from Laurie River Terminal Station to Copper Station in Lynn Lake Town) from a 69 kV to 138 kV operation. Approximately 70.5 km of 71.5 km of Line 6 was constructed to 138 kV design standards in 1995. The remaining 1 km of line will have to be reconstructed to 138 kV standards;
- Convert the Copper St. Station at Lynn Lake from 69 kV to 138 kV;
- Modify the Laurie River Terminal Substation for 138 kV connection to Line 6;
- Construct an approximately 0.3 km, 13.8 kV tap onto line from Line 6 to supply power to the Alamos 138 kV - 34.5 kV substation located adjacent to Manitoba Hydro's Copper Station (see Section 8.4.3 for details on the Alamos Main Substation); and
- Alamos will construct an 8.2 km, 34.5 kV overhead line to the MacLellan site, terminating at an Alamos owned end-of-line structure with a 34.5 kV isolating switch.

In November of 2021 Manitoba Hydro completed an updated load interconnection study at the request of Alamos using updated project load information. The results from this study will be incorporated into the detailed design for the project.

The Gordon site has low electrical power demand. Power requirements at the Gordon site will be met by two 1000 kW diesel generators in duty/standby configuration. Power distribution will consist of 6.9 kV overhead lines.

18.4.2 Power Demand Estimates

The running and connected loads for both sites are shown in Table 18-4. Total loads have been calculated using the project's process plant mechanical equipment list and other building power requirements. Appropriate demand and utilization factors have been applied to the connected electrical loads to arrive at connected and running loads. The calculated connected load was then increased by 5% for the MacLellan site to allow for contingency.

Table 18-4 Running and Connected Loads

Site	Description	Demand
MacLellan Mine	Running Load	20.2 MW
	Connected Load	32.2 MW
	Manitoba Hydro Indicated Peak	26.2 MW
Gordon Mine (Diesel Generator)	Running Load	954 kW
	Connected Load	1,130 kW

18.4.3 Main Substation for MacLellan Site

In the previous feasibility study, the MacLellan site 138 kV Main Substation was located near the process plant and a 138 kV overhead pole line was to be built by Manitoba Hydro up to the Alamos owned isolation main breaker at that substation. As per Manitoba Hydro estimates, this 8.2 km 138 kV pole line would require an exceptionally long construction schedule (due to environmental approvals) and a high capital cost.

In this study, the Alamos MacLellan mine Main Substation is located near the Lynn Lake Copper St. Station, improving both capital costs and the schedule for this item.

A 138 kV - 34.5 kV MacLellan site Main Substation will be built by Alamos next to the existing Lynn Lake Town Copper Street Station. The proposed substation will be double-ended with 100% redundancy in transformer capacity. Two 21/28 MVA oil filled type substation transformers are sized to carry the maximum power required by the MacLellan site. This includes future growth and redundancy in the event a single transformer is temporarily out of service.

The new Alamos-owned 34.5 kV single circuit pole line will terminate at an end-of-line structure with a 34.5 kV isolating switch near the process plant.

18.4.4 Site Power Distribution

Power at the MacLellan mine process plant is received at 34.5 kV near the process plant fence line. The proposed main substation will be double-ended with 100% redundancy in transformer capacity. Two substation transformers in duty/stand-by configuration, will step down the 34.5 kV incoming power to 13.8 kV. The Main Plant Substation is located near the process plant and power is distributed to all electric load centres around the site.

The electrical load centers, in the form of factory built electrical rooms (E-rooms), are strategically located close to clusters of motors and other loads to minimize cable lengths. Prefabricated E-rooms are selected to minimize field installation labour hours and expedite the construction schedule.

Power is distributed to the process plant using 13.8 kV feeder cables, as appropriate, based on distance from the power source.

The overhead 13.8 kV distribution lines will supply power to the outlying pumping stations and service buildings.

18.4.5 Redundancy

The proposed main substation will be double-ended with up to 100% redundancy in transformer capacity.

18.4.6 Standby / Emergency Power Supply

The MacLellan site is provided with a 2 MW standby diesel generator sized to supply critical process loads and safety systems. The standby diesel generator is located close to the process plant main substation and connected to the 13.8 kV main substation switchgear. In this way, a single generator set can supply standby power to all facilities using the normal power distribution system.

At the Gordon site, two 1000 kW diesel generators in duty/standby configuration are included to provide the same reliability for emergency and life safety loads. Gordon power distribution is 6.9 kV.

18.4.7 Ball and SAG Mill Drive

Low speed induction motors, equipped with variable-frequency drives (VFD), are used for the grinding mills (ball mill, dual pinion with 2 x 3500 kW motors and SAG mill with 1 x 3500 kW motor).

Harmonics and power factor correction capacitors are designed to achieve 0.98 power factor (PF) at the utility supply system as committed to Manitoba Hydro. Two 4.5 MVAR harmonic filters and capacitor banks have been added on the 13.8 kV main busbars to achieve a 0.98 PF at the supply end, to minimize harmonic impact on the power distribution system, and to meet Manitoba Hydro's harmonic mitigation mandate.

18.4.8 Construction Power

Contractor power requirement will be 600 V, so a small portion of permanent 13.8 kV overhead line will be built at the Maclellan site to bring power to contractor trailers and construction areas. The Gordon Mine site will utilize diesel generators.

18.5 Plant Control System

18.5.1 Process Control System (PCS)

The key objective of the control system is to provide an automated plant wide system that is uniform in architecture, hardware, and configuration software throughout all process plant areas.

Control of the plant will be through the Human Machine Interfaces (HMIs) located in the primary crushing area control room, and the main control room. PCS controller panels will be located in each E-room and networked with fibre optic cables, providing remote access.

The control system is designed to be redundant down to the controller level, with software updates and certain hardware changes to be done while the plant remains in operation. The servers for the control system will be located in the Grinding Mill E-Room 2. Local uninterrupted power supply (UPS) will maintain operation for 90 minutes to compensate for power surges and outages.

A workstation is provided in the maintenance workshop for remote display of the process plant HMI screens and the Asset Management System.

The Process Control System will be fully configured, and Factory Acceptance Test (FAT) tested before shipment to the site. A Site Acceptance Test (SAT) for the complete system shall be completed after the system has been delivered to the site and is satisfactorily installed. The SAT shall also include verification of PCS communication links with 3rd party package PLC's.

The supplier of package equipment may provide a PLC/Control System which is their standard for the package and is a different brand and model from the plant Process Control System. It is intended that package PLC's shall interface with plant PCS using standard protocols (Modbus TCP/IP or Ethernet/IP) for remote monitoring and control from the PCS operator's consoles.

The Gordon site has minimum control for plant services (water, air, and fuel). The control will be done with a PLC located in the electrical room. It will not communicate with the MacLellan site.

18.5.2 Field Instruments and Valves

Field instrumentation and valves will be wired to either the Process Control System or the specialty PLC's. All analogue devices will have Highway Addressable Remote Transducer (HART) protocol to monitor each device and setup the configuration. An Asset Management System is provided to capture and store call HART transmitter configurations and changes. All analogue devices will be supplied in a pre-calibrated state ready for installation.

Process specific instruments and analysers will be supplied with mechanical equipment.

18.5.3 Closed-Circuit Television

Process video cameras will be installed to assist the operator's view of the process. These cameras are viewed on a separate display in the primary crushing area control room, and the main control room.

18.6 Communication System

The Town of Lynn Lake is presently serviced with communications systems insufficient to support the business needs of Alamos. Existing infrastructure includes the hardwired trunk lines to Lynn Lake and basic residential grade satellite services. Plans are to incorporate these current facilities where practical to provide initial communication requirements.

Anticipated communication plans involve two key services. Firstly, the direct link between the Alamos corporate network and the town of Lynn Lake, and then secondary links between the latter and mine sites surrounding the town.

For the primary link, short term plans are to implement a dedicated commercial grade satellite network (Low Earth Orbit) to deliver the data and Internet requirements of the mine site and its employees. The satellite bandwidth of 100/20 Mbps will be private, scalable, and secure, providing controlled but sufficient data to facilitate all primary business and reasonable non-business communications. This primary satellite link will be converted to a microwave solution once future fibre connections are established within a 100km range of Lynn Lake. It is assumed Alamos would have access to future fibre infrastructure running from Nelson House or Leaf Rapids towards South Indian Lake.

Current primary rate interface (PRI) trunk lines will continue to be used for primary voice communication and backed up through alternate links on Alamos' business network where practical (Wi-Fi calling) and available. Voice calling may be converted to digital if services are available in the future. These current and future plans would include managed recreational access to internet services for construction, contractors, and Alamos personnel.

For secondary links, the main satellite service will be relayed from the Lynn Lake office and be distributed to the two mine sites through point-to-point microwave connections. Microwave towers will be provided and installed in each of the key locations as required – MacLellan, Gordon, and the Alamos office in Lynn Lake. The Lynn Lake office will provide a controlled central environment to facilitate equipment and management of this site network. Standardized phone systems will be deployed at mine or construction sites and be relayed through the main carrier in Lynn Lake (Bell Canada/MTS).

These plans require the establishment of site towers that would fulfil a dual purpose for mine site radio, control systems, security, and tracking communications. It is assumed that each tower could range between 25 and 75 m high, be self-supported and in compliance with all Canadian Standards Authority (CSA) regulations. Structural and CSA regulations may include solid foundations and supporting guy wires. Location and terrain may require this to be located outside of Alamos' property and would require prior approvals from MNRF and possibly land lease arrangements and clean energy provision. The following are the key areas that may require communication towers:

- Gordon Mine: 56 54 11.33 N / 100 26 46.97 W;
- MacLellan Mine: 56 53 51.51 N 1 100 57 22.21 W; and
- Lynn Lake Office: 56 51 4.8 N / 101 2 55.14 W.

Once the main links are in place, standard enterprise grade Wi-Fi solutions will be deployed at the above sites to facilitate on site wireless communication.

Alamos is currently working with local partners to expedite fibre and high-speed internet services, but this is still viewed as a long term option at this stage. Likewise, Alamos has engaged with cellular carriers to review options to extend cellular services to Lynn Lake and is dependant on future microwave and fibre availability.

18.7 Mine Management System

Operations are expected to use radio communications. An allowance of is included in the initial capital budget for the initial purchases. Replacement of radios is covered under the miscellaneous area of the mine operating costs.

18.8 Compressed Air Systems

18.8.1 MacLellan Compressed Air System

The compressed air system at the MacLellan site is comprised of two 850 kPa rotary screw compressors (one duty, one standby). All the air will be filtered and dried using a desiccant air dryer and stored in dedicated plant and instrument air receivers for distribution. Instrument air will be distributed to pneumatically actuated instruments. The plant air will be distributed to various plant air users and utility stations for maintenance.

Both the truckshop and maintenance shops will be equipped with dedicated compressors, refrigerant dryers, and receivers. These systems are completely indoors and are used mainly for shop tools.

18.8.2 Gordon Compressed Air System

The compressed air system at the Gordon site is comprised of two 850 kPa rotary screw compressors (one duty, one standby) with refrigerant dryer and receiver. This system will be for compressed air distributed to utility stations for equipment maintenance. No instrument quality air is required at the Gordon site.

18.9 Fuel Supply, Storage and Distribution

Fuel storage and dispensing equipment will be provided as part of the fuel supply contract for the MacLellan and Gordon sites. Dyed diesel will be used for the mine trucks, undyed diesel for the road haul trucks, and gasoline for the light vehicle fleet.

The fuel storage and dispensing equipment will be supplied as skid mounted fuel stations. Each skid mounted fuel station will consist of a horizontal primary storage tank, 110% capacity secondary containment tank, dispensing pump, auxiliary piping, hose, valves, and instruments. Dispensing pumps on the mine haul truck fuel stations will be high flow type to minimize refueling time.

Each skid mounted fuel station will be located outdoors on a concrete housekeeping pad. Spills from fuelling station transfers will be contained on concrete slabs and routed to buried oil-water separators sized to meet the discharge requirements of the Manitoba Storage and Handling of Petroleum Products and Allied Products regulation. Each oil-water separator will be checked regularly and skimmed out as required.

The following equipment will be required at the MacLellan site:

- One to two 75,000 L dyed diesel fuel stations for the mine haul fleet, depending on the mine plan year;
- One 30,000 L undyed diesel fuel station for the road haul trucks; and
- One 5,000 L gasoline fuel station or similar size will be provided for the light vehicle fleet.

The following equipment will be required at the Gordon site:

- One 65,000 L dyed diesel fuel station for the mine haul fleet.

Most heating will be by electricity; however, propane may be required at the MacLellan camp vehicle wash-down facilities.

Two mine truckwash facilities will be needed; one at MacLellan and one at Gordon. These facilities are discussed further in Sections 18.10.7 and 18.10.15.

18.10 Buildings

18.10.1 Primary Crushing Facility – MacLellan

At the MacLellan primary crushing facility mined ore will be fed from either the ore stockpile by front end loader or directly from the open pit by 139t trucks onto a grizzly screen (800 mm x 800 mm) and into a dump hopper below (180 m^3). A rock breaker will be used to reduce the ore size on the grizzly to allow it to pass through. The hopper will feed an inclined apron feeder which transports the ore into the primary crushing building located immediately north of the dumping area.

The grizzly screen and hopper will be supported on 9.3 m tall concrete retaining walls which transition into mechanically stabilized earth (MSE) walls on either side of the loading pocket. Additional support for the hopper and apron feeder will be provided by steel columns beneath the equipment. The area below the hopper which houses the apron feeder will be enclosed on 3 sides by the reinforced concrete retaining walls and by the primary crushing building on the remaining side. A rock breaker and control cabin will be mounted on steel platforms supported from the top of the concrete retaining walls.

The primary crushing building will be a 24.7 m long x 18.1 m wide x 17.2 m tall stick-built steel building with a 20-tonne overhead crane to service the equipment. It will house the vibrating grizzly screen, primary jaw crusher, chutes, apron feeder, transfer belt conveyor, dust collector, magnetic separator, make-up air unit, electric unit heaters, and a pre-engineered modular control room and washroom. Most of the equipment will be located on the ground floor and one main operating floor with smaller platforms to access equipment for maintenance. The building construction will consist of structural steel framing on reinforced concrete foundations enclosed with insulated metal panels. The building will be located south of the process plant, directly north of the loading pocket within the MSE wall. A pre-engineered compressor building will be located outside the primary crushing building.

18.10.2 Secondary Crushing Building – MacLellan

The crushed ore will be fed from the primary crushing building to the secondary crushing building via a 36” wide, 108.5 m long belt conveyor contained within a heated enclosed gallery. The secondary crushing building will be a 19.5 m long x 13 m wide x 30 m tall stick-built steel building with a 10-tonne overhead crane to service the equipment. It will house the vibrating inclined screen, surge bin (65 t live capacity), chutes, cone crusher, belt feeder, dust collector, make up air unit, and electric unit heaters. The equipment will be located on a series of platforms throughout the height of the building accessed by stairs. The building will be constructed with structural steel framing supported on reinforced concrete foundations enclosed with insulated metal panels. The building will be located southeast of the main process building approximately 100 m north of the primary crushing building.

18.10.3 Fine Ore Storage Facility – MacLellan

The ore from the secondary crushing facility will be fed to the 5,400-tonne steel lined fine ore storage facility via a 36” wide, 146 m long belt conveyor contained within an enclosed heated gallery. The fine ore storage facility will consist of a rectangular steel bin with a central vertical divider wall. The ore will be fed through a pivoting chute diverter gate at the top of the bin that diverts flow to either section of the bin. The ore will then discharge through the hopper at the base of each bin section onto two apron feeders. The bins will be supported by structural steel and reinforced concrete foundations in a 27 m long x 13 m wide footprint. The fine ore storage facility will be located approximately 190 m east of the main process plant.

The facility will have a 2-storey steel framed enclosure above the bin approximately 8.9 m long x 5.9 m wide x 9.0 m tall. The upper level will house the head end of the feed conveyor, and the lower level will support the diverter chute and bin vent. A steel framed enclosure approximately 23.3 m long x 9.2 m wide x 6.6 m tall beneath the bin will house the two apron feeders, dust collector and the head end of the SAG mill feed conveyor. The apron feeders and dust collector will be supported on an elevated steel platform above the SAG mill feed conveyor within the enclosure. Monorails will be provided within the enclosure to perform equipment maintenance. An enclosed stair tower located immediately north of the bin structure will be used to access the working platforms throughout the facility. All enclosures will be clad with insulated metal panels.

18.10.4 Process Plant Building – MacLellan

The process plant building at MacLellan will consist of two adjoining steel buildings:

- The main process building, and
- The reagents storage building.

18.10.4.1 *Main Process Building*

The buildings will be designed as independent steel structures but will have a common wall with shared concrete foundations. The insulated metal panel roofing and wall cladding will enclose both areas together to ensure a seamless appearance and weathertightness.

The main process building will be a single storey insulated steel building supported on reinforced concrete foundations. The building will be 90.5 m long x 43.7 m wide x 26.4 m tall and support a 50-tonne double bridge girder overhead crane with a 7-tonne auxiliary hook. The crane will travel along the length of the building in the east west direction. The main process building will house the following process areas/rooms: grinding area, CIP, ADR plant, lime storage area, electrowinning/gold room, tailings pumpbox and pumps, electrical rooms, control room and metallurgical lab.

The grinding area will house the SAG mill (24 ft diameter x 12 ft long), ball mill (20 ft diameter x 30 ft long), mill drive motors, launders, pebble conveyor (allowance, should it be required in future) , cyclone feed pump and pump box, hydro-cyclones, trash screen, two stage metallurgical sampler, ball kibble, liner handler and sump pumps. An elevated concrete working platform will provide access to the mills and the liner handler. A structural steel platform will be provided to support and access the cyclone, cyclone screen and sampler above the concrete working platform. The process equipment will be serviced by the overhead crane.

The CIP (carbon in pulp) adsorption area will house six 8.8 m diameter x 9.8 m tall CIP tanks supplied with platforms to perform maintenance and access the agitators. A carbon sizing screen and carbon safety screen will be supported by steel framing and reinforced concrete foundations with the CIP tailings pump box and pumps supported on the ground floor level.

The carbon Desorption and Regeneration (DR) area will consist of reinforced concrete foundations to support a vendor supplied structure housing the acid wash and elution columns, electric heating skid, barren solution tank and pumps, electric carbon regeneration kiln, quench tank, loaded carbon screen, carbon dewatering screen and carbon sizing screen. The area will be serviced by the overhead crane.

The lime slurry storage area will be in the southwest corner of the main process building. It will consist of a containment area with lime day tank and pump foundations. A stairway will be provided to access the containment area from the adjacent floor.

The gold room will be a 19.3 m long x 13.7 m wide x 11.3 m tall stick-built steel building with precast concrete panel walls, concrete roof and reinforced concrete foundations contained within the northwest corner of the main process building. The gold room will house the sludge tank, filter press, two electrowinning cells, drying oven, induction furnace, and vault. The electrowinning cells will be supported on an elevated concrete slab within the building. Two pre-engineered modular electrical rooms for the reagent and water management system area, and electrowinning area will be supported on a steel frame mounted on the gold room roof.

The grinding mill area electrical rooms and control are located within the main process building between the grinding and CIP areas. They are pre-engineered modular structures installed on two levels and supported from structural steel frames and reinforced concrete foundations.

The metallurgical lab will be a stick-built steel structure located within the main process building. The building will be supported on reinforced concrete foundations.

18.10.4.2 *Reagent Storage Building*

The reagents storage building will be a 42.3 m long x 16.5 m wide x 14.2 m tall steel building and will adjoin the west wall of the main process plant building. The building steel will be designed to perform independently of the main process building but will share foundations along the common wall. The reagents building will house tanks, pumps, totes, and associated equipment for the following reagents: SMBS, sodium cyanide, copper sulphate, sodium hydroxide, HCL, flocculant, and lime slurry. The building will support a 5-tonne single girder overhead crane travelling in the north south direction.

18.10.5 Oxygen Plant – MacLellan

The oxygen plant will be a 21 m long x 13 m wide x 7 m tall pre-engineered or modular steel building supported on reinforced concrete foundations. The building will have a 5-tonne single girder overhead crane for equipment maintenance.

18.10.6 Plant Warehouse and Workshop – MacLellan

The plant warehouse and workshop at the MacLellan site will be a 25.6 m long x 12.5 m wide x 9.5 m tall fabric building constructed on reinforced concrete foundations. The building will be located southwest of the process plant. It will be used as a warehouse for process plant equipment spares and house the process plant maintenance workshop. The building will be serviced by a 5-tonne single girder overhead crane. This will a turnkey package with the fabric building vendor providing full design, steel, foundations, crane support steel, HVAC, and electrical.

18.10.7 Truckshop and Truckwash Facilities – MacLellan

The truckshop building at the MacLellan site will be a 65.2 m long x 35.3 m wide x 18.5 m tall fabric building (Figure 18-10) located east of the process plant building and fine ore storage bins. The building will be used for maintenance of mine mobile equipment and highway trucks, and storage of spare parts. There will be two maintenance bays each serviced by a 20 tonne overheard bridge crane supported on steel framing independent of fabric building framing.

The truckwash facility will be a 36 m long x 26.3 m wide x 18.5 m tall fabric building located north of the truckshop. The building will be used for washing mine mobile equipment and will be supported on a reinforced concrete raft foundation.

Both the truckshop and truckwash fabric buildings will be supplied as turnkey packages from the vendor which will include steel, foundations, crane support steel and associated foundations, HVAC, and electrical.

The truckshop offices and lunchroom will be housed in prefabricated, modular buildings located adjacent to the truckshop. A modular portable washroom will also be provided at this location. A compressed air facility and a lube storage facility will be provided in two shipping containers placed outside the building’s east wall. Two 40 ft shipping containers will be provided outside to provide additional storage of truck and mobile equipment parts.

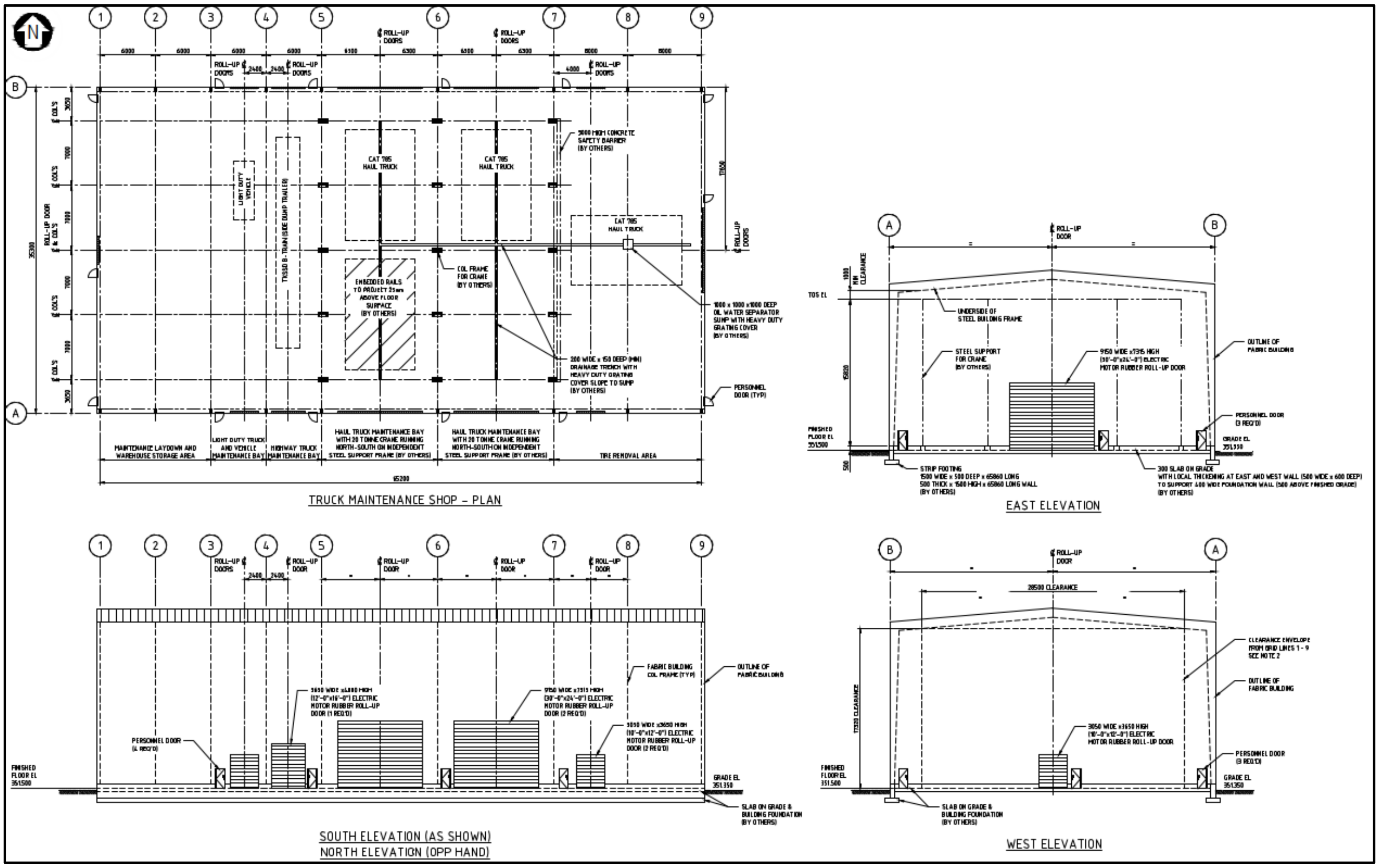


Figure 18-10 MacLellan Truckshop/Warehouse Facility General Arrangement

Source: Worley (2022)

18.10.8 Assay Laboratory – MacLellan

The assay laboratory at MacLellan site will be approximately 19.5 m long x 13 m wide single-story building located north of the process building. The building will house sample preparation, fire assaying, and laboratory equipment. It will be of prefabricated modular construction placed on wood cribbing footings.

18.10.9 Administration and Mine Dry Building – MacLellan

The administration and mine dry building at the MacLellan site will be a 68 m long x 25 m wide single-story building located west of the process plant. The building will house offices, meeting rooms, workstations, lunchrooms, washrooms, men's and women's drys, lockers, showers, and the mine rescue office.

The administration and mine dry building floor plan is shown in Figure 18-11. The building will be of prefabricated modular construction placed on wood cribbing footings.

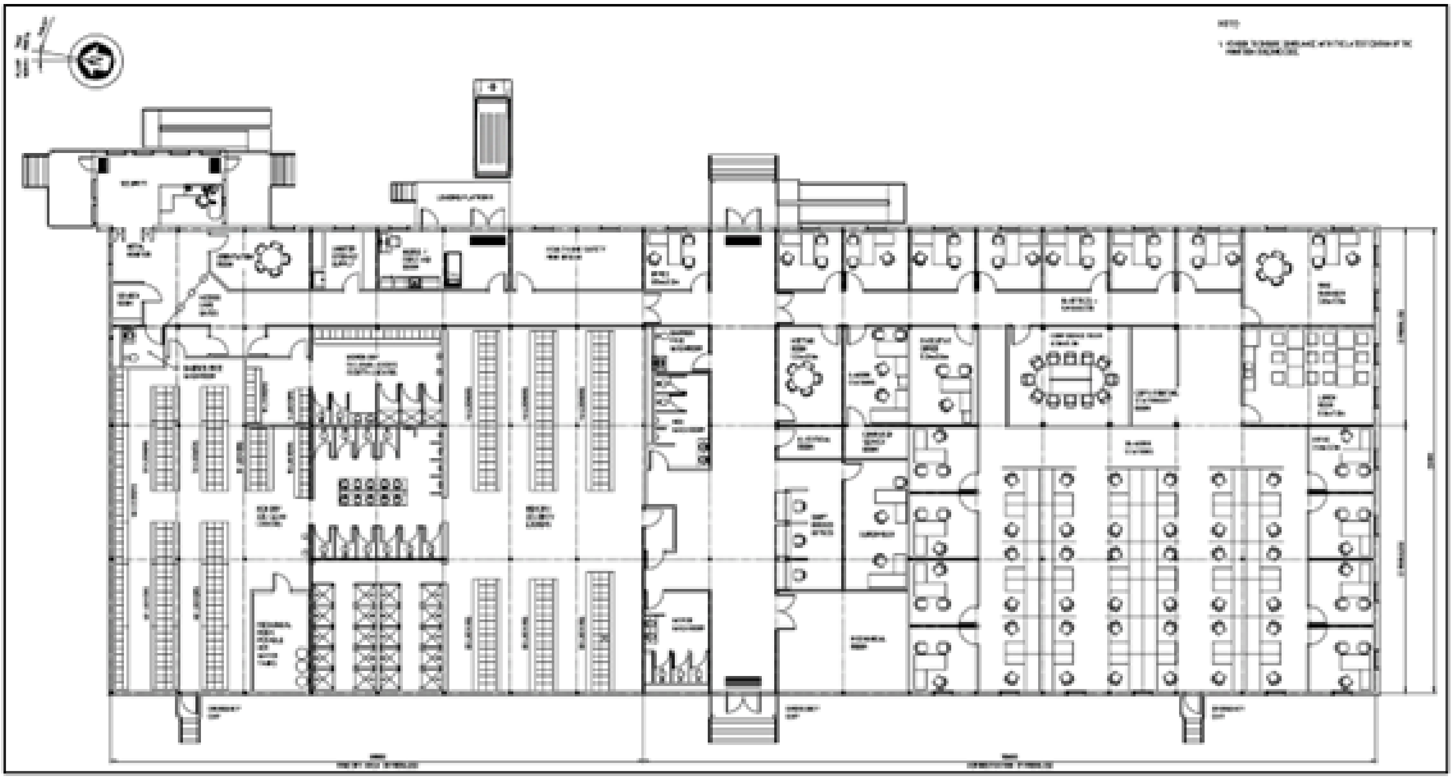


Figure 18-11 MacLellan Administration Building Floor Plan

Source: Worley (2022)

18.10.10 Gate House – MacLellan

The gate house at MacLellan site will be a heated building approximately 7.0 m long x 3.5 m wide x 2.7 m tall located on the access road on the west side of the Keewatin River bridge. The building will be of prefabricated modular construction placed on wood cribbing footings.

18.10.11 Powder Magazine – MacLellan

The powder magazine at MacLellan will be 12 m long x 8 m wide, and will be used for storing, mixing, and preparing explosives. Explosives and accessories will be transported to the Gordon site on an as-needed basis.

The building will be a prefabricated folding metal-type construction with concrete slab floor/foundations.

18.10.12 Freshwater Pumphouse – MacLellan

The freshwater pumphouse will be a building of modular steel construction located on the bank of the Keewatin River to provide freshwater supply to the fresh/fire water tanks located by the process plant.

18.10.13 Collection Pond Pumphouse – MacLellan

The collection water pumphouse will be a building of modular steel construction located in proximity to the site collection water pond.

18.10.14 E-houses and Substation – MacLellan

In addition to the modular electrical rooms located inside the main process plant, there will be four electrical rooms located outside at the MacLellan site which include the primary crushing area, secondary crushing area, fine ore storage area and leach/CIP/Absorption area e-rooms. These four electrical rooms will be supported on steel framing and concrete foundations and be located adjacent to the facilities that they serve. The MacLellan site will also house a substation of modular construction supported on steel structure and reinforced concrete foundations. The substation and transformer area will be located north of the main process plant.

18.10.15 Truckshop and Truckwash Facilities – Gordon

The truckshop building at the Gordon site will be a 39.5 m long x 20.0 m wide x 15.9 m tall fabric building located near the entrance to the site, south of the existing open pit. The building will be used for maintenance of mine mobile equipment, and storage of spare parts. There will be two maintenance bays serviced by 20 tonne overheard bridge cranes. The cranes will be supported on steel framing independent of the fabric building framing.

The truckwash facility at the Gordon site will be a 36 m long x 26.3 m wide x 18.5 m tall fabric building located north of the truckshop. The building will be used for washing mine mobile equipment and will be supported on a reinforced concrete raft foundation.

Both the truckshop and truckwash fabric buildings will be supplied as turnkey packages from the vendor which will include steel, foundations, crane support steel and associated foundations, HVAC, and electrical.

The truckshop offices and lunchroom will be housed in prefabricated, modular buildings located adjacent to the truckshop. A modular wash car for washroom facilities will also be provided at this location. A compressed air facility and a lube storage facility will be provided in two shipping containers placed outside the building. Two 40 ft shipping containers will be provided outside to provide additional storage of truck and mobile equipment parts.

18.10.16 Administration and Mine Dry Building – Gordon

The administration and mine dry building at the Gordon site will be a 33 m long x 18 m wide single-story building. The building will house offices, meeting rooms, workstations, lunchrooms, washrooms, men’s and women’s drys, lockers, showers, and the mine rescue office. The building will be of prefabricated modular construction placed on wood cribbing footings.

18.10.17 Gate House – Gordon

The gate house at Gordon site will be a heated building approximately 7.0 m long x 3.5 m wide x 2.7 m tall located at the entrance to the site. The building will be of prefabricated modular construction, placed on wood cribbing footings. There will be a weigh scale located in proximity to the gate house that will be used for weighing the outbound highway trucks transporting ore to the MacLellan site.

18.10.18 Freshwater Pumphouse – Gordon

The freshwater pumphouse will be a building of modular steel construction located near Farley Lake to provide freshwater supply to the fresh/fire water tanks.

18.10.19 Collection Pond Pumphouse – Gordon

The collection water pumphouse will be a building of modular steel construction located in proximity to the site collection water pond.

18.11 Fire Protection

Both MacLellan and Gordan sites will each be provided with two hours of fire water storage (see Sections 18.3.4 and 18.3.5), a fire pump station and buried fire service main.

The MacLellan fire main is used to feed various hydrants located outside the major site facilities, the main process building standpipe system, truckshop sprinkler system and belt conveyor sprinkler systems. The Gordon fire main is used to feed hydrants and the truckshop sprinkler system.

The design frost line (4 m below grade) is well below the top of bedrock elevation. Since it will not be practical to bury the fire water service mains below the frost line, the pipes will be insulated and will have a small amount of heated water always circulated through them during the winter months. A circulation pump and heater will be provided at the fresh/fire water tank to circulate the water through the fire service main loop. The circulated water will return to the fresh/fire water tank and will assist in preventing any ice formation in the tank.

Each fire water pumping skid consists of an electric pump and a backup diesel driven pump to assure continuous and adequate flow for firefighting. A smaller electrically driven jockey pump will maintain pressure in the fire water ring main.

Automated fire detection and fire protection will be installed in the crushing, grinding and process plant buildings, the interconnecting conveyor galleries and tunnels and project infrastructure such as the warehouse and fuel storage areas and other areas as required. Firewalls and fire rated floors to limit the spread of fire, high temperatures, and smoke will be provided as required. Emergency exists will be mounted in all buildings with appropriately illuminated exist signs.

Supplemental hand-held fire extinguishers, each suitable for each area, will be mounted throughout the buildings including MCCs, control rooms, transformers areas, and fuel storage locations.

First response firefighting activities will be conducted by the mine rescue team utilizing on-site water trucks and EMS equipment. Primary firefighting activities will be handled by the local fire authority of the Town of Lynn Lake.

18.12 Site Security and Health Services

Alamos will be responsible for overall site security. The individual contractors will provide site security for their own respective assets during construction.

During construction, first aid facilities will be supplied by the EPCM contractor. First-aid personnel will provide transport to Lynn Lake hospital when required.

During operations, first aid facilities will be supplied by a dedicated first aid/mine rescue office in each of the site administration offices. Site security personnel will be trained as EMS first responders, and when required, provide transfer to Lynn Lake hospital.

18.13 Tailings Management Facility

The location of the TMF at the MacLellan site was selected based on a TMF Location Review study (Golder, 2018), is located approximately 2 km northeast of the proposed open pit and plant site areas, and 1.5 km northwest of Minton Lake, as shown on Figure 18-12.

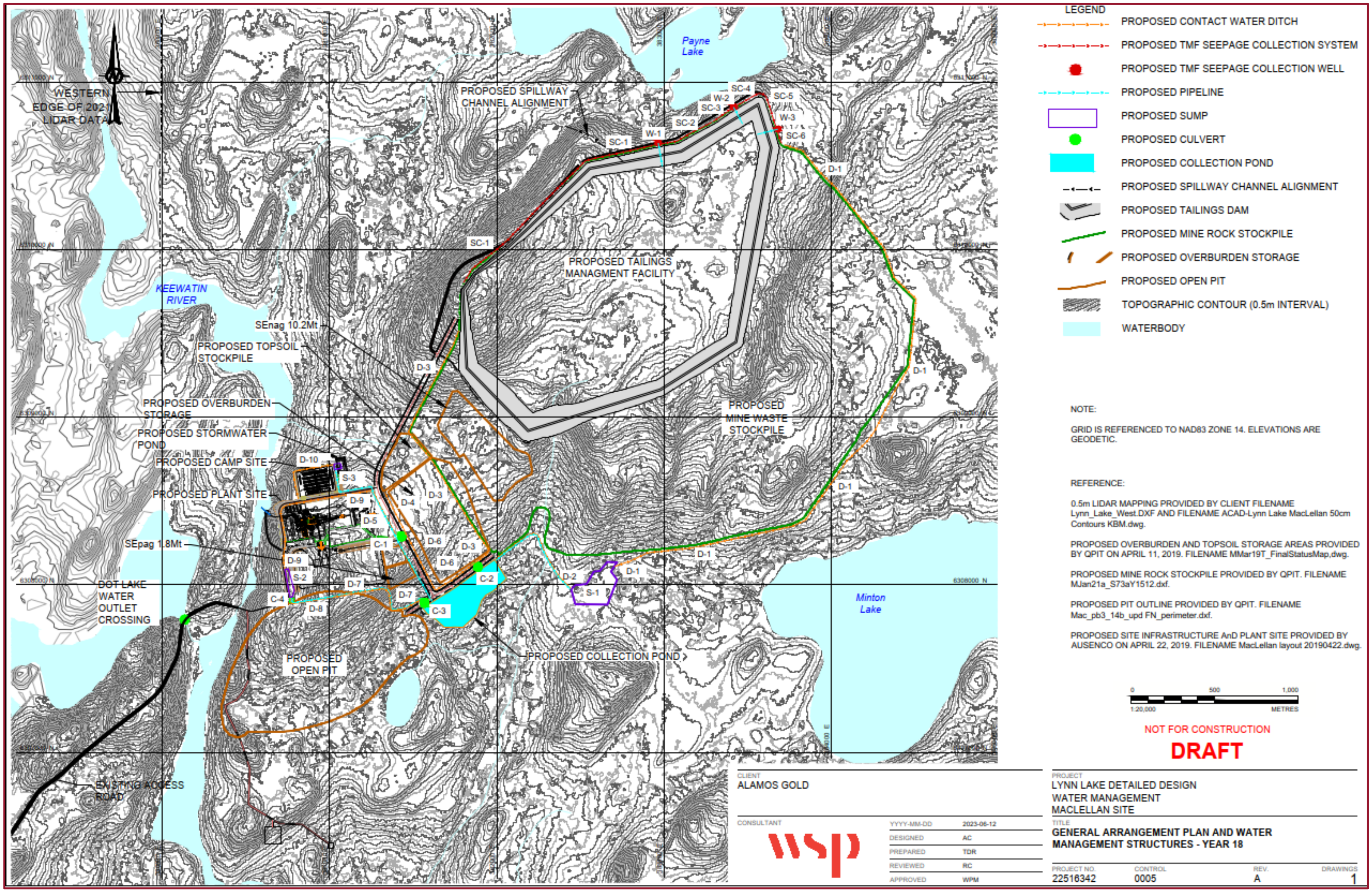


Figure 18-12 Lynn Lake Gold Project MacLellan Site

Source: WSP (2023)

18.13.1 Background Information

The site is located within the sporadic to discontinuous permafrost zone, where permafrost is typically found in 10% to 50% of the land area and in a relatively low seismic hazard region, known as the "stable central region." The mean annual air temperature is -3.2 °C, ranging from a mean monthly maximum temperature of 22 °C in June to a mean monthly minimum temperature of -29 °C in January. There is an annual average of 98 frost-free days. On average, there are 141 days with precipitation per year with an average annual precipitation of 478 mm (318 mm as rain and 160 mm as snow-water-equivalent). The site is vegetated with evergreen trees.

The proposed TMF location lies in a sub-watershed that predominantly drains to the south towards Minton Lake, which drains to Cockeram Lake to the south. The north end of the TMF drains towards Payne Lake and a portion of the western end of the TMF drains towards the Keewatin River.

Three stages of subsurface investigations for the preliminary location of the TMF were initiated by Golder since 2015; one in 2015 (Golder, 2015a), one over the course of the summer of 2016 (Golder, 2016c), and one over the course of the winter of 2017 (Golder, 2017b). Most of these boreholes are now beyond the footprint of the proposed updated TMF location for this feasibility study. Therefore, additional subsurface investigations were carried out by Golder (2019) and WSP-Golder (2022) to better determine subsurface conditions along the perimeter of the proposed TMF.

A total of sixteen (16) boreholes were advanced along the proposed dam alignment for the MacLellan TMF. In general, the overburden across the dam alignment was thin (typically less than 2 m) and consisted of either fibrous peat or a silty sand to sand / gravelly sand material prior to encountering bedrock. Bedrock depths ranged from 0.48 m (hole GBH21-13) to 3.28 m (hole GBH21-11), with an average depth to bedrock of 1.32 m.

18.13.2 Operating Data

The sizing and the flow modelling for the TMF are based on the planned annual mill throughput averaged over 365 days per year. This is defined as the nominal value.

Operating data is required for the sizing of the TMF and flow (water balance) modelling. The key operating data for the sizing of the design of the TMF are listed below:

- Mineral Reserve and Resource — 47.6 Mt
- Average planned annual mill production — 2.92 Mt/a
- LOM Tailings production — 47.6 Mt
- Tailings/ore ratio — 100% by weight
- Mill availability — 92% of the year
- Factor of safety on design — 1.1
- Tailings discharge slurry density (S) — 50.8% solids by weight
- Water content of the ore going into the mill up to — 5%
- Freshwater required in the mill (design) — 16.5 m^3/h of ore
- Losses in the mill to spillage and evaporation — 1% of total flow through the mill

WSP-Golder has assumed:

- Void ratio (e) of the deposited tailings 1.0 (volume of voids/volume of solids)
- Tailings specific gravity 3.0

Key calculated data:

- Life of mine 17 years
- Dry Density of deposited tailings (d) 1.50 t/m^3
- Volume of deposited tailings 31.7 Mm^3

It should be noted that the tailings facility has been designed to allow for flexibility in the development of the TMF and its water management strategies should the amount of Mineral Reserve increase over the life of mine or water that accumulates within the facility freezes and takes away from the available capacity. In the long-term, it is expected that any water that freezes within the facility will eventually thaw but this might be after closure of the facility.

The TMF will receive tailings water, run-off from precipitation on the tailings collecting watershed as well as run-off from the mill site, transportation corridors, waste stockpiles and mine water.

18.13.3 Design Criteria

18.13.3.1 *Dam Hazard Classification*

The TMF dams were classified as “High” based on the Canadian Dam Association Dam Safety Guidelines (Canadian Dam Association, 2019). It is understood that the Province of Manitoba defers to the guidelines developed by CDA to establish dam safety design criteria. The guidelines provide recommendations on the classification of dams with respect to the consequences associated with a presumed dam failure. These consequences are to be evaluated in terms of incremental consequences over and above the consequences of the given event if the dam failure had not occurred. The guidelines recommend that the incremental consequences of a dam failure should be evaluated in terms of:

- Loss of life;
- Property losses;
- Environmental losses; and
- Cultural or built heritage losses.

The TMF dams are classified as “High” during the operations based on the following (Golder, 2021b):

- Population at Risk – temporary workers in the tailings area;
- Loss of Life: 10 or fewer;
- Environmental Impacts – significant loss of wildlife / fish habitat along Minton Lake and potentially further downstream; and
- Economic losses – associated with possible washout of Highway 391. Large financial costs for cleanup and remediation downstream.

18.13.3.2 *Inflow Design Flood*

Based on CDA recommendations for the selection of an appropriate inflow design flood (IDF) (Table 18-5), the IDF of the tailings facility during operations should be determined based on an annual exceedance probability (AEP) of 1/3rd between the 1 in 1000-year flood and the probable maximum flood (PMF). For the passive closure phase, the IDF is raised to 2/3 between the 1 in 1000-year flood and the PMF.

Table 18-5 CDA (2019) Minimum Inflow Design Floods for Dams and Dykes

Dam Class	Inflow Design Flood (IDF) Annual Exceedance Probability – Operating Phase	Inflow Design Flood (IDF) Annual Exceedance Probability –Closure Passive Care Phase
Low	1 / 100	1 / 1,000
Significant	1 / 100 to 1 / 1,000	1/3 between 1 / 1,000 and PMF[1]
High	1/3 between 1 / 1,000 and PMF[1]	2/3 between 1 / 1,000 and PMF
Very High	2/3 between 1 / 1,000 and PMF	PMF
Extreme	PMF	PMF

Note:

1. *PMF is the Probable Maximum Flood.*

18.13.3.3 *Seismic Design*

Table 18-6 provides AEP for earthquakes for the various dam classes for both operations and closure as per CDA (Canadian Dam Association, 2014).

Table 18-6 CDA (2019) AEP Earthquakes for Dams and Dykes – Operation and Closure Phases

Dam Class	Annual Exceedance Probability (AEP) Earthquake – Operations Phase	Annual Exceedance Probability (AEP) Earthquake – Closure Passive Care Phase
Low	1 / 100	1 / 1,000
Significant	1 / 100 to 1 / 1,000	1 / 2,475
High	1 / 2,475	1/2 between 1 / 2,475 and 1 / 10,000 AEP or MCE
Very High	1/2 between 1 / 2,475 and 1 / 10,000 AEP or MCE[1]	1 / 10,000 AEP or MCE
Extreme	1 / 10,000 AEP or MCE	1 / 10,000 AEP or MCE

Note:

1. *MCE is the Maximum Credible Earthquake.*

The design earthquake for a “High” classification tailings dam is the 1 in 2,475-year event (Canadian Dam Association, 2019). The peak ground acceleration (PGA) under this event is 0.031. For passive closure, the design earthquake considered would be ½ between the 1 in 2,475-year event and the 1 in 10,000-year event. Through extrapolation of the data provided in Table 18-6 above, this would correspond to a PGA of 0.07.

18.13.3.4 *Tailings Pond Sizing*

The tailings pond will collect run-off and tailings water. The sizing of the tailings pond is described in Section 18.3.2.

18.13.3.5 *Tailings Pond Discharge*

A reclaim floating pump barge will be used to pump water to the mill. Pumping requirements are discussed further in Section 18.3.8.

18.13.3.6 *Dam Stability*

Table 18-7 presents the minimum factors of safety for slope stability of the tailings dams to be adopted during design based on the CDA (2019) guidelines.

Table 18-7 Factors of Safety for Dam and Dyke Slope Stability (CDA, 2014)

Loading Condition	Minimum Factor of Safety
Short-term (immediately after construction)	1.3
Long-term steady state (once the facility is operating)	1.5
Rapid drawdown (upstream slope where applicable)	1.2 to 1.3
Pseudo-static	1.0
Post-earthquake	1.2

18.13.4 Tailings Management Facility Design

18.13.4.1 *Deposition Modelling*

Table 18-8 provides details on the TMF capacity, maximum elevation of the tailings discharge point, the tailings pond volume, and the dam elevations for each stage.

Table 18-8 Staged Tailings Facility Requirements with Dam Construction

TMF Details		Unit	Start-up (Stage 1)	End of Year 6 (Stage 2)	End of Year 11 (Stage 3)	Ultimate (Stage 4)	Total
Year of Operation		Years	1	2-5	6-11	12-17	17
TMF Tailings Storage Capacity (per stage)		Mm^3	2.2	9.05	10.55	11.3	33.1
TMF Tailings Storage Capacity (total)		Mm^3	2.2	11.25	21.8	33.1	33.1
Tailings Pond Volume	Max. Operating	Mm^3	0.4	0.3	1.3	1.7	NA
	EDF	Mm^3	0.18	0.19	0.20	0.21	NA
	Total	Mm^3	0.58	0.49	1.50	1.91	NA
Dam Crest Elevation		masl	362.75	369.5	375.25	381	NA

Figure 18-13 to Figure 18-16 provide the tailings deposition and TMF configuration for the starter, Year 6, Year 11, and ultimate stages of the mine life, each of which are described below:

Start-up (Stage 1) – Tailings deposition will start in the TMF from the south and east dams. The TMF can accommodate 2.2 Mm^3 tailings during the first year of mine production. The maximum discharge elevation at end of this stage is 361.75 masl. From the onset of the deposition, a pond will form at the toe of the containment dam and be pushed away as deposition progresses. The pond will be pushed towards the west end of the TMF, with water being pumped back to the mill as needed. The capacity of the tailings pond for this stage was considered to contain maximum operating water volume (0.4 Mm^3) plus EDF volume (0.18 Mm^3). The maximum operating water level (MOWL) at this volume is 358.0 masl. The invert elevation of the spillway was estimated to be at 361.75 masl (i.e., 1 m below crest elevation).

End of Year 6 (Stage 2) – Deposition will continue in the TMF from the south, east, and north ends. The TMF can accommodate an additional 9.05 Mm^3 of tailings for another five years up to a discharge elevation of 368.5 masl (11.25 Mm^3). The capacity for this stage was considered to contain maximum operating water volume (0.3 Mm^3) plus EDF volume (0.19 Mm^3). The MOWL at this volume is 360.0 masl, while water will be pushed towards the centre and west end of the TMF. The invert elevation of the spillway was estimated to be at 368.5 masl.

End of Year 11 (Stage 3) - Deposition will continue in a similar manner as Stage 2. For this stage, the TMF will accommodate an additional 10.55 Mm^3 of tailings for another six years to a maximum discharge elevation of 374.25 masl (21.8 Mm^3). The pond is expected to contain a maximum operating water volume of about 1.30 Mm^3 plus an EDF volume of 0.20 Mm^3. The MOWL elevation is anticipated to be about 369.25 masl. The invert elevation of the spillway will be 374.25 masl.

Ultimate (Stage 4) – Tailings deposition will continue in the TMF after raising the dams by the downstream method. For the remainder of the mine life, the tailings will be deposited from the east, south, and north dams and will provide an ultimate tailings storage capacity of 33.1 Mm^3. The capacity was considered to contain maximum operating water volume (1.70 Mm^3) plus EDF volume (0.21 Mm^3). The MOWL at this volume is 375.1 masl. The invert elevation of the spillway was estimated to be at 380.0 masl.

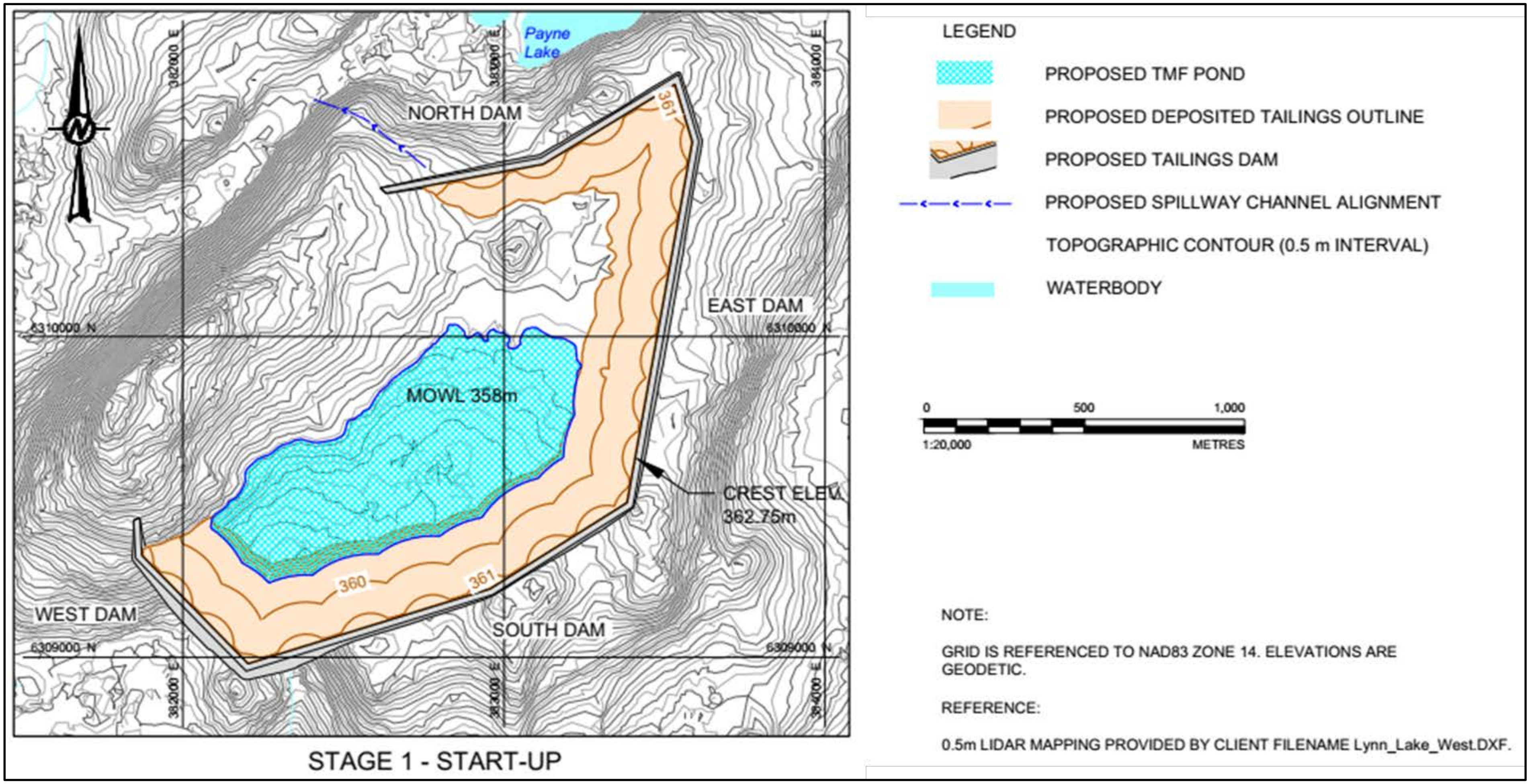


Figure 18-13 Tailings Deposition and TMF Configuration for Start-up

Source: WSP-Golder (2022)

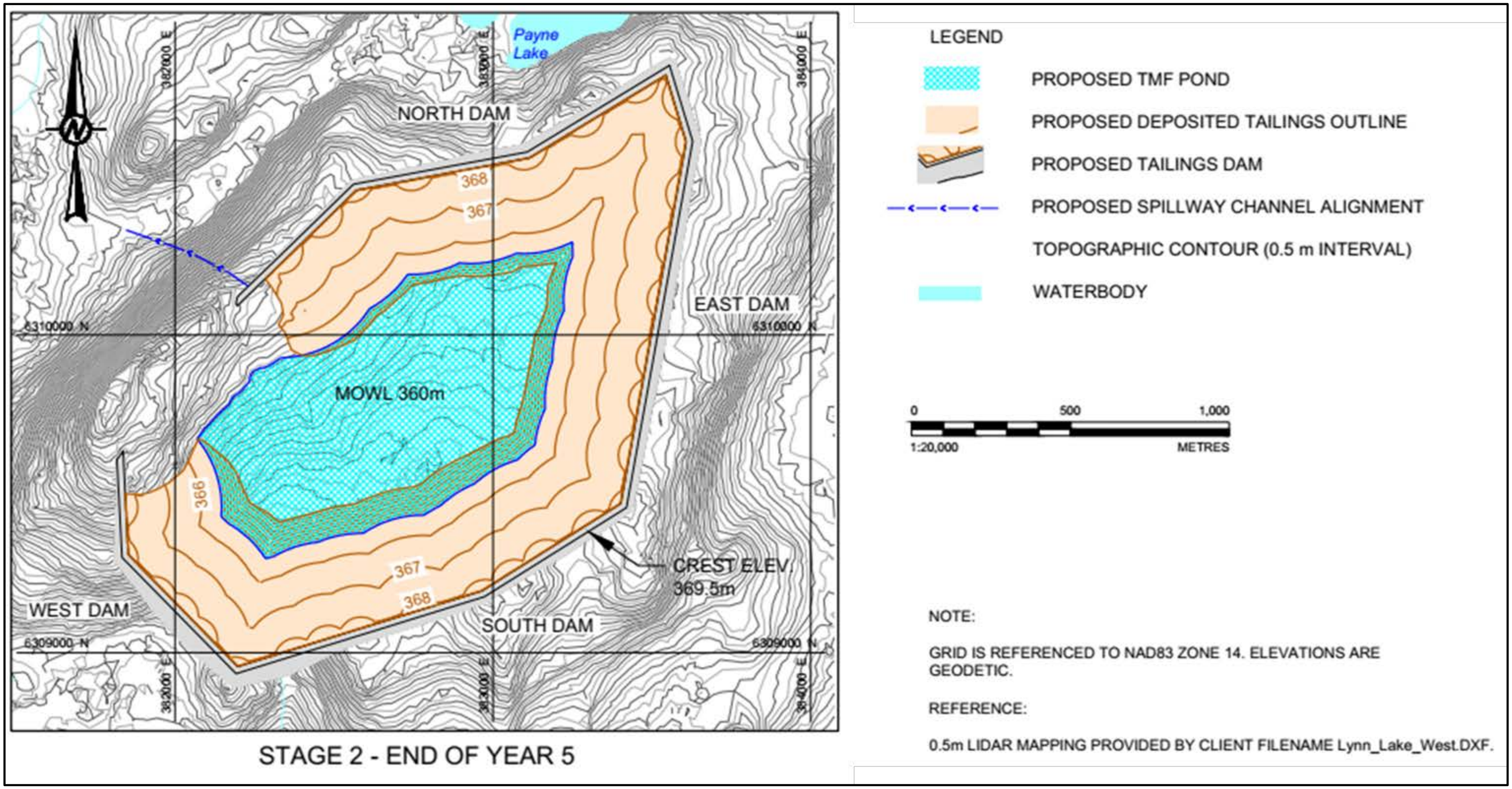


Figure 18-14 Tailings Deposition and TMF Configuration for End of Year 5

Source: WSP-Golder (2022)

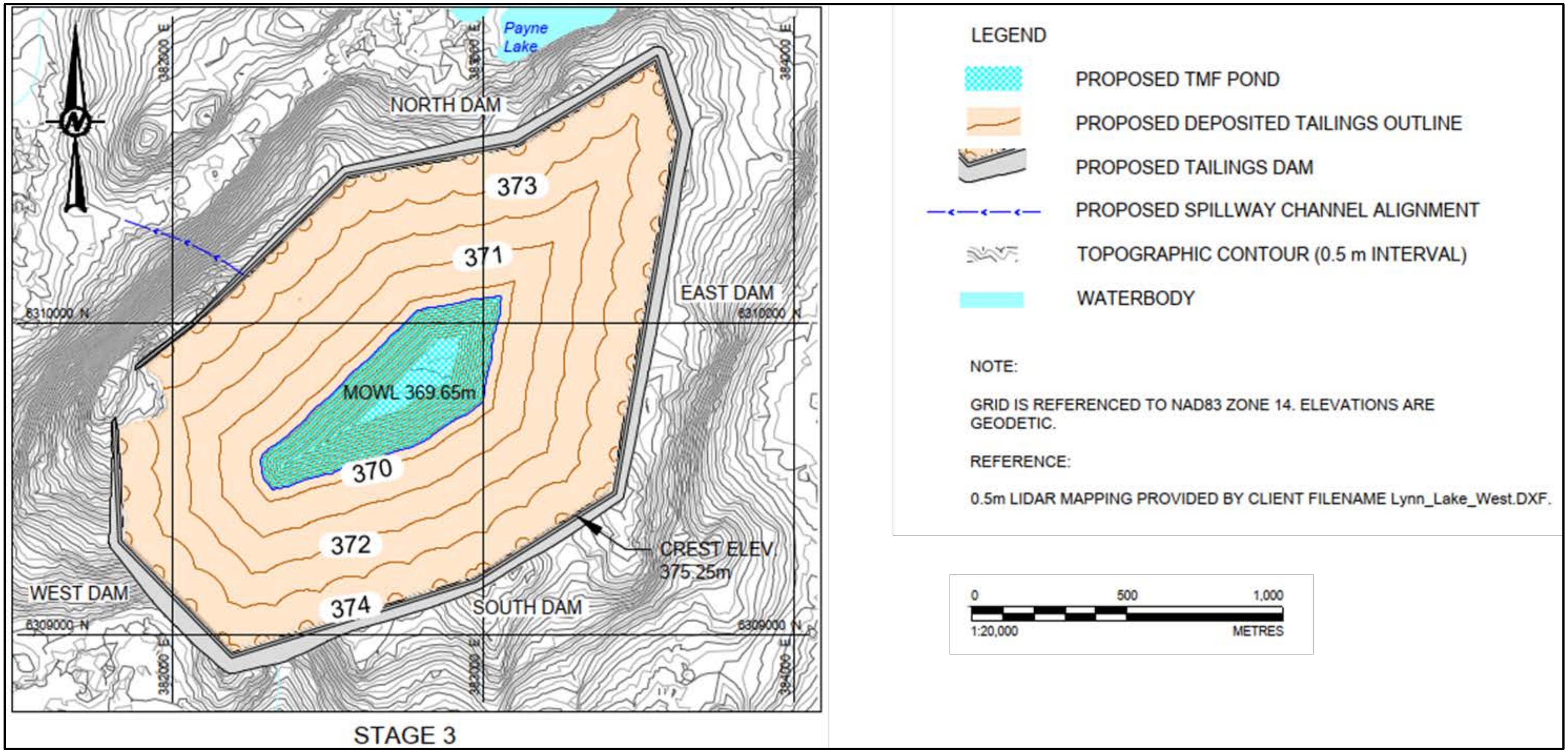


Figure 18-15 Tailings Deposition and TMF Configuration for End of Year 11

Source: WSP-Golder (2022)

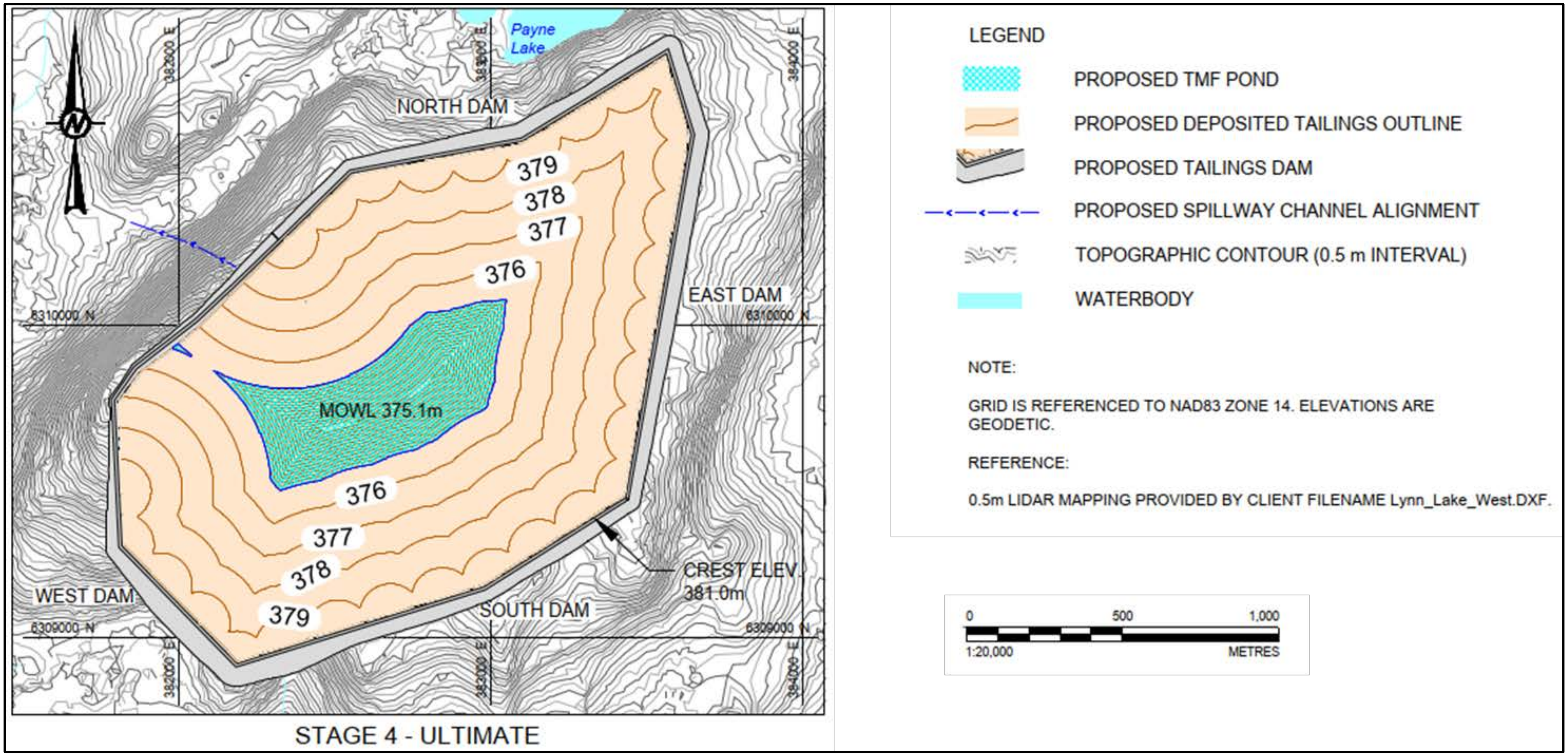


Figure 18-16 Tailings Deposition and TMF Ultimate Configuration

Source: WSP-Golder (2022)

18.13.4.2 *TMF Dam Design*

The key design levels derived from the tailings deposition and water management plans described above are summarized in Table 18-9.

Table 18-9 Key TMF Dam Design Levels

Key Design Levels	Unit	Start-up (Stage 1)	End of Year 6 (Stage 2)	End of Year 11 (Stage 3)	Ultimate (Stage 4)
Maximum Dam Crest Elevation	masl	362.75	369.5	375.25	381.0
Emergency Spillway Invert Elevation	masl	361.75	368.5	374.25	377.5
Maximum Operating Water Level (MOWL)	masl	358.0	360.0	369.65	375.1
Maximum Tailings Discharge Elev.	masl	361.75	368.5	374.25	377.5

Typical cross-section details for the TMF dams are shown on Figure 18-17.

The tailings dams will be raised in stages to minimize the construction requirements over the life of mine and coincide with the storage capacity requirements.

- The first stage has been sized to contain one year of tailings deposition and will be required prior to start-up. This will involve the construction of the dams to elevation of 362.75 masl. The dams will then be raised three more times to reach the ultimate elevation. All future raises of the dams are by the downstream method;
- The second stage of dam raise has been designed to contain five more years (from Year 2 to Year 6) of tailings deposition, with construction required during Year 1 of operation. This will involve the construction of the dams to an elevation of 369.5 masl;
- The third stage of the dam raise has been designed to contain six more years (Year 7 to Year 11) and will raise the dams to an elevation of 375.25 masl. Construction of Stage 3 should be completed by the end of Year 6; and
- Prior to the end of Year 11, the ultimate dam should be constructed to a maximum elevation of 381 masl to contain the remainder of the life of mine tailings.

The perimeter tailings dams will be founded on bedrock. All tailings dams will have an ultimate crest width of 10 m with an upstream slope of 3H:1V and downstream slope of 2H:1V. The crest width for the starter dams, Stage 2, and Stage 3 dams will be 20 m wide to facilitate construction. The tailings dams will be constructed using rockfill materials with an upstream slope lined with a geomembrane (HDPE) as the main water-retaining element. The geomembrane liner will be installed on a 0.3 m thick sand bedding (Zone 1) which will be underlain with 0.5 m of filter sand (Zone 2) and 1 m of transition material (Zone 3). To protect the liner, similar zoning (with the exception of Zone 2) is required on the upstream face of the slope before rockfill placement. The rockfill will consist of a clean, non-acid-generating, relatively free-draining material.

The liner will be anchored to the bedrock foundation via a concrete plinth. Reinforcing steel dowels for the concrete plinth will be installed at 1.5 m intervals along the entire length of the dams. Slush grouting will be also provided on the bedrock, in combination with some dental concrete work to even out the bedrock surface. For the dams founded on fractured (higher hydraulic conductivity) bedrock, a 10 m deep grout curtain will be provided along select portions of the dam alignment to minimize the foundation seepage.

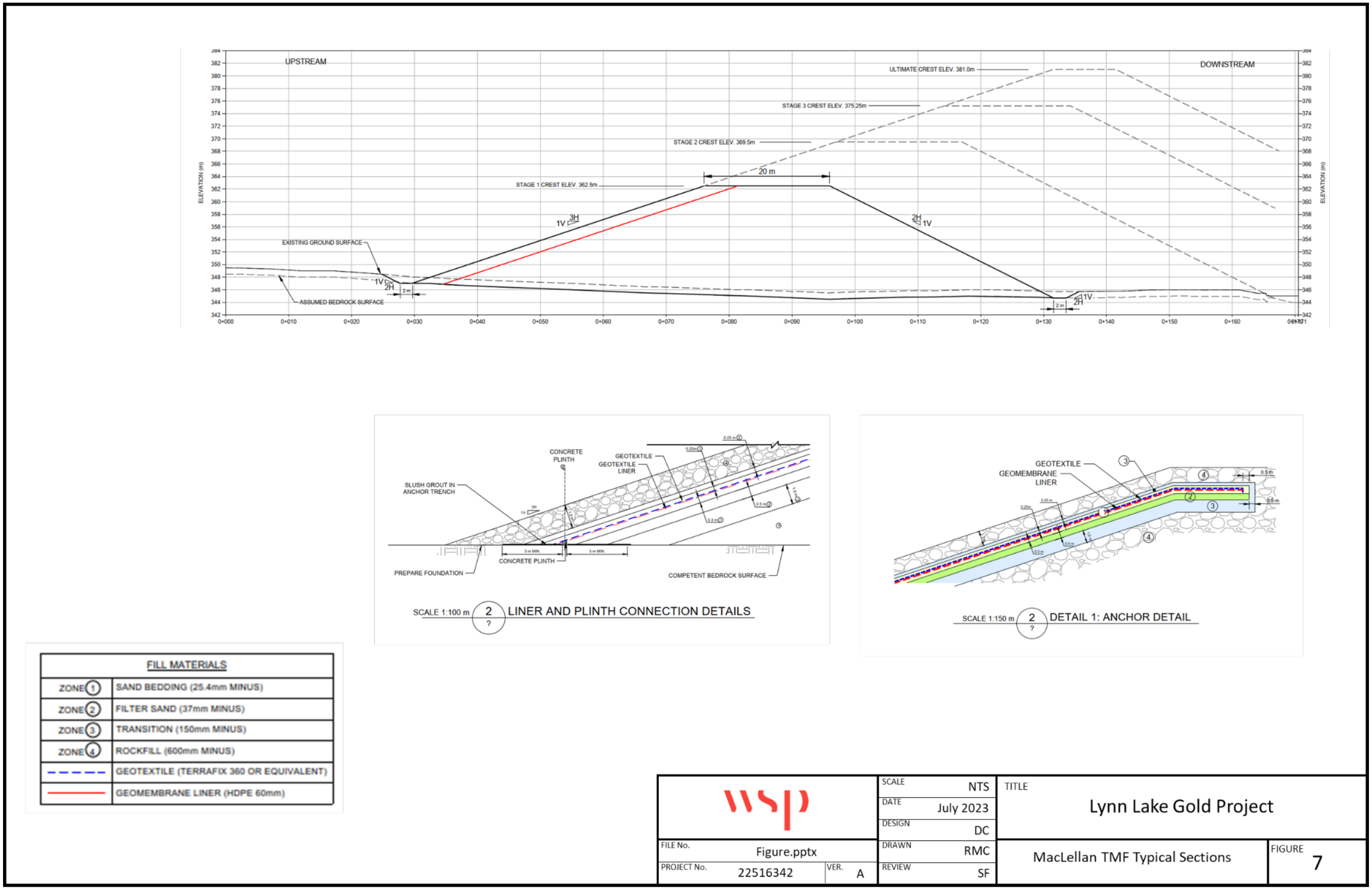


Figure 18-17 Typical TMF Dam Cross-Sections

Source: WSP (2023)

18.13.4.3 *Emergency Spillway*

An emergency spillway is required to prevent dam overtopping. The spillway will be raised progressively to correspond with raising of the TMF dams. The spillway outlet channel is lined with riprap with D50 of 300 mm and a minimum layer thickness of 0.6 m for erosion protection. The side slopes of the outlet channel are 3H:1V. The outlet channel is provided with a stilling basin to promote energy dissipation and prevent erosion and scouring due to high flow velocities.

18.13.4.4 *TMF Floating Barge Design*

A large capacity water pump is required to pump water from the tailings pond back to the process plant. The maximum pumping rate was estimated to be 330 m^3/h for both start-up and ultimate stages. The water pump will be located on the floating barge.

18.13.5 Slope Stability Analysis

Stability analyses were completed to assess the performance (i.e., factor of safety) of the dams under both static and dynamic (seismic) loading conditions. The factor of safety is the ratio of the forces tending to resist failure over the forces tending to cause failure. The minimum factors of safety discussed in Section 18.13.3.6 were used to assess acceptable dam performance for both static and pseudo-static loading conditions.

The slope stability analyses were carried out using the SLOPE/W module of the commercially available software package, GeoStudio 2019 Version 10.0, developed by GEO-SLOPE International Limited of Calgary, Alberta. The selected method of analysis was the Morgenstern-Price Method with a half-sine function to model the inter-slice forces. This method is based on limit equilibrium mechanics in which the solution satisfies both force and moment equilibrium.

The typical dam cross-sections shown in Figure 18-17 were used in the stability analyses. The dams will be founded on bedrock and constructed with rockfill. Therefore, liquefaction of the dam materials and the foundation under an Earthquake Design Ground Motion (EDGM) seismic event is not expected to occur.

For assessment of dam stability during operation, the analyses were completed with the tailings pond at its MOWL level for the ultimate configuration. Given that the tailings pond will not be resting against the upstream side of any of the tailings dams, loading imposed by rapid drawdown was not analyzed.

Dam static stability for the passive closure condition was not analyzed given that no change in the dam cross-section will occur and water levels within the tailings are expected to decrease over time, thereby resulting in a more stable condition. However, the dam stability under the seismic loading for the passive closure scenario was completed with the tailings pond at its MOWL level.

18.13.5.1 *Stability Analysis Results*

The results of the static and pseudo-static stability assessments are summarized in Table 18-10. Based on these results, the dams are expected to be stable under the loading conditions assumed in the analyses.

Table 18-10 Dam Stability Assessment

Stability Assessment	Case	Duration	Calculated Minimum Factor of Safety	Required Minimum Factor of Safety
Static	Dam founded on bedrock (poor and good conditions)	Operation	1.59	1.5
Pseudo-static	Dam founded on bedrock (poor and good conditions)	Operation	1.47	1.0
		Passive Closure	1.30	

Figure 18-18 and Figure 18-19 present the typical static and pseudo-static stability analysis results, respectively, for the ultimate dam founded on poor bedrock (South Dam at BH18-05) at its Environmental Design Flood (EDF) level during operation.

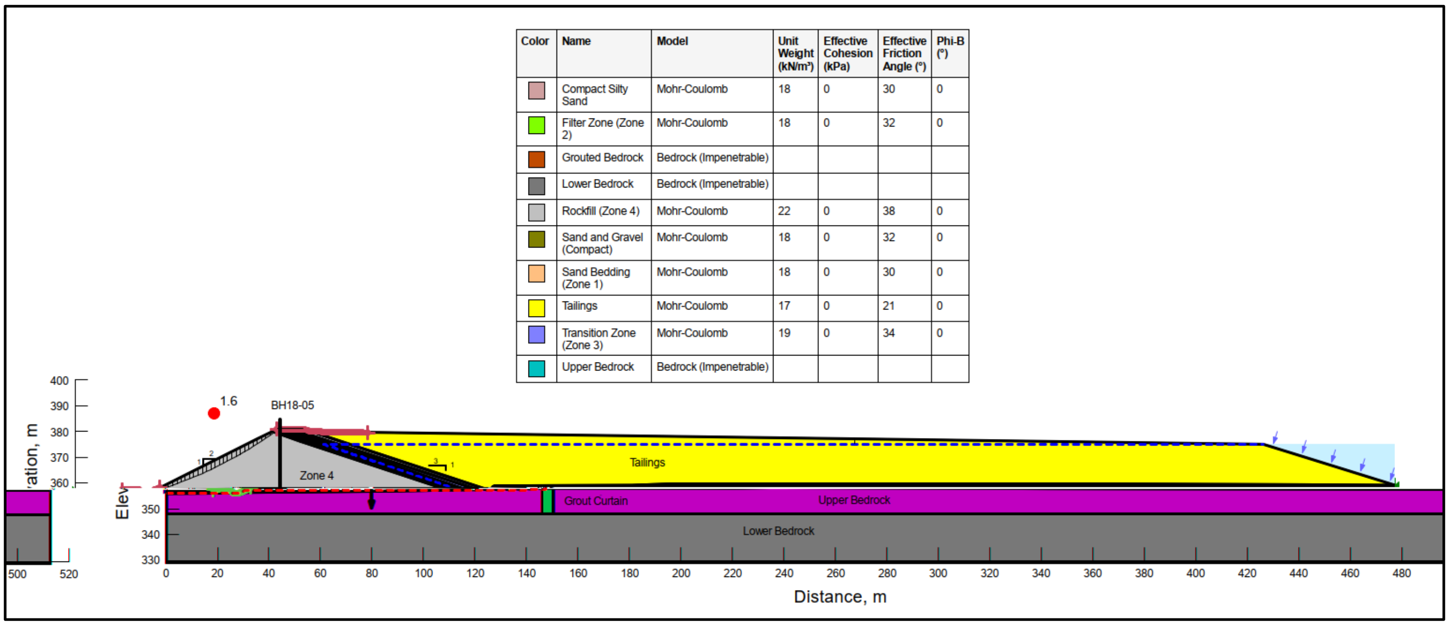
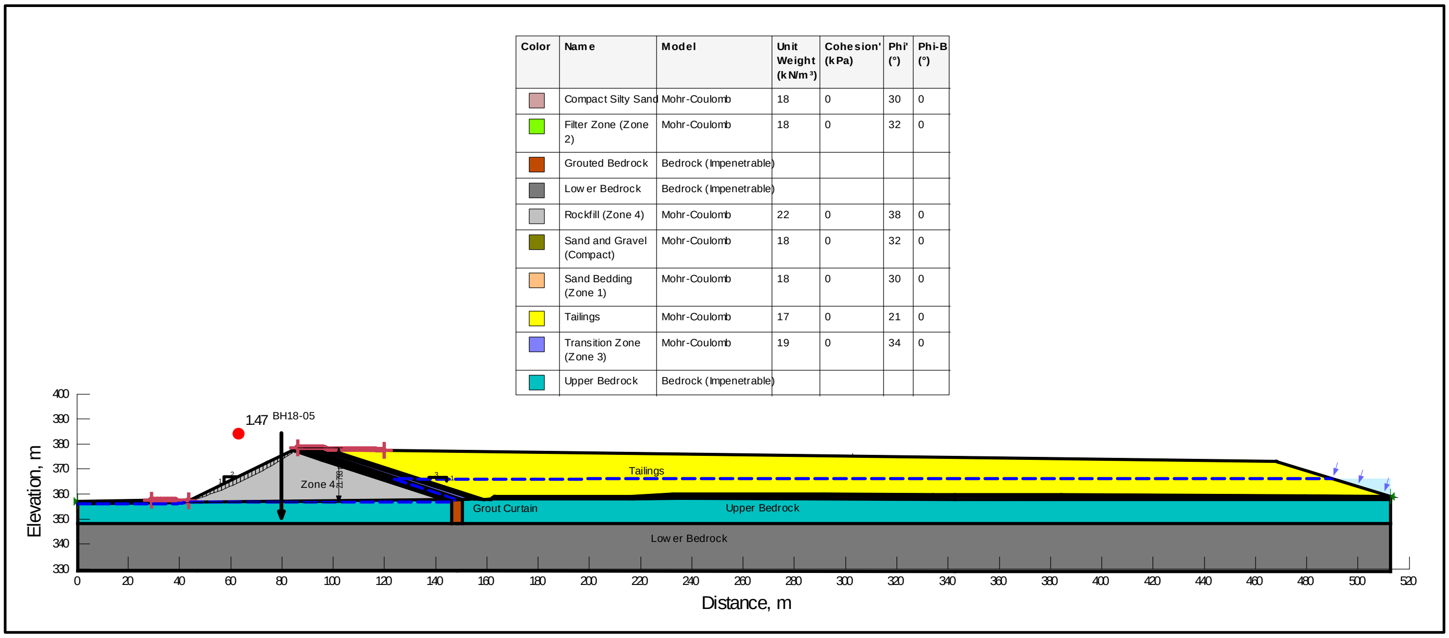


Figure 18-18 Typical Static Slope Stability Analysis

Source: WSP-Golder (2022).



Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)
	Compact Silty Sand	Mohr-Coulomb	18	0	30	0
	Filter Zone (Zone 2)	Mohr-Coulomb	18	0	32	0
	Grouted Bedrock	Bedrock (Impenetrable)				
	Lower Bedrock	Bedrock (Impenetrable)				
	Rockfill (Zone 4)	Mohr-Coulomb	22	0	38	0
	Sand and Gravel (Compact)	Mohr-Coulomb	18	0	32	0
	Sand Bedding (Zone 1)	Mohr-Coulomb	18	0	30	0
	Tailings	Mohr-Coulomb	17	0	21	0
	Transition Zone (Zone 3)	Mohr-Coulomb	19	0	34	0
	Upper Bedrock	Bedrock (Impenetrable)				

Figure 18-19 Typical Pseudo Static Slope Stability Analysis

Source: WSP-Golder (2022).

18.13.6 Construction Sequence

The general construction sequence for the TMF starter dams is anticipated to last about 21 months and would consist of the following:

- Clearing of entire TMF footprint (merchantable timber) – one month;
- Grubbing of surface and stripping/excavation of unsuitable soils along the dam foundation footprints with active dewatering to maintain stability of excavations – two months;
- Subgrade Preparation – includes bedrock cleaning, grout injection, slush grouting, and application of any dental concrete for bedrock foundations – six months;
- Dam fill placement and compaction – eight months;
- Installation of geomembrane liner (likely done in two or three stages as the dam fill is being placed) – occurs in tandem with fill placement – likely two to three weeks per stage;
- Spillway and spillway channel construction – one month; and
- Wrap up of any leftover items and demobilization – one month.

Future dam raises are projected in Years 1, 6, and 12 with construction windows lasting approximately eight to ten months for each.

18.13.7 Geochemistry

The tailings will consist of approximately 54% non-PAG material produced from ores from both sites. ARD is not expected during operation. In the tailings pond, MDMER limits could be exceeded for copper, nickel, and total cyanide during operation. Mercury, silver, iron, cadmium, arsenic, and un-ionized ammonium might also be parameters of concern based on ageing tests. The current plan is to design the TMF as a zero-discharge facility during operation. Seepage from the tailings may have concentrations exceeding the MDMER limits for cyanide and arsenic. The current plan is to collect and pump seepage back to the TMF during operation. Cut-off walls under the TMF dykes will reduce the risk of groundwater contamination. At closure, acidic conditions may develop in pockets of PAG tailings after eight or more years of exposure based on laboratory NP depletion rates. Under acidic conditions, potential exceedances of MDMER limits for nickel and copper and Canadian Water Quality Guideline (CWQG) exceedances for arsenic, cadmium, copper, nickel, lead, and zinc are possible. Even at neutral pH concentrations of arsenic and cadmium may exceed the Canadian Water Quality Guidelines for Freshwater Aquatic Life (CWQG-FAL) in run-off from exposed tailings. The risk of ARD and metal leaching from the tailings will be managed at closure using covers.

18.14 Accommodation

The camp facilities are to be of modular building construction, capable of housing 600 people during peak construction. The facility will include kitchen and recreational areas and is expected to require propane for heating purposes. It will also require connection to potable water, sewage, and electrical infrastructure. The camp will house personnel and contractors that work at both MacLellan and Gordon. Parking with plugins is to be provided in proximity to the camp. During operations it is expected that accommodations for 400 people will be required.

18.15 Mobile Equipment and Light Vehicles

A variety of plant mobile equipment is required for the operation.

A list of the plant mobile equipment for the LLGP is shown in Table 18-11. Mine mobile equipment is covered in Section 16.6.2.

Table 18-11 Processing Plant Mobile Equipment List

Equipment	Capacity	Number
Single Cab 4WD Pickup	-	6
Twin Cab 4WD Hiab Truck	8 t	1
Bus	22 seat	1
Fire Trailer	5 m^3	1
All Terrain Crane	40/50 t	1
Crane	150 t	
Plant Forklift	4 t	2
Warehouse Forklift	4 t	1
Front-End Loader	10 t	1
Skid-Steer Loader (Bobcat)	1 t	1
Tip Truck	3 t	2
Telescopic Handler	3 t	1
Boom/Scissor Lift	-	2
Fusion Butt Welder	90/315	1
Portable Compressor	-	1
Diesel Welder	-	2
Portable Pumps Generator	200 kVA	1
Gravel truck	10 m^3	2
Water Truck	15,000 L	1
Potable water Trailers	5,000 L	4
Franna Crane	15 t	1
Yard Crane – Hydraulic	20 t	1
Pick-n Carry Mobile Crane	-	1
Backhoe	11 t	1
Forklift/Telescopic Handler	20 t	1

19 MARKET STUDIES AND CONTRACTS

19.1 Market studies

No market studies have been conducted by Alamos or its consultants in relation to the gold and silver doré that will be produced by the Lynn Lake Gold Project. There is a steady demand from numerous buyers for gold and silver, which are freely traded commodities on the world market.

19.2 Contracts

No refining agreements or sales contracts relevant to this Technical Report are currently in place.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 Introduction

This section provides a summary of the results of the environmental studies, regulatory processes, and consultation efforts to support the project to date. Environmental baseline studies were initiated for the project in March 2015 and were used to identify environmental constraints during the development of the layouts and designs for the project. This included consideration of siting and layout of project infrastructure as well as consideration of design alternatives from an environmental management and approvals perspective.

The environmental setting described herein refers to a “General Project Area”, which does not have strictly defined spatial boundaries but generally includes the area indicated on Figure 20-1. This area is generally representative of the local environmental context for the project.

The General Project Area (Figure 20-1) supports two communities: the Town of Lynn Lake and Marcel Colomb First Nation. These communities are connected to each other by highway PR 391 which runs southeast from Lynn Lake to Thompson, Manitoba. Engagement with Indigenous Nations and other stakeholders (community members, agencies, interested parties) is an integral part of the project and was undertaken throughout project planning and will continue as the project progresses.

No relevant regional environmental study(s) is (are) known to have been conducted in the General Project Area. There are similarly no known applicable plans pertaining to water use (including groundwater), resource management, or conservation.

20.2 Environmental Approval Process

There are several federal and provincial regulatory requirements that apply to the project, including an environmental assessment (EA) and other environmental permitting obligations.

Under the former Canadian Environmental Assessment Act, 2012 (CEAA, 2012), federal EAs were required for ‘designated projects’ consisting of one or more physical activities specified in the Regulations Designating Physical Activities (the Regulations). The Canadian Environmental Assessment Agency (the CEA Agency, now the Impact Assessment Agency of Canada [IAAC]) is responsible for the administration of federal EAs for metal mines and formally determined that a federal EA is required for the project.

At the provincial level, the Classes of Development Regulation (CD Regulation) under The Environment Act of Manitoba identifies which developments must undergo a provincial EA and obtain a licence in accordance with the Act prior to construction, alteration, or operation. According to Section 3(5) of the CD Regulation, the project is classified as a Class 2 development. This class applies to mines and milling facilities. The Environmental Approvals Branch of the Manitoba Government further advised that it considered the proposed project activities at the Gordon and MacLellan sites to constitute separate “developments” that require separate licences under The Environment Act of Manitoba.

A Project Description was submitted to the CEA Agency on July 19, 2017, to initiate the federal EA process under CEAA 2012 and inform the provincial EA process under The Environment Act of Manitoba.

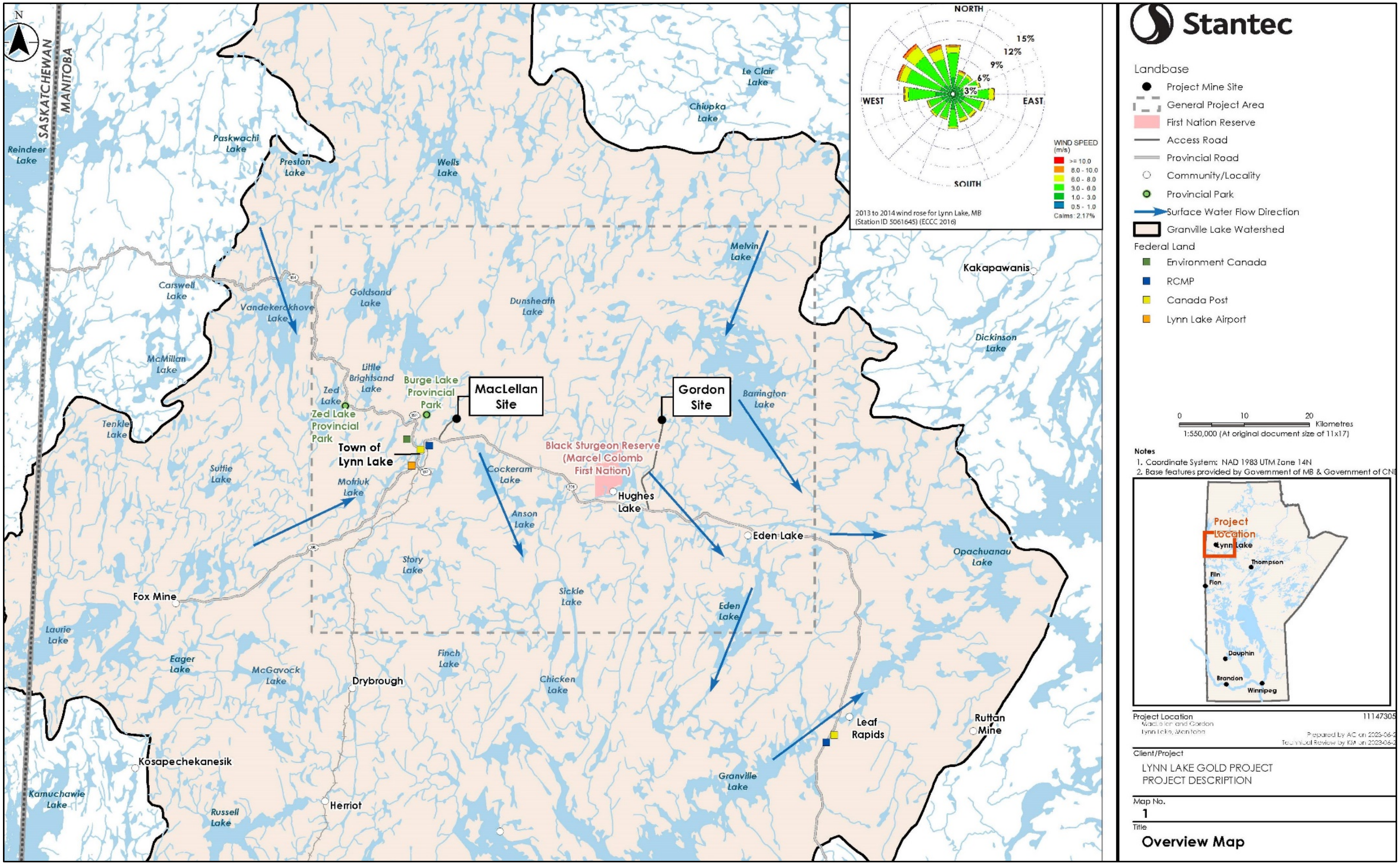


Figure 20-1 General Project Area

Source: Stantec (2023)

A single EIS document was then prepared, using the 2019 project design, and submitted on May 25, 2020, to satisfy federal EA requirements, and two separate provincial Environment Act Proposal Summary Reports (for the MacLellan and Gordon sites, respectively) were submitted to the Environmental Approvals Branch on August 19, 2020, to satisfy provincial requirements.

In early March 2023, Alamos received the federal Decision Statement and the provincial Environmental Act Licenses for the Project. It is expected if the design outlined in this report is to be constructed that a Notice of Alteration (or series of Notices) to the Province of Manitoba and IAAC will be required in relation to the design changes made from 2019. These changes may require additional design modifications or mitigation measures to be implemented.

20.3 Baseline Data

The description of the environment provided below is a summary based on extensive environmental baseline studies that were completed to support the project to date. The purpose of these studies was to characterize the natural, social, economic, cultural, and built aspects of the environment that may be potentially impacted by the project. The corresponding technical data reports that accompanied these studies are identified in Table 20-1. Some high-level information obtained during these studies has been incorporated into the description of the environmental setting below.

Table 20-1 Technical Data Reports Associated with Environmental Baseline Studies

Technical Data Report	Data Sources
Acoustic Baseline	Review of desktop information and collection of field data (i.e., noise monitoring)
Air Quality Baseline	Review of desktop information and collection of field data (i.e., active [continuous] particulate monitoring and dustfall monitoring)
Ambient Lighting Baseline	Review of desktop information and collection of field data (i.e., light survey and photographs)
Amphibian Baseline	Review of desktop information and collection of field data (i.e., habitat assessment, amphibian survey, and visual encounter survey)
Benthos and Sediment Baseline	Review of desktop information and collection of field data (i.e., periphyton sampling, phytoplankton sampling, zooplankton sampling, benthic invertebrate sampling, sediment sampling, and water quality sampling)
Bird Baseline	Review of desktop information and collection of field data (i.e., breeding bird survey, common nighthawk survey, waterbird survey, raptor nest survey, and barn swallow survey)
Climate and Meteorology Baseline	Review of desktop information
Fish Habitat, Distribution, and Tissue Analysis Baseline	Review of desktop information and collection of field data (i.e., fish habitat assessment, fish population sampling, fish spawning survey, and fish tissue sampling)
Geochemistry Baseline	Review of desktop information and characterization of materials, which will be exposed by the project (ore, waste rock, overburden, high-and low-grade ore and solid tailings derived as part of a metallurgical study)
Heritage Resources Baseline	Review of desktop information and collection of field data (i.e., pedestrian transects, shovel testing, and photographs)
Human Health and Ecological Risk Assessment Baseline	Review of desktop information and collection of field data (i.e., soil sampling, vegetation sampling, and small mammal sampling)
Hydrogeology Baseline	Review of desktop information and collection of field data (i.e., borehole drilling, hydraulic response testing, water level monitoring, and water quality monitoring)
Hydrology Baseline	Review of desktop information and collection of field data (i.e., snow survey, hydrometric monitoring, levelling survey, channel geometry survey, and bathymetric survey)
Mammal Baseline	Review of desktop information and collection of field data (i.e., aerial track survey, camera trap survey, ground-based tracking survey, beaver lodge survey, and bat survey)
Socio-Economic Baseline	Review of desktop information
Soil and Terrain Baseline	Review of desktop information and collection of field data (i.e., soil and terrain inspections and aerial reconnaissance)
Vegetation Baseline	Review of desktop information and collection of field data (i.e., ground plot survey [vegetation type characterization], wetland classification, and rare plant survey)

Other project-specific studies that have been undertaken include Traditional Knowledge/ Traditional Land and Resource Use studies, and Transportation Assessments. Further modelling programs for select subject areas (e.g., atmospheric dispersion, surface water quantity and quality and groundwater flows) were also completed in support of the EA.

The EIS provides further details regarding the methods and results of studies completed in support of the project.

20.3.1 Atmospheric Environment

20.3.1.1 *Air Quality*

Baseline dustfall measurements at the Gordon and MacLellan sites are well below dustfall objectives from Ontario and British Columbia (Manitoba does not have a dustfall objective). Average particulate matter baseline concentrations ($PM_{2.5}$ and PM_{10}) are also well below the Canada-Wide Standard for $PM_{2.5}$ (30 µg/m^3) and the Manitoba Ambient Air Quality Guideline for PM_{10} (50 µg/m^3) (CCME 2011; MSD 2005) at the sites and within Marcel Colomb First Nation's Black Sturgeon Reserve lands, although the presence of air emissions from forest fires biases this baseline (e.g., during June and early July 2015). Forest fires were recorded during 2017 near the Gordon site (i.e., within 7 km northeast) and during 2019 near the MacLellan site (i.e., within 8 km) causing short-term episodes of poor air quality. The poor air quality due to the forest fires quickly improved after the fire was extinguished. Existing air quality is reflective of the remote location of the project and the current lack of industrial activity in the area. Existing dust levels are attributed to traffic on unpaved roads and other human activities, such as the use of wood stoves and open fires.

20.3.1.2 *Ambient Sound*

Isolated hourly sound levels (L_{eq}) in a representative remote, unpopulated region of the General Project Area (i.e., Gordon site) were found to range between 22.7 decibel A-weighting (dBA) and 39.1 dBA during the day and between 20.3 dBA and 41.7 dBA during the night. The baseline acoustic environment in remote areas is characterized by wind noise, occasional aircraft flyovers, vegetation rustling, wildlife (birds) and insect noise. Elevated noise levels observed at night are attributed to wildlife activity. The Lynn Lake Airport does not receive regularly scheduled commercial flights; however, aircraft flyovers from occasional air charter flights contribute to baseline ambient sound in remote regions of the General Project Area.

Isolated hourly L_{eq} results for a sparsely populated region of the General Project Area (i.e., Marcel Colomb First Nation's Black Sturgeon Reserve lands) ranged between 33.0 dBA and 46.6 dBA during the day and between 23.2 dBA and 45 dBA during the night. The acoustic environment in sparsely populated areas is characterized by local activities (vehicle traffic, as well as general and recreational human activity and children playing), occasional aircraft flyovers, vegetation rustling, dog barking, and wildlife and insect noise.

Noise monitoring in a representative rural area (i.e., the cottage area within Burge Lake Provincial Park located west of the MacLellan site) identified isolated hourly L_{eq} results ranging between 31.3 dBA and 49.5 dBA during the day and between 22.7 dBA and 43.3 dBA during the night. The acoustic environment in rural areas is characterized by residents' activities, local traffic, watersport and recreational activities, occasional aircraft flyovers, vegetation rustling, wildlife, insects, and water ripple noise. Additional human sources of baseline noise are also related to traffic along PR 391 (which traverses the southern portion of the MacLellan site).

20.3.1.3 *Ambient Light*

The ambient light environment within the General Project Area is typical of light levels in remote towns and villages at higher latitudes. Baseline measurements are consistent with other small towns and villages where light pollution is typically not a priority for control. Sky glow is routinely influenced by the presence of Aurora Borealis (i.e., northern lights).

Dark sky is available within a few kilometers of Lynn Lake and the Marcel Colomb First Nation's Black Sturgeon Reserve lands. The light that affects these communities is the light that is generated within them, not by the overlap of other sources, such as industry, outside of the urban areas.

20.3.2 Water Resources

20.3.2.1 *Surface Water Hydrology*

The General Project Area lies within four subwatersheds of the Granville Lake River Watershed: Hughes River, Lower Keewatin River, Lower Lynn River, and Cockeram Lake.

Surface water around the Gordon site drains southward into the Hughes River, via Swede and Ellystan Lakes, which in turn discharge into Barrington River and Southern Indian Lake on the Churchill River. Around the MacLellan site, water flows south into the Keewatin River and southeast through Cockeram Lake and Sickle Lake before discharging into Granville Lake on the Churchill River, upstream of Southern Indian Lake.

Gordon Lake is located at the top end of the watershed and west of the historical mine area that formerly drained eastward to Farley Lake via Gordon Creek. As part of historical mining activities, a diversion channel was constructed between Gordon and Farley lakes, north of the historical East and Wendy open pits. The East and Wendy pits are flooded and are not directly connected to the diversion channel or Gordon or Farley lakes.

The Keewatin River, Lynn River, Goldsand Lake, and Cockeram Lake are some of the largest waterbodies in the Lower Keewatin River, Lower Lynn River, and Cockeram Lake subwatersheds. The subwatershed on the west side of the MacLellan site flows towards the Keewatin River which ultimately converges with the Lynn River before entering Cockeram Lake.

Five lakes surround the proposed TMF at the MacLellan site, including Payne Lake (which drains into the Keewatin River) and Lobster, Minton, and two unnamed lakes (which drain into an unnamed river that ultimately discharges to Cockeram Lake in the south). The Keewatin River flows southeast from Cockeram Lake, through Sickle Lake before discharging into Granville Lake on the Churchill River, upstream of Southern Indian Lake.

Results from the two years of surveys indicate that the highest flows typically occur during the spring period in response to snowmelt in the General Project Area. Peak flow sometimes occurs later in the melt season in response to rainfall events. In the 2016 water year, the highest recorded flow was 26.7 m^3/s in the Keewatin River on July 16, 2016. The lowest recorded flows occurred during the late winter, prior to the onset of spring snowmelt.

The regional hydrological analysis determined regional annual mean discharge, annual run-off, annual peak flows, monthly flows and distribution, and monthly low flows. The annual run-off calculated at the five regional stations ranged from 156 mm to 203 mm with an average of 178 mm. The average annual run-off from the regional stations (178 mm) was used to estimate mean annual discharge for stations on the Keewatin and Lynn rivers. The annual mean discharge values measured at the local stations were comparable to the values calculated in the regional analysis.

Evidence of beaver activity was noted throughout the General Project Area, particularly in streams and at lake outlets. In these areas, beaver dams have reduced flow and increased water levels upstream.

20.3.2.2 *Groundwater Hydrogeology*

The conceptual hydrostratigraphic understanding of the General Project Area consists of overburden, deposited through a series of glacial processes that overlies bedrock. Overburden thickness is controlled by bedrock topography with thicker overburden deposits associated with topographic lows in the bedrock surface and thin to absent overburden in areas of bedrock topographic highs. Overburden geology was characterized as glaciolacustrine sediments overlying glacial sand till, which generally overlies bedrock. Isolated pockets of glaciofluvial sediments were observed. A thin veneer of organic soils was observed at surface with thicker deposits observed in low-lying areas.

Groundwater flow in the General Project Area is strongly influenced by topography, which results in localized groundwater flow from topographic highs with groundwater discharge to wetland areas or surface water features. The topography is controlled by top of bedrock, which is irregular because of north-dipping beds that strike east-west. Groundwater flow across the MacLellan site is generally toward the southeast with some radial flow in the area of the proposed open pit. At the Gordon site, groundwater flow is controlled by a topographic high located south of the proposed open pit that results in radial flow. Groundwater flow converges on the proposed open pit at the Gordon site.

The hydraulic conductivity of overburden ranged over three orders of magnitude with higher hydraulic conductivity estimates associated with glaciolacustrine nearshore deposits (10^{-6} m/s to 10^{-5} m/s) and lower hydraulic conductivity estimates associated with glaciolacustrine offshore deposits (10^{-7} m/s to 10^{-6} m/s) and till (10^{-7} m/s to 10^{-6} m/s). The hydraulic conductivity of the bedrock decreases with depth, with the upper portions being the most transmissive due to increased weathering and/or fracturing. The shallow bedrock had the greatest variation in hydraulic conductivity estimates, over five orders of magnitude (10^{-8} m/s to 10^{-3} m/s) and is reflective of the variation in weathering and frequency and extent of bedrock fractures. At depths greater than 50 m below the top of bedrock, hydraulic conductivity estimates varied over three orders of magnitude (10^{-8} m/s to 10^{-6} m/s) and were generally three to four orders of magnitude lower than the upper range observed in the shallow bedrock. Packer testing, two 72-hour pumping tests, and groundwater flow modelling have suggested that bulk hydraulic conductivity of the shallow bedrock within the vicinity of the East and Wendy faults at the Gordon site is estimated at 10^{-5} m/s, the higher end of the overall estimates of hydraulic conductivity of the shallow bedrock.

Groundwater quality in the General Project Area was compared with the Manitoba Water Quality Standards, Objectives, and Guidelines (MSOG) for drinking water and the Canadian Drinking Water Quality Guidelines (CDWQG). Background water quality was good and generally met the MSOG and CDWQG except for dissolved arsenic, iron, and manganese. At one background monitoring well, the concentration of sulphate was one to two orders of magnitude greater than other background monitoring wells and is reflective of natural mineralization and/or reduction-oxidation reactions that may be occurring. Groundwater quality associated with historical mining activities at the MacLellan site exceeded the drinking water guidelines for iron and manganese, similar to background, as well as sulphate and uranium. At the Gordon site, groundwater quality associated with historical mining activities exceeded the drinking water guidelines for dissolved arsenic, manganese, and iron, similar to background, as well as sulphate and dissolved cadmium.

Groundwater quality in the General Project Area was also compared with the more stringent MSOG and CWQG for the protection of freshwater aquatic life (FAL). Background groundwater quality met the MSOG-FAL and CWQG-FAL except for fluorine and dissolved arsenic and iron in addition to dissolved copper and aluminum at the MacLellan site and dissolved zinc at the Gordon site. Groundwater quality associated with historical mining activities at the MacLellan site exceeded the MSOG-FAL and CWQG-FAL for the same parameters as background groundwater quality in addition to dissolved aluminum and dissolved uranium. At the Gordon site, groundwater associated with historical mining activities exceeded the MSOG-FAL and CWQG-FAL for the same parameters as background groundwater quality in addition to dissolved cadmium, nickel, selenium, uranium, and zinc.

20.3.2.3 *Geochemistry*

The following summarizes the results of the geochemical characterization completed for each mine material associated with the project.

Overburden

At both sites, overburden is not expected to generate acid rock drainage (ARD) based on kinetic testing and monitoring of historical overburden storage. Leaching of fluorine, aluminum, and copper above CWQG-FAL is predicted by kinetic tests, but no exceedances of CWQG for any of these parameters was observed in association with the historical overburden storage at the Gordon site.

Mine Rock

Approximately 58% and 56% of the mine rock from the MacLellan and Gordon open pits, respectively, will be non-PAG. The rest is represented by PAG and uncertain rock having a risk to generate ARD after closure. The risk of ARD will be addressed through the blending of PAG and non-PAG rock. There is no evidence of ARD observed downstream of the historical rock storage sites at the Gordon site, where PAG and non-PAG were blended and covered with overburden and soil.

A high metal leaching (ML) potential was identified for arsenic and a moderate leaching potential was identified for aluminum, cadmium, molybdenum, and copper in rock from the MacLellan site based on kinetic tests. Mine rock from the Gordon site showed a moderate leaching potential for fluorine, arsenic, selenium, cadmium, chromium, aluminum, and copper. Among these elements, only arsenic and selenium exceeded the CWQG-FAL in ponds located downstream of historical rock storage areas at the Gordon site. At these locations, CWQG exceedances were also observed for iron, NH_3, and NO_2. Ongoing water quality modelling will refine the list of potential parameters of concern and determine if metal leaching from waste rock should be addressed.

Ore

Ore from the MacLellan and Gordon open pits will contain 52% and 66% of non-PAG materials, respectively. The rest is represented by PAG and uncertain materials. ARD is not likely to be an issue with blended ore stockpiles during operation, considering minimum ARD onset time of 14 years compared to the residence time of ore in stockpiles.

The ore from the MacLellan site has a high leaching potential for arsenic based on humidity cell tests. A moderate leaching potential was determined for aluminum, fluorine, and silver at the Gordon site and for silver, cadmium, lead, and aluminum at the MacLellan site. Water treatment during operation is not currently predicted based on the water quality modelling that is currently ongoing. At closure, any remaining ore will require management to prevent future ARD and metal leaching.

Tailings

The geochemistry of the tailings (ARD and ML potential) is discussed in Section 18.13.7.

20.3.3 Aquatic Environment

20.3.3.1 *Water Quality*

Most of the lakes near the Gordon and MacLellan sites are shallow (less than 4 m deep) and do not stratify during the summer. Background surface water quality generally reflects geochemistry of the Precambrian Shield. Lakes and streams are typically low in dissolved ions (< 80 mg/L total dissolved solids), soft (hardness < 75 mg/L as $CaCO_3$), and neutral to slightly acidic in pH. Some parameters (e.g., dissolved oxygen, pH, total phosphorus, aluminum, chromium, and iron) are naturally elevated and occasionally do not meet water quality guidelines.

At the outlet of Gordon Lake, the 2015 to 2017 dataset showed no notable changes in water quality from background conditions. This suggests that drainage from the inactive mine site (i.e., surface run-off from existing mine rock and overburden storage dumps and seepage from the adjacent former open pit) does not affect water quality in Gordon Lake. Water quality data indicate elevated levels of some metals and other ions (e.g., alkalinity, hardness, specific conductance, calcium, chlorine, magnesium, potassium, sodium, sulphate, arsenic, copper, iron, nickel, and uranium) in the existing open pits and in Farley Lake compared to background concentrations in the Gordon site area, however, concentrations of these parameters were similar to background by Swede Lake, the next lake downstream from Farley Lake. In general, the Hughes River subwatershed, within which the Gordon site is located, has the following parameters in concentrations that exceed MSOG-FAL and/or CWQG-FAL: total and dissolved organic carbon, total phosphorus, iron, and aluminum. These exceedances are likely the result of lithology in the case of aluminum and sulphate, the presence of mineralized rock in the case of copper and nickel, and the proliferation of beaver dams, muskeg bogs, and low relief in the case of organic carbon.

The inactive MacLellan site does not appear to affect water quality in the Keewatin River, as there were no identifiable increased concentrations of water quality parameters between the sites upstream and downstream of the site (upstream of the Lynn River confluence). Sulphate and chloride concentrations and aluminum, copper, nickel, cadmium, cobalt, and zinc concentrations were higher in Eldon Lake, the Lynn River, in the Keewatin River downstream of the Lynn River, and in Cockeram Lake (the first lake downstream of the inactive MacLellan site and the unrelated former East Tailings Management Area on the Lynn River) than in other lakes and streams not downstream from these facilities, including the Keewatin River upstream from the Lynn River confluence. Mean copper, nickel, iron, and zinc concentrations were higher than CWQG-FAL in Eldon Lake, the Lynn River, and in Cockeram Lake. These exceedances are generally attributable to past mining activity near Lynn Lake. Other guideline exceedances in the MacLellan site area, including total phosphorus, iron, and aluminum, reflect background conditions.

20.3.3.2 *Fish and Fish Habitat*

Based on the results of field surveys conducted in 2015 and 2016, a total of 17 fish species are known to occur in the lakes and streams near the project mine sites (Table 20-2). Small-bodied fish species are most prevalent in streams and small, shallow lakes including brook stickleback (Culaea inconstans), ninespine stickleback (Pungitius pungitius), log perch (Percina caprodes), trout perch (Percopsis omiscomaycus), emerald shiner (Notropis atherinoides), spottail shiner (Notropis hudsonius), longnose dace (Rhinichthys cataractae), lake chub (Couesius plumbeus), and slimy sculpin (Cottus cognatus). Large-bodied fish species are more prevalent in larger, deeper lakes and include northern pike, walleye, yellow perch, lake whitefish (Coregonus clupeaformis), burbot (Lota lota), cisco (Coregonus artedi), white sucker (Catostomus commersoni), and longnose sucker (Catostomus catostomus). Larger lakes, such as Cockeram Lake, typically support a greater diversity of fish and fish habitat than smaller lakes in the General Project Area. Northern pike are the most widespread large-bodied species in the lakes of the General Project Area, while brook stickleback are the most widespread small-bodied species in the lakes and streams.

Table 20-2 Fish Species Known to Occur in Waterbodies near the Project Mine Sites

Waterbody	Location	Fish Species Confirmed to be Present During Field Surveys Conducted in 2015 and 2016
Gordon Site		
Farley Lake	Adjacent and to the east (downstream) of proposed open pit	Northern pike, yellow perch, white sucker, and brook stickleback
Gordon Lake	Adjacent and to the west (upstream) of proposed open pit	White sucker and brook stickleback
MacLellan Site		
Cockeram Lake	South (downstream) of proposed mine infrastructure and PR391	Northern pike, walleye, yellow perch, lake whitefish, white sucker, trout perch, emerald shiner, spottail shiner, lake chub, log perch, and ninespine stickleback
Dot Lake	West of and across Keewatin River from proposed open pit	Brook stickleback
East Pond	Adjacent to and between proposed open pit and proposed ore milling and processing plant	Brook stickleback
Keewatin River	Adjacent and to the west of proposed mine infrastructure	Northern pike, yellow perch, lake whitefish, cisco, burbot, white sucker, longnose sucker, lake chub, longnose dace, trout perch, brook stickleback, and slimy sculpin
Lobster Lake	Northeast of proposed TMF	Brook stickleback and northern pike
Minton Lake	South (downstream) of proposed TMF	Brook stickleback and northern pike
Payne Lake	North of proposed mine rock storage area and proposed TMF	Brook stickleback

No aquatic species of conservation concern (SOCC) have been documented or are expected in the General Project Area based on known fish species distributions, including those listed as special concern, threatened, or endangered under the federal Species at Risk Act (SARA; Government of Canada 2016b), recommended for listing under SARA by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; 2016), listed as threatened or endangered under Manitoba's The Endangered Species and Ecosystems Act (MB ESEA) (Government of Manitoba 2016), or listed as S1-S3 by the Manitoba Conservation Data Centre (MB CDC; 2015).

Most lakes in the General Project Area are shallow with soft substrates (e.g., sand or muck). Hard substrates (e.g., boulders or cobbles) are less common but present in some locations. Aquatic vegetation and cover in the littoral zone are abundant in most of the lakes in the General Project Area.

The Gordon site is located in the headwaters of the Hughes River watershed, and no large rivers flow through the study area. Farley Creek, the outlet of Farley Lake, is the largest stream potentially affected by the project. Short cascades and a proliferation of beaver dams present seasonal or temporary barriers to fish passage in several of the streams near the Gordon site.

The Keewatin, Cockeram, and Lynn rivers and their tributaries connect the lakes near the MacLellan site. The Keewatin River is the largest river in the General Project Area, connecting Goldsand and Burge Lakes upstream of the MacLellan site to Cockeram Lake downstream of the mine site. The Lynn River is a tributary to the Keewatin River upstream of Cockeram Lake.

Stream habitats are generally low gradient, interspersed with short cascades that do not generally create barriers to migration. Beavers are active in the General Project Area and their dams present seasonal or temporary barriers to fish passage on several tributaries to the rivers and lakes.

Fish Tissue

Metals concentrations in northern pike muscle and whole-body tissues from the Gordon and MacLellan sites are generally below the MDMER and Health Canada guidelines for protection of aquatic life and human consumption. This includes total mercury for which average concentrations were below the human health guideline of 0.5 µg/g (wet weight).

Concentrations of selenium in northern pike muscle and whole-body tissues were approximately one order of magnitude lower than the 4 µg/g (wet weight) guideline used in British Columbia (BCMoE 2014).

20.3.3.3 *Sediment Quality*

Arsenic and chromium concentrations exceed federal or Manitoba sediment quality guidelines in Farley and Gordon lakes, respectively. Iron and aluminum concentrations were also elevated in Gordon and Farley lakes compared to upstream reference sites. Sediment metal concentrations were otherwise below guideline values at the Gordon site.

Elevated concentrations of chromium, copper, arsenic, and zinc that exceed federal and/or Manitoba sediment guidelines have been measured in sediment at the inflow of the Keewatin River into Cockeram Lake. This location is downstream of the MacLellan site, downstream of the former East Tailings Management Area (located on the banks of the Lynn River), and downstream of other historical mining activities and other anthropogenic influences from the Town of Lynn Lake. These data suggest past contamination of sediments in North Cockeram Lake. Other metals, for which no guidelines currently exist, such as aluminum and iron, were also elevated at several locations, including Goldsand Lake located upstream of the MacLellan site. This suggests some natural enrichment from the surrounding geology.

20.3.4 Terrestrial Environment

20.3.4.1 *Terrain and Soils*

The project is located within the Churchill River Upland Ecoregion of the Boreal Shield Ecozone (Smith, 1998). It falls under the South Indian bedrock plateau subdivision of the Kazan Upland (Bostock, 1970) which covers about 35,000 km^2 of mostly hilly, till veneered bedrock terrain, and intervening low areas of organic terrain (Klassen, 1986). The General Project Area terrain ranges from level to moderately sloping, with most slopes ranging from 0 to 15%.

Within the Churchill River Upland Ecoregion, Dystric Brunisols are the dominant soils on sandy acidic till, while Gray Luvisols are dominant on well to imperfectly drained clay deposits (Smith, 1998). Granitic rock outcrops are co-dominant in the area. Appreciable areas of shallow and deep organic Mesisols, Fibrisols and Cryosols are associated with basin bogs, peat plateau and veneer bogs (Smith, 1998). Gray Luvisols, and to a lesser extent Static and Turbic Cryosols, are common on clayey lacustrine deposits along the Churchill River and around Southern Indian Lake, while Eutric Brunisols occur on silty fluvioglacial ridges and on calcareous loamy till.

At the Gordon site, the dominant soils are well drained, coarse-textured Eluviated Dystric Brunisols of the Fay Lake soil series and very poorly drained Terric Fibric Organic Cryosols of the Wuskwatim soil series. At the MacLellan site, the dominant soils are imperfectly drained, coarse-textured Gleyed Eluviated Dystric Brunisols of the Hat Lake soil series and very poorly drained, Terric Fibric Organic Cryosols of the Wuskwatim soil series.

The Permafrost Distribution Map of Canada (Heginbottom, Dubreuil, & Harker, 1995) indicates that the project is located within the sporadic to discontinuous permafrost zone, where permafrost is typically found in 10% to 50% of the land area.

20.3.4.2 *Vegetation and Wetlands*

The General Project Area is characterized by black spruce-dominated forests on mineral soils and in poorly drained peatlands. Tamarack is typical on wetter peatland sites, while drier sites are forested white birch (*Betula papyrifera*), jack pine, and occasionally white spruce (*Picea glauca*). Jack pine stands occur on upland sites, while white birch is found throughout the Ecodistrict. Field surveys documented 200 plant species within the General Project Area.

Common dandelion (Taraxacum officinale) and quack-grass (Elymus repens) are considered noxious weeds in Manitoba and were observed in the General Project Area (Government of Manitoba 2015).

The project is in the High Boreal wetland region, which is characterized by permafrost, and non-permafrost wooded bogs and patterned fens (Halsey, 2003). An estimated 37% of the High Boreal wetland region is covered in wetlands, comprised of (in order of dominance): permafrost wooded bogs, wooded fens with internal lawns, patterned open fens, non-patterned open fens, and wooded fens with internal lawns, along with small percentages of swamps and marshes. Eleven wetland types have been recorded within the General Project Area.

SOCC are those species listed as special concern, threatened, or endangered under SARA (Government of Canada 2016b), recommended for listing under SARA by COSEWIC (2016), listed as threatened or endangered under MB ESEA (Government of Manitoba 2016), or ranked as S1-S3 by the MB CDC (2015). The General Project Area is located within the known range of 23 plant SOCC. Four of these are known to occur within the General Project Area: quillwort (*Isoetes lacustris*), small water-lily (*Nymphaea tetragona*), northern woodsia (*Woodsia aplina*), and shrubby willow (*Salix arbusculoides*). None of the 23 plant SOCC is listed under SARA, nor are any of Manitoba's SARA-listed plant SOCC expected to occur based on the habitat types found in the General Project Area.

20.3.4.3 *Amphibians*

Three species of amphibian have the potential to breed within the General Project Area: boreal chorus frog (*Pseudacris maculata*), wood frog (*Rana sylvatica*), and northern leopard frog (*Lithobates pipiens*). Baseline field surveys confirmed the presence of breeding habitat for boreal chorus and wood frogs; both are widely dispersed throughout the General Project Area. Northern leopard frog is a SOCC (listed as special concern under SARA) and the historical range of northern leopard frog includes the General Project Area; however, there are no recent records of their presence, and none were observed during baseline studies.

20.3.4.4 *Birds*

Based on the Manitoba Breeding Bird Atlas (MB BBA 2016), 198 bird species have the potential to breed in the General Project Area. Of these, 62 are waterbirds, four are upland game birds, 18 are raptors, and 114 are passerines (i.e., songbirds) or near-passerines (e.g., woodpeckers). Common waterbird species observed during baseline studies were mallard (*Anas platyrhynchos*), ring-necked duck, Canada goose (*Branta canadensis*), and common loon (*Gavia immer*). Common songbirds were swamp sparrow *(Melospiza Georgiana*), ruby-crowned kinglet

(*Regulus calendula*), Tennessee warbler, dark-eyed junco (*Junco hyemalis*), and yellow-rumped warbler (*Setophaga coronate*).

The General Project Area is located within the known range of nine bird SOCC. Of these nine bird SOCC, three are confirmed breeders in the area: common nighthawk (*Chordeiles minor*, listed as threatened under SARA and MB ESEA), olive-sided flycatcher (*Contopus cooperi*, listed as threatened under SARA and MB ESEA) and barn swallow (*Hirundo rustica*, listed as threatened by COSEWIC). Trumpeter swan (*Cygnus buccinator*, listed as endangered under MB ESEA), horned grebe (*Podiceps auritus*, listed as special concern by COSEWIC), and rusty blackbird (*Euphagus carolinus*, listed as special concern under SARA) may occur based on the availability of suitable breeding habitat; however, yellow rail (*Coturnicops noveboracensis*, listed as special concern under SARA), short-eared owl (*Asio flammeus*, listed as special concern under SARA and threatened under MB ESEA), and bank swallow (*Riparia riparia*, listed as threatened by COSEWIC) are less likely to occur based on lack of suitable habitat in the General Project Area.

20.3.4.5 *Mammals*

Baseline data indicates the General Project Area is home to American marten, American red squirrel (*Tamiasciurus hudsonicus*), beaver (*Castor canadensis*), black bear, Canadian lynx (*Lynx canadensis*), fisher (*Martes pennant*), grey wolf (*Canis lupus*), mink (*Neovison vison*), moose, red fox (*Vulpes vulpes*), river otter (*Lontra canadensis*), snowshoe hare (*Lepus americanus*), weasel (*Mustela sp*.), wolverine (*Gulo gulo*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown myotis (*Myotis lucifugus*), various small rodents (e.g., voles). Moose and black bear are some of the important game species harvested by local resource users.

The General Project Area is located within the known range of five mammal SOCC. Three of the five mammal SOCC (i.e., little brown myotis, listed as endangered under SARA and MB ESEA; wolverine, listed as special concern by COSEWIC; and boreal woodland caribou, listed as threatened under SARA) have been documented in the General Project Area. Northern myotis was not detected during bat baseline surveys, yet it has the potential to occur in the General Project Area due to the availability of suitable bat roosting and foraging habitat.

The General Project Area lies within the Manitoba Environment and Climate (MEC) Kamuchawie Caribou Management Unit. MEC has yet to delineate any boreal woodland caribou (Rangifer tarandus caribou, listed as threatened under MB ESEA and SARA) herd ranges or provide an estimate of herd size in this management unit (Manitoba Boreal Woodland Caribou Management Committee 2015). The only delineated herds exist south of the General Project Area and south of the Churchill River (COSEWIC 2011). During baseline surveys, boreal woodland caribou were documented west of Lynn Lake in the General Project Area. During aerial surveys conducted by MEC in 2022, boreal woodland caribou were documented between Goldsand Lake and Motriuk Lake (Trim, V, 2022). These observations indicate that boreal woodland caribou occasionally occur in the western part of the General Project Area.

The barren-ground caribou (*Rangifer tarandus groenlandicus*, listed as a threatened species by COSEWIC) range extends to approximately 45 km north of the General Project Area, Beverly, and Qamanirjuaq Caribou Management Board (BQCMB). Discussions with local resource users and MEC, and results of previous studies (Tetra Tech, 2013) indicate it is unlikely that barren-ground caribou occur in the General Project Area

20.3.5 Human and Socio-Economics

20.3.5.1 *Socio-Economic Context*

There are two population centres in the General Project Area: the Town of Lynn Lake and Marcel Colomb First Nation. In 2021, the Town of Lynn Lake had approximately 575 residents, an increase from 494 in 2016. The registered population of Marcel Colomb First Nation is 445, with 83 people listed as those living on Marcel Colomb First Nation Black Sturgeon Reserve lands.

The Town of Lynn Lake was built in the mid-20th century, primarily to serve the mining industry. Since the closure of the Black Hawk mine, the region has sought to develop its tourism industry, which is based largely around fishing and hunting.

The Town of Lynn Lake is accessible by PRs 391, 394, 396, 397 and 399. PR 391 connects the Town of Lynn Lake and the Marcel Colomb First Nation with the Town of Leaf Rapids and City of Thompson. PR 391 also provides access to all-weather gravel access roads to both the Gordon and MacLellan sites. There is currently no rail service to the Town of Lynn Lake. The Lynn Lake Airport is accessed by fishing charters, RCMP, health services, and mining-related activities.

The Town of Lynn Lake provides solid waste services for residents and businesses. Waste from the town and Marcel Colomb First Nation is disposed at the Lynn Lake Landfill. Water for the town comes from West Lynn Lake. Water distribution and wastewater collection infrastructure is more than 50 years old and requires significant investment. A new water treatment plant was recently built and commissioned and there is a large drive to rebuild other infrastructure (piping) throughout the town in future years.

Marcel Colomb First Nation operates its own water treatment plant and sewage lagoon on its Black Sturgeon Reserve lands. Both were built recently and are in good working condition. Hughes Lake is the source of drinking water supplies for this treatment plant.

Education services within the General Project Area are provided through Frontier School Division, Area 1, which provides both in-class teaching services as well as distance education for senior years and career programs. West Lynn Heights School serves the Town of Lynn Lake and Marcel Colomb First Nation.

The General Project Area is in the service delivery area for the Northern Health Region. The Lynn Lake Hospital is in the Town of Lynn Lake. The hospital shares health care resources with the Leaf Rapids Health Centre. For medical emergencies and specialist appointments, residents are transported by medevac to Thompson or Winnipeg.

The Town of Lynn Lake has 24-hour emergency medical services with one ambulance capable of providing patient transport to the Thompson General Hospital. The Lynn Lake RCMP is responsible for initial search and rescue at the outset of an emergency, with a specialized search and rescue team deployed to follow up. Lynn Lake, Leaf Rapids, Thompson, South Indian Lake, Nelson House, and Cross Lake have volunteer search and rescue teams. The Lynn Lake Fire Department is a volunteer-run service that serves both the Town of Lynn Lake and the Marcel Colomb First Nation (Marcel Colomb First Nation has a fire truck but lacks trained operators).

20.3.5.2 *Land Use*

The Gordon and MacLellan sites are in a remote area approximately 37 km and 7 km northeast of the Town of Lynn Lake, respectively. Marcel Colomb First Nation's Black Sturgeon Reserve lands are located approximately 12 km southwest of the Gordon site. The nearest known permanent, seasonal, or temporary residences to the project are a:

- Trapper cabin located on the north shore of Swede Lake approximately 3.5 km southeast of the Gordon site; and
- Remote cottage located on the north shore of Simpson Lake approximately 4.5 km southwest of the Gordon site.

The land use site in closest proximity to the MacLellan site is a landfill located approximately 3 km to the southwest.

Both mine sites are surrounded by vegetated land, forest cover, scattered lakes, watercourses, and wetlands, and located within areas of discontinuous permafrost cover.

The Town of Lynn Lake is the self-proclaimed ‘Sportfishing Capital of Manitoba’. Outdoor recreation activities are popular with both residents and visitors to the region and include sportfishing, hunting, boating, swimming, camping, cross-country skiing, and snowmobiling. There are two provincial parks within 20 km of the Town of Lynn Lake: Burge Lake and Zed Lake. Sand Lakes Provincial Park is approximately 40 km north of the Gordon site.

There are several municipal recreation facilities in the Town of Lynn Lake; however, their use is limited by lack of proper operation and maintenance. The arena has the potential to support curling, skating and hockey in the winter, and basketball, volleyball, floor-hockey, roller-skating, and badminton during other months. There is also an unsupervised beach, a public library, and a mining museum that is open by appointment. The former Royal Canadian Legion Hall in the Town of Lynn Lake is privately owned and used as a gathering place. A recreational facility is being planned for the Marcel Colomb First Nation on the Black Sturgeon Reserve lands as well.

Municipal jurisdictions may adopt development plans and zoning by-laws to guide land use decisions within their respective boundaries. The following municipal development plan and zoning by-law apply to the Town of Lynn Lake:

- Town of Lynn Lake Development Plan No. 1329-2009; and
- The Local Government District (LGD) of Lynn Lake By-law No. 675.

The current Town of Lynn Lake Development Plan No. 1329-2009 identifies the MacLellan site as being designated a “Limited Development” area. Mineral exploration and development are encouraged in the Limited Development land use area under the Town of Lynn Lake Development Plan. There is no applicable development designation under a development plan for the Gordon site as it is located outside of municipal jurisdiction on unorganized Crown land.

Outside the built-up settlement area (townsite) of Lynn Lake, most of the land in the municipal boundary of the town is zoned as “LD – Limited Development District” under the LGD of Lynn Lake By-law No. 675, including the MacLellan site. Mining and quarrying are permitted uses in the Limited Development land use district under the By-law. There is no applicable zoning under a zoning by-law for the Gordon site as it is located outside of municipal jurisdiction on unorganized Crown land.

Provincial Land Use Policies (PLUPs) under the Provincial Planning Regulation No. 81/2011 reflect the provincial government’s interest in land and resource use and sustainable development. The PLUPs apply to all lands subject to The Planning Act of Manitoba in the absence of adopted development plans. PLUPs are also given full consideration when undertaking planning activities and land use decision-making on Crown lands. Schedule 3 of the PLUPs includes Policy Area 8: Mineral Resources, which expresses the provincial interest in mineral resources development.

20.3.5.3 *Heritage Resources*

The Gordon site was reviewed for heritage potential. The proposed ore and overburden stockpile locations were not considered to have high heritage resource potential based on predictive modelling undertaken, including extent of previous disturbance. Field assessments at this location did not record heritage resources.

Development within the MacLellan site is primarily located in areas that would have limited human activity given the nature of the terrain and general lack of navigable and potable water. Locations along the Keewatin River would have been more conducive for human occupation and resource harvesting. The one exception is the upland area where exposed quartz veins may have been quarried for stone tool manufacture. One such site was identified north of the proposed TMF and consisted of quartz flakes shallowly buried beneath the organic overburden. It is possible that additional sites are present at this and other upland locations. However, based on the site extent defined by shovel tests, these sites do not encompass a large area.

20.3.5.4 *Current Use of Lands and Resources for Traditional Purposes by Indigenous People*

Traditional Knowledge/Traditional Land and Resource Use (TK/TLRU) studies were released by Marcel Colomb First Nation, Mathias Colomb Cree Nation, Manitoba Metis Federation, Peter Ballantyne Cree Nation, and Sayisi Dene First Nation. Marcel Colomb First Nation’s Black Sturgeon Reserve lands are located nearest to the Gordon (approximately 12 km) and MacLellan (approximately 24 km) sites.

As presented in the TK/TLRU studies, there is current use of lands and resources for traditional purposes by Indigenous peoples in the General Project Area. Details of the TK/TLRU studies completed (following release by the respective Indigenous Nation) are discussed in the EIS and additional supplemental filings.

20.4 Potential Impacts and Proposed Mitigation Measures

20.4.1 Potential Project-Related Environmental Interactions

Table 20-3 provides an overview of potential project-related changes to environmental components that are directly linked or necessarily incidental to regulatory (federal and provincial) decisions that enable the project to proceed, and associated effects on health and socio-economic conditions, physical and cultural heritage, and resources of historical, archaeological, paleontological, or architectural significance. The scope of the environmental assessment focused on the potential adverse environmental effects of the project on the Valued Components (VCs) identified in the last column of Table 20-3. VCs are environmental attributes associated with the project of special value or interest to Indigenous peoples, regulatory agencies, the Proponent, resource managers, scientists, key stakeholders, and/or the public.

Table 20-3 Potential Project Environmental Interactions

Environmental Component(s) of Concern	Potential Environmental Interactions (Without Mitigation or Management)	How Potential Environmental Interactions are Addressed in EIS
Fish, Fish Habitat, and Aquatic Species	The Gordon and MacLellan sites contain several fish-bearing watercourses and waterbodies. Routine project activities could result in changes to fish and fish habitat due to the following potential interactions: • The project has potential to adversely affect fish if project-related hydrological and/or hydrogeological changes affect the quality or quantity of fish habitat. • Liquid discharges from the project have potential to adversely affect fish habitat and fish health if they cause a reduction in water quality in receiving waters frequented by fish. • Construction, excavation, and dewatering and/or infilling of waterbodies have potential to cause injury or mortality to fish. • Alterations to stream channels have potential to cause injury or mortality to fish, as well as to affect fish mobility and fish habitat. • If any blasting occurs near fish-bearing waters, shock waves from the detonation of explosives have potential to cause injury or mortality to fish. An accidental spill or release to the environment originating from a project activity or component would have potential to result in changes to fish and fish habitat, including: • Injury, mortality, and/or reduced health for fish. • Reduced availability and quality of fish habitat (including water quality).	• Potential project-related environmental effects on fish and fish habitat were assessed primarily in the context of the Fish and Fish Habitat VC, but also indirectly considered in the context of the Surface Water VC. • The assessment included the identification of standard and VC-specific mitigation measures to reduce or eliminate project-related environmental effects; characterization of residual project-related environmental effects; and determination of the significance of residual project-related environmental effects. • The EIS also considers accidental events and assessed the potential effects of an accidental spill or release to the environment on the Fish and Fish Habitat VC and Surface Water VC. • The assessment was based on desktop information, the professional judgement of the EA Study Team, and the results of relevant environmental baseline studies carried out in support of the EIS, including associated baseline field data (e.g., Fish and Fish Habitat, Distribution, and Tissue Analysis; Benthos and Sediment; Water Quality; Hydrology; Hydrogeology; and Geochemistry technical data reports).
Migratory Birds	The Gordon and MacLellan sites may provide habitat for various species of migratory birds. Routine project activities could result in changes to migratory birds as defined in Section 2(1) of MBCA due to the following potential interactions with the environment: • If conducted during the breeding bird season, site preparation activities (e.g., clearing and grubbing) have potential to cause injury or mortality to migratory birds, their nestlings, and their eggs, as well as to damage or destroy their nests. Project construction also has potential to result in alteration or loss of habitat for migratory birds. • Noise, vibration, and air emissions (e.g., dust) during project construction and operation have potential to adversely affect habitat quality for migratory birds and could cause behavioural effects (e.g., avoidance/displacement). • Artificial night lighting during project operation has potential to attract and/or disorient nocturnally migrating birds and could cause an increased risk of injury or mortality from exhaustion and/or collisions with project infrastructure. An accidental spill or release to the environment originating from a project activity or component would have potential to result in changes to migratory birds, including: • Injury, mortality, and/or reduced health for migratory bird species. • Reduced availability and quality of migratory bird habitat.	• Potential project-related environmental effects on migratory birds were assessed primarily in the context of the Wildlife and Wildlife Habitat VC. • The assessment included the identification of standard and VC-specific mitigation measures to reduce or eliminate project-related environmental effects; characterization of residual project-related environmental effects; and determination of the significance of residual project-related environmental effects. • The EIS also considered accidental events and assessed the potential effects of an accidental spill or release to the environment on the Wildlife and Wildlife Habitat VC. • The assessment was based on desktop information, the professional judgement of the EA Study Team, and the results of environmental baseline studies carried out in support of the EIS, including associated baseline field data (e.g., Birds, Acoustics, and Ambient Lighting technical data reports).
Health and Socio-Economic Conditions for Indigenous and Non-Indigenous Peoples	The Gordon and MacLellan sites have potential to be used by various Indigenous and non-Indigenous land and resource users. Routine project activities could result in the following changes to the environment that have potential to affect health and socio-economic conditions for Indigenous and non-Indigenous peoples: • Project activities and components have potential to affect the availability of lands and resources for commercial or recreational fishing and hunting/ trapping activities and/or other recreational uses currently carried out by Indigenous and non-Indigenous peoples. • Project-related requirements and the influx of project personnel could increase the demand for local services and infrastructure, thereby potentially affecting the quality or availability of these amenities for Indigenous and non-Indigenous residents of the Town of Lynn Lake and other surrounding communities.	• Potential project-related environmental effects on health and socio-economic conditions for Indigenous and non-Indigenous peoples were assessed in the context of the following VCs: Labour and Economy, Community Services and Infrastructure, Land and Resource Use, Community Health, Traditional Land and Resource Use, Human Health, and Indigenous Peoples. • The assessment included the identification of standard and VC-specific mitigation measures to reduce or eliminate project-related environmental effects; characterization of residual project-related environmental effects; and determination of the significance of residual project-related environmental effects. • The EIS also considered accidental events and will assess the potential effects of an accidental spill or release to the environment on these VCs.

<table>
<tr><th>Environmental Component(s) of Concern</th><th>Potential Environmental Interactions (Without Mitigation or Management)</th><th>How Potential Environmental Interactions are Addressed in EIS</th></tr>
<tr><td></td><td>The project has potential to adversely affect human health if liquid discharges from the project degrade the quality of drinking water resources or if project-related hydrological and/or hydrogeological changes affect the quality or quantity of drinking water resources.
Air, noise, and light emissions from the project have potential to disturb nearby human receptors and pose a nuisance.
Emission and dispersion of chemicals from project activities have the potential to affect air quality, as well as soil and surface water quality (through deposition), which could potentially affect human health (e.g., through contamination of drinking water resources or species of fish, wildlife, or plants that are consumed by Indigenous or non-Indigenous peoples).
The expenditures and employment associated with project activities will affect local, regional, and provincial economic conditions through all phases of the project. In addition to having positive economic effects, the project could adversely affect labour and economy, for example by contributing to local or regional labour shortages or interacting negatively with the economic activities of other sectors, such as tourism or forestry.</td><td>A Human Health and Ecological Risk Assessment (HHERA) was undertaken using standard risk assessment protocols.
The assessment was based on desktop information; the professional judgement of the EA Study Team; the results of the HHERA; the results of a project-specific Transportation Impact Study; and the results of environmental baseline studies carried out in support of the EIS, including associated informant interviews and baseline field data (e.g., Socio-Economics, Acoustics, Air Quality, and Ambient Lighting technical data reports).</td></tr>
<tr><td>Physical and Cultural Heritage, and Resources of Historical, Archaeological, Paleontological, or Architectural Significance for Indigenous and Non-Indigenous Peoples</td><td>Archaeological and heritage resources have potential to occur on the Gordon and MacLellan sites. Routine project activities could result in the following changes to the environment that have potential to affect the physical and cultural heritage of Indigenous or non-Indigenous peoples, and/or to affect any structure, site, or thing of historical, archaeological, paleontological, or architectural significance to Indigenous or non-Indigenous peoples:
Although the project will be designed to avoid ground disturbance at sites where resources of cultural, historical, archaeological, paleontological, or architectural significance are known to be located, there is potential for project-related ground disturbance (including excavation and blasting) to occur where previously unrecorded resources may be present. Such resources, if present, could be disturbed, damaged, or destroyed by the project.
An accidental spill or release to the environment originating from a project activity or component could result in changes to the environment that could affect physical and cultural heritage, or resources of historical, archaeological, paleontological, or architectural significance for Indigenous and non-Indigenous peoples.</td><td>Potential project-related environmental effects on physical and cultural heritage and resources of historical, archaeological, paleontological, or architectural significance for Indigenous and non-Indigenous peoples were assessed in the context of the Heritage Resources and Indigenous Peoples VCs.
The assessment included the identification of standard and VC-specific mitigation measures to reduce or eliminate project-related environmental effects; characterization of residual project-related environmental effects; and determination of the significance of residual project-related environmental effects.
The EIS also considered accidental events and assessed the potential effects of an accidental spill or release to the environment on the Heritage Resources VC.
A Heritage Resources Impact Assessment (HRIA) was completed for the project in 2012, and a Heritage Resources environmental baseline study, including a field program, was completed in 2015 in support of the EIS.</td></tr>
<tr><td>Current Use of Lands and Resources for Traditional Purposes by Indigenous Peoples</td><td>The Gordon and MacLellan sites have potential to be used for traditional purposes by Indigenous land and resource users. The project may therefore require access to, use or occupation of, or the exploration, development and production of lands and resources currently used for traditional purposes by Indigenous peoples. Routine project activities could result in the following changes to the environment that have potential to affect the current use of lands and resources for traditional purposes by Indigenous peoples:
Project activities and components have potential to affect the availability of lands (including travel routes) and resources currently used by Indigenous peoples for traditional purposes such as fishing, hunting/trapping, and gathering.
The influx of project personnel could increase the recreational demand for lands and resources that are currently used by Indigenous peoples for traditional purposes, thereby potentially affecting the quality or availability of these lands and resources for Indigenous peoples.
The project has potential to adversely affect the quality or availability of fish species of traditional importance to Indigenous peoples (including species that are currently fished by Indigenous harvesters for traditional purposes) if liquid discharges from the project degrade the quality of fish habitat.
Air, noise, and light emissions from the project have potential to disturb wildlife species of traditional importance to Indigenous peoples and affect their movement, thereby potentially affecting their availability for current use by Indigenous peoples (e.g., hunting/trapping).
Emission and dispersion of chemicals from project activities have the potential to affect air quality, as well as soil and surface water quality (through deposition). Thus, the project has potential to adversely affect the quality or availability of fish, wildlife, and plant species of traditional importance to Indigenous peoples (including species that are currently fished, hunted/trapped, and gathered by Indigenous peoples for traditional purposes) if the project results in the degradation of their habitats or the contamination of these resources.</td><td>Potential project-related environmental effects on the current use of lands and resources for traditional purposes by Indigenous peoples were assessed in the context of the Traditional Land and Resource Use and Indigenous Peoples VCs.
The assessment included the identification of standard and VC-specific mitigation measures to reduce or eliminate project-related environmental effects; characterization of residual project-related environmental effects; and determination of the significance of residual project-related environmental effects.
The EIS also considered accidental events and, in particular, assessed the potential effects of an accidental spill or release to the environment on the Traditional Land and Resource Use VC.
The assessment was based on desktop information, the professional judgement of the EA Study Team, the results of available TK/TLRU Studies, and the results of the Socio-Economics and Heritage Resources technical data reports, including associated interviews and baseline field data.
The EIS package included a standalone section demonstrating the assessment of environmental effects on Indigenous peoples in compliance with Section 5(1)c of CEAA 2012.</td></tr>
</table>

Environmental Component(s) of Concern	Potential Environmental Interactions (Without Mitigation or Management)	How Potential Environmental Interactions are Addressed in EIS
	An accidental spill or release to the environment originating from a project activity or component would have potential to result in changes to the environment that could affect the current use of lands and resources for traditional purposes by Indigenous peoples.	
Environmental and Human Health Effects Under Provincial Jurisdiction	In addition to the potential environmental and human health effects discussed above with respect to fish and fish habitat, migratory birds, health and socio-economic conditions, archaeological and heritage resources, and Indigenous traditional use (many of which fall under both federal and provincial jurisdiction), routine project activities also have potential to result in the following other environmental effects under provincial jurisdiction: • Site preparation activities (e.g., clearing and grubbing) have potential to cause injury or mortality to provincially regulated non-migratory birds, their nestlings, and their eggs, as well as to damage or destroy their nests. Provincially regulated small mammals and amphibians may also be susceptible to potential injury or mortality during site preparation activities. Project construction also has potential to result in alteration or loss of habitat for provincially regulated non-migratory birds and other provincially regulated wildlife in general. • Site preparation activities (e.g., clearing and grubbing) will cause mortality to provincially regulated plants and have potential to cause alteration or loss of wetland habitat. • Noise, vibration, and air emissions (e.g., dust) during project construction and operation have potential to adversely affect habitat quality for provincially regulated non-migratory birds and other provincially regulated wildlife, and could cause behavioural effects (e.g., avoidance/ displacement). • The project has potential to cause an increased risk of injury or mortality for provincially regulated non-migratory birds and other provincially regulated wildlife due to collisions with project vehicles. • Artificial night lighting during project operation has potential to attract and/or disorient nocturnally active provincially regulated non-migratory birds and could cause an increased risk of injury or mortality from exhaustion and/or collisions with project infrastructure. Non-migratory birds attracted to the project site by artificial night lighting, if any, could also be exposed to other threats such as predation or interactions with project vehicles and equipment. Other provincially regulated nocturnal wildlife (e.g., bats) may also be susceptible to potential effects from artificial night lighting. • Project-related solid and liquid wastes have potential to attract provincially regulated non-migratory birds and other provincially regulated wildlife, where they may be exposed to threats such as predation or interactions with project vehicles and equipment. • Open pit mining during the operational phase of the project has potential to affect groundwater quantity (i.e., groundwater discharge levels and discharge to surface water features), flow, and quality. The exposure and weathering of some mine materials may result in acid generation and/or leaching of contaminants causing degradation of surface water run-off and groundwater quality. • Deposition of chemicals of potential concern from dust onto soil from project activities has the potential to affect soil quality and surface water quality. This change in soil quality can directly affect ecological receptors that interact either directly or indirectly with this soil. The change in chemical concentrations in soil may alter their concentrations in vegetation, and prey species. These changes in media concentrations disseminate through the food web and can potentially produce effects in organisms that ingest these media. • Discharges and run-off from project operations may release chemicals of potential concern into groundwater and surface water. A change in surface water quality may affect ecological receptors that use surface water from the local assessment area as a source of drinking water. An accidental spill or release to the environment originating from a project activity or component could result in environmental effects under provincial jurisdiction, including many of those discussed above with respect to fish and fish habitat, migratory birds, health and socio-economic conditions, archaeological and heritage resources, and Indigenous traditional use, as well as: • Injury, mortality, and/or reduced health for provincially regulated non-migratory birds and other provincially regulated wildlife. • Reduced availability and quality of habitat for provincially regulated non-migratory birds and other provincially regulated wildlife. The potential environmental effects described above for birds and other wildlife, fish, and vegetation could affect secure species as well as SOCC protected under provincial legislation.	• Potential project-related environmental and human health effects under provincial jurisdiction were assessed in the context of the following VCs: Atmospheric Environment, Acoustic Environment, Groundwater, Surface Water, Fish and Fish Habitat, Vegetation and Wetlands, Wildlife and Wildlife Habitat, Labour and Economy, Community Services and Infrastructure, Land and Resources Use, Community Health, Heritage Resources, Traditional Land and Resource Use, and Human Health. • The assessment included the identification of standard and VC-specific mitigation measures to reduce or eliminate project-related environmental effects; characterization of residual project-related environmental effects; and determination of the significance of residual project-related environmental effects. • The EIS also considered accidental events and assessed the potential effects of an accidental spill or release to the environment on these VCs. • The assessment was based on desktop information; the professional judgement of the EA Study Team; the results of the HHERA, HRIA, and TK/TLRU Studies; and the results of the various environmental baseline studies identified above for each environmental component of concern in this table, including associated interviews and/or baseline field data. The assessment will also consider the results of additional relevant environmental baseline studies, including associated baseline field data not identified above (i.e., Vegetation and Wetlands and Soil and Terrain technical data reports).

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

20.4.2 Valued Components

VCs assessed in the EA included the atmospheric environment, noise and vibration, groundwater, surface water, fish and fish habitat, vegetation and wetlands, wildlife and wildlife habitat, labour and economy, community services, infrastructure, and wellbeing, land and resource use, heritage resources, current use of lands and resources for traditional purposes by Indigenous peoples, human health, and Indigenous peoples. These VCs were selected in consideration of:

- The interactions discussed in Table 20-3;
- Regulatory guidance and requirements;
- Issues raised by regulatory agencies, Indigenous Nations, key stakeholders, and the public;
- Technical aspects of the project (i.e., the nature and extent of project components and activities);
- Existing environmental conditions in the study area and interconnections between the biophysical and socio-economic environment;
- Experience and lessons learned from similar mining projects; and
- Professional judgment.

20.4.3 Potential Mitigation and Environmental Management Measures

Potential mitigation and environmental management measures have been developed for all VCs based on preliminary project planning and design and the EA. These mitigation measures will be considered and refined as project design and engineering progress and be consistent with the terms and conditions of the federal Decision Statement and provincial licences.

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

Mitigation and environmental management include development and implementation of the following project-specific environmental management and monitoring plans, and consultation with applicable federal and provincial regulators and engagement with potentially affected Indigenous Nations regarding these plans:

- Air Quality Management Plan;
- Greenhouse Gas Management Plan;
- Noise and Vibration Monitoring Plan;
- Soil Management and Rehabilitation Plan;

- Erosion and Sediment Control Plan;
- Vegetation and Weed Management Plan;
- Wildlife Monitoring and Management Plan;
- Surface Water Monitoring and Management Plan;
- Groundwater Monitoring Plan;
- Fish Habitat Offsetting Plan;
- Fish Salvage Plan;
- Aquatic Effects Monitoring Program;
- Emergency Response and Spill Prevention and Contingency Plan;
- Waste Management Plan;
- Explosives Management Plan;
- Heritage and Cultural Resources Protection Plan; and
- Acid Rock Drainage and Metal Leaching (ARD/ML) Management and Monitoring Plan.

Alamos will plan for communication of project activities, locations and timing throughout construction, operation, and closure to affected Indigenous Nations, land and resource users, interest groups, the provincial government, and local authorities leading up to construction and throughout the life of the project.

20.5 Rehabilitation

A Conceptual Closure Plan was developed and included in Volume 3, Chapter 23, Appendix 23B of the EIS. This Plan is in the process of being updated and will be implemented for the project in accordance with the Mine Closure Regulation under The Mines and Minerals Act of Manitoba and associated General Closure Plan Guidelines (MGET), to remove unneeded facilities and restore the Gordon and MacLellan sites following the completion of mining activities. The primary objective of reclamation and closure activities will be to establish self-sustaining physical, chemical, and biological stability of the sites, and to meet desired end land functions and uses. The Closure Plan will be updated as necessary during the life of the project to reflect the environmental requirements in place at the time of closure.

At the end of operations of the project, the main features will include the open pits, mill processing facilities, offices, storage areas, TMF, and mine rock storage areas. Reclamation measures expected for each of the main features are described below. Progressive reclamation activities will be carried out where possible throughout the mine life; however, most decommissioning and reclamation work will take place once mining has been completed.

The main elements of the reclamation plan are comprised of:

- Reclamation of mine access roads not needed for post-mining land access, with contouring to restore natural drainages and roadways revegetated;
- Recontouring of disturbed areas to blend in with surrounding topography and to re-establish natural drainage patterns;
- Removal of water management features that are no longer required, such as water treatment systems, ponds, and ditches. This will include: recontouring/spreading of pond berms; backfilling of ponds and ditches; and re-establishing natural drainage patterns;

- Reclamation of mine rock storage areas with suitable covers as needed, revegetation, and establishment of stable drainage conditions;
- Allowing the open pits to fill with water to form pit lakes and directing the overflows to established drainages;
- Implementation of public safety measures around the pits (e.g., fencing or rock berms);
- Management of site run-off from developed areas, including from the ore milling and processing plant site, mine rock storage areas, TMF, and open pits, to meet federal and provincial regulatory requirements for downstream water quality;
- Installation of a suitable cover and revegetation of TMF and establishment of drainage to provide long-term erosion control;
- Removal of equipment and facilities from Gordon and MacLellan sites, together with above-ground concrete structures; and
- Re-vegetation of disturbed areas with plant species that are suitable for reclamation and the end land uses of the area. The goals of reclamation vegetation will be to prevent erosion and sedimentation to protect aquatic resources; prevent invasive plant establishment; and re-establish a land use that is of value for wildlife and/or humans (including Indigenous peoples) and mitigates the residual environmental effects of the project on the environment.

For closure costs, see Section 21.1.4.

20.6 Environmental Monitoring

Environmental monitoring is a requirement outlined in the terms and conditions of the federal Decision Statement and provincial licences for compliance during construction, operation, and closure. Monitoring will follow applicable provincial and federal guidance, and regular reports will be prepared and submitted to the relevant agencies as and when stipulated by the licenses and permits issued for the project. Compliance monitoring programs will be designed to assess whether the project has been implemented in accordance with commitments made in the EIS. Environmental effects monitoring programs will be designed to verify the predictions of key environmental effects made during the EA.

20.7 Environmental Principles

Environmental protection and management measures have been adopted to guide the planning, design, construction, operation, and decommissioning, reclamation, and closure of the project. These include:

- Where possible, siting facilities to avoid sensitive areas such as watercourses, wetlands, important habitat types, and areas of high archaeological potential; and where unavoidable, reducing the size and number of natural features that may be affected;
- Where possible, siting facilities within, instead of across, watershed boundaries to reduce the number of potentially affected waterbodies;
- Reducing the ‘footprint’ of project facilities and activities, to the extent practical, to reduce the amount of disturbed land and disturbed water resources;
- Adhering to regulated standards for air and water emissions, for storage or disposal of solid wastes, and for handling and disposal of hazardous materials;

- Adhering to regulated and/or industry design and management standards to address environmental risks such as seismicity, unusual weather events, flooding, and erosion;
- Preparing and implementing an Environmental Management Plan (EMP) during construction and operation for ongoing monitoring and management of, for example, land and soil resources, water, air and water quality, noise and vibration, hazardous materials and waste, and occupational and community health and safety;
- Preparing and maintaining an Emergency Response and Spill Prevention Plan for the project;
- Planning the mine for closure and having a Closure Plan, including the provision of security to the provincial Crown for performance of rehabilitation work; and
- Planning and financing activities to compensate for unavoidable adverse effects on environmental resources such as aquatic habitats.

The location of project components will be finalized based on engineering feasibility studies and environmental considerations. To the extent possible, project facilities will be sited to avoid or reduce interactions with watercourses/waterbodies, important habitat types, and areas of high archaeological potential. Where avoidance is not possible, mitigation measures will be developed in consultation with the applicable regulatory authorities and Indigenous Nations.

20.8 Community Principles

Alamos commenced public, stakeholder and Indigenous engagement activities in 2016 and these efforts are ongoing and will continue throughout construction, operation, and eventual mine closure with the objective of:

- Addressing public, stakeholder, and Indigenous Nation concerns to the extent possible during the design, construction, operation, and closure of the project; and
- Promoting local benefits, including employment and business opportunities, to the extent practical.

21 CAPITAL AND OPERATING COSTS

21.1 Capital Costs

21.1.1 Capital Cost Estimate Input

The capital cost of the project has been estimated based on the scope of work defined in the sections below. The parties below have contributed to the capital cost estimate in specific areas, as listed.

- Worley:
  - Crushing & screening;
  - Grinding, leaching, desorption, cyanide detoxification and gold room;
  - Truckshops, washbays, administration buildings, etc.;
  - Utilities;
  - On-site infrastructure;
  - Off-site infrastructure;
  - Indirect costs; and
  - Contingency.
- WSP/Golder:
  - TMF;
  - TMF starter dam; and
  - Ditches, drainage, and sumps.
- Stantec/Owner:
  - Water management; and
  - Closure.
- AGP:
  - Pre-production mining; and
  - Mine fleet.
- BBA/Owner
  - Substation; and
  - Powerline to MacLellan site.

21.1.2 Capital Cost Estimate Summary

The estimate conforms to AACE Class 3 guidelines for a Feasibility Study Level Estimate with a -10% to +15% accuracy.

Table 21-1 provides a summary of the estimate for overall initial cost. The costs are expressed in Q4 2022 Canadian dollars and include all mining, site preparation, process plant, dams, first fills, buildings, roadworks, and off-site infrastructure.

Table 21-1 Initial Capital Cost Estimate

Description	MacLellan Mine ($M)	Gordon Mine ($M)	Both Mines ($M)
Direct Cost:			
Mine Infrastructure	$68.1	$14.0	$82.1
Owner Pre-stripping	$20.1	$20.7	$40.8
Mining Initial Capital Lease Payment	$22.8	$10.2	$33.0
Process Plant	$189.0		$189.0
Utilities and Services	$40.5	$5.8	$46.3
Tailings Management	$51.3		$51.3
On-site Infrastructure	$90.6	$50.5	$141.2
Off-site Infrastructure:	$35.9		$35.9
Subtotal Direct Costs	**$518.3**	**$101.2**	**$619.5**
Indirect Cost:			
EPCM and Consulting Services			$18.6
Freight			$10.3
Temporary Construction Facilities and Utilities			$92.3
First Fills and Opening Stocks			$8.4
Subtotal Indirect Costs			**$129.6**
Subtotal Direct + Indirect			**$749.0**
Project Contingency			$70.7
Sub Total Directs + Indirects + Contingency			**$819.7**
Owner's Cost			$22.6
Total Initial Capital			**$842.4**

The following parameters and qualifications were considered:

- The estimate was based on Q4 2022 pricing;
- Mining equipment is purchased and operated by the Company; and
- No allowance has been made for exchange rate fluctuations.

Data for the estimates have been obtained from numerous sources, including:

- Feasibility level engineering design;
- Mine schedules;
- Topographical information obtained from site survey;
- Geotechnical investigations;
- Budgetary equipment quotes;
- Budgetary unit costs from local contractors for civil, concrete, steel, electrical and mechanical works; and

- Data from similar recently completed studies and projects.

Major cost categories (permanent equipment, material purchase, installation, subcontracts, indirect costs, and Owner's costs) were identified and analyzed. Percentage of contingency was allocated to each of these categories on a line-item basis based on the accuracy of the data. An overall contingency amount was derived in this fashion.

21.1.3 Basis of Estimate

21.1.3.1 *Direct Costs*

Direct costs are quantity based and include all permanent equipment, bulk materials, subcontracts, labour, and contractor indirects associated with the physical construction of the facilities.

21.1.3.2 *Commodity Take-offs*

Bulk material take-offs, to a feasibility level, were developed from arrangement drawings. Rates were obtained from quotations from local contractors. These rates include the appropriate gang rate for the commodity and actual cost of the permanent materials. Local freight associated with contractor-supplied material is included in the unit rates.

No imported fill is required. Aggregate material is available via an on-site crushing plant, operated by the contractor (supply and operation). All aggregate will be provided "free-issued" at the site of the crusher. Excess cut material can be stockpiled on site or consumed for future construction.

21.1.3.3 *Labour Rates*

Labour rates have been built up from first principles for different trades (welders, boilermakers, roofers, pipefitters, millwrights, storemen, crane operator, etc.). These rates have been based on the Manitoba labour collective agreement (industrial sector).

As part of the estimate update, the contract packages for each discipline were retendered. The unit installation hours used in the estimated were taken from the evaluated and chosen bids for each contract.

Contractor indirect costs for structural, mechanical, piping, electrical and instrumentation have been developed with the assistance of well-established local construction contractors within Manitoba. Earthworks and concrete have been based on unit rates from contractors within Manitoba. An all-in rate was used for estimating purposes. The work shift considered is 60 hours, six ten-hour days. The labour rates are inclusive of base rates and the contractor's distributable costs. The rates are inclusive of the following to facilitate the allocation of costs to direct labour hours:

- Base labour rate, payroll burdens and benefits, completion bonus, incentives, overtime premiums and transportation to point of hire;
- Small tools and consumables including welding rods, sealant, adhesives, and lubricants;
- Payroll tax (Unemployment Insurance, Canada Pension Plan, WCB, Health Care, Insurance);
- Safety clothing and safety supplies;
- Scaffolding;
- Contractors' supervision and administration;

- Transportation within the site;
- Construction equipment;
- Contractors' temporary facilities;
- Contractors' head office overhead and insurance;
- Contractors' mark-up and profit;
- Daily prestart safety meetings;
- Weekly toolbox meetings; and
- Mobilization.

21.1.3.4 *Equipment Costs*

Multiple quotes were sourced for the mechanical equipment, with the exception of some minor equipment that was sourced from Worley's database. The budget quotes cover over 85% of the overall mechanical equipment supply cost. Repricing of all major mechanical packages was undertaken with updated quotes received from equipment vendors.

21.1.3.5 *Freight*

Plant equipment and bulks freight cost has been obtained from budget quotes (inclusive of the freight component). The freight component has been split and included as an indirect freight cost. If a freight cost was not quoted, then a percentage allowance has been considered.

21.1.3.6 *Duties and Taxes*

All applicable duties have been included.

All taxes are excluded unless otherwise stated.

21.1.3.7 *Escalation*

The capital cost estimate has a base date of Q4 2022 with no allowance for escalation other than the escalation of existing equipment quotes from 2019.

The estimate is compiled from:

- Budget quotations received in Q4 2022;
- Contractor supply and install quotations received in Q4 2022;
- Tenders received in 2019 and escalated to 2022.

21.1.3.8 *Estimate Contingency*

Contingency covers unknown costs that are expected to be incurred within the defined scope of the project, but that cannot be defined and identified at this stage of the project. It should be assumed that the contingency will be spent. The contingency allowance specifically excludes costs arising from scope changes, project risk factors and other items that are excluded from the capital cost estimate. The project contingency is meant to cover the normal inadequacies that are inherent in any project estimate due to the dynamic nature of project engineering and construction.

Contingency was calculated on a line-by-line basis on both direct and indirect costs. Contingency was built up from equipment, labour and estimated quantities based on the level of engineering certainty and source of cost. The overall contingency resulted in an allowance of $71 M.

21.1.3.9 *Exclusions*

The following costs and scope will be excluded from the capital cost estimate:

- All facilities not identified in the summary description of the project;
- Scope changes;
- Any additional work that is required because of conditions, both subsurface conditions and conditions in and around the plant, which were not known as of the base date of the estimate (e.g., latent plant conditions and unknown geotechnical conditions), including any costs incurred in establishing and confirming as-built information over and above that defined in the estimate;
- Fees or royalties relating to use of certain technologies or processes;
- Costs incurred to accelerate the work;
- Financing charges and interest during construction;
- Credits for salvage value of any demolition, modification work, residual construction materials, vehicles, and temporary buildings costs associated with decontamination of site and associated facilities; and
- All costs associated with weather interruption of construction operations.

21.1.4 Mine Capital Cost

The mining equipment capital costs were developed considering financing of the equipment fleet purchases.

Equipment pricing was predominantly based on quotations from regional vendors, with some smaller equipment information coming from AGP's database of recent projects. The base costs provided by the vendors are included in the calculation for each unit cost and options were added for operation in Lynn Lake.

Items such as spare truck boxes and spare shovel buckets were capitalized and purchased at the same time as the mine equipment. In the case of haulage trucks, spare boxes are estimated with one spare box required for every four trucks. For the hydraulic shovels and loader, the estimate is that one spare bucket per two loading units will be required.

The distribution of the capital cost is completed using the equipment units required within a period. If new or replacement units are needed, that number of units, by unit cost, determines the capital cost for that period. There is no allowance for escalation in any of these costs.

It is important to note that contractors will prepare the mining area at MacLellan as part of the construction package. This material movement is not considered in the mine schedule nor costing. The costing shown reflects only the mine costs incurred by the owner's mine operations team.

21.1.4.1 *Pre-Production Mining*

Mining at MacLellan starts in Year -2 but is completed by contractors involved in the development of the project site. They will prepare the mine area for the larger proposed owner operated equipment for use at MacLellan. Those costs are covered in the earthworks costs in other areas.

The mine operations team will start mining in Year -1 at MacLellan and are scheduled to move 8.3 Mt of total material comprised of 8.1 Mt of waste for road widening, dump development and tailings construction. The remaining 0.2 Mt of ore will be stockpiled adjacent to the primary crusher. All operating costs associated with the mining of this material are capitalized. In addition, the contractor will mine 4.8 Mt of waste and 0.3 Mt of ore in Year -1.

The Gordon pit is developed solely by the mine operations team. Mining will be completed with the smaller and separate Gordon mine equipment fleet. In Year -1 a total of 4.4 Mt of material will be mined comprised of waste to the waste dump and surface infrastructure construction. Ore to the stockpile is 6,000 t of the overall total mining. All operating costs for this work are capitalized.

21.1.4.2 *Mine Equipment*

Vendor quotes were obtained for all the major equipment and some of the support equipment. Where quotes were not available, pricing from AGP's database was applied. To the vendor quotes, options for cold weather use, delivery, erection, and onboard dispatch hardware were added to the unit cost. The cost of the mining shovels and drills include the switchgear and substations plus trailing cable to allow them to operate under electrical power.

Mine OEM included freight and assembly for the primary and support mine equipment.

21.1.4.3 *Miscellaneous Mine Capital*

Miscellaneous mine capital refers to those items not considered as part of the mine mobile equipment fleet. This includes mine engineering office equipment such as computers, plotters, drones, and other survey equipment. It also includes copies of mining software initial purchases. The software annual maintenance costs are covered the mine services operating budget.

A dispatch system is employed at both MacLellan and Gordon and the central data storage is at MacLellan. Each mining area has a cost of $1.2 M for dispatching hardware and software.

An allowance of $400,000 at each mine location has been made for communications which includes radios and the data system sufficient to support dispatch data over the radios.

For the MacLellan site, the purchase of a geotechnical radar system to monitor the wall slopes is purchased in Year 4 when sufficient ultimate pit wall has been developed.

Life of mine a total of $4.9 M will be spent in this category for both MacLellan and Gordon pit areas.

21.1.4.4 *Dewatering Infrastructure*

The life of mine cost of the MacLellan dewatering system including its respective horizontal drainholes is estimated at $17.2 M of which the horizontal drainhole program accounts for $13.6 M over the life of the mine or approximately $1.4 M per year.

Horizontal drainholes are part of the Gordon dewatering capital also but due to the different configuration and shorter mine life average only $0.4 M per year.

Total life of mine dewatering capital costs for Gordon are estimated at $3.9 M of which $1.8 M is horizontal drainholes.

21.1.4.5 *Mine Electrification*

The MacLellan mine is scheduled to be electrified. Half of the drill fleet and both hydraulic shovels will be purchased in an electric format. The electrical switchgear and cables are included in the purchase cost of the shovels and drills.

This cost category is for the power line around the MacLellan pit coming from the main substation and is estimated to cost $1.5 M.

No pit electrification is planned for the Gordon pit.

21.1.4.6 *Portable Crushing and Screening Plant*

A crushing and screening plant has been included with the MacLellan mine capital. This will be used by the construction team, so it is purchased early to assist in the project development. It will operate at an average 400 tph to generate material for construction and mine usage. This plant is estimated to cost $2.3 M and will run on diesel until the plant site electrical grid is energized.

21.1.4.7 *Finance Costs*

The owner considers that the mine equipment purchases will be financed by a capital lease for equipment purchases from pre-production and up to Year 3. The project capital deployment requirements were estimated by the owner based on a four-year lease term at a 5% interest rate. Canada has a well-developed market with several capital groups as well as OEMs participating in the financing of mobile mine equipment. The initial lease payments in Year -2 and Year -1 are included with the project initial capital cost. Subsequent lease payments are included with the sustaining capital from Year 1 to Year 6.

21.1.5 Process Plant

The gold plant and associated facility estimates have been prepared on a commodity basis (i.e., divided into earthworks, concrete, structural, etc.) and reported by area (i.e., crushing, milling, etc.). The quantities have been based on a first principles approach.

The estimate is based on the majority of the work being carried out under fixed price or re-measurable unit price contracts under a normal development schedule. No allowance is included for contracts on a cost plus or fast track accelerated schedule basis. The erection of tankage, structural, mechanical, piping, electrical, instrumentation, and civil works will be performed by experienced contractors, using local Manitoba labour.

21.1.6 Freight and Equipment Commissioning Cost

An increase in freight and logistics prices has been observed since the beginning of 2021. This is also reflected in the received quotes for the Lynn Lake Gold Project and similar projects. When offshore and onshore freight was included in quotations, those costs are included as quoted by the vendor. For North American materials and equipment which were not quoted with freight, an allowance of 6% of the material costs was added.

Engineering supervision and field engineering manpower have been included within the EPCM estimate. No allowance has been made for the provision of operating staff or labour on the basis that this will be supplied via the owner’s operations team.

No allowance has been made for the provision of labour outside the operations team for any plant modifications required by the client during commissioning.

21.1.7 Spare Parts for Processing

Spare parts have been considered for start-up and commissioning. The associated costs for these spare parts have been obtained from the budget quotes when available.

21.1.8 Tailings Management Facility

Material quantities for the TMF and its water conveyance structures were provided by WSP. These included quantities for:

- Clearing and grubbing the TMF footprint;
- Foundation excavation and subgrade preparation;
- Bedrock grouting;
- Dam fill placement and installation of the HDPE liner;
- Construction of the spillway and seepage collection ditches; and
- Construction of the decant structure for mill reclaim.

All quantities provided by WSP were based on neat design lines with no added contingency. Worley applied contingencies to each line item.

21.1.9 On-site Infrastructure

The following infrastructure will be built:

- MacLellan administration building
- MacLellan mine truckwash
- MacLellan mine truckshop
- Gordon administration building;
- Gordon mine truckwash;
- Gordon mine truckshop;
- Assay lab building;
- On-site roads; and
- Power distribution.

21.1.9.1 *Roads*

Internal roadways were priced based on construction from crushed waste rock available from site and any naturally available materials. A dedicated mobile aggregate crushing plant will be utilized to prepare the granular and construction material for site roads during construction.

21.1.10 Off-Site Infrastructure

The Alamos Lynn Lake Substation will be a connection between Manitoba Hydro’s 138 kV Transmission system and Alamos’ Maclellan mine site’s 34.5 kV. The substation will utilize a 138 kV breaker, two 138 kV to 34.5 kV, 20-27 MVA oil filled transformers, and a control building for Alamo's monitoring equipment. The design will include redundancy for distributing power to the site so that maintenance or breakdown of a power transformer doesn't affect the power being distributed to site. In the event Manitoba Hydro experiences power disruptions or plans outages. The monitoring and control equipment at the Alamos Lynn Lake substation will be powered by a low voltage Uninterrupted Power Supply located in the control room. While at the MacLellan site, a Black Start 2 Mega Watt Back up Generator will provide power to essential loads connected to the MacLellan substation feeding the process building and site overhead line.

The 34.5 kV powerline to the MacLellan mine site will travel from the Lynn Lake Substation 200 metres underground along the edge of an existing road to the intersection of Canoe Street and Highway 391. The line will then transition to an overhead line on poles routed along the south side of Highway 391. The overhead line will be routed along the right-of-way in a utility corridor until the access road of the MacLellan Mine. There it will cross over both Highway 391 and a 12 kV distribution line feeding the Black Sturgeon Community. The line will continue on the north side of the MacLellan access road for 7.2 km where it will connect to the MacLellan mine site substation for stepdown to 13.8 kV distribution onsite.

Upgrades to Manitoba Hydro's infrastructure are required to supply power to the Lynn Lake Substation. A Load Interconnecting Facilities study was completed by Manitoba Hydro in 2022 to establish the requirements and costs for this upgrade.

21.1.11 Indirect Costs

Indirect costs include items that are necessary for project completion, but not related to the direct construction cost.

These items are summarized in the subsections below.

21.1.11.1 *Temporary Facilities and Services*

Temporary facilities and services are items that are not directly related to the construction of specific facilities of the plant or associated infrastructure but are required to support construction activities. These items have been estimated in detail.

These costs include:

- EPCM office complex, HS&E services, security services, site vehicles, refuelling, bus transportation, recurring project costs, maintenance services, temporary roads, temporary power, water, effluent disposal, and other facilities as required; and
- Heavy lift construction cranes with a capacity of > 100 tonnes.

21.1.11.2 *EPCM and Consulting Services*

The engineering, procurement, project, and construction management budget has been compiled by identifying resources over a defined schedule. The EPCM and consulting services estimate includes the following items:

- Engineering;
- Procurement;
- Construction management;
- Travel expenses;

- Home office expenses;
- Site office expenses;
- Commissioning support; and
- Other consulting services (geotechnical, environmental, shipping logistics, surveys, and QA/QC).

21.1.11.3 *Vendor Representatives*

The cost for vendor representatives for installation supervision and commissioning is included and is based on vendor-recommended support included in the quotations and incorporated where applicable. In instances where these were not provided in the quotation, but were still required, a historical percentage of the equipment supply cost was included based on Worley's database.

21.1.11.4 *Camp – Pre-Production Operations*

The supply and operation of a construction and workforce camp has been quoted by a third-party vendor. The number of construction and operations personnel required to stay on site has been used to generate the approximate the number of beds and camp catering requirements. Camp operation, staffing, and facility maintenance for a two year period (Year -2 and Year -1) have been included. A pioneer camp has been included to accommodate the construction personnel during the early works bulk earthworks and permanent camp construction period. The camp facility will be comprised of a 500-bed purchased camp plus 100 bed leased camp for the two year pre-production period. The 500-bed purchased camp will be used as the permanent camp during operations and an allowance of $2 M has been included in the estimate to refurbish the camp.

21.1.11.5 *Initial Spares*

Spares include capital spares, one year of operational spares, and commissioning/start-up spares for the process plant and infrastructure. Mining equipment spares are included in mining capital.

A spares list was developed from the budget quotations provided. Where spares were not priced in the quotation, a percentage of the equipment cost was applied to each spares category.

21.1.11.6 *First Fills and Opening Stocks*

An estimate for first fills has been included for all reagents. Grinding media and liners for the SAG and ball mills have been included.

21.1.12 Owner's Costs

Owner's costs include the following:

- Land;
- Owner's team (including construction, startup commissioning and operational readiness activities);
- Pre-production process and administrative costs, offset by pre-commercial production gold sales;
- Recruiting, training, and site visits;

- IT and communications;
- Insurance, finance, legal and Lynn Lake office; and
- Permitting and fish habitat offset costs.

21.1.12.1 *Dewatering*

An allowance of $20.0 M for interceptor wells for Gordon pit dewatering was used.

21.2 Sustaining Capital

21.2.1 Mine Sustaining Capital

Primary and support mine equipment purchases after the pre-production period are included under sustaining capital costs. Equipment requirements are presented in Section 16. The cost of the equipment is considered incurred during the period required. No equipment replacement is expected to take place during the short life of the open pits, other than for pickup trucks and pumps.

The MacLellan sustaining capital cost includes 16 of the 19 purchased highway haulage trucks.

21.2.2 TMF

The TMF will require progressive rising in the life of the project. The lifts will occur in Years 2, 5 and 11.

21.2.3 Water Management

An allowance of $1.5 M is included in Year 4 for the supply and installation of water wells including pipes, pumps, drilling, instruments, and earthworks to maintain the Water Management System.

21.2.4 Closure

Closure costs have been distributed in accordance with Provincial Regulation (Manitoba Mine Closure Regulation 67/99, n.d.). A mine closure costs of $36.0 M covers:

- Demolishing and disposing of process and on-site infrastructure;
- Draining and covering the TMF;
- Partially covering the mine rock stockpile;
- Removing and covering roads and culverts; and
- Recontouring disturbed areas to blend in with surrounding topography and re-establish natural drainage patterns.

Alamos intends to purchase a bank guarantee for the value of the closure costs in lieu of annual contributions.

21.3 Operating Costs

The operating cost estimate is presented in Q4 2022 Canadian dollars. The estimate was developed to have an accuracy of ±15%.

The sections included in the cost breakdown consist of mining, processing, and G&A/accommodation costs. Credits associated with silver, offset by royalties, are provided by Alamos, and applied to partially offset operating costs.

The operating cost estimates for the life of mine are provided in Table 21-2.

. The overall life-of-mine operating cost is $2,104.9 M over 17 years, or $44.21/t of ore milled.

Table 21-2 Life-of-Mine Operating Costs

Operating Cost[1]	M$	$/t milled	% of Total
Mining[2]	1,064.2	22.35	51%
Highway Haulage (Gordon hauled ore averaged over full mill tonnage)3	74.2	1.56	4%
Processing	682.0	14.33	32%
General and Administration	342.9	7.20	16%
External Refining	7.1	0.15	<1%
Subtotal	2,170.4	45.59	103%
Royalties and Silver Credits	-65.6	-1.38	-3%
Total Operating Costs	2,104.9	44.21	100%

Notes:
1. *Operating costs exclude working capital and are based on per tonne of processed basis, unless noted;*
2. *Average costs starting with Y+1; and*
3. *Haulage costs are reported per tonne of Gordon ore processed, hauled ore average of $1.56/t over full mill tonnage.*

21.3.1 Basis of Operating Cost

Common to all operating cost estimates are the following assumptions:

- Cost estimates are based on Q4 2022 pricing without allowances for inflation;
- For material sourced in US dollars, an exchange rate of US$0.75 per Canadian dollar was assumed;
- Diesel costs used were $1.00/L;
- The annual power costs were calculated using a unit price of $0.038/kWh calculated using the Tariff No. 2016-62 from Manitoba Hydro website;
- Labour is assumed to come predominantly from Manitoba with sources being locally, Thompson, Flin Flon, and Winnipeg;
- Rotations at site will be as follows:
  - Hourly personnel, two weeks in / two weeks out;
  - Salaried personnel five days in / two days out, or four days in / three days out; and
  - Whenever possible, a five-and-two schedule will be applied to local staff.
- FIFO workers will be housed in an owner-supplied accommodation camp managed by a third party.

21.3.2 Mine Operating Cost

Mine operating costs are estimated from first principles. Key inputs to the mine costs are fuel and labour. The fuel cost is estimated using local vendor quotations for fuel delivered to. A value of $1.00/L is used in this estimate. The carbon tax is not included in the value shown but is accounted for in each of the mining cost centres.

21.3.2.1 *Open Pit Mine Equipment Operating Cost Estimate*

Labour costs are based on an owner operated scenario. The mine is responsible for the maintenance of the equipment with its own employees.

Labour cost estimates were based on discussion with Alamos referencing their other operating mines in Canada and recent salary surveys at mines in Manitoba.

The number of loader, truck, and support equipment operators is estimated using the projected equipment operating hours.

Equipment suppliers provided repair and maintenance (R&M) costs for each piece of equipment. These came in the quotations for the capital cost. Fuel consumption rates are also estimated for the conditions expected at Lynn Lake and are used in the detailed costs for the mine equipment. The costs for the R&M are expressed in a $/h form.

The various suppliers provided the costs for different tire sizes that will be used during the project. Estimates of the tire life are based on AGP's experience and conversations with mine operators. The operating cost of the tires is expressed in a $/h form. The life of the 136t haulage truck tires is estimated at 5,000 hours per tire with proper rotation from front to back. On the haulage trucks each tire costs $39,100 so the cost per hour for tires is $46.92/h for the truck using six tires in the calculation.

Ground Engaging Tool (GET) costing is estimated from other projects and conversations with personnel at other operations.

Drill consumables were estimated as a complete drill string using the parts list and component lives provided by the vendor. Drill productivity for the 178 mm drill is estimated at 25.8 m/h for the smaller drill, which requires an addition of drill steel for the bench height, and the larger drill at 26.9 m/h. Equipment costs used in the estimate are shown in Table 21-3.

Table 21-3 Major Equipment Operating Costs – No Labour

Equipment	Fuel/ Power ($/h)	Lube/ Oil ($/h)	Tires ($/h)	Under-Carriage ($/h)	Repair & Maintenance ($/h)	GET/ Consumables ($/h)	Total ($/h)
Small Production Drill - Diesel	65.00	6.50	-	3.00	129.76	83.29	287.55
Production Drill - Diesel	95.00	9.50	-	6.00	149.55	121.06	381.11
Production Drill – Electric	16.95	-	-	6.00	124.34	121.06	268.35
Production Loader (11 m^3)	80.00	8.00	39.87	-	56.61	10.00	194.48
Hydraulic Shovel (22 m^3)	40.15	-	-	-	191.90	30.00	262.05
Excavator (6.7 m^3)	75.00	7.50	-	10.00	64.09	8.00	172.09
Haulage Truck – 139 t	95.00	9.50	46.92	-	80.22	4.00	235.64
Haulage Truck – 63 t	48.00	4.80	13.42	-	39.89	5.00	111.11
Crusher Loader (11 m^3)	80.00	8.00	39.87	-	56.61	10.00	194.48
Transfer Loader (7.5 m^3)	50.00	5.00	21.03	-	51.82	8.00	135.85
Track Dozer	70.00	7.00	-	10.00	87.04	5.00	179.04
Grader	20.00	2.00	3.07	-	23.97	5.00	54.04

The blasting cost is estimated using quotations from a regional vendor. The mine is responsible for guiding the loading process, including placement of boosters/Nonels, and stemming and firing the shot.

Total cost of delivery to the hole of explosives is $252,000/month which covers the vendor's trucks, pumps, labour, and explosives plant. The explosives vendor also leases the explosives and accessories magazines to Lynn Lake as part of that cost.

21.3.2.2 *Grade Control Cost Estimate*

A total of 315,400 samples will be assayed from that drilling at a cost of $14.25/sample at MacLellan. Samples collected will assayed at the onsite laboratory for use in the short-range mining model. For Gordon a total of 59,400 samples will be assayed.

Costs associated with this separate drill program are tracked as a distinct line item for the mining cost. Each drill crew consists of one driller and two helpers with oversight by the Mine Geology department. Two drills will be required for the project. The cost of this drilling is expected to be on average $2.2 M per year at MacLellan and $1.7 M per year at Gordon.

21.3.2.3 *Pit Dewatering Cost Estimate*

The horizontal drill holes are considered an operating cost and total $13.6 M over the life of the mine for MacLellan and $1.8 M for Gordon.

The dewatering operating cost is estimated at $2.0 M over the mine life at MacLellan or $0.2 M/a. At Gordon with the diesel pumps it is estimated to cost $3.5 M over the mine life or $0.6 M/a.

21.3.2.4 *Total Open Pit Mining Costs*

The total life of mine open pit operating costs are shown in Table 21-4. The total life of mine open pit operating costs per tonne of material mined and per tonne of ore processed are shown in Table 21-5.

Table 21-4 Open Pit Mine Operating Costs by Pit Area – Life of Mine (Total $)

Open Pit Operating Category	Unit	MacLellan	Gordon
General Mine and Engineering	$ x 1,000	128,277	28,592
Drilling	$ x 1,000	84,550	17,878
Blasting	$ x 1,000	125,416	20,353
Loading	$ x 1,000	79,469	24,850
Hauling	$ x 1,000	249,960	59,943
Support	$ x 1,000	135,430	54,602
Grade Control	$ x 1,000	25,325	8,945
Dewatering	$ x 1,000	15,744	4,826
Sub-total - Mining Cost	$ x 1,000	844,172	219,988
Gordon Ore Haul	$ x 1,000		74,211
Total	$ x 1,000	844,172	294,200

Table 21-5 Open Pit Mine Operating Costs by Pit Area – Life of Mine ($/t Mined)

Open Pit Operating Category	Unit	MacLellan	Gordon
General Mine and Engineering	$/t mined	0.44	0.47
Drilling	$/t mined	0.29	0.29
Blasting	$/t mined	0.43	0.34
Loading	$/t mined	0.27	0.41
Hauling	$/t mined	0.86	0.99
Support	$/t mined	0.47	0.90
Grade Control	$/t mined	0.09	0.15
Dewatering	$/t mined	0.05	0.08
Sub-total - Mining Cost	**$/t mined**	**2.92**	**3.62**
Gordon Ore Haul	$/t mined	-	1.22
	$/t processed	-	9.43
Total	**$/t mined**	**2.92**	**4.84**
	$/t processed	**21.24**	**37.39**

21.3.3 Process Operating Costs

The LOM process operating cost is $682.0 M or $14.33/t milled over 17 years. A breakdown of this value and its unit costs are presented in Table 21-6, note that this table excludes transport, treatment and refining of doré.

Table 21-6 Life-of-Mine Processing Costs

Cost Centre	$M	$/t milled	% of Total
Labour (O&M)	176.4	3.71	26%
Power	86.6	1.82	13%
Operating Consumables:			
Reagents	241.8	5.08	35%
Steel Liners and Ball Media	76.2	1.60	11%
Utilities	7.6	0.16	1%
Maintenance	81.9	1.72	12%
Laboratory and Assays	11.4	0.24	2%
Total Process Operating Costs	**682.0**	**14.33**	**100%**

21.3.3.1 *Basis of Process Operating Cost*

The following was used to determine the LOM process operating costs required for the project in agreement with the cost definition and estimate methodologies outlined below. This basis considers the development of a facility capable of processing 8,000 t/d of ore.

Assumptions made in developing the process operating cost estimate are listed below:

- Production is set at an average of 2.92 Mt annually;
- Commercial production will be maintained over 17 years of operation;
- Operating costs are calculated based on labour, power consumption, and process and maintenance consumables;
- Off-site gold refining, insurance, and transportation costs are excluded, and are included elsewhere;
- The oxygen plant is owned;
- Consumables costs are based on data from recent quotes from relevant suppliers and from similar projects;
- No factor was applied to adjust for consumption of less spare parts in early years of operation;
- Grinding media consumption rates have been estimated based on the ore characteristics;
- Reagent consumption rates have been estimated based on the metallurgical testwork results; and
- First fill cost is excluded and is included in the capital cost.

21.3.3.2 *Labour*

The labour organisational chart was developed by Worley with input from Alamos and was benchmarked against similar gold plants. The operating roster is based on a four panel 12-hour shift rotation. The labour costs incorporate requirements for plant operation, such as management, metallurgy, operations, maintenance, site services, assay lab, and contractor allowance. The total operational labour is 87 employees for normal plant operation and maintenance.

Individual personnel were divided into their respective positions and classified as either “salaried” or “hourly” employees. Salaries and wages were provided by Alamos. Alamos also indicated the specific benefits and bonuses to be allocated. Thus, the rates were estimated as overall rates, including all burden costs, but do not include camp costs (included separately under “accommodation and transport” in the G&A cost centre).

21.3.3.3 *Power*

The processing power draw was based on the average power utilization of each motor on the equipment list for the process plant and services. Power will be supplied by the Manitoba Hydro grid to service the facilities at the MacLellan site. Diesel-fired generators will supply power to the facilities at the Gordon site.

21.3.3.4 *Operating Consumables – Reagents and Utilities*

Operating consumables are based on reagent consumptions and propane utilities for heating.

Individual reagent consumption rates were estimated based on the metallurgical testwork results, Worley’s in-house database and experience, industry practice, and peer-reviewed literature. Each reagent cost was obtained through vendor quotations and Alamos operations and were compared with prices among competing vendors operating in Manitoba. Therefore, most reagent costs are comparable to those obtained in similar gold mining facilities. A detailed description of the reagents required for the process is provided in Section 17.5.

Reagents represent approximately 35% of the total process operating cost at $5.08/t milled.

21.3.3.5 *Operating Consumables – Steel*

These operating consumables include liners for the primary and secondary crusher, SAG mill, ball mill and balls media for the mills, and were estimated using:

- Metallurgical testing results (abrasion index);
- Worley’s in-house calculation methods, including simulations; and
- Forecast total power consumption.

Steel consumables represent approximately 11% of the total process operating cost at $1.60/t milled.

21.3.3.6 *Maintenance*

Annual maintenance consumable costs were calculated based on a total installed mechanical capital cost by area using an average factor of 3.6%, ranging between 2.5-4% (Table 21-7). The factor was applied to mechanical equipment, plate work and piping. The total maintenance consumables operating cost is $1.72/t milled representing 11% of the total process operating cost.

Table 21-7 Average Life-of-Mine Plant Maintenance Costs

Area	Equipment Supply Cost	Maintenance Factor	Maintenance Cost $/year	Maintenance Cost $/t Milled
Process Plant				
Area 1300 - MacLellan - On Site Infrastructure	2,275,480	3.00%	68,264	0.023
Area 1360 - MacLellan - Freshwater System	2,348,639	2.50%	58,716	0.020
Area 1400 - MacLellan - Utilities & Services	16,612,340	3.50%	581,432	0.199
Area 1610 - Crushing, Storage & Reclaim	18,569,776	4.00%	742,791	0.254
Area 1620 - Grinding	37,731,399	4.00%	1,509,256	0.517
Area 1630 - Thickening	3,238,170	3.00%	97,145	0.033
Area 1640 - Pre-Aeration, Leach, Adsorption	20,001,199	3.50%	700,042	0.240
Area 1650 - Desorption & Regeneration	6,259,771	3.50%	219,092	0.075
Area 1660 - Electrowinning & Gold Room	3,437,365	3.50%	120,308	0.041
Area 1670 - Detox & Tailings Pumping	3,861,207	3.00%	115,836	0.040
Area 1680 - Reagents	11,623,296	3.00%	348,699	0.119
Area 1700 - Tailings Management Facility	2,549,928	3.00%	76,498	0.026
Area 2300 - Gordon - On Site Infrastructure	1,567,603	3.00%	47,028	0.016
Area 2400 - Gordon - Utilities and Services	1,345,012	3.00%	40,350	0.014
Mobile Equipment	6,017,800	3.60%	216,641	0.074
Maintenance General				
Maintenance Software			25,000	0.009
Maintenance Manuals			5,000	0.002
Maintenance Training			25,000	0.009
Control Systems Licenses			3,000	0.001
Control Systems Maintenance			12,000	0.004
Contract Labour			3,784	0.001
Total			**5,015,882**	**1.718**

21.3.3.7 *Light Vehicles and Mobile Equipment*

Vehicle costs are based on a scheduled number of light vehicles and mobile equipment, including fuel, maintenance, spares and tires, and annual registration and insurance fees.

21.3.3.8 *Laboratory and Assays*

Operating costs associated with laboratory and assay activities were estimated according to the anticipated number of assays per day and per year. Assay costs include environmental sampling and assaying. Assay costs associated with processing grade control samples or exploration samples are included in the mine operating costs. The laboratory and assays make up approximately 1% of the total process operating cost at $0.24/t milled. The forecasted requirement will be around 21,750 internal assays per year for the processing plant. Approximately 1,890 samples per year are required for the environmental sampling schedule.

21.3.4 General and Administrative

General and administrative (G&A) costs are expenses not directly related to the production of gold and include expenses not included in mining, processing, external refining, and transportation costs. These costs were developed with input from Alamos based on its existing Canadian operations, as well as Worley in-house data.

A bottom-up approach was used to develop estimates for G&A costs over the life of mine. These costs were assembled according to the following departmental cost reporting structure:

- G&A personnel including salaries, wages, and business travel;
- Human Resources including recruiting, training, and community relations;
- Site Administration, Maintenance and Security including subscriptions, professional memberships and dues, external training, first aid, office equipment, garbage disposal, bank, and payroll fees;
- IT and Telecommunications including hardware and satellite link; and
- Health and Safety including personal protective equipment.

The G&A labour costs were estimated by developing a headcount profile for each department that was then forecast over the life of mine. Labour schedule and salaries based on Alamos supplied data, were applied to develop the total G&A labour cost.

G&A resources include 32 employees. Hourly wage-based staff work one 12-hour shift per day to support 24 hour operations.

Health and safety equipment, supplies, training, and environmental costs were provided for, as were the IT and telecommunications costs for telecommunication, networking, Internet, computers, radio system and repairs in the estimate.

A breakdown summary of LOM G&A costs is shown in Table 21-8. G&A costs substantially decrease in Years 11 to 17, with the overall site personnel reduction, upon the cessation of open pit mining, decreasing administration salary, camp, and transportation expenses.

Table 21-8 Life-of-Mine G&A Costs

Cost Centre	Years 1-11		Years 12-17		LOM	
	$ x 1,000	$/t	$ x 1,000	$/t	$ x 1,000	$/t
Salaries	56,626	1.80	21,638	1.34	78,264	1.64
Personnel Costs	944	0.03	484	0.03	1,428	0.03
Human Resources	3,146	0.10	1,615	0.10	4,761	0.10
Infrastructure	2,202	0.07	1,130	0.07	3,332	0.07
Site Admin, Maint & Security	2,517	0.08	1,292	0.08	3,809	0.08
Vehicles	944	0.03	484	0.03	1,428	0.03
Health and Safety	944	0.03	484	0.03	1,428	0.03
IT & Communications	11,954	0.38	6,136	0.38	18,090	0.38
Contract Services	18,875	0.60	9,689	0.60	28,564	0.60
Misc.	3,460	0.11	1,776	0.11	5,237	0.11
Camp Cost	71,854	2.28	9,797	0.61	81,651	1.72
Personnel Transportation	66,214	2.10	7,839	0.49	74,053	1.56
Community Engagement	25,245	0.80	15,574	0.96	40,818	0.86
Total	**264,925**	**8.42**	**77,939**	**4.83**	**342,863**	**7.20**

21.3.4.1 *Accommodation Camp and Personnel Transportation*

The operating cost for the 500-bed production camp was estimated following a cost per occupied bed-day or person-day approach. The total operational camp cost consists of the following costs:

- Accommodation and catering;
- FIFO transportation cost; and
- Local ground transportation.

The overall LOM cost is $87.66/person/day and includes accommodation and catering ($75.00/person/day), FIFO ($12.66/person/day). Transportation to site will be provided by a site bus driver.

Camp sizing during the production phase was based on an estimate of full time equivalent personnel (FTE), which provides a total headcount across all areas of how many persons will be at site and housed in the camp. The FTE number was calculated on the following basis:

- 2x2 rotation – two out of four weeks = 50% occupancy per person;
- 3x1 rotation – three out of four weeks = 75% occupancy per person (contractor for TMF lift only);
- 4x3 rotation – four out of seven days = 57% occupancy per person; and
- 5x2 rotation – five out of seven days = 71% occupancy per person.

22 ECONOMIC ANALYSIS

An engineering economic model was developed to estimate annual cash flows and sensitivities for the LLGP. After-tax estimates were developed to approximate the true investment value.

Sensitivity analyses were performed for variation in metal price, foreign exchange rate, operating costs, capital costs, and discount rates to determine their relative importance as project value drivers.

Capital and operating cost estimates have been developed specifically for this project and are summarized in Section 21. Unless otherwise indicated, all costs and economic results in this section are presented in Q4 2022 Canadian dollars (CAD or C$). The economic analysis includes no inflation (constant dollar basis).

22.1 Assumptions

Table 22-1 outlines the planned LOM tonnage, grade, and production estimates.

Table 22-1 Life of Mine Plan Summary

Parameters	Unit	Value
Mine Life	Years	17.0
Total Ore	Kt	47,607
Strip Ratio	w:o	6.81
Processing Rate	t/d	8,000
Average Au Head Grade	g/t	1.52
Total Au Production (Life of Mine)	oz	2,185,434
Au Production (Years 1 to 5)	Average oz per year	206,925
Au Production (Years 1 to 10)	Average oz per year	175,760
Au Production (Life of Mine)	Average oz per year	135,100

Note:
- *Life of mine average annual production reflects full years, i.e., excluding final (partial) year.*

Other economic factors and assumptions used in the economic analysis include the following:

- US$1,675/oz gold, US$22.50/oz silver and a $0.75 USD/CAD exchange rate were used in the cash flow model
- Discount rate of 5%;
- Closure cost of $36.0 M (US$27.0 M);
- No salvage assumed at the end of mine life;
- Working capital outflow of $10.0 M (US$7.5 M) in Year +1, offset by $10.0 M (US$7.5 M) total inflow at the end of mine life;
- Numbers are presented on a 100% ownership basis and do not include inter-company management fees or financing costs; and
- Exclusion of all pre-development and sunk costs (i.e., exploration and Mineral Resource definition costs, engineering fieldwork and studies costs, environmental baseline studies costs, etc.). However, pre-development and sunk costs are utilized in the tax calculations.

22.2 Revenue and Working Capital

A working capital assumption of $10.0 M (US$7.5 M) has been accounted for in the economic analysis due to the timing difference between cash inflows and cash outflows regarding operating costs.

Mine revenue is derived from the sale of gold doré into the international marketplace. No contractual arrangements for refining exist currently. However, the parameters used in the economic analysis are consistent with current industry rates. Gold production and sales are assumed to begin in Year +1 and continue for 17 years.

Figure 22-1 illustrates the annual recovered gold and cumulative recovered gold by project year.

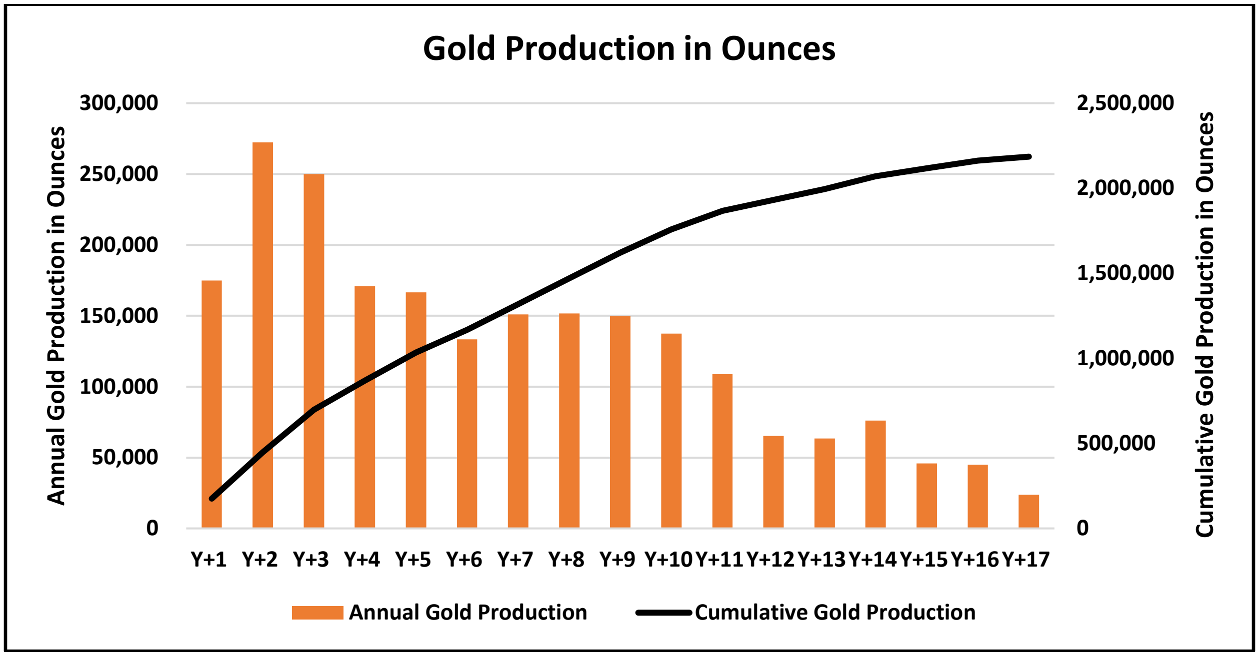


Figure 22-1 Annual and Cumulative Gold Production

Source: Alamos (2023)

22.3 Summary of Operating Costs

Total LOM operating costs, presented in Table 22-2, amount to $2,104.9 M (US$1,578.7 M), including silver by-product credits, royalties and refining and transportation charges. This translates into an average cost of $44.21/t ore processed during the production period. A detailed analysis of operating costs can be found in Section 21.3 of this report.

Table 22-2 Summary of Operating Costs

Operating Cost[1]	C$/t	LOM C$M	US$/t	LOM US$M
Mining per tonne mined[2]	3.04	1,064.2	2.28	798.1
Haulage per tonne of Gordon ore[3]	9.43	74.2	7.07	55.7
Processing	14.33	682.0	10.75	511.5
G&A	7.20	342.9	5.40	257.1
Refining and Transport	0.15	7.1	0.11	5.4
Silver Credit	-1.65	-78.7	-1.24	-59.0
Royalties	0.28	13.1	0.21	9.9
Total Operating Costs	**44.21**	**2,104.9**	**33.16**	**1,578.7**

Notes:

1. *Operating costs exclude working capital and are based on per tonne of processed basis, unless noted;*
2. *Average costs starting with Y+1; and*
3. *Haulage costs are reported per tonne of Gordon ore processed, hauled ore average of $1.56/t over full mill tonnage.*

22.4 Summary of Capital Costs

The capital costs used for the economic analysis are outlined below. The pre-production period spans 27 months, including EPCM activities and access road construction. Table 22-3 summarizes the capital costs used in the economic analysis. Detailed information can be found in Section 21 of this report.

Table 22-3 Summary of Capital Costs

Capital Cost	Initial (C$M)	Sustaining (C$M)	LOM (C$M)	Initial (US$M)	Sustaining (US$M)	LOM (US$M)
Mining Infrastructure	82.1	43.3	**125.4**	61.6	32.5	**94.0**
Pre-production Mining	40.8		**40.8**	30.6		**30.6**
Mobile equipment	33.0	159.2	**192.2**	24.7	119.4	**144.2**
Process Plant	189.0	0.0	**189.0**	141.8	0.0	**141.8**
Utilities and Services	46.3	0.0	**46.3**	34.7	0.0	**34.7**
On-site Infrastructure	141.2	0.0	**141.2**	105.9	0.0	**105.9**
Off-site Infrastructure	35.9	0.0	**35.9**	26.9	0.0	**26.9**
Tailings Management	51.3	18.7	**70.0**	38.5	14.0	**52.5**
Indirects	111.0	0.0	**111.0**	83.2	0.0	**83.2**
EPCM	18.6	0.0	**18.6**	13.9	0.0	**13.9**
Owner's Cost	22.6	10.4	**33.0**	17.0	7.8	**24.7**
Subtotal	**771.7**	**231.6**	**1,003.3**	**578.8**	**173.7**	**752.4**
Contingency	70.7	0.0	**70.7**	53.0	0.0	**53.0**
Rehabilitation and Closure	0.0	36.0	**36.0**	0.0	27.0	**27.0**
Total Capital	**842.4**	**267.6**	**1,109.9**	**631.8**	**200.7**	**832.4**

Alamos assessed the option of leasing primary, support and miscellaneous equipment required over the LOM, and concluded that this option improves the economics of the project. The financial model reflects leasing equipment and making principal and interest payments starting in Year -1. Payments made during the construction period are reflected under initial capital, and those made starting in Year +1 and beyond are reflected under sustaining capital.

22.5 Reclamation and Mine Closure

The reclamation and mine closure plan is set out in in Section 21.2.4. The current plan anticipates a cost of $36.0 M (US$27.0 M) for reclamation and closure. In Manitoba, reclamation costs are set aside in the form of bonding, or other means, as the liabilities are incurred or as the area to be reclaimed in the future is first disturbed. The bulk of the closure costs and reclamation activity will occur after Year 17, after processing has been completed.

22.6 Taxes

The LLGP will be subject to provincial, federal, and mining taxes as follows:

- Manitoba Mining Tax: sliding scale with rates between 10% and 17%
- Manitoba Provincial Income Tax: 12%
- Federal Income Tax: 15%
- Manitoba Retail Sales Tax (“RST”): 7%

The rates above are current as of the date of this report and are subject to change. Based on these rates and the financial assumptions used in this report, the LLGP is expected to have payable income and mining taxes of $499.1 M (US$374.3 M) over its 17-year life.

Alamos expects to pay Manitoba RST on all taxable goods or services purchased or rented for its own use, and this includes large vehicles and equipment, SAG mill, ball mill, concentrator, conveyor belts, electrical, HVAC systems and computers. This report includes an estimate of RST to be paid, with that paid on mobile equipment included in the capital lease payments.

22.7 Royalties

The LLGP is subject to a capped third-party royalty in the first few years of production from the Gordon pit. Total royalty included in the cash flow model is $13.1 M (US$9.9 M)) and the project is expected to be unencumbered by third-party royalties for the majority of the mine life.

22.8 Economic Analysis

The project is economically viable with an after-tax internal rate of return (IRR) of 16.6% and an after-tax net present value at 5% (NPV5%) of $570.5 M (US$427.9 M).

Figure 22-2 shows the projected cash flows used in the economic analysis, based on the assumptions in Section 22.1. Table 22-4 shows the detailed results of this evaluation.

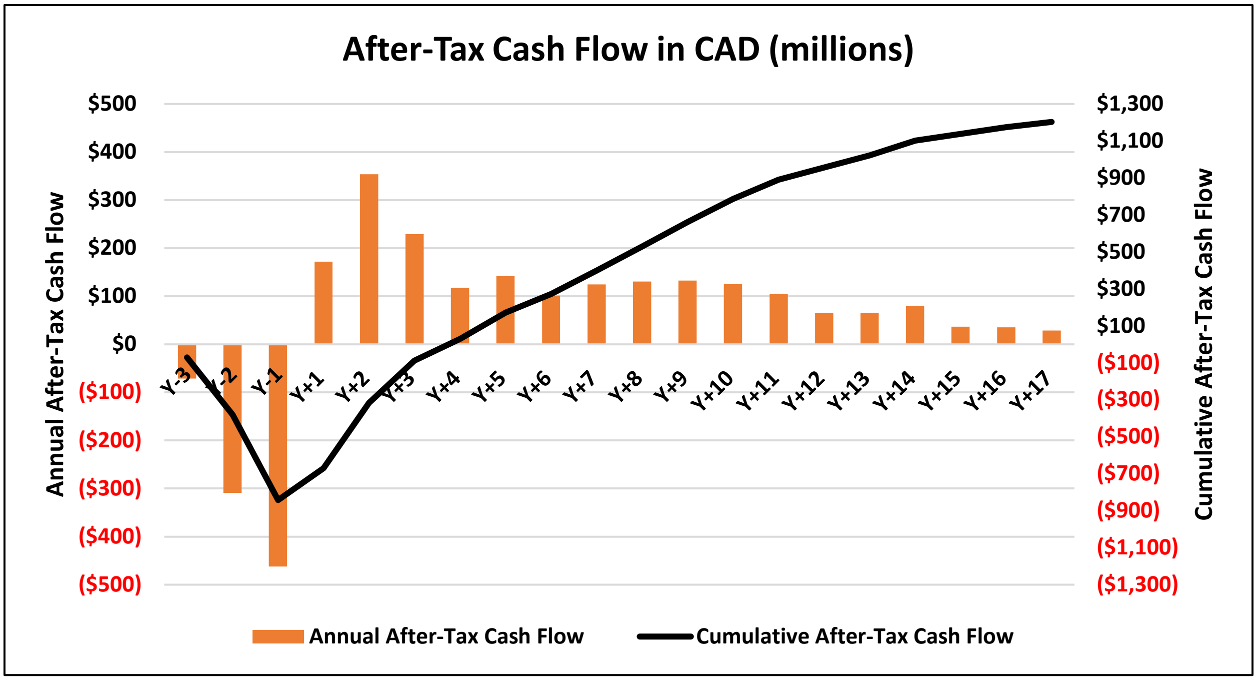


Figure 22-2 Annual and Cumulative After-Tax Cash Flow in C$

Source: Alamos (2023)

Table 22-4 Summary of Economic Results

Category	Unit	Value (C$)	Value (US$)
Net Revenues	$M	4,880.8	3,660.6
Operating Costs[1]	$M	2,104.9	1,578.7
Cash Flow from Operations	$M	2,276.8	1,707.6
Initial Capital Costs	$M	842.4	631.8
Sustaining Capital, Rehabilitation and Closure Costs	$M	267.6	200.7
Total Cash Cost	US$/oz		722
Mine Site All-In Sustaining Cost	US$/oz		814
Net After-Tax Cash Flow	$M	1,166.9	875.2
After-Tax NPV$^{5\%}$	$M	570.5	427.9
After-Tax IRR	%	16.6%	16.6%
After-Tax Payback	Years	3.7	3.7

Note:
1. *Operating Costs include mining, processing, G&A, royalties, transport and refining costs and silver credit.*

22.9 Sensitivities

A sensitivity analysis was performed to test project value drivers on the project's NPV using a 5% discount rate. The results of this analysis are demonstrated in Table 22-5, Table 22-6, and Table 22-7 and illustrated in Figure 22-3 and Figure 22-4. The project proved to be most sensitive to changes in metal price and foreign exchange, followed by capital and operating costs. A sensitivity analysis of the after-tax results was performed using various gold prices. The results of this analysis are demonstrated in Table 22-7.

Table 22-5 After-Tax NPV5% Sensitivity Results

After-Tax NPV5%, millions of CAD					
	-10%	-5%	Base Case	+5%	+10%
Gold Price	$376.5	$469.6	**$570.5**	$671.1	$769.1
Canadian Dollar	$794.0	$677.6	**$570.5**	$473.1	$383.1
Capital Costs	$635.1	$603.7	**$570.5**	$538.4	$506.6
Operating Costs	$659.4	$616.1	**$570.5**	$526.1	$481.5

Table 22-6 After-Tax IRR Sensitivity Results

After-Tax IRR					
	-10%	-5%	Base Case	+5%	+10%
Gold Price	12.7%	14.6%	**16.6%**	18.4%	20.2%
Canadian Dollar	20.6%	18.5%	**16.6%**	14.7%	12.9%
Capital Costs	19.0%	17.8%	**16.6%**	15.5%	14.5%
Operating Costs	18.2%	17.4%	**16.6%**	15.7%	14.9%

Table 22-7 Gold Price Sensitivity on NPV and IRR

Gold Price (US$)	After-Tax NPV (C$M)	After-Tax NPV (US$M)	After-Tax IRR (%)
$1,500	$367.4	$275.6	12.6%
$1,600	$480.3	$360.3	14.8%
$1,675	**$570.5**	**$427.9**	**16.6%**
$1,750	$661.1	$495.8	18.2%
$1,850	$777.9	$583.5	20.3%
$1,950	$893.7	$670.3	22.4%

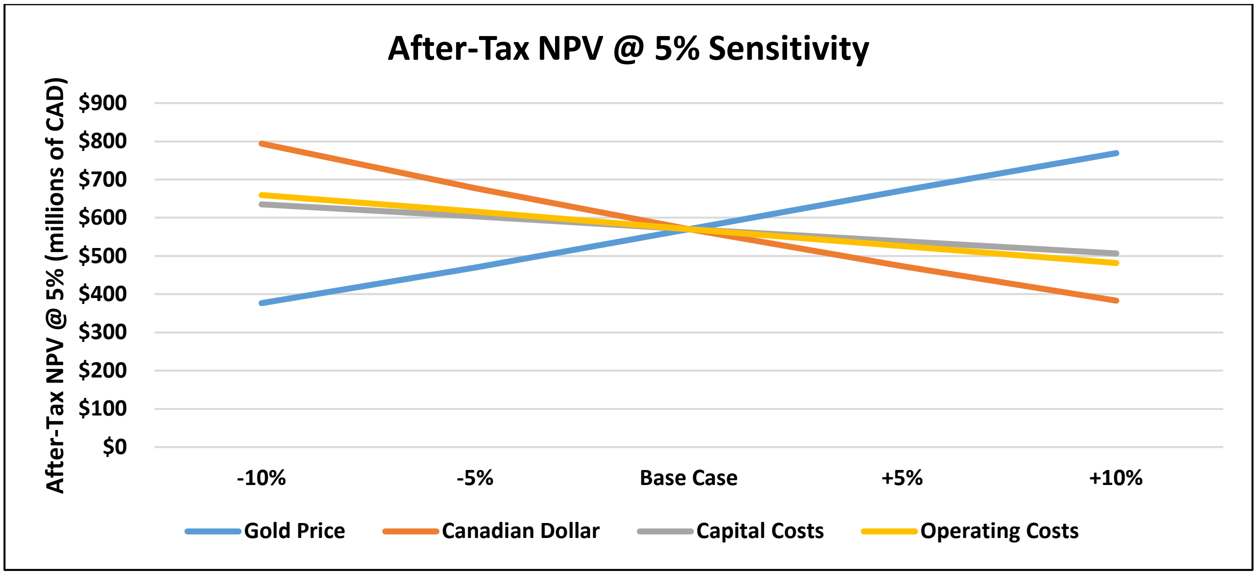


Figure 22-3 After-Tax NPV5% Sensitivity Results

Source: Alamos (2023)

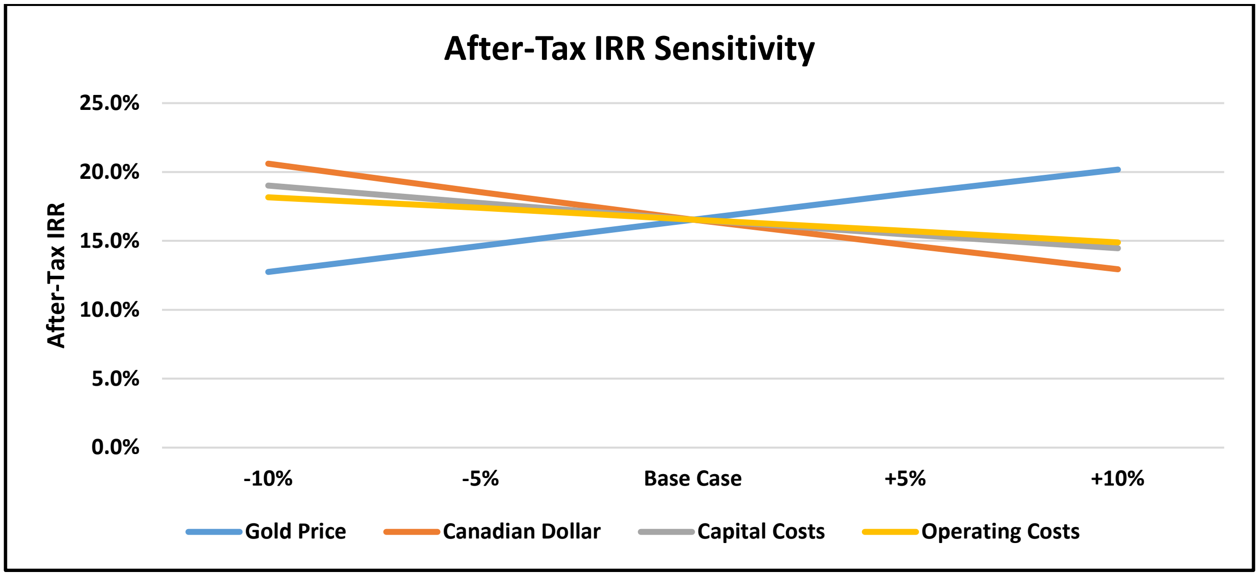


Figure 22-4 After-Tax IRR Sensitivity Results

Source: Alamos (2023)

Table 22-8 Lynn Lake Project Financial Model Summary in CAD

(thousands of CAD dollars)	LOM	Y-3	Y-2	Y-1	Y+1	Y+2	Y+3	Y+4	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	Y+11	Y+12	Y+13	Y+14	Y+15	Y+16	Y+17	Y+18
Assumptions																						
Gold Price (US$/oz)	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675	$1,675
Silver Price (US$/oz)	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50	$22.50
CAD to USD	$0.750	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75	$0.75
Physicals																						
Lynn Lake Open-Pit Mining																						
Tonnes Mined																						
Ore	47,606,577	0	67,000	526,390	5,075,871	9,138,050	5,674,643	2,768,314	2,692,629	2,780,597	4,611,261	5,380,682	4,502,634	2,725,698	1,662,808	0	0	0	0	0	0	
Waste	324,214,999	0	4,170,000	17,320,260	33,924,128	39,861,950	43,325,359	40,533,169	33,753,205	30,219,403	28,388,739	26,310,104	15,872,863	7,831,721	2,704,098	0	0	0	0	0	0	
Total Material Moved	371,821,576	0	4,237,000	17,846,650	38,999,999	49,000,000	49,000,002	43,301,483	36,445,834	33,000,000	33,000,000	31,690,786	20,375,497	10,557,419	4,366,906	0	0	0	0	0	0	
Strip Ratio	6.8	0.0	62.2	32.9	6.7	4.4	7.6	14.6	12.5	10.9	6.2	4.9	3.5	2.9	1.6	0.0	0.0	0.0	0.0	0.0	0.0	
Au Grade Mined	1.52	0.00	0.92	0.94	1.49	1.58	1.86	1.82	1.73	1.20	1.28	1.26	1.36	1.70	1.79	0.00	0.00	0.00	0.00	0.00	0.00	
Ag Grade Mined	3.57	0.00	2.95	2.91	4.44	3.69	1.77	1.30	2.01	3.22	3.59	4.17	4.83	5.19	5.49	0.00	0.00	0.00	0.00	0.00	0.00	
Lynn Lake Milling																						
Tonnes Milled	47,606,577	0	0	0	2,258,700	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	1,547,877	
Au Grade	1.52	0.00	0.00	0.00	2.55	3.07	2.85	1.96	1.91	1.52	1.71	1.71	1.69	1.56	1.23	0.74	0.73	0.87	0.53	0.52	0.52	
Au Recovery	93.7%	0.0%	0.0%	0.0%	94.4%	94.4%	93.3%	92.9%	93.0%	93.7%	94.2%	94.3%	94.3%	94.1%	93.8%	93.3%	93.3%	93.4%	92.3%	92.0%	92.0%	
Au Ounces Produced	**2,185,434**	**0**	**0**	**0**	**174,982**	**272,312**	**249,988**	**170,797**	**166,544**	**133,319**	**150,884**	**151,558**	**149,790**	**137,424**	**108,670**	**65,159**	**63,515**	**75,973**	**45,734**	**44,954**	**23,830**	
Ag Grade	3.57	0.00	0.00	0.00	5.42	5.50	2.51	1.69	2.21	2.20	3.60	5.25	5.70	4.83	4.30	3.36	3.18	3.55	2.48	2.39	2.41	
Ag Recovery	48.0%	0.0%	0.0%	0.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	
Ag Ounces Produced	**2,623,062**	**0**	**0**	**0**	**188,969**	**247,669**	**112,937**	**76,137**	**99,379**	**99,260**	**162,237**	**236,423**	**256,896**	**217,868**	**193,832**	**151,185**	**143,208**	**159,858**	**111,802**	**107,861**	**57,541**	
Financials (in 000's of CAD)																						
Total Gold Revenue	$4,880,803				$390,793	$608,164	$558,307	$381,448	$371,949	$297,746	$336,975	$338,480	$334,532	$306,913	$242,696	$145,522	$141,850	$169,674	$102,139	$100,396	$53,220	
Operating Costs																						
Mining and Haulage Costs	$1,138,372				$106,644	$137,027	$150,967	$145,603	$123,170	$108,069	$101,451	$91,199	$72,613	$51,475	$29,921	$4,637	$3,469	$3,338	$3,364	$3,556	$1,870	
Processing	$682,043				$32,796	$42,398	$42,398	$42,398	$42,398	$42,398	$42,398	$42,398	$42,398	$42,398	$42,398	$40,734	$40,734	$40,734	$40,734	$40,734	$21,593	
Administration	$342,863				$20,148	$24,680	$23,645	$24,458	$25,317	$26,153	$26,129	$25,252	$23,484	$24,628	$21,031	$15,262	$13,653	$13,702	$14,218	$12,503	$8,601	
Selling Costs and Silver Credit	($71,551)				($5,330)	($6,992)	($2,950)	($1,846)	($2,543)	($2,540)	($4,429)	($6,655)	($7,269)	($6,098)	($5,377)	($4,098)	($3,858)	($4,358)	($2,916)	($2,798)	($1,494)	
Inventory Adjustment	($0)				($59,188)	($89,103)	($92,096)	($62,680)	$260	($1,274)	($1,799)	$6,233	($484)	$765	$21,999	$47,375	$49,628	$51,261	$49,698	$52,980	$26,425	
Royalty	$13,140				$5,471	$6,850	$819	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
TOTAL Cash Costs	**$2,104,868**				**$100,540**	**$114,861**	**$122,784**	**$147,933**	**$188,603**	**$172,806**	**$163,750**	**$158,428**	**$130,743**	**$113,168**	**$109,972**	**$103,910**	**$103,626**	**$104,677**	**$105,098**	**$106,975**	**$56,994**	
Other Costs																						
Working Capital Changes	$0				$69,188	$89,103	$92,096	$62,680	($260)	$1,274	$1,799	($6,233)	$484	($765)	($21,999)	($47,375)	($49,628)	($51,261)	($49,698)	($52,980)	($36,425)	
Mining Taxes	$123,316				$0	$0	$9,780	$574	$3,237	$574	$10,056	$14,912	$22,026	$22,306	$15,040	$4,151	$4,708	$12,139	$1,464	$1,774	$574	
Income Taxes	$375,782				$0	$0	$56,587	$18,999	$27,325	$16,606	$30,438	$35,729	$40,103	$38,866	$31,198	$17,358	$17,773	$24,111	$8,716	$8,900	$3,075	
Total Other Costs	$499,098				$69,188	$89,103	$158,463	$82,253	$30,302	$18,455	$42,293	$44,407	$62,613	$60,408	$24,239	($25,866)	($27,147)	($15,011)	($39,518)	($42,305)	($32,776)	
Operating Cash Flow	**$2,276,837**				**$221,065**	**$404,200**	**$277,060**	**$151,262**	**$153,044**	**$106,485**	**$130,932**	**$135,645**	**$141,176**	**$133,337**	**$108,484**	**$67,479**	**$65,371**	**$80,008**	**$36,559**	**$35,726**	**$29,002**	
Total Capital	$1,109,933	$70,859	$309,148	$462,375	$49,056	$50,685	$47,980	$33,892	$10,830	$5,356	$5,995	$4,950	$8,443	$7,884	$4,078	$2,423	$0	$0	$0	$0	$0	$35,980
Free Cash Flow	**$1,166,904**	**($70,859)**	**($309,148)**	**($462,375)**	**$172,009**	**$353,515**	**$229,081**	**$117,370**	**$142,215**	**$101,130**	**$124,937**	**$130,695**	**$132,732**	**$125,453**	**$104,407**	**$65,056**	**$65,371**	**$80,008**	**$36,559**	**$35,726**	**$29,002**	**($35,980)**

23 ADJACENT PROPERTIES

There are no operating properties of significance adjacent to the LLGP.

24 OTHER RELEVANT DATA AND INFORMATION

There is no other relevant data or information that is material to this report.

25 INTERPRETATIONS AND CONCLUSIONS

This report confirms the technical feasibility and economic viability of the Lynn Lake Gold Project. The project has two properties, MacLellan and Gordon, and is based on conventional open-pit mining with a centralized processing plant facility and tailings management facility. The processing plant, located at MacLellan, has a design processing throughput of 8,000 t/d over the estimated 17-year mine life.

Capital costs were developed according to AACE Class 3 Guidelines for a feasibility study estimate with a -10% to +15% accuracy. The initial capital cost of the project, including processing, initial mine equipment lease payments and pre-production activities, infrastructure, spares, and other direct and indirect costs is $842.4 M (US$631.8 M). Sustaining capital cost is $267.6 M (US$200.7 M) and includes MacLellan and Gordon primary and support equipment lease payments, spare parts, additional TMF lifts, water management and closure costs. The total project capital cost including initial and sustaining capital is $1,109.9 M (US$832.4 M).

The overall operating cost for mining and haulage ($23.91/t milled, $1,138.4 M LOM), processing ($14.33/t milled, $682.0 M LOM), G&A/accommodation ($7.20/t milled, $342.9 M LOM) and external refining ($0.15/t milled, 7.1 M LOM) is $45.59/t milled or $2,170.4 M LOM. After adjusting for royalties and silver credits, the expected operating cost is $44.21/t milled or $2,104.9 M LOM (US$1,578.7 M).

Risk identification and mitigation was ongoing throughout the FS, and will continue through detailed engineering, construction, operations, and closure. Risks were identified and qualitatively ranked in the LLGP Risk Register. As the Project moves from feasibility into the execution phase, it will be necessary to update the Project risk register.

26 RECOMMENDATIONS

The following activities should be in place during the next phase of the project development:

- Prepare all equipment packages to go for tender;
- Prepare all construction packages to go for tender;
- Secure all remaining required environmental and construction permits beyond the federal and provincial approvals obtained in March 2023; and
- Manage and mitigate key risks and pursuing the opportunities to improve project economics.

A list of specific recommendations has been developed per area as shown in the sub-sections below. The cost to evaluate these recommendations is described below in Table 26-1.

Table 26-1 Proposed Budget Summary

	Cost (C$)
Drilling/Refine ARD Model	$300,000
Metallurgical Services	$110,000
Detailed Engineering & Procurement	$11,700,000
Tailings Management	$300,000
Environment	550,000
Total	**12,960,000**

26.1 Geology and Mineral Resource Estimate

Previous work by Carlisle has identified a sizable underground resource at MacLellan that has not been included in this study. Additional drilling is required to infill some gaps in the drilling data with the potential to evaluate the underground Mineral Resources and test the depth extensions of the gold mineralization.

The Burnt Timber and Linkwood deposits, located to the southwest of MacLellan represent an opportunity for additional future mill feed for the MacLellan processing plant. Additional drilling is required to convert Inferred Mineral Resources at these two deposits to Measured and Indicated Resources. Upon receipt of the required permits this higher grade material could potentially offset or postpone the processing of low grade stockpile material in Years 12 to 17.

26.2 Mineral Reserve Estimate Update

The work carried out to date on the LLGP has been done in accordance with industry standards, and with applicable risks related to the open pit mining and the estimate of the Mineral Reserves identified. This includes the pit limit optimizations, mine design and mine equipment selection.

The in-situ material value and cut-off grade models are expected to be updated and refined with each iteration of the mine plan. The Mineral Reserves were estimated using cut-off grades of

0.796 g/t gold for Gordon and 0.355 g/t for MacLellan. The cut-off grades were calculated based on the design parameters active at the time of the work.

26.3 Metallurgy and Process Plant

The following metallurgical work is recommended for the next phase of engineering:

- Confirm competency and hardness characteristics in which suitable samples are selected based on the most recent mine plan and which represent the initial two years of operation and up to about 50 m depth; and
- Operability review of the comminution circuit with respect to dust, materials handling, and cold climate.

Additionally, water catchment prior to commissioning should be reviewed to allow for use of water collected in the collection ponds for process plant commissioning and early operations.

26.4 Infrastructure

The following activities are recommended for the next phase of engineering:

- The administrative building and mine dry facility were sized based on feasibility level information. The actual size of the facility shall be optimized for actual / updated personnel needs;
- The FS design of the Truck shop facility includes concrete flooring and overhead cranes. The need for hard flooring and fixed crane shall be re-evaluated; and
- Considering the cold climate in the region, the use of precast concrete foundations shall be maximized across the site to improve the construction schedule.

26.5 Tailings Management

The current level of study for the LLGP is basic engineering. This will be followed by detailed design and the preparation of construction documents and specifications. This is an evolutionary process as the level of study and design progresses.

For the TMF, the following tasks should be considered for the next stage of engineering:

- Further development of the waste rock management plan with consideration of materials to be used for construction of the start-up dams that are non-acid generating and non-metal leaching;
- Further evaluate the potential borrow sources for dam construction in terms of quantity available and suitability;
- Finalize the tailings dam design incorporating additional geotechnical investigations; and
- Appropriate regulatory agencies must be consulted, and relevant permits and approvals will be acquired.

26.6 Environment

The following activities are recommended:

- Other environmental permitting and planning, mitigation, management and follow-up monitoring plans, and associated consultation/ engagement activities (required by federal and provincial project approvals) should proceed in line with the overall project schedule;
- Geochemical characterization should continue as the processing and mining plans are detailed, with modification to the mineral waste management plan as appropriate;
- Estimated closure and reclamation costs should be reassessed, and a complete Closure Plan developed in the next phase of development as more detailed engineering designs become available;
- Water modelling should be updated in the future based on operational conditions to allow any potential future water issues to be identified and proactively mitigated; and
- Active reclamation should be undertaken to the extent practical through operation.

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QUALIFIED PERSON CERTIFICATES

CERTIFICATE OF QUALIFIED PERSON

I, Jennifer Abols, B.Sc., P.Eng., as an author of this report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" prepared for Alamos Gold Inc. ("Alamos") and with an effective date of August 2, 2023, do hereby certify that:

1. I am employed as Director, Projects for Alamos Gold Inc., located at 181 Bay Street, Suite 3910, Toronto, Ontario, M5J 2T3;
2. I received a Bachelor of Science in Extractive Metallurgy from Laurentian University (Ontario, Canada) in 1996;
3. I am a registered Professional Engineer in Ontario, Canada, (P. Eng. no 90481847). I have worked for mine operating companies and suppliers for more than 25 years since my graduation. I have worked mainly in operations, project development and execution for Placer Dome, Metso Minerals, Gekko Systems, Magma Metals, Lundin Mining and Alamos Gold Inc., with increasing levels of responsibilities;
4. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;
5. I have been an employee of Alamos since June 2021;
6. I visited the Lynn Lake Project during 2021, 2022 and 2023 and most recently on July 11-13, 2023;
7. I am the author of Sections 13 and 17, and co-author of Sections 18, 21 and 26 of the NI 43-101 report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" with an effective date of August 2, 2023;
8. I have no personal knowledge, as of the date of this certificate, of any material fact or change, which is not reflected in this report;
9. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
10. I have prepared this Technical Report in compliance with National Instrument 43-101 and in conformity with generally accepted Canadian mining industry practices. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading; and
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated this 22nd day of August 2023

(Signed & Sealed) "Jennifer Abols"

(Original signed)

Jennifer Abols, B.Sc., P.Eng. (P.Eng., no 90481847)

CERTIFICATE OF QUALIFIED PERSON

I, Christopher John Bostwick, B.Sc., FAusIMM, as an author of this report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" prepared for Alamos Gold Inc. and with an effective date of August 2nd, 2023, do hereby certify that:

1. I am employed as Senior Vice President, Technical Services for Alamos Gold Inc., located at 181 Bay Street, Suite 3910, Toronto, Ontario, M5J 2T3;
2. I received a Bachelor of Applied Science in Mining Engineering from Queen's University (Ontario, Canada) in 1986;
3. I am a registered Fellow of the Australasian Institute of Mining and Metallurgy, (FAusIMM no 306761). I have worked for mine operating companies for more than 35 years since my graduation. I have worked mainly in operations, project development, technical services, and corporate development for Rio Tinto, Barrick Gold Corporation and Alamos Gold Inc., with increasing levels of responsibilities;
4. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;
5. I have been an employee of Alamos since January 2009;
6. I last visited the Lynn Lake Project on November 4th, 2021;
7. I am the author of Sections 2, 3, 4, 5, 15, 16, 19, 21, 22, and 23, and co-author of Sections 1, 21, 25, 26 and 27 of the NI 43-101 report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada " with an effective date of August 2nd, 2023;
8. I have no personal knowledge, as of the date of this certificate, of any material fact or change, which is not reflected in this report;
9. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
10. I have prepared this Technical Report in compliance with National Instrument 43-101 and in conformity with generally accepted Canadian mining industry practices. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading; and
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated this 22nd day of August 2023

(Signed & Sealed) "Christopher John Bostwick"

(Original signed and sealed)

Christopher John Bostwick, FAusIMM (FAusIMM no 306761)

CERTIFICATE OF QUALIFIED PERSON

I, Michele Lee Cote, M.Sc., P.Geo, as an author of this report entitled “Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada” prepared for Alamos Gold Inc. (“Alamos”) and with an effective date of August 2, 2023 do hereby certify that:

1. I am employed as Chief Exploration Geologist, Corporate for Alamos Gold Inc., located at 181 Bay Street, Suite 3910, Toronto, Ontario, M5J 2T3;
2. I received a Bachelor of Science, Honours in Geology from University of Toronto (Ontario, Canada) in 1990 and a Masters of Science in Geology from the University of Toronto (Ontario, Canada) in 1995;
3. I am a registered as Professional Geoscientist with the Professional Geoscientists of Ontario (registration no. 1671). I have worked as a geologist, exploration manager and Vice President, Exploration for more than 30 years since my graduation mainly in exploration for both consulting and mining companies. Relevant experience for the purpose of this technical report includes more than 15 years of experience in grass roots and advanced stage exploration of orogenic gold deposits as well as overseeing technical aspects of the exploration programs at the Lynn Lake Project for over 5 years;
4. I have read the definition of “qualified person” set out in National Instrument 43-101 (“NI 43-101”) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101;
5. I have been an employee of Alamos since November 2017;
6. I visited the Lynn Lake Project during the past 5 years and most recently on August 18th to August 22nd, 2022;
7. I am the author of Sections 6,7,8,9,10,11 and 12 of the National Instrument 43-101 report entitled “Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" with an effective date of August 2, 2023;
8. I have no personal knowledge, as of the date of this certificate, of any material fact or change, which is not reflected in this report;
9. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
10. I have prepared this Technical Report in compliance with NI 43-101 and in conformity with generally accepted Canadian mining industry practices. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading; and
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated this 22nd day of August 2023

(Signed & Sealed) “Michele Lee Cote”

(Original signed)

Michele Lee Cote, M.Sc., P.Geo (No. 1671)

CERTIFICATE OF QUALIFIED PERSON

I, Jeffrey Volk, M.Sc. CPG, FAusIMM, as an author of this report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" prepared for Alamos Gold Inc. ("Alamos") and with an effective date of August 2, 2023, do hereby certify that:

1. I am employed as Director, Reserves and Resources for Alamos Gold Inc., located at 181 Bay Street, Suite 3910, Toronto, Ontario, M5J 2T3;
2. I graduated with a Master of Science degree in Structural Geology from the Washington State University in 1986. In addition, I have obtained a Bachelor of Arts degree in geology from the University of Vermont in 1983. I have over 34 years of operational and consulting experience and continuous employment in the minerals industry, specifically in mineral resource estimation, production geology, feasibility studies and economic evaluations. I am knowledgeable in all aspects of public reserve/resource disclosure and compliance. I have completed resource modeling, due diligence, acquisition and evaluations assignments for precious and base metals, platinum group metals, laterite and uranium in Russia and the Former Soviet Union, Australia, Africa, Peru, Philippines, Mexico, Chile, and North America gained with Barrick Gold, SRK and Alamos Gold Inc.;
3. I am a fellow of the Society of Economic Geologists and a Certified Professional Geologist and member of the American Institute of Professional Geologists (AIPG #CPG-10835). I am also a Fellow and Member of the Australian Institute of Mining and Metallurgy (FAusIMM #304113);
4. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;
5. I have been an employee of Alamos since August, 2012;
6. I visited the Lynn Lake Project during 2015-2018 and most recently on September 24th to 27th, 2018;
7. I am the author of Section 14, and co-author of Sections 1, 25 and 26 of the NI 43-101 report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" with an effective date of August 2, 2023;
8. I have no personal knowledge, as of the date of this certificate, of any material fact or change, which is not reflected in this report;
9. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
10. I have prepared this Technical Report in compliance with National Instrument 43-101 and in conformity with generally accepted Canadian mining industry practices. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading; and
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated this 22nd day of August, 2023

(Signed & Sealed) "Jeffrey Volk"

(Original signed)

Jeffrey Volk, M.Sc. CPG, FAusIMM

CERTIFICATE OF QUALIFIED PERSON

I, Colin Webster, P. Eng., as an author of this report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" prepared for Alamos Gold Inc. ("Alamos") and with an effective date of August 2, 2023, do hereby certify that:

1. I am employed as Vice President, Sustainability and External Affairs for Alamos Gold Inc., located at 181 Bay Street, Suite 3910, Toronto, Ontario, M5J 2T3;
2. I received a Bachelor of Science in Mining Engineering from in Queen's University (Kingston, Ontario) in 1990 and a diploma in Environmental Technology from Fanshawe College (London, Ontario) in 1994;
3. I am a registered member of the Professional Engineers of Ontario (PEO licence no 90498825). I have worked as an Engineer for more than 26 years since my graduation. I have worked mainly in environmental management and sustainability within the mining and consulting industries for different companies with increasing levels of responsibilities;
4. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;
5. I have been an employee of Alamos since January 2016;
6. I visited the Lynn Lake Project during 2016 – 2023 and most recently on June 13, 2023;
7. I am the author of Sections 20, of the NI 43-101 report entitled "Feasibility Study Update NI 43-101 Technical Report for the Lynn Lake Project, Lynn Lake, Manitoba, Canada" with an effective date of August 2, 2023;
8. I have no personal knowledge, as of the date of this certificate, of any material fact or change, which is not reflected in this report;
9. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
10. I have prepared this Technical Report in compliance with National Instrument 43-101 and in conformity with generally accepted Canadian mining industry practices. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading; and
11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public.

Dated this 22nd day of August 2023

(Signed & Sealed) "Colin Webster"

(Original signed)

Colin Webster, P.Eng. (PEO no 90498825)