NI 43-101 Technical Report
for the
Mulatos Property,
Sahuaripa Municipality, Sonora, Mexico

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 "expect", “assume”, “believe”, “anticipate”, “intend”, “envisage”, “potential”, “plan”, “objective”, “predict”, “outlook”, “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 expectations, estimates and projections as of the date of this report.

Forward-looking statements in this report may include, without limitation, information as to strategy, plans, expectations or future financial or operating performance, such as expectations and guidance regarding: the addition of underground operations at Mulatos and the expected timing of their commencement; the expected length of mining the La Yaqui Grande (LYG) open pit; execution of the workplan for Puerto del Aire (PDA) in 2023; production decision on the development of PDA; expected method of accessing and mining PDA and expected method of processing ore from PDA; intended construction of, and timing for, a new water treatment plant for the LYG mine site; Mulatos and LYG 2023 budget estimates for ore and waste mined, ore stacked, gold grades, recoveries, mining cost, processing cost, G&A cost, growth capital, sustaining capital, exploration capital, cash costs and mine-site AISC; expected life of mine physicals for LYG through to 2027 (including anticipated total tonnes mined, waste tonnes mined, ore tonnes mined, grade mined (g/t), tonnes crushed, grade crushed (g/t), and produced ounces); expected life of mine operating costs and capital cost for LYG beyond 2023; timing of expected completion of operations at the main Mulatos open pit and the processing of existing stockpiles and residual leaching; Mineral Resource and Mineral Reserve estimates; mining and recovery methods; mining and mineral processing and rates; anticipated gold production and production rates; mined and processed gold grades and weights; mine life; project-related risks as well as any other statements that express Alamos’ plans and expectations or estimates of future performance.

Alamos cautions that forward-looking statements are necessarily based upon a number of 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 document include, but are not limited to: changes to current estimates of Mineral Reserves and Resources; changes to production estimates (which assume accuracy of projected ore grade, mining rates, recovery timing and recovery rate estimates which may be impacted by unscheduled maintenance, weather issues, labour and contractor availability and other operating or technical difficulties); operations may be exposed to new diseases, epidemics and pandemics, including the ongoing effects and potential further effects of the COVID-19 pandemic; the impact of the COVID-19 pandemic or any other new illness, epidemic or pandemic on the broader market and the trading price of the Company's shares; government orders or mandates (including with respect to mining operations generally or auxiliary businesses or services required for the Company’s operations) in Canada, Mexico, the United States and Türkiye; the duration of any ongoing or new regulatory responses to the COVID-19 pandemic or any other new illness, epidemic or pandemic; government and the Company’s attempts to reduce the spread of COVID-19 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; fluctuations in the price of gold or certain other commodities such as, diesel fuel, natural gas, and electricity; changes in foreign exchange rates (particularly the Canadian Dollar, Mexican Peso, U.S. Dollar and Turkish Lira); the impact of inflation; changes in the Company's credit rating; any decision to declare a quarterly dividend; employee and community relations; litigation and administrative proceedings; disruptions affecting operations; availability of and increased costs associated with mining inputs and labour; changes with respect to the intended method of accessing and mining the deposit at PDA and changes related to the intended method of processing any ore from the deposit at PDA; 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; the *speculative nature of mineral exploration and development, including the risks of obtaining and maintaining necessary licenses and permits, including the necessary licenses, permits, authorizations and/or approvals from the appropriate regulatory authorities for the Company's development stage and operating assets; labour and contractor availability (and being able to secure the same on favourable terms); contests over title to properties; expropriation or nationalization of property; inherent risks and hazards associated with mining and mineral processing including environmental hazards, seismic activity, industrial hazards, industrial accidents, unusual or unexpected formations, pressures and cave-ins; changes in national and local government legislation, controls or regulations in Canada, Mexico, Türkiye, the United States and other jurisdictions in which the Company does or may carry on business in the future; increased costs and risks related to the potential impact of climate change; failure to comply with environmental and health and safety laws and regulations; disruptions in the maintenance or provision of required infrastructure and information technology systems; 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 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: (1) mine-site free cash flow; (2) total cash cost per ounce of gold sold; (3) all-in sustaining cost per ounce of gold sold; and (4) mine-site all-in sustaining cost per ounce of gold sold. 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.

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1 SUMMARY

1.1 Property Description & Location

The Mulatos Property, which encompasses a total of approximately 34,682 ha covering a portion of the Mulatos District, is in the Sierra Madre Occidental mountain range in the east central portion of the State of Sonora, Mexico. The property is located approximately 220 km by air east of the city of Hermosillo, and 300-km south of the border with the United States of America.

The Mulatos Property contains the Mulatos and La Yaqui Grande deposits, which are currently in operation, as well as the past producing Victor, Cerro Pelon and San Carlos open pit mines and the Escondida Deep and San Carlos underground mines. Mineral rights for all concessions comprising the Mulatos Property are controlled by Minas de Oro Nacional, S.A. de C.V., a Mexican company, wholly owned by Alamos Gold, Inc.

1.2 Geological Setting and Deposit Type

The Mulatos mineral deposits are large epithermal, high-sulfidation, disseminated gold deposits. Gold mineralization is closely associated with silicic alteration within extensive areas of argillic and advanced argillic alteration. The Mulatos deposit proper is composed of the contiguous Estrella, El Salto, Mina Vieja, and Puerto del Aire Mineral Resource areas. The Escondida deposit is the faulted extension of the Mina Vieja and El Salto sub-deposits and is believed to be continuous to the northeast with the Gap, El Victor, and San Carlos mineralized areas. Although zones are often bounded by post-mineral faults, together they form a trend of 2.7 km of gold mineralization starting at the north end of the Estrella pit to the San Carlos deposit.

Within the larger Mulatos Group of Concessions, and generally within 20 km from the Mulatos deposit, geologically similar high sulfidation gold deposits, occurrences, or prospects are known.

Gold deposits of the Mulatos district are considered to be high sulphidation-state epithermal systems. Epithermal precious metal systems may be classified as high, intermediate, and low sulphidation styles. They are characterized by the sulphidation state of the hypogene sulphide mineral assemblage, and show general relations in volcano-tectonic setting, precious and base metal content, igneous rock association, proximal hypogene alteration, and sulphide abundance. Ore in all occurrences is of the type formed under epizonal conditions, that is, generally within 2 km of the paleo-surface.

Precious metal mineralization at Mulatos is associated with intense silicic alteration (mostly vuggy silica), advanced argillic alteration, and the presence of hydrothermal breccias. The original protolith (dacite porphyry flow/tuff, coarse-grained volcaniclastic rocks, breccias), as indicated by surface mapping and core drilling, may have contained in the order of 2-3% sulphide as pyrite with various amounts of enargite and tetrahedrite. The principal gold-bearing host rock is interpreted as favoured for mineralization due to relatively high primary porosity and its intense fracturing.

Gold mineralization within the Mulatos deposit occurs primarily within areas of pervasive silicic alteration of the volcanic host rocks, and to a lesser extent, within advanced argillic alteration assemblages proximal to silicic alteration. The gold-bearing advanced argillic zones are dominated by pyrophyllite or dickite alteration. Silicic rocks host approximately 80% of the contained gold within the deposit. There are three main mineralization assemblages. From oldest to youngest they are: 1) quartz + pyrite + pyrophyllite + gold; 2) quartz + pyrite + kaolinite + gold + enargite; 3) kaolinite + barite + gold. Free gold is commonly found in hematite-filled fractures. Gold also occurs in pyrite, as gold/silver telluride minerals, and possibly as a solid solution in some copper sulphide minerals. Supergene oxidation and perhaps remobilization and secondary enrichment of gold have been ongoing since the post-mineral volcanic cover was removed (in those specific deposits where it has been removed).

1.3 Exploration

In addition to the Mulatos/Estrella deposit, the nine satellite systems have known gold mineralization with varying levels of exploration advancement:

- El Halcon: Drill-indicated mineralization, untested exploration targets;
- La Yaqui Grande: Drill-defined reserve; untested exploration targets;
- Los Bajios: Partially drill-tested exploration target; mineralized intercepts;
- El Jaspe: Partially drill tested exploration target; mineralized intercepts;
- Cerro Pelon: Drill-defined reserve (mined out); untested exploration targets;
- El Victor/Gap: Drill-defined resource and reserve (El Victor open pit mined out);
- San Carlos: Drill-defined resource and reserve (mined out); open intercepts; and
- El Carricito: Drill-defined resource.

1.4 Mineral Resource Estimates

The Mineral Resource estimates were performed by Marc Jutras of Ginto Consulting Inc. and have an effective date of December 31, 2022.

1.4.1 La Yaqui Grande

The Mineral Resources at the La Yaqui Grande deposit were estimated from a total of 616 drill holes. There are three contiguous zones of interest at La Yaqui Grande; Zones 1, 2, and 3. Within each zone, models of alteration, reduced oxidation state (redox), gold mineralized envelopes, and silver mineralized envelopes, were interpreted for the estimation of the Mineral Resources. These controls were integrated in the estimation of gold and silver grades, AuCN/AU ratios, and percent sulphur. with the ordinary kriging technique. Assay composites of 1.5 m lengths were capped for high-grade outliers and utilized to determine the gold grade spacial continuities with omni-directional, downhole, and directional variograms. Grades were interpolated into 6 m x 6 m x 9 m blocks with parameters derived from the modeled variograms.

1.4.2 Puerto del Aire Sulphide

The Mineral Resources at the Puerto del Aire Sulphide Project (PDA) were estimated from a total 41,653 of drilling in 819 drill holes. There are three distinct contiguous zones of interest at the PDG Project; Puerto del Aire, Estrella, and Gap-Victor. Within each zone, models of alteration, reduced oxidation state (redox), gold mineralized envelopes, and silver mineralized envelopes, were interpreted for the estimation of the Mineral Resources. These controls were integrated in the estimation of gold and silver grades, AuCN/AU ratios, and percent sulphur. with the ordinary kriging technique. Assay composites of 1.52 m lengths were capped for high-grade outliers and utilized to determine the gold grade spacial continuities with omni-directional, downhole, and directional variograms. Grades were interpolated into 3 m x 3 m x 3 m blocks with parameters derived from the modeled variograms.

1.4.3 Mulatos Property Mineral Resources

December 31, 2022, Measured and Indicated Mineral Resources for the Mulatos pit, La Yaqui Grande, Puerto del Aire and Carricito are presented in Table 1-1. December 31, 2022. Inferred Mineral Resources are presented in Table 1-2. Mineral Resources in the case of the Mulatos pit, La Yaqui Grande and Puerto del Aire are net of Mineral Reserves. Carricito does not have Mineral Reserves.

Table 1-1 Measured and Indicated Mineral Resources, December 31, 2022

	Measured Resources			Indicated Resources			Total Measured and Indicated		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	850	1.25	34	5,253	1.04	176	6,103	1.07	210
La Yaqui Grande	0	0.00	0	1,506	0.87	42	1,506	0.87	42
Puerto del Aire	146	5.28	25	1,192	4.95	190	1,338	4.98	214
Carricito	58	0.82	2	1,297	0.82	34	1,355	0.83	36
Total Mulatos	**1,054**	**1.79**	**61**	**9,248**	**1.49**	**442**	**10,302**	**1.52**	**502**

Table 1-2 Inferred Mineral Resources, December 31, 2022

	Inferred Resources		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	560	0.92	17
La Yaqui Grande	175	1.31	7
Puerto del Aire	139	5.90	26
Carricito	900	0.74	22
Total Mulatos	**1,774**	**1.27**	**72**

Notes to Table 1-1 and Table 1-2:

- *The Company's Mineral Reserves and Mineral Resources as at December 31, 2022 are classified in accordance with the Canadian Institute of Mining Metallurgy and Petroleum's "CIM Standards on Mineral Resources and Reserves, Definition and Guidelines" as per Canadian Securities Administrator's NI 43-101 requirements;*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability;*
- *Mineral Resources are exclusive of Mineral Reserves;*
- *All Measured, Indicated and Inferred open pit Mineral Resources are pit constrained;*
- *With the exceptions noted following, Mineral Resource estimates assumed a gold price of $1,600 per ounce. Carricito estimates assumed a gold price of $1,400 per ounce; and*
- *The Mulatos pit used a cut-off of 0.5 g/t of gold, Puerto del Aire used a cut-off of 2.5 g/t of gold, and La Yaqui Grande and Carricito used a cut-off of 0.3 g/t of gold.*

1.5 Mineral Reserve Estimates

The Mineral Reserve for the Mulatos Property is the sum of open pit and underground Mineral Reserves plus the existing stockpiles. The open pit Mineral Reserve is contained within designed pits for the main Mulatos pit and the La Yaqui Grande pit. The underground Mineral Reserve is contained within the Puerto del Aire Project. Table 1-3 is a summary of the Proven and Probable Mineral Reserve as of 31 December 2022.

Table 1-3 Mulatos Property Proven and Probable Mineral Reserves, December 31, 2022

	Proven Reserves			Probable Reserves			Total Proven and Probable		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	310	1.22	12	2,562	1.17	96	2,872	1.17	108
Stockpiles	2,658	2.06	176	0	0.00	0	2,658	2.06	176
La Yaqui Grande	268	0.89	8	16,263	1.26	659	16,531	1.25	667
Puerto del Aire	589	4.69	89	4,084	4.87	639	4,673	4.84	728
Total Mulatos	**3,825**	**2.32**	**285**	**22,909**	**1.89**	**1,394**	**26,734**	**1.95**	**1,679**

Notes:

- *The Company's Mineral Reserves and Mineral Resources as at December 31, 2022 are classified in accordance with the Canadian Institute of Mining Metallurgy and Petroleum's "CIM Standards on Mineral Resources and Reserves, Definition and Guidelines" as per Canadian Securities Administrator's NI 43-101 requirements.*
- *The gold price used for report Mineral Reserves is $1,400 per ounce of gold.*
- *Mineral Reserve cut-off grade for the Mulatos Pit, stockpile and the La Yaqui Pitt are determined as a net of process value of $0.10 per tonne for each model block. Cut-off grade for Puerto del Aire is 3.00g/t.*

1.6 Mining Methods

The mining at Mulatos is currently by open pit mining with the addition of underground operations likely to start within three years time. Open pit mining commenced at Mulatos in 2005 and has continued un-interrupted within the main pit area. Alamos Gold has completed mining at the Victor, San Carlos, Yaqui Phase 1, and Cerro Pelon open pits.

1.6.1 Main Mulatos Pit

The open pit mining is a typical drill, blast, load haul operation with mining in the main pit being done with 9 meter bench heights. The open pit schedule calls for an average of 17,500 tonnes of ore per day. Open pit mining is carried out by a contractor under the direction of Mulatos staff. Waste is delivered to waste dumps south of the pit and ore is delivered to the crushing area where it is either direct dumped into the primary crusher or put on to a short term pad. The contractor currently operates with a fleet of three CAT 992 front end loaders, 14 CAT 777 haul trucks, three drills and various pieces of support equipment. El Salto, on the west side of the main pit, is the last in a series of pushbacks and is expected to be completed in Q3 of 2023 based on current Mineral Reserves.

1.6.2 La Yaqui Grande Pit.

Pre-stripping of the La Yaqui Grande pit commenced in December of 2020. Ore mining started in January of 2022 with some ore being used to produce over liner for the heap leach pad and the remainder being stockpiled until commissioning of the crusher commenced in May 2022. In the fourth quarter of 2022 La Yaqui Grande was mining at its design rate of 10,000 tpd of ore. Mining is undertaken by a contractor, different from that used at the main Mulatos pit, and is supervised by Mulatos staff. The contractor employs six CAT 992 front end loaders, 21 CAT 777 haul trucks, eight drills and 14 pieces of support equipment. Mining of the La Yaqui Grande open pit is expected to continue through 2027 based on current Mineral Reserves.

1.6.3 Puerto del Aire Underground

Conceptual mine design work has been undertaken on the Puerto del Aire sulphide project (PDA). PDA underground is expected to be accessed via two portals located within the Estrella portion of the main Mulatos pit. Mining would be fully mechanized and carried out by a local underground mining contractor. The two primary mining methods are expected to be longhole stoping and drift and fill stoping. With a substantially larger Mineral Resource and Reserve at the end of 2022, an extensive work plan has been developed for the second half of 2023 to allow for a production decision to be made on the development of PDA. The work plan includes:

- Undertaking a geotechnical study to determine maximum span widths for stope and support requirements for development and stoping. This will require detailed geotechnical logging of existing exploration holes and the likely requirement for additional geotechnical drilling.
- Partly based on the geotechnical study, and the planned mining methods, refining the dilution and mining recovery assumptions.
- Developing a new mine design based on the expanded Mineral Reserve and Resource, refined geotechnical parameters and refined mining parameters.
- Developing a new mining sequence, with the goal of maximizing the active panels and stopes to support the optimal mining rate.
- Developing information packages to support requests for proposals from local underground mining contractors to support operating and capital cost estimates.

1.7 Recovery Methods

1.7.1 Mulatos Heap Leach

The Mulatos heap leach facility and ADR plant have been operating since 2006 and have demonstrated that the selected precious metal recovery methods are reasonable. Costs drivers are principally cyanide and lime consumption which are dependent on levels of ore oxidation. The facility has been steadily expanded over the years and currently has the capacity to crush up to 18,500 tpd. The facility employes four stages of crushing to produce a -9.5 mm product. Crusher material is transported via an overland conveyor to two agglomerators where cement and cyanide are added prior to being stacked on the heap leach with a radial stacker. Gold is then recovered in an ADR facility. To date, 97 million tonnes have been put on the heap leach pad with ore sourced from the main Mulatos pit, and the Victor, San Carlos, and Cerro Pelon open pits.

1.7.2 La Yaqui Grande Heap Leach

The La Yaqui Grande heap leach facility was commissioned in mid-2022 and is operated at a rate of 10,000 tpd. The facility consists of a three stage crushing circuit, crushing to -3/4 inches, agglomeration, and a heap leach pad. The facility has a set of carbon columns, and the loaded carbon is trucked to the main Mulatos ADR for stripping, electrowinning, and doré production.

1.7.3 High Grade Mill

The high grade mill (gravity plant) was installed in early 2012 and treated high grade ore from the Escondida deposit. The original configuration utilized primary and secondary crushing, followed by in line pressure jigs and a Falcon concentrator. Gravity concentrates were then treated in intensive leach reactors, and the pregnant solutions were subjected to electrowinning. In 2015 the mill was modified to produce a flotation gold concentrate from the San Carlos underground. The gold concentrate was marketed overseas. The high grade mill was put on care and maintenance in the third quarter of 2018.

1.8 Environmental

The current environmental conditions at the site plus the potential environmental impacts from mining operations are summarized in Section 20.1. The waste and water management programs are summarized in Section 20.2. The regulatory framework and permit status are described in Section 20.3. The socio-economic program is described in Section 20.4. Reclamation and mine closure planning is discussed in Section 20.5. All five topics are briefly summarized in this section.

The Mulatos Property is located in a rural area of the State of Sonora, Mexico, in a ranching area that has a low population density. Potential environmental impacts to surface soils, water, the ecology, and air quality are mitigated as part of the mining operations. Environmental baseline studies were prepared to characterize the environmental conditions of the area, including climate, fauna, flora (AGRA Ambiental, 1995) and hydrology (Water Management Consultants, 1997), and were summarized in the Feasibility Study prepared by M3 Engineering & Technology Corp (M3 2004d). Subsequent updates have taken place during the Life of Mine as new development projects were introduced.

The project area lies in a temperate sub-humid climate zone. The mean annual temperature at Mulatos is approximately 19°C. Rainfall at the site shows marked seasonal variation that is characteristic of all northwestern Mexico. The mean annual rainfall is estimated to be 817 mm, year-to-year fluctuations can be extreme, with maximum monthly rainfall occurs in July and August, representing about 50 percent of the annual total.

The mean annual pan evaporation rate in the project area is estimated at 2,048 mm. Evaporation generally coincides with an increase in temperature. Except for the months of July and August, evaporation exceeds precipitation. The data indicate that the greater portion of the precipitation falling in the project area is lost to evaporation.

The Mulatos Mine uses a fresh water source and influences the local hydrologic system. The local surface water and groundwater system were characterized prior to operations and is currently monitored on a routine basis for impacts.

In the Mulatos region, groundwater flow on a regional scale is minimal. The lack of regional flow results from structural dissection of the terrain (which gives topography dominant control over groundwater flow), and from the absence of laterally extensive porous and permeable geologic units. Despite this, general statements can be made about the controls and characteristics of local and sub-regional groundwater flow.

Flora and fauna studies have been undertaken for the Mulatos Mine area. The state of Sonora holds the 15th place in diverse vertebrates endemic to Mesoamerica. There are 153 species in Mesoamerica, and 70 are endemic to Mexico, eight endemic to the state and six have limited distribution. For the state of Sonora, in the biomes represented in and around the project area, the literature reports fewer than 200 species of animals, including amphibians. Of this total, about 39 percent of the genre and 46 percent of the species corresponds to mammals, followed by birds represented with 48 genres.

Mexican laws require mandatory monitoring programs that are implemented under the Mexican environmental agency (SEMARNAT). The following monitoring programs have been established at the Mulatos Mine: groundwater quality, surface water quality, air quality, perimeter noise, fauna registry, flora species rescue record, nursery plant production, soils, and cleared surface restored/reforested registry. Most monitoring is completed quarterly, biannually or annually.

Mulatos manages water on the site through a variety of facilities, including ponds, tanks and diversion structures. Water pumped from the Rio Mulatos and from precipitation is used in the operations. The only discharge (effluent) from the site is via the waste rock dump, where run-off is captured at the North Dam and then conveyed to the water treatment plant. The current pumpage to the plant is a maximum of 1,200 gpm. The layout of the water balance flow diagram has been defined. A written water management plan and detailed water balance have been developed and have evolved through the life of mine including the new La Yaqui Grande site.

The water treatment system includes a Sludge Densification Plant (SDP). It is located west of the Escondida Pit on a mid-elevation bench close to the former village of Mulatos. Seepage and runoff water from the mine site are pumped from a collection pond to the plant. The treated water is released to Arroyo Mulatos, which flows to the Rio Mulatos. The discharge is treated to meet the water quality concentrations equivalent to the baseline concentrations prior to entering the discharge point at the arroyo. It was noted, however, that the community of Mulatos discharges untreated wastewater into the arroyo at a point immediately downstream of the mine.

A new water treatment plant will be constructed in 2023 for the La Yaqui Grande mine site.

Mulatos has an established socio-economic program with the local community and has supported it with social projects and financial assistance. Examples of recent projects and assistance provided by the Company include the following:

- Mulatos has a scholarship program for children and youth in the region (Mulatos, Matarachi, El Trigo, Yécora, Arivechi, Sahuaripa, Bacanora), for primary (6 to 12 years), secondary (12 to 15 years), preparatory (15 to 18 years) and university levels.
- Free medical services and medicine for nearby residents.
- Support for school infrastructure or supplies for the five schools in the region.
- Economic support for specialized medical services for the residents of Mulatos.
- Small business support for services that don’t qualify as local providers. Includes services for different areas of the mine.
- Education program at the high school level with a prestigious institution (Tecnológico de Monterrey)
- Various programs in coordination with the government or with philanthropic institutions have been carried out such as:
    - Mental health check-up, vision health glasses endowment program, arts program such as painting, crafts, music and film.

Examples of recent projects and assistance provided by the Company include the following:

- The mine has established a detailed community feedback protocol to allow for dialogue and information availability between Mulatos and their stakeholders.

The Mulatos Property includes open pits, waste rock piles, leach pads, storage ponds, conveyors, a dam, roads, an air strip, a water treatment plant, buildings and other structures, and areas used for crushing, explosive storage, and numerous working areas. Closure planning includes covering the waste dumps and leach pads with an engineered store and release cover to minimize the amount of water entering these facilities and to allow for reclamation.

The Closure and Reclamation objectives are to minimize acid generation, re-establish productive land use, provide stable landforms, protect aquatic resources, develop a self-sustaining environment, and reduce visual disturbance.

1.9 Operating Financials

The Mulatos Property has been in production since 2005 and commercial production since 2006. Gold production has averaged over 150,000 ounces per year since 2008. To the end of 2022, over 2.5 million ounces of gold have been produced. Table 1-4 highlights selective operating and financial information from the 2023 budget estimate.

Table 1-4 Mulatos and La Yaqui Grande 2023 Budget Estimates

		2023 Budget		
		Mulatos	**La Yaqui Grande**	**Combined**
Ore Mined	Tonnes	3,068,840	3,651,000	6,719,840
Waste Mined	Tonnes	1,753,210	18,599,000	20,352,210
Total Mined	Tonnes	4,822,050	22,250,000	27,072,050
Ore Stacked	Tonnes	3,509,528	3,651,000	7,160,528
Grade	g/t	0.90	1.30	1.10
Contained Ounces	oz	101,663	152,905	254,568
Recovered Ounces	oz	53,373	126,686	180,059
Recovered/Stacked Ounces	%	53%	83%	71%
Mining Cost	$/t mined	5.34	2.37	2.90
Processing Cost	$/t processed	13.02	5.26	9.06
G&A Cost	$/t processed	3.87	2.70	3.27
Growth Capital	$ millions	-	-	7.5
Sustaining Capital	$ millions	-	-	10.0
Exploration Capital	$ millions	-	-	4.0
Cash Costs	$/oz	-	-	925
Mine-Site-All-in Sustaining Costs	$/oz	-	-	975

1.10 Economic Analysis

Under NI 43-101, producing issuers may exclude the information required in this section on properties currently in production, unless the Technical Report includes a material expansion of current production. Alamos is a producing issuer, the Mulatos Property is currently in production, and a material expansion in gold production is not being planned. Alamos has performed an economic analysis of the Mulatos Property using the estimates presented in this report and confirms that the outcome is a positive after tax cash flow and net present value at a 5% discount rate at USD $1400 per ounce of gold price that supports the statement of Mineral Reserves.

2 INTRODUCTION

This report forms an update to the report titled "Mulatos Technical Report Update (2012)" dated December 21, 2012. This report was prepared by Alamos Gold Inc staff, and independent consultant Marc Jutras.

The report includes an update of the Mulatos Property for the mining and ore processing of the Mulatos open pit, the La Yaqui Grande Open pit and the proposed Puerto del Aire underground. The report is written to comply with the requirements of the National Instrument 43-101, "Standards of Disclosure for Mineral Properties", as part of Mulatos' ongoing continuous disclosure obligations regarding the company's exploration activities and property development.

2.1 Terms of Reference

All costs are in Q4 2022 United States dollars unless otherwise stated.

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

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 Mulatos Property as indicated below:

- Chris Bostwick, FAusIMM, Senior Vice President - Technical Services, Alamos Gold Inc. last visited the site June 15th to 17th, 2022;
- Michele Cote, M.Sc., P.Geo, Chief Exploration Geologist, Alamos Gold Inc, has visited the site on numerous occasions during the previous year, with her last site visit occurring February 24th to March 2nd, 2023;
- Dave Bucar, M.Sc., P.Eng, Director, Environmental Sustainability, Alamos Gold Inc, last visited the site January 18th and 19th, 2023; and
- Marc Jutras, M.A.Sc., P.Eng, Principal, Ginto Consulting Inc. last visited the site May 12th to 17th, 2018.

Mr. Bostwick, Ms. Cote, and Mr. Bucar, being employees of Alamos Gold Inc, are not independent of the issuer. Mr. Jutras is independent of the issuer.

Table 2-1 Section Qualified Persons

Section	Description	Qualified Person	Company
1	Summary	All in part	
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	Chris Bostwick	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	Chris Bostwick	Alamos Gold Inc.
14	Mineral Resource Estimates	Marc Jutras	Ginto Consulting Inc.
15	Mineral Reserve Estimates	Chris Bostwick	Alamos Gold Inc.
16	Mining Methods	Chris Bostwick	Alamos Gold Inc.
17	Recovery Methods	Chris Bostwick	Alamos Gold Inc.
18	Project Infrastructure	Chris Bostwick	Alamos Gold Inc.
19	Market Studies and Contracts	Chris Bostwick	Alamos Gold Inc.
20	Environmental Studies, Permitting and Social or Community Impact	Dave Bucar	Alamos Gold Inc.
21	Capital and Operating Costs	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	
25	Interpretations and Conclusions	All in part	
26	Recommendations	All in part	
27	References	All in part	

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.

Knight Piesold, Inc. (KP) has provided guidance for the open pit slope angles used in the design of the final pits.

Independent Mining Consultants (IMC) have designed the final pits utilized for reporting Mineral Reserves and Resources.

Practical Mining LLC has provided conceptual mining designs for the Puerto del Aire underground project.

Anthony Longo of Spire Exploration LLC has provided the background on the geological setting and mineralization.

SND Consulting has designed and supervised the metallurgical testwork for Puerto del Aire sulphide project.

M3 Engineering has provided designs for the La Yaqui crushing plant and carbon columns.

Golder Associates has provided the design for the La Yaqui Grande heap leach pad.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Location

The Mulatos mining district is in the Sahuaripa Municipality of Northern Mexico, near the eastern border of the state of Sonora (Figure 4-1). Alamos Gold, through its wholly owned Mexican subsidiary Minas de Oro Nacional S.A. de C.V (MON), controls the Mulatos mining property (the “Mulatos Property”) encompassing 34,682 hectares of mineral rights in the Sierra Madre Occidental mountain range in the east central portion of the State of Sonora, Mexico.

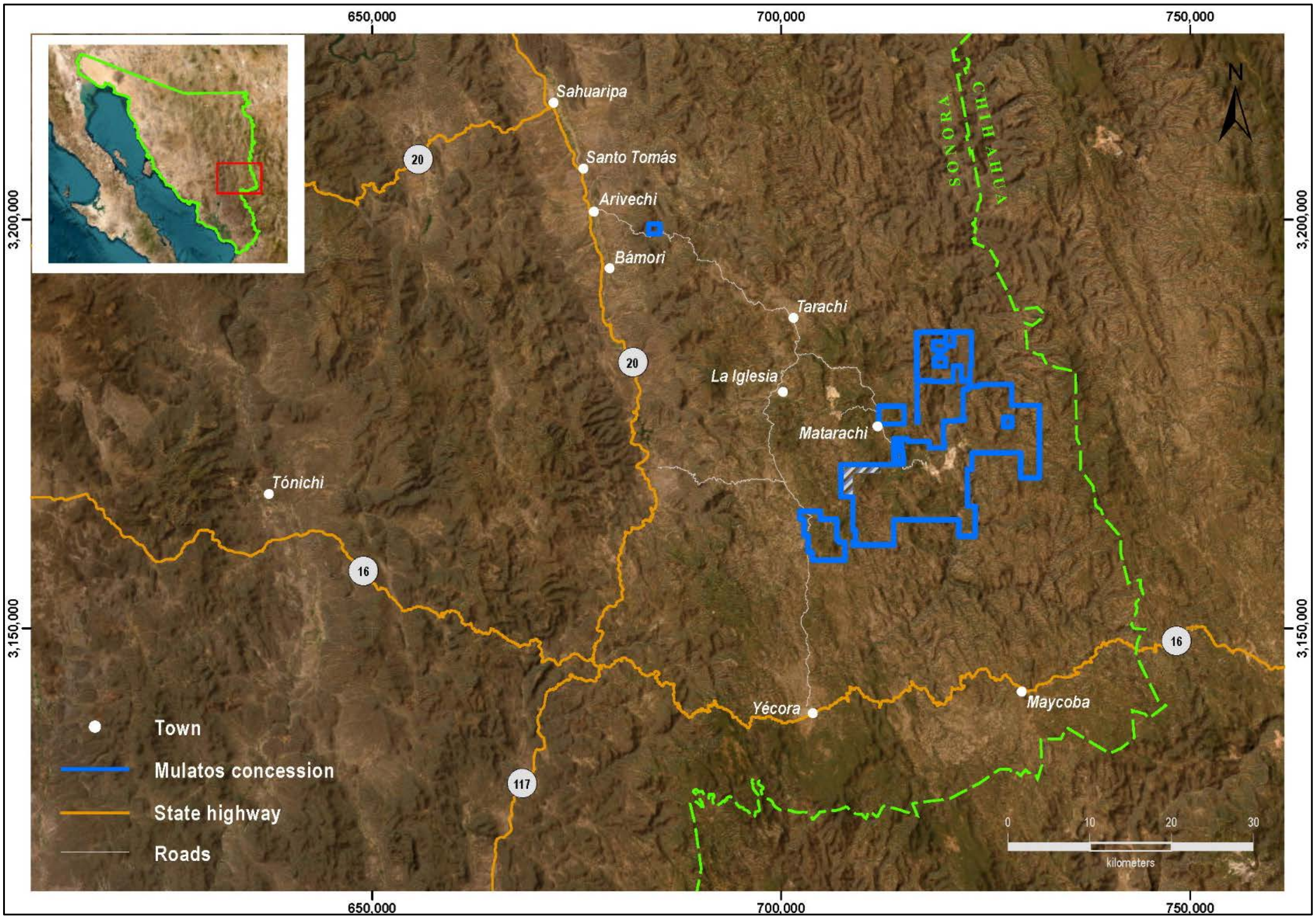


Figure 4-1 Location of the Mulatos Property – Sonora, Mexico

The Mulatos Property is centered around UTM coordinates 715,000 meters east and 3,169,000 meters north and the Mulatos open pit mine itself is located between UTM coordinates 700,000 meters and 730,000 meters east and 3,160,000 meters and 3,185,000 meters north or 108°44’ west longitude and 28°39’ north latitude. All UTM coordinates in the report are Zone 12, NAD27.

4.2 Property Description

The Mulatos Property, which includes the Mulatos mine, consists of 42 concessions encompassing some 34,682 hectares of mineral rights properties. Mineral rights in Mexico are issued by the Mexican Department of Economy, Direcion General of Mines.

Surface rights in the exploitation and exploration areas are held privately, some of which were purchased by Minas de Oro Nacional (MON), and by the Mexican Government through the “Ejido Mulatos”.

Ejidos (or “comunidades agrarias”) are communal agrarian land grants that represent a significant part of the surface land ownership coverage in Mexico. Individuals of the ejido (ejidatarios) have the right to use specific areas of the ejido, and decisions regarding land use are made by the ejido members.

Surface rights in the exploitation area are held both privately and by the Ejido Mulatos. In December 2016, the Company and the Ejido Mulatos entered into a new temporary occupation agreement (the “2016 Agreement”). The 2016 Agreement, among other things, provided for the dismissal of several lawsuits related to both the Company’s operations and prior occupation agreements; as well, replaced all prior temporary occupation agreements governing the communal land underlying the Mulatos Mine. The 2016 Agreement provides for both annual rent payments to Ejido Mulatos members (both individually and collectively) as well as additional success fee type payments, better aligning the interest of the Company and the local community.

Concessions in the Mulatos mining area were legally surveyed, licensed, reviewed, and approved by Mexican mining engineers (“peritos”). The location of all known mineralized zones, mineral resources, mineral reserves and mine workings, existing infrastructure and important natural features and improvements, relative to the property boundaries, have also been surveyed and are properly located.

4.3 Description of Mining Titles and Recorded Interests

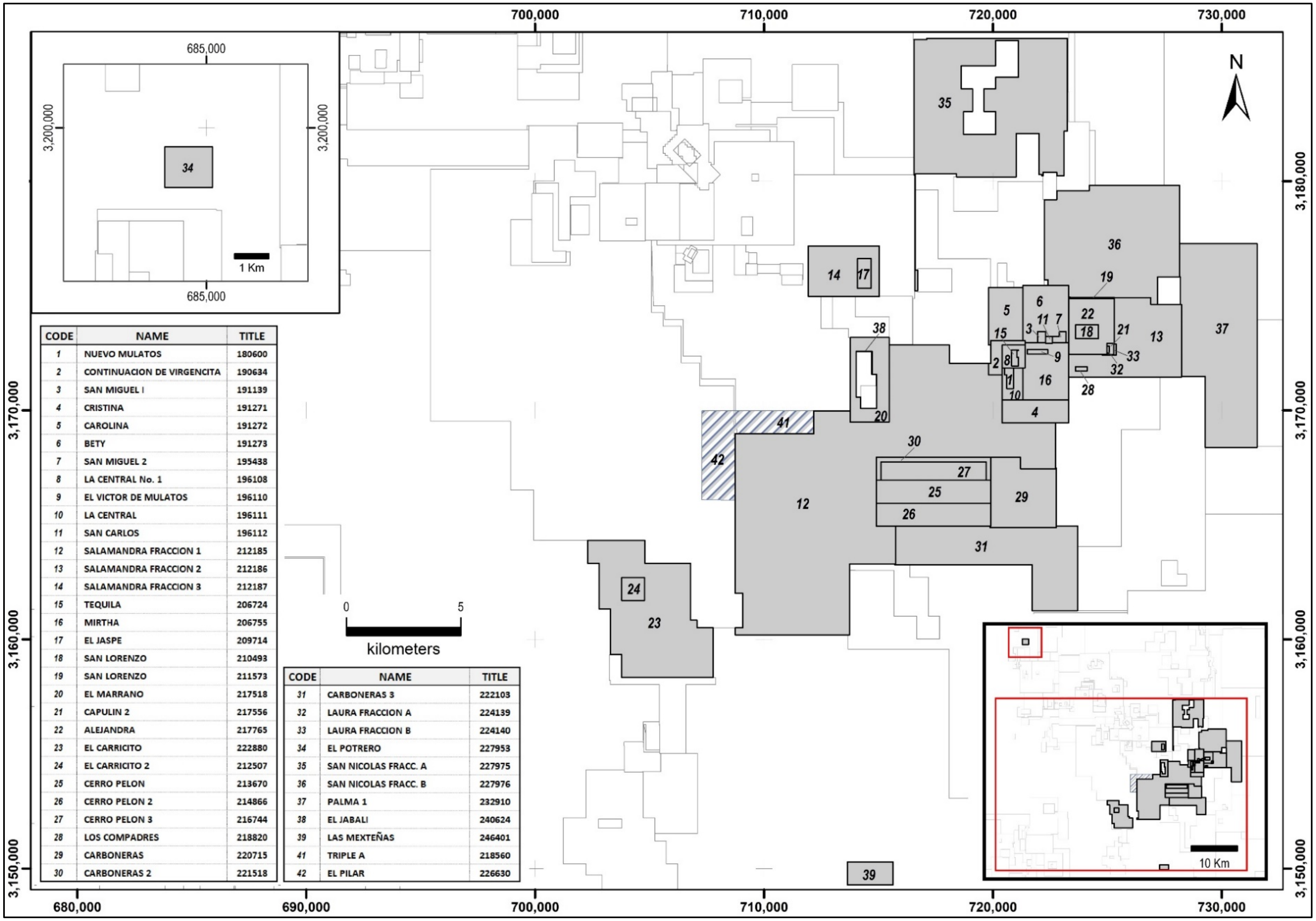
Table 4-1 provides a list of the current concession details for titles owned by MON on the Mulatos Property. Figure 4-2 illustrates the location of MON’s concessions in the district. Alamos is in receipt of an updated title opinion (Rubio, 2023) for MON’s mining concessions dated January 31, 2023, prepared by EC Legal Rubio Villegas, S.C.

4.4 Mining Royalties

The Mulatos Property is not subject to any third party royalties.

Table 4-1 Description of MON's Concessions- Mulatos District

	Name	Title No.	Term	Area (ha)
1	NUEVO MULATOS	180600	12-Jul-37	30.0
2	CONTINUACIÓN DE VIRGENCITA	190634	28-Apr-41	100.0
3	SAN MIGUEL I	191139	28-Apr-41	16.7
4	CRISTINA	191271	18-Dec-41	290.0
5	CAROLINA	191272	18-Dec-41	347.0
6	BETY	191273	18-Dec-41	453.7
7	SAN MIGUEL 2	195438	13-Sep-42	20.3
8	LA CENTRAL No. 1	196108	22-Sep-42	81.3
9	EL VÍCTOR DE MULATOS	196110	22-Sep-42	18.0
10	LA CENTRAL	196111	22-Sep-42	96.0
11	SAN CARLOS	196112	22-Sep-42	9.0
12	SALAMANDRA FRACCIÓN 1	212185	29-Aug-46	8,072.7
13	SALAMANDRA FRACCIÓN 2	212186	29-Aug-46	1,161.5
14	SALAMANDRA FRACCIÓN 3	212187	29-Aug-46	604.0
15	TEQUILA	206724	11-Mar-46	18.7
16	MIRTHA	206755	11-Mar-46	470.3
17	EL JASPE	209714	02-Aug-49	78.0
18	SAN LORENZO	210493	02-Aug-49	60.0
19	SAN LORENZO	211573	15-Jun-50	15.6
20	EL MARRANO	217518	15-Jun-52	434.0
21	CAPULÍN 2	217556	15-Jun-52	12.0
22	ALEJANDRA	217765	12-Aug-52	405.7
23	EL CARRICITO	222880	16-Sep-54	2,176.3
24	EL CARRICITO 2	212507	30-Oct-50	100.0
25	CERRO PELÓN	213670	07-Jun-51	500.0
26	CERRO PELÓN 2	214866	03-Dec-51	500.0
27	CERRO PELÓN 3	216744	27-May-52	368.0
28	LOS COMPADRES	218820	20-Jan-53	10.0
29	CARBONERAS	220715	29-Sep-53	801.4
30	CARBONERAS 2	221518	18-Feb-54	132.0
31	CARBONERAS 3	222103	10-May-54	1,729.5
32	LAURA FRACCIÓN A	224139	07-Apr-55	3.0
33	LAURA FRACCIÓN B	224140	07-Apr-55	6.3
34	EL POTRERO	227953	14-Sep-56	168.0
35	SAN NICOLÁS FRACC. A	227975	19-Sep-56	3,323.3
36	SAN NICOLÁS FRACC. B	227976	19-Sep-56	2,631.0
37	PALMA 1	232910	03-Nov-58	2,640.9
38	EL JABALÍ	240624	13-Jun-62	3.7
39	LAS MEXTEÑAS	246401	13-Jun-68	200.0
41	TRIPLE A	218560	08-Sep-58	6,591.6
42	El Pilar	226630	08-Sep-58	2.9
Total				**34,682.2**



CODE	NAME	TITLE
1	NUEVO MULATOS	180600
2	CONTINUACION DE VIRGENCITA	190634
3	SAN MIGUEL I	191139
4	CRISTINA	191271
5	CAROLINA	191272
6	BETY	191273
7	SAN MIGUEL 2	195438
8	LA CENTRAL No. 1	196108
9	EL VICTOR DE MULATOS	196110
10	LA CENTRAL	196111
11	SAN CARLOS	196112
12	SALAMANDRA FRACCION 1	212185
13	SALAMANDRA FRACCION 2	212186
14	SALAMANDRA FRACCION 3	212187
15	TEQUILA	206724
16	MIRTHA	206755
17	EL JASPE	209714
18	SAN LORENZO	210493
19	SAN LORENZO	211573
20	EL MARRANO	217518
21	CAPULIN 2	217556
22	ALEJANDRA	217765
23	EL CARRICITO	222880
24	EL CARRICITO 2	212507
25	CERRO PELON	213670
26	CERRO PELON 2	214866
27	CERRO PELON 3	216744
28	LOS COMPADRES	218820
29	CARBONERAS	220715
30	CARBONERAS 2	221518

CODE	NAME	TITLE
31	CARBONERAS 3	222103
32	LAURA FRACCION A	224139
33	LAURA FRACCION B	224140
34	EL POTRERO	227953
35	SAN NICOLAS FRACC. A	227975
36	SAN NICOLAS FRACC. B	227976
37	PALMA 1	232910
38	EL JABALI	240624
39	LAS MEXTEÑAS	246401
41	TRIPLE A	218560
42	EL PILAR	226630

Figure 4-2 MON's Concessions Location - Mulatos District

Note:

- *Concessions 41 (Triple A) and 42 (El Pilar) were received in a concession swap and are awaiting authorization of the Mining Registry*

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility, Local Resources, Infrastructure

The Mulatos district is located approximately 220 kilometres east of the city of Hermosillo, capital of the state of Sonora, and 260 kilometers west of Chihuahua, capital of the state of Chihuahua. The project is situated 300 kilometres south of the border with the United States of America. The closest villages to the mine project are Mulatos, located about one kilometre to the northwest of the Mulatos open pit, and Matarachi some 10 kilometres to the east northeast of the mine. The villages of Mulatos and Matarachi are part of the municipality of Sahuaripa.

Road access from Hermosillo is through the towns of Mazatan, Sahuaripa (population 7,000), Arivechi, Tarachi and Matarachi, or from Hermosillo through Tecoripa and Yecora on the Chihuahua-Hermosillo highway, then northeast to Mulatos on an all-weather gravel road (Figure 5-1). Both routes, under normal conditions, take approximately 4-6 hours to travel. The site is also accessible by light plane to the Mulatos airstrip located within the mine camp installation.

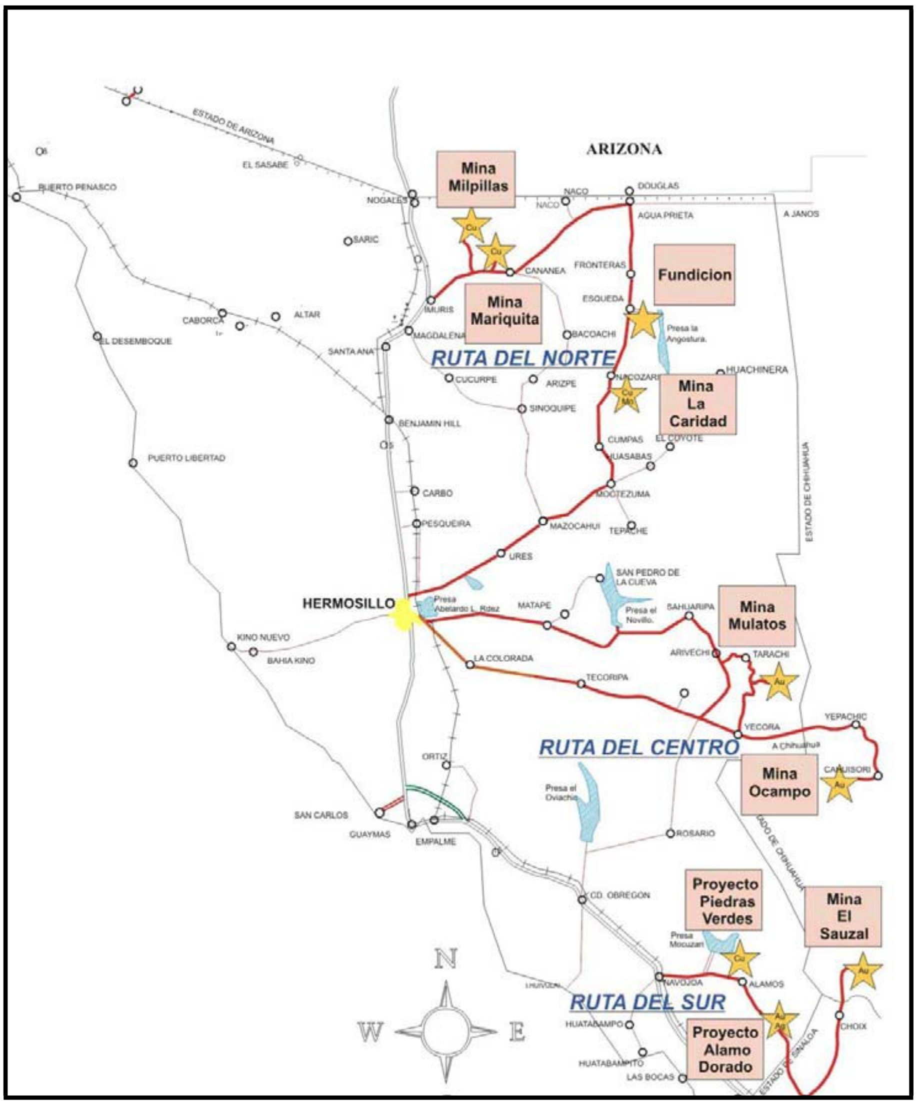


Figure 5-1 Mulatos Property Accessibility

5.2 Physiography

The project is located in the Sierra Madre Occidental mountain range. Topographic relief is often abrupt with steep-sided V-shaped valleys that form rugged canyons, and locally, cliffs hundreds of meters high. The Mulatos district is situated in the Basin and Range physiographic province with predominantly north to northwest trending block faults and related structures. In general, the topographic relief increases toward the east. The lowest project elevation is 950 meters above sea level at the Mulatos River, 1.5 kilometres east of the Mulatos open pit. Average project elevation is 1,400 meters with peaks rising to 1,700 meters.

The Mulatos River is the primary drainage in the area, with flow throughout the year. It is located about 1.5 kilometres east of the Mulatos pit and directly between the now mined-out Victor and San Carlos open pits. Secondary drainages in the area are typically intermittent. Numerous springs and seeps, used by local ranchers for watering livestock, exist in the area. Vegetation consists mainly of oak and mesquite trees along with numerous types of cacti. Ponderosa pine grows at higher elevations.

5.3 Climate

Annual temperatures vary from -12^{o} to 48^{o} C with a mean of 19^{o} C. Night-time summer low temperatures are typically 15^{o} to 20^{o} C, and winter nightly lows are 0^{o} to -12^{o} C range. Snow can occur on surrounding mountains.

Average annual rainfall is 817 millimeters, mainly occurring from June through September. Light rains may occur during the late fall and early winter, with dry conditions generally prevailing from February to June. During the summer rainy season, the wind blows to the northwest 50 percent of the time and to the southwest or southeast during the remainder of the year. The wind generally reaches a moderate intensity of about 15 to 20 kilometers per hour in the late afternoon.

6 HISTORY

6.1 Pre-Alamos (Prior To 2001)

The Mulatos district was first discovered in 1635 by Jesuit priests. The area saw considerable activity by various groups throughout the 1800's and 1900's. The owner of the first registered claim was Thomas Suza, in 1806. Succeeding owners include N.Y. Ancheta and Ramon Bringas in 1821 and Mr. Ortese in 1863. In 1869, the property was bought by the Aguayo brothers. In 1887, they sold it to Hobart and Hayward of San Francisco, California. After a long lawsuit, the property was given to the Rey del Oro Mining Company in 1890 and later transferred to Greene Gold Silver Company, which mined some of the claim ("Mina Vieja") until the Mexican Revolution in 1910. Numerous reports were written between 1827 and 1960 concerning the Mulatos district.

Companies that have been interested in the district after 1960 include Phillips Petroleum in 1962, Theodore A. Dodge in 1963, Cannon Hicks Associates in 1972, Tormex Developers in 1973, Explomin S.A. de C.V. in 1974 (formerly part of Minera Real de Angeles), Homestake Mining Company in 1975, British Petroleum in 1982, Papanton Minas in 1984, and Kennecott in 1990. Kennecott conducted exploration activities on the ground surrounding the Nuevo Mulatos and Tequila claims (claims where the Mulatos pit is located) for several years. Their efforts focused on the El Victor- San Carlos area as well as the area immediately surrounding the Nuevo Mulatos claim.

Minera Real de Angeles ("MRA") acquired the Nuevo Mulatos claim in 1986 and carried out extensive exploration activities. MRA culminated their efforts with a pre- feasibility study in 1990. Placer Dome, Inc. ("PDI") acquired full ownership of the claims from MRA in 1993. Subsequently, PDI and Kennecott entered into a joint venture agreement covering the Mulatos deposit and 34,000 hectares of surrounding land. PDI functioned as the developer and operator with a 70 percent interest. Exploration work was conducted by Placer Dome Exploration ("PDX"), a subsidiary of PDI, and Empresa Minera Can-Mex, S.A. de C.V. ("Can-Mex"), a subsidiary of PDX. PDX conducted extensive exploration in the Mulatos deposit area and reconnaissance exploration on the remainder of the land position from 1993 through 1997, resulting in a feasibility study and a positive mine construction decision at Mulatos in 1997. Additional exploration work, undertaken in the mid/late 1990's, resulted in the identification of numerous exploration targets that were the site of sporadic work. PDX suspended all exploration and development activities in the district in the second quarter of 1999.

6.2 Alamos

6.2.1 Period 2001 To 2003

In 2001 National Gold Corporation ("National"), through its Mexican subsidiary Minas de Oro Nacional, S.A. de C.V. ("MON" - formerly O.N.C. de Mexico, S.A. de C.V.) acquired a 100 percent interest in the Mulatos Property from Minera San Augusto, S.A. de C.V. ("MSA") a PDI subsidiary, for cash and a sliding scale Net Smelter Royalty in favour of MSA on the first two million ounces of gold. This royalty was later purchased by Royal Gold Inc. Alamos Minerals ("AM") then optioned 50 percent of the assets by being responsible for exploration and other expenditures. In 2003, AM and National merged to form Alamos Gold Inc. (Alamos). Alamos, through its wholly owned Mexican subsidiary MON owns 100 percent interest in the Mulatos Property.

Between the years 2001 and 2003 limited exploration work was performed by National, AM and Alamos with the Mulatos deposit and surrounding areas remaining, at the time, the only focus of work.

6.2.2 Period 2004 To Present

MRA acquired the Nuevo Mulatos concession in 1986 and carried out extensive exploration activities, including the drilling of 121 reverse circulation holes for a total of 20,688 meters, 11 diamond core holes for a total of 1,928 meters, and driving 1,061 meters of exploration drifts from which bulk samples were taken. MRA completed a pre- feasibility study on the property in 1990. As part of that study, MRA calculated a log normally kriged Mineral Resource of 15.5 million tonnes grading 1.83 g/t gold at a cut-off grade of 1.0 g/ gold. Note that the MRA resource numbers are non-NI 43-101 compliant and are provided for information only.

After purchasing the claims from MRA and entering a joint venture with Kennecott, PDI completed over 75,000 meters of drilling. PDI on behalf of the Placer Dome/Kennecott consortium completed a feasibility study in June 1997. The Mineral Resource was 83 million tonnes grading 1.04 g/t gold at a 0.50 g/t gold cut-off. The Mineral Reserves were 49.7 million tonnes grading 1.23 g/t gold. Placer Dome updated this study in 1999-2000 with a new Mineral Reserve of 43.5 million tonnes grading 1.59 g/t gold. Behre Dolbear, of Vancouver, British Columbia, Canada, reviewed PDI's work in January 2001 for National Gold and produced a qualifying report just before the NI 43-101 rules were implemented. Many of Behre Dolbear recommendations have been followed in the work for the 2004 Alamos Feasibility Study.

In September 2002, Pincock Allen and Holt ("PAH"), of Denver Colorado did a preliminary assessment and scoping study for the Estrella (pit) development alternative for the Mulatos deposit. In it the Mina Vieja and Escondida, the Northern parts of the Placer Dome pit, were eliminated with the new smaller pit called "Estrella", which was to operate at 17,500 tonnes per day.

In 2004, M3 Engineering and Technology Company (M3) of Tucson completed a detailed feasibility study and NI 43-101 Technical Report for the Estrella Zone entitled "Mulatos Feasibility Study Phase 1 - Estrella Pit". The 2004 Feasibility Study identified that the exploration programs completed by Alamos, PDI, Kennecott and Minera Real de Angles had delineated measured and indicated (M&I) resources of 62.2 million tonnes (Mt) at 1.51 g/t (g/t) gold and 0.6 g/t silver, totalling 3,020,000 ounces of gold and a relatively small amount of silver. These resources were only contained in the Estrella, Mina Vieja, and part of the Escondida areas of the Mulatos deposit. The Gap, El Victor, and San Carlos portions were not included in this determination of resources and were not used for economic evaluation. The Mineral Reserves were calculated to be 36.4 million tonnes averaging 1.64 g/t, presented at a 0.8 g/t gold cut off.

Construction began on the Mulatos Mine heap leach facility (for processing Estrella "Ore") in the third quarter of 2004. The first gold pour occurred in July 2005 and by December of the same year the major components of the mine were in place including the gold recovery plant, Phase 1 of the leach pad, and facilities to accommodate 250 full-time workers. Construction and commissioning were substantially completed in December 2005. In subsequent years Alamos continued improvement to and expansion of the Mulatos mine. Alamos continued exploration work on targets defined by the previous operator.

The Mulatos Property consists of the Mulatos deposit area, which includes the Estrella, El Salto, Mina Vieja, Escondida, Gap, El Victor, San Carlos, and Puerto del Aire zones, and a minimum of six satellite gold systems known as El Halcon, La Yaqui, Los Bajios, El Jaspe, Cerro Pelon, and El Carricito. Numerous smaller areas of hydrothermal alteration like those known to host gold mineralization at Mulatos are also present in the district which were also subject of sporadic exploration in the past, but which are now being systematically re-evaluated by Alamos.

Since production commenced on the Mulatos Property in 2006, numerous milestones have been reached, including:

- In 2010 the processing rate was increased to 13,500 tpd.
- In 2013 the processing rate was increased to 17,000 tpd.
- The Escondida high grade zone was mined from 2012 to mid 2014. Ore was processed through a purpose built milling facility.
- El Victor, an open pit mine within the Mulatos mining area, was mined from 2014 to 2021. Ore was placed on the main Mulatos heap leach pad.

- The San Calos underground mine was mined from 2014 to 2017. Ore was milled in the milling facility originally constructed for Escondida, after some modifications.
- San Carlos, an open pit mine within the Mulatos mining area, was mined between 2018 and 2021. Ore was placed on the main Mulatos heap leach pad.
- Yaqui Phase 1, an open pit with a crushing and leach pad facility was mined from 2017 to 2019. Loaded carbon was processed at the Mulatos ADR facility.
- Cerro Pelon, an open pit and crushing facility, was mined from 2019 to 2021. Ore was placed on the main Mulatos heap leach pad.
- In 2019, the Mulatos Property produced its two millionth ounce of gold. With this milestone the sliding scale royalty to Royal Gold Inc. met it payout obligations and was terminated.
- The La Yaqui Grande project, consisting of an open pit, crushing facility, and heap leach pad, was commissioned in June 2022 and is expected to operate through 2027. Loaded carbon is being processed at the Mulatos ADR facility.
- A project development plan is currently being put together for the PDA, Gap, Victor, and Estrella underground deposits, collectively know as the Puerto del Aire underground project. It is anticipated that the Puerto del Aire ore will be processed through the same mill as was used for the Escondida deposit and the San Carlos underground mine.

Throughout the developments outlined above, the main Mulatos open pit continued to be mined. Distinct Zones mined between 2006 and 2023 within the main Mulatos pit have included the Estrella, Escondida, Mina Vieja, and El Salto deposits. The last remaining zone, El Salto, is expected to be completed in late 2023.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

Arc magmatism swept eastward across the Sonora in Mexico from Late Cretaceous to early Cenozoic time (known as Laramide magmatic arc) coinciding with the subduction and flattening to the Farallon plate in North America (Dickinson, 1981). Laramide magmatism resulted in extensive volcanism that deposited thick sequences of andesitic to dacitic lava and pyroclastic flows, interbedded with volcaniclastic rocks, contemporaneous with the emplacement of granitic plutonic rocks from 71 to 50 Ma (mega annum or million years ago) (McDowell et al., 2001; Gonzalas-Leon et al., 2011). This volcanic sequence was named the Tarahumara Formation in Sonora (Wilson and Rocha, 1949).

The Sierra Madre Occidental (SMO) volcanic province in western Mexico represents one of the largest silicic volcanic provinces on Earth (Figure 7-1A; Byran and Ferrari, 2013). Four volcanic rock packages define the northern part of the SMO volcanic province in eastern Sonora:

1) The Late Cretaceous-early Eocene Tarahumara Fm (~90-55 Ma),
2) The first episode of explosive rhyolitic volcanism from late Eocene to early Oligocene (~36-32 Ma) and the initial phase of the “ignimbrite flare-up”,
3) A bimodal volcanic sequence of basaltic-andesite lava flows and rhyolitic pyroclastic rocks (~29-25 Ma), and
4) The second episode of explosive rhyolitic volcanism or “ignimbrite flare-up” from late Oligocene to Miocene in the southern part of the SMO (McDowell et al., 2001; Ferrari et al., 2007).

The Tarahumara Formation in eastern Sonora is the oldest volcanic rock package in the SMO and lies atop pre-Tarahumara basement rocks from Proterozoic to early Cretaceous age (McDowell et al., 2001; Gonzalas-Leon et al., 2011). The Tarahumara Fm is composed predominately of andesitic to dacitic lava flows interbedded with volcaniclastic sediments, and minor rhyolitic pyroclastic rocks. Early Eocene rhyodacitic crystal-rich tuffs with fiamme conformable with porphyritic dacitic rocks crop out in the Mulatos district in eastern Sonora. These ash flow tuffs were previously considered flow units in the Upper Volcanic Series but belong to the Tarahumara Fm. In the Mulatos district of the eastern Sonora region, the Tarahumara rocks are known traditionally as the Lower Volcanic Series.

In the northern part of the SMO, Late Eocene to early Oligocene rhyolitic ignimbrites and ashfall tuff deposits erupted atop an erosional hiatus of ~20 million years that overlies the Tarahumara Fm. This was followed by a bimodal volcanic sequence with effusive fissure eruptions of Oligocene basaltic-andesites interbedded with conglomerates and rhyolitic tuff. These fissure eruptions were initiated by the onset of Basin and Range extensional tectonics from 27-16 Ma (Ferrari et al., 2007; Ferrari et al., 2013). In the Mulatos district of the eastern Sonora region these rhyolitic tuffs and basaltic lavas are known traditionally as the Upper Volcanic Series.

Basin and Range extensional tectonics dominant the regional structural fabric. Major northwest-striking normal faults bound grabens and half-grabens that are rotated 20°-30° NE and ENE, and in some local sites, half-grabens are rotated 20° SW and WSW (Ferrari et al., 2007 and 2013). The Mulatos district in the northern SMO straddles the northern part of an unextended core in the SMO (Figure 7-1A) where the youngest rocks are exposed and flat lying concealing older rocks below. Extensional tectonics affected only the margins of the SMO leaving a central core unextended (Ferrari et al., 2007).

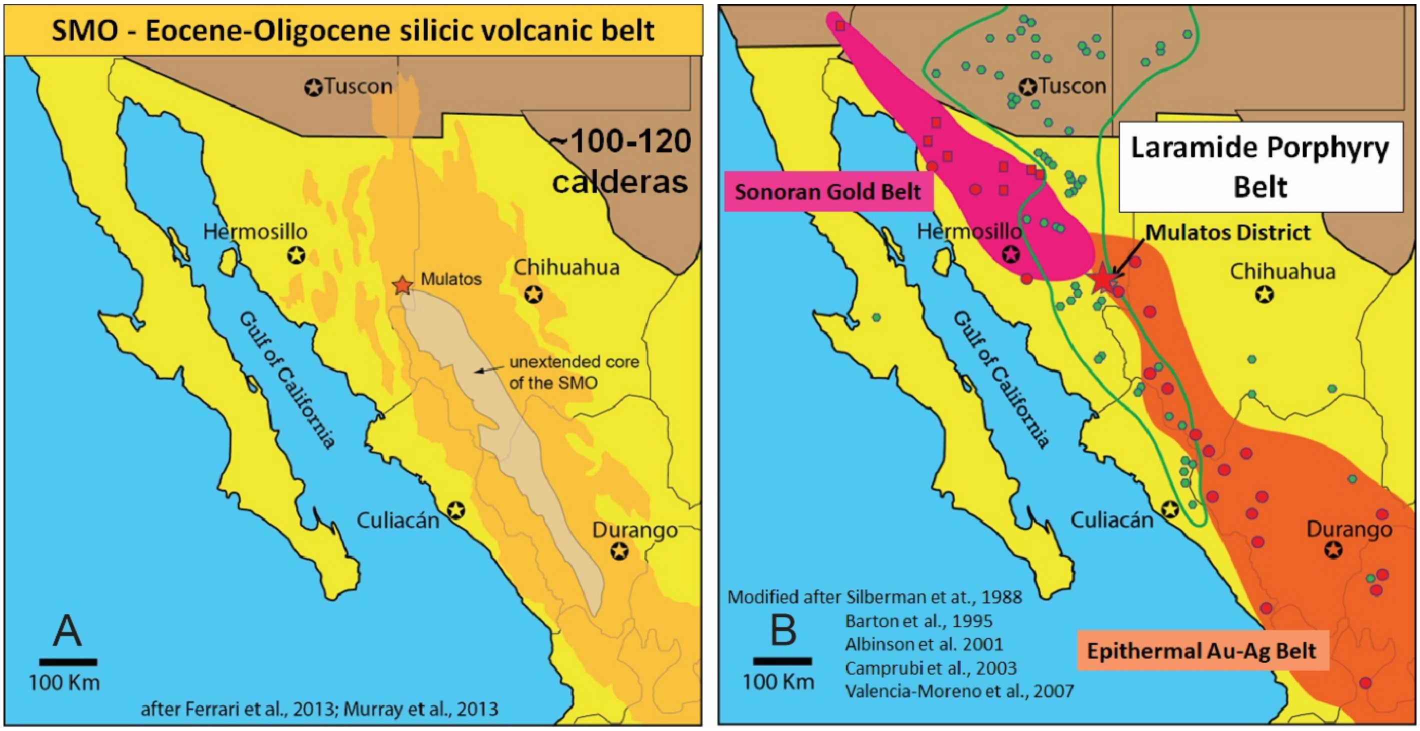


Figure 7-1 Location Map for Mulatos in Northwest Mexico.

Notes:

- *(A) Mulatos is situated at the NW end of a belt of Eocene-Oligocene silicic volcanic rocks in the SMO, NW Mexico; on the north end of the unextended core of the Mexican Basin and Range province.*
- *It's predicted that this silicic volcanic belt represents eruptions of 100-120 calderas. Silicic volcanism was both pre- to syn-rift eruptions. Modified after Ferrari et al., (2013); Murray et al., (2013);*
- *(B) Mulatos is at the intersection of two major gold belts (the Sonoran and epithermal Au-Ag belts) and the Laramide porphyry belt.*
- *Source: Modified after Silberman et al., (1988); Barton et al., (1995); Albinson et al., (2001); Staude and Barton, (2001); Camprubi et al., (2003); Valencia-Moreno et al., (2007).*

7.2 District and Property Geology

The Mulatos district is situated at the northwest end the SMO volcanic province in eastern Sonora, Mexico at the north end of the unextended core of the Mexican Basin and Range province. Mulatos is at the intersection of two major gold belts (the Sonoran gold belt and the Mexican epithermal Au-Ag belt) and the Laramide porphyry belt (Figure 7-1B).

The Mulatos district geologic setting has been described previously by geologic work conducted by Kennecott and PDX in the 1990`s, Staude (1995), and numerous Alamos technical reports related to the development of Estrella, Mina Vieja, Escondida, GAP, PDA, Victor, and San Carlos deposits (Austin et al, 2004; Escondida technical report, May 20, 2009; Alamos 43-101, 2010; Mulatos Project - Technical Report Update, 2012, and Balleweg, 2018). Since 2015, extensive geologic mapping combined with radiometric dating, petrography, and geochemical analyses has increased the understanding of the district geology presented in Figure 7-2, Figure 7-3, Figure 7-4, and Figure 7-5 and discussed below.

Volcanic rocks in the Mulatos district include three compositionally and temporally distinct rock packages (Longo et al., 2020).

1) The upper Cretaceous to lower Eocene Tarahumara Formation Laramide volcanic sequence (75-54 Ma) is subdivided into three Members.

    a) The Lower Mulatos Andesite Member (75-62 Ma),

    b) The Upper Mulatos Dacite Member (61-58 Ma), and

    c) The Estrella Rhyodacitic Tuff Member (55 Ma).

2) The Tarahumara Fm is overlain unconformably by the upper Eocene to lower Oligocene rhyolitic ignimbrite sequence named the Nopal Rhyolite Tuff (36-32 Ma).

3) The Oligocene Upper Bimodal volcanic sequence contains the youngest volcanic rocks at Mulatos (29-25 Ma) and consist of interbedded basaltic-andesite lavas, rhyolitic tuffs, and conglomerates.

Plutonic rocks include Laramide age granodiorites that intruded the Tarahumara Fm and yielded upper Paleocene isotopic ages of 58-56.8 Ma in the central part of the Mulatos district. Other granodiorites in the region range in age from 62.8-56.7 Ma (Valencia et al., 2001; McDowell, 2007).

7.2.1 District and Property Alteration and Mineralization

The majority of Mulatos economic mineral deposits are high-sulfidation, epithermal gold deposits hosted within the Upper Mulatos Dacite Member of the Tarahumara Fm. These deposits are associated with large zones of magmatic-hydrothermal alteration characterized by advanced argillic cores and expansive argillic haloes that covers more than 100 square kilometers.

High-sulfidation epithermal deposits develop in zones of quartz-rich alteration and ore minerals with high sulfur contents. Broad zones of advanced argillic alteration are characteristic with alunite and quartz ± pyrophyllite ± diaspore and dickite at relatively low formation temperatures of ~150-350ºC. Conditions of the hydrothermal fluid are highly acidic, oxidized, and sulfidized (SO_2-rich). These acidic fluids enhance the permeability and create fluid flow pathways with the development of residual vuggy quartz for the later gold deposition.

High-sulfidation alteration and associated gold mineralization in the Mulatos district varies from deposit to deposit.

1) The *La India deposits* feature quartz-dickite ±alunite with gold that zones outward to quartz-kaolinite and illite-smectite. Residual vuggy quartz and pyrophyllite are rare to absent.

2) In contrast, residual vuggy quartz with gold is common at *La Yaqui Grande* deposit and zones outward to quartz-dickite ±alunite, quartz-kaolinite, and illite-smectite±chlorite. Coarse alunite is present on fractures in ore zones, and patchy quartz-alunite is found locally at depth (patchy alunite is considered an indication of the epithermal-porphyry transition, cf., Gustafson et al., 2004), pyrophyllite is absent. Advanced argillic quartz-dickite-alunite alteration provides significant gold resource at La Yaqui Grande.

3) At *Mulatos*, the Estrella-Escondida deposits feature residual vuggy quartz and quartz-dickite-pyrophyllite with gold. Whereas Mulatos Far East at San Carlos features quartz-pyrophyllite-dickite-kaolinite with gold, and vuggy quartz is absent.

Two $^{40}Ar/^{39}Ar$ age determinations on hydrothermal advanced argillic alunite alteration establish the age of high-sulfidation epithermal mineralization in the Mulatos district at upper Paleocene from 57.91±0.17 Ma to 57.34±0.09 Ma. A third alunite yielded a less reliable $^{40}Ar/^{39}Ar$ total fusion age of 55.2±0.06 Ma.

High-sulfidation epithermal deposits develop in advanced argillic lithocaps with close connections, above or laterally adjacent, porphyry Cu deposits at depth (Sillitoe, 2010; Hedenquist and Taran, 2013). Porphyry Cu deposits in and peripheral to the Mulatos district have Laramide ages similar to the alunite ages. A dacite porphyry adjacent to AEM's La India's main zone "Viruela" high-sulfidation deposit yielded a $^{40}Ar/^{39}Ar$ age of 43.2 Ma and contains subeconomic Cu-Au-Mo grades (Rueda, 2014). Two Cu-Mo-W porphyry deposits ~40 km southwest of Mulatos yielded radiometric ages of 55.7 to 49.6 Ma (Barton et al., 1995; Mead et al., 1988; Valencia et al., 2001).

Mineralization east of Rio Mulatos, in the eastern part of the district known as Refugio, is characteristic of intermediate and low sulfidation (IS-LS) epithermal systems and hosted in late Eocene rhyolitic ash flow tuffs in the Nopal Rhyolite. The San Carlos IS-like Cu-Ag-Au epithermal deposit is fracture and shear controlled in the To Member of Nopal Rhyolite Tuff sequence. Mineralization is associated with pyrite-tetrahedrite±barite veinlets in zones of advanced argillic alteration with dickite-kaolinite±pyrophyillite, and high-grade gold is erratic (Balleweg, 2018). Age of IS-LS mineralization in the Nopal upper rhyolite is bracketed between the weighted mean average age of the To unit at San Carlos <36.02±0.12 Ma and older than an upper volcanic rhyolite tuff east of the Estrella pit at >29.18±0.09 Ma (Figure 7-2).

Prior to these new radiometric age data, the age of mineralization for Mulatos was bracketed between 31.6 and 25 Ma (Staude, 1995), thus temporally associated with Oligocene caldera volcanism. Dacitic flow-domes that host the gold were also assumed Oligocene. New radiometric age determinations now indicate a Laramide age for the dacitic flow-domes and mineralization that pre-date the Oligocene ignimbrite flare-up.

7.2.2 District and Property Lithology

7.2.2.1 *Tarahumara Laramide Volcanic Sequence*

The Tarahumara Fm rocks in the Mulatos district are subdivided to three members (Tla, Tud, Tplt) and discussed separately below.

Lower Mulatos Andesite Member (Tla)

The late Cretaceous to early Paleocene Tarahumara lower andesite in the Mulatos district is composed of fine-grained, trachytic-textured pyroxene±amphibole±olivine basaltic-andesite lavas and lapilli tuff interbedded with volcaniclastic sediments and rare rhyolitic crystal tuff and spheriolitic tuff. These rocks represent the oldest volcanic rocks in the Mulatos district. The lower andesite is typically hydrothermally altered from illite-smectite to propylitic. Four samples collected throughout the district yield U/Pb zircon ages that range from 75.15±0.68 Ma to 64.4±0.5 Ma.

Upper Mulatos Dacite Member (Tud)

The late Paleocene Tarahumara upper dacite in the Mulatos district is composed of medium to coarse porphyritic, high-K, high silica andesites to low silica dacites. Characteristic phenocryst mineralogy consists of 1-3% quartz, hornblende (opacite rims are common) and pyroxene. These rocks are typically crystal-rich (20-30%) and when acid leached develop residual vuggy quartz that is the most permissible host lithology for the high-sulfidation gold ore. Five samples collected throughout the district yield U/Pb zircon and $^{40}Ar/^{39}Ar$ ages that range from 61.56±0.27 Ma to 58.55±0.17 Ma.

Plutonic Rocks of the Mulatos District (Tgd)

Plutonic rocks with granodiorite compositions crop out in four localities at Mulatos that include La Yaqui, Halcon Oeste, southeast of Pelon, and San Nicolas (Figure 7-3 and Figure 7-4). Granodiorites at Mulatos are medium- to light-colored, coarse equigranular rocks that contain quartz, plagioclase, alkali feldspar with lesser hornblende and biotite. Quartz and feldspar contents range from 25-35%. Rocks are typically unaltered to weak illite-smectite-chlorite altered. Two age determinations on the Yaqui granodiorite yielded

U/Pb zircon and $^{40}Ar/^{39}Ar$ ages that range from 58.0-56.8 Ma. The preferred age for the Yaqui granodiorite is a high precision U/Pb zircon age of 58.0±0.6 Ma.

Estrella Tuff (Tplt) Member

The early Eocene Tarahumara Estrella Tuff crops out only in the southeast part of the Mulatos district, the eastern high wall of the Estrella pit, and is traditionally referred to as TPLT. The tuff overlies the upper Mulatos dacite with an unconformity that is locally recognized with a layer of conglomerate and siltstone traditionally named Tpcg. The ash flow tuff is a dacite to high silica dacite (Figure 7-2) that was elutriated and fines-depleted with up to 40% to >50% broken phenocrysts in the groundmass. The base of the flow is quartz-biotite crystal-rich and pumice-lithic poor and grades upward to a welded pumice and lapiili lithic tuff with eutaxitic texture. Phenocryst mineralogy is distinct with quartz>plagioclase>biotite ±titanite. This unit is unaltered to illite-smectite altered and does not host significant mineralization in most of the Mulatos district, however, it displays silicic alteration at Los Bajios and contains minor gold anomalies in the Mulatos mine area. It is traditionally termed Tpqz at the Mulatos mine when the base of the flow is silicic altered. Five samples collected from the southeast part of the district yield U/Pb zircon and $^{40}Ar/^{39}Ar$ ages that range from 55.4±0.5 Ma to 54.55±0.38 Ma and return a weighted mean average age of 55.00±0.32 Ma.

An unconformity with a hiatus of ~20 million years overlies the Estrella Tuff and is recognized in the eastern part of the district as a layer of polymict breccia traditionally named Tpcg (Figure 7-3).

7.2.2.2 *Nopal Rhyolite Ash Flow Tuff or Ignimbrite Sequence (Tur)*

The late Eocene to early Oligocene Nopal rhyolite, or upper rhyolite (Tur), is the product of late Eocene caldera-forming eruptions and represent the initial episode of the "ignimbrite flare-up" in the SMO of eastern Sonora. The ignimbrite package is composed of at least six texturally and temporally distinct ash flow and airfall tuffs of rhyolitic composition (Figure 7-2 and Figure 7-3; labeled To-Tj). Six samples from units To-Tk collected from the southeast part of the district yield U/Pb zircon ages that range from 36.17±0.48 Ma to 34.13±0.27 Ma. Two additional samples returned $^{40}Ar/^{39}Ar$ ages on biotite of 32.91±0.12 Ma and 31.58±0.14 Ma (Staude, 1995).

Mineralization in the upper rhyolite east of Rio Mulatos postdates the high sulfidation epithermal mineralization (~57.5±0.75 Ma, weighted mean average, N=3) and is bracketed between 36-29 Ma (see above in District Geology).

Tn Member of the Nopal Rhyolitic Ignimbrite Sequence

The lower Oligocene Tn member of the Nopal rhyolitic sequence is a porphyritic pyroxene andesite with compositions approaching trachyandesite ($K_2O+Na_2O \geq 6.5$ wt%). The andesite features 25-30% euhedral phenocrysts of plagioclase and clinopyroxene. Some plagioclase display sieve-textured cores with overgrowth rims and other feldspars have a spongy and porous texture from inclusions of glass. Clinopyroxene displays a glomeroporphyritic texture and is typically unaltered.

The Tn unit is common in the upper rhyolite sequence east of the Rio Mulatos at San Carlos and Refugio. It does not crop out district-wide and is localized to the eastern Mulatos mine area. At San Carlos, the Tn overlies mineralized To and the pyroxene is altered to chlorite and hematite, but Tn is not mineralized.

Four samples of Tn returned $^{40}Ar/^{39}Ar$ ages that range from 32.35±0.06 Ma to 31.62±0.06 Ma with a weighted mean average n=4 of 31.66±0.16 Ma. This age is significantly younger than the underlying To at ~36 Ma and the overlying Tm at 35.7 Ma suggesting that Tn may be an intrusive sill.

7.2.2.3 *Upper Bimodal Volcanic Sequence (Tuv)*

Oligocene volcanism followed the onset of extensional tectonics with a suite of bimodal slightly alkaline basaltic andesite dikes, lavas, and rhyolitic tuff interbedded with conglomerates (29-25 Ma). These rocks overlie the Nopal rhyolitic ignimbrite sequence with an Oligocene unconformity. Basaltic andesite dikes and lavas are fine-grained to aphanitic and display flow-foliated trachytic plagioclase microlites and intergranular textures with interstitial clinopyroxene and olivine.

Bimodal volcanism filled rift basins as extension progressed. Extension may have begun Late Eocene (~34 Ma) with the emplacement of fissure-related basaltic-andesite dikes. Extensional tectonics dominated from ~29-20 Ma rotating structural blocks northeast.

Five samples of basaltic andesite dikes/lava flows and one sample of an interbedded rhyolite tuff from throughout the Mulatos district yielded U/Pb zircon ages that range from 29.18±0.09 Ma to 28.22±0.13 Ma. One sample from ~20km northwest of the Mulatos mine yielded a $^{40}Ar/^{39}Ar$ age of 28.2±1.4 Ma. The youngest sample of a basaltic andesite lava flow came from Staude (1995) at 25.00±0.30 Ma east of San Carlos.

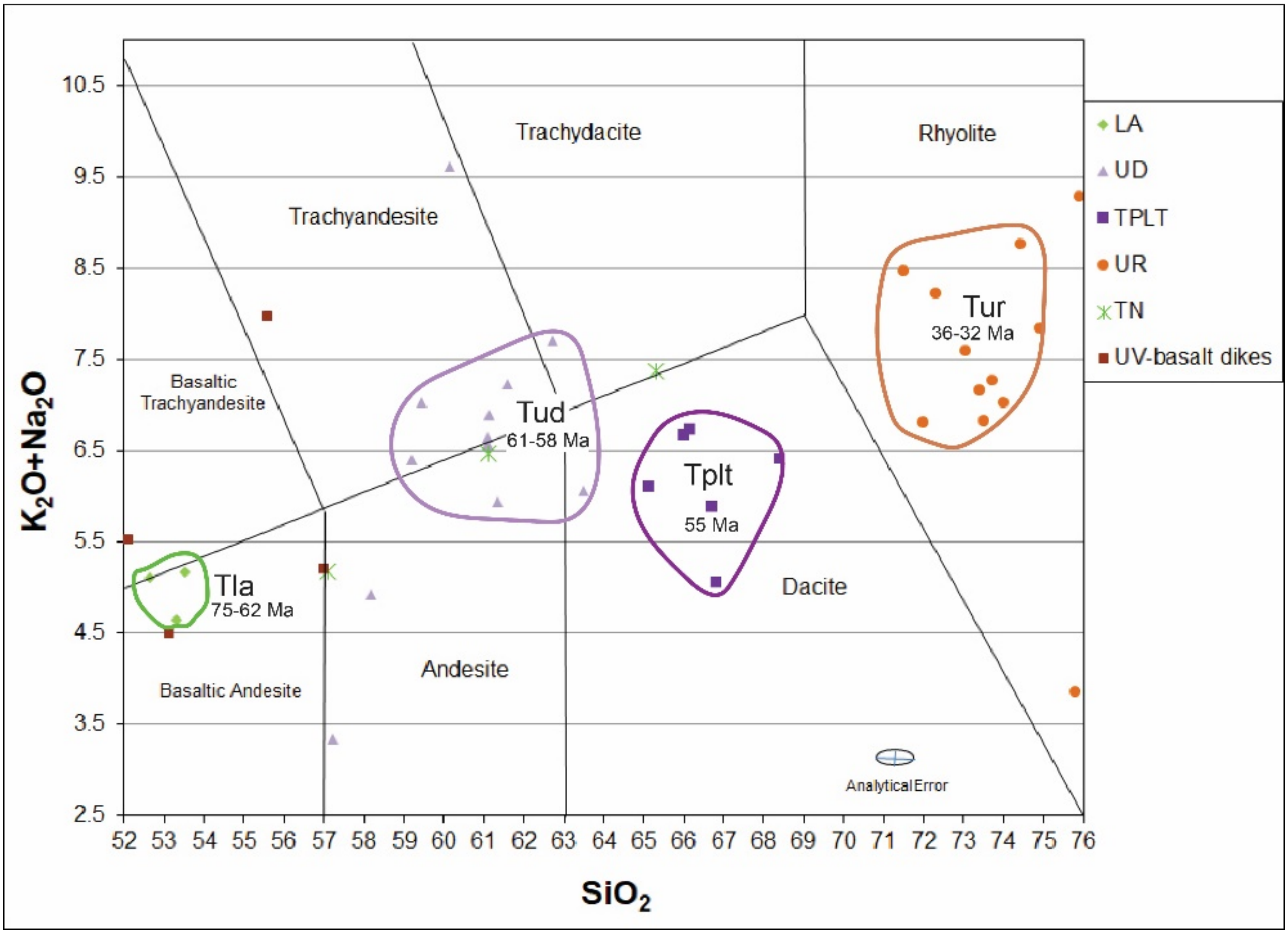


Figure 7-2 Total Alkali Silica (TAS) Diagram Showing the Compositional Variation through Time for the Mulatos Rocks.

Notes:

- *The Tn (31.7 Ma) and upper volcanic (UV) basaltic dikes (28.7 Ma) are displayed as green asterisks and brown squares, respectively.*

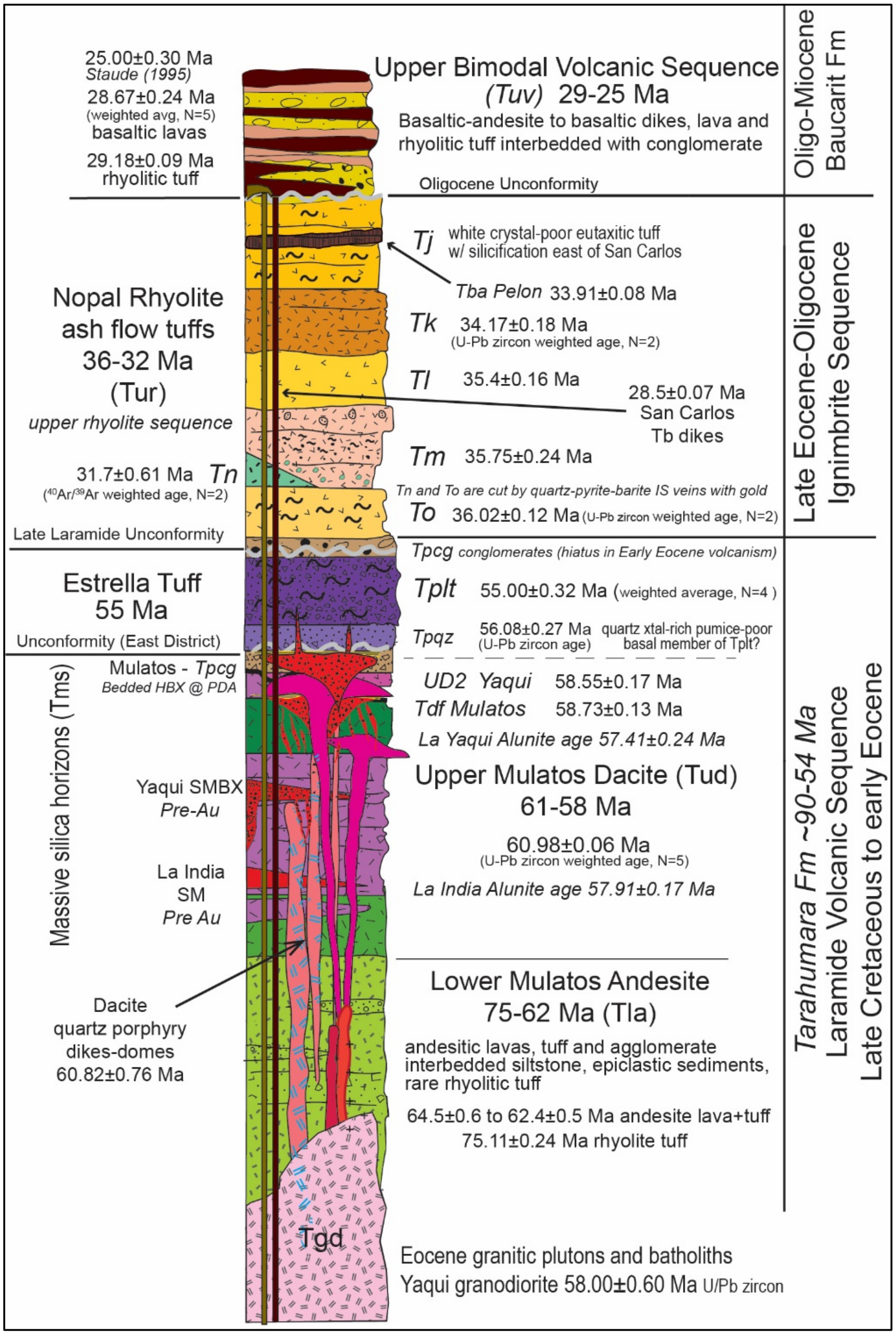


Figure 7-3 Generalized Stratigraphic Column for the Mulatos District

Notes:

- *Shows three time-stratigraphic and mineralogically distinct volcanic rock packages (~ 75 to 25 Ma).*
- *The Laramide Tarahumara Fm are the oldest volcanic rocks in the district from Upper Cretaceous to Lower Eocene age and include the lower Mulatos andesites (Tla), the upper Mulatos dacites (Tud), and the Estrella Tuff (Tplt-SE district).*
- *Youngest rocks include the Upper Eocene to Lower Oligocene Nopal upper rhyolite (Tur) sequence of ash flow tuff and the Oligocene Upper bimodal sequence of volcanic rocks (Tuv).*
- *The Estrella tuff (Tplt) is a distinct time-stratigraphic marker unit that crops out in the SE portion of the district.*
- *All high-sulfidation epithermal Au-Ag mineralization was deposited below the Estrella tuff in the Upper Mulatos Dacite*

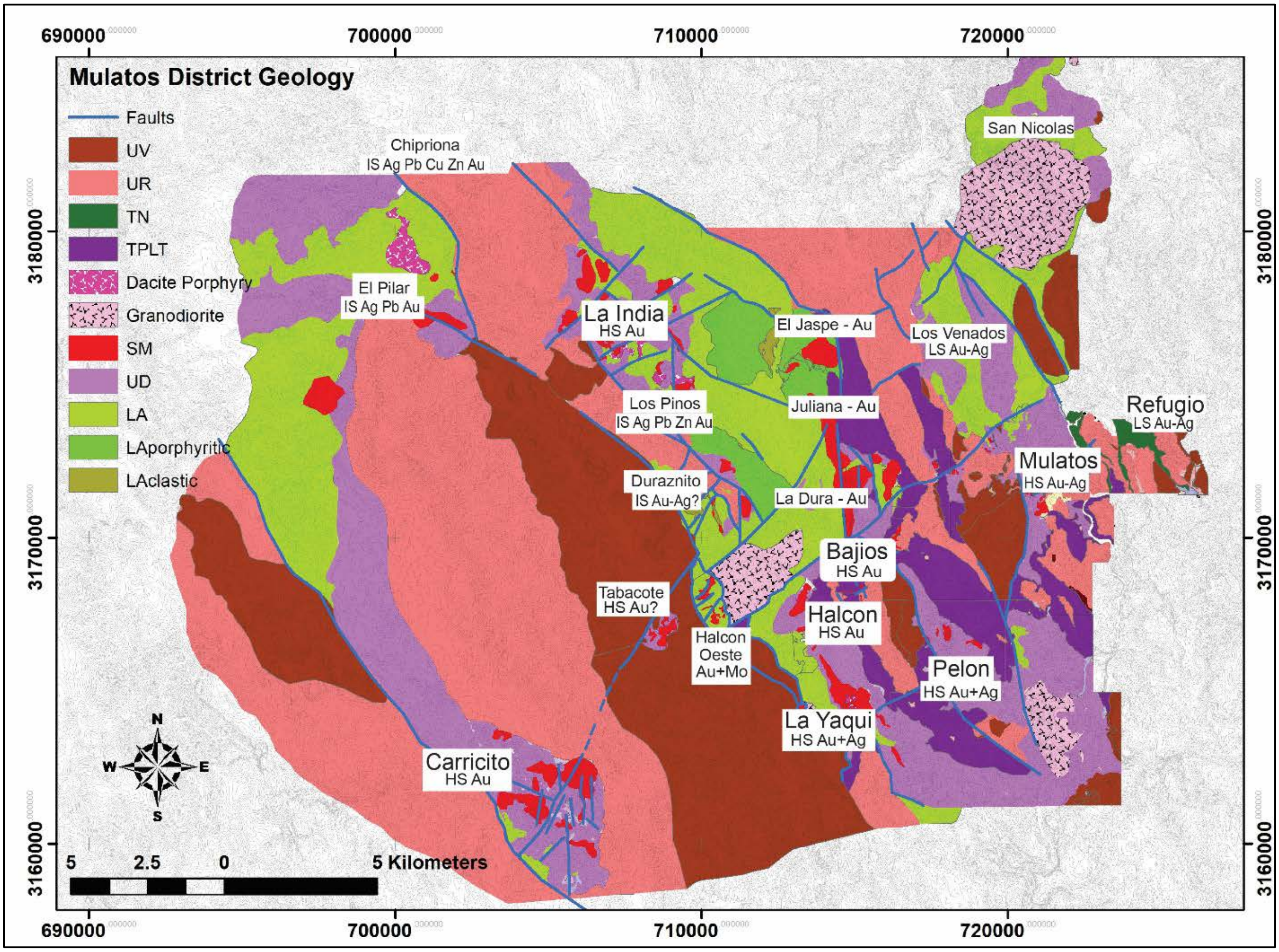


Figure 7-4 Interpretive Geologic Map of the Mulatos District

Notes:

- *Shows the significant mineral occurrences and Au-Ag deposits.*
- *Surface geology is modified from the work of numerous district geologists from 2005 to 2022.*
- *Source: Modified from Longo et al., 2022, GSN 2022 symposium presentation.*

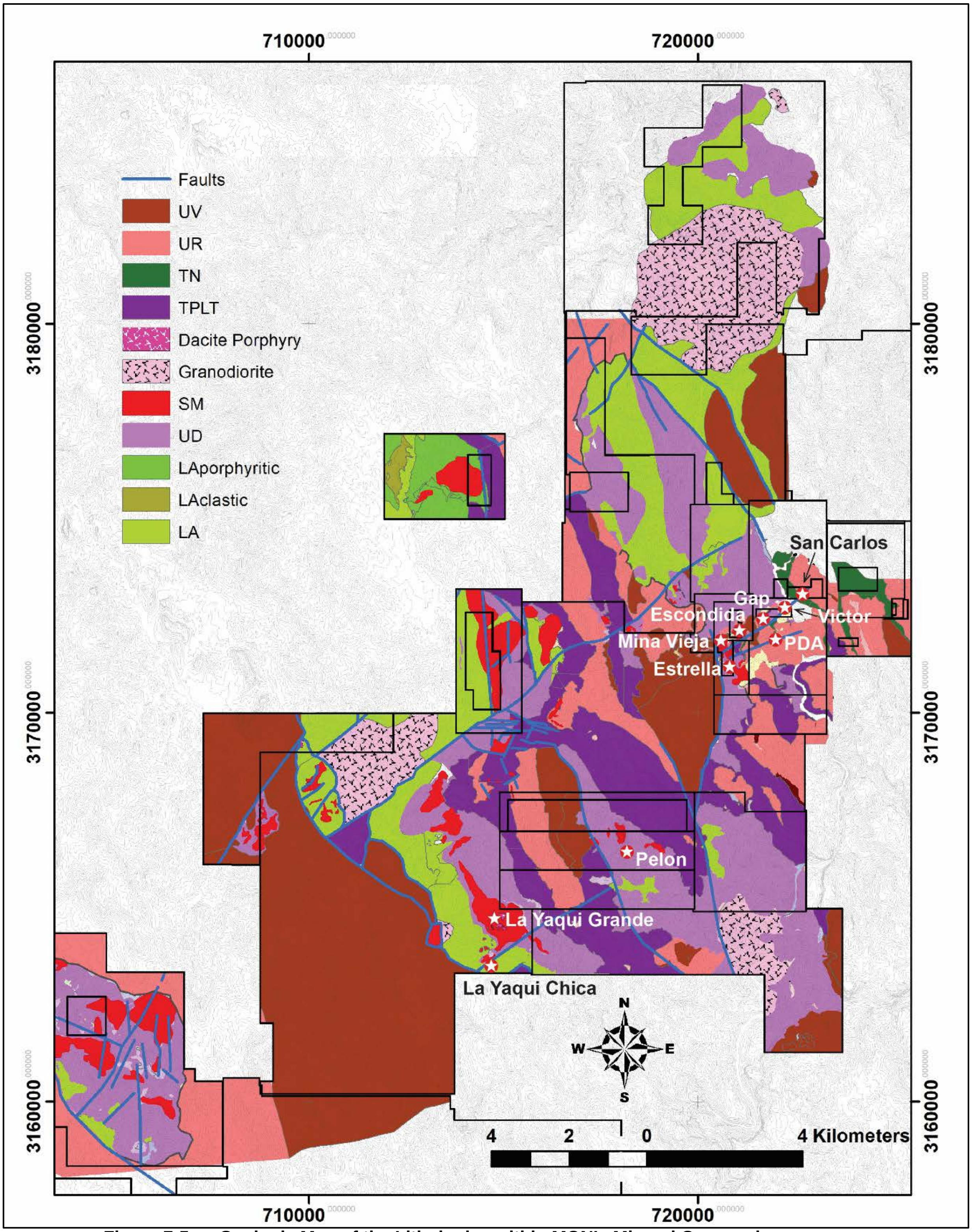


Figure 7-5 Geologic Map of the Lithologies within MON's Mineral Concessions

Notes:

- *The locations for Alamos' gold and gold-silver mines are marked with white stars.*
- *Surface geology is modified from the work of numerous geologists from Minas de Oro and Alamos Gold Corp.*

7.3 Geology and Mineralization of the La Yaqui Grande High-Sulfidation Epithermal Deposit

La Yaqui Grande (LYG) is a new discovery 9 km southwest of the Mulatos Mine. LYG is a high- sulfidation epithermal Au-Ag deposit situated on the northern end of the Mexican Au-Ag belt along the southern arm of the Laramide porphyry belt in the Sierra Madre Occidental volcanic province (Figure 7-1).

Volcanic rocks at LYG are subdivided into compositionally, texturally, and temporally distinct rock units that crop out across the Mulatos mining district (discussed above in sections 7.2.2, Figure 7-6). The Lower Mulatos Andesite represents the oldest rocks (~75-62 Ma) and consists of fine-grained andesitic lavas and pyroclastic rocks interbedded with epiclastic rocks. Upper Mulatos Dacite (~61-58 Ma) overlies Mulatos Andesite and consists of porphyritic andesite and dacitic flow-domes with related pyroclastic rocks that host the gold ore. Massive silica lies atop mineralized Mulatos Dacite and consists of stratified polymictic and silicified breccia containing massive and vuggy silica fragments (Figure 7-7). Mulatos Dacite and massive silica are intruded by Yaqui dacite porphyry (60.82±0.76 Ma), followed by emplacement of the Yaqui granodiorite (58.0±0.6 Ma). The rhyodacitic Estrella Tuff (55.01±0.13 Ma) overlies upper Mulatos Dacite and represents the final explosive Laramide eruption at Mulatos. Yaqui dacite porphyries display hydrothermal quartz alunite-dickite alteration, whereas Estrella Tuff and Yaqui granodiorite are unaltered to weakly altered with illite-chlorite-smectite. Post-Laramide late Eocene to Oligocene rhyolitic ash-flow tuffs of the Nopal Rhyolite (~36-32 Ma) overlie the Estrella Tuff with unconformity and a hiatus of ~20 million years. These rocks represent the onset of the middle Cenozoic caldera-forming ignimbrite flare up and are unaltered at LYG.

Extensional tectonics (28-16 Ma) post-date Mulatos ore and the caldera eruptions, juxtapose the stratigraphy and rotated bedding (20° to 35° ENE) exposing advanced argillic alteration below barren massive silica (Figure 7-8). Basins were filled with post-mineral Oligo-Miocene deposits of basaltic-andesite lavas (28-25 Ma) interbedded with rhyolitic tuff and well-bedded conglomerates. Basaltic-andesite dikes crosscut the advanced argillic alteration.

Gold mineralization is hosted by residual vuggy quartz and quartz-dickite-alunite advanced alteration in the upper Mulatos Dacite (Figure 7-9). This silicic alteration formed by intense hypogene acidic leaching of porphyritic rocks, below a cap of barren massive silica. $^{40}Ar/^{39}Ar$ age determinations of coarse crystalline hydrothermal alunite from LYG yielded a plateau age of 57.34±0.09 Ma, and a fine-grained alunite matrix-supported silica breccia returned total gas age of 55.20±0.06 Ma. Hydrothermal alunite is common at LYG, in contrast to pyrophyllite-dominant alteration at the Mulatos Mine.

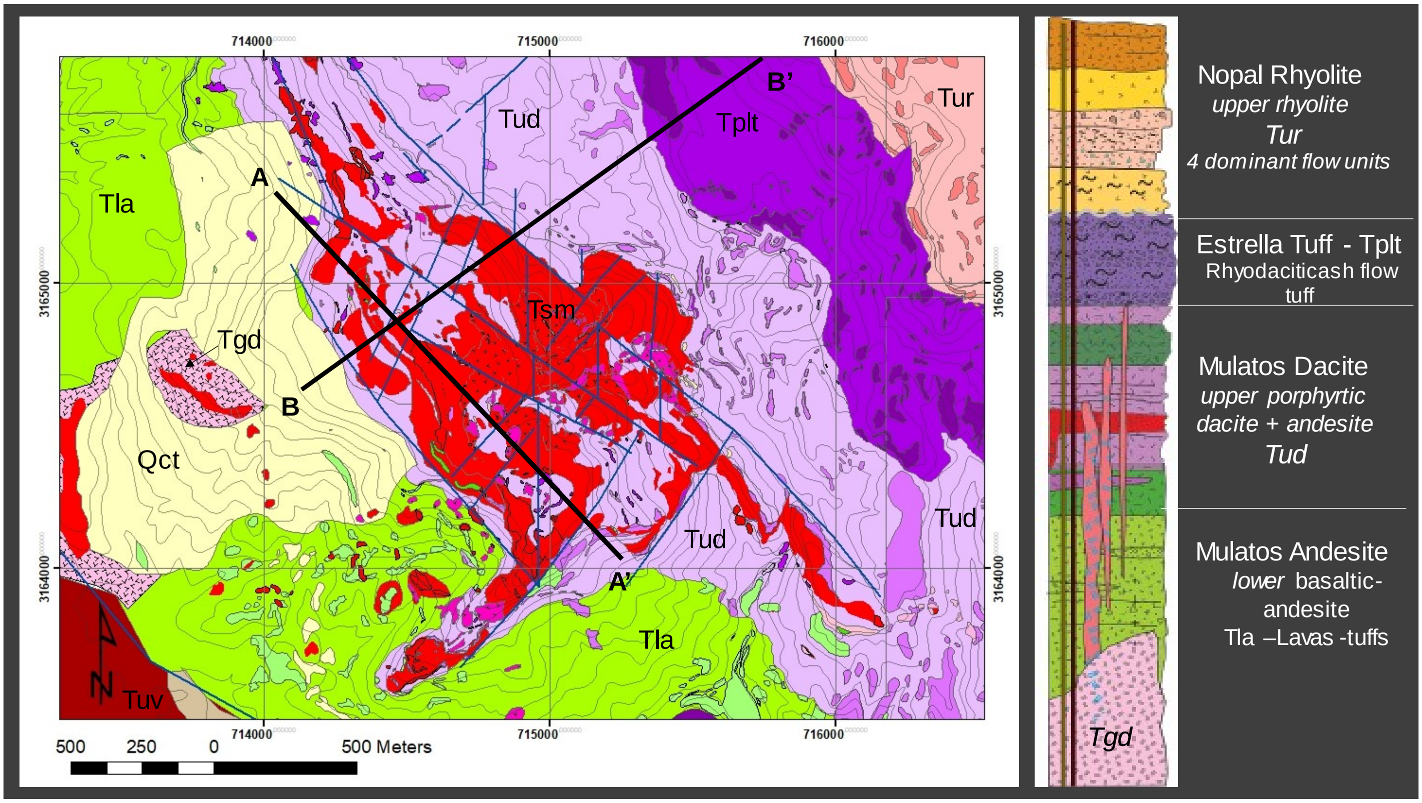


Figure 7-6 Geologic Map of the Lithologies at La Yaqui Grande

Notes:

- *Locations of cross sections A-A' (Figure 7-7) and B-B' (Figure 7-8) are shown.*
- *Geology is from Minas de Oro exploration geo4logists from 2015-2016.*
- *Source: Longo et al., 2022 GSN symposium presentation.*

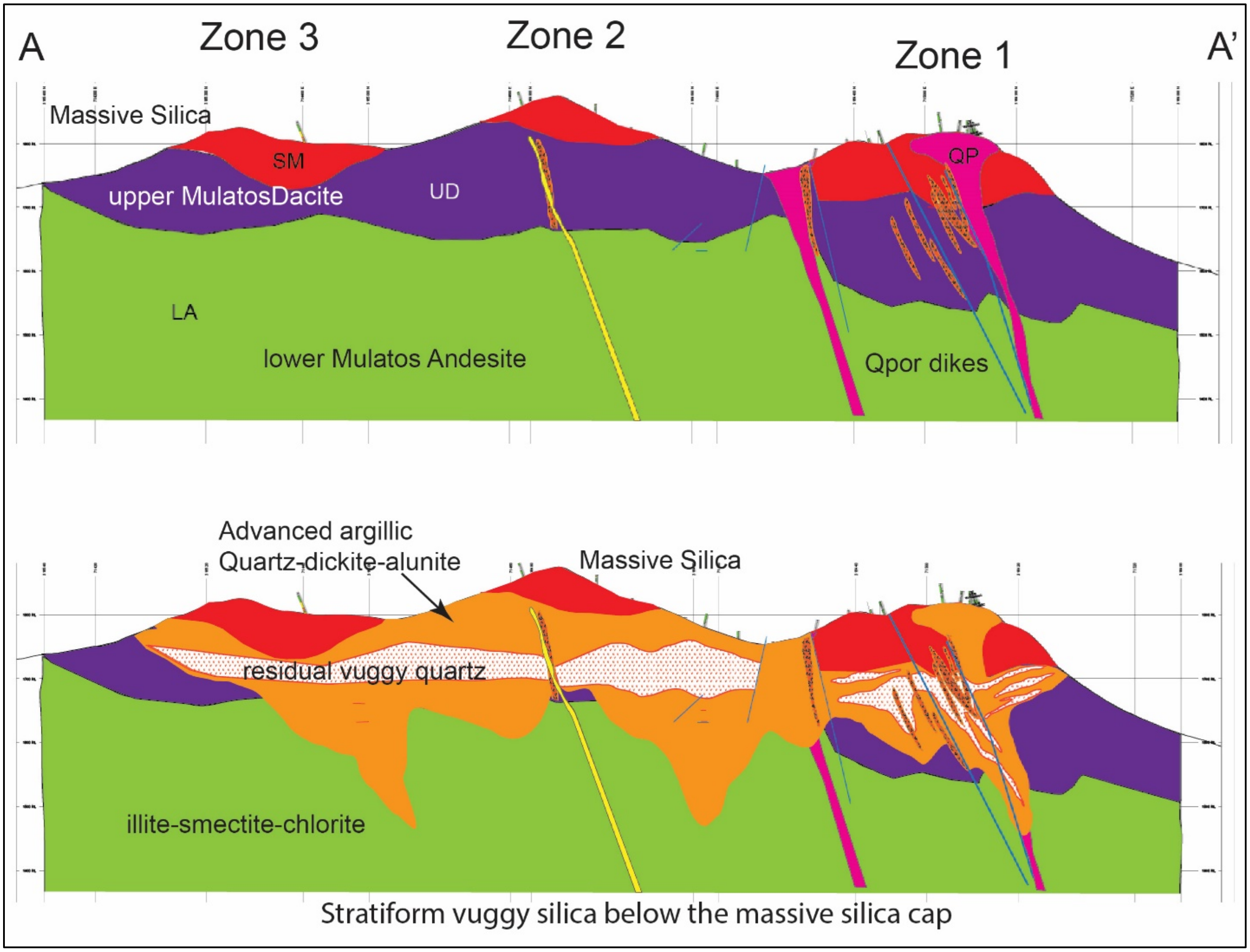


Figure 7-7 Geologic Cross Sections A-A' Showing Lithologies Above and Alteration Below.

Notes:

- *Geology is from Minas de Oro exploration geologists from 2015-2016.*
- *Source: Longo et al., 2022 GSN symposium presentation.*

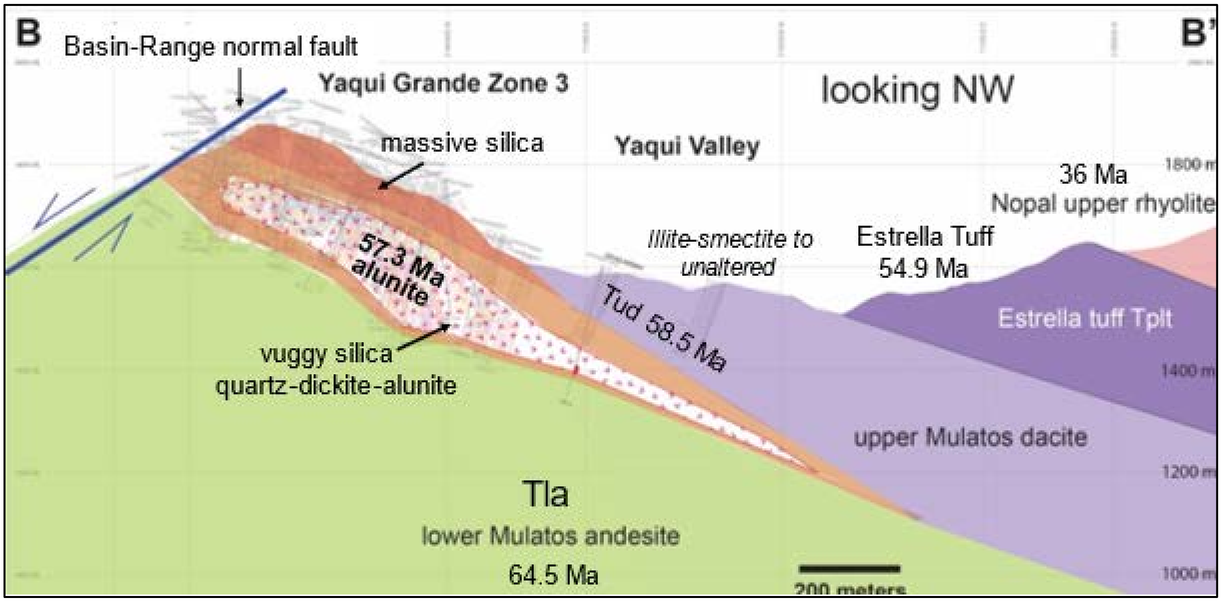


Figure 7-8 Geologic Cross Sections B-B' across LYG Showing Lithology, Alteration, and Stratigraphy

Notes:

- *Exploration discovered the advanced argillic alteration extends below unaltered upper dacite and Estrella tuff.*
- *The alunite age of mineralization is approximately 2.4 million years before the eruption of the Estrella tuff. Note the stratiform shape of the residual vuggy quartz.*
- *Vuggy quartz best develops in the medium-coarse porphyritic andesites and dacites below massive silica.*
- *Source: From Longo et al., 2022 GSN symposium presentation.*

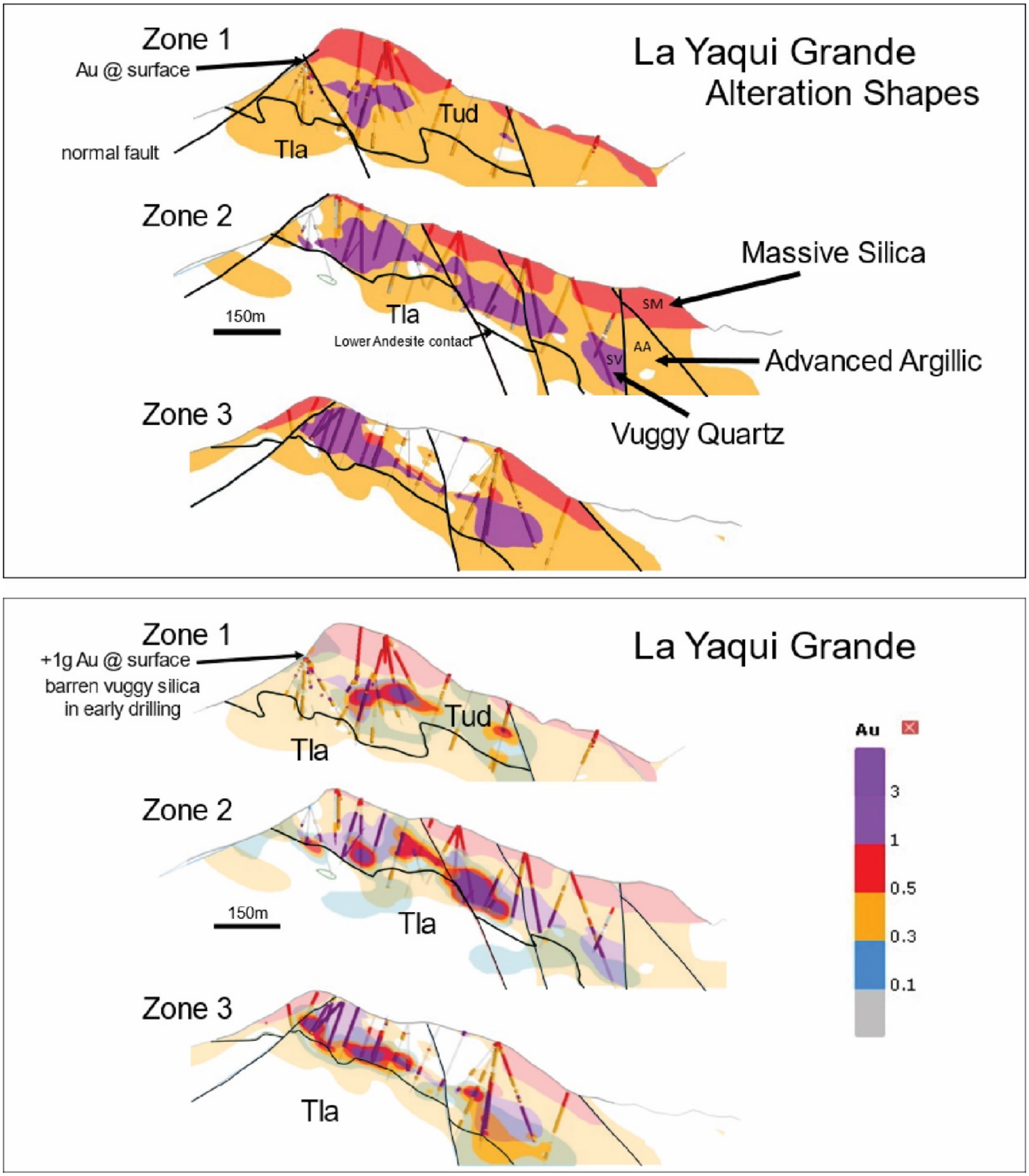


Figure 7-9 Modelled Cross Sections through Zones 1-3 of the La Yaqui Grande Deposit

Notes:

- *Shows drill hole traces with gold grades in ppm.*
- *Alteration and lithology are interpreted for each section.*
- *Gold shapes >0.5 ppm gold are shown in the section below.*
- *Highest gold grades are consistently in vuggy quartz, although significant gold is also in advanced argillic alteration.*
- *All gold ore is hosted in the upper Mulatos dacite (Tud) below the massive silica.*
- *Source: Longo et al., 2022 GSN symposium presentation.*

7.3.1 La Yaqui Grande Geophysics

Ground-based IP/resistivity and magnetic surveys delineate massive silica as sub- horizontal zones of high resistivity above zones of moderate resistivity coincident with gold- bearing vuggy quartz (Figure 7-10). Zones of low magnetics shadow the higher resistivity and extend below higher gold grades indicating deeper hydrothermal alteration in feeder zones.

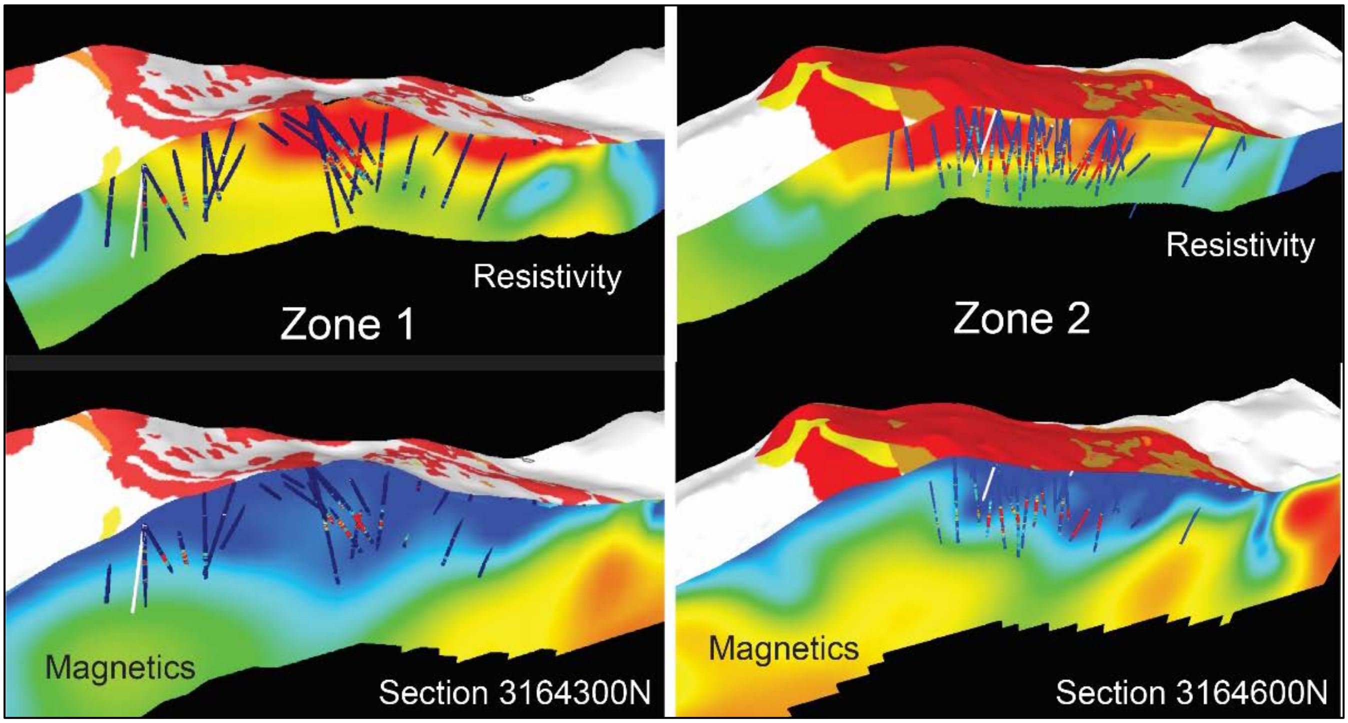


Figure 7-10 Geophysics Sections through Zone 1 and Zone 2 at La Yaqui Grande

Notes:

- *Shows both resistivity from Ip and coincident magnetics.*
- *Source: Longo et al., 2022 GSN symposium presentation.*

7.3.2 La Yaqui Grande Geochemistry

Trace metals most closely associated with mineralization at La Yaqui Grande and Cerro Pelon are Au, Ag, As, Sb, Hg, Bi, ± Sn, Ba, Te, and Pb (Figure 7-11). Gold correlates best with Ag, Hg, Sb, and Mo; and silver correlates with Au, Sb, Bi, Hg, As, and Mo. Bismuth correlates with Sb, Hg, Mo, Ba, Pb, Sn, and Te. (Longo et al., 2020). Copper displays negative correlations with the trace metals listed above. High copper up to 1% by weight, is related to late-stage enargite and covellite filling vugs in residual vuggy quartz of acid leached porphyritic andesite and dacite from the upper Mulatos dacite sequence. Anomalous copper is also focused along fractures in lower Mulatos andesite with advanced argillic alteration.

Two trace metal-rich sulfides are associated with gold and include:

1) Late ore stage pyrites; and
2) Late Ag-Bi sulfosalts. These have been recognized in both the La Yaqui Grande and Cerro Pelon deposits.

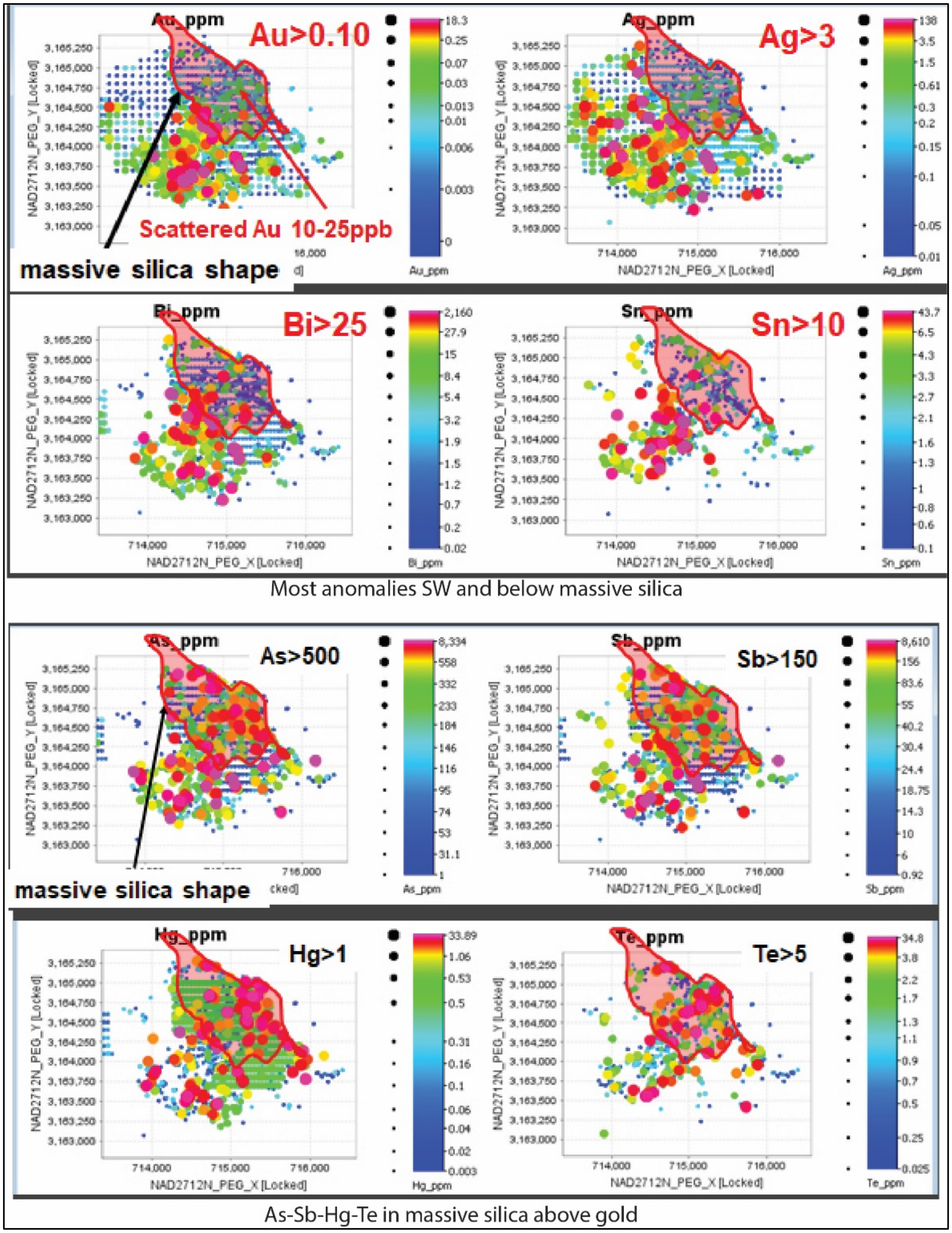


Figure 7-11 Trace Element Surface Geochemistry at La Yaqui Grande

Notes:

- *Red shape represents the massive silica body above the gold ore.*
- *Anomalous Au, Ag, Bi, and Sn are mostly found SW at lower elevations below the massive silica.*
- *As, Sb, Hg, and Te are anomalous in the massive silica and the best indicator elements for gold ore below.*
- *Source: Longo et al., 2022 GSN symposium presentation.*

7.4 Puerto del Aire

The Puerto del Aire sulphide hosted gold deposit currently consists of four zones: PDA, PDA Extension, GAP-Victor and Estrella. The deposit is located between the current Mulatos deposit and the past producing Victor Deposit (Figure 7-12). Of the four zones, PDA, is the largest, hosting 78% of the current mineral resource.

The zones are generally stratiform, dipping gently to the north-east. PDA has a strike length of approximately 1100 m and has a pinch-and-swell geometry due primary and post mineralization faulting (Figure 7-13). The zone thickness ranges from 20 m to over 120 m. GAP – Victor has a strike length of approximately 850 m and thickness ranges from 15 to 50 m.

Lithologically, the mineralization at PDA is hosted in either a porphyritic dacite unit or a phreatic breccia below the Tplt rhyolite. Alteration consists of vuggy silica in the center and advanced argillic alteration at the borders of the system. Hydrothermal breccias are centered around faults, which are interpreted as the conduits for gold.

Gold mineralization is associated with multiple alteration styles, including:

- Vuggy silica and advanced argillic alteration with dickite filling vugs and fractures,
- Advanced argillic alteration in hydrothermal breccia with a silica-dickite cement, and strong dickite in fractures, and
- Advanced argillic alteration with dickite crystals and dickite in fractures.

The best mineralization is also associated with barite infilling vugs and fractures.

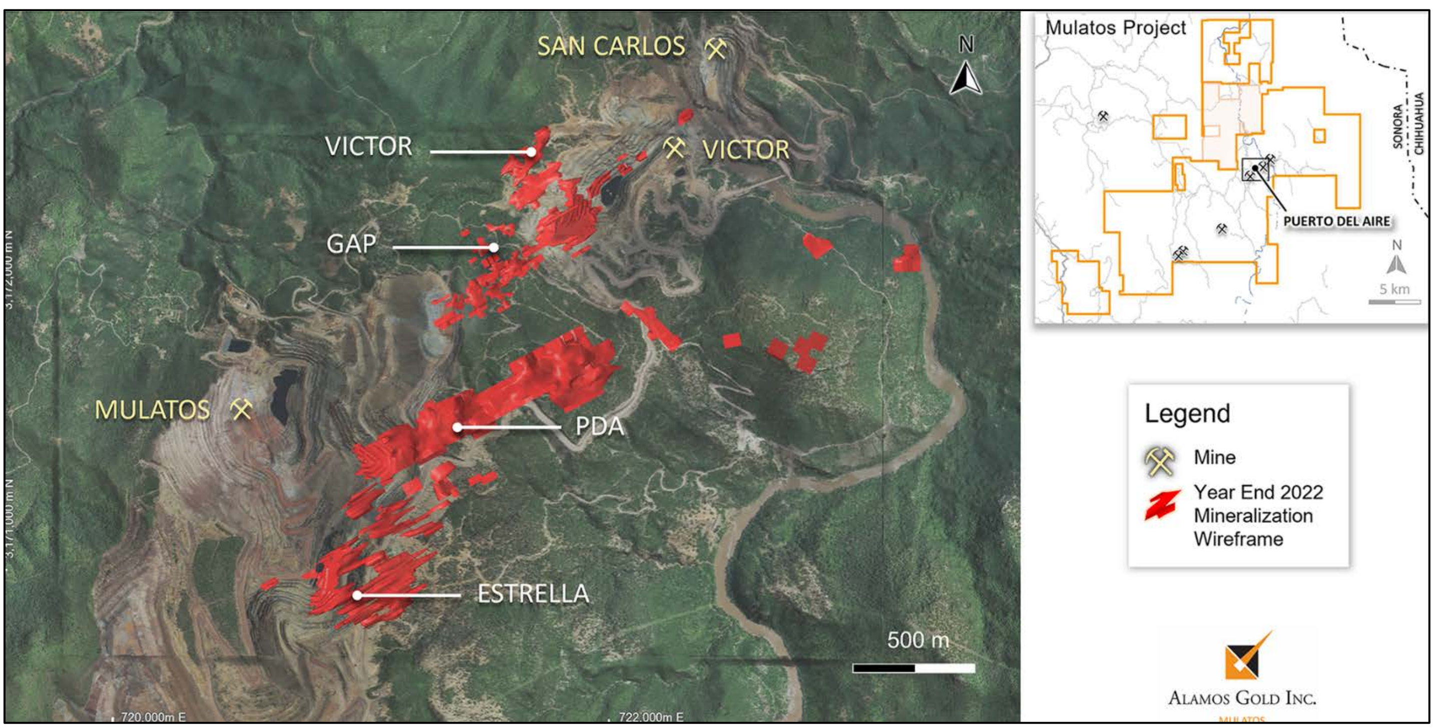


Figure 7-12 Location of the Sulphide Mineralization Zones at Puerto del Aire

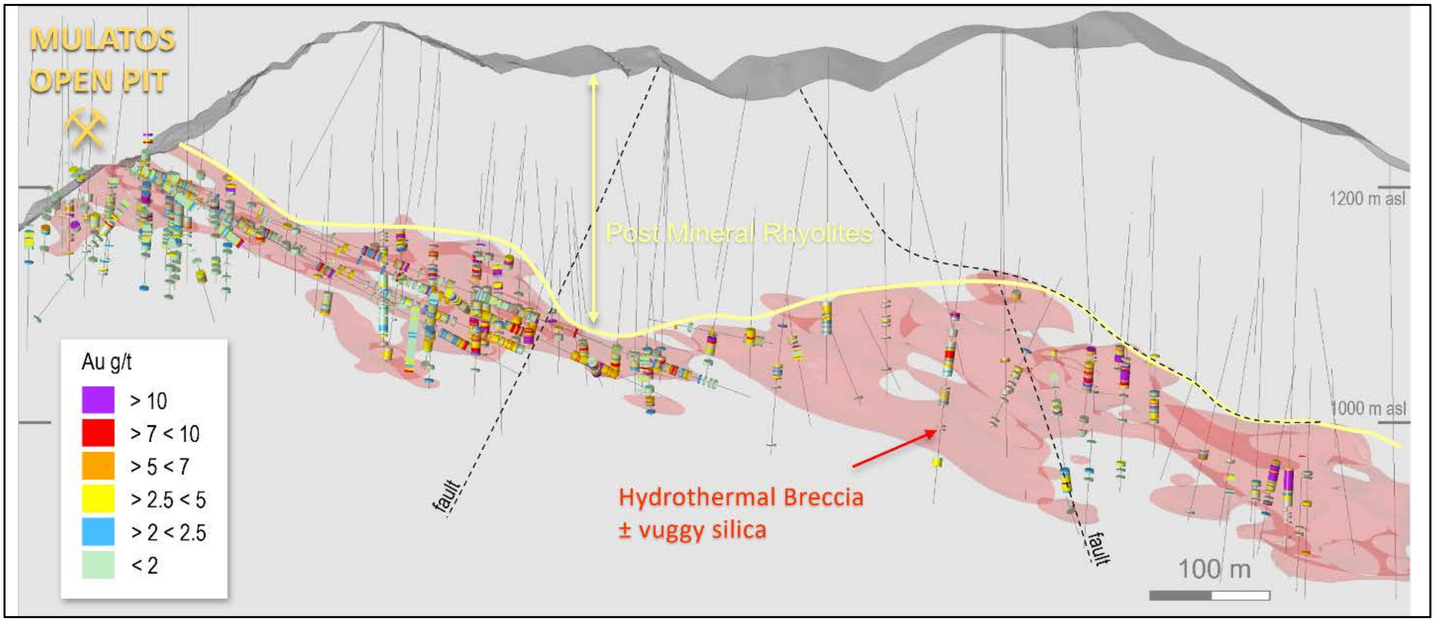


Figure 7-13 Vertical Long Section through the PDA Zone of the Deposit.

Notes:

- *Section facing northwest with a 50m window.*

7.5 Mulatos District Geologic Model

Laramide arc volcanism in the Mulatos district began during late Cretaceous ~75 Ma to lower Paleocene ~62 Ma depositing basaltic andesite lavas and tuffs with rare rhyolitic tuffs interbedded with volcaniclastic sediments (Figure 7-14A-E).

(A) During late Cretaceous, the Laramide magmatic arc was centered over central Sonora west of the Mulatos district (Barton et al., 1995; Valencia-Moreno et al., 2001). The arc migrated eastward with the flattening of the Farallon plate and effusive volcanism continued with subsequent dome building eruptions of high-K, high silica andesite to low silica dacite from 61-58 Ma.

(B) A brief hiatus in volcanism began after 58 Ma in the eastern part of the Mulatos district for ~2 million years. Isolated quartz-eye dacite porphyry plugs intruded the lower andesite and separate hydrothermal cells developed throughout the district (only La India, Mulatos, and Yaqui-Pelon are represented in Figure 7-14). Magmatic fluids ascended from the dacite porphyry and volatilized through boiling. Hot oxidized magmatic vapors (SO_2-HCl) continued upward into a favorable stratigraphic horizon in upper dacite above fine-grained basaltic andesite in lower andesite. The fluid condensed and mixed with heated meteoric waters below the water table forming an acidic fluid with a pH<1 as follows, $4SO_2 + 4H_2O = 3H_2SO_4 + H_2S$. The favorable host horizon, a crystal-rich, porphyritic dacite, became acid leached to residual vuggy quartz haloed by quartz-alunite-dickite advanced argillic alteration at 57 Ma. Early pyrite with enargite were deposited in vuggy quartz. Wall rock interaction buffered the fluid, pH increased, and stratiform massive silica developed at the water table above vuggy quartz. The hydrothermal ore fluid evolved.

(C) Late gold in ore-stage pyrite on cores of early pyrite and Ag-Bi sulfosalts were deposited filling vugs in the vuggy quartz and fractures in the advanced argillic alteration below the massive silica horizon. Massive silica acted an impermeable barrier to the later evolved hydrothermal ore fluid. A final explosive eruption of the Estrella tuff (Tplt) at 55 Ma signaled the end of Laramide volcanism and waning of the high-sulfidation (HS) epithermal mineralization in the southeast part of the Mulatos district. The Tplt then covered the HS systems and only the lower tuff members were altered and slightly mineralized at Mulatos. A second hiatus of volcanism for ~20 million years began after the eruption of the Estrella tuff creating an Eocene unconformity characterized by epiclastic conglomerates (Tpcg).

(D) Explosive volcanism was renewed at ~36 Ma with extensive caldera-forming eruptions of the Nopal rhyolitic ash flow tuffs. At least five rhyolitic tuff members (To-Tj) of the Nopal Rhyolite were deposited at Mulatos. This period of explosive volcanism is termed the “ignimbrite flare-up” and persisted for 3 million years until ~33 Ma in the area of Mulatos Far East. A second stage of epithermal mineralization was hosted by the Nopal Rhyolite with an estimated age bracketed between the To member of the Nopal Rhyolite at San Carlos <36.02±0.12 Ma and >29.18±0.09 Ma age of an unaltered basal rhyolite tuff in the Upper Bimodal Volcanic rocks.

In Mulatos Far East, the To member (36 Ma) hosts fracture controlled advanced argillic alteration (dickite, pyrophyllite, kaolinite) with veinlets of tetrahedrite and pyrite at San Carlos, representing fluids with intermediate sulfidation states. Vuggy quartz and other silicic alteration are absent. At Refugio, the To member hosts gold mineralization similar to San Carlos, and basal conglomerates are silicified with stratiform hydrothermal breccia. The Tk member (34 Ma) is also locally silicified.

(E) Oligocene bimodal volcanism followed the onset of extensional tectonics with a suite of slightly alkaline basaltic andesite dikes, lavas, and rhyolitic tuff interbedded with conglomerates (29-25 Ma). These rocks overlie the Nopal Rhyolite with an Oligocene unconformity.

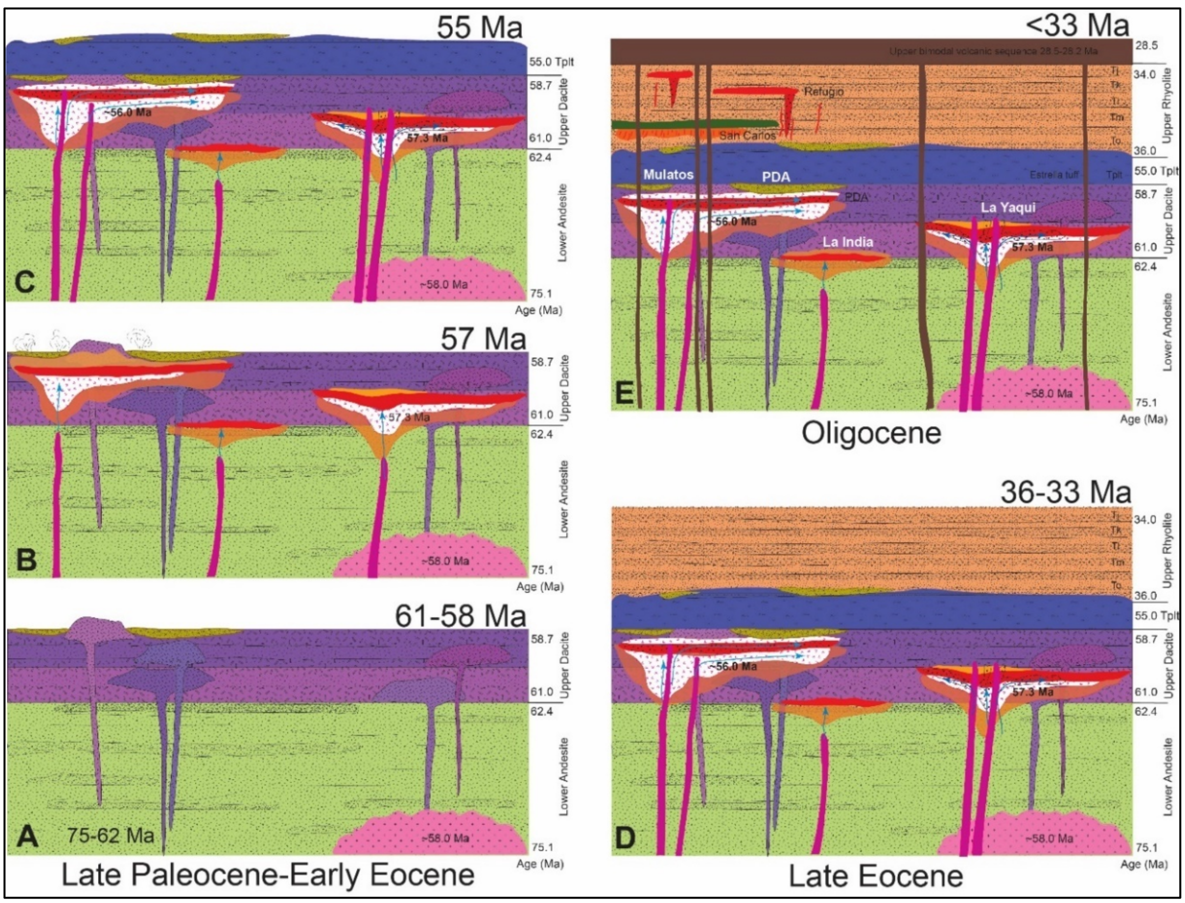


Figure 7-14 Volcanic and Magmatic-hydrothermal Evolution in the Mulatos District.

Notes:

- *Schematic cross-section model from ~75 to 28 Ma*
- *Modified after Longo et al., 2022.*

Extensional tectonics dominated from ~29-20 Ma rotating structural blocks northeast exposing the epithermal mineralization (Figure 7-15). Fissure-related eruptions basaltic-andesite lavas filled rift basins as extension progressed.

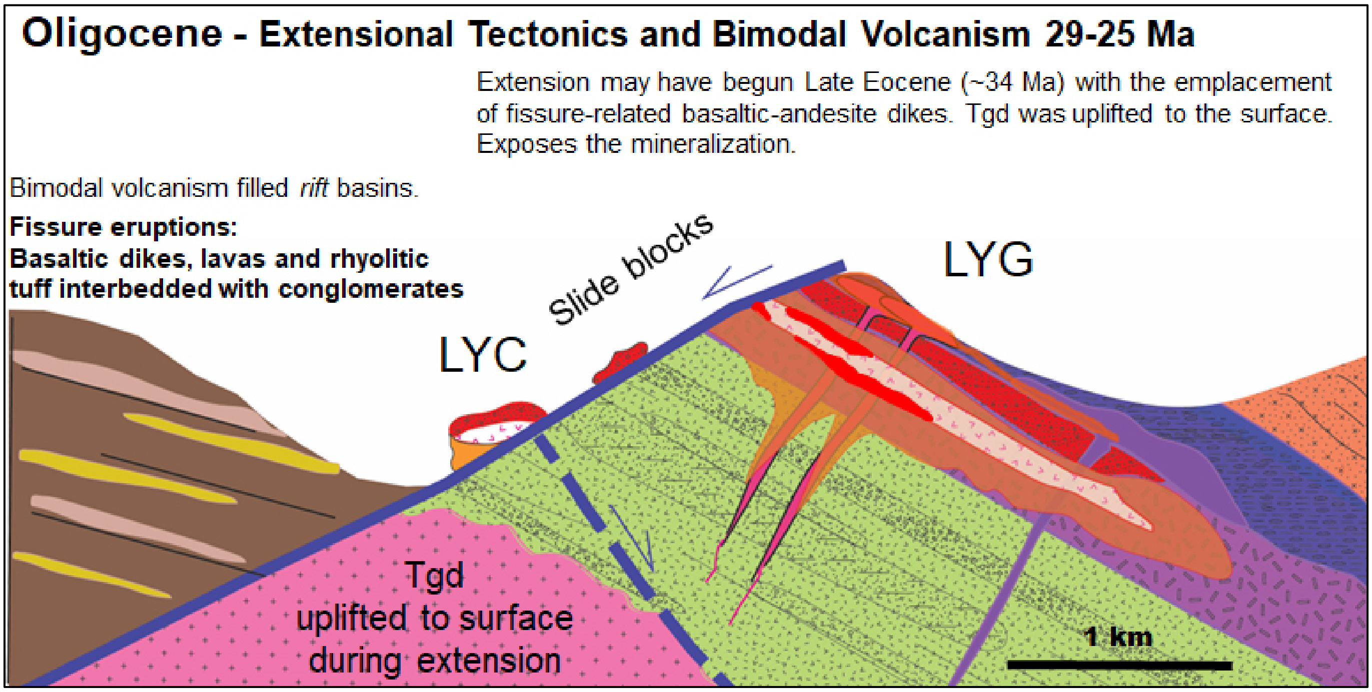


Figure 7-15 Schematic Model through La Yaqui Grande

Notes:

- *From the period of Oligocene extensional tectonics and bimodal volcanism from 29-25 Ma.*
- *Half graben blocks were rotated east northeast and eroded exposing the high-sulfidation epithermal silicic and advanced argillic alteration.*
- *The Yaqui granodiorite (58 Ma) was also uplifted and exposed at surface.*
- *Blocks of LYG broke off and slide down along the footwall.*
- *A large slide block was mined and represents La Yaqui Phase 1 deposit (~40 Koz gold).*
- *Source: From Longo et al., 2022, GSN symposium presentation.*

8 DEPOSIT TYPES

Economic gold deposits of the Mulatos district are considered as high sulfidation-state epithermal systems (Longo, 2022, Austin et al, 2004; Staude, 2001), except for the San Carlos east deposit which is considered as an intermediate sulfidation epithermal deposit. Epithermal ore deposits form at shallow depth at temperature ranges of <150°C to ~ 300°C, from the surface to depths of 1 – 2 km (White and Hedenquist, 1995). Epithermal deposits can be classified as high sulfidation, intermediate sulfidation or low sulfidation based on alteration mineralogy which is a result of contrasting chemistry of the hydrothermal fluids.

In epithermal systems, magmatic-hydrothermal fluids exsolve from a hydrous intrusive complex and are split into large volumes of vapour and small volumes of brine (Cooke et all., and references therein, 2017). The brines produce potassic alteration and porphyry-style mineralization at depth, while the vapour phases ascend towards the surface. In this epithermal environment, high sulfidation systems form as the vapour is either absorbed by groundwater or contracts back to liquid, causing a highly acidic solution (HCl and SO_2) that leaches the rock outward from the conduit (White and Hedenquist, 1995, Figure 8-1) The fluid conduits are fracture controlled and are commonly referred to as feeders. The leached rock or lithocap is horizontal to subhorizontal and consists or residual quartz (vuggy silica) and advanced argillic alteration. The feeders and lithocaps are spatially and genetically associated with underlying intrusions. High sulfidation gold and copper mineralization can be found both in the feeders and the lithocaps (Sillitoe, 1993, 1999). Where supergene leaching has oxidized the refractory sulphides present in high sulfidation deposits, large oxide deposits are formed such as at LYG, Cerro Pelon and Mulatos.

In high sulfidation deposits the early acidic fluid (pH < 2) responsible for the advanced argillic alteration of the host rocks has relatively low salinity (<1 wt % NaCl, Hedenquist et al., 1998). The advanced argillic alteration is characterized by a halo of quartz+alunite+-pyrophyllite+-dickite. The introduction of the copper and gold mineralization is thought happen late in the high sulfidation mineralizing system. Paragenetic and fluid inclusion studies suggest that copper ores require a high sulfidation state late fluid that has an intermediate salinity (4 to 20 wt % NaCl equivalent) while gold-rich tennantite-tetrahedrite+pyrite assemblages precipitate even later from intermediate sulfidation state fluids (Sillitoe and Hedenquist, 2003).

Intermediate sulfidation deposits generally fringe high sulfidation deposits suggesting they are spatially related with the volcanic centers and magmatic activity responsible for the fluids that form high sulfidation deposits (Sillitoe and Hedenquist, 2003, Figure 8-1). Intermediate sulfidation deposits have a general similarity with high sulfidation deposits (Einaudi and Hedenquist, 2003) but lower sulphidation state suggests additional interaction with wall rock or other factors (e.g. boiling). Intermediate sulfidation deposits commonly have a base metal association in additional to precious metals (Sillitoe and Hedenquist, 2003). The addition of base metals is though to be a result of the introduction of brines into the otherwise low salinity acidic fluids in the epithermal environment.

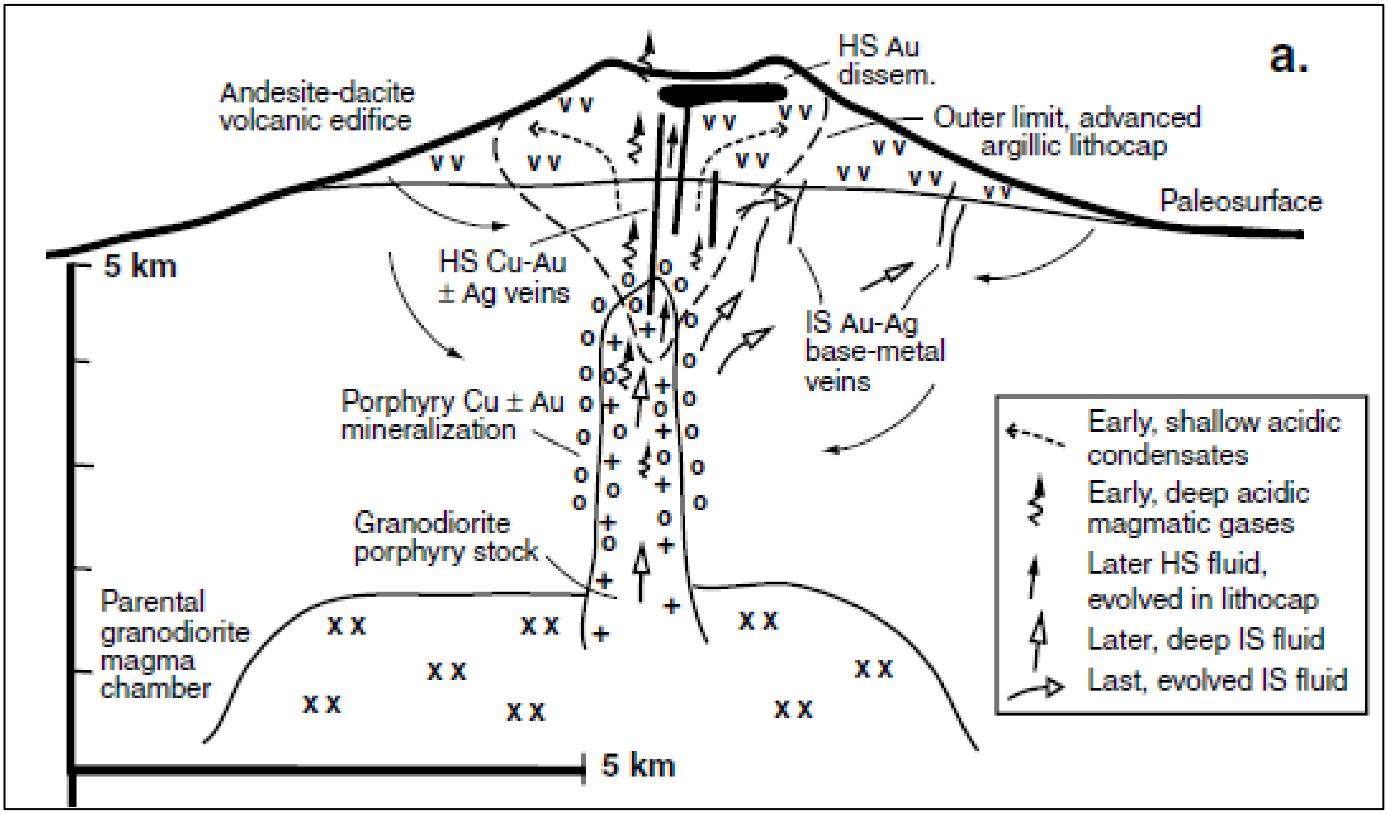


Figure 8-1 Schematic Cross Sectional Model of the Volcano Tectonic Setting for High Sulfidation and Low Sulfidation Epithermal Deposits

Note:

- *Source: Sillitoe and Hedenquist, 2003*

9 EXPLORATION

Historical exploration activities prior to Alamos' involvement are documented in Section 6 of this report, the readers are referred to that section for additional information.

Exploration from 2003 to the present has focused on surface mapping and geochemical sampling, ground induced polarization and magnetic surveys, and both reverse circulation (RC) and diamond (core) drilling. The drilling campaigns are described in Section 10 of this report.

Exploration since 2003 can be subdivided into 3 major periods:

- 2003 to 2014: primary focus was on the Mulatos area deposits; Estrella, Escondida, El Salto, Mina Vieja, Victor, and San Carlos as well as on the Carricito concession between 2010 – 2012. Regional targets were also explored.

- 2015-2017: primary focus was on the La Yaqui Grande and Cerro Pelon Deposits

- 2017 – current: primary focus on regional exploration as well as the Puerto Del Aire deposit from 2019 to present.

Geological mapping and identification of areas hosting advanced argillic alteration is the main method of exploration on the property. Between 2003 and 2014, surface geological and geochemical work continued with 5,335 samples collected. Between 2015 and 2017, 3,535 samples were collected. From 2018 to present, an emphasis on mapping the prospective areas of all concessions resulted in the collection of 2,995 samples for geochemical and hyperspectral analysis.

Since 2016, geophysical techniques have been useful for identifying areas of advanced argillic alteration (Figure 9-1).

In 2016, four ground induced polarization (IP) and two ground magnetic surveys were undertaken. These IP surveys included the La Yaqui Grande survey, Cerro Pelon survey, Baijos survey and Ranchito survey (Figure 9-1). Ground magnetics was completed only at La Yaqui Grande and Cerro Pelon (Figure 9-1).

The pole-dipole IP/resistivity survey completed on the La Yaqui Grande project in May 2016 was done on 200 meter line spacing with 100 meter dipole spacing for 24.6 line kilometers. A more detailed survey was completed by October 2019 consisting of 100 meter line spacing with 25 meter dipoles. N=1 to 10 was surveyed on 15 east-west striking lines for a total 21.9 line kilometers. Both surveys were done by Geofisica TMC S.A. de C.V ("Geofisica") of Mexico City.

By the end of March 2016, a ground magnetic survey was completed at La Yaqui Grande by Atyca Geociencias Aplicadas ("Atyca") of Hermosillo. The traverse direction was north-south with line separation of 100 meters, some infill lines, and some east-west striking lines for a final distance of 94 kilometer. By early December 2019 a ground magnetic survey covering La Yaqui Grande and surroundings was completed on 100 meter spaced east-west striking traverses for a total distance of approximately 220 line kilometers. This survey was done by Geofisica.

A pole-dipole IP/resistivity survey over Cerro Pelon was completed in April 2016 by Geofisica. Nine east-west striking traverses were surveyed with 100 meter dipole spacings. The lines were 200 meters apart and measurements for N=1 to N=10 were acquired. A final distance of 19.1 line kilometers was completed.

By the end of March 2016, a ground magnetic survey was completed at Cerro Pelon. Atyca did the magnetic data acquisition. The traverse direction was north-south with line separation of 100 meters. In addition to the 100 meter line spaced survey, twenty-four, 50 meter spaced infill lines, and three east-west striking traverses were done on the project. The final distance covered is approximately 206 line kilometers.

A pole-dipole IP/resistivity survey was completed on the Bajios project in early December 2016 by Geofisica. Nine east –west striking traverses were surveyed with 100 meter dipole spacings. The lines were 200 meters apart and measurements for N=1 to N=10 were made. Some of the planned lines could not be surveyed in the east due to land ownership issues, those lines were extended to the west to have sufficient line length for modeling purposes. A total distance of 22.5 line kilometers was completed.

A pole-dipole IP/resistivity survey was completed on the Ranchito (also called Bajios Norte) project in November 2016 by Geofisica. Nine east–west striking traverses were surveyed with 100 meter dipole spacings. The lines are 200 meters apart and measurements for N=1 to N=10 were made. A total distance of 30.6 line kilometers was completed.

Pole–dipole IP/resistivity and magnetic surveys were completed at El Jaspe in March 2018 by Geofisica. For the electrical work twelve east–west striking traverses were surveyed with 100 meter dipole spacings. The lines are 200 meters apart and measurements for N=1 to N=10 were made. A total distance of 30.6 kilometers was covered.

For the magnetics at El Jaspe 23 traverses with 100 meter separations were done for a total of 58.4 line kilometers. The magnetic equipment used is GPS based, resulting in readings approximately every 1 to 3 meters along line.

In late 2018, Geotech Ltd completed a helicopter borne VTEM and magnetic survey. The survey was flown in an east-west direction and covered three blocks for a total of 4,042 line kilometres. Nominal line spacing was 200 meters. The survey was processed and interpreted and used to focus the regional mapping and surface prospecting campaigns in later years (Figure 9-2).

In 2019 a ground Induced Polarization and magnetic survey was completed on the Carricito concession. Also, in 2019 an infill induced polarization survey was completed at La Yaqui Grande to fill in the area between Cerro Pelon and La Yaqui Grande.

During the first quarter of 2020 the Mexico based contractor Geofisica TMC S.A. de C.V. worked on a pole–dipole IP/resistivity survey on the Carboneras grid (an area east of Cerro Pelon and south of the Mulatos Mine). Twenty-two east–west striking traverses 200 meters apart were surveyed with variable Tx-Rx spacing (50m, 100m and 200m) for a total of 63 line kilometer. The ground magnetic survey was done with 100m line spacings using the IP/resistivity grid resulting in forty-three lines for a final distance of approximately 130 kilometers.

Between November 19, 2021, and February 4, 2022, the Mexico based contractor Geofisica TMC S.A. de C.V. worked on a pole–dipole IP/resistivity survey at the Halcon West project. Seventeen east–west trending traverses 200 meters apart were surveyed with variable Tx-Rx spacing (50m, 100m and 200m) for a total of 75.1 line kilometer.

Additionally, at Halcon West a high-resolution drone based magnetic survey conducted by MWH Geo-Services International Inc. and completed by 6 December 2021. The survey consists of 180 east-west trending flight lines 25 meters apart flown at a mean terrain clearance of 36 meters. After editing of the data, a total flight distance of 1,338 kilometer was reported.

In 2022 a drone magnetic survey was flown over the Ranchito area of the Baijos project.

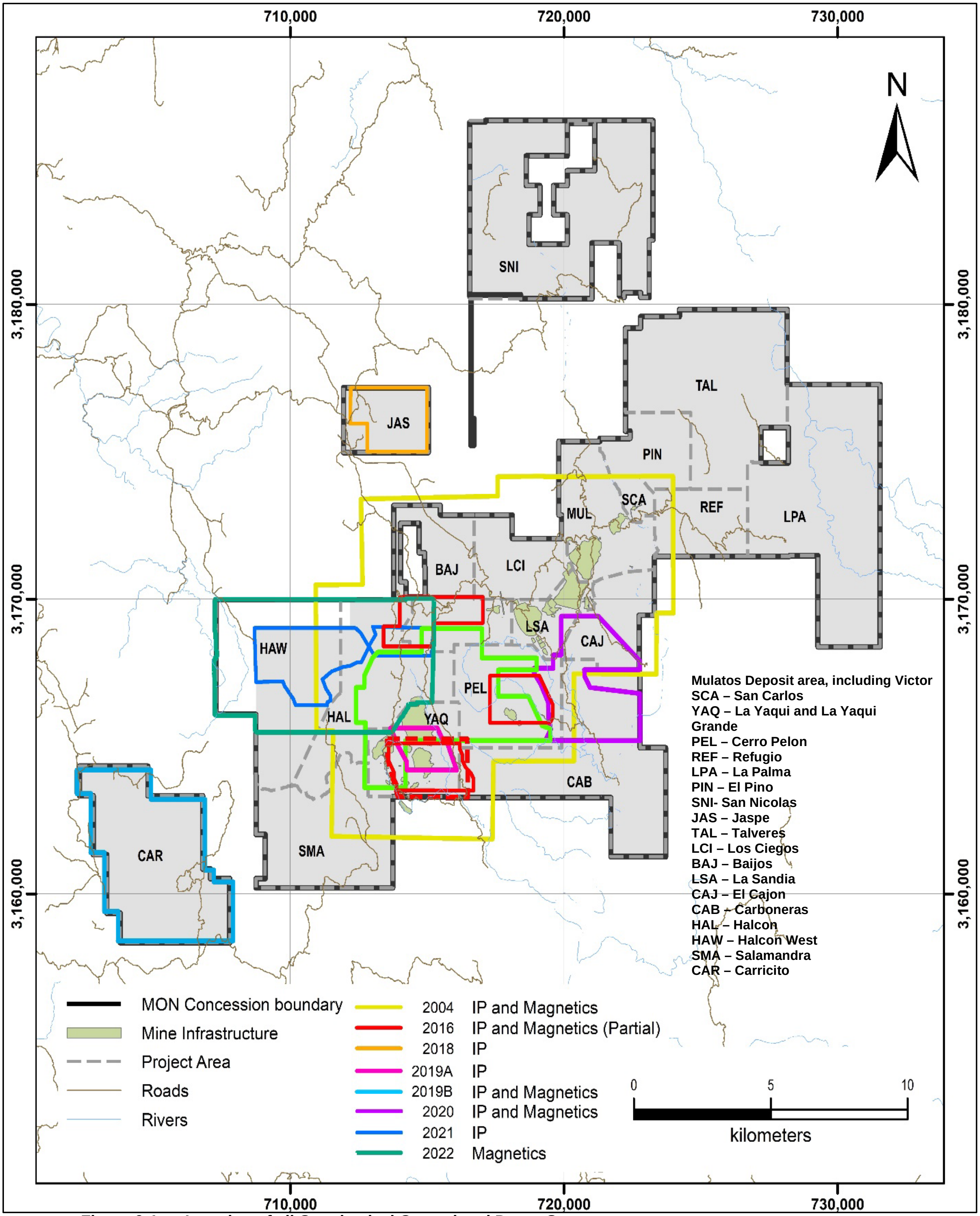


Figure 9-1 Location of all Geophysical Ground and Drone Surveys

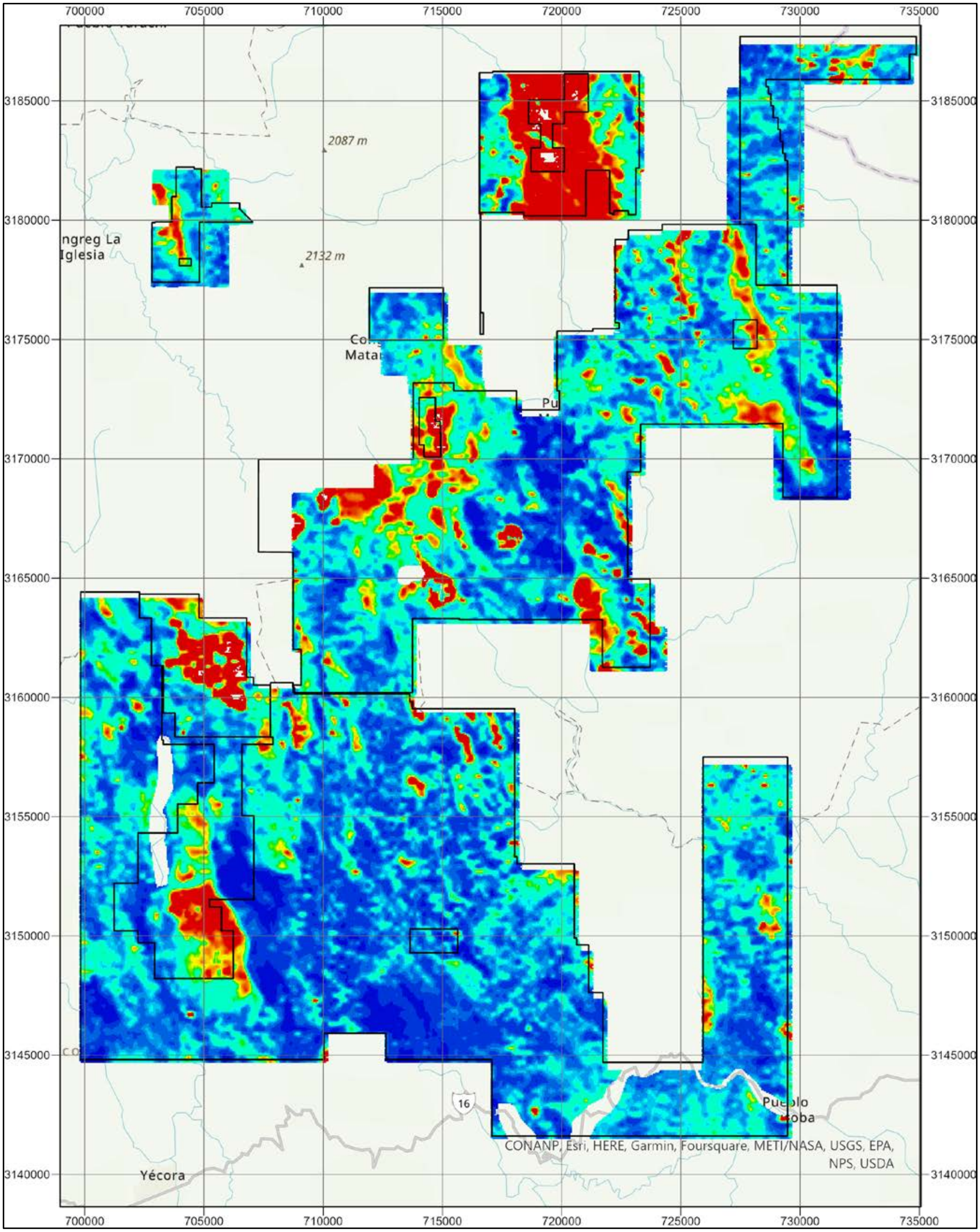


Figure 9-2 2018 VTEM Survey Showing Resistivity at a 50m Depth Slice

10 DRILLING

10.1 Pre-Alamos (Prior To 2001)

Four sampling methods were used to collect information on the gold grade of the Mulatos deposit prior to 2001: core drilling, reverse circulation drilling, underground drift round sampling, and underground channel sampling. Core drilling and reverse circulation drilling were used on Escondida and El Victor to collect samples for assaying. Table 10-1 summarizes the drilling and sampling completed up to 2001 on the Mulatos and Escondida deposits while Figure 10-1 locates all drill holes completed prior to 2001. The following sections describe the various drilling programs conducted.

Table 10-1 Drilling and Sampling Programs Conducted on the Mulatos/Escondida Deposits Prior to 2001

Program Description	Year	Contractor	Number of Holes	Length (m)	Sampling Interval (m)
Reverse Circulation Drilling					
MRA “M” Series	1987 – 1990	MRA	121	20,688	3
Kennecott “K” Series		?	66	14,780	1.52
Placer “P” Series – Phase 1	1993 – May 1994	Dateline	20	3,447	1.52
Placer “P” Series – Phase 1	1993 – May 1994	Drilling Services	36	7,742	1.52
Placer “P” Series	1993 – May 1994	Dateline	13	2,187	1.52
Placer “P” Series	After May 1994	Drilling Services	37	7,475	1.52
Placer “NE” Series	1996	Layne, Boytec	29	4,287	1.52
Placer “98EI” Series	1998	Layne	14	2,495	1.52
		Total	**336**	**63,101**	
Core Drilling					
MRA “M” Series	1986	?	11	1,928	3
Placer “PD” Series – Phase I	1993 – May 1994	Major Drilling	14	3,540	1.52
Placer “PD” Series	After May 1994	Major Drilling	74	14,186	1.52
Placer “96PM” Series	1996	Major Drilling	13	2,273	1.52
Placer “97RE” Series	1997	Major Drilling	43	7,373	Variable
Placer “98EE” Series	1998	Layne	11	2,437	Variable
Placer “98EI” Series	1998	Layne	9	1,286	Variable
		Total	**175**	**33,023**	
Drift Round Sampling					
MRA Underground Program	1986	MRA	N/A	1,061	1.52
Underground Channel Sampling					
1994 Program	1994	COMYCSA	N/A	297	1.52
1996 Program	1996	Tres Hermanos	N/A	697	1.52
Total				**98 ,179**	

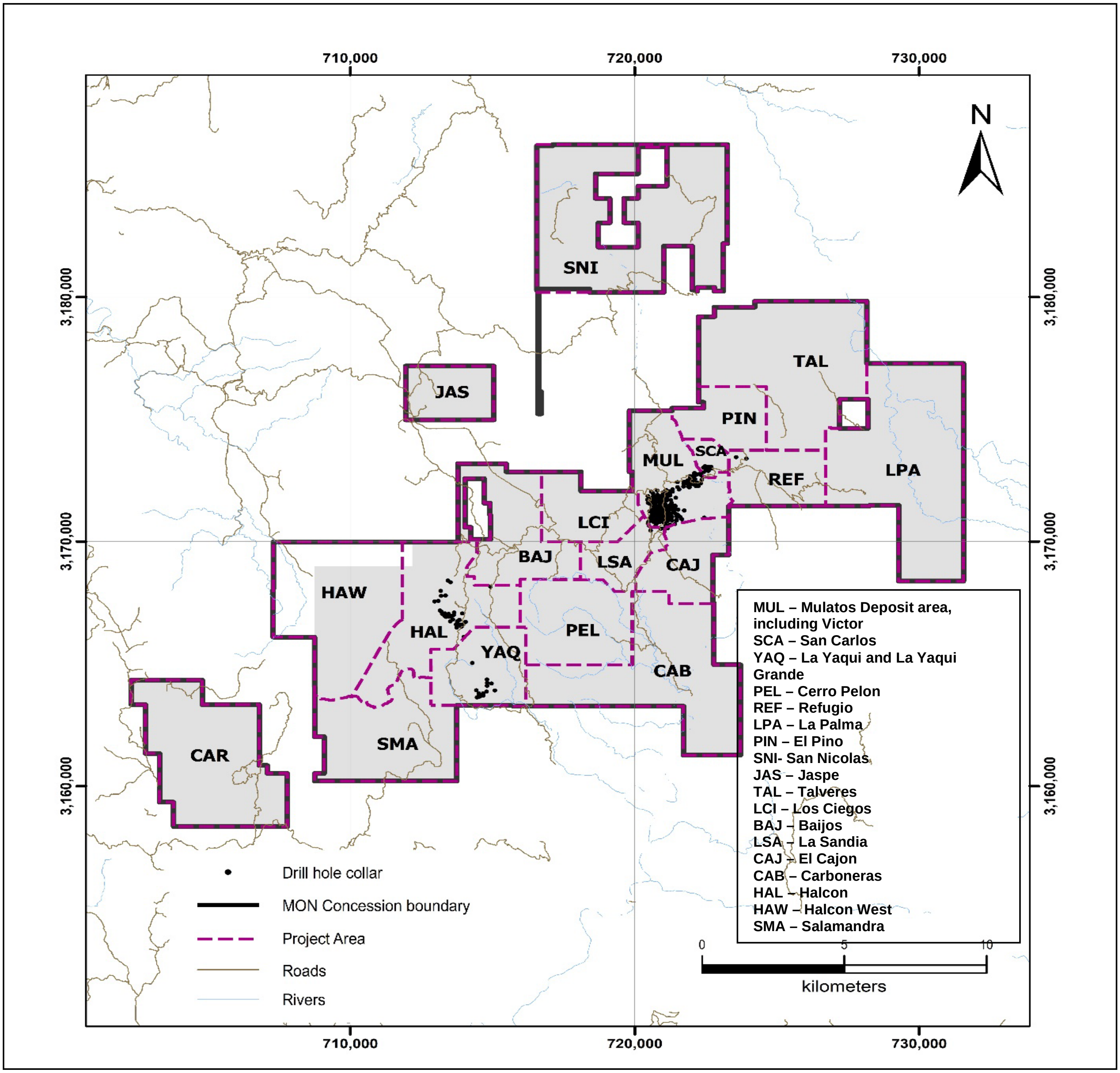


Figure 10-1 Pre-2001 Mulatos Area Drill Hole Location

10.1.1 Methodology and Logging Procedure

Data collection began with the geologists logging the drill holes on site. Reverse circulation holes were logged from chip trays containing representative samples collected from each sample interval. Geologists logged onto paper sheets. Logging included the notation of various aspects of lithology, alteration, and mineralization. Core drill holes were also logged onto paper sheets. Core hole logging was more detailed and included core recovery, RQD, lithology, structure, alteration, and mineralization.

Drill hole geologic data from MRA's project was available as both basic graphic and descriptive logs, the majority of which have been translated into the Geology format. Kennecott logs were available as paper copies depicting graphic and descriptive information, and as digital files. The majority of Kennecott and MRA reverse circulation sample chip trays are still available and are stored at the project site. They have been re-logged by Alamos to conform to the currently understood stratigraphy and mineralization.

Prior to 1994, information from drill hole logs was compiled and entered into the Paradox database, then transformed into Geolog type files. From 1994, drill hole geology and other information was input directly into Geolog type files. As part of the re-modeling exercise, all holes were re-logged for rock types, alteration, and oxidation in the spring of 1996.

10.2 Alamos (After 2001)

Alamos began its exploration programs in 2003, drilling 13 underground core holes and 31 surface holes in the Estrella portion of the Mulatos deposit.

Starting in 2004 and up to the end of 2014, Alamos drilled approximately 492,486 m of core and reverse circulation drilling in 3,000 holes. A good portion of the drilling focused on definition and delineation drilling of the Mulatos deposit as well as some drilling done within the larger Mulatos district Figure 10-2). The Mulatos deposit is composed of sub targets known as Estrella, El Salto, Escondida, Mina Vieja, all of which are encompassed by the Mulatos open pit (Table 10-2).

Drilling of the Victor deposit occurred in 2006 and 2007 and again in 2011 and 2012. The San Carlos deposit, on the east side of the Mulatos river was drilled between 2009 and 2015 and in 2017 and 2018 (Table 10-2).

In the years 2015-2018, Alamos exploration focused mainly on the two satellite deposits Cerro Pelon and La Yaqui Grande. Some drilling was also conducted at San Carlos in support of mining operations there.

Exploration drilling on the Carricito project, a concession to the west of the main Mulatos Property began between 2010 and 2012. The western part of the Carricito concession was drilled in 2018 after an extensive surface exploration mapping and surface sampling program. Limited drilling resumed in 2020 through 2022 (Table 10-2).

In 2017 through 2022, exploration drilling resumed on more regional targets including Baijos, Refugio, and Halcon, In 2020 regional exploration focused on mapping and surface sampling in the Halcon West area, with an initial drill program initiated in 2021 (Table 10-2).

Exploration drilling of the sulphide mineralization in the Puerto Del Aire and Gap – Victor trends initiated as early as 2006. These deposits form two north easterly trends of blind (do not outcrop at surface) auriferous, sulphide mineralization between the Mulatos and Victor deposits. In 2009, high grade sulphide mineralization was identified in the Puerto Del Aire trend, and exploration continued sporadically until 2019. In 2019, a new geological model for the Puerto Del Aire deposit was developed by relogging all available drill core. The new model was tested in 2020 with two flat holes collared in the Mulatos pit and drilled down the interpreted dip of the deposit. The results confirmed the geological model and exploration in 2021 and 2022 has been successful in extending the deposit.

10.2.1 Methodology and Logging Procedures

Alamos has used a combination of reverse circulation (RC) and diamond drilling (core). Prior to 2012, reverse circulation drilling was the preferred sampling method with core drilling generally used for specific purposes such as quality assurance, underground drilling, metallurgical sampling, and geotechnical studies. The principal drill contractor from 2001-2015 was Layne de Mexico, S.A. de C.V. After 2012, diamond drilling was the preferred drill method as an emphasis was places on collecting more detailed geological data. Several different drilling contractors were utilized after 2015,

- Layne drilling for infill and oriented campaign at San Carlos in 2015;
- Energold Drilling for regional exploration from 2015 to 2016;
- GlobeXplore drilling for San Carlos underground and regional exploration from 2016 to 2018;
- G4 drilling for infill drilling in 2019;
- GlobeXplore for exploration from 2020 to 2022; and
- Bylsa Drilling for exploration in 2022 to present.

Since 2004, each drill collar is located in the field with a handheld GPS, currently the Garmin 64sx. The drill is aligned under the field supervision of geologists and oriented using a compass and wooden pickets as foresights and backsights. Once the drill has moved off the drill pad, the mine survey department uses a high precision GPS (R10 Trimble) to survey accurate coordinates for each drill hole collar. The standard projection on the project is UTM Z12, NAD27 and all coordinates are established using the Mulatos Survey Control Points. Most drill collars since 2004 have been surveyed by a high precision GPS, whether at the time of drilling or in later years to verify drill hole location.

Various downhole survey instruments have been used to routinely take downhole survey measurements. Prior to 2012, a gyro was commonly used. Currently the Reflex EFLEX EZtracis is used to collect downhole survey data every 50 metres.

Between year 2001 and 2004 limited drilling was performed at Mulatos. All core was logged on site with paper logs and entered as digital Geolog files. The drill core was photographed using a digital camera and then cut and sampled on site. A one-half split for all core is archived on site.

Logging procedures between 2004 – 2018 were continually adapted and improved. Microsoft Access was used as a database until 2014, at which time all data was migrated to an acQuire SQL database.

Logging methods from 2018 to present have adhered to the following procedure:

For diamond drill core, the core boxes are delivered to the front of the core shed where they are unloaded and stacked together according to hole number. The exploration office and core shed are secured by a fence. Access is limited to authorized personnel. The facility is monitored by video cameras and inspection rounds are performed on a regular basis by security guards outside regular working hours.

The boxes are placed on the core tables in sequential order starting with Box 1 one on the left, with the front of each box facing the front of the core table. The boxes are uncovered, and the core is cleaned with a brush and water to remove sand or loose soil.

Geotechnical data is collected by the geotechnician. Collected data includes RQD, recovery, specific gravity, and point load tests.

Specific gravity measurements have been taken on core samples every ten meters since 2005. Every ten meters a representative sample of 10 cm long core is take making sure that the sample is free of fractures. The hole number and sample depth are written on the core using permanent marker and the sample number is also marked in the core box. The samples are dried for a period of three hours at a temperature of 105°C to eliminate moisture. The samples are then weighed on a scale. The sample weight in water is then determined by hanging the sample and fully immersing it in water without letting it touch the container. The specific gravity is calculated using the following formula:

Specific Gravity = (sample weight in air / sample weight in air – sample weight in water).

The sample is then wrapped in bubble wrap and packed in core boxes and stored.

Point load tests are taken every 5 meters. Each sample is between 10 and 20 cm long and has a minimum of 1 m of hard rock on either side of the sample. The sample is free of veinlets, fractures, and porosity. If a suitable sample cannot be taken, a note is inserted in the database indicating that a test was not taken. The sample is marked with the hole number and depth and the sample number is also written on the core box at the appropriate depth. The sample is placed horizontally in the equipment and rotated to avoid any planar discontinuities in the rock. Pressure is applied and the reading recorded into the database. The broken core is returned to the core box.

The core is then logged by the geologist who records lithology, alteration, structure, veins, oxidation state into separate tables in the drill hole database. Contacts or important intervals are marked using blue flagging tape tied around the core at the beginning and end of the interval. After logging the hyperspectral measurements are taken. The geologist marks the intervals to be sampled for analysis on the core using a permanent marker. A sample tag with a unique number is placed at start of the sample and the sample number is written directly on the core using permanent marker. Sample length is typically 1.5 but is at the discretion of the geologist. A red cut line is drawn along the center of the core, longitudinally.

Hyperspectral point measurements are collected using an ASD Terraspec4. Routine use began in 2009, but many samples prior to 2009 have been retroactively analysed. Measurements are commonly taken every meter and at the geologist’s discretion. Spectra interpretation is completed at site by a trained geologist.

Photographs are taken of each core box using a sign to specify the hole number, from and to meterage of the box, date, and box number. Photographs are taken of both wet and dry core.

The core is stored in locked, covered buildings within the perimeter of the mine.

For reverse circulation drill chips, the chip boxes are placed in the core shed at the end of each drill shift. The chip boxes are already labelled with the depth, as this procedure occurs at the drill. The chips are logged using the same criteria as core holes, described above.

Table 10-2 Drilling and Sampling Programs Conducted on the Property After 2001

Year	Project	Type	Number of Holes	Metres
2003	Mulatos	DDH	44	3,921.8
2004	Mulatos	RC	21	3,396.4
	Baijos	RC	16	2,681.7
	Realito	RC	14	2,234.8
	La Sandia	RC	6	951.2
2005	Mulatos	RC	103	14,740.7
		DDH	24	2,663.1
	Puerto Del Aire	RC	3	797.3
	Jaspe	RC	34	4,574.7
	Baijos	RC	24	4,862.3
		DDH	1	486.9
	Realito	RC	1	93.0
2006	Mulatos	RC	101	13,222.2
		DDH	206	8,112.9
	San Carlos	RC	4	356.7
	Puerto Del Aire	RC	23	4,862.8
	Victor	DDH	10	6,952.1
	Baijos	RC	17	3,782.0
	Realito	RC	32	6,268.3
2007	Mulatos	RC	85	11,189.2
	Puerto Del Aire/GAP Victor	RC	41	8,551.8
	Victor	RC	5	839.9
	Yaqui Chica	RC	24	2,323.1
	Baijos	RC	3	690.6
2008	Puerto Del Aire / Gap Victor	RC	35	8,067.9
		DDH	30	7,894.1
	Yaqui Chica	RC	20	2,181.4
		DDH	7	721.3
	La Yaqui Grande	RC	21	3,730.2
		DDH	1	347.4
	Cerro Pelon	RC	65	10,140.3
		DDH	4	566.7
	Halcon	RC	20	3,425.3
	Jaspe	DDH	4	899.2

Table 10-2 Drilling and Sampling Programs Conducted on the Property After 2001 (Cont.)

Year	Project	Type	Number of Holes	Metres
2009	Puerto Del Aire / Gap Victor	RC	201	46,362.0
		DDH	33	7,963.5
	Mulatos	RC	22	3,659.9
	Cerro Pelon	DDH	44	4,236.9
	San Carlos	DDH	4	715.7
	Baijos	RC	2	570.0
2010	Puerto Del Aire / Gap Victor	RC	68	21,402.4
		DDH	1	397.4
	Mulatos	RC	46	4,964.9
		DDH	6	131.9
	Halcon	RC	3	316.5
		DDH	1	72.8
	San Carlos	RC	65	14,157.1
		DDH	7	1,400.7
	Refugio	RC	3	760.7
	Carricito	RC	24	5,059.5
2011	Puerto Del Aire / Gap Victor	RC	16	3,274.4
	Mulatos	RC	28	2,146.3
	San Carlos	RC	30	8,902.3
		DDH	2	248.7
	Carricito	RC	111	20,186.0
		DDH	5	573.5
	Victor	RC	110	15,206.9
		DDH	14	1,084.1
2012	Puerto Del Aire / Gap Victor	RC	7	1,827.0
		DDH	2	628.9
	Mulatos	RC	301	20,246.0
		DDH	9	1,033.1
	San Carlos	RC	23	8,894.8
		DDH	4	2,039.4
	Carricito	RC	2	390.9
		DDH	2	323.8
	Victor	RC	121	18,345.4
		DDH	12	2,117.6
	Refugio	RC	2	939.0
		DDH	2	188.6

Table 10-2 Drilling and Sampling Programs Conducted on the Property After 2001 (Cont.)

Year	Project	Type	Number of Holes	Metres
2013	Puerto Del Aire / Gap Victor	RC	6	1,706.5
		DDH	36	10,112.1
	Mulatos	RC	59	7,067.6
		DDH	19	2,896.6
	San Carlos	RC	24	8,071.9
		DDH	11	3,892.8
	Realito	RC	50	9,482.9
		DDH	29	5,442.0
2014	Puerto Del Aire / Gap Victor	RC	39	11,147.9
		DDH	19	5,170.2
	Mulatos	RC	54	6,694.3
		DDH	58	5,214.4
	San Carlos	RC	132	36,573.5
		DDH	108	12,764.6
	Realito	RC	16	2,593.0
	Victor	DDH	2	280.6
2015	La Yaqui Grande	RC	21	4,379.6
		DDH	19	3,910.1
	Mulatos	RC	15	4,387.2
	San Carlos	RC	35	9,493.6
		DDH	104	11,376.3
	Cerro Pelon	RC	57	12,732.4
		DDH	40	5,982.0
	Victor	RC	11	3,164.6
	Yaqui Chica	RC	46	5,678.3
		DDH	19	3,479.3
2016	La Yaqui Grande	RC	30	6,416.2
		DDH	198	39,963.7
	Mulatos	RC	22	6,044.2
		DDH	16	1,038.0
	Cerro Pelon	RC	34	5,462.4
		DDH	56	13,602.0

Table 10-2 Drilling and Sampling Programs Conducted on the Property after 2001 (Cont.)

Year	Project	Type	Number of Holes	Metres
2017	La Yaqui Grande	RC	4	713.4
		DDH	166	28,069.8
	Mulatos	DDH	3	726.0
	Cerro Pelon	RC	1	46.9
		DDH	16	4,072.7
	Baijos	RC	2	377.9
		DDH	26	8,215.0
	Halcon	DDH	2	460.6
	Refugio	DDH	20	5,412.4
	Puerto Del Aire / Gap Victor	RC	3	717.7
		DDH	6	1,659.7
	Victor	DDH	5	1,123.0
	San Carlos	DDH	63	5,726.6
2018	La Yaqui Grande	RC	36	3,974.6
		DDH	3	599.3
	Mulatos	DDH	24	5,577.4
	Cerro Pelon	DDH	6	529.6
	Halcon	DDH	15	3,791.5
	Refugio	DDH	5	1,418.2
	Puerto Del Aire / Gap Victor	DDH	8	2,328.8
	Victor	DDH	8	2,379.3
	San Carlos	DDH	30	4,079.0
	Jaspe	DDH	27	4,670.8
	Carricito	DDH	21	5,293.0
2019	Mulatos	DDH	3	545.8
	Cerro Pelon	DDH	26	2,140.3
	Puerto Del Aire / Gap Victor	DDH	20	5,310.8

Table 10-2 Drilling and Sampling Programs Conducted on the Property after 2001 (Cont.)

Year	Project	Type	Number of Holes	Metres
2020	Puerto Del Aire / Gap Victor	DDH	2	1,081.5
	Carricito	DDH	3	822.0
	Carboneras	DDH	5	1,029.2
	La Sandia	DDH	1	597.5
	San Carlos	DDH	11	719.5
	La Yaqui Grande	DDH	44	4,782.4
2021	Puerto Del Aire / Gap Victor	DDH	23	7,376.5
	Carricito	DDH	16	4,748.3
	Carboneras	DDH	3	606.0
	La Yaqui Grande	DDH	10	1,339.9
	Halcon	DDH	10	2,073.0
	Halcon West	DDH	16	4,283.0
	Los Ciegos	DDH	7	1,942.5
	Mulatos	DDH	1	163.0
	Cerro Pelon	DDH	18	743.5
2022	Puerto Del Aire / Gap Victor	DDH	57	17,187.9
	Carricito	DDH	11	2,137.5
	Baijos	DDH	5	1,183.5
	La Yaqui Grande	DDH	2	541.0
	Refugio	DDH	6	1,635.0
	Halcon West	DDH	27	8,158.5
	Mulatos	DDH	12	2,184.1

Notes:

- *RC = Reverse Circulation*
- *DDH= Diamond Drill Hole (Core)*
- *Mulatos = Estrella, Escondida, El Salto, Minas Vieja*

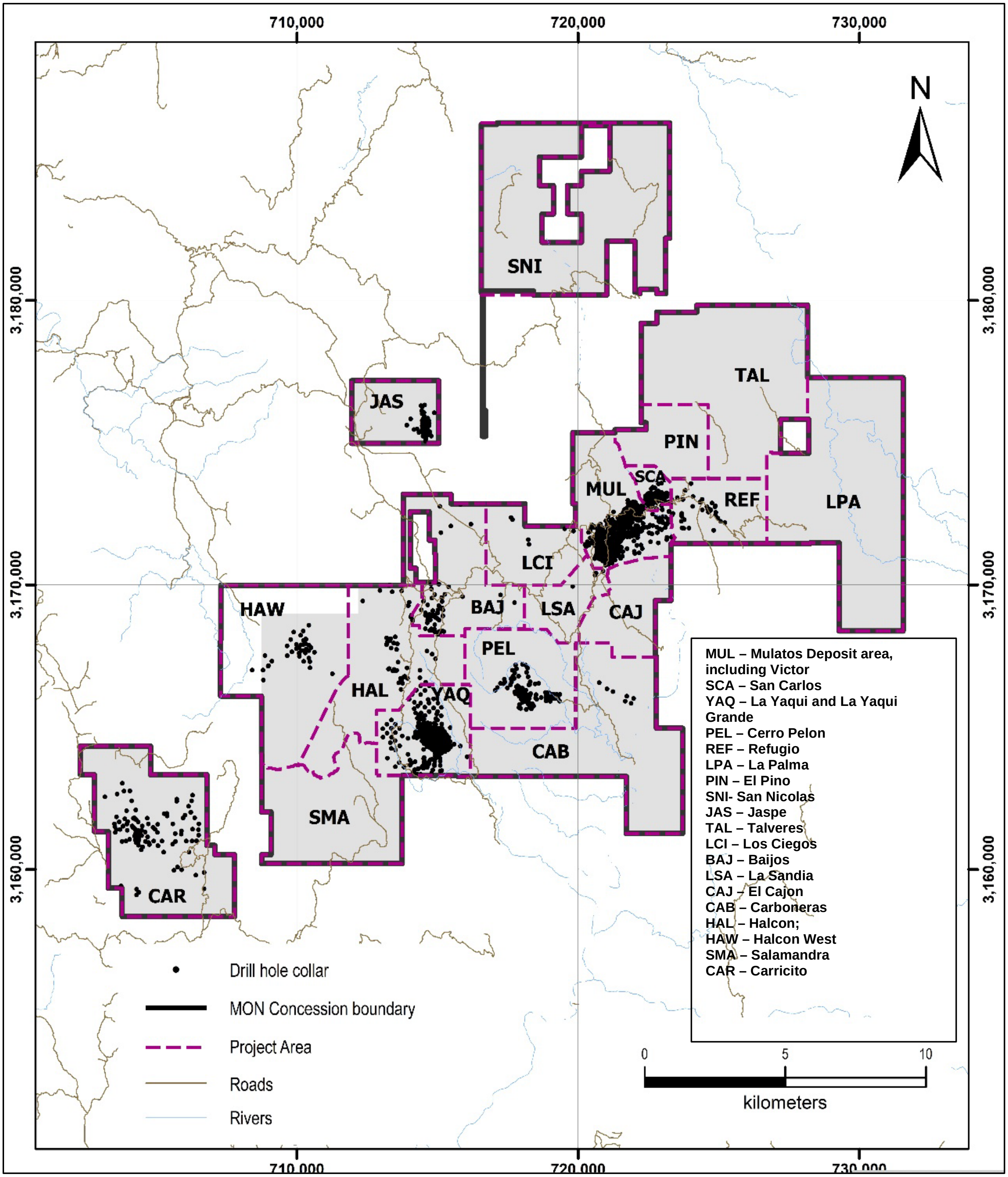


Figure 10-2 Post-2001 Drill Hole Locations

11 SAMPLE PREPARATION, ANALYSIS 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 and similar procedures were followed in prior years.

11.1 Core Handling, Sampling and Security

Core is placed in plastic 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 plastic strapping. The drill core is transported daily to the core shed by Alamos exploration staff.

At the core shed, the core undergoes geotechnical and geological logging as described in Section 10.2.1.

Following Alamos' Quality Assurance/Quality Control ("QA/QC") protocols, the geologist marks the interval for sampling. A geologist or geotechnician inserts a sample label at the start of the sample interval and writes the sample number on the core in permanent marker. The hole number, box number, date and sample depth are recorded on the sample label. The sample interval is also indicated on the box by an arrow and the sample number is recorded on the box in permanent marker as well. A red cutting line is marked on the core.

Either a blank, standard, or field duplicate is inserted every 10 sample at the geologist's discretion. This results in a standard or blank being inserted every 30 samples.

Each sample is cut along the red 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.

The samples are then placed in larger plastic bags which are sequentially numbered and dispatched twice weekly via road by exploration staff. Samples do not leave the control of the exploration staff until they are delivered to the Bureau Veritas Laboratory in Hermosillo, Mexico.

Core boxes are stored at the locked exploration core storage facility within the perimeter of the mine site and thus is protected by continuous security. The pulps are returned from the laboratory and stored in a locked facility at Alamos' offices in Hermosillo, Mexico. All pulps from the project have been kept except those which have deteriorated. Coarse rejects are also stored at the Alamos offices in Hermosillo for five years before disposal.

11.2 Laboratory Accreditation and Certification

Since 2014 all samples have been submitted to Bureau Veritas Minerals Laboratories ("BV") laboratory in Hermosillo, Mexico (formerly ACME). Fire assay analysis is completed in Hermosillo and pulps are sent to Bureaus Veritas' laboratory in British Columbia, Canada for multielement analysis.

BV is an ISO/IEC 17025 accredited laboratory and has internal quality control ("QC") programs that include insertion of reagent blanks, reference materials, and pulp duplicates that are in line with normal requirements, as well as participating in yearly proficiency tests to evaluate lab performance.

ALS Laboratories (ALS) is used for external check assays on pulps. ALS is an ISO/IEC 17025 accredited laboratory and has internal quality control ("QC") programs that include insertion of reagent blanks, reference materials, and pulp duplicates that are in line with normal requirements, as well as participating in yearly proficiency tests to evaluate lab performance.

11.3 Laboratory Preparation, Assays and Measurements

The standard primary sample is a half-core sample while the field duplicates (FDUPS) are quarter-core samples. The samples are received by the BV laboratory where they are prepared for analysis. Preparation and analysis consist of the following:

- Samples are dried and weighed and logged into the Laboratory Information Management System (LIMS);
- Samples are crushed to 80% passing a -2mm screen;
- Samples are split to 300 grams using a rifle splitter;
- Samples are pulverized to 85% passing a -75um screen;
- Alamos requests the laboratory to prepare coarse-reject/preparation duplicates (FCDUP) from the -2mm material for specific samples. The laboratory, as part of their standard preparation protocol, prepare and analyze (LABDUP) coarse reject and preparation duplicates and pulp and replicate duplicates;
- A 30 gram pulp aliquot is analyzed for gold using fire assay and atomic absorption spectroscopy (AAS) finish (FA430) in the Hermosillo laboratory;
- For samples returning results higher than 5 g/t gold, a second 30 gram pulp aliquot is assayed by fire assay with a gravimetric finish (FA530-Au) in the Hermosillo Laboratory;
- For samples returning results higher than 0.3 g/t gold, a cyanide leach AAS finish is completed at the Vancouver laboratory; and
- Samples are analyzed with an ICP-AES/MS for 45 elements using a multi-acid, near total digestion.

11.4 Quality Assurance and Quality Control

Alamos' current QA/QC program, in place since 2015, includes a routine insertion of certified refence materials ("CRMs" or standards), blanks and duplicates, as well as an external duplicate assay check ("check assay"). One CRM is inserted every 30 samples and one blank is inserted every 30 samples. Quarter-core field duplicates are collected every 30 samples. Prior to 2015, either a standard, blank or duplicate was inserted into the sample stream every 15th sample. Insertion rates for CRM's used between 2003 and 2022 are shown in Table 11-1.

Table 11-1 Number of, and Insertion Rate of CRMs

Type	Number of Samples (2003-2022)	Insertion Rate
Standards	8,384	3%
Blanks	8,887	3%
Field Duplicates	6,990	2%
Check Assays	3,871[1]	3%

Notes:
1. *Check assays inserted 2015-2022*

11.4.1 Certified Reference Materials (Standards)

Standards are used to detect any problem with specific sample batches and/or any possible long-term biases in the overall dataset. Since 2005 standards purchased from Rocklabs Ltd., and since 2015 standards purchased from CDN Resource Laboratories Ltd., have been used at Mulatos.

Assay results of inserted standards must pass the standard deviation test ("SD"). Standards results exceeding +/-3 SD are considered a failure. When a standard fails, then results are rejected for five samples on either side of the failed standard and the pulps are re-analyzed.

Between 2003 and 2022, a total of 8,384 standards were submitted. Both oxide and sulphide standards are used at Mulatos. Oxide standards range in grade from 0.462 to 2.365 g/t gold. Sulphide standards range from 0.599 to 2.812 g/t gold. Individual standard failures have been tracked since 2018. Since 2018, 0.3% of the CRMs failed the +/-3 SD test.

11.4.2 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. Currently Alamos uses a purchased crushed gravel from Aquafim in Hermosillo for blank preparation. No certification for this material is provided. Historically, blank control samples are from rock type "TK", a barren post-mineral geological unit located near Mulatos.

For coarse blanks, 5 times the lower gold 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. From 2015 to 2022, a blank failure flagged a re-run for a minimum of 5 samples in the batch on either side of the failed blank sample. Individual blank failures have only been tracked since 2018. Since 2018, 0.07 % of the blanks have failed, triggering a rerun of adjacent samples. Coarse blank assay values and laboratory detection limits for 2015 to 2022 are presented in Figure 11-1.

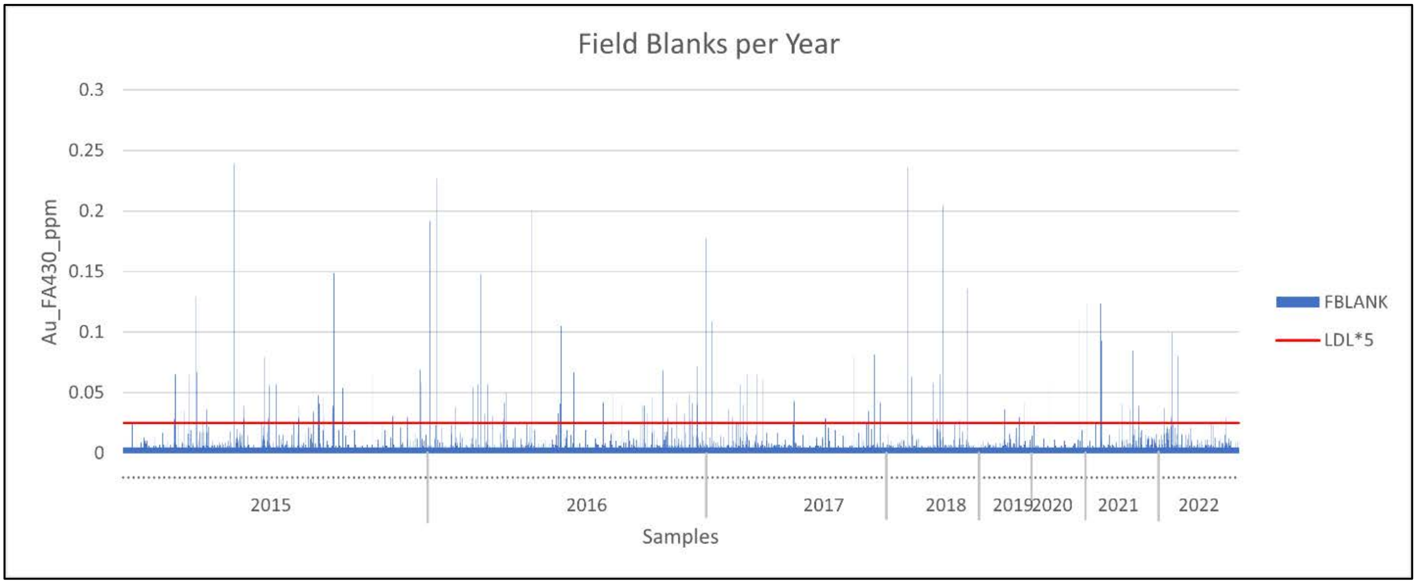


Figure 11-1 Performance of Blanks from 2015 – 2022

11.4.3 Field Duplicates

Field duplicates (Figure 11-2) are quarter-core samples of a primary sample. The purpose of a field duplicate is to replicate the entire sampling process and is used to estimate sampling and laboratory analysis precision.

If the relative difference (MPRD) between the field duplicate result and its primary sample result is >20% then the field duplicate is flagged as a failure in the database.

MPRD%= (Duplicate Value-Primary Value) / Mean (Duplicate Value, Primary Value) x 100

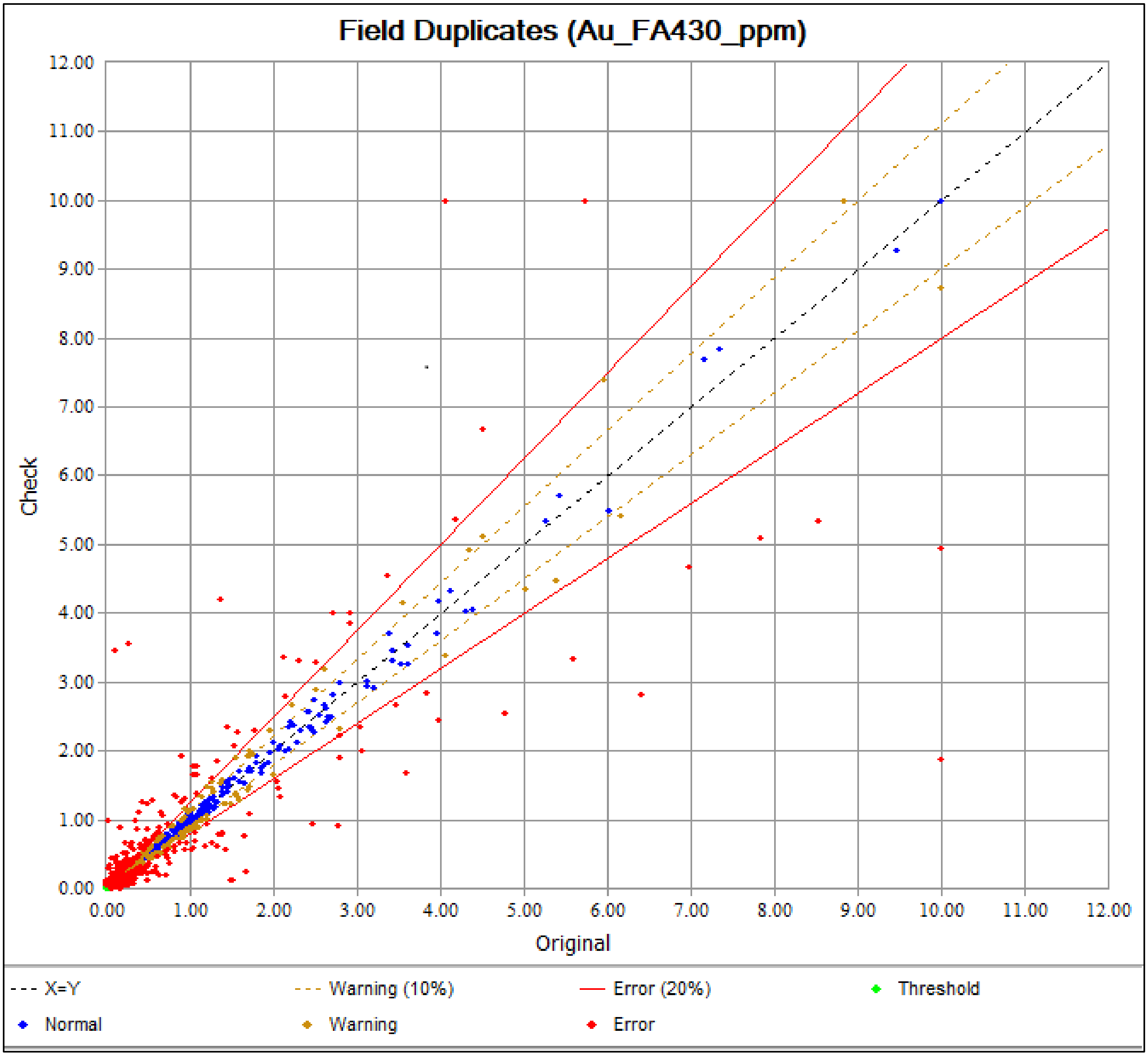


Figure 11-2 Field Duplicate Value versus Original Sample Value (2015-2022)

11.4.4 Check Assays

To check the accuracy of the primary laboratory, pulp samples from the mineralized sections are routinely collected and sent to ALS every 3 months. (Figure 11-3)

From 2014-2022, a rate of 3% of the pulp samples were sent to the secondary laboratory.

Between 2015-2022, 3,781 pulp samples were sent to ALS. The overall results show a mean grade of 0.2644 g/t gold compared to 0.2642 g/t gold, with a correlation coefficient of 0.998.

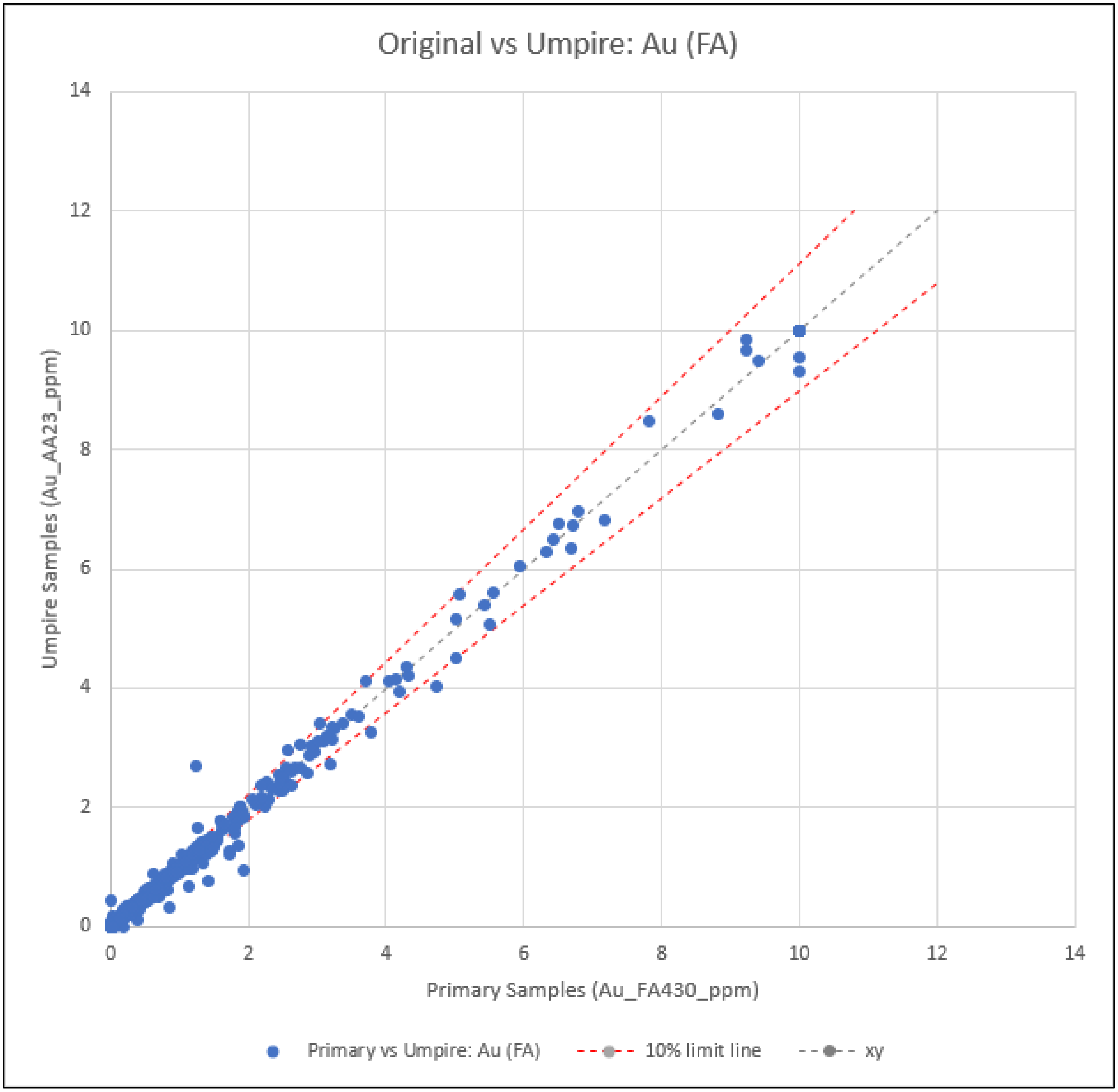


Figure 11-3 Scatter Plot of Check versus Original Assays from 2014-2022

12 DATA VERIFICATION

This section covers the data verification of the diamond drill hole database used for the Puerto del Aire and La Yaqui Grande Mineral Resource estimates. All drilling on the project has been through the mine site exploration department and as such is housed in a single database. Currently an acQuire SQL database is used to hold collar information, downhole survey data, assay results, specific gravity, hyperspectral data, and geology descriptions. All geotechnical data (recovery, RQD, and point load data) is held in the same database. The acQuire database was implemented in 2015, prior to that time the data was separated with assay data held in a Datashed database and geology information stored in a Microsoft Access database.

12.1 Collar Location Validation

Visual validation is carried out on all hole locations with respect to the topographic surface. Additionally, geological data of historical holes is compared to the current geological models. Discrepancies are rarely observed, but occasionally a historical drill hole collar is adjusted if supporting evidence is found. Historical collar locations have periodically been resurveyed by the mine survey department if a visual inspection indicates there may be a discrepancy in the elevation.

12.2 Assays

Since 2015 all assays are loaded directly into the acQuire database from the original laboratory certificates. This ensures that the data is free of typographical errors and that all results are matched to the corresponding sample ID automatically. When the assay data was migrated to acQuire, all historical assay certificates were re-imported in the current database as an added level of validation.

Generally, the entire length core is sampled and assayed. However, during 2016-2017 a technique of composite sampling, termed “Button” sampling was carried out across five exploration projects at Mulatos. Essentially, the method takes several short samples of half core, typically 10 cm (every 1 m), across a wider interval (typically 6 m at La Yaqui Grande). The sample is submitted to the lab as one sample with one sample number. The grade of the larger interval is reported as the grade of the combined 10 cm half core samples, which typically represents a total of 1 m of half core at best. This method was applied where the rock was expected to be barren.

At the La Yaqui Grande deposit, 2,842 composite samples were taken for a total of 19,417 m. Of these, 620 composites samples comprising 4,082 m of core were deemed to be within the current mineral reserve. Of these, only 16 composite samples comprising 88.9m had a value of >0.1 and < 0.2 g/t gold. During 2019-2020, the 620 composite samples (4,000 m), were resampled by subdividing the larger composite sample intervals into the typical 1.5 m sample length. Only five of the resampled intervals reported a value >0.3 g/t gold.

12.3 Survey Control

Down-hole survey measurements are monitored by geologists. If a measurement deviates excessively from the previous reading, then the geologist requests a second down-hole test.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 La Yaqui Grande

13.1.1 Bottle Roll Testwork

The La Yaqui Grande deposit is split into three zones, Zone 1, Zone2, and Zone3. Composites were created from exploration diamond drill core across each of the three zones for bottle roll tests in the Mulatos metallurgical laboratory. Two samples, an A and B, were crushed to three sizes -3/4 inch, -1/2 inch, and -3/8 inch. A 500 gram charge, at 30% solids by weight, was used for each test. NaCN concentration was maintained at 600 ppm, pH was maintained at greater than 11.0, and tests were run for 72 hours. Results are presented in Table 13-1, Table 13-2, and Table 13-3 and are graphically represented in Figure 13-1, Figure 13-2, and Figure 13-3.

Table 13-1 La Yaqui Grande Zone 1 Bottle Roll Tests

Size	Sample	Agglomerated?	Au Head (g/t)	Au Tail (g/t)	Au % Extraction
3/4"	A	No	1.18	0.26	77.95
3/4"	B	No	1.16	0.24	79.30
1/2"	A	No	1.53	0.36	76.42
1/2"	B	No	1.52	0.33	78.31
3/8"	A	No	1.41	0.29	79.39
3/8"	B	No	1.44	0.30	79.16

Table 13-2 La Yaqui Grande Zone 2 Bottle Roll Tests

Size	Sample	Agglomerated?	Au Head (g/t)	Au Tail (g/t)	Au % Extraction
3/4"	A	No	2.57	0.39	84.83
3/4"	A	Yes	2.77	0.52	81.26
1/2"	A	No	2.55	0.40	84.32
1/2"	A	Yes	2.84	0.46	83.80
3/8"	A	No	2.92	0.39	86.64
3/8"	A	Yes	2.91	0.41	85.93

Table 13-3 La Yaqui Grande Zone 3 Bottle Roll Tests

Size	Sample	Agglomerated?	Au Head (g/t)	Au Tail (g/t)	Au % Extraction
3/4"	A	No	1.76	0.36	79.55%
3/4"	B	No	1.81	0.39	78.45%
3/4"	A	Yes	2.32	0.47	79.74%
3/4"	B	Yes	1.69	0.47	72.19%
1/2"	A	No	2.02	0.39	80.69%
1/2"	B	No	1.88	0.45	76.06%
1/2"	A	Yes	2.14	0.51	76.17%
1/2"	B	Yes	1.94	0.49	74.74%
3/8"	A	No	1.95	0.39	80.00%
3/8"	B	No	2.02	0.31	84.65%
3/8"	A	Yes	1.92	0.40	79.17%
3/8"	B	Yes	2.02	0.44	78.22%

Bottle roll gold recoveries for Zone 1 were between 76% and 79%, for Zone 2 were between 81% and 86%, and for Zone 3 between 72% and 84%. Generally gold recoveries increased with finer crush sizes. NaCN consumption for the tests average 150 grams per tonne of material.

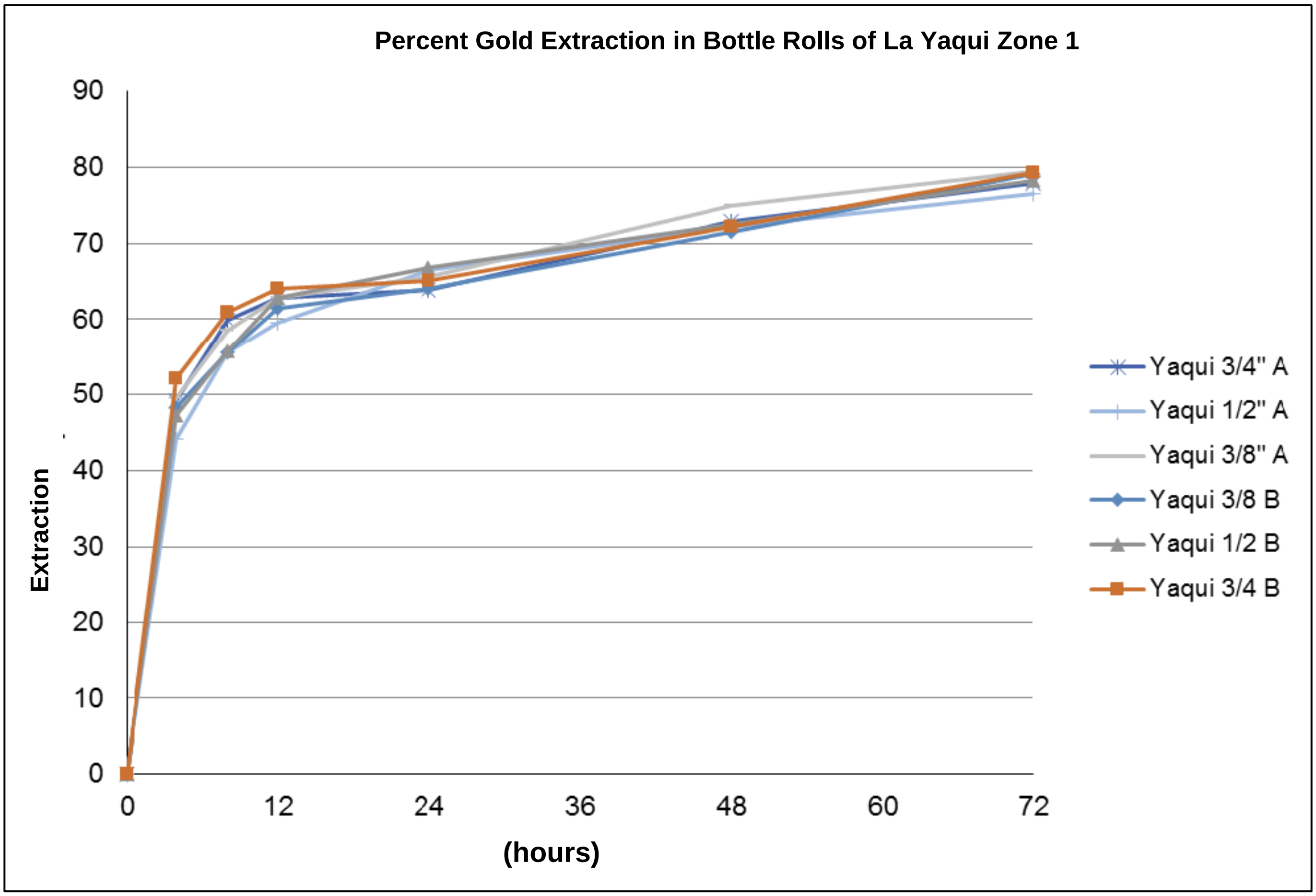


Figure 13-1 La Yaqui Grande Zone 1 Bottle Roll Tests

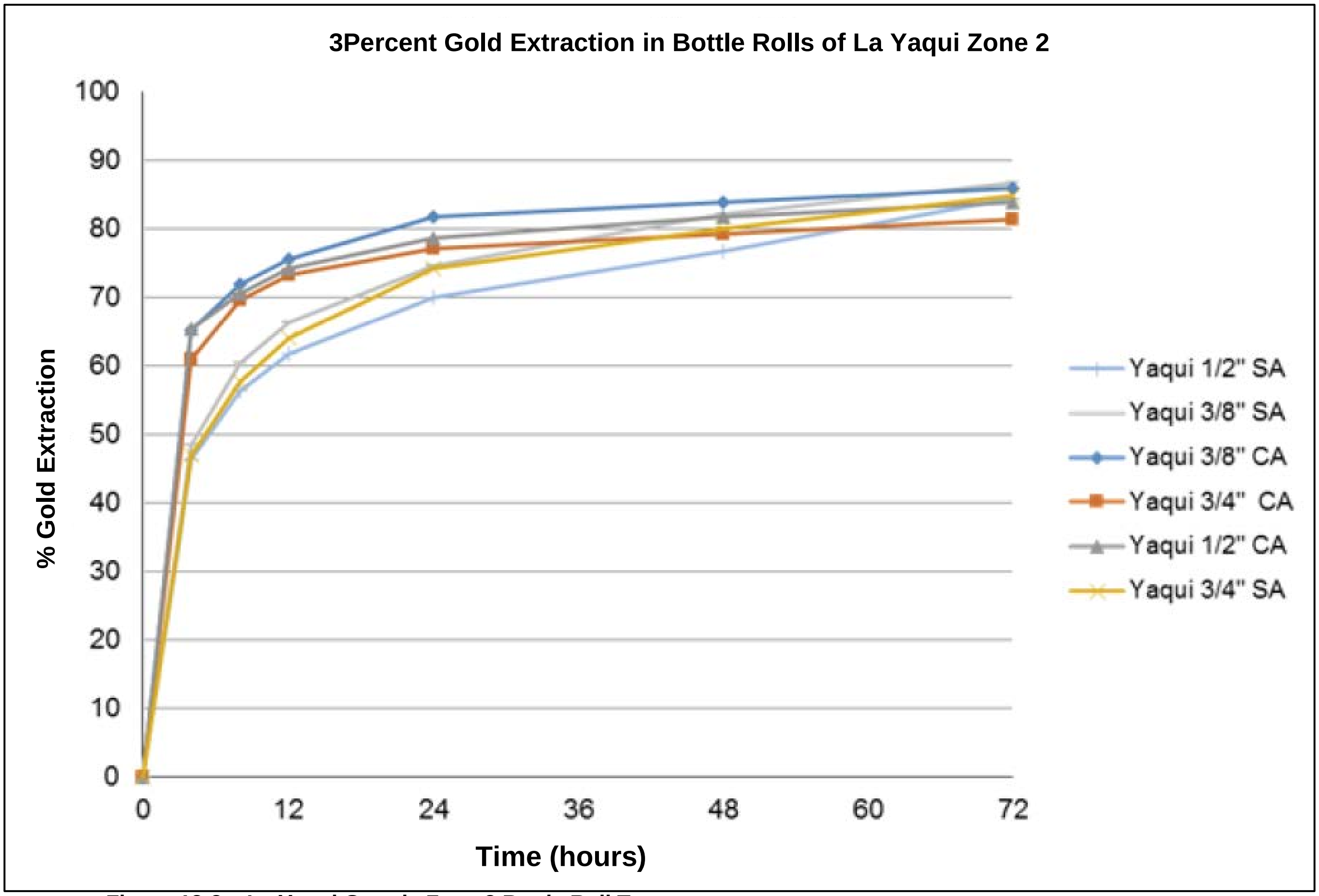


Figure 13-2 La Yaqui Grande Zone 2 Bottle Roll Tests

Notes :

- *SA tests are without agglomeration.*
- *CS test are with agglomeration.*

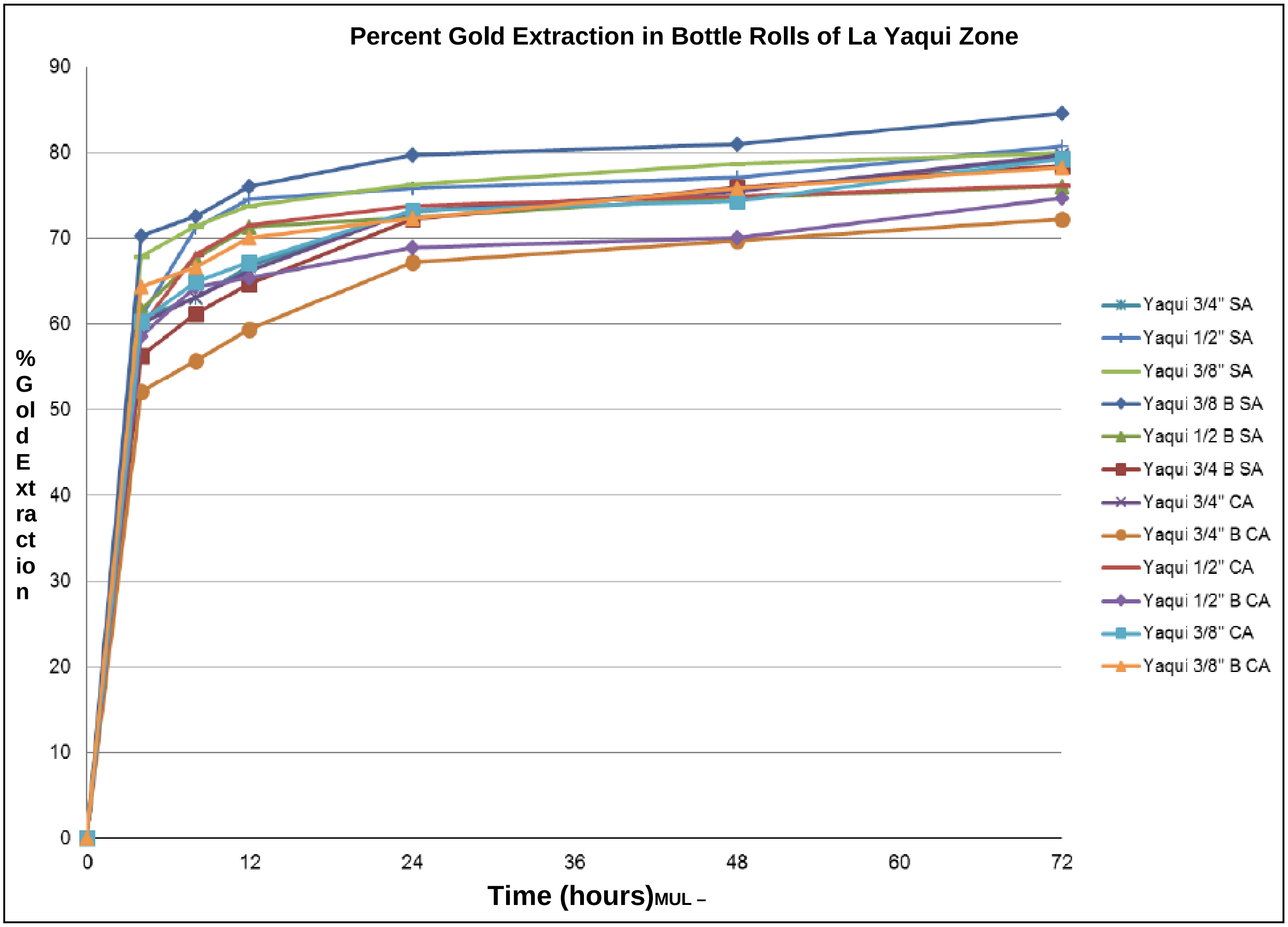


Figure 13-3 La Yaqui Grande Zone 3 Bottle Roll Tests

Notes :

- *SA tests are without agglomeration.*
- *CS test are with agglomeration.*

13.1.2 Column Testwork

The same zonal composites were used for column testwork undertaken in the Mulatos metallurgical laboratory. Two samples, an A and B, were crushed to three sizes -3/4 inch, -1/2 inch, and -3/8 inch. Each of the A and B samples and crusher sizes were run under an agglomeration and non-agglomeration condition, resulting in 12 columns for each of the three zones. A 60 kg gram charge, in a six inch diameter column, was used for each test. NaCN concentration was maintained at 600 ppm, pH was maintained at greater than 11.0, and tests were run for up to 121 days with an irrigation rate of 7 L/h-m^2. Results are presented in Table 13-4, Table 13-5, and are graphically represented in Figure 13-4 to Figure 13-9.

Table 13-4 La Yaqui Grande Zone 1 Column Tests

Size	Sample	Agglomerated?	Au Head (g/t)	Au Tail (g/t)	Au % Extraction	Days Under Leach
0.75"	A	No	1.40	0.14	89.83	62
0.75"	B	No	1.42	0.13	90.86	49
0.75"	A	Yes	1.34	0.11	91.81	58
0.75"	B	Yes	1.34	0.13	90.31	50
0.50"	A	No	1.35	0.11	91.76	62
0.50"	B	No	1.41	0.12	91.50	50
0.50"	A	Yes	1.32	0.09	93.20	59
0.50"	B	Yes	1.35	0.12	91.14	50
0.375"	A	No	1.41	0.12	91.49	62
0.375"	B	No	1.41	0.12	91.50	49
0.375"	A	Yes	1.31	0.10	92.37	58
0.375"	B	Yes	1.39	0.11	92.09	51

Table 13-5 La Yaqui Grande Zone 2 Column Tests

Size	Sample	Agglomerated?	Au Head (g/t)	Au Tail (g/t)	Au % Extraction	Days Under Leach
0.75"	A	No	2.28	0.08	96.49	74
0.75"	B	No	2.45	0.06	97.55	74
0.75"	A	Yes	2.39	0.14	94.14	75
0.75"	B	Yes	2.33	0.13	94.42	75
0.50"	A	No	2.33	0.07	97.00	74
0.50"	B	No	2.45	0.07	97.14	74
0.50"	A	Yes	2.53	0.15	94.06	75
0.50"	B	Yes	2.56	0.15	94.14	75
0.375"	A	No	2.67	0.19	92.87	74
0.375"	B	No	2.62	0.18	93.12	74
0.375"	A	Yes	2.35	0.18	92.35	75
0.375"	B	Yes	2.50	0.38	84.81	75

Table 13-6 La Yaqui Grande Zone 3 Column Tests

Size	Sample	Agglomerated?	Au Head (g/t)	Au Tail (g/t)	Au % Extraction	Days Under Leach
0.75"	A	No	1.69	0.33	80.52	121
0.75"	B	No	1.68	0.22	86.91	121
0.75"	A	Yes	1.85	0.29	84.32	121
0.75"	B	Yes	1.84	0.28	84.78	121
0.50"	A	No	1.60	0.21	86.86	121
0.50"	B	No	1.49	0.22	85.20	121
0.50"	A	Yes	1.77	0.21	88.11	121
0.50"	B	Yes	1.82	0.30	83.49	121
0.375"	A	No	1.49	0.18	87.90	121
0.375"	B	No	1.46	0.17	88.37	121
0.375"	A	Yes	1.79	0.24	86.56	121
0.375"	B	Yes	1.86	0.23	87.64	121

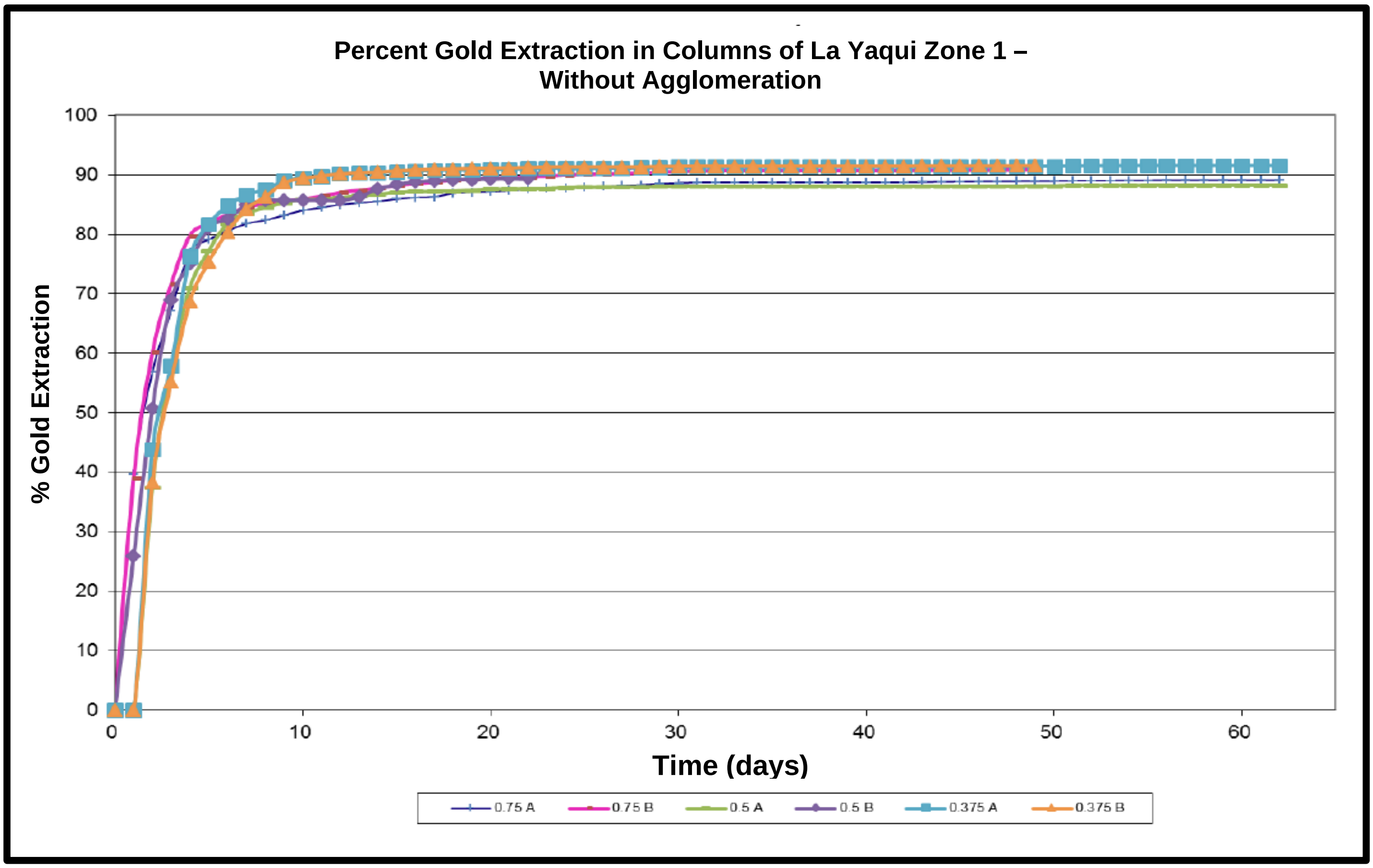


Figure 13-4 La Yaqui Grande Zone 1 Columns without Agglomeration

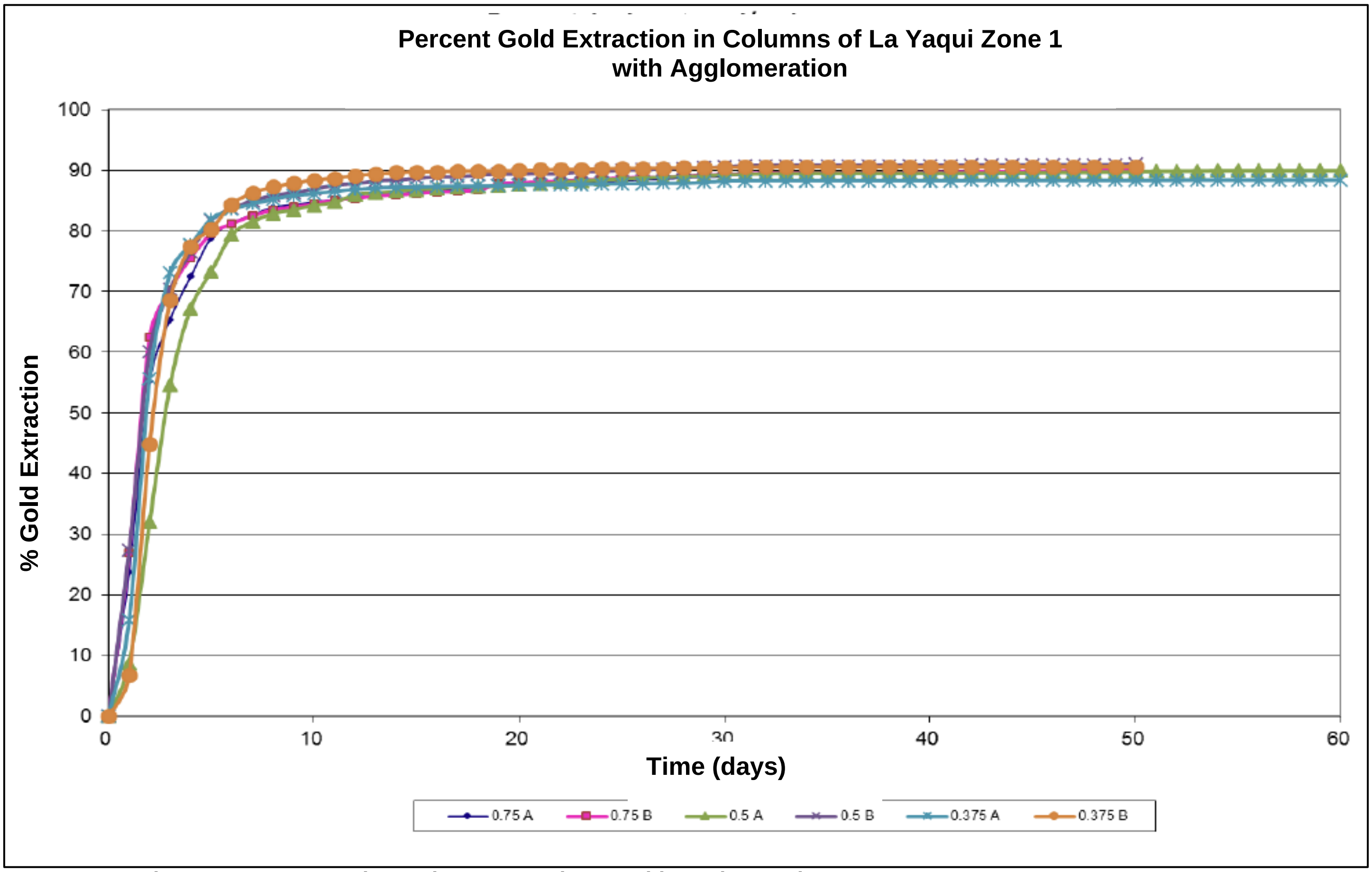


Figure 13-5 La Yaqui Grande Zone 1 Columns with Agglomeration

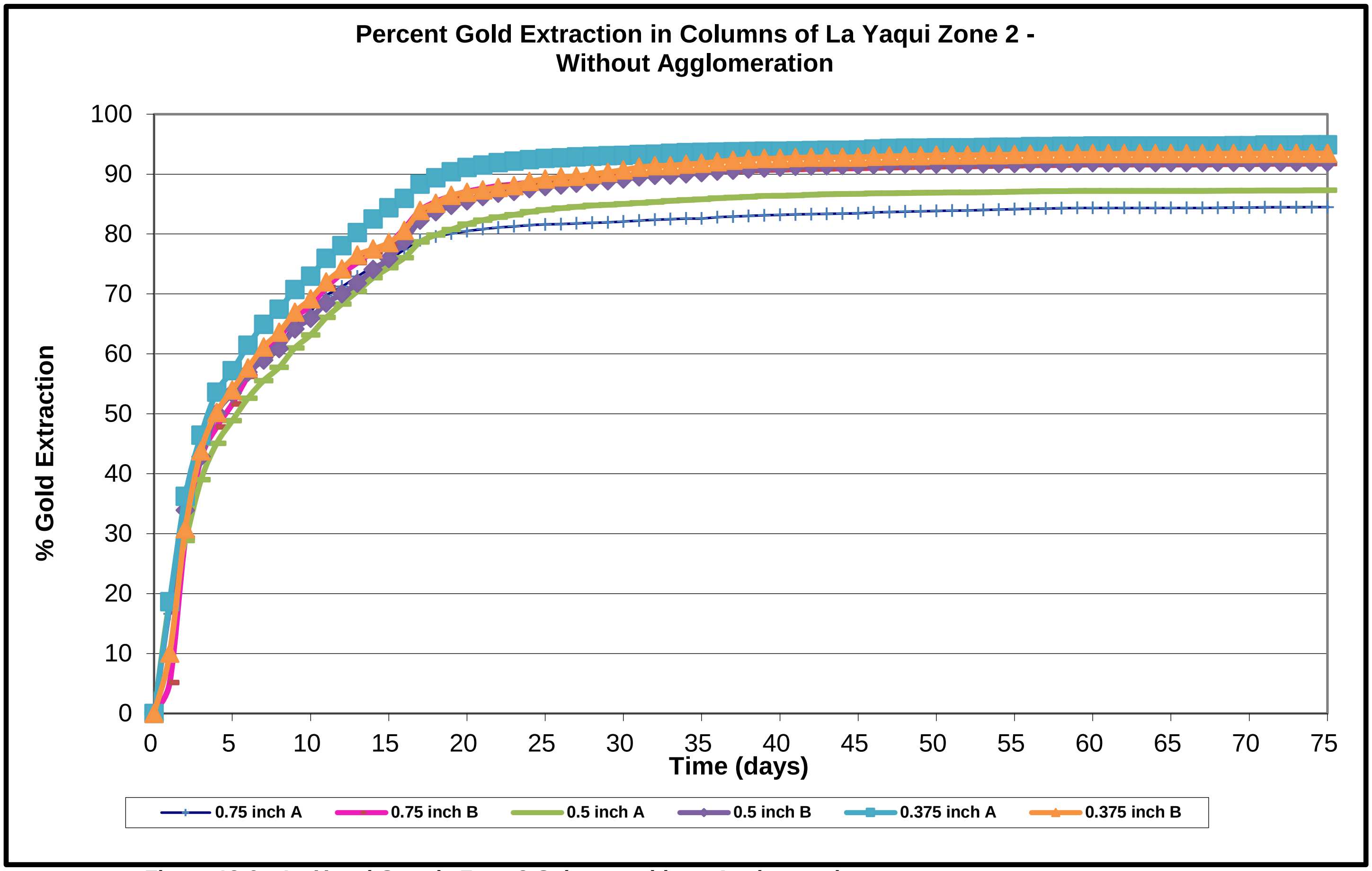


Figure 13-6 La Yaqui Grande Zone 2 Columns without Agglomeration

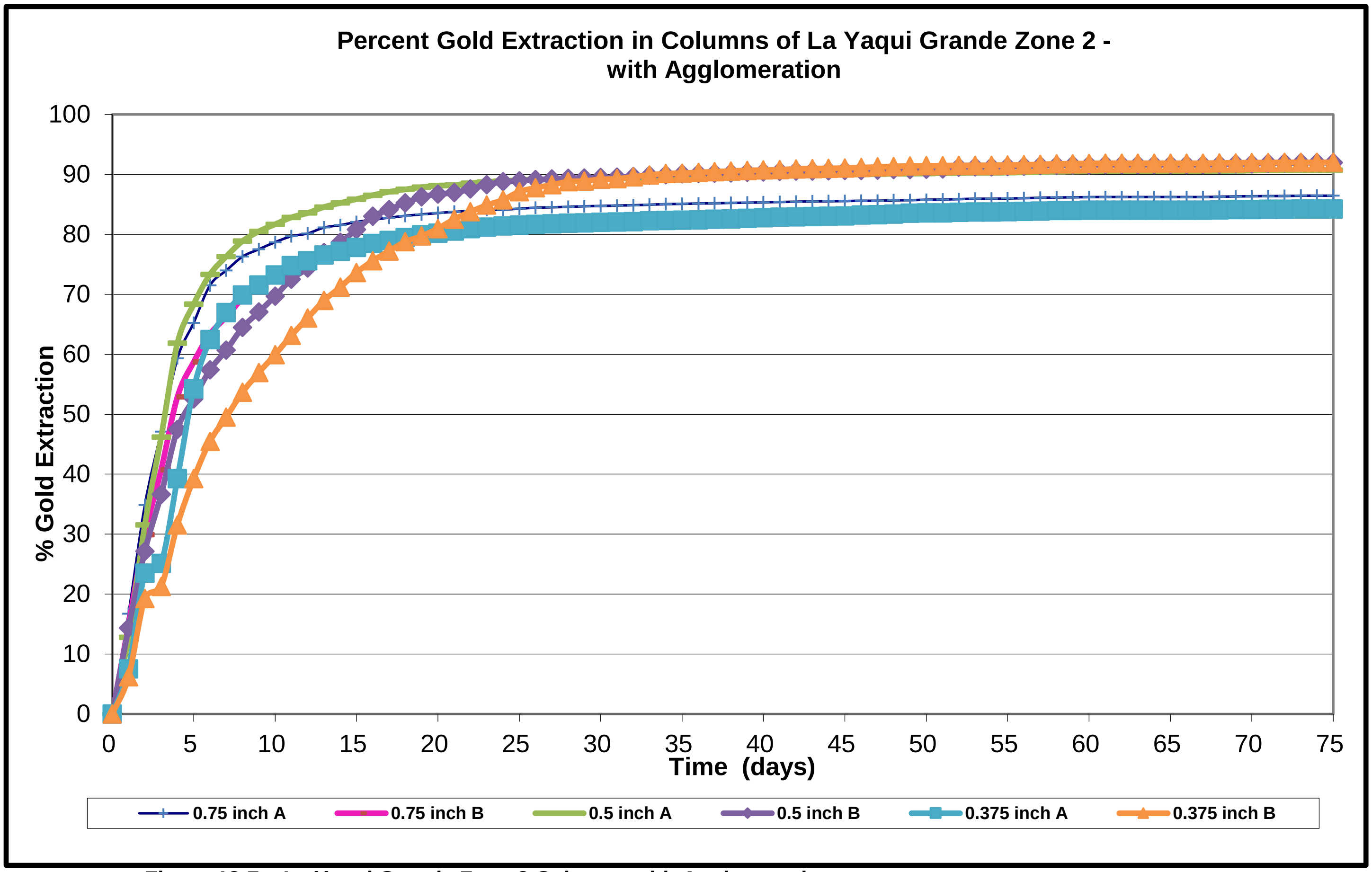


Figure 13-7 La Yaqui Grande Zone 2 Columns with Agglomeration

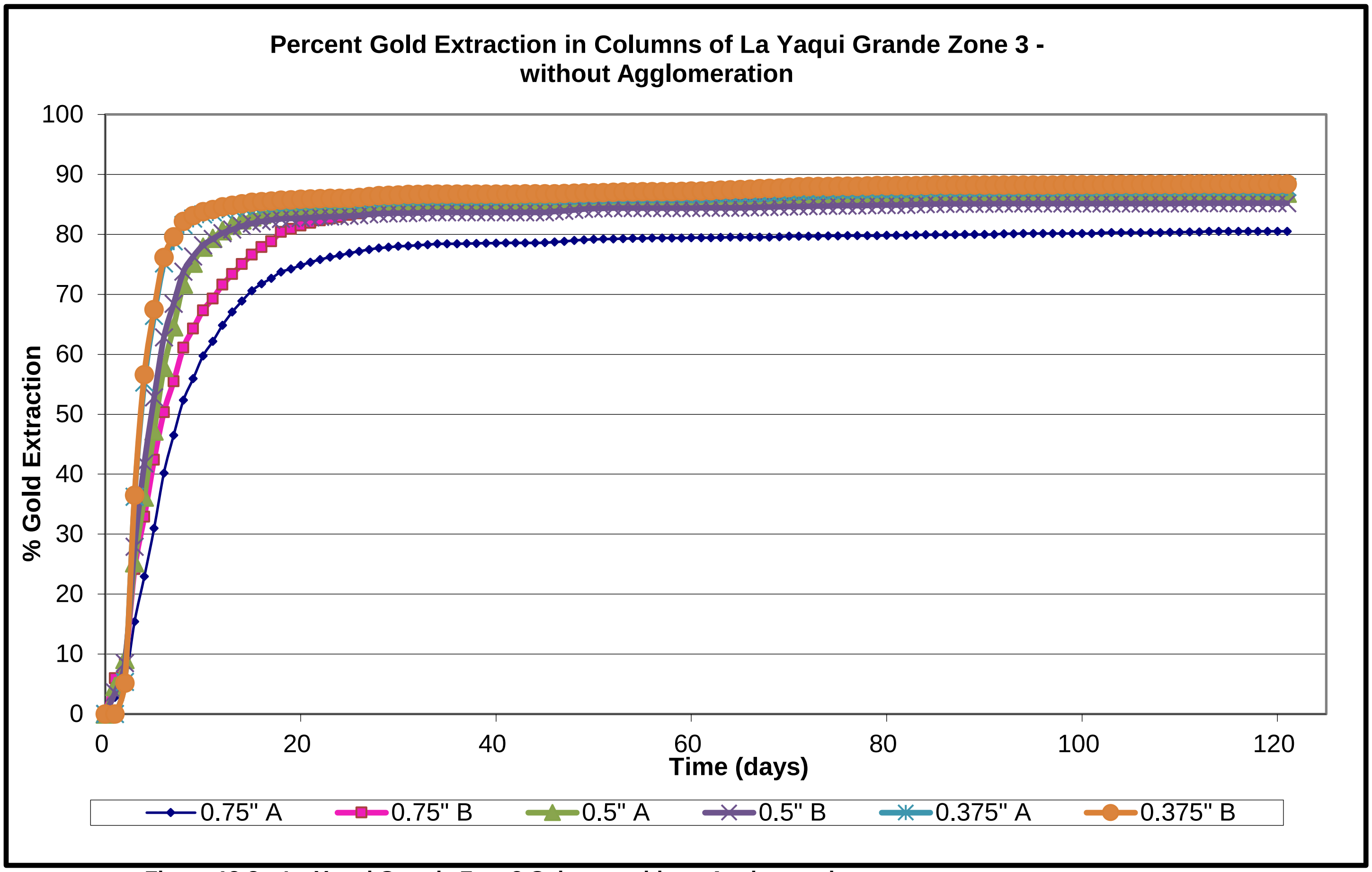


Figure 13-8 La Yaqui Grande Zone3 Columns without Agglomeration

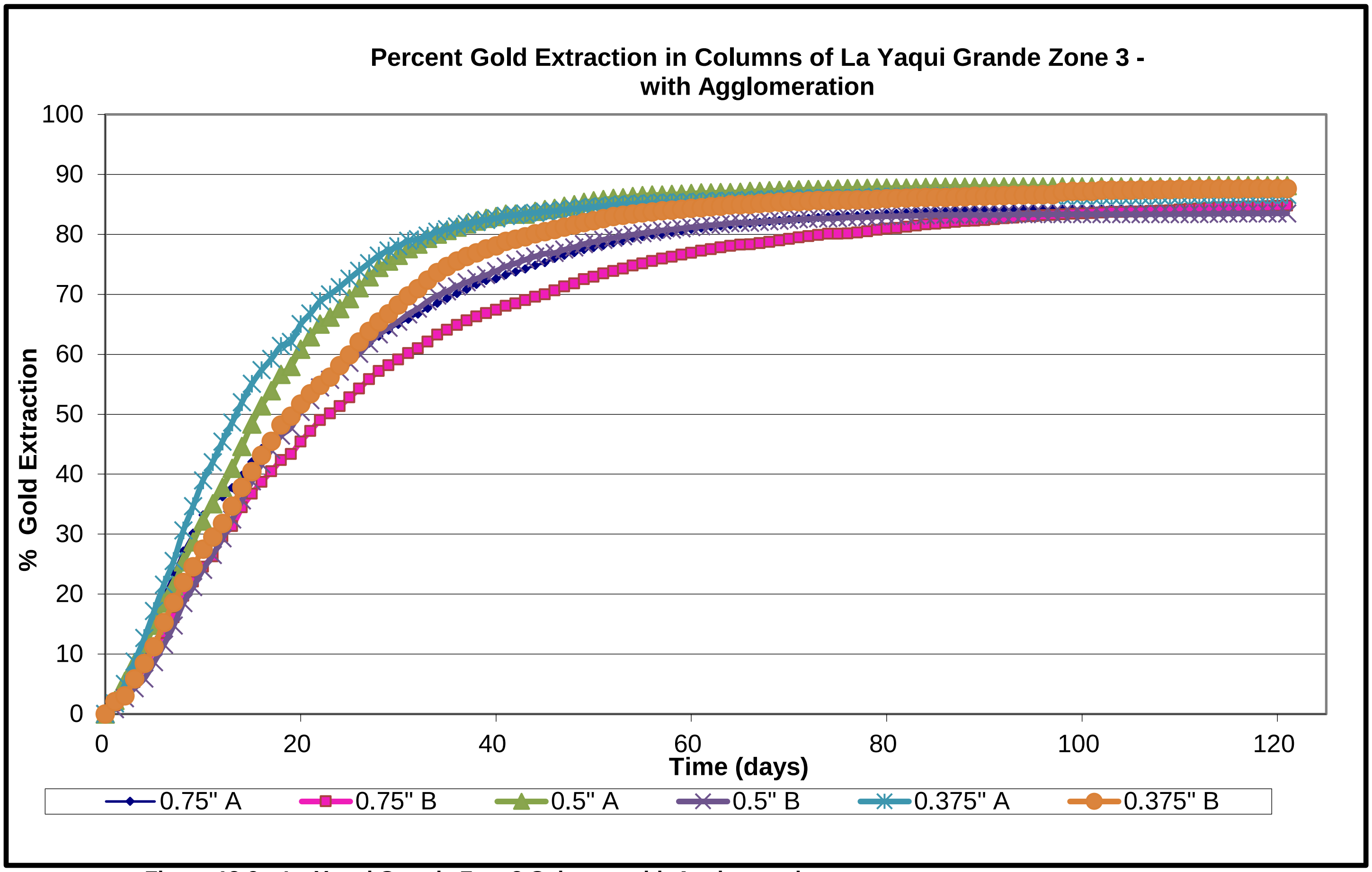


Figure 13-9 La Yaqui Grande Zone3 Columns with Agglomeration

Column test gold recoveries for Zone 1 were between 89% and 92% after up to 62 days of leaching. Recoveries for Zone 2 were between 84% and 97% after up to 75 days of leaching. Note that for Zone 2 all but one of the column's recoveries were over 92%. Recoveries for Zone 3 were between 80% and 88% after up to 121 days of leaching. Generally, gold recoveries slightly increased with finer crush sizes. NaCN consumption for the tests averaged 250 grams per tonne of material.

There were no material increases in gold recovery with finer crusher sizes, and only a marginal improvement in gold recovery when agglomeration was used. Mulatos has elected to crush to -0.75 inches and utilize agglomeration in the La Yaqui crushing plant. For expected gold recoveries Mulatos uses the AuCN/Au ratio, as determined in the Mineral Resource model, for mine and process planning. This ratio is capped at 85%.

13.2 Puerto del Aire Sulphide Project

Mulatos has a high grade milling facility that was initially used to process ore from the Escondida deposit and San Carlos underground mine. The flowsheet for the Escondida ore employed gravity concentration, with in-line pressure jigs, followed by leaching using Intensive Leach Reactors, and electrowinning to produce a sludge for smelting into doré. Plant modifications were subsequently made to the plant to produce a gold/sulphide, plus 100 g/t Au, flotation concentrate for the San Carlos underground ore.

Given the relatively high sulphide content of the Puerto del Aire ore, a flotation concentrate and intensive cyanide leach flowsheet has been investigated.

Testwork was supervised by Steve Dixon of SND Consulting, and all testing was done by McClelland Laboratories, Inc in Sparks, Nevada (McClelland, 2022).

13.2.1 Rougher Flotation Testwork

Four composites from the PDA deposit were tested for flotation recovery of gold (with silver and copper) at a P80 of the tails averaging 53 microns (SND 2021a). The variation in head grade for gold, silver, copper, and sulphide sulfur are presented in Table 13-7. Composite 4680-004 had a significantly lower silver grade than the other three composites. Composite 4640-002 had a significantly higher copper grade than the other three composites. Composite 4680-003 had a significantly lower sulphur grade than the other three deposits.

Table 13-7 Calculated and Assay Head Grades of PDA Composites

Test	Composite #	Calculated Head Grade				Assay Head Grade			
		Au (g/t)	Ag (g/t)	Cu (g/t)	% S	Au (g/t)	Ag (g/t)	Cu (g/t)	% S
F-1	4680-001	11.47	13	185	5.06%	10.39	17	201	6.52%
F-2	4680-002	8.18	14	4,823	5.92%	12.29	14	5,420	7.80%
F-3	4680-003	9.42	13	52	0.52%	9.04	11	38	0.73%
F-4	4680-004	16.19	2	89	2.58%	19.63	2	92	3.74%

A 1 kg sample was split from each composite for flotation testing. Each composite was ground in a ball mill at 66% solids for 20 minutes. The slurry was washed from the grinding mill into a flotation cell. The slurry was diluted to 33% solids. The collectors used were PAX (potassium amyl xanthate) and Aero 3477 (isobutyl dithiophosphate). The addition of each reagent was 5 g/t at 5 minute intervals of collection of the froth. The total collection time was 25 minutes. The total reagent consumption was 25 g/t for each collector. Frother (Aerofroth 65) was added as required. Each concentrate and the flotation tails were filtered and assayed for gold, silver, copper, and sulphide sulfur. The flotation tails were sized at 75, 45 and 37 microns. Each size fraction was assayed for gold, silver, copper, and sulphide sulfur.

Table 13-8 presents the summary of the recovery of gold, silver, copper, and sulfide sulfur for each composite. The recovery of gold was high for all composites (average 96%). The variation of silver, copper and sulfur in the composites influence the recoveries.

The impact of sulfur content in composite 4680-003 (0.73% S) is shown in the amount of weight collected. The recovery of silver was low for composite 4680-003 due to the low sulfur content.

Table 13-8 PDA Recovery by Flotation

Test	Composite #	Tail Grind (P80 microns)	% Weight		% Recovery in Concentrate			
			Rougher Concentrate	Rougher Tails	Au	Ag	Cu	S
F-1	4680-001	50	25.8%	74.2%	95.9%	83.0%	80.5%	89.7%
F-2	4680-002	55	25.8%	74.2%	95.2%	94.8%	98.9%	96.7%
F-3	4680-003	55	7.3%	92.7%	96.2%	22.7%	44.7%	92.8%
F-4	4680-004	58	22.2%	77.8%	98.3%	56.6%	86.8%	93.9%

The kinetics of recovery for gold are presented in Figure 13-10. Composites 4680-003 and 4680-004 have very fast kinetics for gold. Composites 4680-001 and 4680-002 had slower kinetics for gold but achieved comparable recoveries after 20 minutes of flotation.

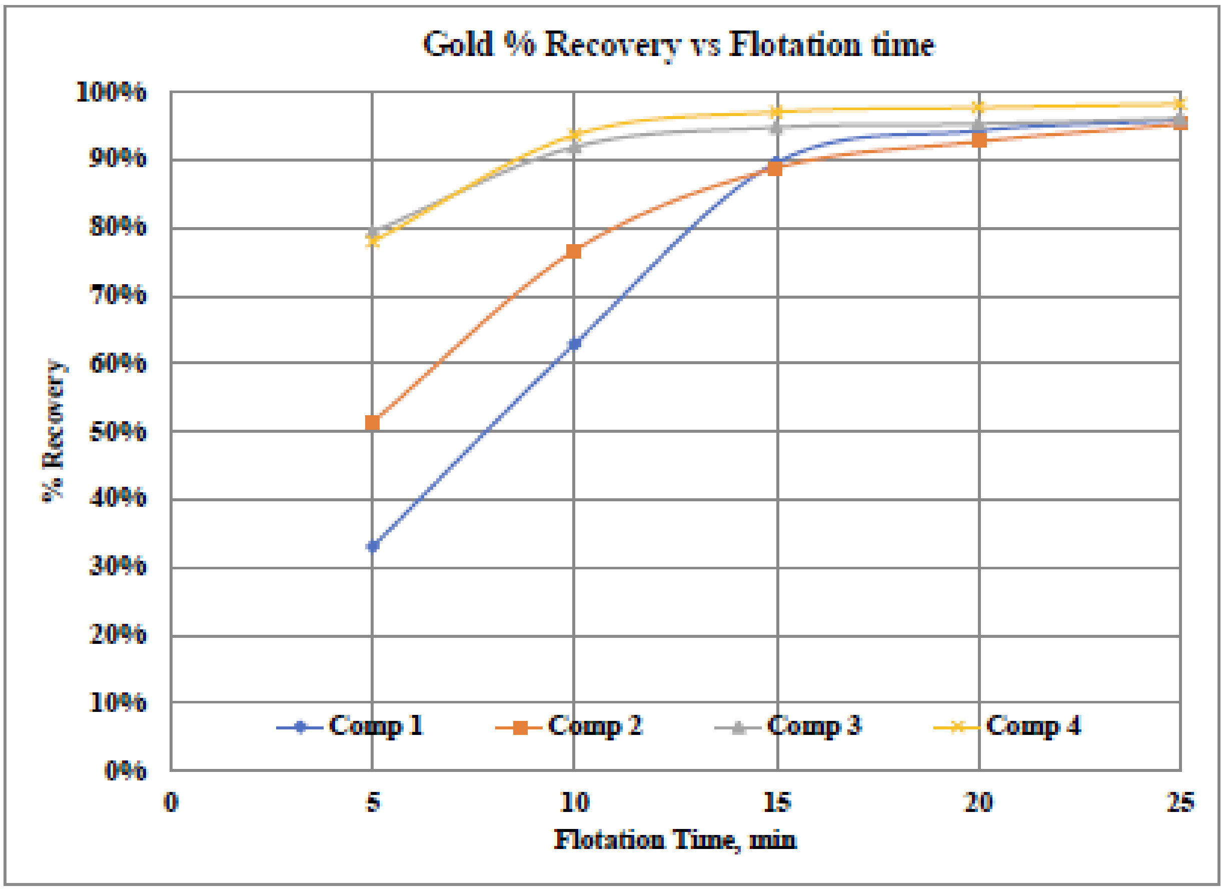


Figure 13-10 PDA Gold Recovery versus Flotation Time

The flotation test was a rougher to define the maximum recovery values for each element. The average grade of gold in the flotation tails is 0.48 gpt. The flotation tail is low enough to question the addition of the material to the heap leach. Table 13-9 presents the flotation concentrate and tail grade for each composite.

Table 13-9 Flotation Concentrate and Tails Grades of PDA Composites

Test	Composite #	Flotation Tail Grade				Flotation Concentrate Grade			
		Au (g/t)	Ag (g/t)	Cu (g/t)	% S	Au (g/t)	Ag (g/t)	Cu (g/t)	% S
F-1	4680-001	0.64	3	49	0.71%	42.63	42	577	17.58%
F-2	4680-002	0.52	1	69	0.36%	30.23	53	18,496	21.92%
F-3	4680-003	0.39	11	31	0.02%	124.09	41	318	6.87%
F-4	4680-004	0.37	1	15	0.14%	71.63	5	348	11.14%

The relationships of concentrate gold grade to recovery are presented in Figure 13-11. Composites 4680-003 and 4680-004 had rapid high grade recovery of gold. The dilution of the gold grade was significant over the 25 minute flotation period. Composites 4680-001 and 4680-002 started low with recovery but the dilution was less than found in the other two composites. These two composites had the lowest sulfur content of the four composites.

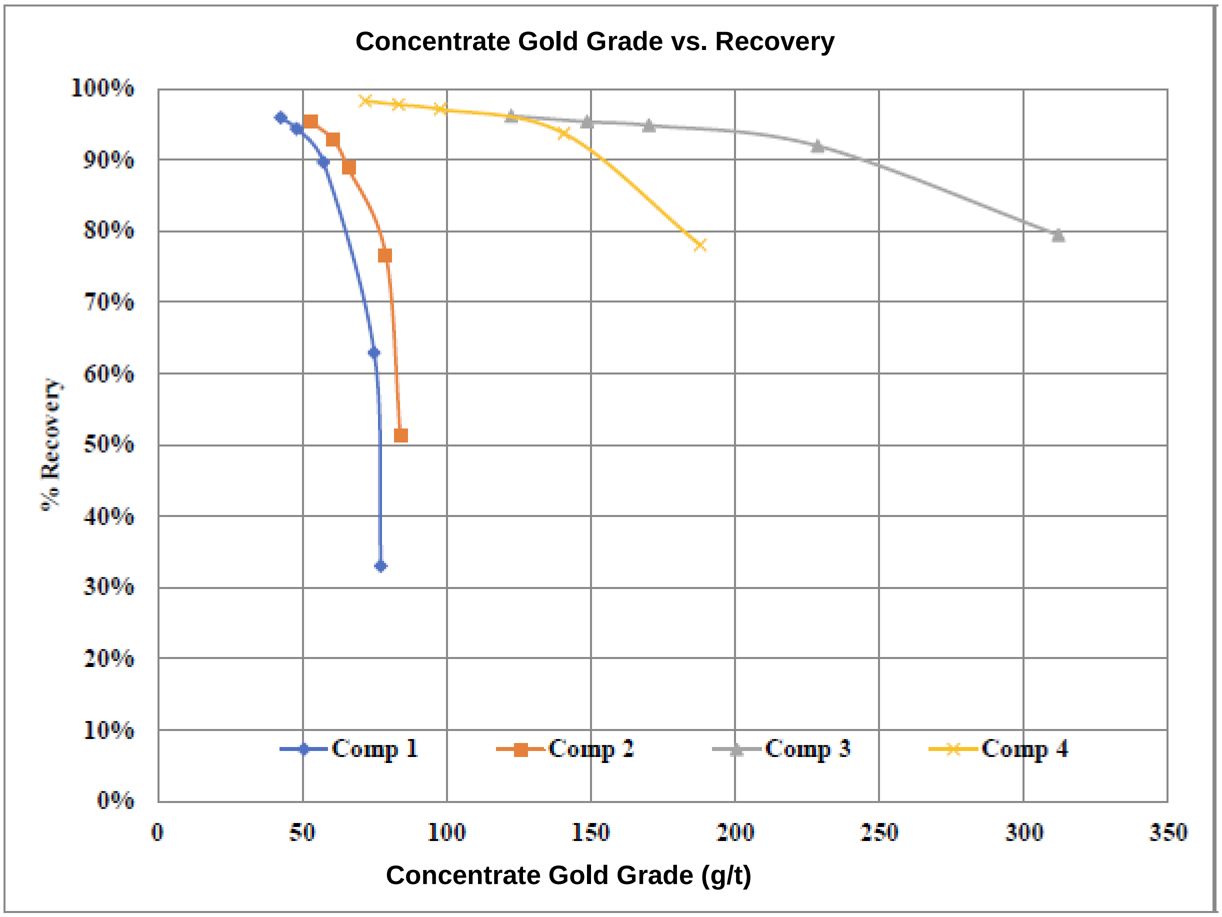


Figure 13-11 PDA Concentrate Gold Grade versus Recovery

13.2.2 Locked Cycle Testwork

The Puerto del Aire Mineral Resource was evaluated for batch rougher and batch cleaning tests on two composites (SND 2021b). The presence of sulfide sulfur above 2% resulted in high mass recovery into the rougher concentrate. The cleaning of the rougher concentrate was impacted by the sulfide mineralization.

The flotation conditions used a grind P80 of 100 microns, and a natural pH (4-5). The flotation reagents were 20 gpt of Aero 3477 (butyl dithiophosphate) and 10 gpt of PAX (potassium amyl-xanthate). The froth collection time for rougher was 25 minutes. The first stage cleaning used 8 minutes of froth collection time. The second & third stages of cleaning used 3 minutes of froth collection time.

The locked cycle flotation tests used the flow diagram in Figure 13-12. The second and third cleaner tails are recycled. These two streams are collected in the eighth cycle to complete the mass balance.

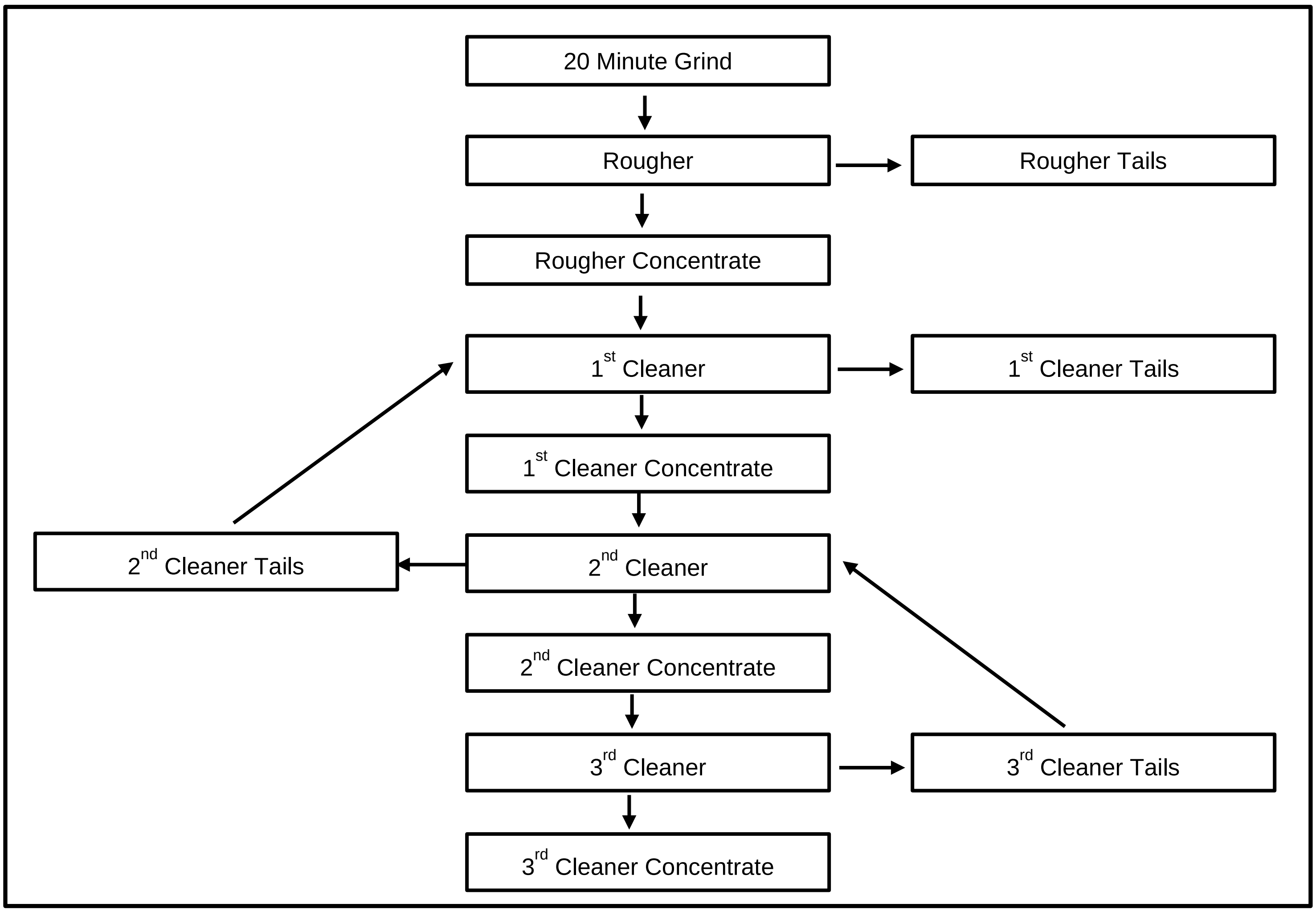


Figure 13-12 Locked Cycle Flotation Test Flow Diagram

The eight flotation cycles for each composite were combined to define the material balance of the sample used in the eight cycles. The percent distribution for each product of the eight cycles was calculated. Summaries of the eight cycles for each composite are provided in the appendix. Cycles 7 and 8 are combined to define the equilibrium values of concentrate, first cleaner tail, and rougher tail. This combination of cycles 7 and 8 are presented in Table 13-10 and Table 13-11.

Table 13-10 Summary Cycles 7 and 8 of Flotation for Composite 4680-001

Product	% wt	Assay (g/t or %)				% Distribution			
		Au	Ag	Cu	% S=	Au	Ag	Cu	S=
Cycle 7									
Feed	100%	19.2	23.3	319	6.70%	100%	100%	100%	100%
Final Concentrate	22.2%	84.2	99.0	1,100	28.64%	97.8%	94.6%	76.8%	95.1%
1st Cleaner Tail	2.4%	7.1	25.4	267	4.17%	0.9%	2.6%	2.0%	1.5%
Rougher Tail	75.4%	0.35	0.9	90	0.300%	1.4%	2.8%	21.2%	3.4%
Cycle 8									
Feed	100%	11.5	16.7	194	4.30%	100%	100%	100%	100%
Final Concentrate	15.5%	70.2	92.0	1,050	24.69%	94.5%	85.8%	83.9%	89.2%
1st Cleaner Tail	2.6%	7.4	24.7	251	3.97%	1.7%	3.9%	3.4%	2.4%
Rougher Tail	81.8%	0.53	2.1	30	0.44%	3.8%	10.3%	12.7%	8.4%
Combined Cycle 7 & 8									
Feed	100%	15.5	20.1	259	5.55%	100%	100 %	100%	100%
Final Concentrate	19.0%	78.7	96.3	1,081	27.10%	96.6%	91.1%	79.3%	92.9%
1st Cleaner Tail	2.5%	7.2	25.1	259	4.07%	1.2%	3.1%	2.5%	1.8%
Rougher Tail	78.4%	0.44	1.5	60	0.37%	2.2%	5.7%	18.1%	5.2%

Table 13-11 Summary Cycles 7 and 8 of Flotation for Composite 4680-002

Product	% wt	Assay (g/t or %)				% Distribution			
		Au	Ag	Cu	% S=	Au	Ag	Cu	S=
Cycle 7									
Feed	100%	4.6	8.7	2,395	2.72%	100%	100%	100%	100%
Final Concentrate	4.5%	42.3	110.0	36,500	35.28%	41.3%	56.7%	68.2%	58.1%
1st Cleaner Tail	9.0%	25.8	30.0	7,480	8.92%	50.7%	31.1%	28.1%	29.5%
Rougher Tail	86.5%	0.4	1.2	104	0.39%	8.1%	12.2%	3.7%	12.4%
Cycle 8									
Feed	100%	7.9	14.6	4,813	5.21%	100%	100%	100%	100%
Final Concentrate	10.8%	55.2	103.0	37,500	38.38%	76.1%	76.4%	84.5%	79.8%
1st Cleaner Tail	8.4%	18.9	31.0	7,900	9.38%	20.3%	17.9%	13.9%	15.2%
Rougher Tail	80.7%	0.4	1.0	100	0.32%	3.6%	5.7%	1.7%	5.0%
Combined Cycle 7 & 8									
Feed	100%	6.3	11.7	3,643	4.01%	100%	100%	100%	100%
Final Concentrate	7.8%	51.6	105.0	37,221	37.51%	63.8%	69.3%	79.3%	72.7%
1st Cleaner Tail	8.7%	22.4	30.5	7,690	9.15%	31.0%	22.6%	18.4%	19.9%
Rougher Tail	83.5%	0.4	1.1	102	0.36%	5.2%	8.1%	2.3%	7.4%

The results of the test program found the ability to produce a concentrate greater than 100 gpt gold with three stages of cleaning was not possible. The average grade and recovery of gold in the final concentrate of cycles 7 and 8 for composite 4680-001 was 78 gpt and 96% recovery in 19% of the feed weight. The average grade and recovery of gold in the final concentrate of cycles 7 and 8 for composite 4680-002 was 52 gpt and 64% recovery in 7% of the feed weight. The first cleaner tail contained a significant amount of gold for each composite. The average grade and recovery of gold in the 1st cleaner tail for composite 4680-001 was 7.2 gpt and 1.2% recovery in 2.5% of the feed weight. The average grade and recovery of gold in the first cleaner tail for composite 4680-002 was 22 gpt and 31% recovery in 8.7% of the feed weight.

Recommendations from Flotation Testwork

- The optimum primary grind may be coarser than used (P80 of 100 micron).
- The flotation conditions maximized the recovery of sulfide minerals. The evaluation of selective depression of pyrite may be an option to evaluate. A significant percentage recovery of gold reported into the 1st cleaner tail for composite 4680-002.
- Cyanidation of the rougher concentrate is recommended. The percent recovery of gold into the rougher concentrate was 95% for both concentrates.
- Undertake mineralogical study to understand what is contained in each composite rougher concentrate.
- Based on the above additional testwork, finalize the Puerto del Aire Sulphide Project processing flowsheet.

14 MINERAL RESOURCE ESTIMATES

The following sections outline the preparation and results for the Mineral Resources for La Yaqui Grande and the Puerto del Aire Sulphide Project (comprising the PDA, Estrella, and Gap-Victor zones). Remaining Mineral Resources at the main Mulatos pit and the Carricito deposit are not detailed as they are not material within the Mulatos Property.

The interpretation of the mineralized zones was performed by Alamos' site exploration team (except where as noted) while the estimation of the Mineral Resources was carried out by Independent Qualified Person ("QP"), Marc Jutras, P.Eng., M.A.Sc., Principal, Mineral Resources at Ginto Consulting Inc. ("Ginto"). The Mineral Resources have been estimated in accordance with the "CIM Estimation and Mineral Resources and Reserves Best Practices Guidelines" (CIM, 2019) and have been classified as "Measured", "Indicated" and "Inferred" in conformity with the "CIM Standards on Mineral Resources and Reserves: Definitions and Guidelines" (May 2014).

It should be noted that 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. The estimate of Mineral Resources may be materially affected by future changes in environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues. However, there are no currently known issues that negatively impact the stated Mineral Resources.

The CIM definitions were followed for the classification of Measured, Indicated, and Inferred Mineral Resources. The Inferred Mineral Resources have a lower level of confidence and must not be converted to Mineral Reserves. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

Mineral Resources are reported in accordance with Canadian Securities Administrators National Instrument 43-101; and have been estimated in conformity with the "CIM Estimation and Mineral Resources and Reserves Best Practices Guidelines" (CIM, 2019) and the "CIM Definition Standards for Mineral Resources and Mineral Reserves" (CIM, 2014).

14.1 La Yaqui Grande

14.1.1 Introduction

The current study concerns the update of the Mineral Resource estimation of the La Yaqui Grande ("LYG") deposit located at the Mulatos Property, Sonora State, Mexico. The La Yaqui Grande deposit is on Alamos' Mulatos Property, approximately 8 km southwest of the Estrella pit of the Mulatos mine. This estimation of the La Yaqui Grande Mineral Resources represents the latest update since June 2018. It incorporates 6 new holes drilled in 2020, as well as a new interpretation of the silver mineralized zones, alteration and redox, and an updated interpretation of the gold mineralized zones. The estimation of gold grades, silver grades, ratio of AuCN/Au, copper grades, and total sulphur grades was carried out from first principles with the Vulcan® software and internally developed utilities in GSLIB-type format. The steps and results leading to the tabulation of the Mineral Resources at La Yaqui Grande are summarized below.

14.1.2 Drill Hole Database

The La Yaqui drill hole database is comprised of 616 drill holes with 60,226 gold assays in g/t, 58,381 silver assays in g/t, 10,450 ratios of AuCN/Au, 58,382 copper assays in ppm, and 55,713 total sulphur assays in percent. The La Yaqui drill hole database includes holes in the La Yaqui Phase 1 area, which has been mined out, and holes in the La Yaqui Grande area. A total of 6 new holes were drilled in the La Yaqui Grande area in 2020, since the last Mineral Resource update in June 2018. In the drill hole database prior to this update, it was observed that in some cases, multiple regular sample intervals located outside mineralized zones were grouped and assayed as one longer interval, a technique called "button sampling". To have a more regularized representation of the assay grades, these longer intervals located closer to mineralization were re-assayed on 2m lengths on average. From this program, a total of 790 intervals from 30 holes drilled in 2016 were re-assayed and integrated into the La Yaqui Grande drill hole database for this update.

14.1.3 Location, Orientation, and Spacing of Drill Holes

The location of the drill holes in plan view is presented in Figure 14-1 and in a perspective view with the topography surface in Figure 14-2. Multiple orientations of drilling are observed in the deposit area, with the most prevalent orientation angled to the southwest at azimuths varying from 235° to 245° and dips varying from -65° to -80°. Figure 14-3 displays a stereonet-type of drill hole orientations. Statistics of the drill hole spacing are presented in Table 14-1.

Table 14-1 LYG - Drill Hole Spacing Statistics

Domains	Average Spacing (m)	Median Spacing (m)	Minimum Spacing (m)	Maximum Spacing (m)
In Au High-Grade ZONE 1	25.3	21.6	0.3	174.7
In Au High-Grade ZONE 2	29.1	30.2	0.7	89.0
In Au High-Grade ZONE 3	32.8	29.8	8.4	267.4
In Au High-Grade ALL ZONES	28.5	27.0	0.3	174.7
Out Au High-Grade ZONE 1	28.1	24.1	0.01	131.0
Out Au High-Grade ZONE 2	32.1	27.6	0.1	274.7
Out Au High-Grade ZONE 3	37.4	31.9	0.3	205.5
Out Au High-Grade ALL ZONES	31.5	27.7	0.01	274.7
In/Out Au High-Grade ALL ZONES	30.6	27.1	0.01	274.7

The average drill hole spacing within the higher-grade gold zones is 28.5m with a median of 27.0m. The average drill hole spacing outside the higher-grade gold zones is 31.5m with a median of 27.7m. Overall, the drill hole spacing within the three zones of interests, inside and outside the higher-grade gold mineralized zones, is 30.6m on average with a median of 27.1m. As seen in Table 14-1, the average drill hole spacing is tighter in Zone 1, followed by Zone 2, and Zone 3.

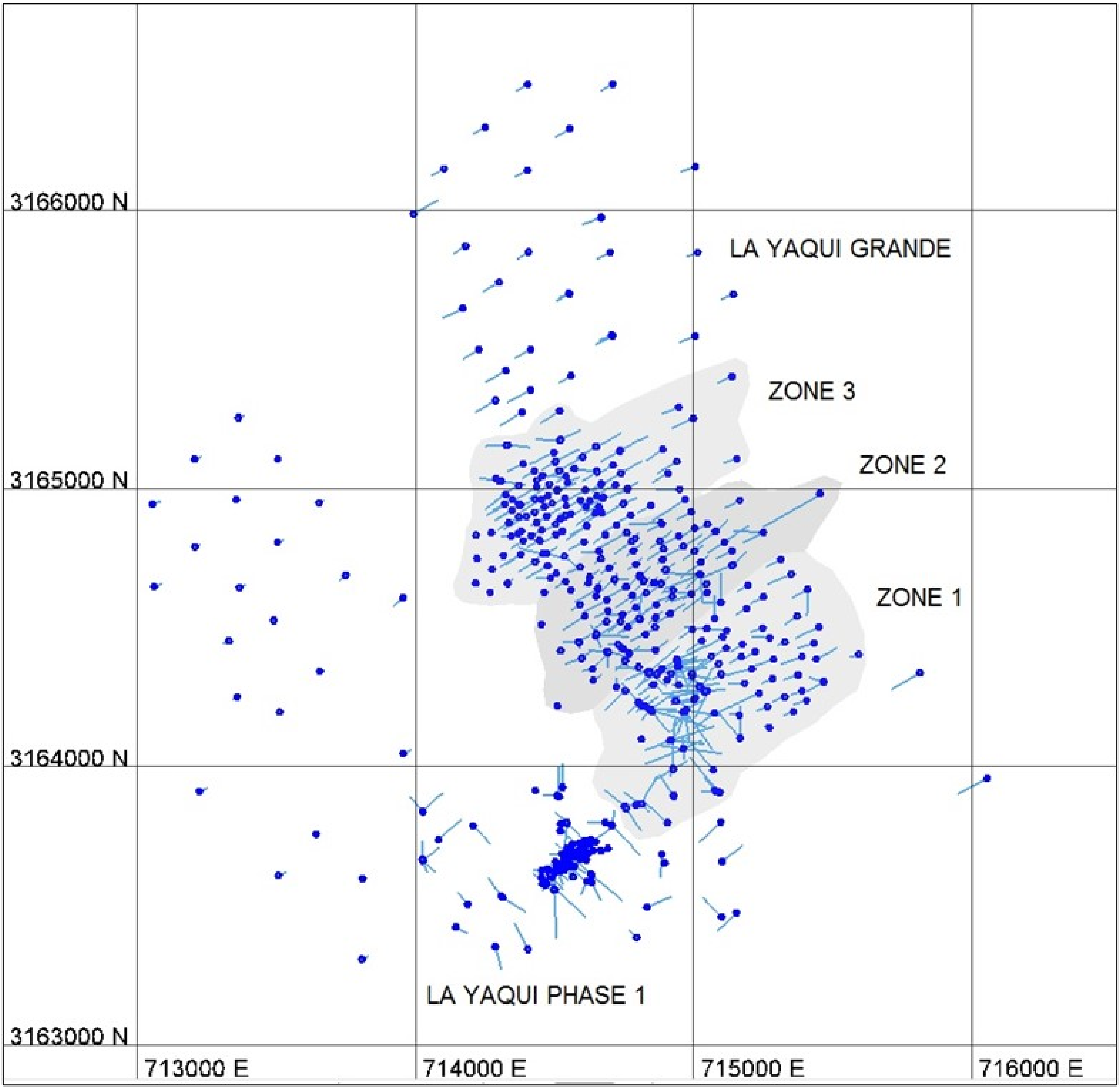


Figure 14-1 LYG - Drill Hole Location – Plan View

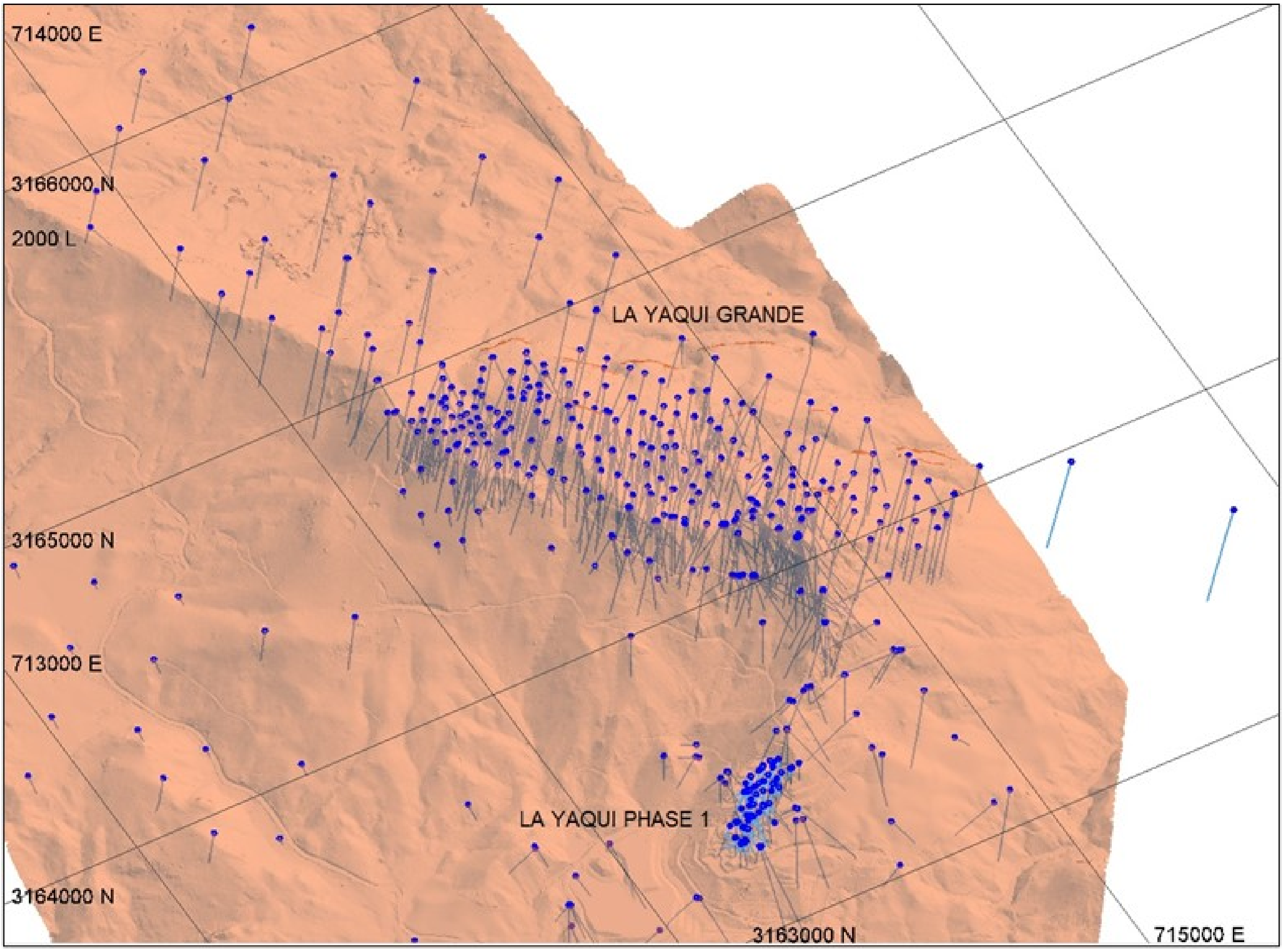


Figure 14-2 LYG - Drill Hole Location with Topography Surface. Perspective View Looking to the NE

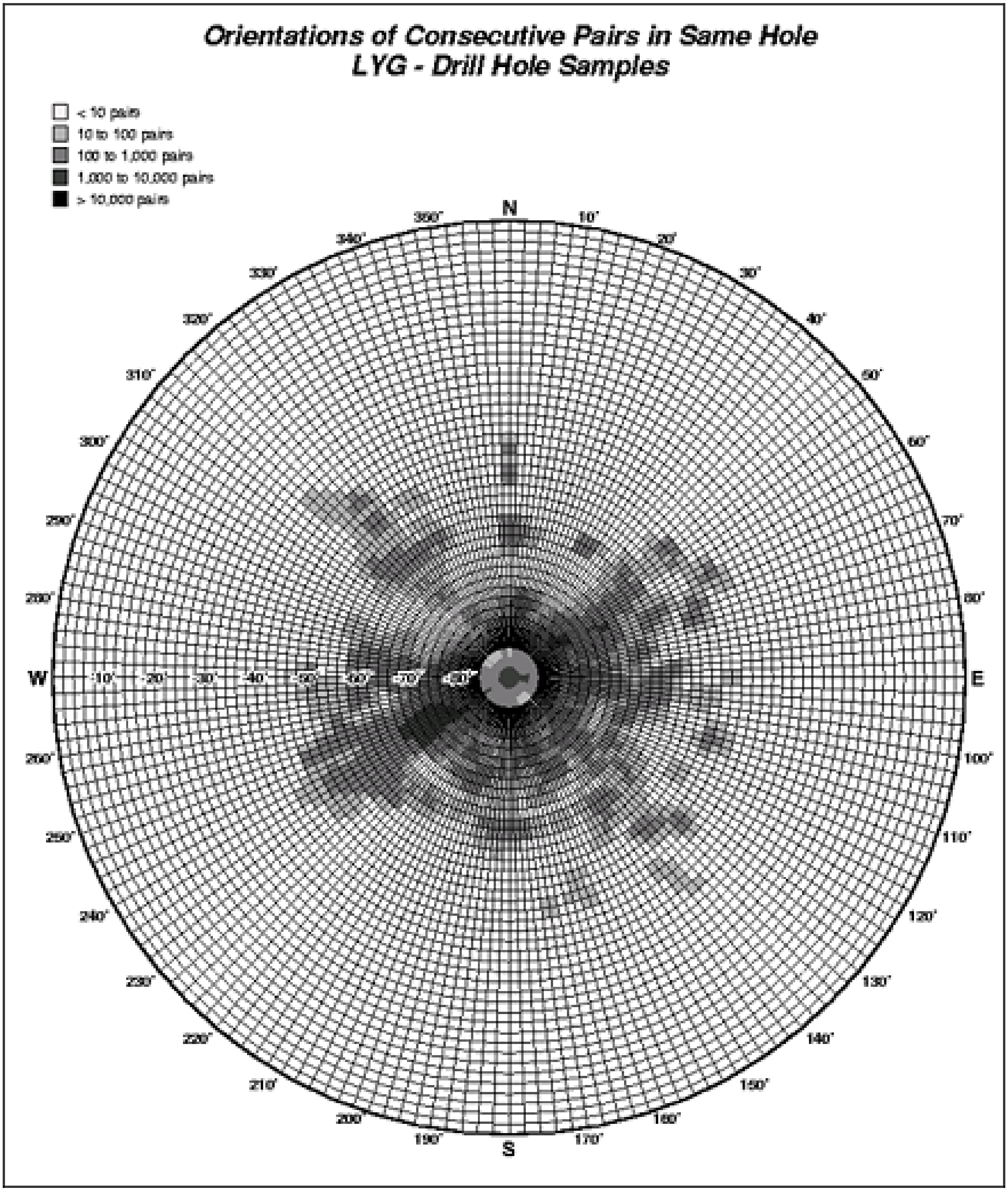


Figure 14-3 LYG - Drill Hole Orientation – Stereonet

14.1.4 Geologic Model

There are three contiguous zones of interest at La Yaqui Grande; Zones 1, 2, and 3. Within each zone, models of alteration, reduced oxidation state (redox), gold mineralized envelopes, and silver mineralized envelopes, were interpreted for the estimation of the Mineral Resources. The alteration, redox, and silver mineralized envelopes were newly interpreted in Leapfrog® for this update, while the gold mineralized envelopes were updated in Vulcan® with the latest drilling. The modeling of the alteration, redox, and silver mineralized envelopes was performed by Mulatos' exploration team, while the update of the gold mineralized envelopes was performed by Ginto Consulting Inc.

The gold mineralized envelopes were modeled at a 0.3 g/t gold cut-off, and the silver mineralized envelopes were modeled at a 10.0 g/t silver cut-off. Both gold and silver mineralization are found along a north-northwest ridge, within three areas (Zones 1, 2, and 3) striking to the northeast at an azimuth of approximately 60° and slightly plunging to the northeast at angles varying from 0° to -25°. They are found under a silica cap and are associated with the advanced argillic and vuggy silica alteration. The ratio of AuCN/Au, copper and total sulphur are associated with the redox model.

The codes and volumes related to the gold domains are presented in Table 14-2, those related to the silver domains are presented in Table 14-3, and the redox domains related to the copper, total sulphur, and AuCN/Au ratio are presented in Table 14-4. The triangulated solids of the gold domains are shown in Figure 14-4 and Figure 14-5, the silver domains are shown in Figure 14-6 and Figure 14-7, and the redox domains are shown in Figure 14-8. The pre-mining triangulation of the topography surface as of May 29, 2020, was also provided by Mulatos' exploration team.

Table 14-2 LYG - Geologic Domains for Gold

Codes	Domain	Volume (m^3)
1	High-Grade Au - Zone 1	3,090,045
2	Out High-Grade Au - Zone 1	571,964,168
3	High-Grade Au - Zone 2	4,802,991
4	Out High-Grade Au - Zone 2	433,060,081
5	High-Grade Au - Zone 3	3,395,919
6	Out High-Grade Au - Zone 3	506,819,430
All	All	1,523,132,634

Table 14-3 LYG - Geologic Domains for Silver

Codes	Domain	Volume (m^3)
1	High-Grade Ag - Zone 1	1,964,901
2	Out High-Grade Ag - Zone 1	573,089,312
3	High-Grade Ag - Zone 2	8,816,925
4	Out High-Grade Ag - Zone 2	429,046,147
5	High-Grade Ag - Zone 3	8,700,165
6	Out High-Grade Ag - Zone 3	501,515,184
All	All	1,523,132,634

Table 14-4 LYG - Redox Domains for Copper, Total Sulphur, and AuCN/Au Ratio

Codes	Domain	Volume (m^3)
1	Oxide	163,440,163
2	Transition	35,309,210
3	Sulphide	881,166,683
4	Out	443,216,577
All	All	1,523,132,634

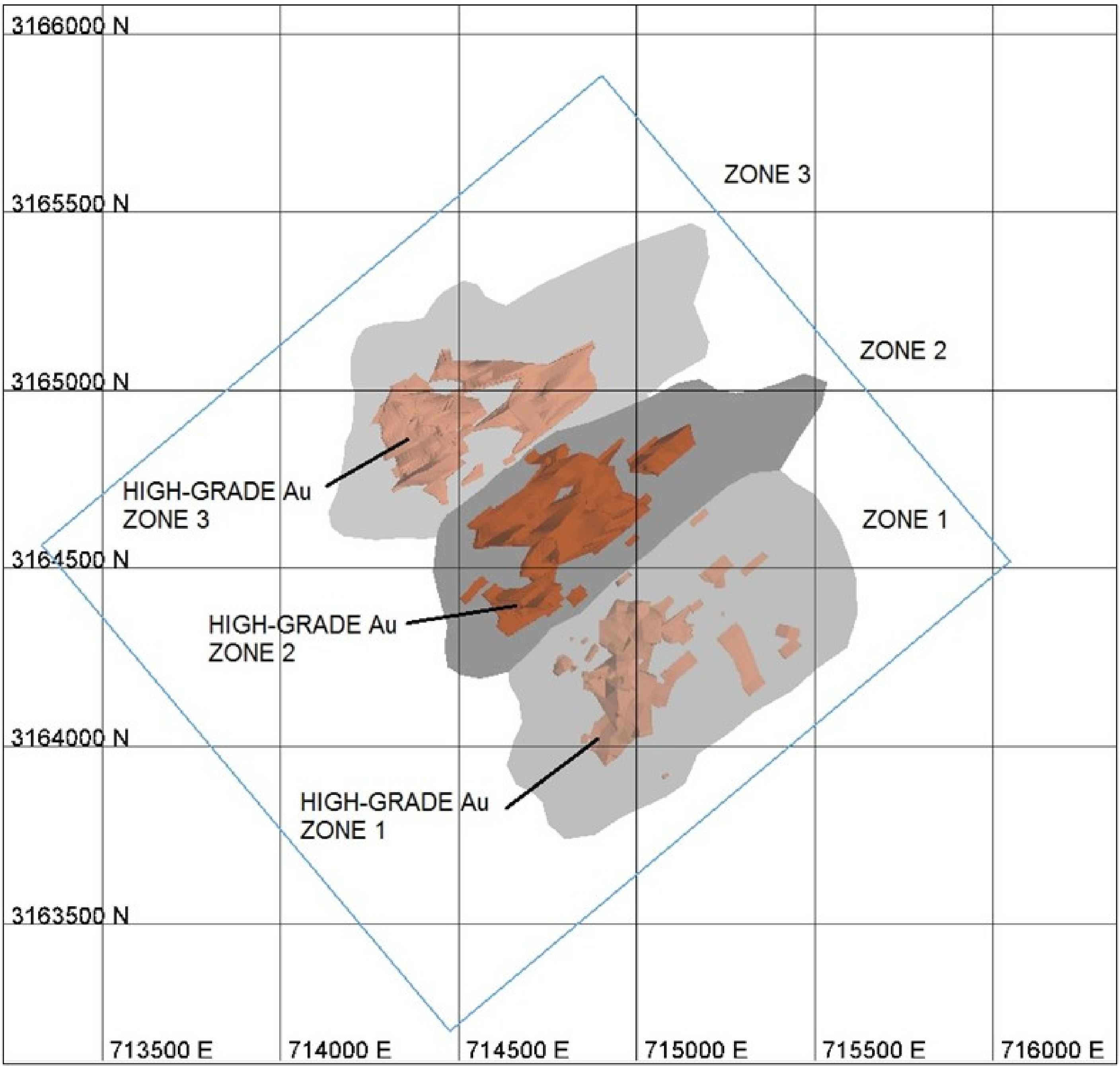


Figure 14-4 LYG - Gold Domain Wireframes – Plan View

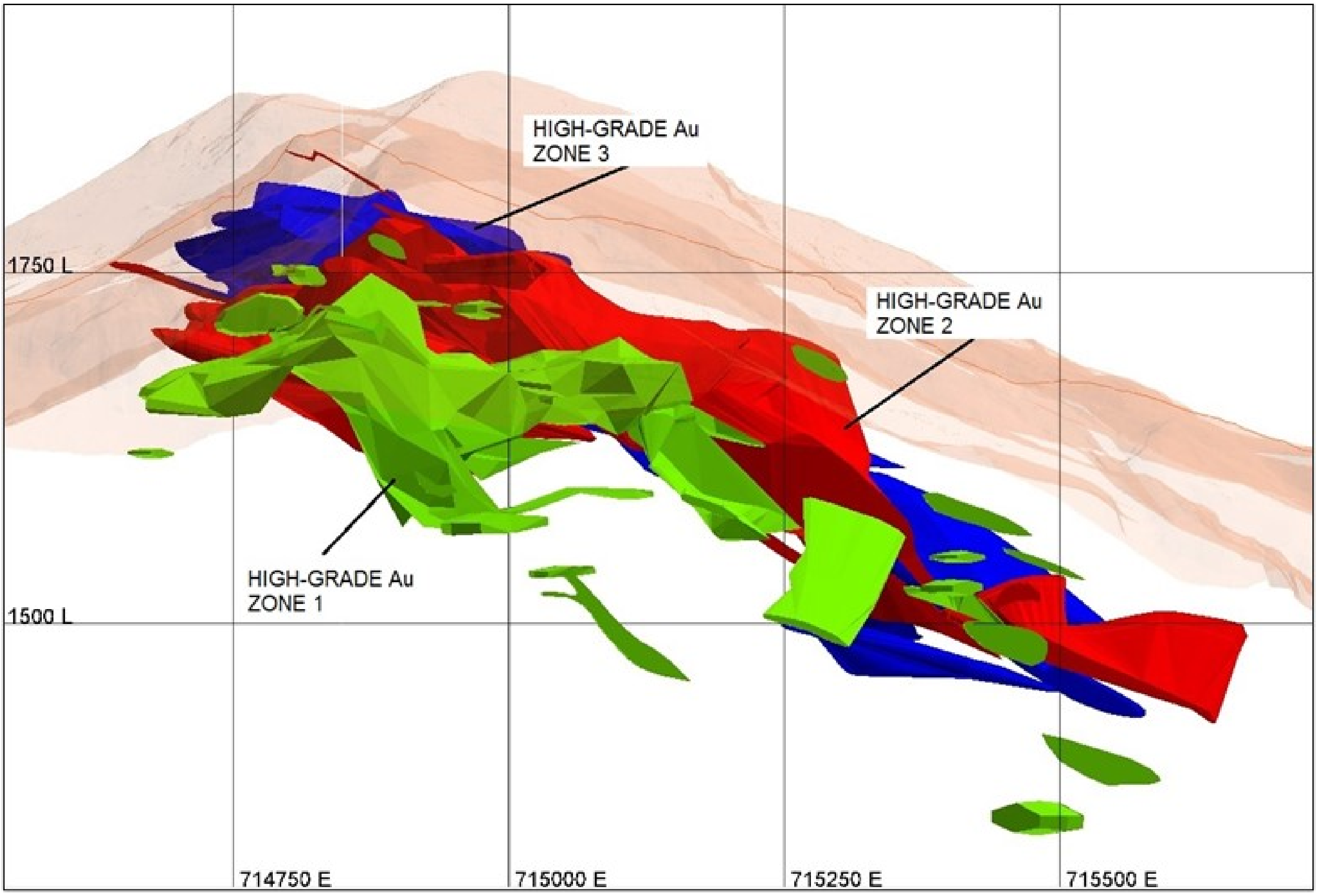


Figure 14-5 LYG - Gold Domain Wireframes with Topography – Longitudinal NE-SW Section – Looking NW

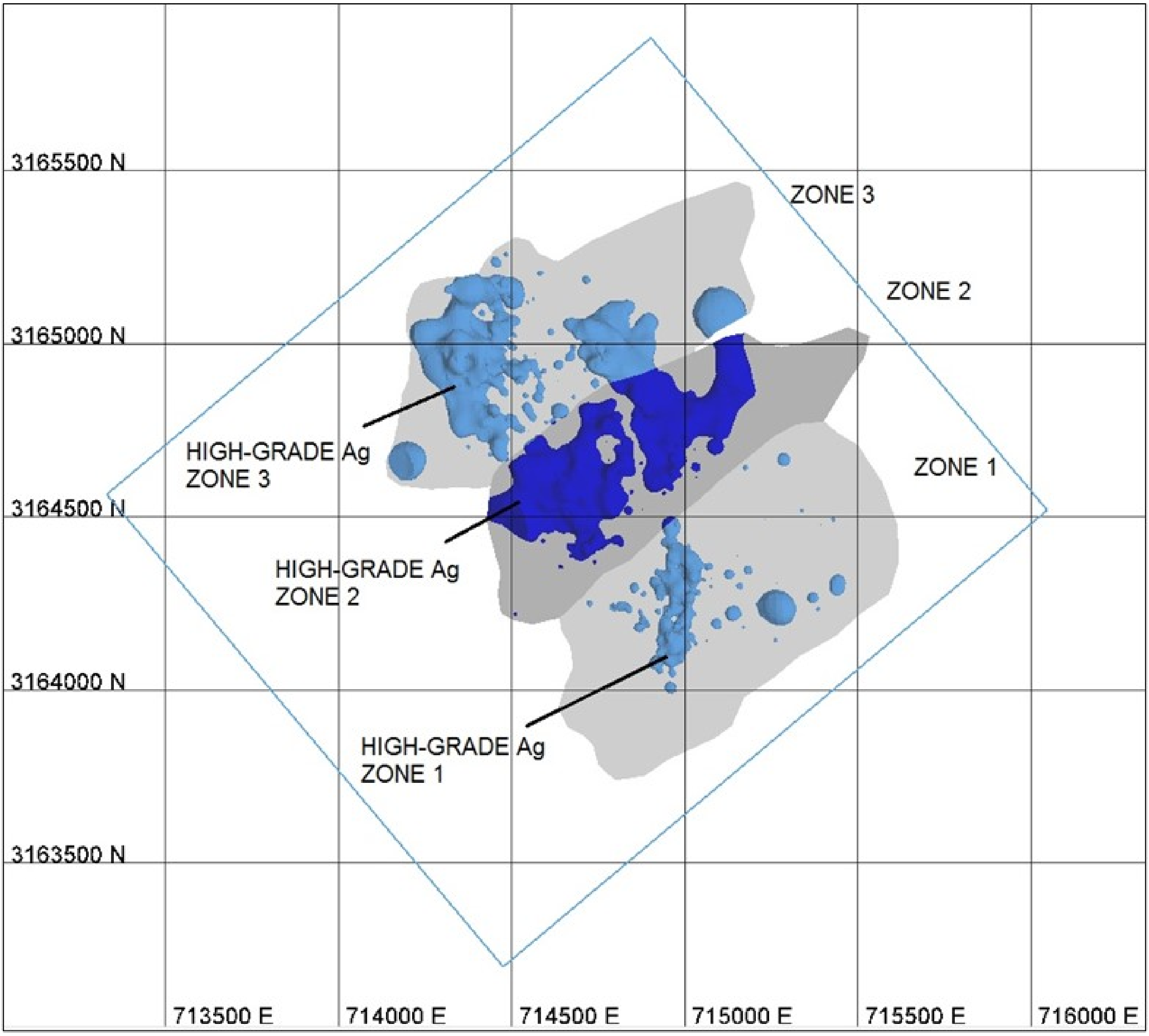


Figure 14-6 LYG - Wireframes of Silver Domains – Plan View

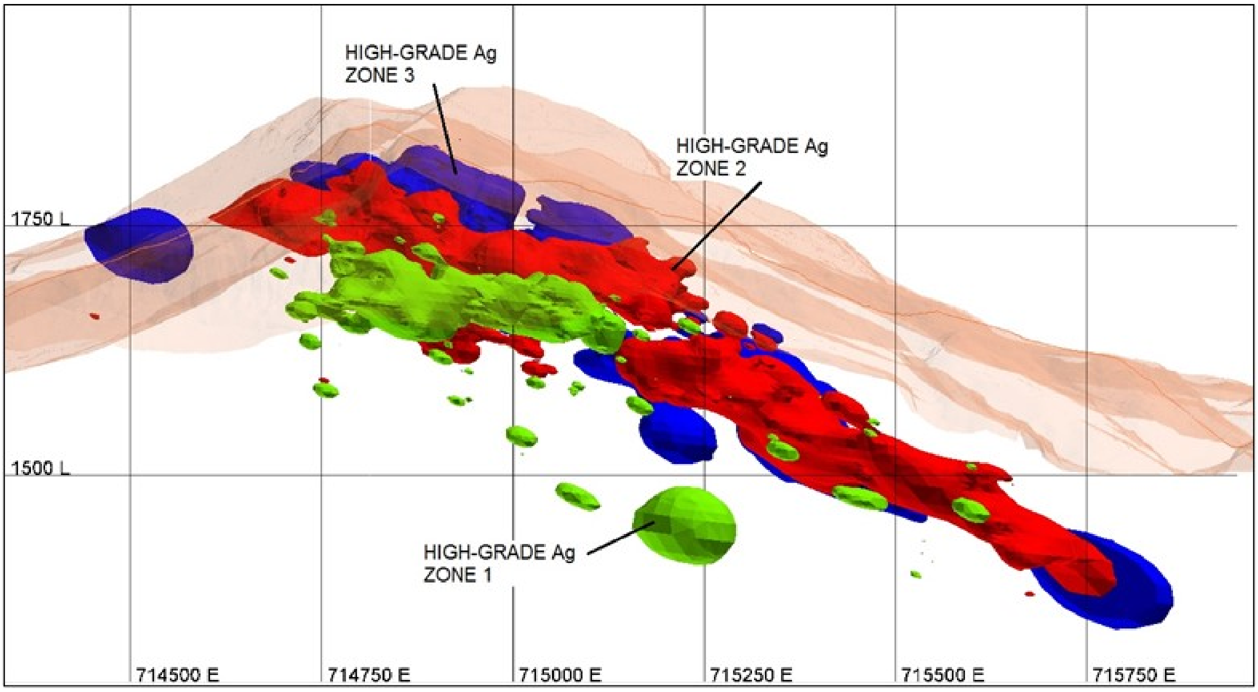


Figure 14-7 LYG - Silver Domains Wireframes with Topography – Longitudinal NE-SW Section – Looking NW

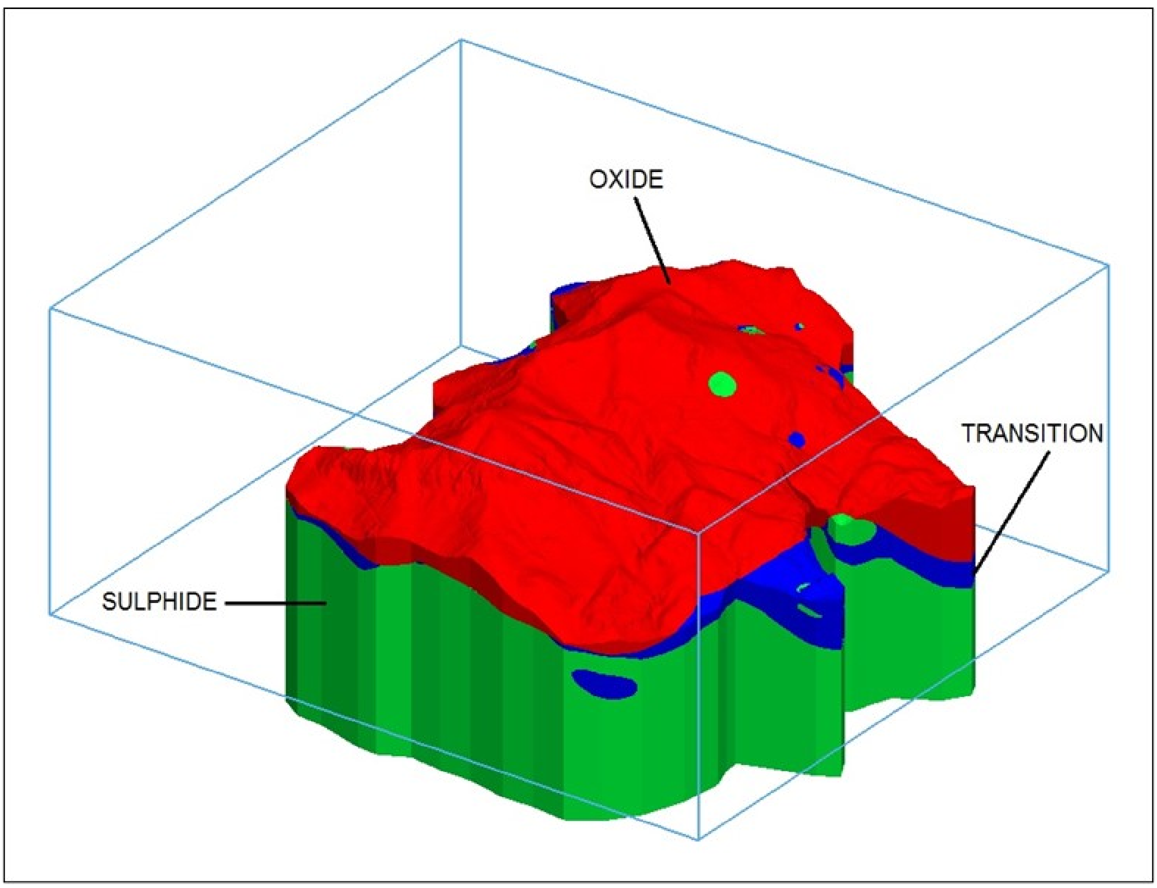


Figure 14-8 LYG - Redox Domains Wireframes – Perspective View Looking to the Northwest

14.1.5 Compositing, Capping, Statistics

The original gold samples were composited to regular 1.5m lengths as it is the most common sampling interval with more than 65% of the assays sampled. A dynamic compositing process was utilized for this exercise whereby residual composites are redistributed within the domain to ensure that all composites are of the same length. A total of 6,019 gold composites from 288 holes are located within the high-grade gold domains, and a total of 7,199 silver composites from 322 holes are located within the high-grade silver domains. For the AuCN/Au ratio, 8,437 composites from 421 holes are found within the redox domains, as well as 55,820 copper composites from 575 holes, and 53,687 total sulphur composites from 544 holes.

The capping of the high-grade outliers was carried out on composited grades to 1.5m lengths rather than on grades from original samples. This strategy was selected to ensure a more rigorous statistical approach, where grades examined by the different capping utilities are on the same support, thus representing grades for the same volume of material.

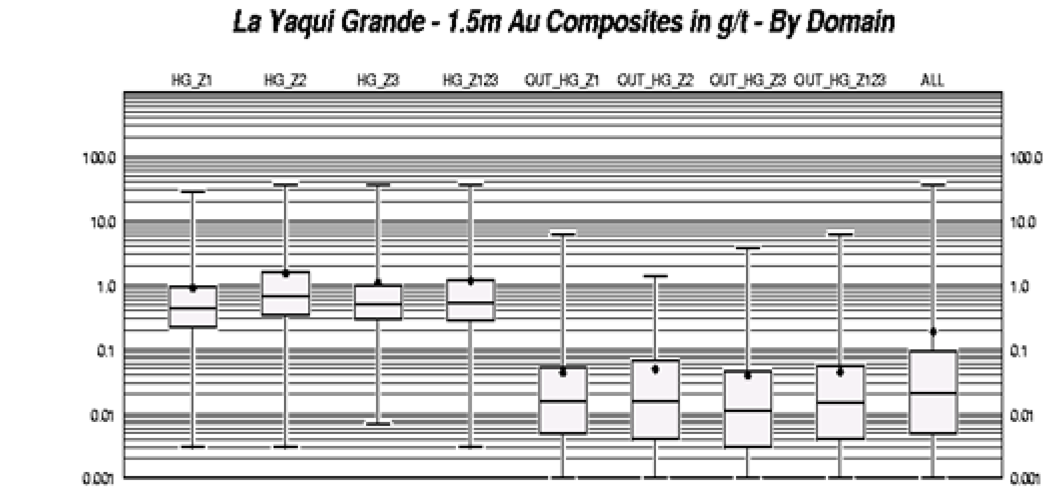
The capping of the high-grade outliers was examined with 2 different utilities: the probability plot and the cutting statistics utility. This approach of selecting the capping thresholds from different statistical utilities is aimed at providing greater support to this process. Results of this analysis are provided in Table 14-5 for gold, silver, and copper.

No capping of high-grade outliers was performed on the total sulphur and AuCN/Au ratio composites as no values above 10% and 1.0, respectively, are reported.

Table 14-5 LYG - Capping Thresholds of High-Grade Gold, Silver, and Copper Outliers

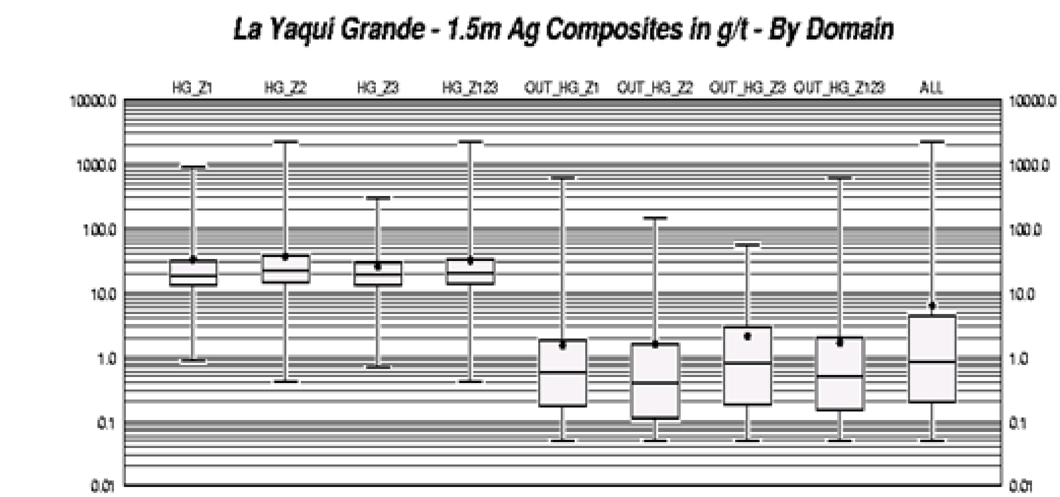
Domains	Probability Plot	Cutting Statistics	Final	% of Metal Capped	# Capped
Gold in g/t					
1- HG Au Zone 1	9.0, 15.0	15.0	15.0	1	5
2- Out HG Au Zone 1	1.2	1.2	1.2	1	3
3- HG Au Zone 2	20.0	20.0	20.0	1	4
4- Out HG Au Zone 2	1.0	1.0	1.0	1	4
5- HG Au Zone 3	10.0, 20.0	18.0	18.0	2	8
6- Out HG Au Zone 3	1.0	1.0	1.0	2	7
Silver in g/t					
1- HG Ag Zone 1	400.0, 500.0	500.0	500.0	2	10
2- Out HG Ag Zone 1	30.0, 35.0	30.0	30.0	2	4
3- HG Ag Zone 2	450.0, 500.0	500.0	500.0	3	6
4- Out HG Ag Zone 2	22.0	22.0	22.0	1	7
5- HG Ag Zone 3	200.0, 230.0	200.0	230.0	1	4
6- Out HG Ag Zone 3	30.0	30.0	30.0	1	3
Copper in ppm					
1- Oxide	3,000.0, 5,000.0	3,000.0	3,000.0	2	9
2- Transition	3,000.0	3,000.0	3,000.0	2	7
3- Sulphide	6,000.0	5,000.0	5,000.0	2	18
4- Out of Redox	70.0	70.0	70.0	6	6

As seen in Table 14-5, the capping of the high-grade outliers has had a minimal effect on the percentage of metal content affected. As a guideline, less than 10% of the metal content affected by the capping procedure is targeted. This is not always possible as some domains might have very high grade outliers containing a significant portion of the metal content. This was not observed at La Yaqui Grande since the domains adequately captured zones of similar grades. Basic statistics were computed on the un-capped 1.5m composites for gold, silver, AuCN/Au ratio, copper, and total sulphur and shown in the boxplots of Figure 14-9, Figure 14-10, Figure 14-11, Figure 14-12, and Figure 14-13, respectively. Basic statistics of the capped composites for gold, silver, and copper are shown in the boxplots of Figure 14-14, Figure 14-15, and Figure 14-16, respectively.



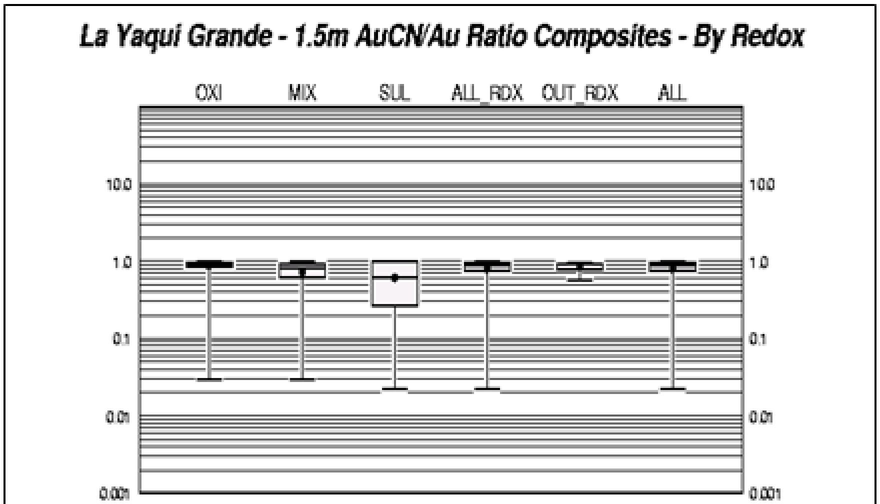
	HG_Z1	HG_Z2	HG_Z3	HG_Z123	OUT_HG_Z1	OUT_HG_Z2	OUT_HG_Z3	OUT_HG_Z123	ALL	
Number of data	2243	2266	1508	6019	16545	14653	10026	41226	47245	Number of data
Mean	0.887	1.501	1.076	1.166	0.043	0.049	0.039	0.044	0.187	Mean
Std. Dev.	1.586	2.408	2.191	2.097	0.082	0.078	0.073	0.078	0.84	Std. Dev.
Coef. of Var.	1.787	1.605	2.037	1.799	1.909	1.578	1.85	1.77	4.486	Coef. of Var.
Maximum	26.8	36.671	35.71	36.671	6.156	1.387	3.693	6.156	36.671	Maximum
Upper quartile	0.926	1.599	0.97	1.176	0.052	0.065	0.046	0.055	0.092	Upper quartile
Median	0.425	0.682	0.493	0.516	0.016	0.016	0.011	0.015	0.021	Median
Lower quartile	0.219	0.344	0.295	0.285	0.005	0.004	0.003	0.004	0.005	Lower quartile
Minimum	0.003	0.003	0.007	0.003	0.001	0.001	0.001	0.001	0.001	Minimum
Number of holes	90	99	100	286	159	149	150	449	737	Number of holes

Figure 14-9 LYG - Boxplots of Un-Capped Gold Grade Composites



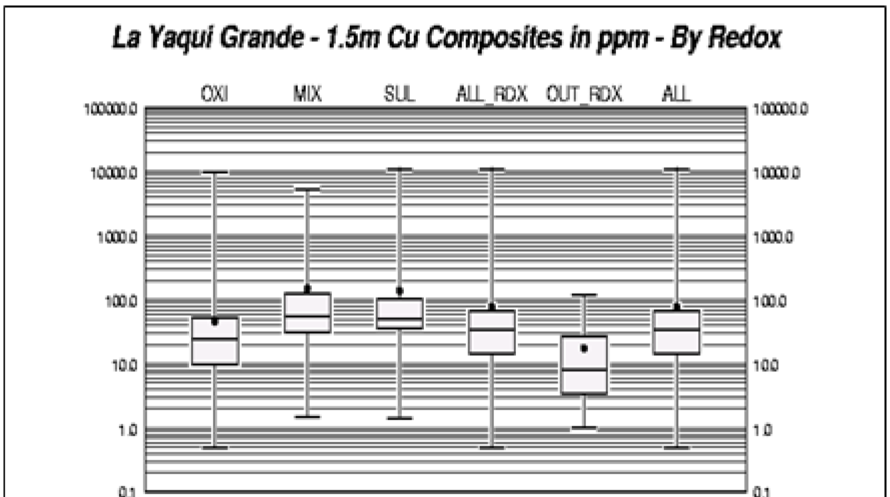
	HG_Z1	HG_Z2	HG_Z3	HG_Z123	OUT_HG_Z1	OUT_HG_Z2	OUT_HG_Z3	OUT_HG_Z123	ALL	
Number of data	1355	3322	2522	7199	17433	13620	8755	39808	47007	Number of data
Mean	33.0	36.33	25.55	31.93	1.52	1.57	2.12	1.67	6.27	Mean
Std. Dev.	60.78	70.05	23.54	56.38	5.17	2.99	3.04	4.1	24.83	Std. Dev.
Coef. of Var.	1.84	1.93	0.92	1.77	3.41	1.91	1.43	2.46	3.96	Coef. of Var.
Maximum	902.02	2221.0	301.54	2221.0	604.11	141.28	54.14	604.11	2221.0	Maximum
Upper quartile	30.76	37.09	29.6	33.29	1.83	1.6	2.96	1.99	4.38	Upper quartile
Median	18.54	22.23	19.1	20.17	0.58	0.39	0.8	0.51	0.85	Median
Lower quartile	12.86	14.22	13.32	13.58	0.17	0.11	0.18	0.15	0.2	Lower quartile
Minimum	0.86	0.41	0.69	0.41	0.05	0.05	0.05	0.05	0.05	Minimum
Number of holes	83	124	117	322	159	149	147	446	768	Number of holes

Figure 14-10 LYG- Boxplots of Un-Capped Silver Grade Composites



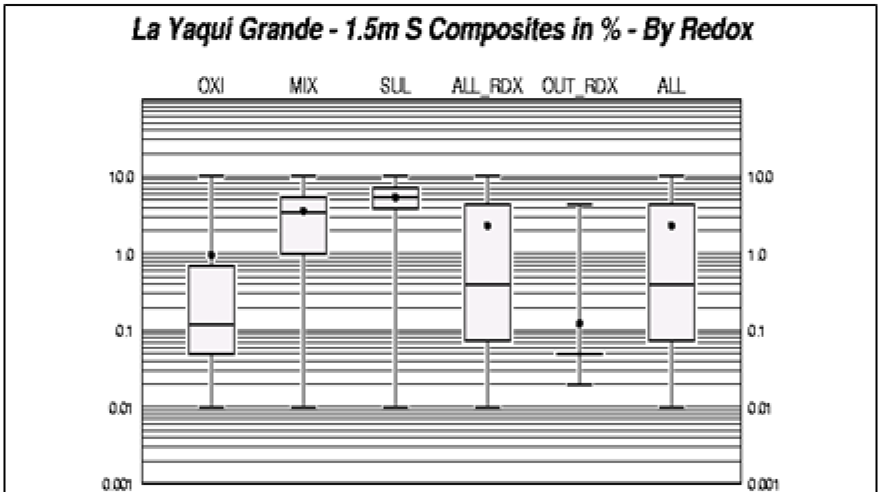
	OXI	MIX	SUL	ALL_RDX	OUT_RDX	ALL	
Number of data	5865	506	2064	8437	3	8440	Number of data
Mean	0.873	0.733	0.606	0.799	0.879	0.799	Mean
Std. Dev.	0.139	0.252	0.354	0.247	0.124	0.247	Std. Dev.
Coef. of Var.	0.159	0.344	0.584	0.309	0.141	0.309	Coef. of Var.
Maximum	1.0	1.0	1.0	1.0	0.937	1.0	Maximum
Upper quartile	0.964	0.924	1.0	0.969	0.929	0.969	Upper quartile
Median	0.912	0.813	0.608	0.897	0.919	0.897	Median
Lower quartile	0.836	0.624	0.265	0.751	0.787	0.751	Lower quartile
Minimum	0.029	0.029	0.022	0.022	0.576	0.022	Minimum
Number of holes	363	131	162	421	3	424	Number of holes

Figure 14-11 LYG - Boxplots of AuCN/Au Ratio Composites



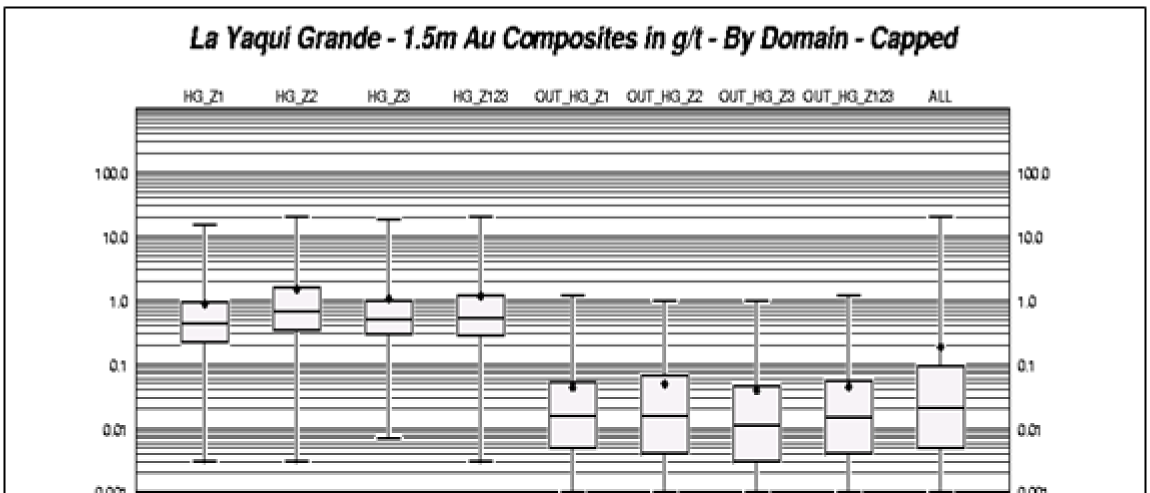
	OXI	MIX	SUL	ALL_RDX	OUT_RDX	ALL	
Number of data	36690	3973	14957	55620	81	55901	Number of data
Mean	45.6	150.3	138.3	77.5	17.6	77.5	Mean
Std. Dev.	121.4	332.5	379.6	240.7	19.5	240.6	Std. Dev.
Coef. of Var.	2.7	2.2	2.7	3.1	1.1	3.1	Coef. of Var.
Maximum	9655.8	5371.6	11133.6	11133.6	116.0	11133.6	Maximum
Upper quartile	51.4	122.5	102.2	66.7	26.4	66.6	Upper quartile
Median	23.8	53.8	50.1	34.6	8.1	34.6	Median
Lower quartile	9.7	30.7	35.0	14.4	3.4	14.4	Lower quartile
Minimum	0.5	1.5	1.4	0.5	1.0	0.5	Minimum
Number of holes	563	410	431	575	69	644	Number of holes

Figure 14-12 LYG - Boxplots of Un-Capped Copper Grade Composites



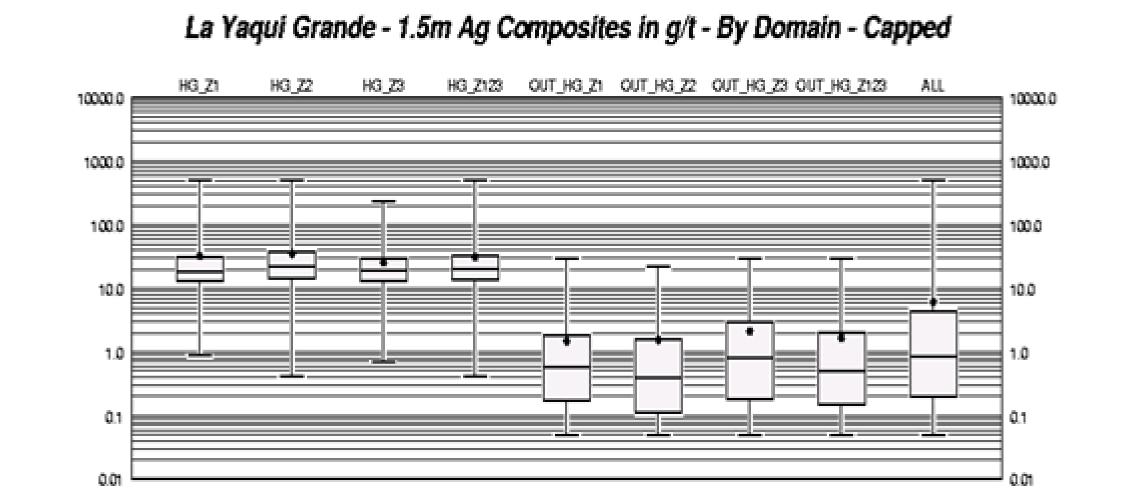
	OXI	MIX	SUL	ALL_RDX	OUT_RDX	ALL	
Number of data	35671	3647	14389	53687	73	53760	Number of data
Mean	0.957	3.599	5.359	2.307	0.122	2.305	Mean
Std. Dev.	1.773	2.747	2.528	2.849	0.412	2.849	Std. Dev.
Coef. of Var.	1.853	0.763	0.472	1.235	3.374	1.236	Coef. of Var.
Maximum	10.0	10.0	10.0	10.0	4.4	10.0	Maximum
Upper quartile	0.692	5.353	7.016	4.427	0.05	4.427	Upper quartile
Median	0.118	3.502	5.302	0.402	0.05	0.402	Median
Lower quartile	0.05	0.98	3.883	0.073	0.05	0.073	Lower quartile
Minimum	0.01	0.01	0.01	0.01	0.02	0.01	Minimum
Number of holes	533	384	407	544	65	609	Number of holes

Figure 14-13 LYG - Boxplots of Total Sulphur Grade Composites



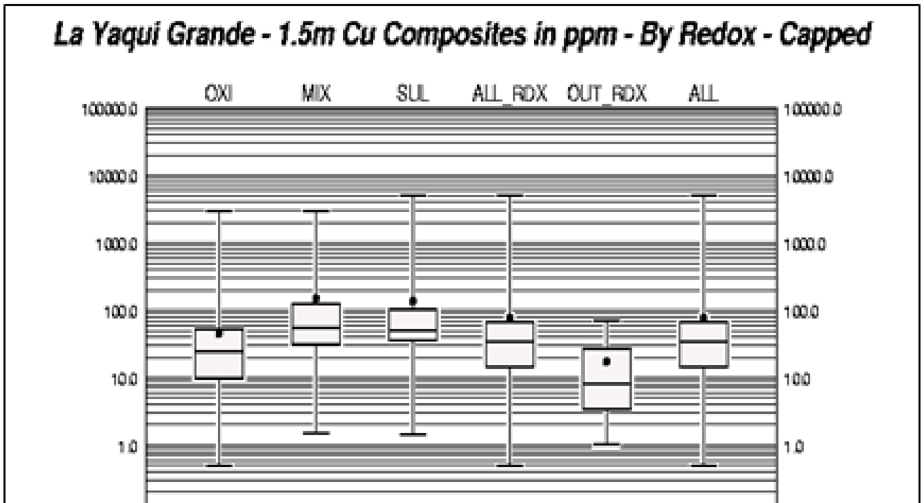
	HG_Z1	HG_Z2	HG_Z3	HG_Z123	OUT_HG_Z1	OUT_HG_Z2	OUT_HG_Z3	OUT_HG_Z123	ALL	
Number of data	2243	2268	1508	6019	16545	14653	10028	41226	47245	Number of data
Mean	0.876	1.488	1.048	1.15	0.043	0.049	0.039	0.044	0.185	Mean
Std. Dev.	1.442	2.28	1.884	1.923	0.067	0.077	0.069	0.071	0.783	Std. Dev.
Coef. of Var.	1.646	1.532	1.798	1.672	1.575	1.562	1.765	1.616	4.227	Coef. of Var.
Maximum	15.0	20.0	18.0	20.0	1.2	1.0	1.0	1.2	20.0	Maximum
Upper quartile	0.926	1.599	0.97	1.176	0.052	0.065	0.046	0.055	0.092	Upper quartile
Median	0.425	0.682	0.493	0.518	0.016	0.016	0.011	0.015	0.021	Median
Lower quartile	0.219	0.344	0.295	0.285	0.005	0.004	0.003	0.004	0.005	Lower quartile
Minimum	0.003	0.003	0.007	0.003	0.001	0.001	0.001	0.001	0.001	Minimum
Number of holes	90	99	100	288	159	149	150	449	737	Number of holes

Figure 14-14 LYG - Boxplots of Capped Gold Grade Composites



	HG_Z1	HG_Z2	HG_Z3	HG_Z123	OUT_HG_Z1	OUT_HG_Z2	OUT_HG_Z3	OUT_HG_Z123	ALL	
Number of data	1355	3322	2522	7199	17433	13620	8755	39808	47007	Number of data
Mean	32.19	35.12	25.51	31.2	1.48	1.55	2.11	1.64	6.14	Mean
Std. Dev.	52.47	45.0	23.09	40.73	2.28	2.64	2.96	2.58	19.27	Std. Dev.
Coef. of Var.	1.63	1.28	0.91	1.31	1.54	1.7	1.4	1.57	3.14	Coef. of Var.
Maximum	500.0	500.0	230.0	500.0	30.0	22.0	30.0	30.0	500.0	Maximum
Upper quartile	30.76	37.09	29.6	33.29	1.83	1.6	2.96	1.99	4.38	Upper quartile
Median	18.54	22.23	19.1	20.17	0.58	0.39	0.8	0.51	0.85	Median
Lower quartile	12.86	14.22	13.32	13.56	0.17	0.11	0.18	0.15	0.2	Lower quartile
Minimum	0.68	0.41	0.69	0.41	0.05	0.05	0.05	0.05	0.05	Minimum
Number of holes	83	124	117	322	159	149	147	446	768	Number of holes

Figure 14-15 LYG - Boxplots of Capped Silver Grade Composites



	OXI	MIX	SUL	ALL_RDX	OUT_RDX	ALL	
Number of data	36890	3973	14957	55820	81	55901	Number of data
Mean	44.9	148.6	136.4	76.5	17.3	76.4	Mean
Std. Dev.	92.3	313.4	346.1	215.4	18.7	215.4	Std. Dev.
Coef. of Var.	2.1	2.1	2.5	2.8	1.1	2.8	Coef. of Var.
Maximum	3000.0	3000.0	5000.0	5000.0	70.0	5000.0	Maximum
Upper quartile	51.4	122.5	102.2	66.7	26.4	66.6	Upper quartile
Median	23.8	53.8	50.1	34.6	8.1	34.6	Median
Lower quartile	9.7	30.7	35.0	14.4	3.4	14.4	Lower quartile
Minimum	0.5	1.5	1.4	0.5	1.0	0.5	Minimum
Number of holes	563	410	431	575	69	644	Number of holes

Figure 14-16 LYG - Boxplots of Capped Copper Grade Composites

From the boxplots of Figure 14-14, Figure 14-15, and Figure 14-16 for the capped gold, silver, and copper grade composites, and of Figure 14-11 and Figure 14-13 for the AuCN/Au ratios and total sulphur grade composites, the coefficients of variation (CV = mean/standard deviation) are low overall (below 3.0). This is characteristic of more homogeneous populations and for such, a grade estimation approach utilizing an ordinary kriging method with capped composites is deemed appropriate.

14.1.6 Variography

A variographic analysis was carried out on all elements of interest for each of their associated geologic domains. The objective of this analysis was to spatially establish the preferred directions of grade continuity. In turn, the variograms modeled along those directions would be later utilized to select and weigh the composites during the block grade interpolation process. For this exercise, all experimental variograms were of the type, relative lag pairwise, which is considered robust for the assessment of gold and silver grade continuity.

Variogram maps were first calculated to examine general grade continuities in the XY, XZ, and YZ planes. The next step undertaken was to compute omni-directional variograms and down-hole variograms. The omni-directional variograms are calculated without any directional restrictions and provide a good assessment of the sill of the variogram. As for the down-hole variogram, it is calculated with the composites of each hole along the trace of the hole. The objective of these calculations is to provide information about the short scale structure of the variogram, as the composites are more closely spaced down the hole. Thus, the modeling of the nugget effect is usually better derived from the down-hole variograms.

Directional variograms were then computed to identify more specifically the three main directions of continuity. A first set of variograms were produced in the horizontal plane at increments of 10 degrees. In the same way, a second set of variograms were computed at 10° increments in the vertical plane of the horizontal direction of continuity (plunge direction). A final set of variograms at 10° increments were calculated in the vertical plane perpendicular to the horizontal direction of continuity (dip direction). The final variograms were then modeled with a 2-structure spherical variogram. The resulting variogram parameters are presented in Table 14-6, Table 14-7, Table 14-8, Table 14-9, and Table 14-10 for gold, silver, AuCN/Au ratio, copper, and total sulphur, respectively. Corresponding plots of the modelled variograms are provided in Appendix A. No conclusive variograms were obtained for the AuCN/Au ratios within the transition domain due to their wider spacing within this unit.

For gold, the best direction of continuity (“principal” direction) was observed to be along the strike and plunge direction, at azimuths varying from 50° to 65° and plunges from 0° to -25° to the northeast. The second best direction of continuity (“minor” direction) was thus oriented perpendicular to the principal direction, at azimuths varying from 140° to 155°. While the third best direction of continuity (“vertical” direction) was perpendicular to the principal and minor directions, with azimuths varying from 50° to 65° and plunges from -90° to -65° to the southwest. The nugget effect for gold was found to be low overall, with percentages to the sill varying from 4.7% to 11.3%.

Table 14-6 LYG - Variographic Models for Gold

Parameters	1- High-Grade Au Zone 1			3- High-Grade Au Zone 2		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	65°	155°	65°	50°	140°	50°
Dip[2]	0°	0°	-90°	-25°	0°	65°
Nugget Effect C0	0.071			0.127		
1st Structure C1	0.993			0.654		
2nd Structure C2	0.436			0.574		
1st Range A1	28.5m	21.0m	21.0m	17.8m	15.7m	6.0m
2nd Range A2	61.8m	45.7m	26.4m	68.3m	45.8m	29.6m
Parameters	**5- High-Grade Au Zone 3**			**2+4+6 – Out High-Grade Au Zones 1+2+3**		
	Principal	**Minor**	**Vertical**	**Principal**	**Minor**	**Vertical**
Azimuth[1]	60°	150°	60°	60°	150°	60°
Dip[2]	-25°	0°	65°	0°	0°	-90°
Nugget Effect C0	0.134			0.076		
1st Structure C1	0.577			0.505		
2nd Structure C2	0.478			0.715		
1st Range A1	17.8m	17.2m	17.8m	21.0m	33.9m	29.6m
2nd Range A2	64.0m	46.2m	39.3m	73.6m	50.0m	62.9m

Notes:

1. *positive clockwise from north*
2. *negative below horizontal*

Table 14-7 LYG - Variographic Models for Silver

Parameters	1- High-Grade Ag Zone 1			3- High-Grade Ag Zone 2		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	65°	155°	65°	65°	155°	65°
Dip[2]	0°	0°	-90°	-15°	0°	75°
Nugget Effect C0	0.117			0.060		
1st Structure C1	0.189			0.497		
2nd Structure C2	0.399			0.226		
1st Range A1	32.7m	32.7m	34.9m	11.4m	13.5m	14.6m
2nd Range A2	60.6m	48.8m	47.7m	59.7m	38.2m	54.3m
Parameters	**5- High-Grade Ag Zone 3**			**2+4+6 – Out High-Grade Ag Zones 1+2+3**		
	Principal	**Minor**	**Vertical**	**Principal**	**Minor**	**Vertical**
Azimuth[1]	65°	155°	65°	65°	155°	65°
Dip[2]	-20°	0°	70°	0°	0°	-90°
Nugget Effect C0	0.058			0.078		
1st Structure C1	0.304			0.569		
2nd Structure C2	0.163			0.808		
1st Range A1	23.2m	16.8m	10.3m	9.2m	8.1m	10.3m
2nd Range A2	63.1m	27.5m	23.2m	85.4m	80.1m	61.8m

Notes:
1. *positive clockwise from north*
2. *negative below horizontal*

Table 14-8 LYG - Variographic Models for AuCN/Au Ratio

Parameters	1- Oxide			3- Sulphide		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	90°	180°	90°	90°	180°	90°
Dip[2]	-10°	0°	80°	0°	0°	-90°
Nugget Effect C0	0.010			0.034		
1st Structure C1	0.027			0.206		
2nd Structure C2	0.027			0.220		
1st Range A1	22.1m	19.9m	12.4m	53.7m	30.9m	24.4m
2nd Range A2	67.2m	48.9m	28.5m	61.3m	39.6m	42.9m

Notes:
1. *positive clockwise from north*
2. *negative below horizontal*

Table 14-9 LYG - Variographic Models for Copper

Parameters	1- Oxide			2- Transition		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	55°	145°	55°	55°	145°	55°
Dip[2]	0°	0°	-90°	0°	0°	-90°
Nugget Effect C0	0.064			0.096		
1st Structure C1	0.564			0.598		
2nd Structure C2	0.322			0.705		
1st Range A1	22.1m	23.2m	14.6m	35.0m	27.4m	19.9m
2nd Range A2	66.1m	65.0m	26.4m	65.0m	41.4m	35.0m
Parameters	**3- Sulphide**					
	Principal	**Minor**	**Vertical**			
Azimuth[1]	90°	180°	90°			
Dip[2]	0°	0°	-90°			
Nugget Effect C0	0.068					
1st Structure C1	0.483					
2nd Structure C2	0.414					
1st Range A1	16.7m	12.4m	9.2m			
2nd Range A2	59.7m	43.6m	36.1m			

Notes:
1. *positive clockwise from north*
2. *negative below horizontal*

Table 14-10 LYG - Variographic Models for Total Sulphur

Parameters	1- Oxide			2- Transition		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	85°	175°	85°	60°	150°	60°
Dip[2]	-10°	0°	80°	0°	0°	-90°
Nugget Effect C0	0.063			0.094		
1st Structure C1	0.641			0.590		
2nd Structure C2	0.736			0.511		
1st Range A1	15.7m	30.7m	29.6m	28.5m	32.8m	13.5m
2nd Range A2	104.0m	89.8m	66.1m	61.8m	48.9m	35.0m
Parameters	**3- Sulphide**					
	Principal	**Minor**	**Vertical**			
Azimuth[1]	65°	155°	65°			
Dip[2]	-25°	0°	65°			
Nugget Effect C0	0.023					
1st Structure C1	0.212					
2nd Structure C2	0.204					
1st Range A1	11.4m	16.7m	9.2m			
2nd Range A2	79.0m	74.7m	23.2m			

Notes:
1. *positive clockwise from north*
2. *negative below horizontal*

14.1.7 Grade Estimation

The estimation of grades into a block model was carried out with the ordinary kriging technique for gold, silver, AuCN/Au ratio, copper, and total sulphur. The input data consisted of capped gold grades, capped silver grades, capped copper grades, and AuCN/Au ratios and total sulphur grades, all composited to 1.5m intervals. The block model is rotated 40° counter clockwise with its X axis' azimuth set at 50°. The blocks were dimensioned to 6m (X) by 6m (Y) by 9m (Z). The block grid definition is presented in Table 14-11. It should be noted that the origin of the block model corresponds to the lower left corner, the point of origin being the exterior edges of the first block.

Table 14-11 LYG - Block Grid Definition

Coordinates	Origin (m)	Rotation (Counter-clockwise)	Distance (m)	Block Size (m)	Number of Blocks
Easting (X)	714,475.0	40°	2,052.0	6.0	342
Northing (Y)	3,163,200.0		1,782.0	6.0	297
Elevation(Z)	1150.0		891.0	9.0	99
Total Number of Blocks			10,055,826		

The size and orientation of the search ellipsoid for the estimation process was based on the variogram parameters modeled for each element of interest. A minimum of 2 composites and maximum of 12 composites were utilized in the block grade estimation process. No other constraints were applied. Blocks within the mineralized gold and silver domains were estimated, as well as outside them. A hard boundary condition between the higher grade mineralized domains and outside of them was assigned to the gold and silver estimates. Similarly, hard boundaries between the redox domains were assigned to the AuCN/Au ratio, copper, and total sulphur estimates. A 3-pass approach with increasing search ellipsoid size was selected for the grade estimation strategy. The first pass has a search ellipsoid dimensioned to the variogram ranges, while the second pass is dimensioned to 1.5 times these ranges and finally the third pass with 3 times the ranges. The objective of this strategy was to fill the mineralized domains with estimates. For the gold estimates within the mineralized domains, 99% of the estimates were from the 1st pass with the additional 1% from the 2nd pass. For silver, between 76% to 95% of the estimates are from the 1st pass, 3% to 15% of the estimates are from the 2nd pass, and 2% to 18% of the estimates are from the 3rd pass.

14.1.8 Validation of Estimates

Validation tests were carried out to assess the quality of the estimates.

14.1.8.1 *Visual Checks*

A visual inspection of the block estimates of gold, silver, copper, and total sulphur grades, as well as AuCN/Au ratios, with the drill hole grades on northeast-southwest cross-sections, northwest-southeast cross-sections, and level plans, was performed as a first check of the estimates. Observations from stepping through the estimates along the different sections indicated that there was overall a good agreement between the drill hole grades and the estimates and their projection away from drill hole data. Examples of sections and plan for gold grade estimates are presented in Figure 14-17, Figure 14-18, and Figure 14-19.

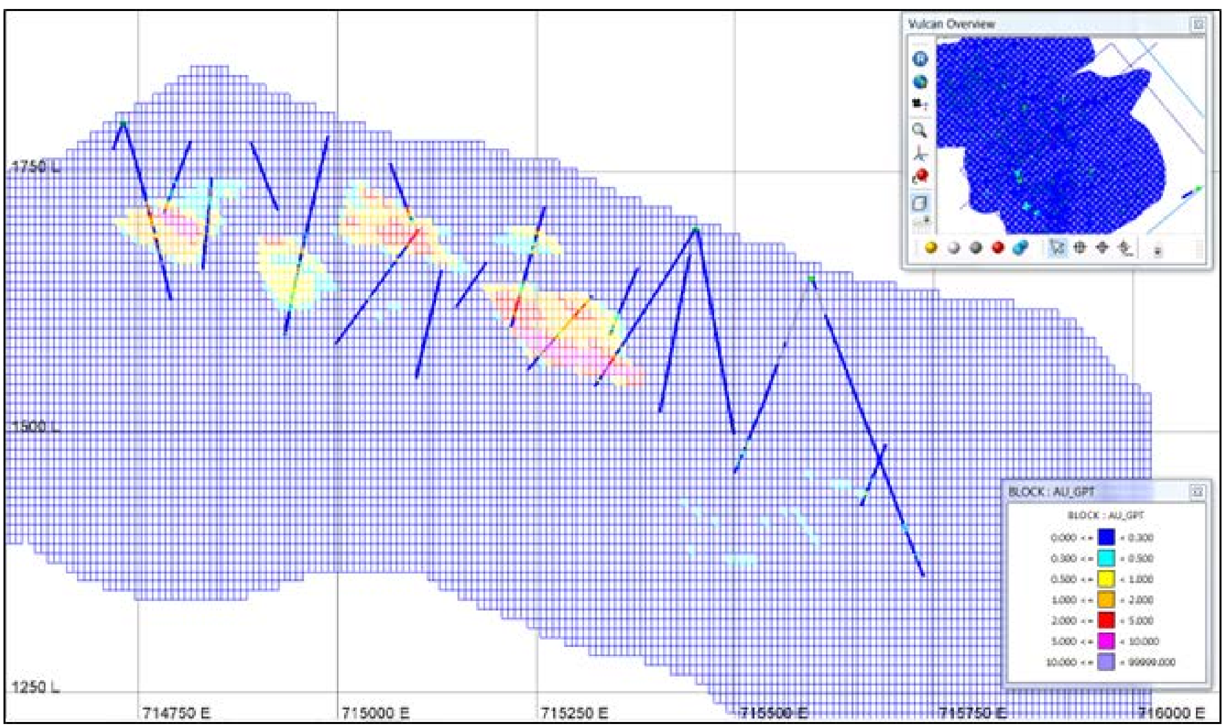


Figure 14-17 LYG - Gold Grade Estimates and Drill Holes – NE-SW Section Looking Northwest – Zone 2

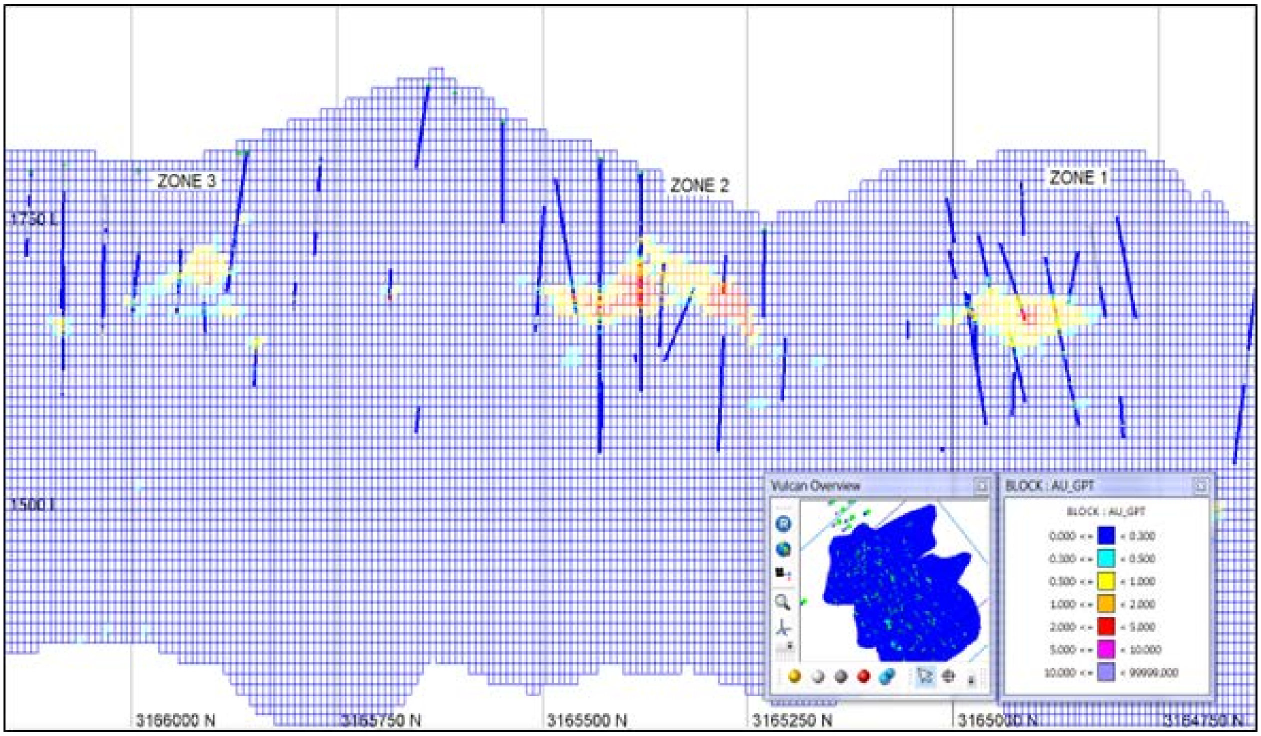


Figure 14-18 LYG - Gold Grade Estimates and Drill Holes – NW-SE Section Looking Northeast

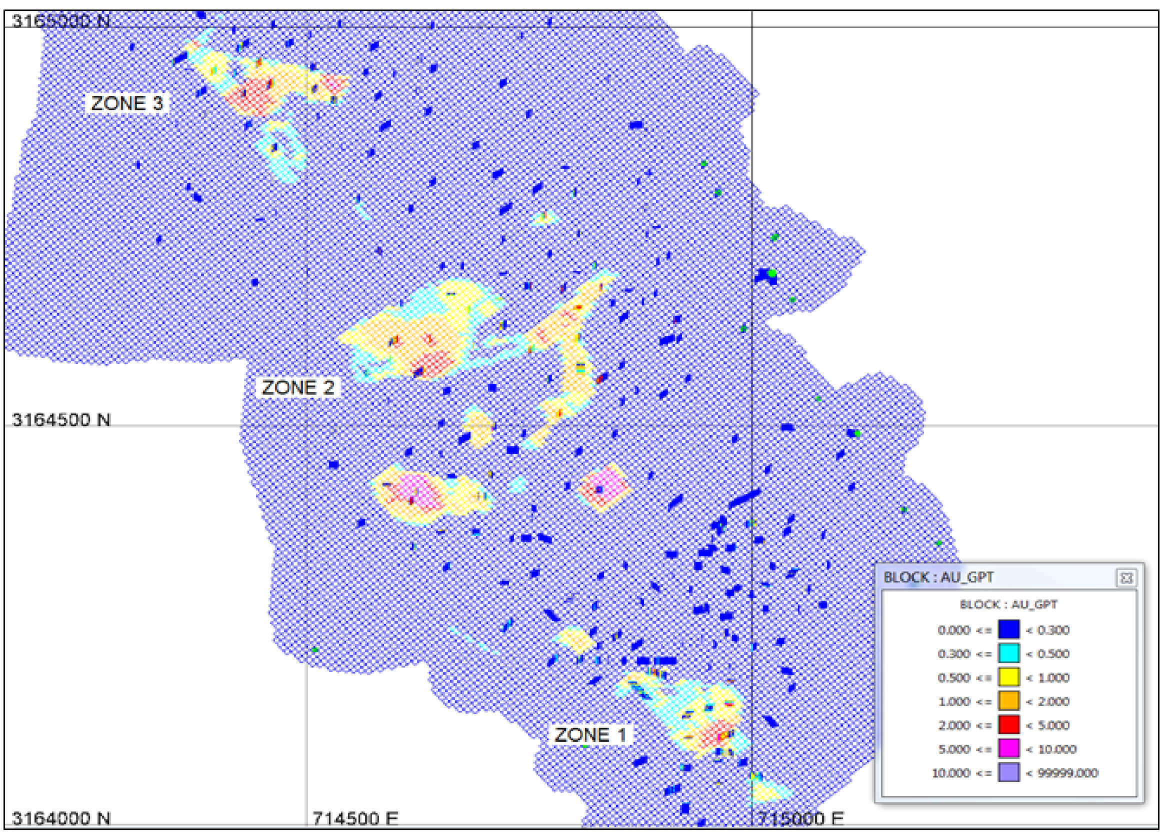


Figure 14-19 LYG - Gold Grade Estimates and Drill Holes – Level 1700 Elevation

14.1.8.2 *Global Bias Test*

The comparison of the average grades from the polygonal declustered composites and the estimated block grades examines the possibility of a global bias of the estimates. As a guideline, a difference between the average gold grades of more than ± 10% would indicate a significant over- or under-estimation of the block grades and the possible presence of a bias. It would be a sign of difficulties encountered in the estimation process and would require further investigation. Results of this comparison are presented in Table 14-12.

Table 14-12 LYG - Average Grade Comparison – Polygonal-Declustered Composites with Block Estimates

Stats	Gold		Silver	
	Declustered Composites (Au g/t)	Block Estimates (Au g/t)	Declustered Composites (Ag g/t)	Block Estimates (Ag g/t)
Average Grade	0.699	0.707	15.107	13.899
Difference	1.1%		-8.0%	
Stats	AuCN/Au		Copper	
	Declustered Composites (AuCN/Au)	Block Estimates (AuCN/Au)	Declustered Composites (Cu ppm)	Block Estimates (Cu ppm)
Average Grade	0.780	0.779	91.726	91.850
Difference	-0.2%		0.1%	
Stats	Total Sulphur			
	Declustered Composites (%S)	Block Estimates (%S)		
Average Grade	2.395	2.437		
Difference	1.8%			

As seen in Table 14-12, the average grades and ratio between the declustered composites and the block estimates are within the limits of acceptability for all elements of interest. It can be concluded that no global bias is present in the gold, silver, copper, and total sulphur grade estimates, as well as in the AuCN/Au ratio estimates.

14.1.8.3 *Local Bias Test*

A comparison of the grade from composites within a block with the estimated grade of that block provides an assessment of the estimation process close to measured data. Pairing of these grades on a scatterplot gives a statistical valuation of the estimates. It is anticipated that the estimated block grades should be similar to the composited grades within the block, however without being of exactly the same value. Thus, a high correlation coefficient (≥ 0.8) will indicate satisfactory results in the interpolation process, while a medium to low correlation coefficient will be indicative of larger differences in the estimates and would suggest a further review of the interpolation process. Results from the pairing of composited and estimated grades within blocks pierced by a drill hole are presented in Table 14-13 for all element of interest.

Table 14-13 LYG - Grade Comparison for Blocks Pierced by a Drill Hole – Paired Composites Grades with Block Grade Estimates

Gold				Silver			
Block Composites Average (Au g/t)	Block Estimates Average. (Au g/t)	Difference	Correlation Coefficient	Block Composites Average (Ag g/t)	Block Estimates Average (Ag g/t)	Difference	Correlation Coefficient
1.063	0.917	-13.7%	0.835	30.80	26.79	-13.0%	0.855
AuCN/Au				**Copper**			
Block Composites Average (AuCN/Au)	Block Estimates Average (AuCN/Au)	Difference	Correlation Coefficient	Block Composites Average (Cu ppm)	Block Estimates Average (Cu ppm)	Difference	Correlation Coefficient
0.818	0.810	-1.0%	0.931	80.11	79.95	-0.2%	0.844
Total Sulphur							
Block Composites Average (%S)	Block Estimates Average ((%S)	Difference	Correlation Coefficient				
1.972	2.075	5.2%	0.944				

As seen in Table 14-13, higher correlation coefficients are observed for all elements estimated, indicating satisfactory results. The average gold and silver grades from the block estimates are however slightly below the tolerance limits of ± 10%.

14.1.8.4 *Grade Profile Reproducibility Test*

The comparison of the grade profiles of the polygonal declustered composites with that of the estimates allows for a visual verification of an over or under-estimation of the block estimates at the global and local scales. A qualitative assessment of the smoothing/variability of the estimates can also be observed from the plots. For this test the utility produces an output consisting of three graphs displaying the average grade according to each of the coordinate axes (east, north, elevation). The ideal result is a grade profile from the estimates that follows that of the declustered composites along the three coordinate axes, in a way that the estimates have lower high-grade peaks than the composites, and higher low-grade valleys than the composites. A smoother grade profile for the estimates, from low to high grade areas, is also anticipated to reflect that these grades represent larger volumes than the composites. Results for gold, silver, AuCN/Au, copper, and total sulphur are presented in Figure 14-20, Figure 14-21, Figure 14-22, Figure 14-23, and Figure 14-24, respectively.

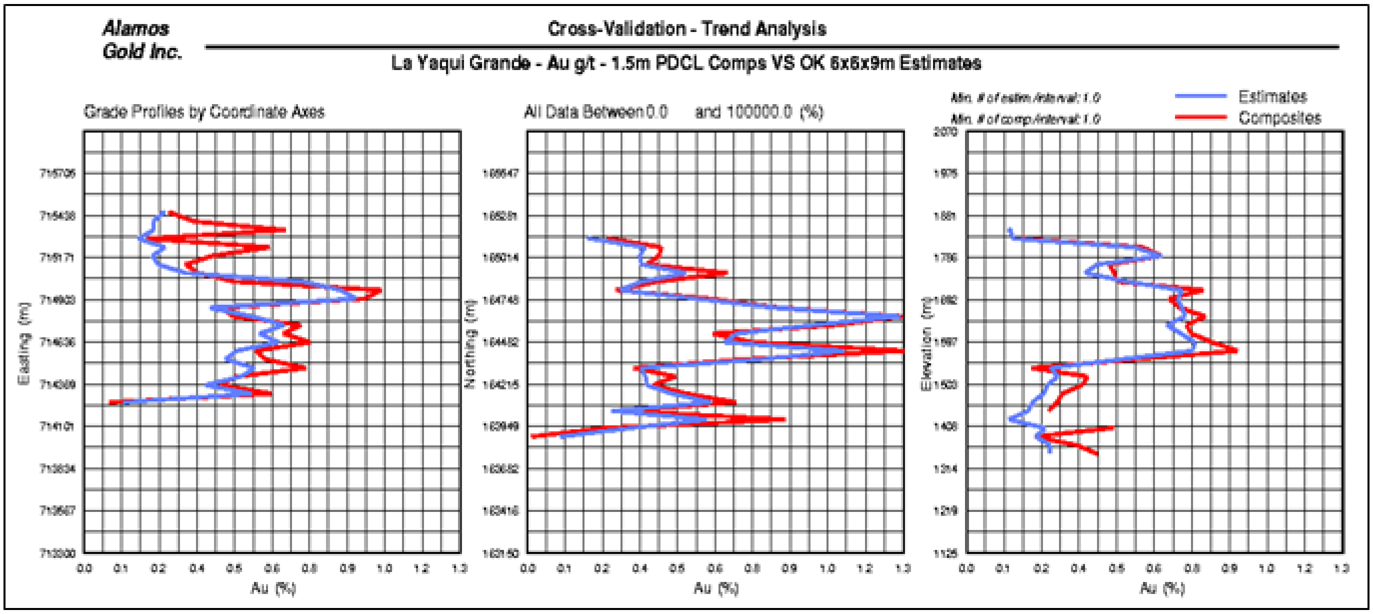


Figure 14-20 LYG - Gold Grade Profile

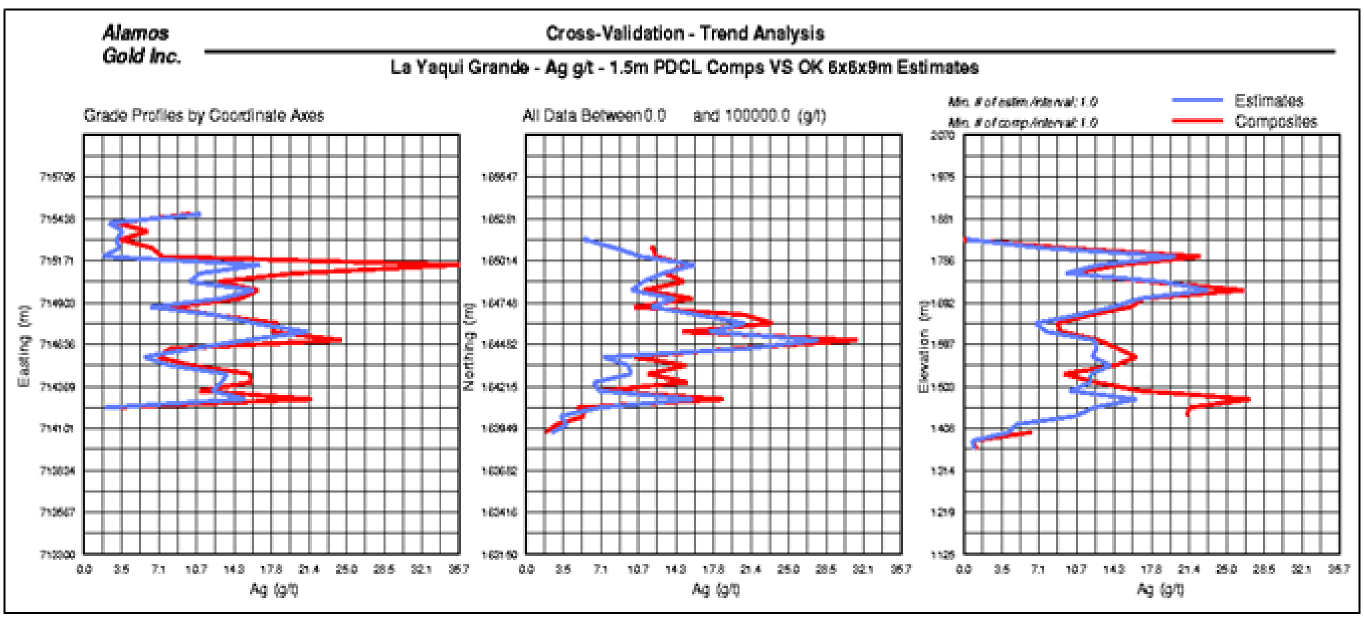


Figure 14-21 LYG - Silver Grade Profile

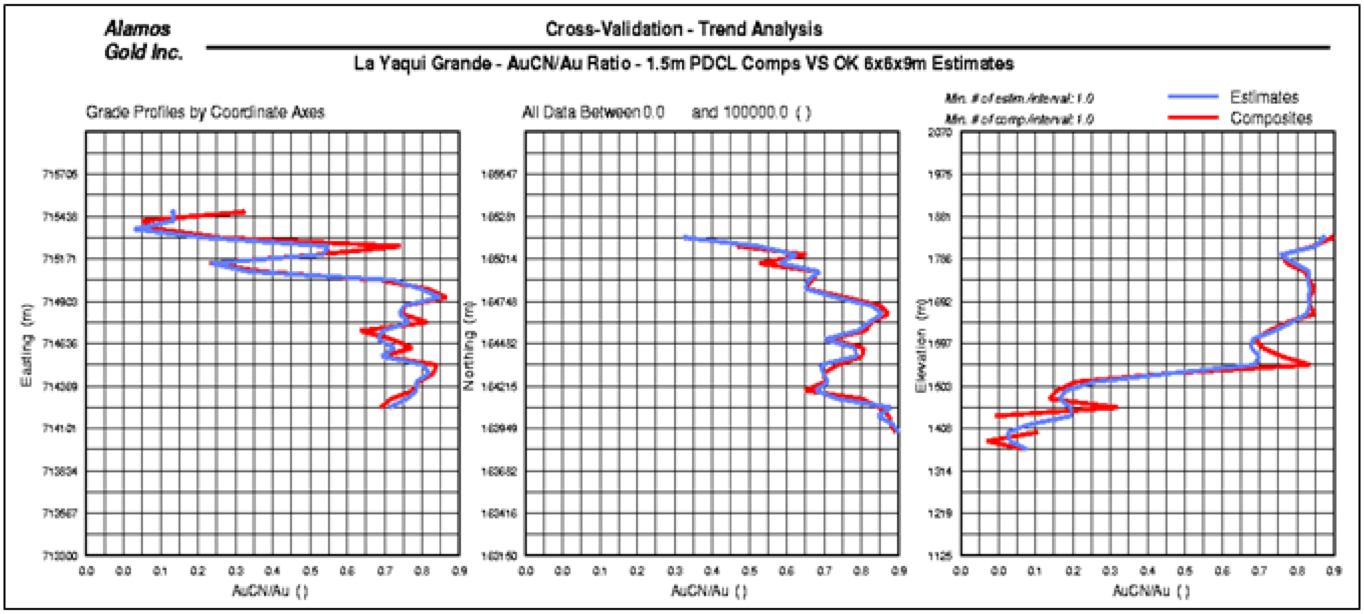


Figure 14-22 LYG - AuCN/Au Ratio Profile

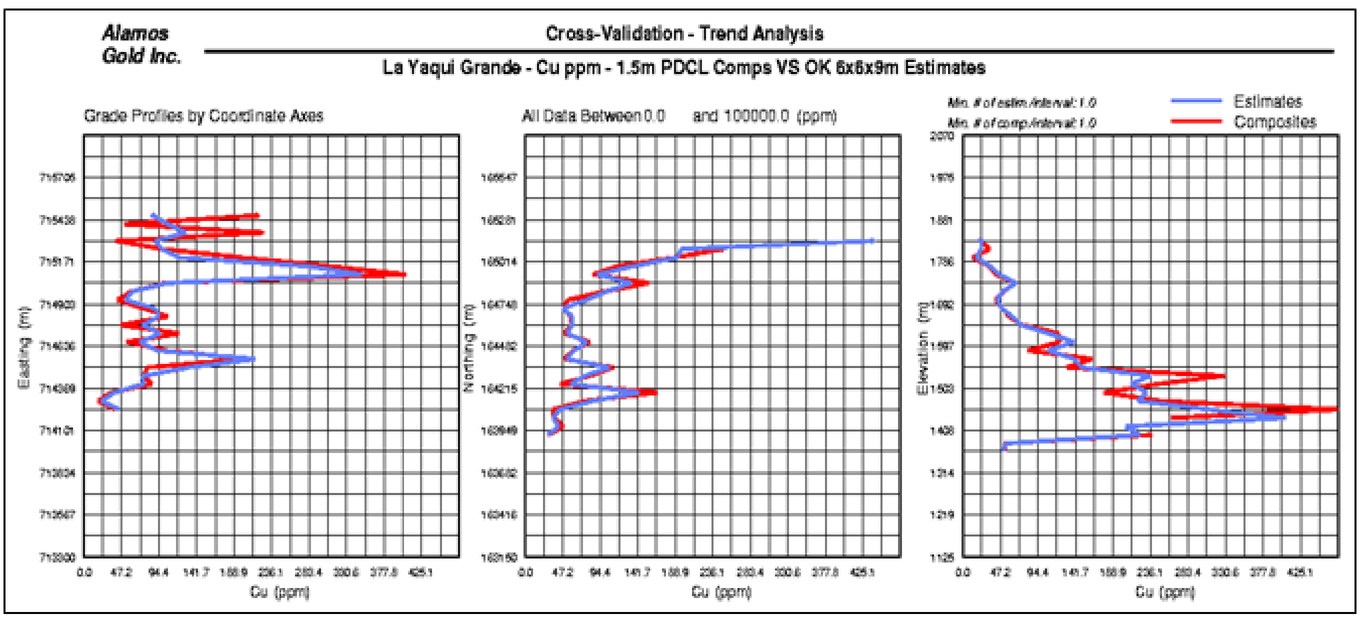


Figure 14-23 LYG - Copper Grade Profile

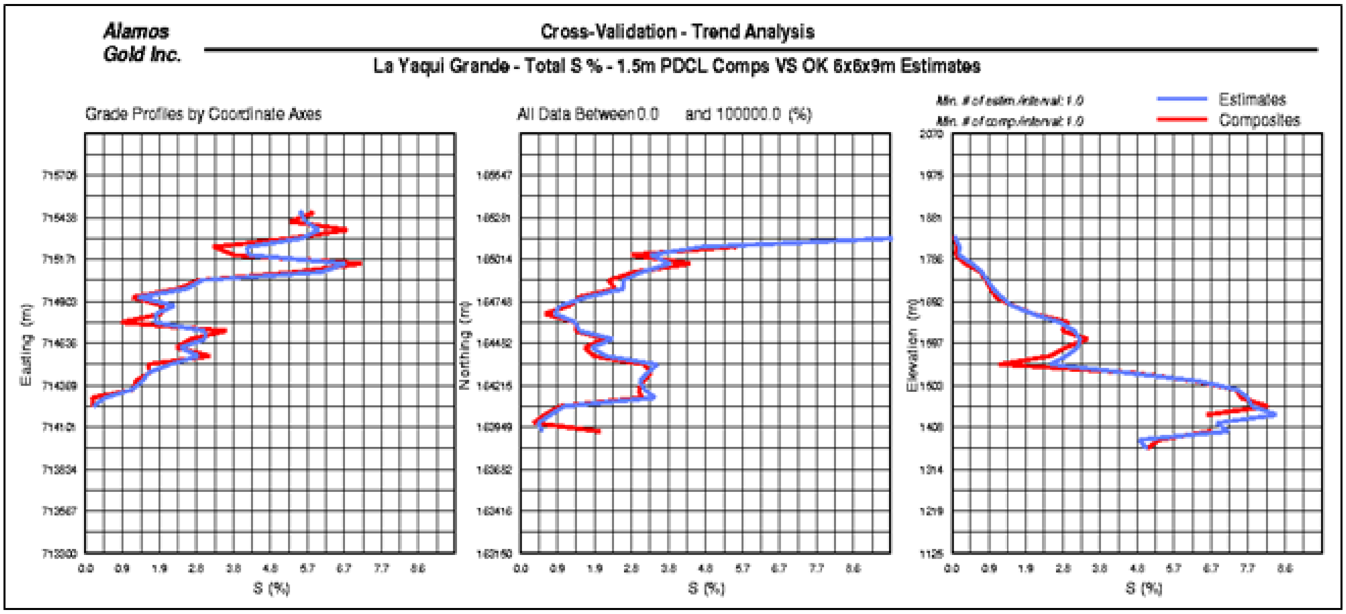


Figure 14-24 LYG - Total Sulphur Grade Profile

As seen in Figure 14-20, Figure 14-21, Figure 14-22, Figure 14-23, and Figure 14-24, the grade profiles from the estimates follow reasonably well the grade profiles from the declustered composites with no over-estimation observed. As expected, the estimates display higher grades in lower grade areas and lower grades in higher grade areas, as they represent larger volumes than the composites.

14.1.8.5 *Level of Smoothing/Variability*

The level of smoothing/variability of the estimates can be measured by comparing a theoretical distribution of block grades with that of the actual estimates. The theoretical distribution of block grades is derived from that of the declustered composites, where a change of support algorithm is utilized for the transformation (Indirect Lognormal Correction). In this case, the variance of the composites' grade population is corrected (reduced) with the help of the variogram model, to reflect a distribution of block grades (6m x 6m x 9m). The comparison of the coefficient of variation (CV) of this population with that of the actual block estimates provides a measure of smoothing. Ideally a lower CV from the estimates by 5 to 20% is targeted as a proper amount of smoothing. This smoothing of the estimates is desired as it allows for the following factors: the imperfect selection of ore blocks at the mining stage (misclassification), the block grades relate to much larger volumes than the volume of core (support effect), and the block grades are not perfectly known (information effect). A CV lower than 5 to 20% for the estimates would indicate a larger amount of smoothing, while a higher CV would represent a larger amount of variability. Too much smoothing would be characterized by grade estimates around the average grade, where too much variability would be represented by estimates with abrupt changes between lower and higher-grade areas.

Results of the level of smoothing/variability analysis are presented in Table 14-14 for all estimates. As observed in this table, the CVs of the gold, silver, and copper estimates are within the targeted range of acceptability and thus have an adequate level of smoothing/variability. However, higher variability levels of the AuCN/Au and total sulphur estimates are observed.

Table 14-14 LYG - Level of Smoothing/Variability of Estimates

Gold			Silver		
CV – Theoretical Block Grade Distribution	CV – Actual Block Grade Distribution	Difference	CV – Theoretical Block Grade Distribution	CV – Actual Block Grade Distribution	Difference
1.736	1.467	-15.5%	1,674	1.535	-8.3%
AuCN/Au			**Copper**		
CV – Theoretical Block Grade Distribution	CV – Actual Block Grade Distribution	Difference	CV – Theoretical Block Grade Distribution	CV – Actual Block Grade Distribution	Difference
0.291	0.301	3.5%	2.382	1.893	-20.5%
Total Sulphur					
CV – Theoretical Block Grade Distribution	CV – Actual Block Grade Distribution	Difference			
1.093	1.154	5.6%			

14.1.9 Mineral Resource Classification

The Mineral Resource was classified as Indicated and Inferred based on the variogram ranges and the classification strategy adopted at Mulatos. The distance of the closest sample from the block center was utilized as the classification criterion. The classification distances for each category are provided in Table 14-15.

Table 14-15 LYG - Classification Distances

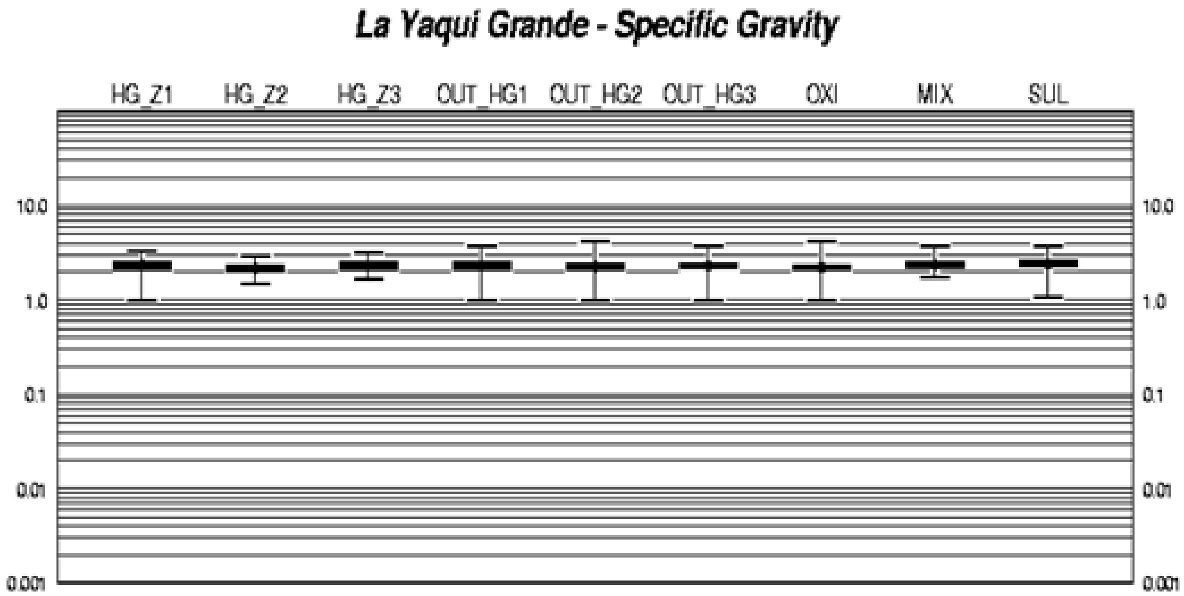
Class	Distance of Closest Sample
Indicated	≤ 36.0m
Inferred	> 36.0m and ≤ 74.0m

14.1.10 Mineral Resource Calculation

The Mineral Resource's tonnage was calculated for 6m (X) x 6m (Y) x 9m (Z) blocks with specific gravity (SG) values. The portion of the block inside and outside of the higher-grade gold mineralized domains was registered and utilized in the calculation of the block's specific gravity. A total of 5,997 SG measurements were available within the region of interest. A set of boxplots of the specific gravity data by higher-grade gold domains and redox domains is presented in Figure 14-25. The average specific gravity by higher-grade gold domain was utilized in the tonnage calculations as it corresponds to the reporting strategy of the Mineral Resources.

For the blocks straddling the domain boundaries, the weighted average of the grade estimates and tonnage, based on the volume proportion in/out of the domain, was utilized in the Mineral Resource calculations.

The Mineral Resources were constrained within an optimized pit shell to satisfy the NI 43-101 requirement of "reasonable prospects for economic extraction". The pit optimization parameters are presented in Table 14-16. An example of the optimized pit shell constraining the mineral resources is shown in Figure 14-26.



	HG_Z1	HG_Z2	HG_Z3	OUT_HG1	OUT_HG2	OUT_HG3	OXI	MIX	SUL
Number of data	201	267	175	1567	1952	1815	4097	392	1508
Mean	2.34	2.164	2.309	2.296	2.242	2.31	2.221	2.367	2.41
Std. Dev.	0.256	0.18	0.246	0.233	0.216	0.196	0.194	0.223	0.219
Coef. of Var.	0.109	0.083	0.106	0.101	0.096	0.085	0.087	0.094	0.091
Maximum	3.333	2.96	3.161	3.727	4.154	3.72	4.154	3.72	3.727
Upper quartile	2.5	2.259	2.451	2.446	2.371	2.437	2.344	2.531	2.556
Median	2.333	2.136	2.256	2.263	2.233	2.303	2.214	2.367	2.412
Lower quartile	2.167	2.034	2.133	2.136	2.107	2.182	2.097	2.228	2.269
Minimum	1.005	1.464	1.7	1.005	1.006	1.006	1.005	1.73	1.057
Number of holes	50	79	77	95	134	137	355	136	240

Figure 14-25 LYG - Specific Gravity Measurements

Table 14-16 LYG – Mineral Resource Pit Optimization Parameters

Pit Optimization Parameters	
Price of Gold	US$ 1,600/oz
Mining Cost	US$ 2.36/t
Processing Cost	US$ 5.26/t
G&A Cost	US$ 2.84/t
Gold Recovery Min of AuCN/FA or: oxide transition sulphide	85% 80% 75%.
Pit Slopes	40° - 44°

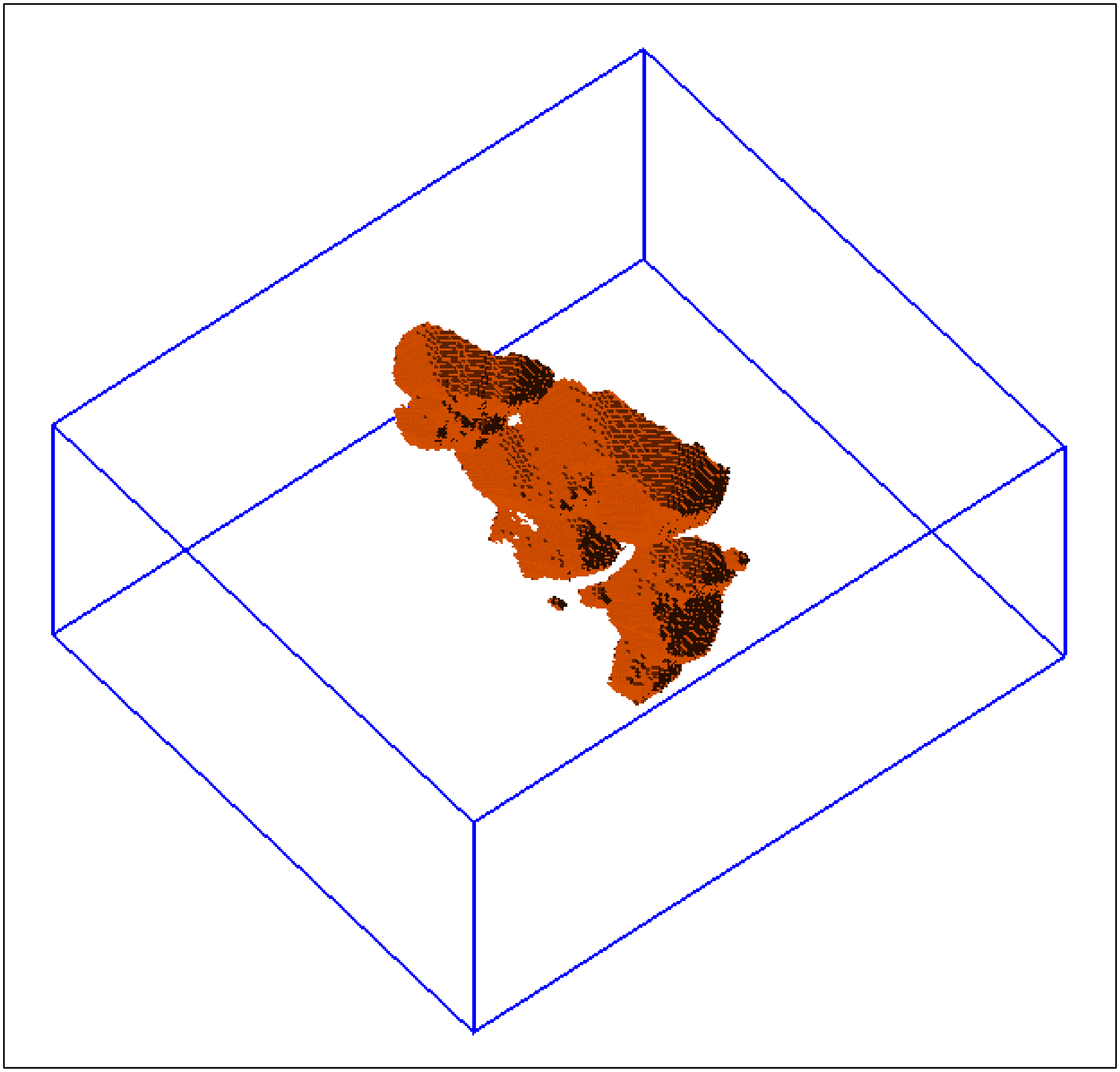


Figure 14-26 LYG – Mineral Resource Optimized Pit Shell – Looking North

The block model was trimmed to the mined-out topography as of December 31, 2022, for the calculation of the Mineral Resources. The mined-out topography surface is shown Figure 14-27.

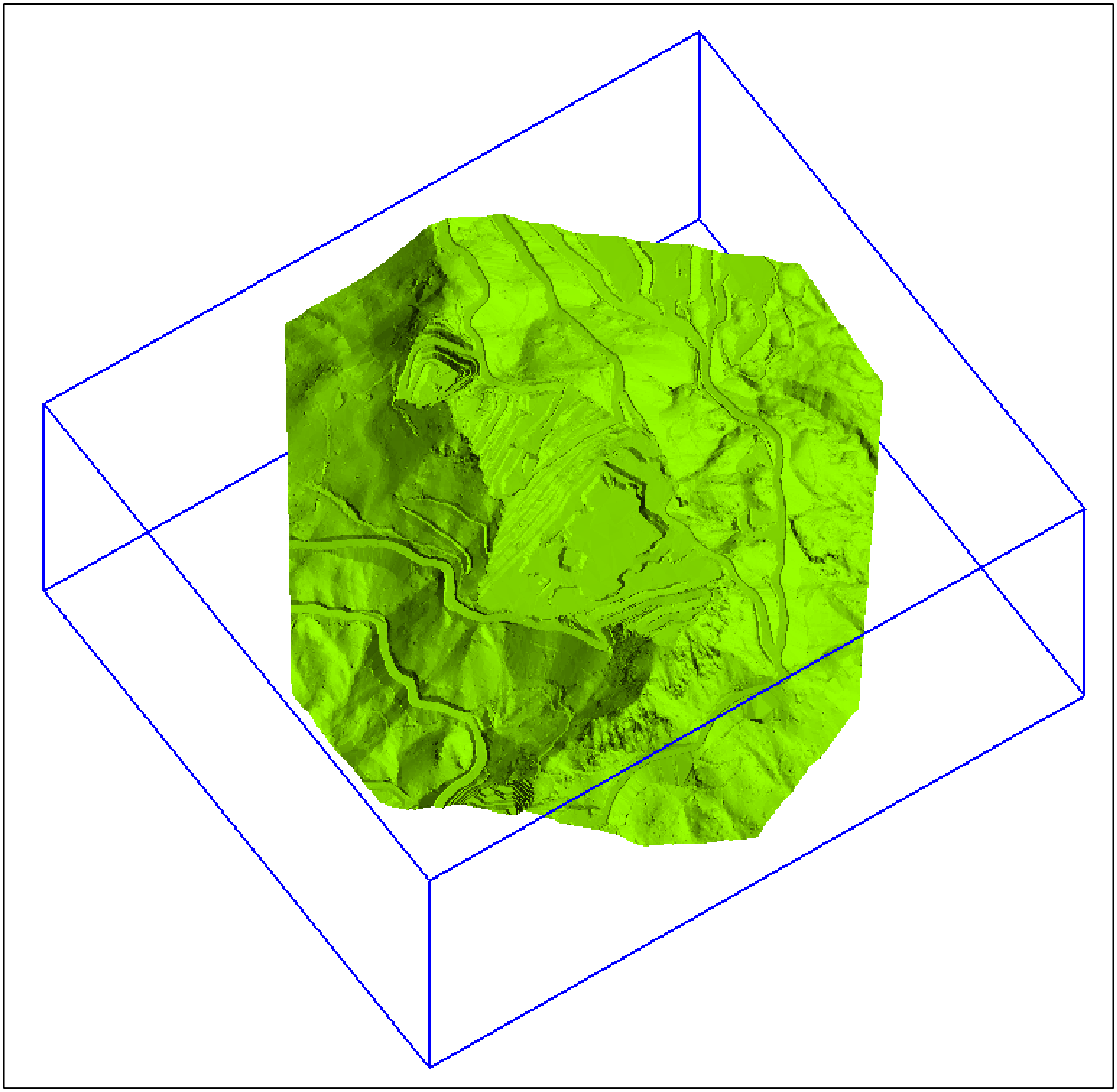


Figure 14-27 LYG – Mined-Out Topography Surface as of December 31, 2022 – Looking North

It should be noted that 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. The estimate of Mineral Resources may be materially affected by future changes in environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues. However, there are no currently known issues that negatively impact the stated Mineral Resources.

The CIM definitions were followed for the classification of Indicated and Inferred Mineral Resources. The Inferred Mineral Resources have a lower level of confidence and must not be converted to Mineral Reserves. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

The pit constrained Mineral Resources at various gold grade cut-offs are presented in Table 14-17 and Table 14-18 for the Indicated and Inferred Mineral Resources, respectively, for each zone. as well, the pit constrained Mineral Resources at various gold grade cut-offs are presented in Table 14-19 for the Indicated and Inferred Mineral Resources of all zones.

Table 14-17 LYG - Indicated Mineral Resources by Zones – Pit Constrained – Year-End 2022 Topography

Effective Date of December 31, 2022									
Au Cut-off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Ag Content (oz)	AuCN/Au Ratio	Copper (ppm)	Total S (%)	Specific Gravity
Indicated – Zone 1									
0.1	8,767,218	0.650	183,217	11.26	3,173,885	0.90	41.06	1.38	2.32
0.2	5,994,793	0.885	170,572	14.18	2,733,011	0.90	45.02	1.49	2.33
0.3	4,861,461	1.034	161,614	15.33	2,396,072	0.90	46.72	1.49	2.33
0.4	3,987,997	1.184	151,809	16.68	2,138,660	0.90	48.18	1.46	2.34
0.5	3,316,656	1.333	142,142	18.06	1,925,791	0.90	49.46	1.48	2.34
0.6	2,847,933	1.462	133,865	19.32	1,769,000	0.90	49.73	1.48	2.34
0.7	2,492,565	1.578	126,457	20.45	1,638,818	0.90	50.60	1.47	2.34
0.8	2,177,807	1.698	118,891	21.61	1,513,091	0.90	50.08	1.42	2.34
0.9	1,914,352	1.815	111,709	22.75	1,400,213	0.90	49.48	1.41	2.34
1.0	1,683,437	1.934	104,675	23.71	1,283,274	0.90	49.08	1.38	2.34
Indicated – Zone 2									
0.1	13,451,823	1.121	484,817	18.70	8,087,489	0.89	51.61	1.07	2.20
0.2	10,357,388	1.413	470,526	19.75	6,576,704	0.89	51.79	1.07	2.18
0.3	8,956,514	1.596	459,582	19.93	5,739,014	0.89	51.81	1.06	2.18
0.4	8,047,705	1.736	449,172	20.40	5,278,289	0.89	51.76	1.03	2.17
0.5	7,198,902	1.888	436,978	20.93	4,844,249	0.90	51.81	1.00	2.17
0.6	6,479,592	2.037	424,355	21.53	4,485,209	0.90	51.94	0.95	2.17
0.7	5,885,242	2.177	411,921	22.08	4,177,865	0.90	51.80	0.91	2.17
0.8	5,398,783	2.306	400,264	22.43	3,893,284	0.90	51.94	0.89	2.17
0.9	4,986,910	2.427	389,128	22.64	3,629,936	0.91	52.15	0.86	2.17
1.0	4,589,673	2.555	377,019	23.16	3,417,522	0.91	52.22	0.83	2.17
Indicated – Zone 3									
0.1	4,933,476	0.622	98,658	13.84	2,195,230	0.87	54.67	0.92	2.31
0.2	3,208,395	0.882	90,980	14.47	1,492,613	0.87	62.70	1.03	2.31
0.3	2,570,079	1.040	85,935	14.89	1,230,360	0.87	62.56	1.09	2.31
0.4	2,100,919	1.195	80,718	15.63	1,055,746	0.87	62.49	1.13	2.31
0.5	1,748,498	1.346	75,666	16.46	925,307	0.87	61.94	1.15	2.31
0.6	1,494,852	1.482	71,226	17.28	830,487	0.87	61.14	1.18	2.31
0.7	1,289,095	1.615	66,934	18.19	753,891	0.87	61.48	1.18	2.31
0.8	1,131,973	1.735	63,143	19.16	697,305	0.87	62.50	1.17	2.31
0.9	974,103	1.879	58,847	20.41	639,203	0.87	64.15	1.16	2.31
1.0	865,615	1.995	55,521	21.03	585,268	0.88	64.83	1.17	2.31

Notes:

- *Mineral Resources reported in the table are inclusive of Mineral Reserves*

Table 14-18 LYG - Inferred Mineral Resources by Zones – Pit Constrained – Year-End 2022 Topography

Effective Date of December 31, 2022									
Au Cut-off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Ag Content (oz)	AuCN/Au Ratio	Copper (ppm)	Total S (%)	Specific Gravity
Inferred – Zone 1									
0.1	732,523	0.193	4,545	1.86	43,805	0.89	25.53	0.56	2.30
0.2	145,776	0.415	1,945	1.63	7,639	0.89	28.33	0.79	2.31
0.3	48,115	0.784	1,213	1.33	2,057	0.91	40.13	0.91	2.32
0.4	24,178	1.229	955	1.57	1,220	0.92	57.88	0.97	2.33
0.5	16,657	1.582	847	0.89	477	0.93	63.87	1.02	2.34
0.6	13,638	1.803	791	0.80	351	0.93	66.75	0.98	2.34
0.7	12,883	1.872	775	0.70	290	0.93	67.53	0.98	2.34
0.8	12,126	1.940	756	0.69	269	0.93	69.24	1.04	2.34
0.9	12,126	1.940	756	0.69	269	0.93	69.24	1.04	2.34
1.0	11,368	2.007	734	0.70	256	0.92	71.43	1.01	2.34
Inferred – Zone 2									
0.1	393,423	0.616	7,792	9.86	124,718	0.89	50.76	1.55	2.22
0.2	188,778	1.125	6,828	9.45	57,355	0.88	53.07	1.66	2.20
0.3	144,718	1.395	6,491	10.84	50,436	0.89	51.61	1.65	2.19
0.4	113,311	1.686	6,142	10.78	39,272	0.89	53.37	1.70	2.19
0.5	96,936	1.896	5,909	8.14	25,369	0.89	54.48	1.77	2.18
0.6	84,204	2.101	5,688	8.82	23,878	0.88	56.05	1.83	2.18
0.7	71,440	2.361	5,423	9.24	21,223	0.88	56.43	1.81	2.18
0.8	63,594	2.561	5,236	9.68	19,792	0.88	57.57	1.87	2.18
0.9	58,610	2.707	5,101	8.57	16,149	0.87	59.31	1.95	2.18
1.0	54,356	2.844	4,970	8.81	15,396	0.87	59.16	2.08	2.18
Inferred – Zone 3									
0.1	62,868	0.138	279	4.26	8,611	0.80	21.05	0.58	2.31
0.2	5,238	0.410	69	5.20	876	0.80	12.38	0.12	2.31
0.3	2,993	0.525	51	2.89	278	0.83	12.24	0.16	2.31
0.4	2,245	0.567	41	3.32	240	0.85	11.53	0.08	2.31
0.5	1,497	0.604	29	2.99	144	0.84	13.41	0.08	2.31
0.6	1,497	0.604	29	2.99	144	0.84	13.41	0.08	2.31
0.7	-	-	-	-	-	-	-	-	-
0.8	-	-	-	-	-	-	-	-	-
0.9	-	-	-	-	-	-	-	-	-
1.0	-	-	-	-	-	-	-	-	-

Notes:

- *Mineral Resources reported in the table are inclusive of Mineral Reserves*

Table 14-19 LYG - Indicated and Inferred Mineral Resources for All Zones – Pit Constrained – Year-End 2022 Topography

Effective Date of December 31, 2022									
Au Cut-off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Ag Content (oz)	AuCN/Au Ratio	Copper (ppm)	Total S (%)	Specific Gravity
Indicated – Zones 1+2+3									
0.1	27,152,516	0.878	766,471	15.42	13,461,251	0.89	48.76	1.14	2.26
0.2	19,560,576	1.164	732,024	17.18	10,804,279	0.89	51.50	1.19	2.25
0.3	16,388,054	1.342	707,084	17.78	9,368,070	0.89	51.99	1.19	2.24
0.4	14,136,620	1.500	681,754	18.64	8,471,932	0.89	52.34	1.16	2.24
0.5	12,264,056	1.661	654,930	19.52	7,696,706	0.89	52.62	1.15	2.24
0.6	10,822,377	1.809	629,437	20.36	7,084,210	0.90	52.63	1.12	2.23
0.7	9,666,902	1.948	605,435	21.14	6,570,271	0.90	52.78	1.09	2.23
0.8	8,708,563	2.080	582,372	21.80	6,103,711	0.90	52.85	1.06	2.23
0.9	7,875,365	2.210	559,569	22.39	5,669,121	0.90	52.99	1.03	2.23
1.0	7,138,725	2.340	537,066	23.03	5,285,737	0.90	53.01	1.00	2.23
Inferred – Zones 1+2+3									
0.1	1,188,814	0.330	12,613	4.63	176,964	0.88	33.64	0.89	2.27
0.2	339,792	0.810	8,849	6.03	65,875	0.89	41.83	1.26	2.25
0.3	195,826	1.232	7,757	8.38	52,760	0.89	48.19	1.44	2.22
0.4	139,734	1.589	7,139	9.06	40,703	0.89	53.48	1.55	2.21
0.5	115,089	1.834	6,786	7.02	25,975	0.89	55.30	1.64	2.21
0.6	99,338	2.037	6,506	7.63	24,369	0.89	56.88	1.69	2.21
0.7	84,323	2.286	6,197	7.94	21,526	0.89	58.12	1.68	2.21
0.8	75,719	2.461	5,991	8.24	20,060	0.89	59.44	1.74	2.21
0.9	70,735	2.575	5,856	7.22	16,420	0.88	61.02	1.79	2.21
1.0	65,724	2.699	5,703	7.41	15,658	0.88	61.28	1.89	2.21

Notes:

- *Mineral Resources reported in the table are inclusive of Mineral Reserves*

A comparison of the updated unconstrained Mineral Resource with that of June 2018 at a 0.3 g/t Au cut-off is presented in Table 14-20. As seen in this table for the Indicated Mineral Resources, an increase in tonnage with a decrease in average gold grade, resulting in similar total ounces were noted for the updated gold Mineral Resources. Larger increases in grade and ounces are observed for the updated silver Indicated Mineral Resources.

Table 14-20 LYG - Comparison of Updated Mineral Resource and June 2018 Mineral Resource – Pit Constrained

	Tonnage tonnes	Average Au Grade (g/t)	Au Content (oz)	Average Ag Grade (g/t)	Ag Content (g/t)
La Yaqui Grande Indicated Mineral Resources					
June 2018	14,674,204	1.492	703,769	14.64	6,909,295
June 2020	16,388,054	1.342	707,084	17.78	9,368,070
Difference	11.7%	-10.0%	0.5%	21.4%	35.6%
La Yaqui Grande Inferred Mineral Resources					
June 2018	169,698	0.962	5,247	4.87	26,564
June 2020	195,826	1.232	7,757	8.38	52,760
Difference	15.4%	28.1%	47.8%	72.1%	98.6%

Notes:

- *Reported at a 0.3 g/t Gold cut-off grade.*
- *Starting surface is year-end 2022 topography.*
- *Mineral Resources reported in the table are inclusive of Mineral Reserves.*

14.1.11 Discussion

The current study is an update of La Yaqui Grande's Mineral Resources from June 2018. A similar approach was selected for the estimation of grades, however all steps leading to the Mineral Resource were re-examined. The main features of this updated Mineral Resource comprise the addition of 6 new drill holes, a set of re-assayed samples on regular intervals replacing previously assayed "button" samples, new interpretations of the higher-grade silver domains, of the alteration, and of the redox units, and an updated interpretation of the higher-grade gold domains.

The re-interpretation of the higher-grade silver domains has shown better continuity of the mineralized zones, which are believed to be more realistic than the previous interpretations. The prior silver domain model was observed to be discontinuous and more single-hole based. Similar observations were made for the transition unit of the redox model.

It is believed that the drill hole spacing is adequate for the estimation of an Indicated Mineral Resource. Drill hole spacing is tighter in Zone 1, followed by Zone 2, and then Zone 3.

There are fewer AuCN/Au ratio data than for the other elements of interest. For such, in areas where other elements were estimated without any estimates for the AuCN/Au ratio, the average ratio by redox domain was assigned. This occurred for approximately 26% of the estimated blocks.

The capping of the high-grade outliers had only a minimal effect over the metal content and the average grade. In general, the metal content of the grade composites was reduced by 2% or less, and the average grade was reduced by 1% for gold, 2% for silver, and 1.4% for copper. The AuCN/Au ratios and total sulphur grades were not capped as they had an upper limit value of 1.0 and 10.0%, respectively.

The distribution of gold, silver, copper, and total sulphur grades, along with the AuCN/Au ratios, showed low coefficients of variation (CV) for each domain. CV values lesser than 3.0 were observed in general, indicating well-behaved populations. In turn, the low CVs suggest that no difficulties with the estimation of higher grades are anticipated.

Overall, the experimental variograms were of sufficient quality to interpret conclusive models of grade continuity. Only variograms for the AuCN/Au ratio of the transition redox unit were not conclusive due to the data's wider spacing. Nugget effects were found to be low overall.

The grade estimation strategy involved the usage of the ordinary kriging technique with capped composites. Grades were estimated within each modeled domain with a hard boundary. This approach is believed to be suitable for the estimation of the Mineral Resources.

The overall satisfactory results from the various validation tests are indicative of the adequate representativity of the updated Mineral Resources at La Yaqui Grande, considering the available drill hole data and latest geologic understanding.

The June 2020 Mineral Resources, depleted to December 31, 2022, and constrained within a Mineral Resource pit, and net of Mineral Reserves, are presented in Section 14-3 of this report.

14.2 Puerto del Aire, Estrella, and Gap-Victor (PDA)

14.2.1 Introduction

The current study relates to the estimation of the Mineral Resources of the PDA, Estrella, and Gap-Victor sulphide deposits (collectively referred to as the Puerto del Aire Sulphide Project), located at the Mulatos Mine, Sonora State, Mexico. The estimation of gold grades, silver grades, ratio of AuCN/Au, and total sulphur grades were carried out with the Vulcan software (version 12.02.2) and internally developed utilities in GSLIB-type format. For this update, the interpretation of the mineralized zones was revisited as well as the different steps leading to the estimation of the Mineral Resources due to the inclusion of additional drill holes from the 2022 drilling campaign.

The steps and results leading to the tabulation of the Mineral Resources at PDA, Estrella, and Gap-Victor are summarized below.

14.2.2 Drill Hole Database

The Mulatos drill hole database was initially utilized for the resource estimation process. This database is comprised of 2,961 drill holes with 237,661 gold assays in g/t.

There are 291 drill holes intersecting the mineralized PDA zone with 12,959 gold assays in g/t, 12,662 silver assays in g/t, 8,363 AuCN/Au ratios, and 10,139 total sulphur assays in %. A total of 19,788 meters of drilling are found within the mineralized zone at PDA.

For the Estrella zone, there are 214 drill holes within the mineralized zone with 7,889 gold assays in g/t, 7,650 silver assays in g/t, 1,805 AuCN/Au ratios, and 5,273 total sulphur assays in %. A total of 12,149 meters of drilling are found within the mineralized zone at Estrella.

For the Gap-Victor zone, there are 314 drill holes within the mineralized zone with 6,561 gold assays in g/t, 6,562 silver assays in g/t, 4,598 AuCN/Au ratios, and 3,342 total sulphur assays in %. A total of 9,716 meters of drilling are located within the mineralized zone at Gap-Victor. Location, Orientation, and Spacing of Drill Holes

The location of the drill holes in plan view and longitudinal section views is presented in Figure 14-28 for all three zones, in Figure 14-29 and Figure 14-30 for the PDA zone, in Figure 14-31 and Figure 14-32 for the Estrella zone, and in Figure 14-33 and Figure 14-34 for the Gap-Victor zone.

The drilling orientations are displayed on stereonet-type of plots in Figure 14-35 for the PDA zone, in Figure 14-36 for the Estrella zone, and in Figure 14-37 for the Gap-Victor zone. For the PDA zone, three main orientations of drilling are observed in the deposit area: to the northwest at 325° to 335° azimuths and dipping -45° to -85°, to the northeast at 55° to 60° azimuths and dipping -20° to -25°, and vertical or near vertical holes.

For the Estrella zone, the drill holes intersecting the sulphide mineralization are oriented along three main directions: to the east with dips varying from -45° to -75°, to the west with dips varying from -45° to -80°, and vertical holes.

For the Gap-Victor zone, the drill holes intersecting the sulphide mineralization are mainly oriented to the northwest with azimuths between 320° to 340° and to the southeast at azimuths varying from 135° to 155°. These holes have dips ranging from -40° to -85°. A set of vertical holes are also noted, as well as holes oriented to the south and dipping from -60° to -85°.

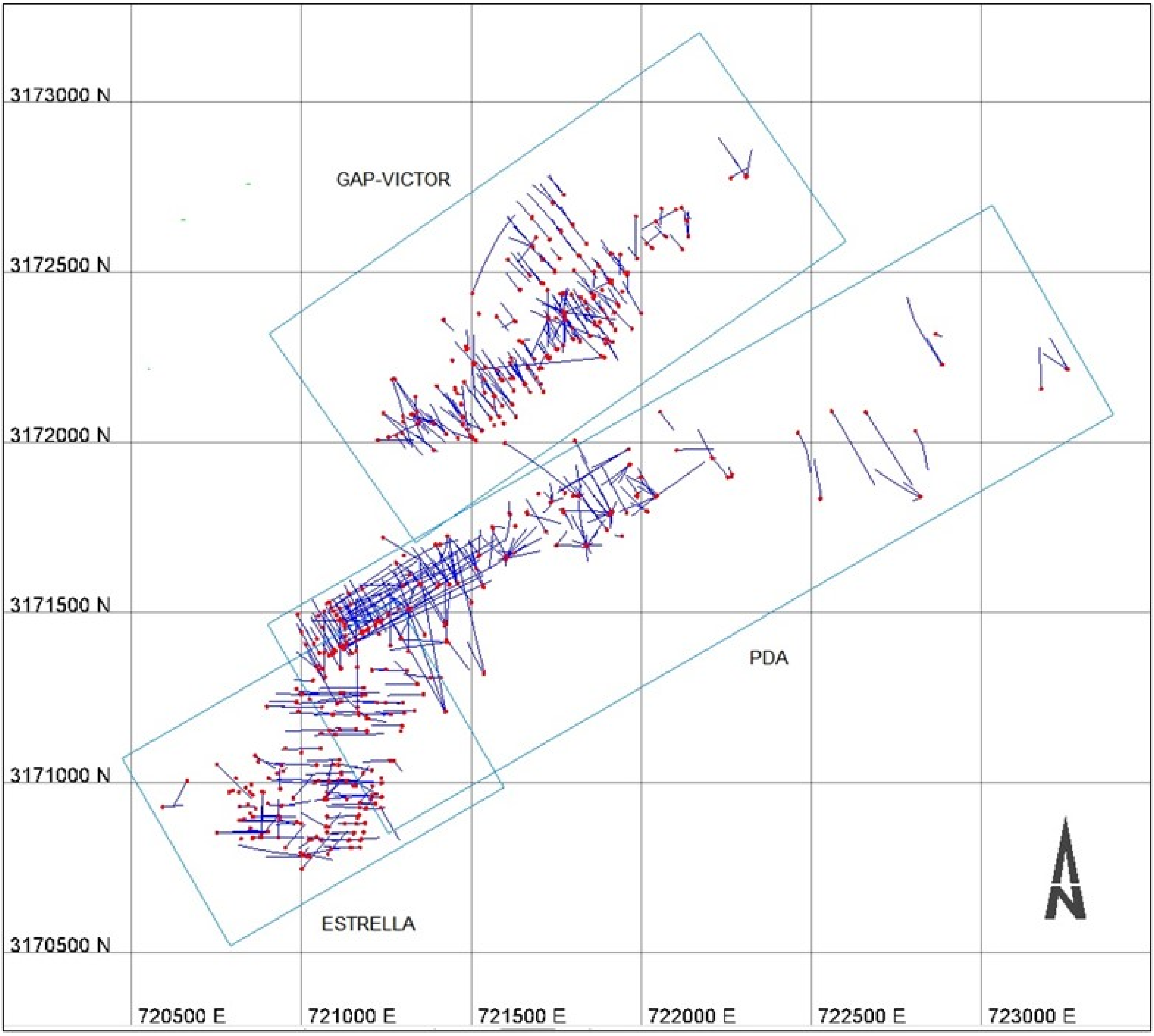


Figure 14-28 Drill Hole Locations at PDA, Estrella, and Gap-Victor, with Block Models' Limits – Plan View

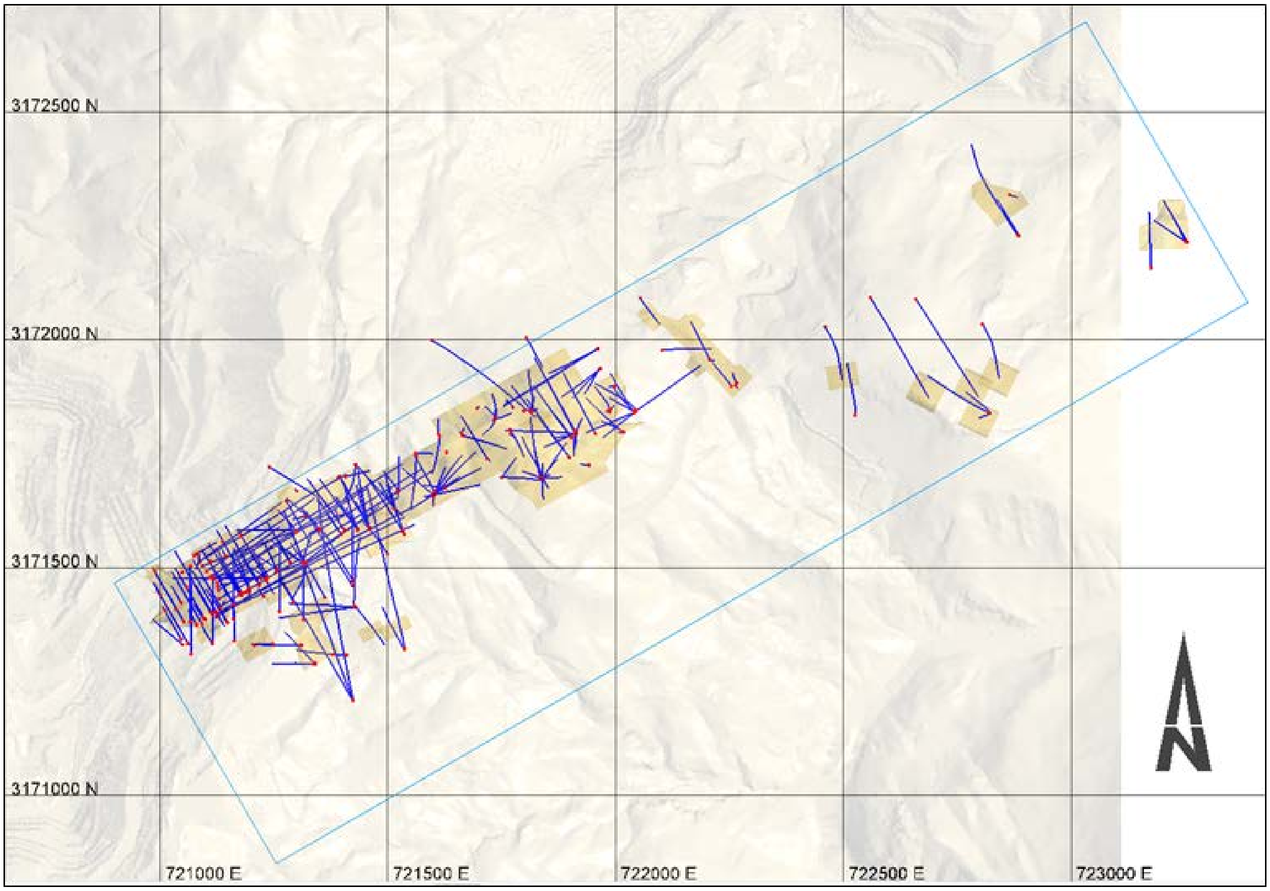


Figure 14-29 PDA - Drill Hole Location with Block Model Limits, Topography, and Sulphide Zones – Plan View

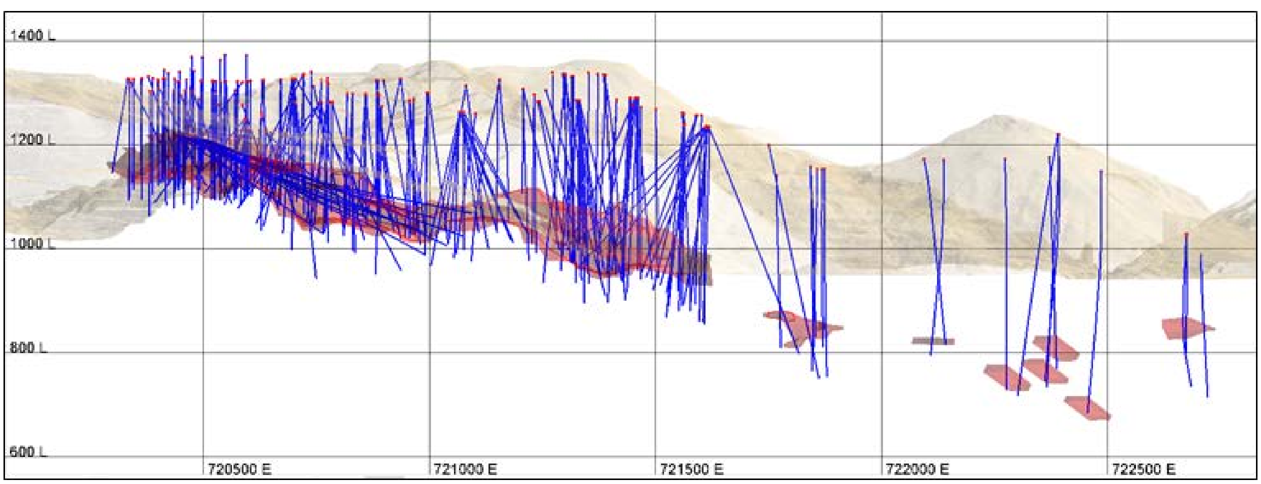


Figure 14-30 PDA - Drill Hole Location with Topography and Sulphide Zones – NE-SW Longitudinal Section Looking NW

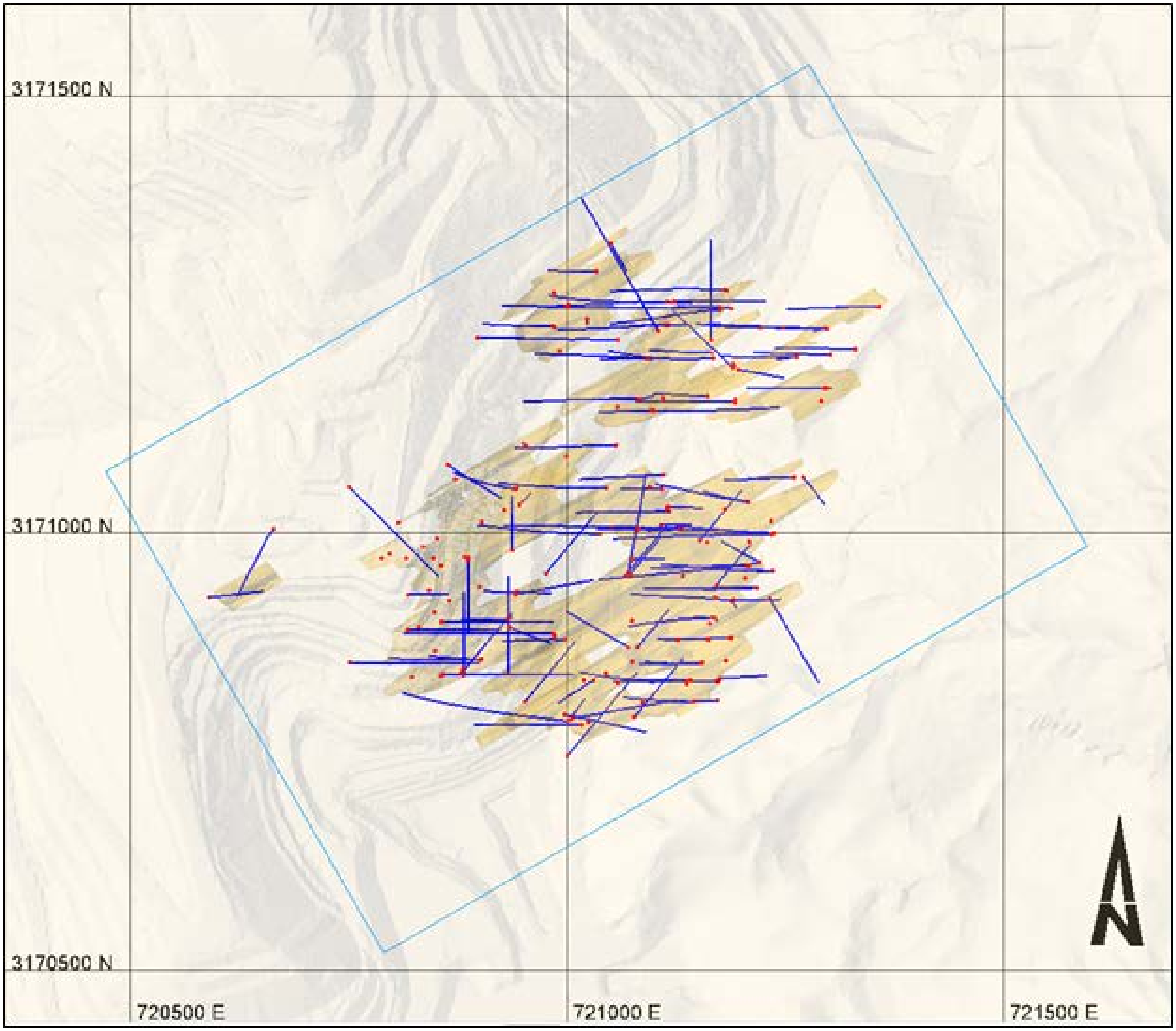


Figure 14-31 Estrella - Drill Hole Location with Block Model Limits, Topography, and Sulphide Zones – Plan View

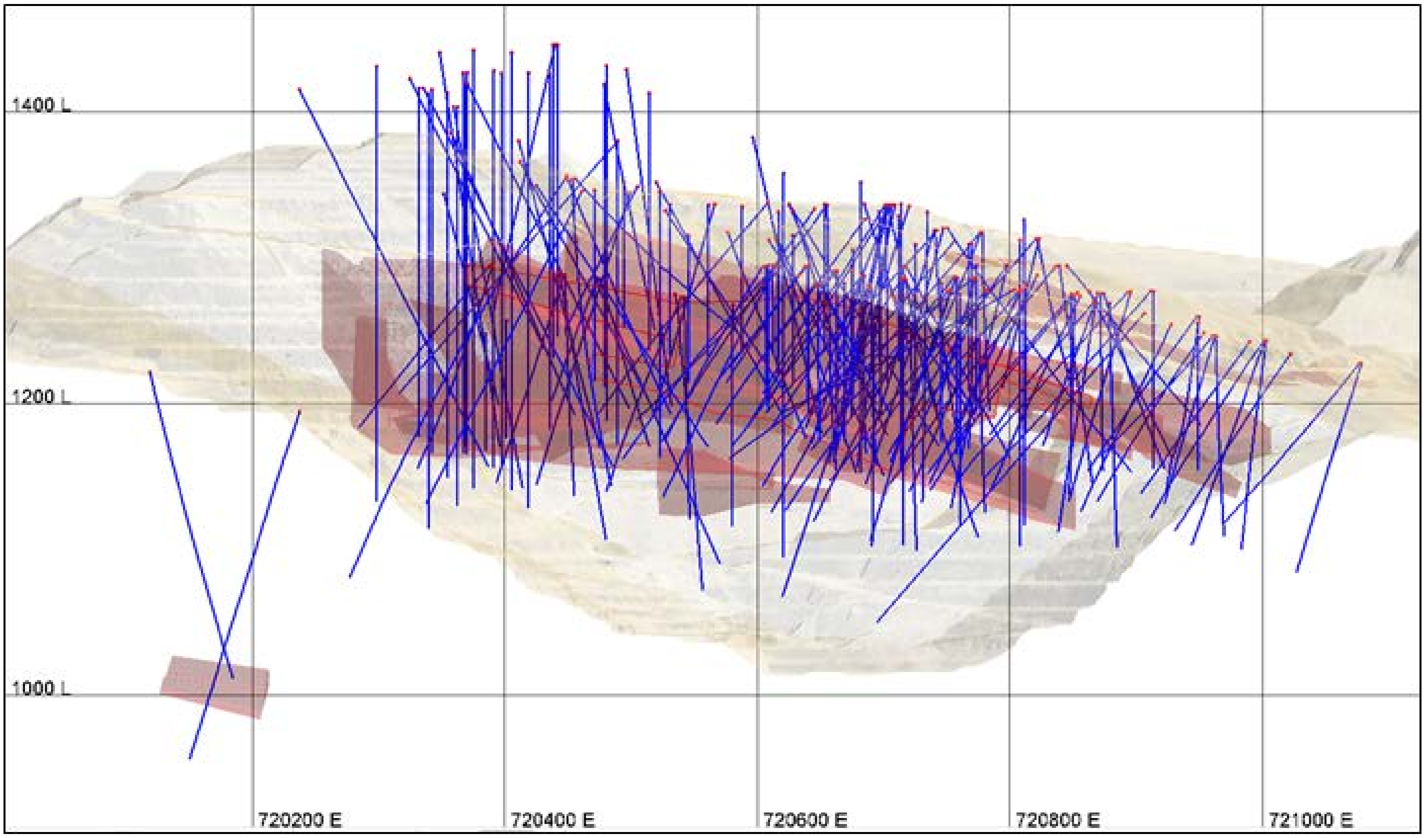


Figure 14-32 Estrella - Drill Hole Location with Topography and Sulphide Zones – NE-SW Longitudinal Section Looking NW

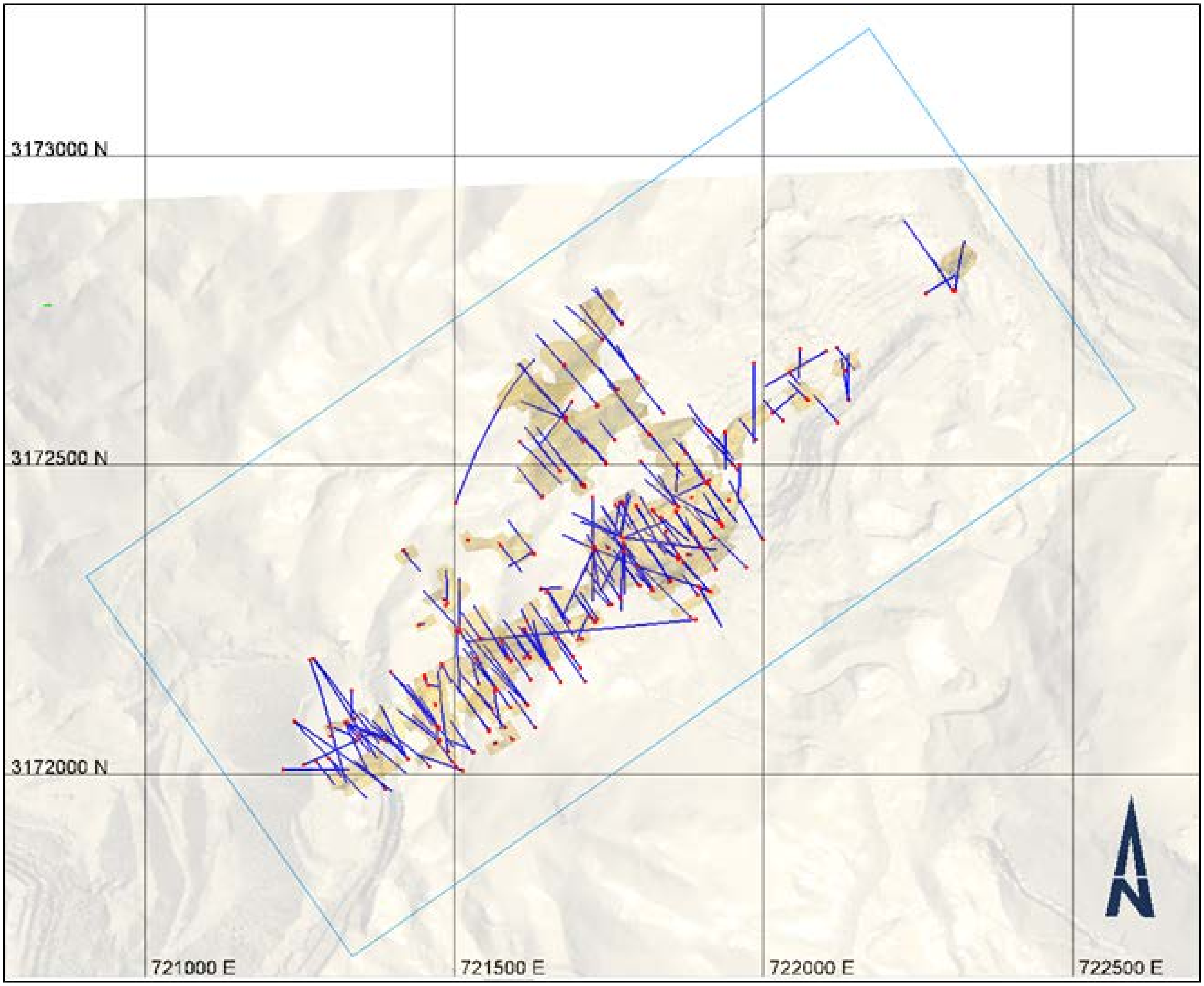


Figure 14-33 Gap-Victor - Drill Hole Location with Block Model Limits, Topography, and Sulphide Zones – Plan View

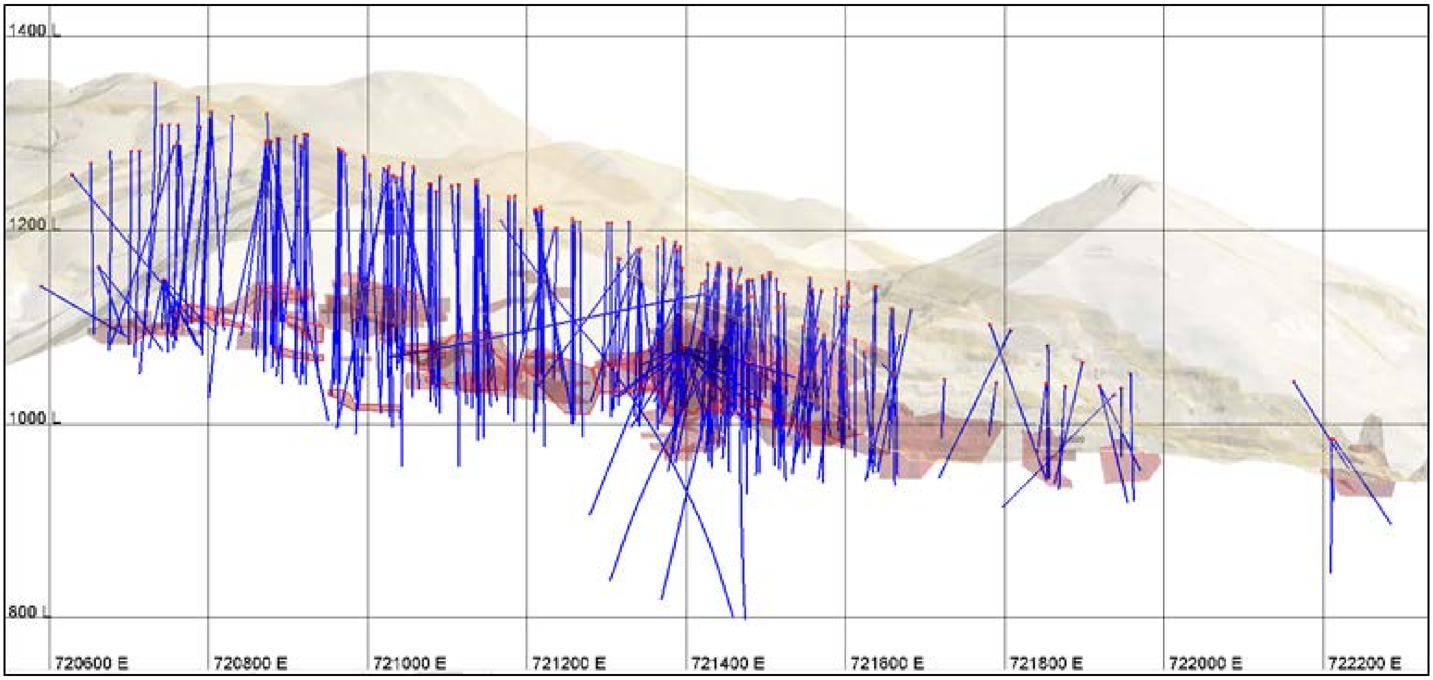


Figure 14-34 Gap-Victor - Drill Hole Location with Topography and Sulphide Zones – NE-SW Longitudinal Section Looking NW

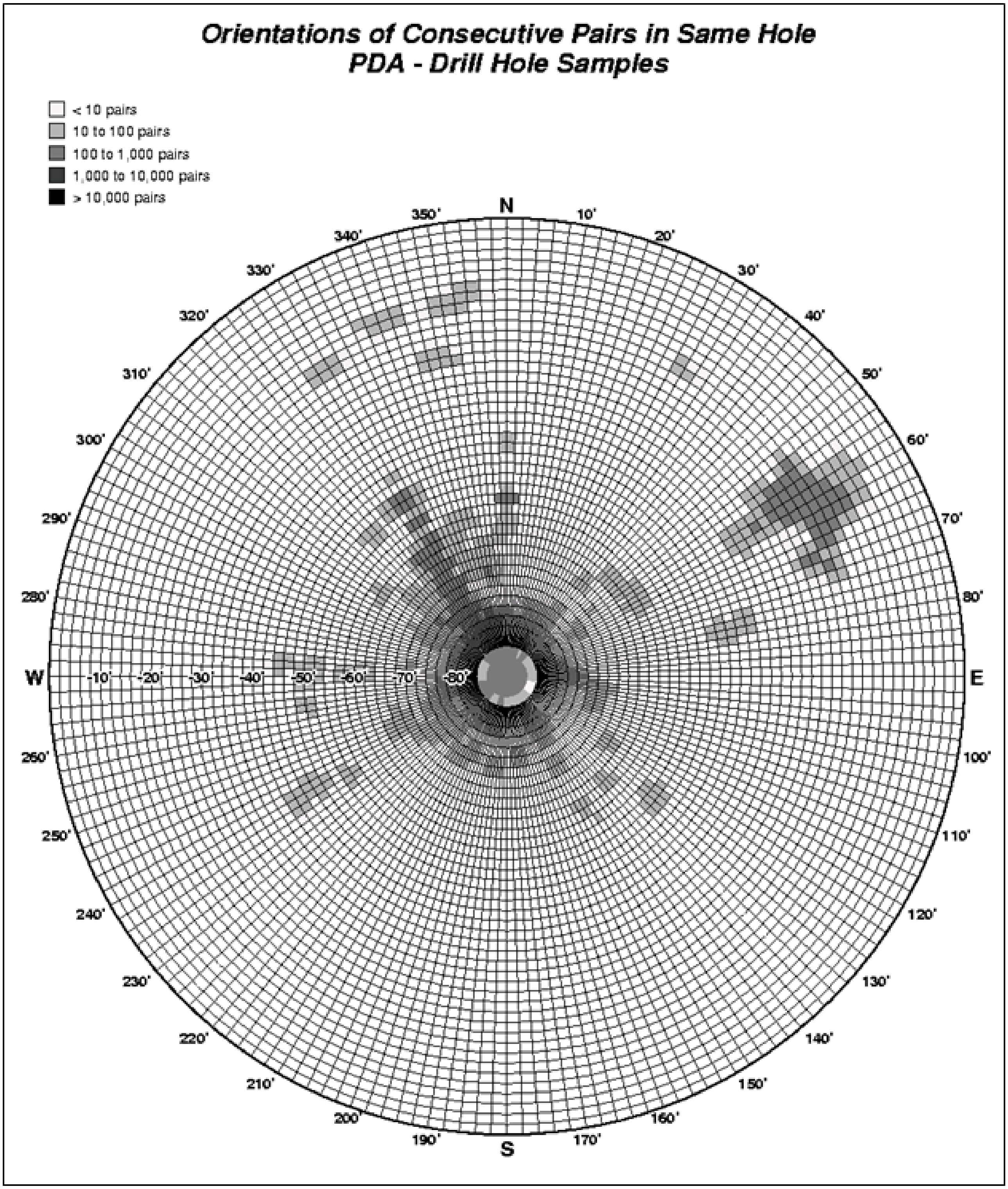


Figure 14-35 PDA - Drill Hole Orientation – Stereonet

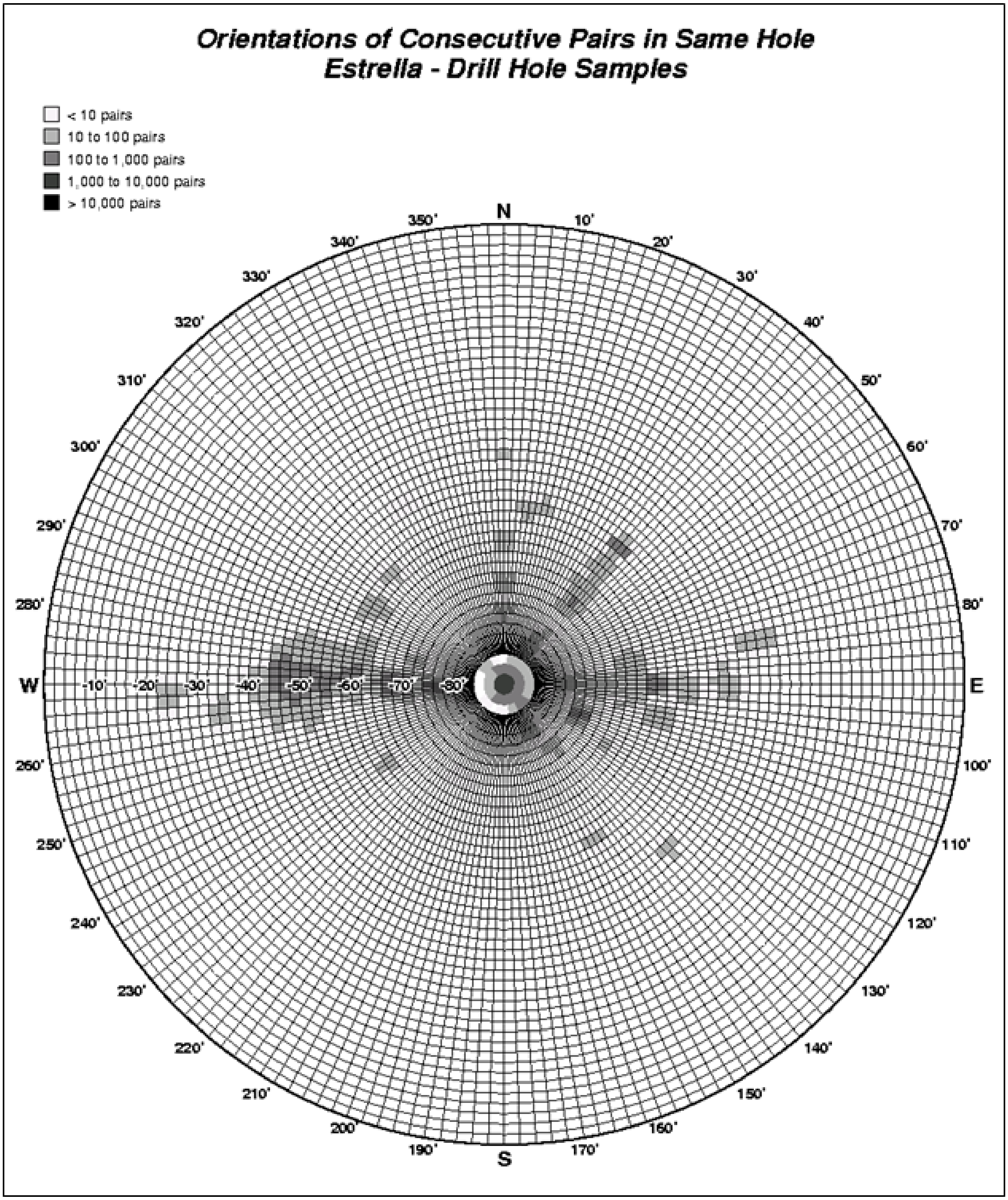


Figure 14-36 Estrella - Drill Hole Orientation – Stereonet

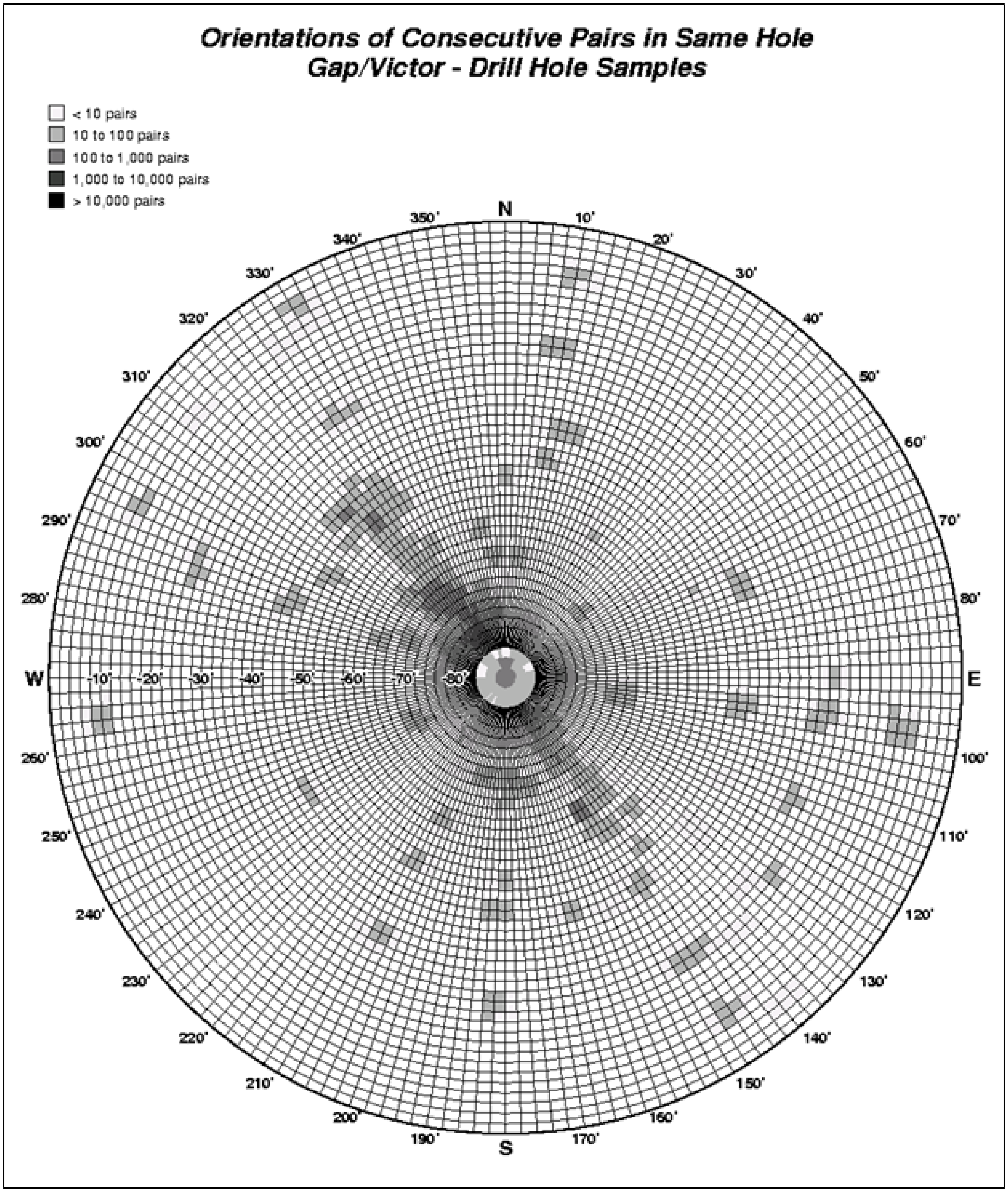


Figure 14-37 Gap-Victor - Drill Hole Orientation – Stereonet

Statistics of the drill hole spacing are presented in Table 14-21. The drill hole spacing is calculated by recording the distance of the closest sample from a different hole for all samples within the mineralized sulphide zones. Basic statistics are then computed on these closest distances.

Table 14-21 Drill Hole Spacing Statistics – PDA, Estrella, and Gap-Victor Sulphide Zones

Domains	Average Spacing (m)	Median Spacing (m)	Minimum Spacing (m)	Maximum Spacing (m)
PDA	14.3	12.4	0.08	120.3
Estrella	16.4	14.1	0.3	107.2
Gap-Victor	10.3	8.2	0.2	71.7

Average drill hole spacing within the PDA mineralized zones is 14.3m with a median of 12.4m for gold and silver. The average spacing of the AuCN/Au ratio samples within the mineralized zones is 15.7m with a median of 13.8m, while the average spacing of the total sulphur is 16.3m with a median of 15.1m.

The average drill hole spacing within the Estrella mineralized zones is 16.4m with a median of 14.1m for gold and silver. The average spacing of the AuCN/Au ratio samples within the mineralized zones is 19.5m with a median of 17.3m, while the average spacing of the total sulphur is 20.7m with a median of 19.0m.

The average drill hole spacing within the Gap-Victor mineralized zone is 10.3m with a median of 8.2m for gold and silver. The average spacing of the AuCN/Au ratio samples within the mineralized zone is 11.8m with a median of 9.8m, while the average spacing of the total sulphur is 16.1m with a median of 13.6m, within the mineralized zone.

From Table 14-21, it can be noted that the average drill hole spacing of the PDA zone is similar to that of the Estrella zone. The drill hole spacing within the Gap-Victor shows the shortest average distance.

14.2.3 Geologic Model

The geologic models for the PDA, Estrella, and Gap-Victor zones were developed by Mulatos' exploration geology team. The interpretations of the alteration, redox, lithologies, and faults were developed in Leapfrog®, while the interpretation of the mineralized sulphide zones were carried out in Vulcan®.

For the PDA area, the previous two main areas of higher gold grade sulphide mineralization (PDA1 and PDA2) were merged for this updated interpretation. The mineralized zones were developed as a gold grade envelope using a 3.0 g/t gold cut-off, similar to the previous model. The PDA deposit is found at the eastern edge of the Estrella pit and is oriented at approximately 60° azimuth and plunging at 15° to the northeast. Aside from the main zone, there are 4 smaller sub-zones to the southwest and 9 smaller sub-zones down plunge further to the northeast.

For the Estrella area, the mineralized sulphide zones were modelled as grade envelopes based on a 2.0 g/t gold equivalent grade due to the higher silver content in this area. The main mineralized zone is flanked by 10 smaller sub-zones on its northern side. The Estrella sulphide zones are located at the south-eastern end of the Estrella pit and are oriented at an azimuth of 60° and are plunging to the northeast at angles varying from 0° to 20°.

For the Gap-Victor area, the mineralization is made up of multiple zones with four larger zones and numerous smaller zones. Since only one new hole was added to this area for this update, the mineralization model is very similar to the previous Mineral Resource estimate and was also modelled at a 2.0 g/t gold cut-off. The mineralized zones are oriented at an azimuth of 54° and dipping 13° to the northeast. The various zones were considered as part of the same zone in this study due to their similar geologic characteristics.

The geologic controls on mineralization were modeled to be a combination of the presence of hydrothermal breccia and higher gold grades. The volumes of the mineralized zones for each area are shown in Table 14-22. As seen in this table much larger volumes are noted for the PDA and Estrella mineralized zones when compared to the previous study in 2021. This increase in size stems from the additional drilling carried out since the previous 2021 study and the use of a gold equivalent grade to develop the mineralization model at Estrella.

Table 14-22 Mineralized Sulphide Zones – PDA, Estrella, and Gap-Victor Sulphide Zones

Area	2022 Model - Volume (m^3)	2021 Model - Volume (m^3)
PDA	13,140,889	1,888,857
Estrella	5,890,701	1,978,629
Gap-Victor	3,500,320	3,496,627
PDA + Estrella + Gap-Victor	22,531,910	7,364,113

The triangulated solids of the different mineralized zones are displayed in Figure 14-38 and Figure 14-39 for PDA, Figure 14-40 and Figure 14-41 for Estrella, and Figure 14-42 and Figure 14-43 for Gap-Victor.

A triangulation of the topography surface was also provided by Mulatos' exploration geology team.

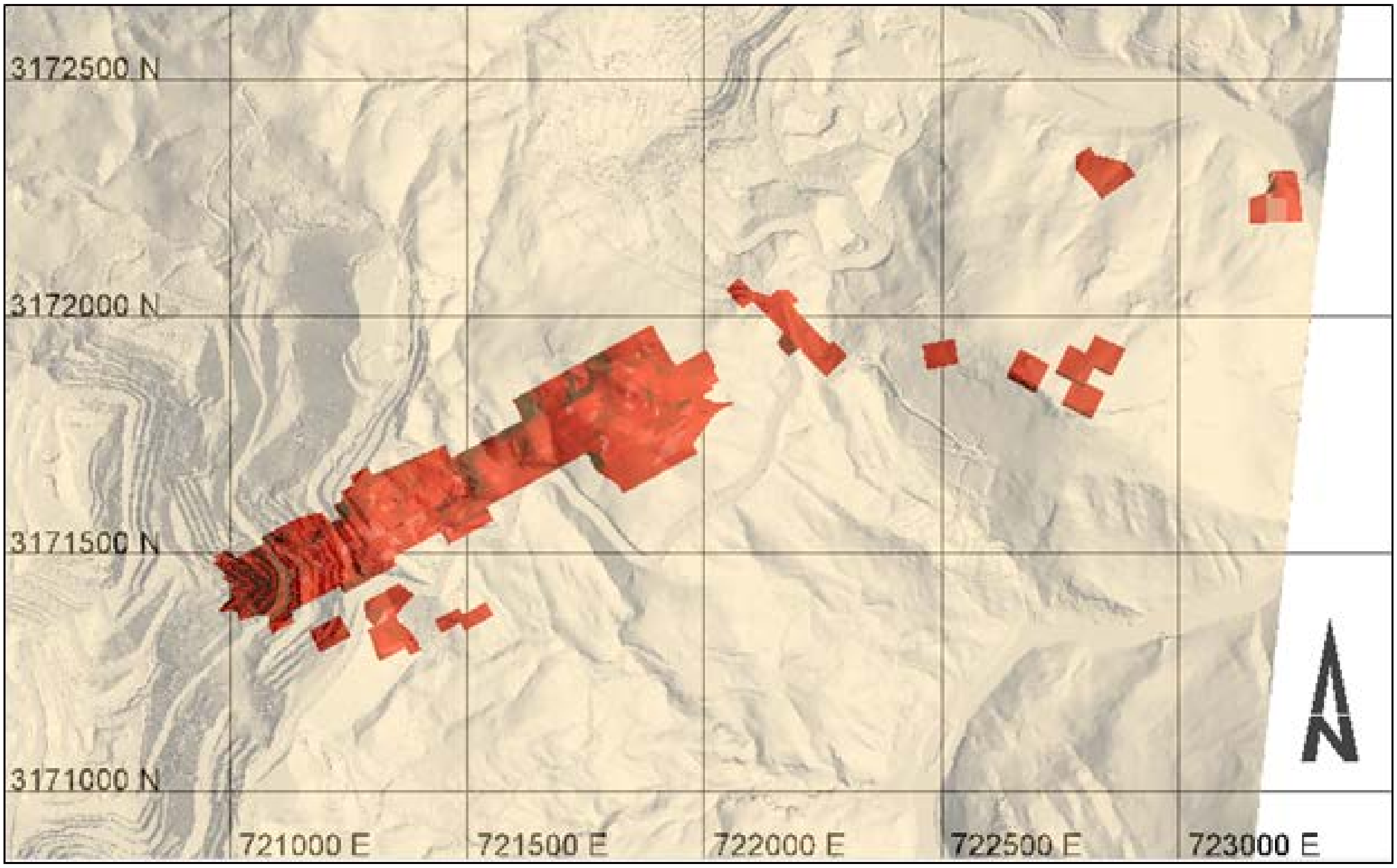


Figure 14-38 PDA - Wireframes – Plan View

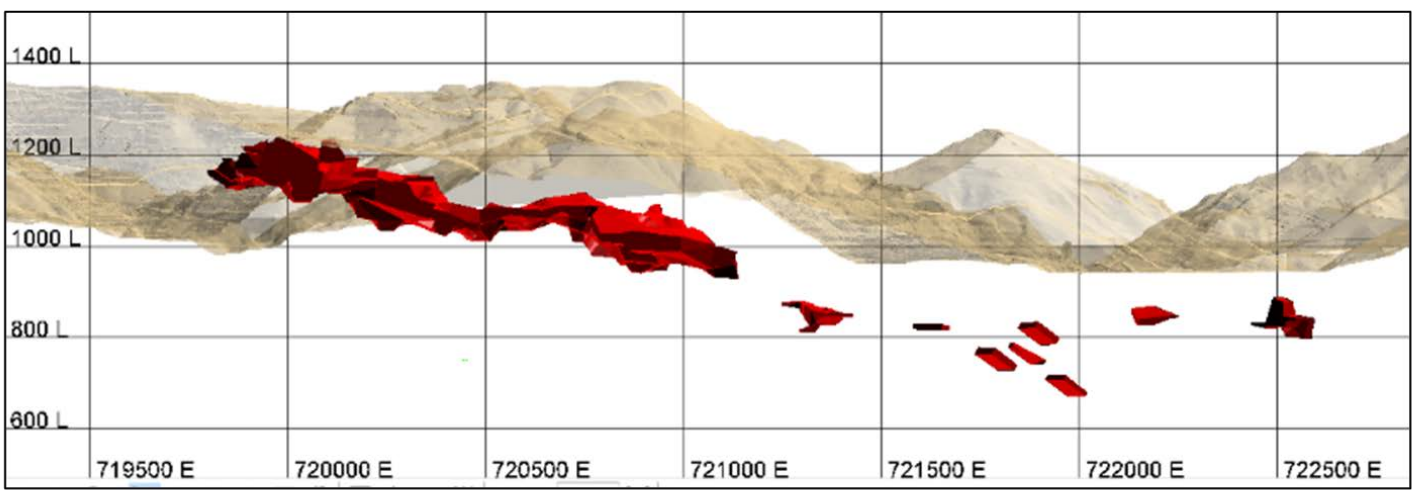


Figure 14-39 PDA - Wireframes – Longitudinal NE-SW Section Looking NW

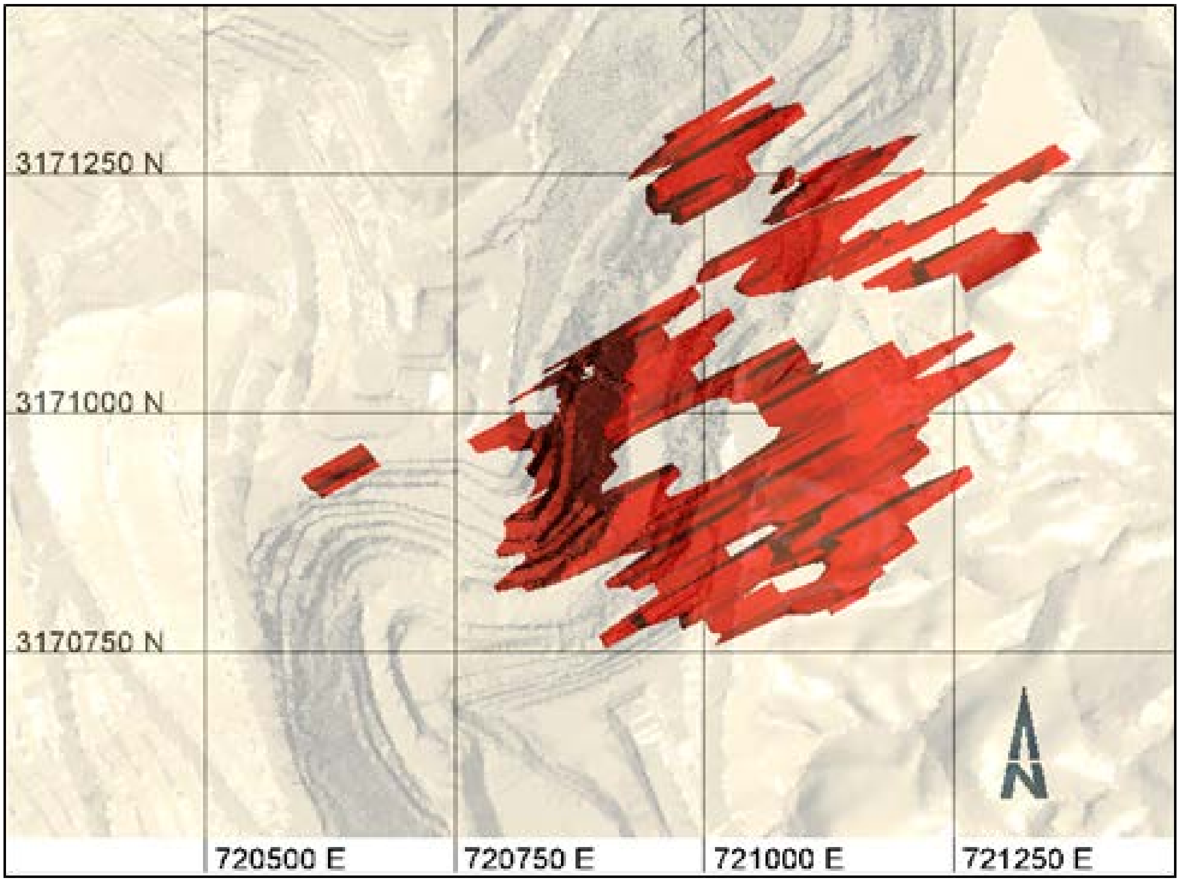


Figure 14-40 Estrella – Wireframes – Plan View

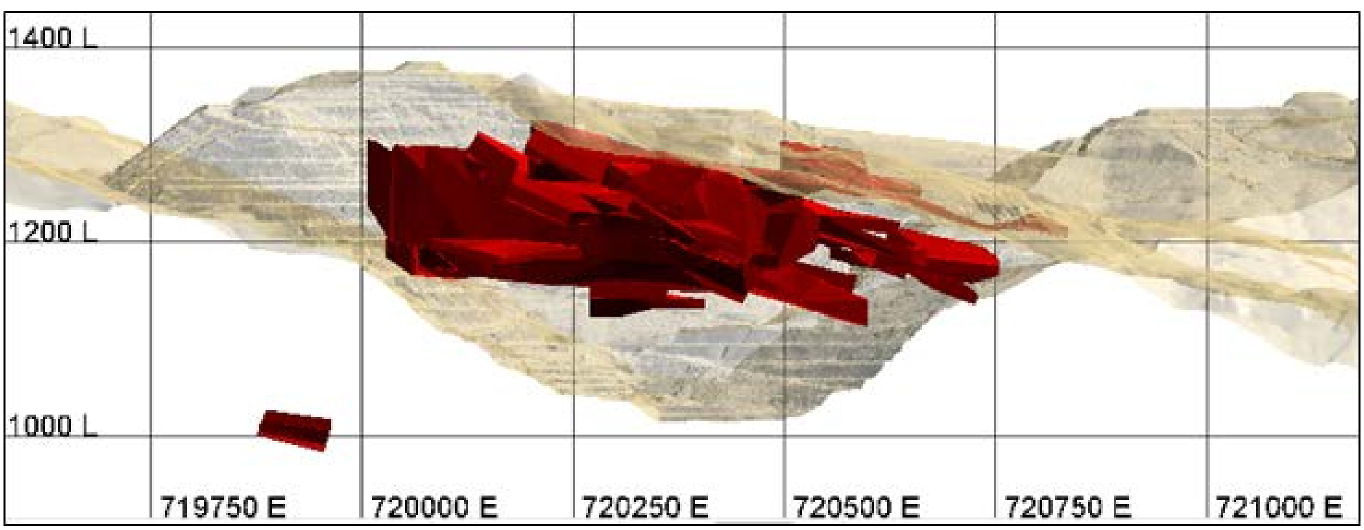


Figure 14-41 Estrella – Wireframes – Longitudinal NE-SW

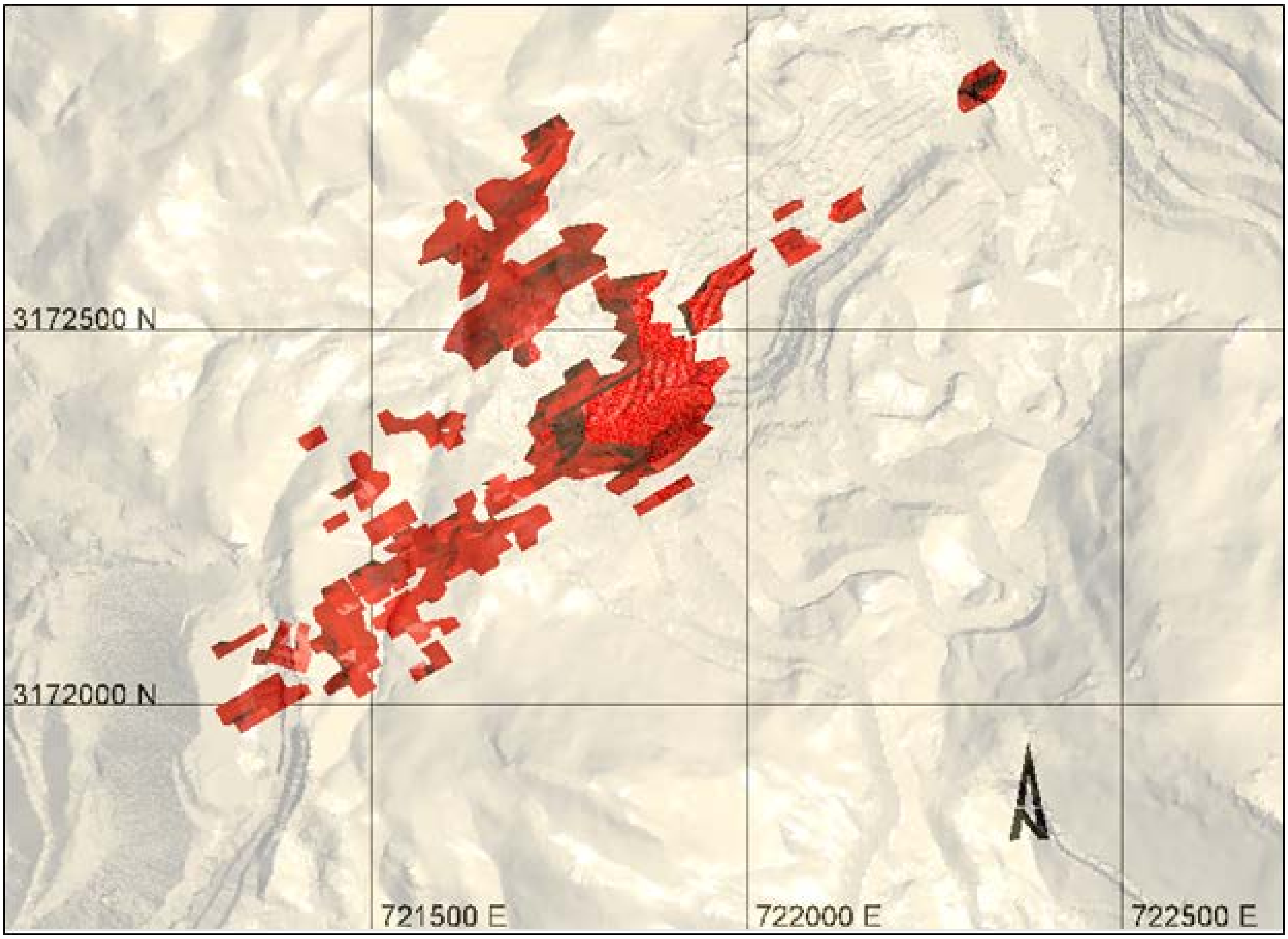


Figure 14-42 Gap-Victor – Wireframes – Plan View

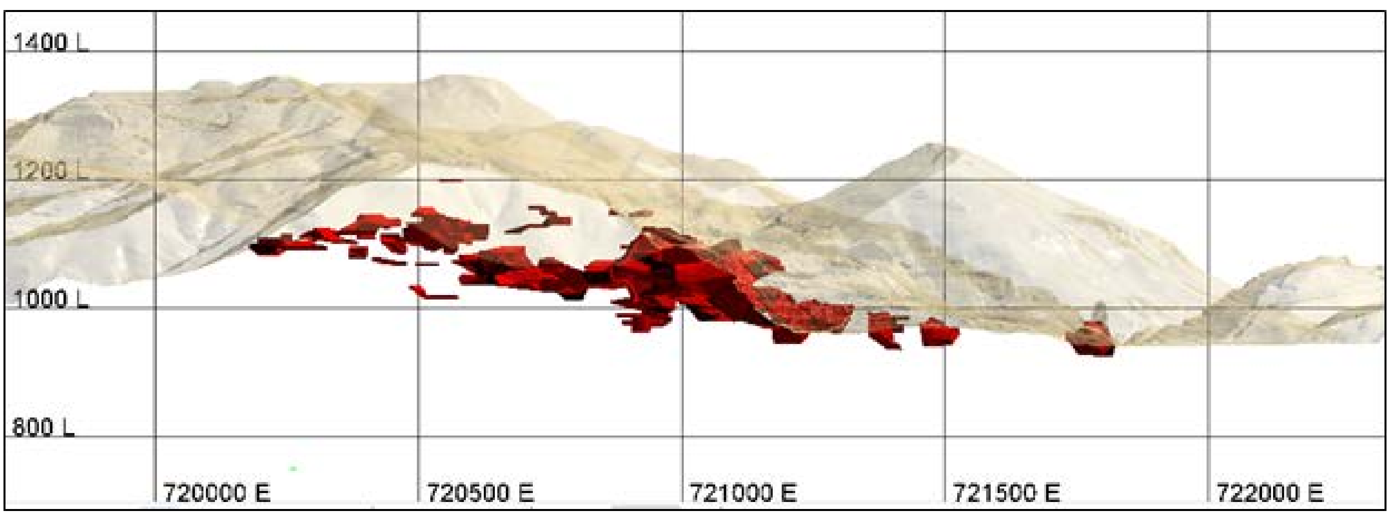


Figure 14-43 Gap-Victor – Wireframes – Longitudinal NE-SW Section Looking NW

14.2.4 Compositing, Capping, Statistics

The original gold samples were composited to regular 1.52m lengths (5 feet) as it is the most common sampling interval with more than 70% of the assays sampled at PDA and Gap-Victor, and with more than 90% at Estrella. A dynamic compositing process was utilized for this exercise whereby residual composites are redistributed within the zone to ensure that all composites are of the same length. At PDA, a total of 13,014 gold composites from 291 holes are located within the mineralized zone, as well as 12,692 silver composites from 281 holes, 8,331 AuCN/Au ratio composites from 250 holes, and 10,283 total sulphur composites from 211 holes.

At Estrella, a total of 7,982 gold composites from 214 holes are located within the mineralized zone, as well as 7,652 silver composites from 202 holes, 1,802 AuCN/Au ratio composites from 134 holes, and 5,277 total sulphur composites from 131 holes.

At Gap-Victor, a total of 6,386 gold composites from 314 holes are located within the mineralized zone, as well as 6,387 silver assays from 314 holes, 4,493 AuCN/Au ratio composites from 286 holes, and 3,248 total sulphur composites from 171 holes.

The capping of the high-grade outliers was carried out on composited grades to 1.52m lengths rather than on gold grades from original samples. This strategy was selected to ensure a more rigorous statistical approach, where grades examined by the different capping utilities are on the same support, thus representing grades for the same volume of material.

The capping of the high-grade outliers was examined with 3 different utilities: the probability plot, the cutting statistics utility, and the decile analysis. This approach of selecting the capping thresholds from different statistical utilities is aimed at providing greater support to this process. Results of this analysis are provided in Table 14-23 for gold, silver, and total sulphur.

No capping of high-grade outliers was performed on the AuCN/Au ratio composites as no values above 1.0 are reported.

Table 14-23 PDA District - Capping Thresholds of High-Grade Gold Outliers

	Probability Plot	Cutting Statistics	Decile Analysis	Final	% of Metal Capped	# Capped
Zone	**Capping Threshold – Au g/t**					
PDA	50		15.3	50.0	5	14
Estrella	15	15	9.4	15.0	2	11
Gap-Victor	50	50	17.8	50.0	18	12
Zone	**Capping Threshold – Ag g/t**					
PDA	70,120	80,70,100	32.2	70.0	2	22
Estrella	800,400	800,600	156.6	800.0	6	8
Gap-Victor	190	180,200	91.0	190.0	7	13
Zone	**Capping Threshold – S %**					
PDA	10	10	10.0	10.0	1	18
Estrella	-	-	-	-	0	0
Gap-Victor	10	10	10.0	10.0	1	6

Basic statistics were computed on the elements of interest and showed positively skewed lognormal populations for all mineralized zones. Boxplots were calculated for the un-capped and capped 1.52m composites for gold, silver, the ratio of AuCN/Au, and total sulphur. The boxplots of un-capped gold grades for the different mineralized zones are shown in Figure 14-44, for the un-capped silver grades in Figure 14-45, for the un-capped AuCN/Au ratios in Figure 14-46, and for the un-capped total sulphur grades in Figure 14-47.

The boxplots of capped gold grades for the different mineralized zones are shown in Figure 14-48, for the capped silver grades in Figure 14-49, and for the capped total sulphur grades in Figure 14-50. The AuCN/Au ratios were not capped as they do not exceed 1.0.

For the different mineralized zones, as seen in Figure 14-48, the coefficients of variation (CV = mean/standard deviation) of the capped gold grades are low (CV < 3.0) for each mineralized zone, with values varying from 2.36 to 2.54. The CV values for AuCN/Au ratio are low and vary from 0.51 to 0.63 (Figure 14-46), and similarly for total sulphur the CV values vary from 0.36 to 0.74 (Figure 14-50). For the capped silver grades, low CV values are observed for PDA (1.96) and for Gap-Victor (2.23) however, a higher CV value is observed for the capped silver grades at Estrella.

These results for the PDA, Estrella, and Gap-Victor areas are characteristic of more homogeneous populations. With such attributes, a grade estimation approach utilizing an ordinary kriging method with capped composites is deemed appropriate.

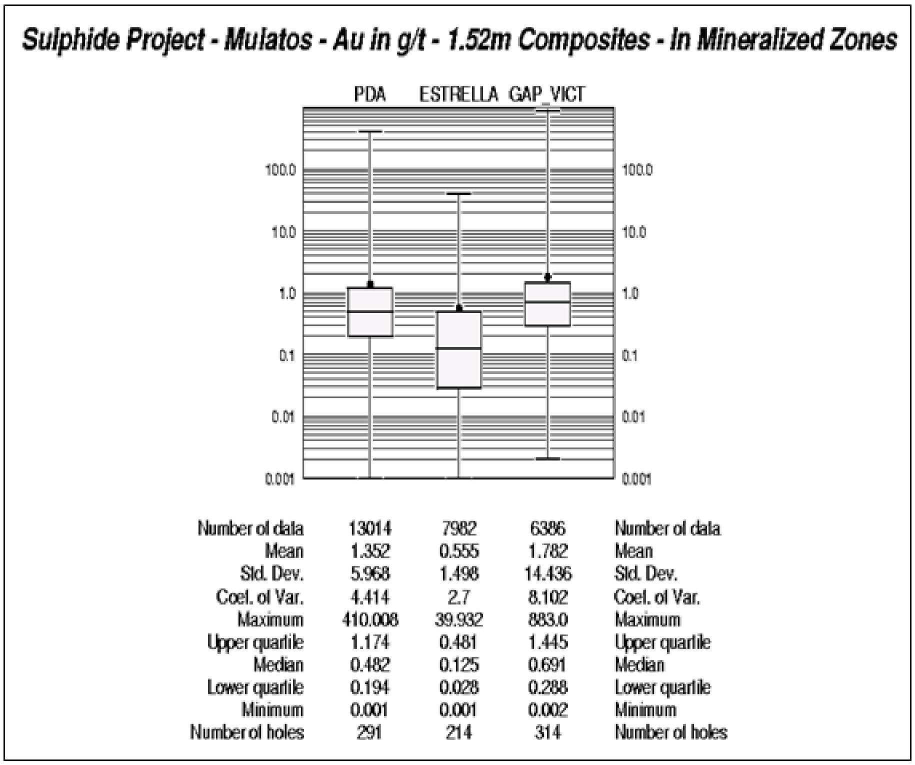
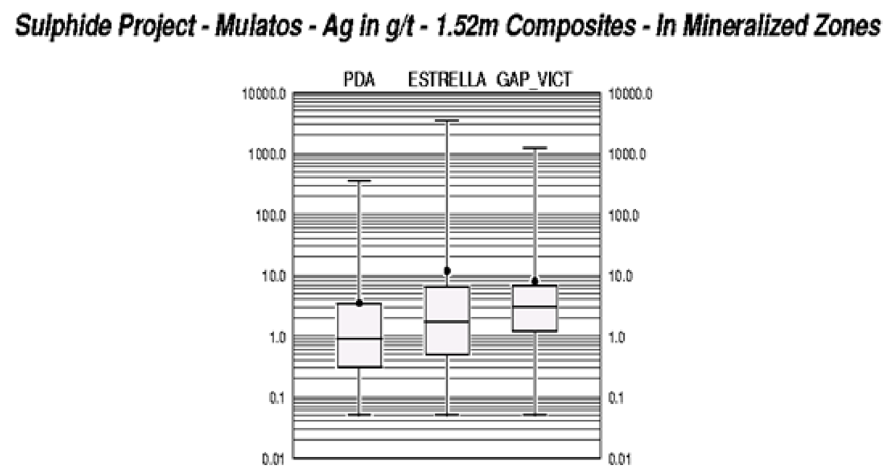
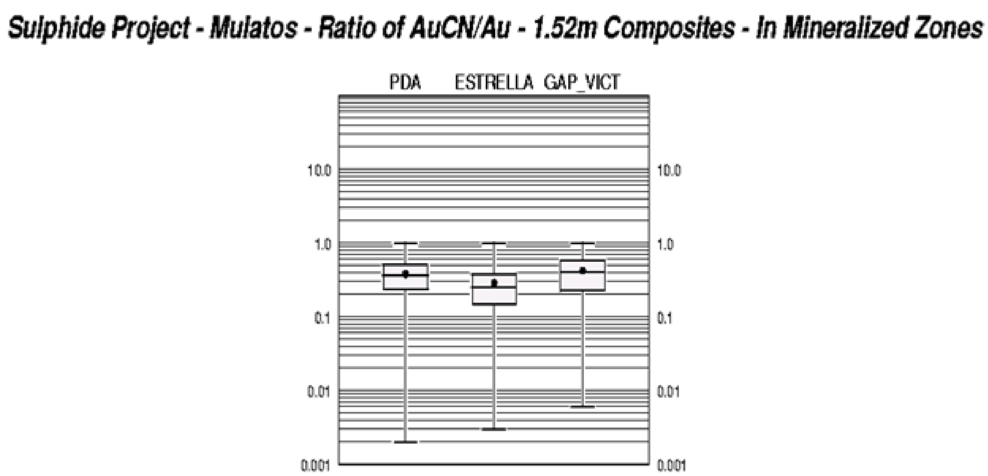


Figure 14-44 PDA Project - Boxplots of Gold Grade Composites – Un-Capped – Within Mineralized Zones



	PDA	ESTRELLA	GAP_VICT	
Number of data	12692	7652	6387	Number of data
Mean	3.47	11.81	7.92	Mean
Std. Dev.	8.11	66.82	28.43	Std. Dev.
Coef. of Var.	2.34	5.66	3.59	Coef. of Var.
Maximum	348.0	3426.44	1233.06	Maximum
Upper quartile	3.42	6.5	6.7	Upper quartile
Median	0.9	1.7	3.0	Median
Lower quartile	0.31	0.5	1.2	Lower quartile
Minimum	0.05	0.05	0.05	Minimum
Number of holes	281	202	314	Number of holes

Figure 14-45 PDA Project - Boxplots of Silver Grade Composites – Un-Capped – Within Mineralized Zones



	PDA	ESTRELLA	GAP_VICT	
Number of data	8331	1802	4493	Number of data
Mean	0.378	0.284	0.42	Mean
Std. Dev.	0.192	0.18	0.237	Std. Dev.
Coef. of Var.	0.507	0.634	0.566	Coef. of Var.
Maximum	1.0	1.0	1.0	Maximum
Upper quartile	0.503	0.38	0.578	Upper quartile
Median	0.358	0.254	0.401	Median
Lower quartile	0.234	0.146	0.225	Lower quartile
Minimum	0.002	0.003	0.006	Minimum
Number of holes	250	134	286	Number of holes

Figure 14-46 PDA Project - Boxplots of AuCN/Au Ratio Composites – Un-Capped – Within Mineralized Zones

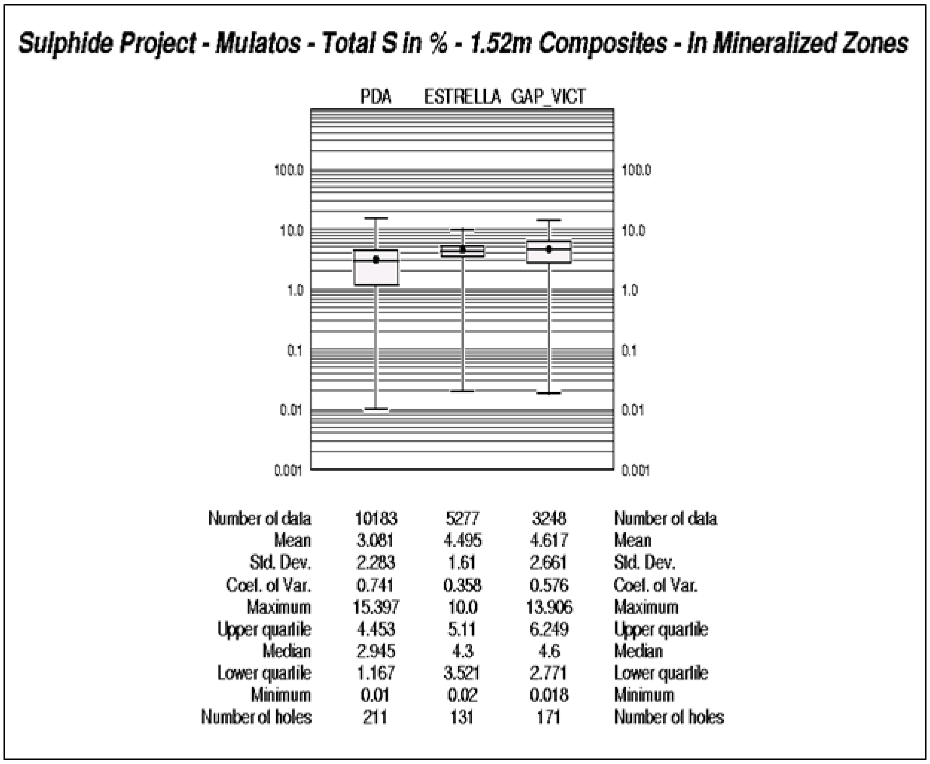


Figure 14-47 PDA Project - Boxplots of Total Sulphur Grade Composites – Un-Capped – Within Mineralized Zones

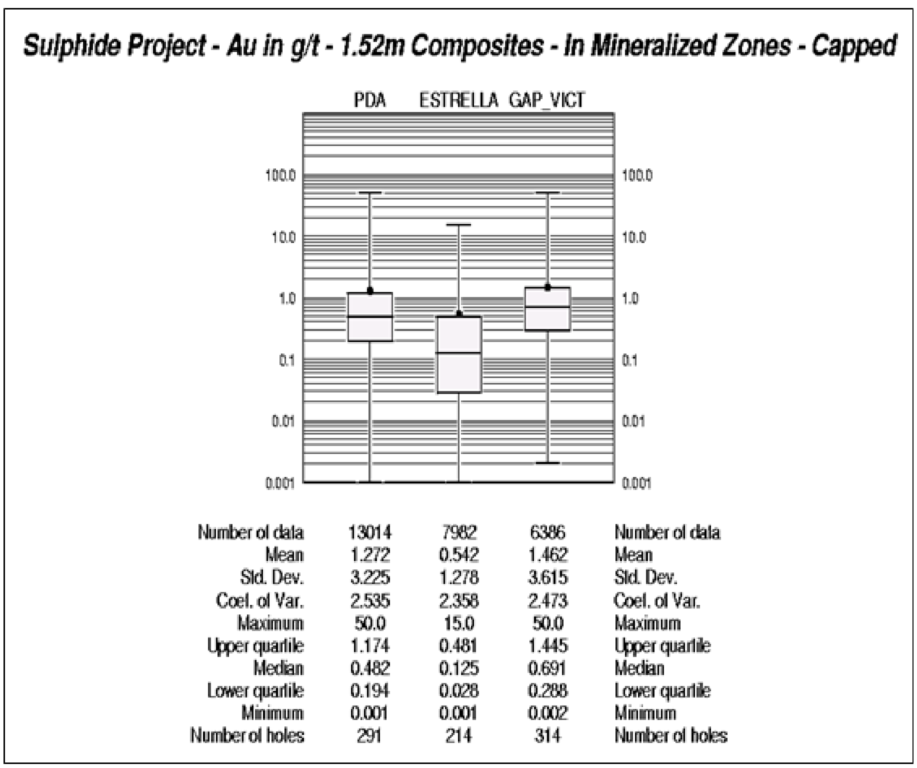
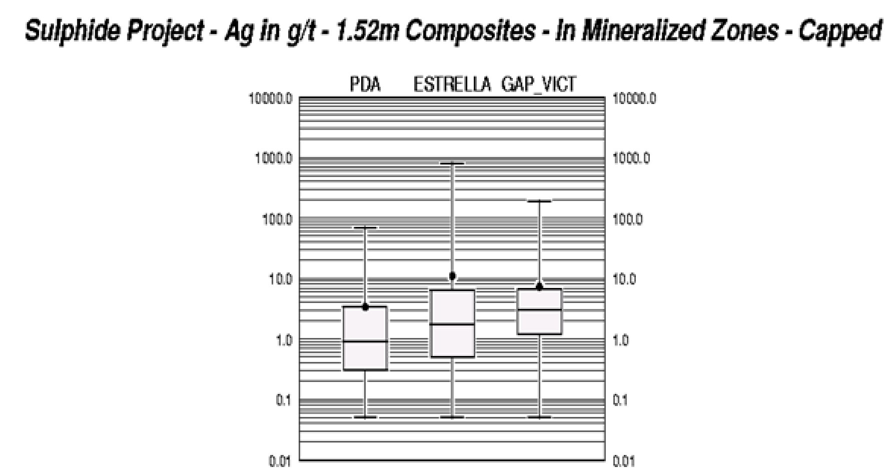
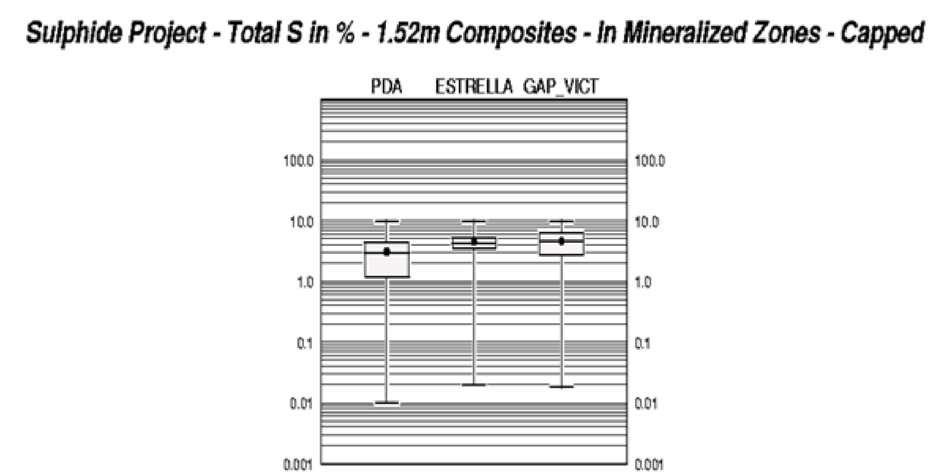


Figure 14-48 PDA Project - Boxplots of Gold Grade Composites – Capped – Within Mineralized Zones



	PDA	ESTRELLA	GAP_VICT	
Number of data	12692	7652	6387	Number of data
Mean	3.38	10.99	7.35	Mean
Std. Dev.	6.63	42.91	16.37	Std. Dev.
Coef. of Var.	1.96	3.9	2.23	Coef. of Var.
Maximum	70.0	800.0	190.0	Maximum
Upper quartile	3.42	6.5	6.7	Upper quartile
Median	0.9	1.7	3.0	Median
Lower quartile	0.31	0.5	1.2	Lower quartile
Minimum	0.05	0.05	0.05	Minimum
Number of holes	281	202	314	Number of holes

Figure 14-49 PDA Project - Boxplots of Silver Grade Composites – Capped – Within Mineralized Zones



	PDA	ESTRELLA	GAP_VICT	
Number of data	10183	5277	3248	Number of data
Mean	3.079	4.495	4.612	Mean
Std. Dev.	2.274	1.61	2.65	Std. Dev.
Coef. of Var.	0.739	0.358	0.575	Coef. of Var.
Maximum	10.0	10.0	10.0	Maximum
Upper quartile	4.453	5.11	6.249	Upper quartile
Median	2.945	4.3	4.6	Median
Lower quartile	1.167	3.521	2.771	Lower quartile
Minimum	0.01	0.02	0.018	Minimum
Number of holes	211	131	171	Number of holes

Figure 14-50 PDA Project - Boxplots of Total Sulphur Grade Composites – Capped – Within Mineralized Zones

14.2.5 Variography

A variography study was performed on gold, silver and total sulphur capped grade composites and on the AuCN/Au ratio composites of the PDA, Estrella and Gap-Victor mineralized zones. The objective of this analysis was to spatially establish the preferred directions of gold, silver, and total sulphur grade continuity and of the AuCN/Au ratio continuity. In turn, the variograms modeled along those directions would be later utilized to select and weigh the composites during the block grade interpolation process. For this exercise, all experimental variograms were of the type, relative lag pairwise, which is considered robust for the assessment of gold grade continuity in particular.

Variogram maps were first calculated to examine general grade and ratio continuities in the XY, XZ, and YZ planes. The next step undertaken was to compute omni-directional variograms and down-hole variograms. The omni-directional variograms are calculated without any directional restrictions and provide a good assessment of the sill of the variogram. As for the down-hole variogram, it is calculated with the composites of each hole along the trace of the hole. The objective of these calculations is to provide information about the short scale structure of the variogram, as the composites are more closely spaced down the hole. Thus, the modeling of the nugget effect is usually better derived from the down-hole variograms.

Directional variograms were then computed to identify more specifically the three main directions of continuity. A first set of variograms were produced in the horizontal plane at increments of 10 degrees. In the same way a second set of variograms were computed at 10° increments in the vertical plane of the horizontal direction of continuity (plunge direction). A final set of variograms at 10° increments were calculated in the vertical plane perpendicular to the horizontal direction of continuity (dip direction). The final variograms were then modeled with a two-structure spherical variogram. Parameters from the modeled variograms for gold, silver, AuCN/Au ratio, and total sulphur, are shown in Table 14-24 for the PDA zone, in Table 14-25 for the Estrella zone, and Table 14-26 for the Gap-Victor zone. Plots of modeled variograms are provided in Appendix B.

Table 14-24 PDA - Variographic Models for Gold, Silver, AuCN/Au Ratio, and Total Sulphur

Parameters	Au g/t			Ag g/t		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	65°	155°	65°	50°	140°	50°
Dip[2]	-15°	0°	75°	-15°	0°	75°
Nugget Effect C0	0.191			0.204		
1st Structure C1	0.932			0.602		
2nd Structure C2	0.480			0.889		
1st Range A1	11.4m	11.4m	11.4m	18.9m	14.6m	15.6m
2nd Range A2	72.5m	55.4m	42.5m	113.0m	72.5m	41.4m
Parameters	**AuCN/Au Ratio**			**Total Sulphur %**		
	Principal	**Minor**	**Vertical**	**Principal**	**Minor**	**Vertical**
Azimuth[1]	55°	145°	55°	60°	150°	60°
Dip[2]	-15°	0°	75°	-20°	0°	70°
Nugget Effect C0	0.084			0.057		
1st Structure C1	0.169			0.433		
2nd Structure C2	0.307			0.590		
1st Range A1	32.8m	23.2m	10.3m	19.9m	21.0m	11.4m
2nd Range A2	111.0m	53.2m	33.9m	76.8m	45.7m	19.9m

Notes:
1. *positive clockwise from north*
2. *negative below horizontal*

Table 14-25 Estrella - Variographic Models for Gold, Silver, AuCN/Au Ratio, and Total Sulphur

Parameters	Au g/t			Ag g/t		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	65°	155°	65°	65°	155°	65°
Dip[2]	-10°	10°	80°	-10°	0°	80°
Nugget Effect C0	0.189			0.256		
1st Structure C1	1.141			1.169		
2nd Structure C2	0.701			0.564		
1st Range A1	4.9m	4.9m	9.2m	9.2m	7.1m	9.2m
2nd Range A2	59.6m	40.3m	47.8m	55.3m	39.2m	45.7m
Parameters	**AuCN/Au Ratio**			**Total Sulphur %**		
	Principal	**Minor**	**Vertical**	**Principal**	**Minor**	**Vertical**
Azimuth[1]	65°	155°	65°	70°	160°	70°
Dip[2]	-10°	10°	80°	-5°	10°	85°
Nugget Effect C0	0.095			0.035		
1st Structure C1	0.267			0.100		
2nd Structure C2	0.271			0.088		
1st Range A1	19.9m	14.6m	19.9m	21.0m	19.9m	13.5m
2nd Range A2	57.5m	33.9m	42.5m	61.7m	46.7m	31.7m

Notes:

1. *positive clockwise from north*
2. *negative below horizontal*

Table 14-26 Gap-Victor - Variographic Models for Gold, Silver, AuCN/Au Ratio, and Total Sulphur

Parameters	Au g/t			Ag g/t		
	Principal	Minor	Vertical	Principal	Minor	Vertical
Azimuth[1]	45°	135°	45°	45°	135°	45°
Dip[2]	--15°	0°	75°	-15°	0°	75°
Nugget Effect C0	0.267			0.204		
1st Structure C1	0.723			0.817		
2nd Structure C2	0.572			0.378		
1st Range A1	4.9m	8.1m	8.1m	10.3m	14.6m	8.1m
2nd Range A2	72.5m	43.5m	35.0m	80.0m	29.6m	50.0m
Parameters	**AuCN/Au Ratio**			**Total Sulphur %**		
	Principal	**Minor**	**Vertical**	**Principal**	**Minor**	**Vertical**
Azimuth[1]	45°	135°	45°	110°	200°	110°
Dip[2]	-15°	0°	75°	0°	0°	-90°
Nugget Effect C0	0.125			0.070		
1st Structure C1	0.227			0.451		
2nd Structure C2	0.291			0.153		
1st Range A1	18.9m	37.1m	30.7m	16.7m	22.1m	11.4m
2nd Range A2	74.7m	57.5m	37.1m	54.3m	37.1m	28.5m

Notes:
1. *positive clockwise from north*
2. *negative below horizontal*

For the PDA zone, the main direction of continuity showing longer ranges was found to be along strike and down plunge for the elements of interest. A second direction was found to be across strike with slightly shorter ranges of continuity. It was observed that the best directions of continuity were, in general, well identified from the variogram analysis. A geometric trend was noted for the total sulphur grades along the northwest-southeast orientation.

For the Estrella zone, the best direction continuity was found to be along strike and down plunge for the elements of interest. The across strike and across strike and dip directions showed similar grade continuity. As seen in PDA, a geometric trend was observed for total sulphur along the northwest-southeast orientation.

For the Gap-Victor area, the best direction of continuity was observed to be along strike to the northeast-southwest gently plunging to the northeast. The second best direction of continuity was defined as being along the northwest-southeast direction. The total sulphur grade continuity was found to be at a different orientation than the other elements of interest.

14.2.6 Grade Estimation

The estimation of grades into a block model was carried out with the ordinary kriging technique for gold, silver, AuCN/Au ratio, and total sulphur. Three block models were constructed for this exercise; one for the PDA area, one for the Estrella area, and one for the Gap-Victor area. The PDA and Estella block models are rotated 30° counter-clockwise with their X axis' azimuth set at 60°, while the Gap-victor block model is rotated 35° counter-clockwise with its X axis oriented at a 55° azimuth. The block grid definition for the PDA area is presented in Table 14-27, for the Estrella area in Table 14-28, and for the Gap-Victor area in Table 14-29. It should be noted that the origin of the block model corresponds to the lower left corner, the point of origin being the exterior edges of the first block. Although overlaps in the block models' limits are observed between the PDA, Estrella, and Gap-Victor areas, all mineralized zones are defined as separate from each other without any overlaps.

Table 14-27 PDA - Block Grid Definition

Coordinates	Origin (m)	Rotation (Counter-clockwise)	Distance (m)	Block Size (m)	Number of Blocks
Easting (X)	721,255.0	30°	2,463.0	3.0	821
Northing (Y)	3,170,850.0		711.0	3.0	237
Elevation(Z)	650.0		600.0	3.0	200
Total Number of Blocks			38,915,400		

Table 14-28 Estrella - Block Grid Definition

Coordinates	Origin (m)	Rotation (Counter-clockwise)	Distance (m)	Block Size (m)	Number of Blocks
Easting (X)	720,790.0	30°	930.0	3.0	310
Northing (Y)	3,170,520.0		636.0	3.0	212
Elevation(Z)	930.0		420.0	3.0	140
Total Number of Blocks			9,200,800		

Table 14-29 Gap-Victor - Block Grid Definition

Coordinates	Origin (m)	Rotation (Counter-clockwise)	Distance (m)	Block Size (m)	Number of Blocks
Easting (X)	721,335.0	35°	1,545.0	3.0	515
Northing (Y)	3,171,705.0		750.0	3.0	250
Elevation(Z)	880.0		321.0	3.0	107
Total Number of Blocks			13,776,250		

A similar estimation strategy was utilized for the PDA, Estrella, and Gap-Victor sulphide zones. The size and orientation of the search ellipsoids for the estimation process was based on the variogram parameters modeled for each element of interest. A minimum of 2 composites and maximum of 12 composites were utilized in the block grade estimation process. No other constraints were applied. Only blocks within the mineralized domains were estimated. A 3-pass approach with increasing search ellipsoid size was selected for the grade estimation strategy. The first pass has a search ellipsoid dimensioned to the variogram ranges, while the second pass is dimensioned to 1.5 times these ranges and finally the third pass with 3 times the ranges. The objective of this strategy was to fill the mineralized domains with estimates.

For PDA, approximately 99% of the estimates are from the 1st pass and 1% from the 2nd pass for gold, silver, AuCN/Au, and total sulphur.

For Estrella, approximately 99% of the blocks were estimated from the 1st pass, and 1% from the 2nd pass for gold and silver. For the AuCN/Au ratio 92% of the blocks were estimated from the 1st pass, 7% from the 2nd pass and 1% from the 3rd pass. For total sulphur estimates, 95% of the blocks were estimated from the 1st pass, and 5% from the 2nd pass.

For Gap-Victor, all the blocks were estimated from the 1st pass for gold, silver, and AuCN/Au. For total sulphur, 97% of the blocks were estimated from the 1st pass and 3% of the blocks from the 2nd pass.

14.2.7 Validation of Estimates

Validation tests were carried out to assess the quality of the gold grade estimates. The statistical validation tests of the estimates were performed with the polygonal declustered capped composites.

14.2.7.1 *Visual Checks*

A visual inspection of the block estimates of gold grades from the PDA, Estrella, and Gap-Victor deposits with the drill hole grades on northwest-southeast cross-sections, northeast-southwest cross-sections, and level plans, was performed as a first check of the estimates. Observations from stepping through the estimates along the different sections indicated that there was overall a good agreement between the drill hole grades and the estimates and their projection away from drill hole data. Longitudinal sections of gold grades from estimates and drill holes are presented in Figure 14-51 for PDA, Figure 14-52 for Estrella, and Figure 14-53 for Gap-Victor.

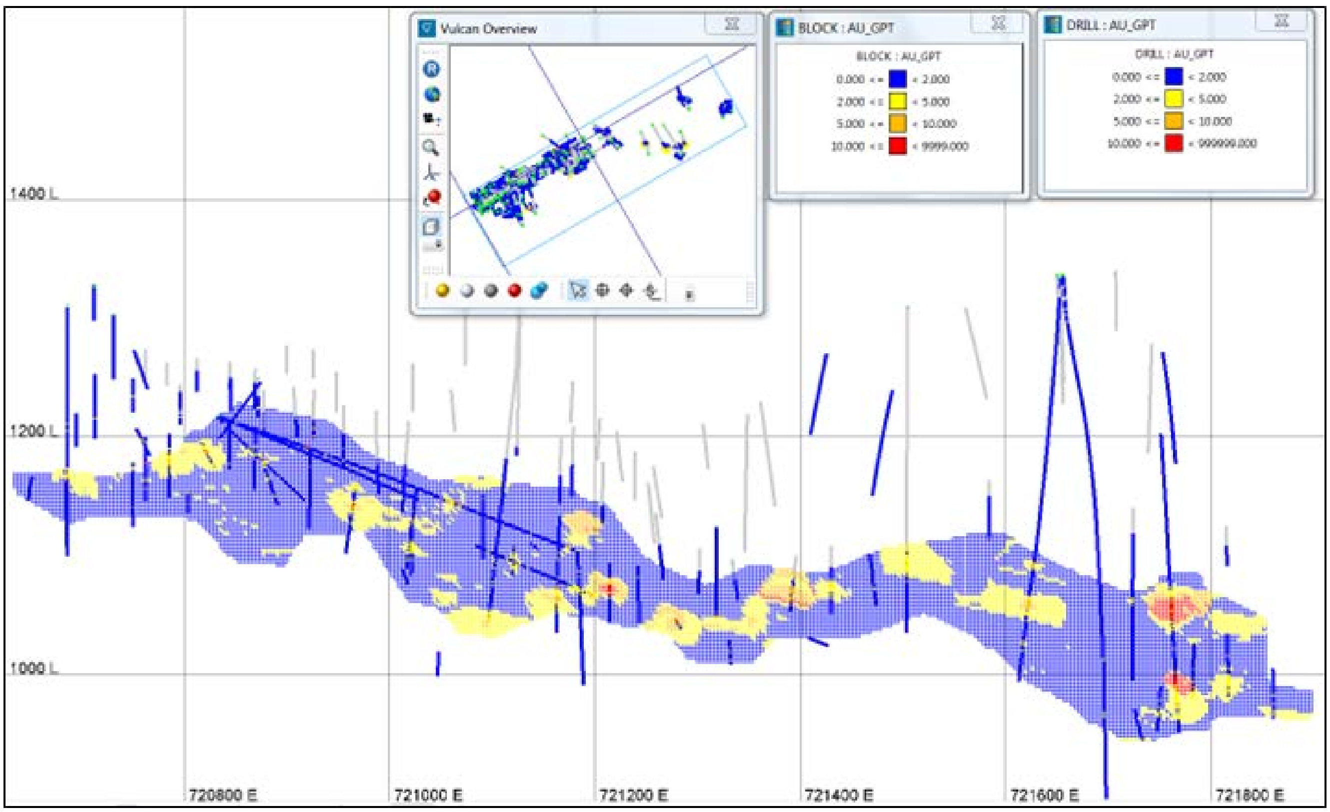


Figure 14-51 PDA - Gold Grade Estimates and Drill Hole Gold Grades – Longitudinal NE-SW Section Looking NW

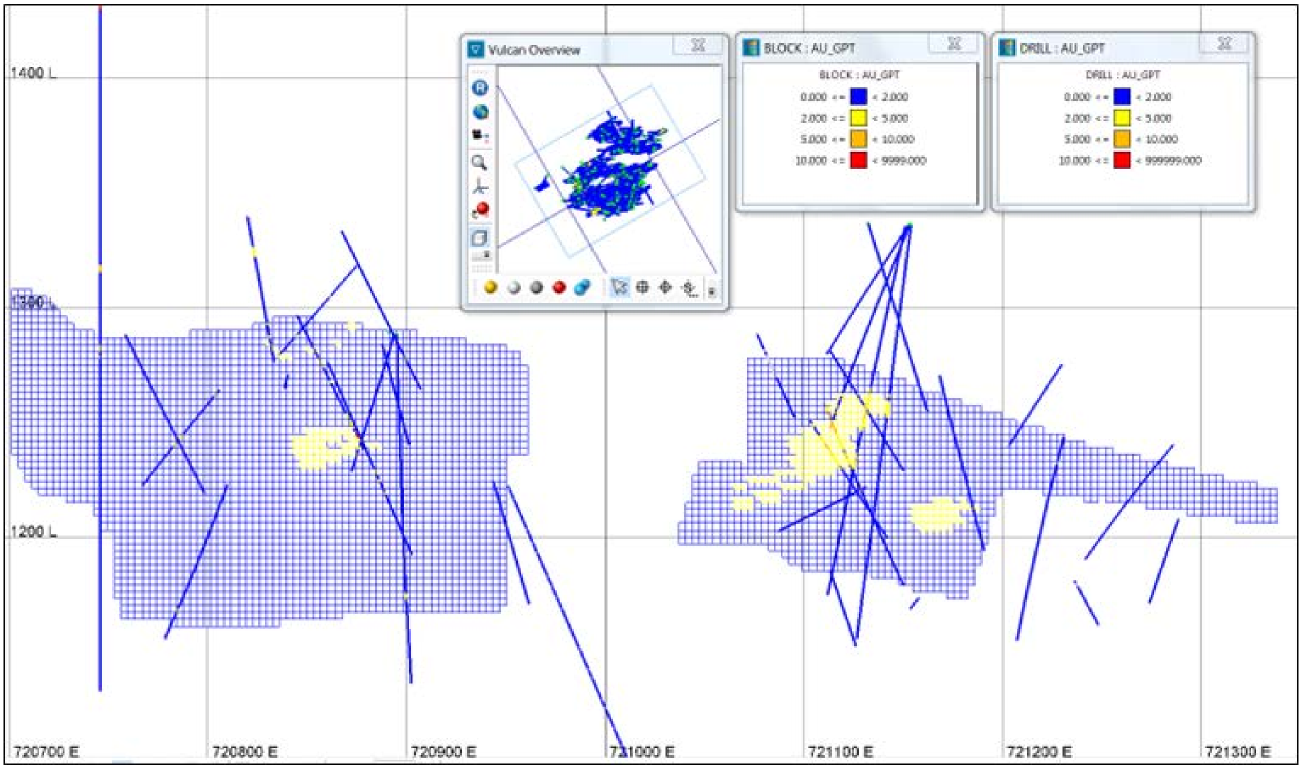


Figure 14-52 Estrella - Gold Grade Estimates and Drill Hole Gold Grades – Longitudinal NE-SW Section Looking NW

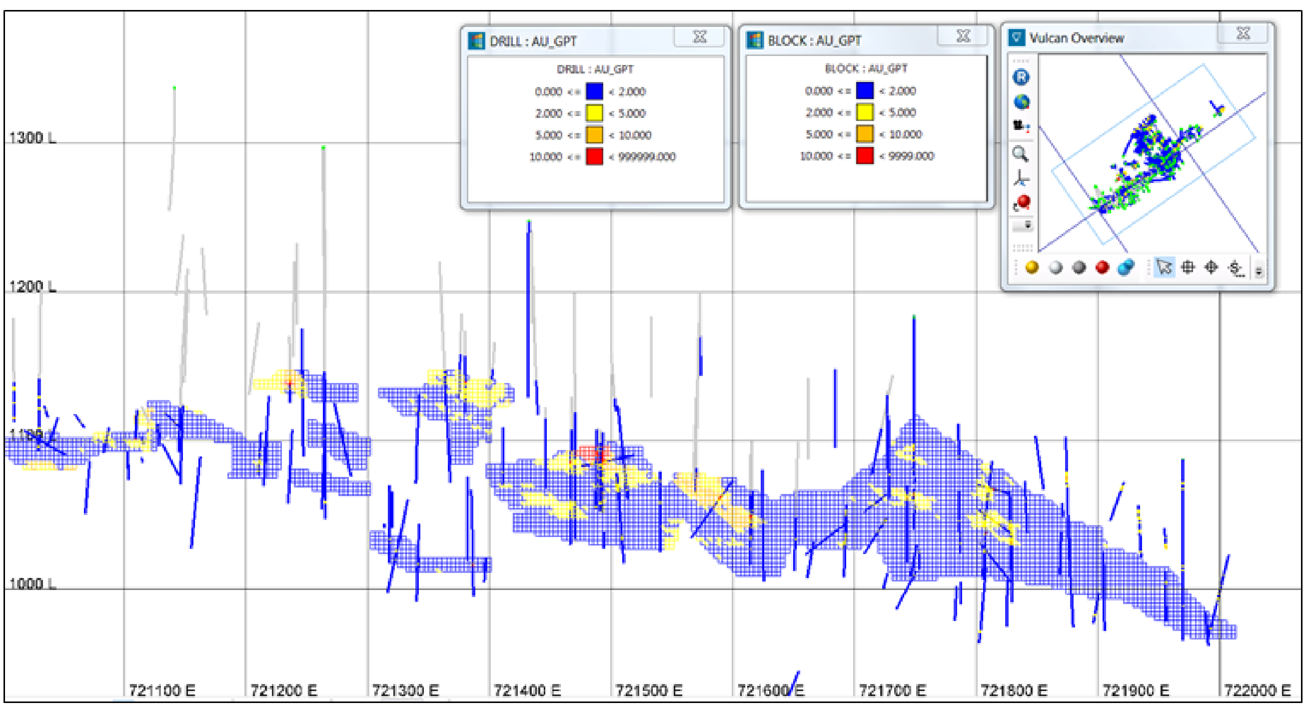


Figure 14-53 Gap-Victor - Gold Grade Estimates and Drill Hole Gold Grades – Longitudinal NE-SW Section Looking NW

14.2.7.2 *Global Bias Test*

The comparison of the average gold grades from the polygonal declustered composites and the estimated block grades examines the possibility of a global bias of the estimates. As a guideline, a difference between the average grades of more than ± 10% would indicate a significant over- or under-estimation of the block grades and the possible presence of a bias. It would be a sign of difficulties encountered in the estimation process and would require further investigation. Results of this comparison are presented in Table 14-30.

Table 14-30 PDA Project - Average Gold Grade Comparison – Polygonal-Declustered Composites with Block Estimates

Stats	PDA		Estrella		Gap-Victor	
	Declustered Composites (Au g/t)	Block Estimates (Au g/t)	Declustered Composites (Au g/t)	Block Estimates (Au g/t)	Declustered Composites (Au g/t)	Block Estimates (Au g/t)
Average Grade	1.362	1.443	0.596	0.619	1.596	1.572
Difference	5.9%		3.8%		-1.5%	

As seen in Table 14-30, the average gold grades between the declustered composites and the block estimates are within the limits of acceptability for the PDA, Estrella, and Gap-Victor zones. It can be concluded that no global bias is present in the gold grade estimates.

14.2.7.3 *Local Bias Test*

A comparison of the gold grade from composites within a block with the estimated grade of that block provides an assessment of the estimation process close to measured data. Pairing of these grades on a scatterplot gives a statistical valuation of the estimates. It is anticipated that the estimated block grades should be similar to the composited grades within the block, however without being of exactly the same value. Thus, a high correlation coefficient (≥ 0.8) will indicate satisfactory results in the interpolation process, while a medium to low correlation coefficient will be indicative of larger differences in the estimates and would suggest a further review of the interpolation process. Results from the pairing of composited and estimated grades within blocks pierced by a drill hole are presented in Table 14-31 for gold at PDA, Estrella, and Gap-Victor.

Table 14-31 PDA Project - Gold Grade Comparison for Blocks Pierced by a Drill Hole – Paired Composites Grades with Block Grade Estimates

Block Composites Average Au (g/t)	Block Estimates Average Au (g/t)	Difference	Correlation Coefficient	Block Composites Average Au (g/t)	Block Estimates Average Au g/t	Difference	Correlation Coefficient
PDA				**Estrella**			
1.273	1.285	0.9%	0.869	0.658	0.668	1.4%	0.809
Gap-Victor							
1.390	1.409	1.4%	0.789				

As seen in Table 14-31, the average gold grades from the block estimates are very similar to that of the composite grades within blocks pierced by a drill hole. Higher correlation coefficients are also observed. From these results, there is no local bias noted.

14.2.7.4 *Grade Profile Reproducibility Test*

The comparison of the grade profiles of the polygonal declustered composites with that of the estimates allows for a visual verification of an over or under-estimation of the block estimates at the global and local scales. A qualitative assessment of the smoothing/variability of the estimates can also be observed from the plots. For this test the utility produces an output consisting of three graphs displaying the average grade according to each of the coordinate axes (east, north, elevation). The ideal result is a grade profile from the estimates that follows that of the declustered composites along the three coordinate axes, in a way that the estimates have lower high-grade peaks than the composites, and higher low-grade valleys than the composites. A smoother grade profile for the estimates, from low to high grade areas, is also anticipated in order to reflect that these grades represent larger volumes than the composites. Results for gold are presented in Figure 14-54 for the PDA zone, in Figure 14-55 for the Estrella zone, and in Figure 14-56 for the Gap-Victor zone.

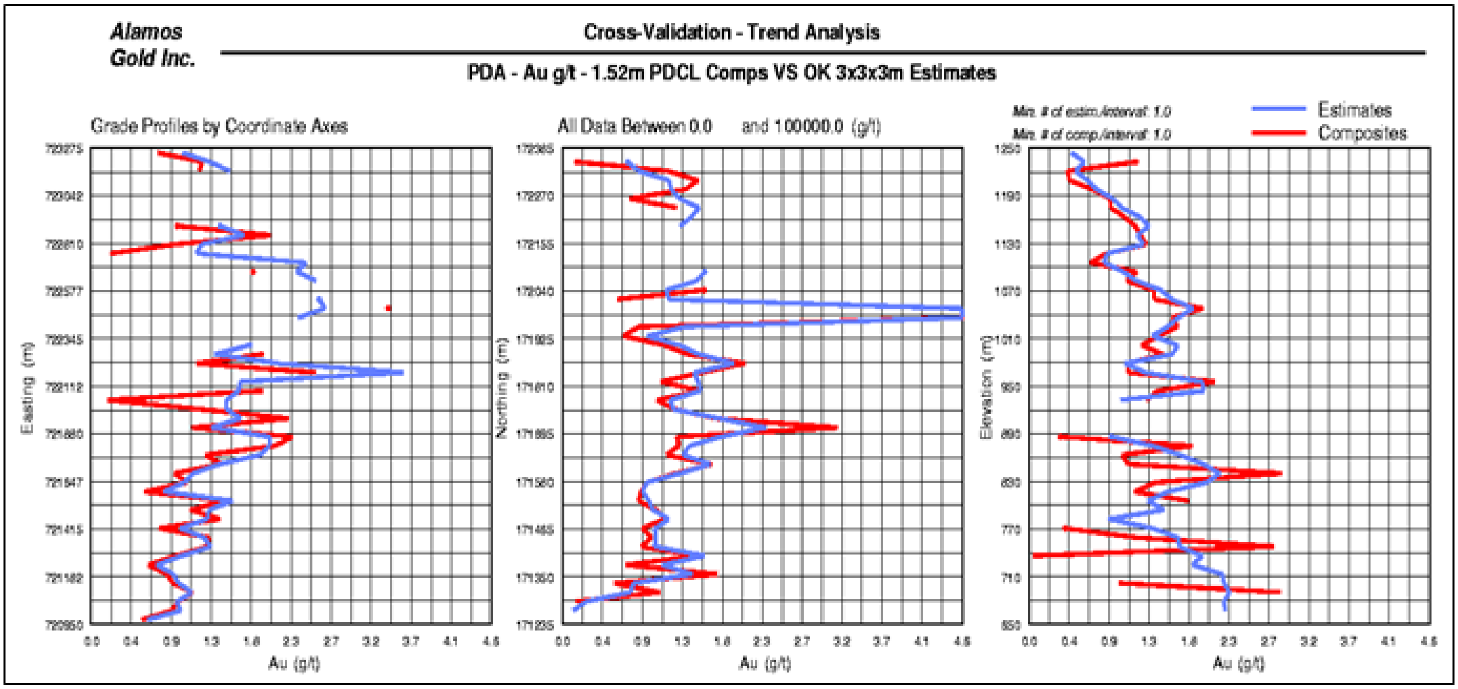


Figure 14-54 PDA - Gold Grade Profile

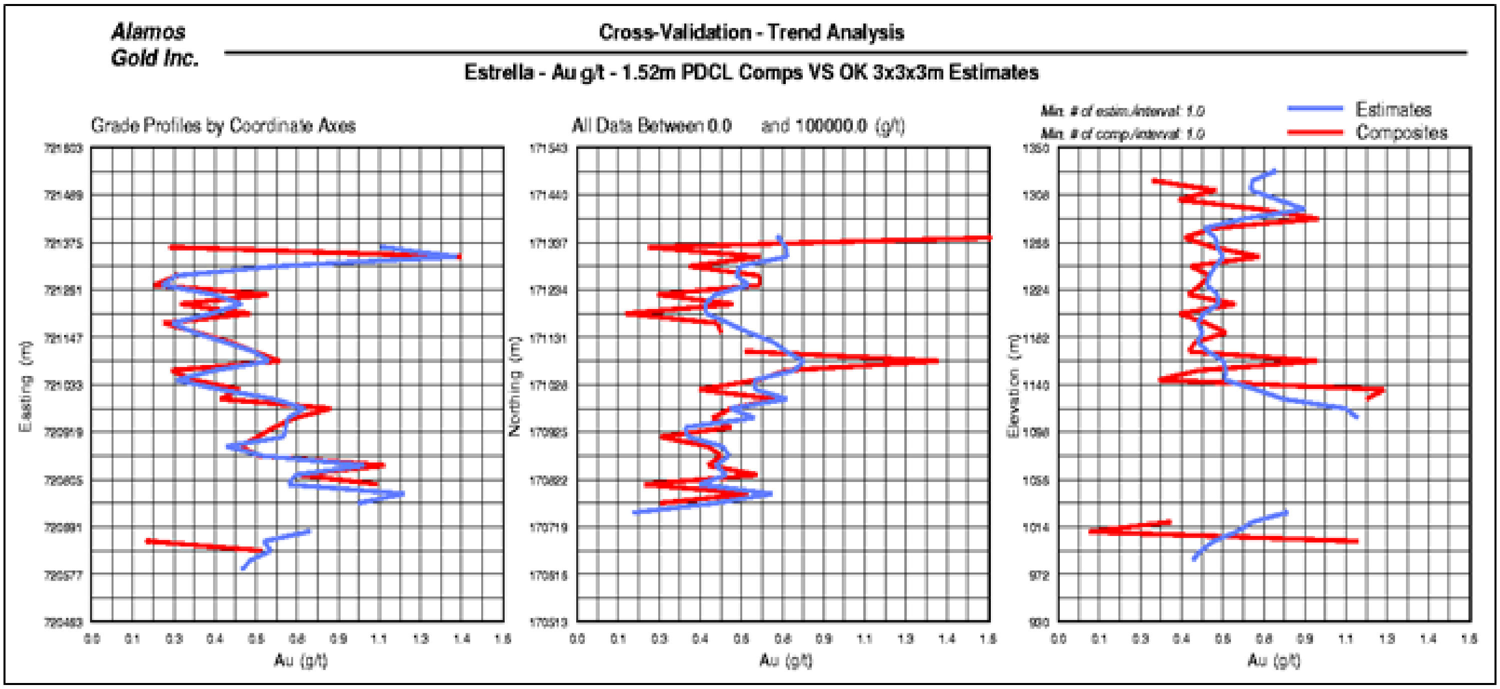


Figure 14-55 Estrella - Gold Grade Profile

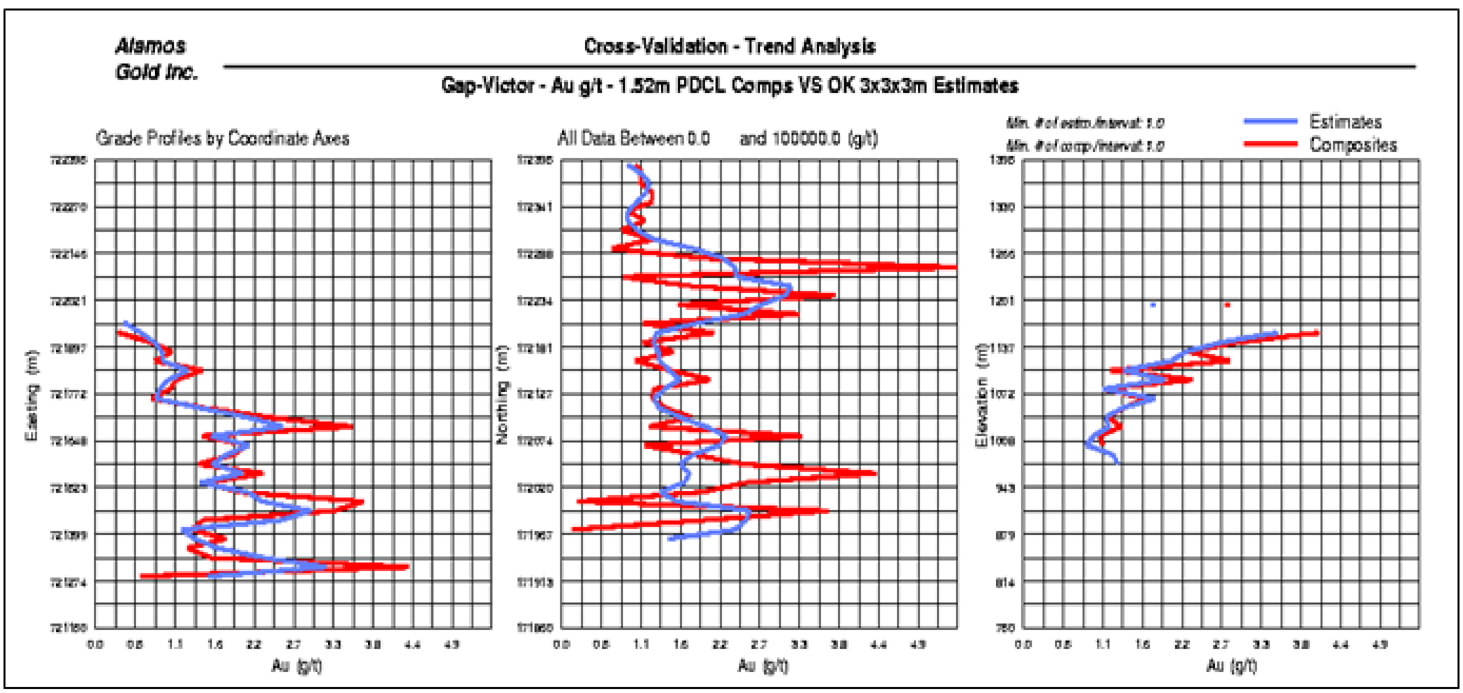


Figure 14-56 Gap-Victor - Gold Grade Profile

As seen in these figures, the grade profiles from the gold grade estimates follow reasonably well the grade profiles from the declustered gold grade composites. No global or local over or under-estimations are observed. As expected, the estimates display higher grades in lower grade areas and lower grades in higher grade areas, as they represent larger volumes than the composites.

14.2.7.5 *Level of Smoothing/Variability*

The level of smoothing/variability of the estimates can be measured by comparing a theoretical distribution of block grades with that of the actual estimates. The theoretical distribution of block grades is derived from that of the declustered composites, where a change of support algorithm is utilized for the transformation (Indirect Lognormal Correction). In this case, the variance of the composites' grade population is corrected (reduced) with the help of the variogram model, to reflect a distribution of block grades (3m x 3m x 3m). The comparison of the coefficient of variation (CV) of this population with that of the actual block estimates provides a measure of smoothing. Ideally a lower CV from the estimates by 5 to 30% is targeted as a proper amount of smoothing. This smoothing of the estimates is desired as it allows for the following factors: the imperfect selection of ore blocks at the mining stage (misclassification), the block grades relate to much larger volumes than the volume of core (support effect), and the block grades are not perfectly known (information effect). A CV lower than 5 to 30% for the estimates would indicate a larger amount of smoothing, while a higher CV would represent a larger amount of variability. Too much smoothing would be characterized by grade estimates around the average grade, where too much variability would be represented by estimates with abrupt changes between lower and higher-grade areas.

Results of the level of smoothing/variability analysis are presented in Table 14-32 for the gold grade estimates at PDA, Estrella, and Gap-Victor. As observed in this table, the CVs of the gold estimates are close to or over the lower limit of acceptability signifying higher levels of smoothing.

Table 14-32 PDA Project - Level of Smoothing/Variability of Gold Grade

Zones	CV – Theoretical Block Grade Distribution	CV – Actual Block Grade Distribution	Difference
PDA	2.242	1.283	-42.8%
Estrella	1.456	1.087	-25.4%
Gap-Victor	1.656	1.124	-32.1%

14.2.8 Mineral Resource Classification

The Mineral Resource was classified as Measured, Indicated, and Inferred. The classification strategy was based on a two-step process. A first step consisted of defining the different classes based on the variogram ranges and the classification strategy adopted at Mulatos. In this case, the distance of the closest sample from the block center was utilized as the classification criterion. The classification distances for each category are provided in Table 14-33.

Table 14-33 Classification Distances - PDA, Estrella, and Gap-Victor Sulphide Zones

Class	Distance of Closest Sample
Measured	≤ 6.0m
Indicated	>6.0m and ≤ 36.0m
Inferred	>36.0m and ≤ 74.0m

A second step consisted in visually defining contiguous areas of Measured Mineral Resources to remove the "spotty" effect of the Measured class. Examples of the Mineral Resource classification are displayed in Figure 14-57 for PDA, in Figure 14-58 for Estrella, and in Figure 14-59 for Gap-Victor.

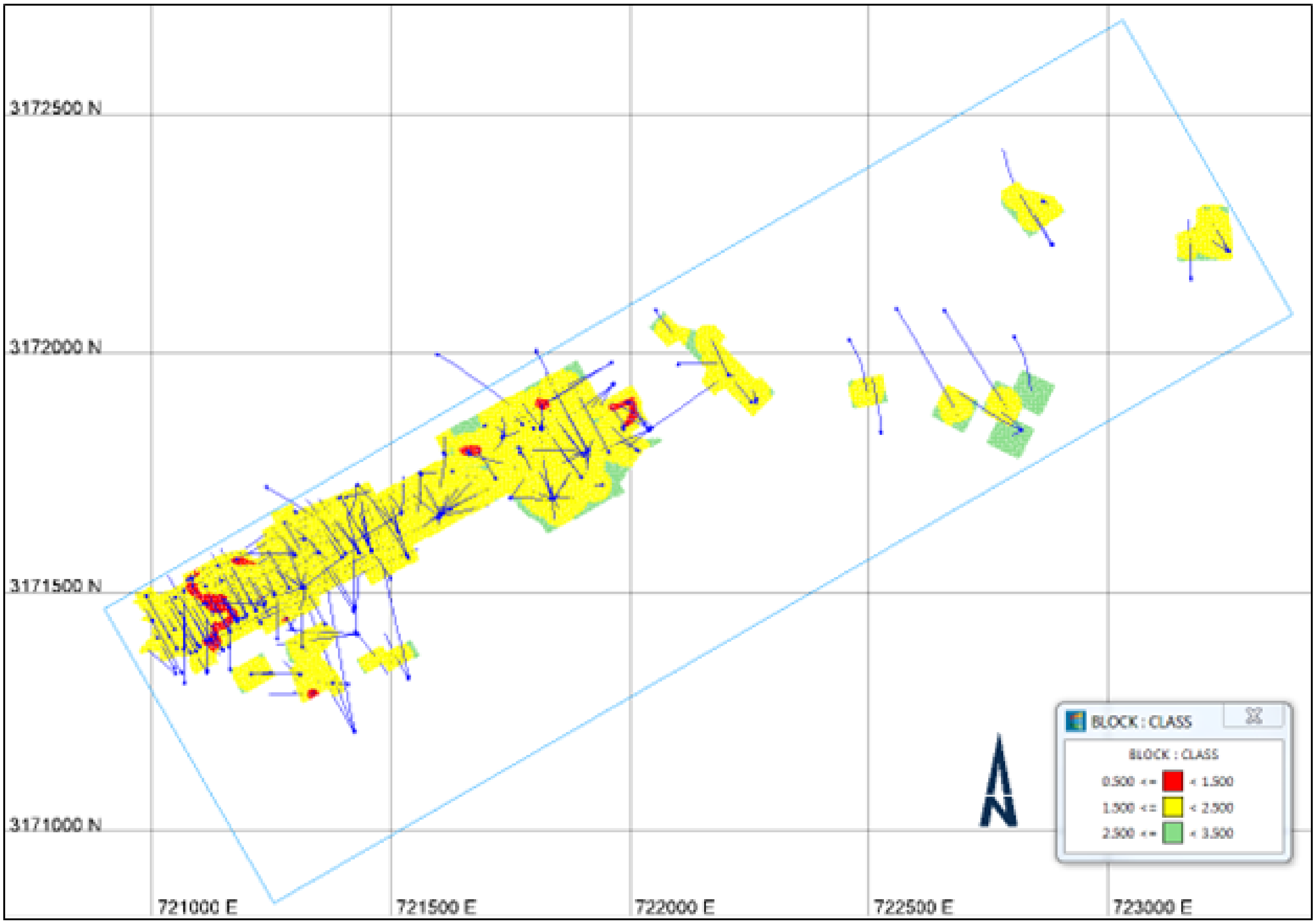


Figure 14-57 PDA - Mineral Resource Classification – Plan View

Notes:

- *Measured (red), Indicated (yellow), and Inferred (green)*

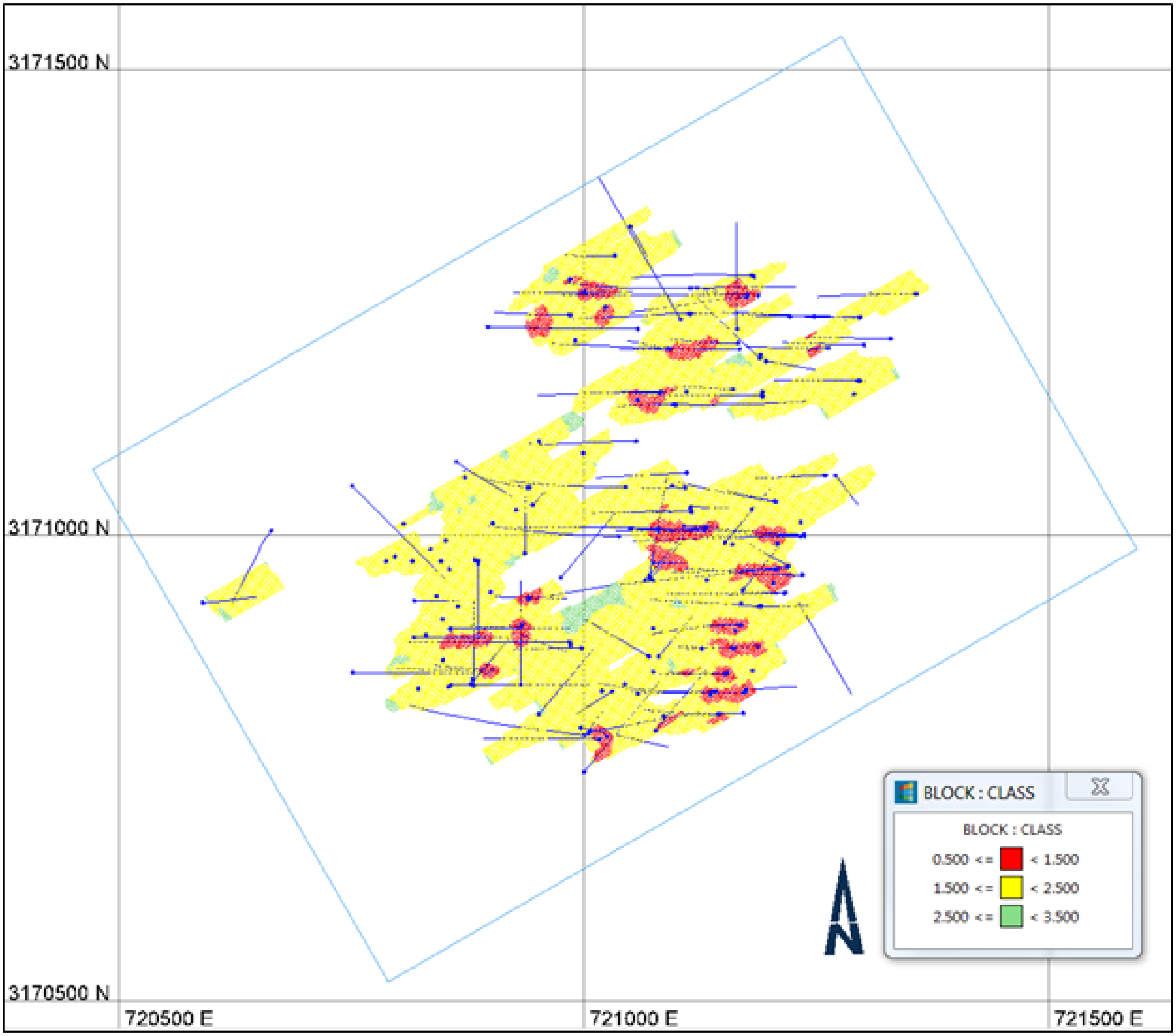


Figure 14-58 Estrella - Mineral Resource Classification – Plan View

Notes:

- *Measured (red), Indicated (yellow), and Inferred (green)*

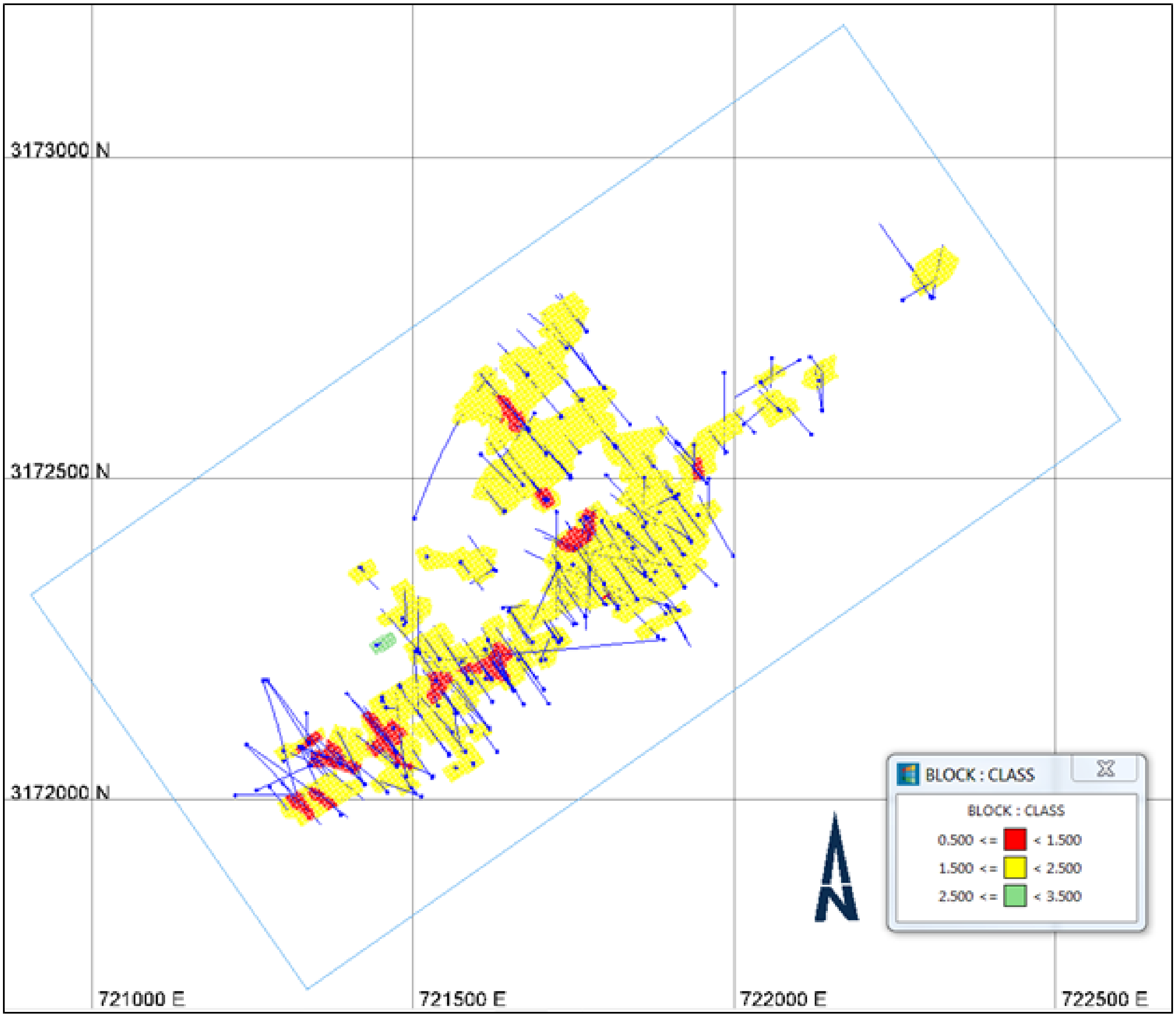


Figure 14-59 Gap-Victor - Mineral Resource Classification – Plan View

Notes:

- *Measured (red), Indicated (yellow), and Inferred (green)*

14.2.9 Mineral Resource Calculation

14.2.9.1 *Specific Gravity*

The Mineral Resource was calculated for 3m (X) x 3m (Y) x 3m (Z) blocks with specific gravity (SG) values. At PDA, the average SG value of the two most common mineralization styles was used for the tonnage calculation. At Estrella, the average SG value of 108 SG measurements from 18 holes was used for the tonnage calculation, while at Gap-Victor the average SG value of 196 measurements from 65 holes was used. The average SG values used for tonnage calculation are presented in Table 14-34.

Table 14-34 PDA Project - Specific Gravity Averages

Sulphide Zone	Average Specific Gravity
PDA	2.548
Estrella	2.549
Gap-Victor	2.569

14.2.9.2 *Editing of the Block Model*

All blocks were trimmed to the topography surface as of November 2022 for the PDA, Estrella, and Gap-Victor zones with the block proportion below the topography surface used in the Mineral Resources' tonnage calculations. As well, the tonnage inside the mineralized domains was calculated by accounting for the block fraction inside them.

For the Gap-Victor area, the mined-out voids from an underground drift were removed from the Mineral Resources' tonnage calculation (Figure 14-60). The mined-out voids of the Escondida area did not affect the Mineral Resources of the Gap-Victor sulphide zones.

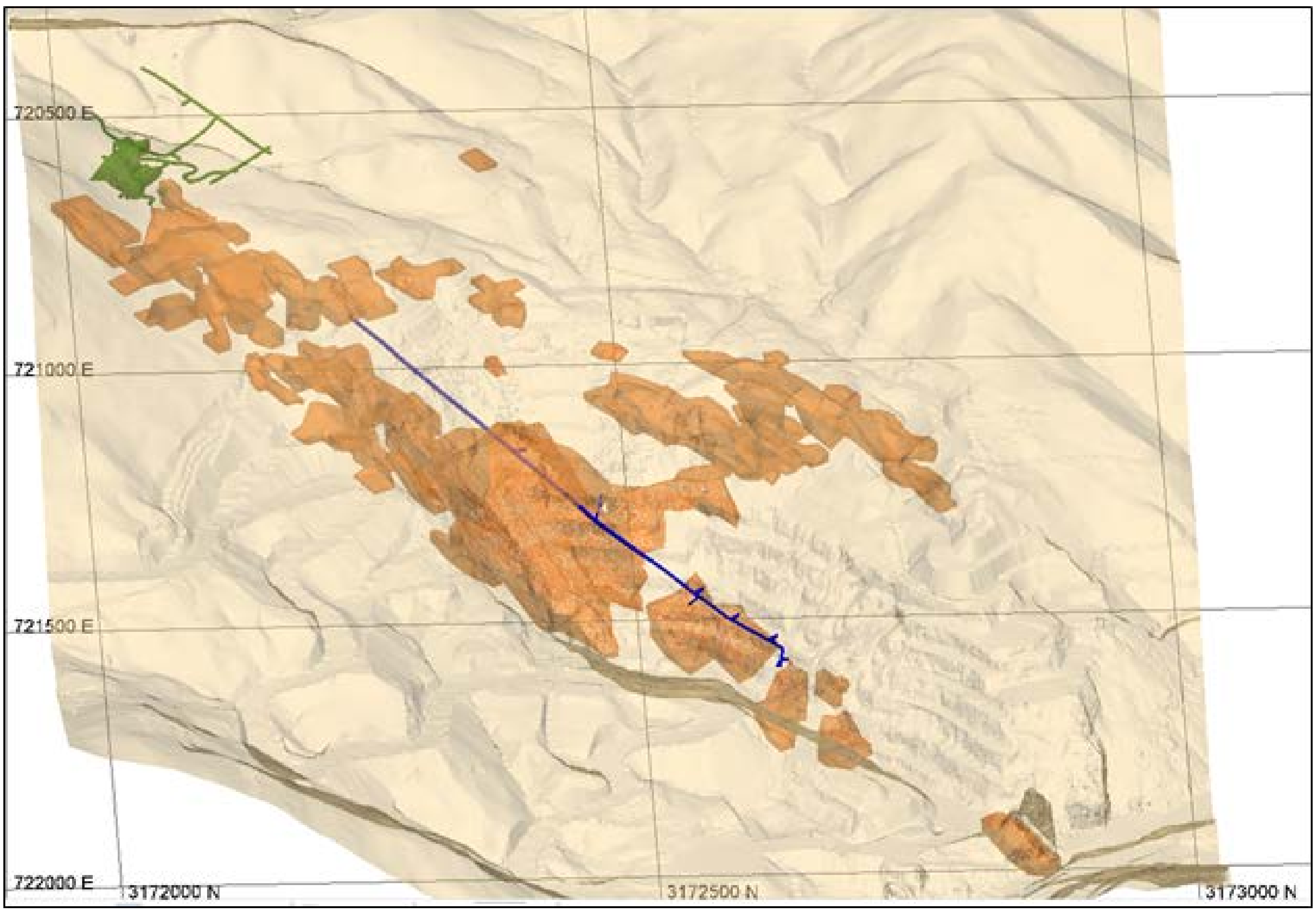


Figure 14-60 Gap-Victor - Mineralized Zones– Perspective View Looking W-SW

Notes:

- *Topography, Drift (blue) and Escondida Mined-Out Voids (green)*

14.2.10 Unconstrained Mineral Resource Estimate Statement

The unconstrained Mineral Resource estimate for the combined sulphide mineralized zones of PDA, Estrella, and Gap-Victor is reported in Table 14-35 at a 2.5 g/t gold cut-off grade. The unconstrained Mineral Resource estimate for each sulphide mineralized zone is reported in Table 14-36 at a 2.5 g/t gold cut-off grade. The unconstrained Mineral Resource estimate is also reported at various gold grade cut-offs for each sulphide mineralized zone in Table 14-37 for Measured Mineral Resources, in Table 14-38 for Indicated Mineral Resources, in Table 14-39 for Measured and Indicated Mineral Resources, and in Table 14-40 for Inferred Mineral Resources.

Table 14-35 PDA Project - Total Mineral Resource Estimates – Unconstrained – at a 2.5 g/t Gold Cut-Off

	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Au Recovery AuCN/Au	Total S (%)
Measured	735,018	4.810	113,668	13.16	0.30	4.09
Indicated	5,275,571	4.884	828,380	6.39	0.34	3.22
Measured + Indicated	6,010,589	4.875	942,119	7.22	0.33	3.32
Inferred	139,093	5.899	26,380	5.37	0.40	3.07

Notes for Tables 14-35 through Table 14-40:

- *The effective date for the Mineral Resource is December 31, 2022.*
- *Mineral Resources, which are not Mineral Reserves, do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.*
- *The CIM definitions were followed for classification of Mineral Resources. The quantity and grade of reported Inferred Mineral Resources in this estimation are uncertain in nature and there has been insufficient exploration to define these Inferred Mineral Resources as an Indicated Mineral Resource and it is uncertain if further exploration will result in upgrading them to an Indicated or Measured Mineral Resource category.*
- *Mineral Resources are reported at a cut-off grade of 2.5 g/t gold.*
- *Mineral Resources reported in Section 14-2 are inclusive of Mineral Reserves*

Table 14-36 Mineral Resource Estimates by Sulphide Zone – Unconstrained – at a 2.5 g/t Gold Cut-off

Zone	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Au Recovery AuCN/Au	Total S (%)
Measured						
PDA	488,784	4.924	77,380	7.74	0.27	4.14
Estrella	83,298	3.527	9,446	58.49	0.18	6.42
Gap-Victor	162,936	5.124	26,842	6.26	0.43	2.76
Indicated						
PDA	4,078,678	5.03	659,597	4.02	0.34	2.77
Estrella	253,771	3.346	27,300	23.53	0.26	5.38
Gap-Victor	943,122	4.666	141,483	12.01	0.35	4.57
Measured and Indicated						
PDA	4,567,462	5.019	737,027	4.42	0.33	2.91
Estrella	337,069	3.391	36,748	32.17	0.24	5.64
Gap-Victor	1,106,058	4.734	168,344	11.17	0.36	4.3
Inferred						
PDA	130,820	5.037	21,185	3.32	0.4	2.85
Estrella	1,051	2.961	100	35.18	0.18	6.8
Gap-Victor	7,222	21.944	5,095	38.21	0.34	6.49

Table 14-37 PDA Project - Measured Mineral Resources – Unconstrained

Au Cut-Off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Au Recovery AuCN/Au	Total S (%)
Measured – PDA						
1.0	1,791,360	2.460	141,680	6.64	0.30	3.91
1.5	1,090,069	3.250	113,901	7.11	0.29	4.01
2.0	690,419	4.135	91,787	7.39	0.28	4.09
2.5	488,784	4.924	77,380	7.74	0.27	4.14
3.0	367,916	5.643	66,750	8.10	0.27	4.18
3.5	285,241	6.339	58,133	8.67	0.26	4.27
4.0	226,608	7.011	51,079	9.26	0.26	4.36
4.5	182,760	7.676	45,103	9.77	0.25	4.41
5.0	149,499	8.329	40,033	10.13	0.25	4.41
Measured – Estrella						
1.0	462,823	1.889	28,109	37.80	0.23	5.59
1.5	251,172	2.447	19,760	45.95	0.23	5.81
2.0	146,225	2.965	13,939	52.26	0.21	6.03
2.5	83,298	3.527	9,446	58.49	0.18	6.42
3.0	51,783	4.004	6,666	58.43	0.17	6.71
3.5	30,922	4.523	4,497	61.01	0.17	7.20
4.0	18,740	5.042	3,038	62.70	0.17	7.69
4.5	11,858	5.518	2,104	65.70	0.17	8.04
5.0	7,980	5.902	1,514	68.53	0.18	8.52
Measured – Gap-Victor						
1.0	726,789	2.299	53,720	6.69	0.37	4.17
1.5	395,388	3.200	40,678	7.02	0.38	3.75
2.0	227,243	4.303	31,438	6.65	0.41	3.11
2.5	162,936	5.124	26,842	6.26	0.43	2.76
3.0	125,452	5.842	23,563	5.94	0.43	2.61
3.5	100,038	6.509	20,935	5.78	0.44	2.53
4.0	83,577	7.051	18,946	5.76	0.44	2.51
4.5	69,620	7.617	17,049	5.77	0.43	2.58
5.0	58,498	8.165	15,356	6.04	0.43	2.71

Table 14-38 PDA Project - Indicated Mineral Resources – Unconstrained

Au Cut-Off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Au Recovery AuCN/Au	Total S (%)
Indicated – PDA						
1.0	13,135,226	2.618	1,105,600	4.19	0.34	3.24
1.5	8,242,804	3.444	912,702	4.32	0.34	3.10
2.0	5,514,519	4.301	762,550	4.15	0.34	2.89
2.5	4,078,678	5.030	659,597	4.02	0.34	2.77
3.0	2,993,731	5.865	564,510	3.46	0.33	2.46
3.5	2,427,080	6.478	505,494	3.21	0.33	2.34
4.0	2,009,330	7.049	455,376	3.07	0.34	2.28
4.5	1,701,554	7.562	413,688	2.89	0.35	2.23
5.0	1,471,193	8.001	378,447	2.86	0.35	2.21
Indicated – Estrella						
1.0	2,258,989	1.709	124,122	17.68	0.28	5.13
1.5	1,082,344	2.252	78,365	23.01	0.26	5.30
2.0	553,624	2.738	48,735	24.75	0.26	5.35
2.5	253,771	3.346	27,300	23.53	0.26	5.38
3.0	125,012	4.014	16,133	20.98	0.26	5.21
3.5	62,059	4.845	9,667	14.31	0.24	5.04
4.0	36,374	5.615	6,566	12.69	0.26	5.03
4.5	25,932	6.175	5,148	9.59	0.29	4.83
5.0	16,068	7.055	3,645	6.85	0.37	4.61
Indicated – Gap-Victor						
1.0	4,605,988	2.202	326,085	9.82	0.36	5.01
1.5	2,822,930	2.812	255,215	11.13	0.35	4.98
2.0	1,554,100	3.702	184,972	11.98	0.34	4.91
2.5	943,122	4.666	141,483	12.01	0.35	4.57
3.0	662,639	5.492	117,003	12.45	0.37	4.24
3.5	520,719	6.103	102,173	11.58	0.38	3.98
4.0	419,563	6.672	90,000	10.32	0.37	3.85
4.5	322,303	7.400	76,681	9.29	0.35	3.84
5.0	249,101	8.179	65,504	8.16	0.35	3.79

Table 14-39 PDA Project - Measured and Indicated Mineral Resources – Unconstrained

Au Cut-Off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Au Recovery AuCN/Au	Total S (%)
Measured and Indicated – PDA						
1.0	14,926,586	2.599	1,247,262	4.48	0.33	3.32
1.5	9,332,874	3.421	1,026,501	4.64	0.33	3.21
2.0	6,204,937	4.282	854,230	4.51	0.33	3.02
2.5	4,567,462	5.019	737,027	4.42	0.33	2.91
3.0	3,361,647	5.841	631,292	3.97	0.32	2.65
3.5	2,712,321	6.464	563,681	3.79	0.33	2.54
4.0	2,235,938	7.045	506,444	3.70	0.33	2.49
4.5	1,884,313	7.573	458,788	3.56	0.34	2.44
5.0	1,620,693	8.031	418,467	3.53	0.34	2.41
Measured and Indicated – Estrella						
1.0	2,721,812	1.740	152,264	21.10	0.27	5.20
1.5	1,333,516	2.289	98,138	27.33	0.26	5.40
2.0	699,848	2.785	62,664	30.50	0.25	5.49
2.5	337,069	3.391	36,748	32.17	0.24	5.64
3.0	176,795	4.011	22,799	31.95	0.23	5.65
3.5	92,981	4.738	14,164	29.84	0.22	5.76
4.0	55,114	5.420	9,604	29.70	0.23	5.94
4.5	37,790	5.969	7,252	27.19	0.25	5.84
5.0	24,047	6.672	5,158	27.32	0.31	5.91
Measured and Indicated – Gap-Victor						
1.0	5,332,777	2.215	379,768	9.39	0.36	4.89
1.5	3,218,319	2.860	295,928	10.62	0.36	4.83
2.0	1,781,343	3.779	216,429	11.30	0.35	4.68
2.5	1,106,058	4.734	168,344	11.17	0.36	4.30
3.0	788,091	5.547	140,548	11.41	0.38	3.98
3.5	620,758	6.169	123,120	10.64	0.39	3.75
4.0	503,140	6.735	108,948	9.56	0.38	3.63
4.5	391,922	7.439	93,736	8.66	0.37	3.62
5.0	307,599	8.176	80,857	7.75	0.36	3.58

Table 14-40 PDA Project - Inferred Mineral Resources – Unconstrained

Au Cut-Off (g/t)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Ag Grade (g/t)	Au Recovery AuCN/Au	Total S (%)
Inferred – PDA						
1.0	568,321	2.559	46,758	6.15	0.32	3.37
1.5	421,476	3.010	40,788	7.37	0.34	3.91
2.0	341,340	3.307	36,292	8.33	0.35	4.30
2.5	130,820	5.037	21,185	3.32	0.40	2.85
3.0	87,360	6.210	17,442	1.97	0.42	2.29
3.5	71,029	6.910	15,780	1.77	0.44	2.35
4.0	65,545	7.174	15,118	1.64	0.45	2.40
4.5	60,735	7.409	14,467	1.55	0.47	2.40
5.0	47,218	8.155	12,380	1.67	0.50	2.53
Inferred – Estrella						
1.0	21,112	1.623	1,102	20.04	0.24	5.62
1.5	11,690	1.921	722	24.03	0.22	6.02
2.0	1,717	2.653	146	30.59	0.19	6.71
2.5	1,051	2.961	100	35.18	0.18	6.80
3.0	539	3.238	56	39.18	0.16	6.90
3.5	0	-	0	-	-	-
4.0	0	-	0	-	-	-
4.5	0	-	0	-	-	-
5.0	0	-	0	-	-	-
Inferred – Gap-Victor						
1.0	7,222	21.944	5,095	38.21	0.34	6.49
1.5	7,222	21.944	5,095	38.21	0.34	6.49
2.0	7,222	21.944	5,095	38.21	0.34	6.49
2.5	7,222	21.944	5,095	38.21	0.34	6.49
3.0	7,222	21.944	5,095	38.21	0.34	6.49
3.5	7,222	21.944	5,095	38.21	0.34	6.49
4.0	7,222	21.944	5,095	38.21	0.34	6.49
4.5	7,222	21.944	5,095	38.21	0.34	6.49
5.0	7,222	21.944	5,095	38.21	0.34	6.49

14.2.10.1 *Comparison with the April 2021 Mineral Resource Estimate*

The current update of the Mineral Resources at PDA, Estrella, and Gap-Victor are compared to those of the last update in April 2021 in Table 14-41.

Table 14-41 Comparison of the Updated Mineral Resources with the April 2021 Mineral Resources

Mineral Resource Estimates	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)	Tonnage (Tonnes)	Au Grade (g/t)	Au Content (oz)
	Measured			**Indicated**		
Apr-21	659,564	5.06	107,287	2,955,056	4.69	445,137
Dec-22	735,018	4.81	113,668	5,275,571	4.88	828,380
Difference	75,454	-0.25	6,381	2,320,515	0.19	383,243
	11.4%	-4.9%	5.9%	78.5%	4.1%	86.1%
	Measured + Indicated			**Inferred**		
Apr-21	3,614,620	4.75	552,409	82,809	5.14	13,680
Dec-22	6,010,589	4.88	942,119	139,093	5.90	26,380
Difference	2,395,969	0.12	389,710	56,284	0.76	12,700
	66.3%	2.6%	70.5%	68.0%	14.8%	92.8%

Notes:

- *Mineral Resources are calculated at a cut-off 0f 2.50 g/t.*
- *Mineral Resources are Inclusive of Mineral Reserves.*

From this table it can be seen that the Mineral Resources were expanded in this update with increases of 70% for the Measured and Indicated gold content and of 93% for the Inferred gold content. It is believed that a great portion of these additional Mineral Resources stems from the additional drilling undertaken since the April 2021 Mineral Resources mainly at PDA, and partially from the modelling of a gold equivalent zone at Estrella.

14.2.11 Mineral Resource Estimate Net of Mineral Reserves Statement

PDA Project Measured and Indicated Resources, net of Mineral Reserves, and with an effective date of December 31, 2022, are presented in Table 14-42. Inferred Mineral Resources are presented in Table 14-43.

Table 14-42 Measured and Indicated Mineral Resources Net of Reserves, December 31, 2022

	Measured Resources			Indicated Resources			Total Measured and Indicated		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
PDA	91	5.52	16	845	5.26	143	937	5.28	159
Estrella	27	3.75	3	119	3.25	12	146	3.34	16
Gap-Victor	27	5.97	5	227	4.68	34	255	4.82	40
Total	146	5.28	25	1,192	4.95	190	1,338	4.98	214

Table 14-43 Inferred Mineral Resources, December 31, 2022

	Inferred Resources		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
PDA	131	5.04	21
Estrella	1	2.96	0
Gap-Victor	7	21.94	5
Total	139	5.90	26

Notes for Table 14-42 and Table 14-43:

- *The effective date for the Mineral Resource is December 31, 2022.*
- *Mineral Resources, which are not Mineral Reserves, do not have demonstrated economic viability. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues.*
- *The CIM definitions were followed for classification of Mineral Resources. The quantity and grade of reported Inferred Mineral Resources in this estimation are uncertain in nature and there has been insufficient exploration to define these Inferred Mineral Resources as an Indicated Mineral Resource and it is uncertain if further exploration will result in upgrading them to an Indicated or Measured Mineral Resource category.*
- *Mineral Resources are reported at a cut-off grade of 2.5 g/t gold.*
- *Mineral Resources reported in Section 14-2 are inclusive of Mineral Reserves*

14.2.12 Discussion

The PDA, Estrella, and Gap-Victor sulphide deposits are presented as higher gold grade mineralized zones amenable to an underground extraction method with conventional milling, due to their lower heap leach recoveries (ratio of AuCN/Au).

Additional holes were drilled since the last April 2021 Mineral Resource estimate and incorporated into this update. Along with this additional information, changes in this update include the merging of the PDA1 and PDA2 mineralized zones into the PDA zone, the inclusion of silver into a gold equivalent grade for the modeling of the Estrella mineralized zone, and the estimation of silver grades.

With the new drilling, a larger mineralized zone was outlined at PDA and at Estrella. The Gap-Victor mineralized zone remained similar to the previous interpretation as only one new hole was added. As the grade estimation approach remained similar to the previous Mineral Resource estimate, it is believed that the main increases in tonnage and metal content stem from the larger mineralized zones, when compared to the April 2021 Mineral Resource estimate.

The coefficients of variation from each zone are low (< 3.0) with regards to the capped gold and silver grade composites, AuCN/Au ratios, and total sulphur composites. This characteristic is indicative of more homogeneous distributions of grades within each deposit and thus conducive to a more traditional grade estimation method such as ordinary kriging.

The modeling of the gold, silver, AuCN/Au ratio, and total sulphur variograms was found to be adequate overall. The best directions of grade continuity were found to be along strike and down plunge overall. A secondary trend to the northwest was observed for total sulphur grades.

The validation tests of the gold grade estimates within the PDA, Estrella, and Gap-Victor zones showed good results with no global or local bias observed. As such, it is believed that the Mineral Resource estimates are representative of the information currently available and most recent geologic understanding.

The December 31, 2022, PDA Project Mineral Resources, net of Mineral Reserves, are presented in Section 14-3 of this report.

14.3 Mulatos Property Mineral Resources, December 31, 2022

December 31, 2022, Measured and Indicated Mineral Resources for the Mulatos pit, La Yaqui Grande, PDA and Carricito are presented in Table 14-44. December 31, 2022. Inferred Mineral Resources are presented in Table 14-45. Mineral Resources. Mineral Resources in the case of the Mulatos pit, La Yaqui Grande and PDA are net of Mineral Reserves. Carricito does not have Mineral Reserves.

U.S. investors should reference the cautionary note at the outset of this report regarding mining disclosure rules in the United States and SEC definitions of “Measured Mineral Resources”, “Indicated Mineral Resources”, “Inferred Mineral Resources”, “Proven Mineral Reserves” and “Probable Mineral Reserves.

Table 14-44 Mulatos Property Measured and Indicated Mineral Resources, December 31, 2022

	Measured Resources			Indicated Resources			Total Measured and Indicated		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	850	1.25	34	5,253	1.04	176	6,103	1.07	210
La Yaqui Grande	0	0.00	0	1,506	0.87	42	1,506	0.87	42
Puerto del Aire	146	5.28	25	1,192	4.95	190	1,338	4.98	214
Carricito	58	0.82	2	1,297	0.82	34	1,355	0.83	36
Total Mulatos	**1,054**	**1.79**	**61**	**9,248**	**1.49**	**442**	**10,302**	**1.52**	**502**

Table 14-45 Mulatos Property Inferred Mineral Resources, December 31, 2022

	Inferred Resources		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	560	0.92	17
La Yaqui Grande	175	1.31	7
Puerto del Aire	139	5.90	26
Carricito	900	0.74	22
Total Mulatos	**1,774**	**1.27**	**72**

Note to Table 14-44 and Table 14-45:

- *The Company's Mineral Reserves and Mineral Resources as at December 31, 2022 are classified in accordance with the Canadian Institute of Mining Metallurgy and Petroleum's "CIM Standards on Mineral Resources and Reserves, Definition and Guidelines" as per Canadian Securities Administrator's NI 43-101 requirements.*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.*
- *Mineral Resources are exclusive of Mineral Reserves.*
- *All Measured, Indicated and Inferred open pit Mineral Resources are pit constrained.*
- *With the exceptions noted following, Mineral Resource estimates assumed a gold price of $1,600 per ounce. Carricito estimates assumed a gold price of $1,400 per ounce.*
- *The Mulatos pit used a cut-off of 0.5 g/t of gold, Puerto del Aire used a cut-off of 2.5 g/t of gold, and La Yaqui Grande and Carricito used a cut-off of 0.3 g/t of gold.*

15 MINERAL RESERVES ESTIMATES

15.1 Puerto del Aire Sulphide

Modifying factors used for Mineral Reserves at Puerto del Aire are similar to those experienced during mining of the San Carlos underground deposit between 2015 and 2018. These are presented in Table 15-1. At a $1,400 gold price, a cut-off grade of 2.75 g/t was calculated. To maintain some conservatism at this early stage of the project, the cut-off grade was increase to 3.00 g/t. Mineral Reserves for Puerto del Aire Sulphides are presented in Table 15-2.

Table 15-1 Puerto del Aire Sulphide Reserve Modifying Factors

Parameter	Value
Dilution	20%
Diluting Grade	0.5 g/t
Mining Recovery	90%
Gold Price	$1,400/oz
Process Recovery	85%
Mining Cost	$75/t
Processing Cost	$25/t
G&A Cost	$5/t
Refining Cost	$5/oz
Calculated Cut-off Grade	2.75 g/t
Cut-off Grade Used	3.00 g/t

Table 15-2 Puerto del Aire Sulphide Reserves, December 31, 2022

	Proven Reserves			Probable Reserves			Total Proven and Probable		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
PDA	397	4.79	61	3,233	4.97	517	3,631	4.95	578
Estrella	56	3.42	6	135	3.43	15	191	3.43	21
Gap-Victor	135	4.95	22	716	4.66	107	851	4.71	129
Total	**589**	**4.69**	**89**	**4,084**	**4.87**	**639**	**4,673**	**4.84**	**728**

15.2 Mulatos Pit

Mineral Reserves at the Mulatos pit are contained within a design pit, which was developed at the start of mining of the final layback, know as the El Salto layback. Ore within the block model has assigned to it variable recovery based on AuCN assay results and modeling. Reserves are reported at $0.10/t NSR cut-off, meaning that if a block of ore within the design pit generates positive from the recoverable gold expected revenue after covering processing and general and administrative costs, it is included in Mineral Reserves. Modifying factors for the Mulatos pit are presented in Table 15-3.

It should be noted that in 2022 while undertaking stripping in El Salto layback, considerable material was encountered that was below cut-off at the then Alamos Mineral Reserve gold price of $1,250 per ounce of gold. With the gold price average of $1,800 per ounce of gold in 2022, this material was considered ore if it met the $0.10 NSR criteria at the time it was mined and was thus processed.

Table 15-3 Mulatos Pit Reserve Modifying Factors

Parameter	Value
Gold Price	$1,400/oz
Process Recovery	variable
Base Mining Cost	$3.50/t
Incremental Mining Cost	$0.015/t/bench
Processing Cost	$12.16/t
G&A Cost	$2.39/t
Cut-off	$0.10/t NSR

15.3 Stockpiles

Other than short term run of mine stockpiles at the crushers, Mulatos has three stockpiles of siliceous argillized sulphide (SAS) material, classified by grade and copper content. This material, due to its sulfidic nature, has lower recoveries than the typical oxide and transition Mulatos ores. As a result, SAS material encountered during mining was stockpiled during the period of 2006 to 2019.

During the period 2020 to 2022, 7.5 million tonnes grading 0.98 g/t, were rehandled from the SAS 2 stockpile, crushed, and placed on the Mulatos leach pad. This material experienced recoveries in the range of 40-50%. Due to the sulfidic nature of this material, lime, and caustic acid consumption for control of pH, were significantly higher than that experienced by typical oxide and transition Mulatos ores. Mulatos plans to process a portion of the stockpiles after completion of mining in the Mulatos pit. End of year 2022 stockpile positions are presented in Table 15-4.

Table 15-4 Mulatos Stockpile Proven Mineral Reserves, December 31, 2022

	Stockpile Proven Reserves		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Crusher Pad	504	0.38	6
SAS 1	504	3.59	58
SAS 2	882	1.51	43
SAS 3	768	2.80	69
Total Stockpiles	**2,658**	**2.06**	**176**

15.4 La Yaqui Grande

Mineral Reserves for La Yaqui Grande are reported within a pit optimized using the modifying factors found in Table 15-5. Mineral Reserves are reported using a cut-off $0.10/t NSR.

Table 15-5 La Yaqui Grande Pit Reserve Modifying Factors

Parameter	Value
Gold Price	$1,400/oz
Process Recovery (capped)	75%
Base Mining Cost	$2.36/t
Incremental Mining Cost	$0.016/t/bench
Processing Cost	$5.25/t
G&A Cost	$2.84/t
Cut-off	$0.10/t NSR

15.5 Mineral Reserves, December 31, 2022

Mineral Reserves for the Mulatos Property, as at December 31, 2022, are reported in Table 15-6.

Table 15-6 Mulatos Property Proven and Probable Mineral Reserves, December 31, 2022

	Proven Reserves			Probable Reserves			Total Proven and Probable		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	310	1.22	12	2,562	1.17	96	2,872	1.17	108
Stockpiles	2,658	2.06	176	0	0.00	0	2,658	2.06	176
La Yaqui Grande	268	0.89	8	16,263	1.26	659	16,531	1.25	667
Puerto del Aire	589	4.69	89	4,084	4.87	639	4,673	4.84	728
Total Mulatos	**3,825**	**2.32**	**285**	**22,909**	**1.89**	**1,394**	**26,734**	**1.95**	**1,679**

Notes:

- *The Company's Mineral Reserves and Mineral Resources as at December 31, 2022 are classified in accordance with the Canadian Institute of Mining Metallurgy and Petroleum's "CIM Standards on Mineral Resources and Reserves, Definition and Guidelines" as per Canadian Securities Administrator's NI 43-101 requirements.*
- *The gold price used for report Mineral Reserves is $1,400 per ounce of gold.*
- *Mineral Reserve cut-off grade for the Mulatos Pit, stockpile and the La Yaqui Pitt are determined as a net of process value of $0.10 per tonne for each model block. Cut-off grade for Puerto del Aire is 3.00g/t*

16 MINING METHODS

16.1 Mulatos Pit

16.1.1 Geotechnical

The Mulatos open pit employs an extensive system of tools to aid in monitoring pit wall stability (Figure 16-1). A SSR 126 ground probe radar and a Maptek LiDAR scanner are used to monitor the El Salto layback and the East Wall. In addition, an S9 Trimble total station is used to monitor over prisms positioned around the pit. Three extensometers are employed, and nine piezometers are in installed in the El Salto and the East Wall.

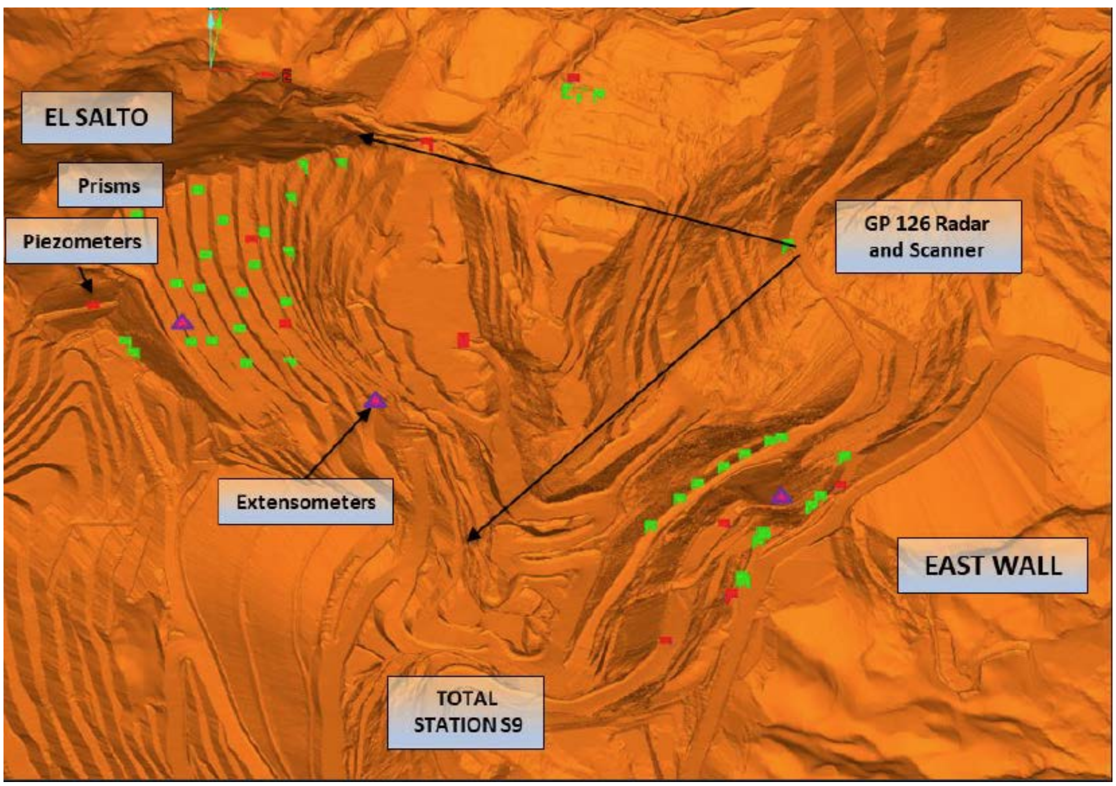


Figure 16-1 Mulatos Pit Slope Monitoring

16.1.2 Mine Operations

The Mulatos open pit mining is a typical drill, blast, load haul operation with mining in the main pit being done with 9 meter bench heights. The open pit schedule calls for an average of 17,500 tonnes of ore per day. Open pit mining is carried out by a contractor under the direction of Mulatos staff. Waste is delivered to waste dumps south of the pit and ore is delivered to the crushing area where it is either direct dumped into the primary crusher or put on to a short term pad. The contractor currently operates with a fleet of three CAT 992 front end loaders, 14 CAT 777 haul trucks, three drills and various pieces of support equipment. El Salto, on the west side of the main pit, is the last in a series of pushbacks and is expected to be completed by the end of 2023. Figure 16-2 depicts the final pit designs for all the pits comprising the Mulatos pit complex.

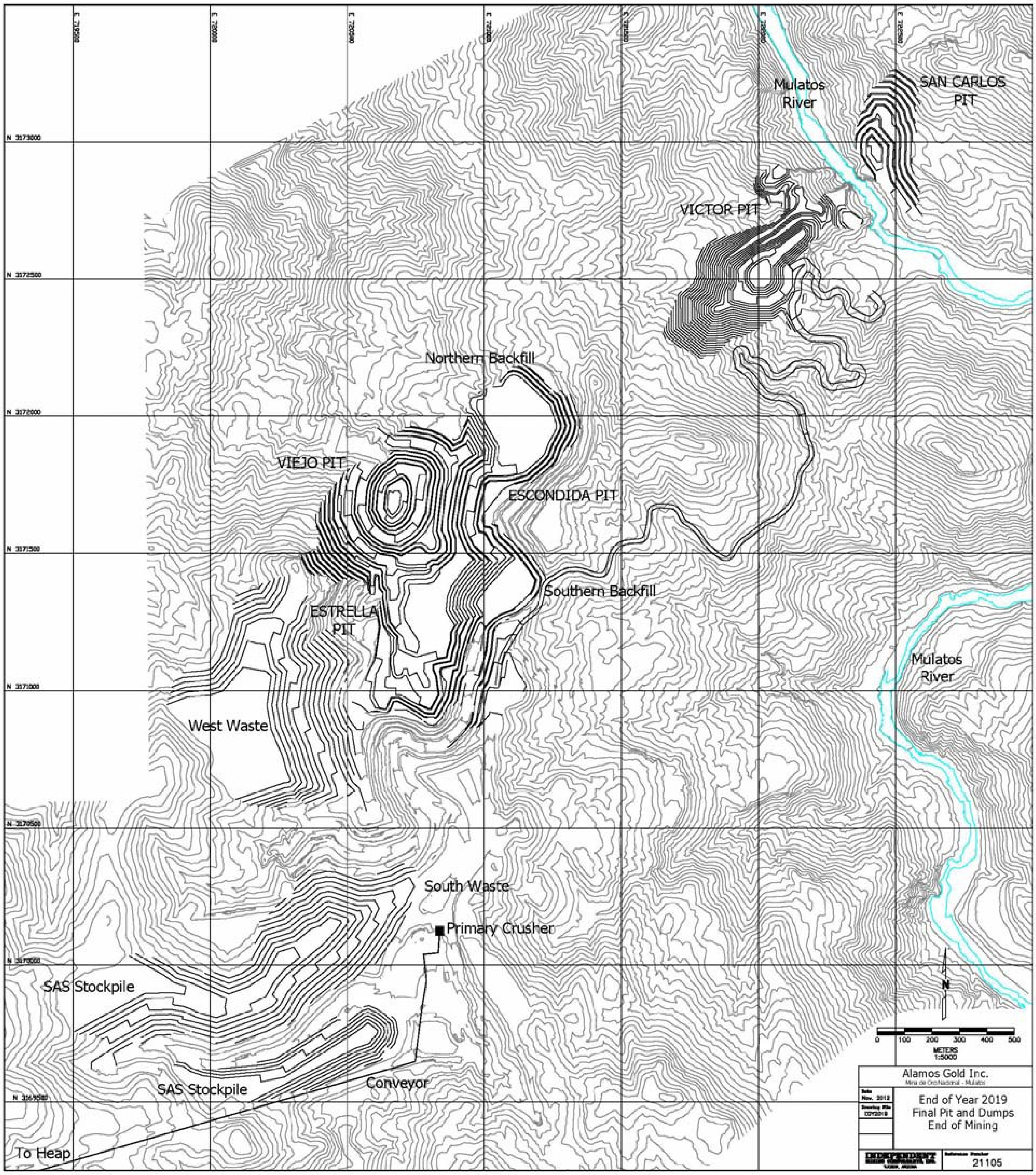


Figure 16-2 Mulatos Pit General Layout

16.2 La Yaqui Grande Pit

16.2.1 Geotechnical Investigation and Pit Slope Recommendations

Knight Piésold prepared a report (Knight Piésold 2021) for Mulatos to present pit slope angle recommendations and supporting documentation for the La Yaqui Grande (LYG) open pit. This pit slope stability evaluation report utilized the pit shell, lithologic/alteration block models, and lithology logs provided by Mulatos along with data from a site investigation completed by Knight Piésold in 2021 at the location of the project site. Table 16-1 provides recommended pit slope geometries for the LYG open pit including interramp slope angles (IRA), bench face angles (BFA), and bench widths (BW) for three different bench stacking options including 9m, 18m, and 27m bench heights (BH).

16.2.1.1 *Geology*

The deposit was formed by sub-vertical hydrothermal intrusion breccias. Lithologies include dacite porphyry and rhyodacite porphyry. The mineralized lithologies have been hydrothermally altered such that rock strength is more a function of degree and type of alteration than a function of parent lithology. The alteration sequence is silica to advanced argillic (alunite and dickite) to argillic (kaolinite to illite) to a pyrophylitic assemblage. Engineering lithologies are based on the alteration model provided by Mulatos. The stratigraphy of these three units is roughly concentric around the ore body with argillic alteration surrounding a relatively thin halo of advanced argillic alteration which surrounds the silicic alteration. Several major faults influence alteration causing rock strengths to vary in the vicinity of the La Yaqui pit.

16.2.1.2 *Geotechnical Field Data*

Pit slope analyses were based on geotechnical field data collected by Knight Piésold in site investigations. Site investigations involving geotechnical coreholes were conducted in 2016, 2017 and 2021. The core logging data was supplemented with data collected from previous site investigations by Knight Piésold performed in 2016 and 2017.

For the 2021 site investigation, a total of six geotechnical coreholes were drilled into the vicinity of the La Yaqui Grande open pit. The six coreholes were logged for geotechnical parameters and sampled for laboratory testing by Knight Piésold. Select samples from the coreholes were point load tested on site during drilling operations.

The coreholes were logged to obtain information on lithology, rock strength, and discontinuity characteristics. Orientation of discontinuities was accomplished in the inclined geotechnical coreholes using the ACT III Reflex tool, which is a digital, accelerometer-based core orientation system used to record the orientation of discontinuities observed in rock core.

Knight Piésold used the geotechnical data to facilitate rock mass characterization in support of development of a geotechnical model for the pit slope evaluation.

16.2.1.3 *Laboratory Testing*

As part of the 2021 core logging program, Knight Piésold selected representative samples from the geotechnical coreholes for laboratory testing. Laboratory testing included unconfined compressive strength (UCS) testing and small-scale direct shear testing (SSDS). The data obtained from the laboratory testing programs were used as input to the slope stability models.

Unconfined Compressive Strength Testing

Unconfined compressive strength (UCS) testing was conducted on 25 samples by Agapito Associates, Inc. (AAI) according to ASTM D4543-08 (preparation) and ASTM D7012-14 (testing). Reported UCS values ranged from 3.5 MPa to 200.4 MPa. Elastic properties (elastic modulus, E, and Poisson’s ratio, v) were also measured on nine of the UCS samples. Measurements of unit weight were also included in the UCS laboratory testing programs.

Direct Shear Testing

Direct shear testing was conducted to estimate shear strength properties of discontinuities. The potential for displacement along pre-existing geologic discontinuities exists because shear stress levels developed within open pits may exceed the shear strengths of rock discontinuities. As such, the determination of discontinuity shear strengths is critical to developing input shear strength parameters for Backbreak analysis, which is an estimate of the angle that slopes will break back to, was conducted in support of bench design.

16.2.1.4 *Geotechnical Model*

Knight Piésold used information provided by Mulatos, the Knight Piésold site investigation data, and data from the Knight Piésold laboratory testing program to construct the geotechnical model. The geotechnical model was developed to facilitate slope stability analyses by simulating site geotechnical and hydrogeologic conditions and is comprised of engineering lithologies, groundwater (pore pressure) conditions, and definition of design sectors.

Selection of design sectors was based on pit wall orientation, rock strength, and discontinuity orientation. Design sectors are shown on Figure 16-3. Stratigraphy of the design sectors is based on the lithology model provided by Mulatos and core logging data from the geotechnical coreholes. Stratigraphic nomenclature developed by Mulatos is preserved for the engineering lithologies, although some simplification has been used where appropriate.

Pit Slope Design Sectors

The La Yaqui Grande open pit was divided into 3 Zones of development, with Zones 1 and 2 designed in 2018. Zones 1 and 2 were redesigned in 2021 due to updates to the strengths of the engineering lithologies used. Zone 3 of the La Yaqui Grande open pit was separated into four design sectors designated Sectors 3A, 3B, 3-C, and 3D. Selection of design sectors was based on slope height, slope orientation, rock properties, and engineering lithologies within each design sector.

Engineering Lithologies

Two-dimensional cross section models were developed to represent each design sector using the selected engineering lithologies. These models provided the basis for computer-based limit equilibrium slope stability analyses. The arrangements of the engineering lithologies within these models were based on the lithology block model provided by Mulatos and lithology logs for the Knight Piésold site investigation geotechnical coreholes.

Hydrogeological Conditions

Knight Piésold assumed that the La Yaqui Grande pit will drain during development, and that drained conditions will be maintained during mining. Therefore, all analyses were conducted assuming drained (zero pore water pressure) conditions without a phreatic surface within the slope. If groundwater conditions change significantly during pit advancement or following future hydrogeologic modeling, then sector recommendations and stability models should be re-evaluated.

Slope Stability Monitoring

Cross sections representing the most critical section for each Design Sector in terms of slope height, slope angle, and location of engineering lithologies were developed for each design sector. These cross sections provide the basis for computer-based limit equilibrium slope stability analyses.

Seismicity

The potential for seismic loading of the La Yaqui Grande open pit slopes was modeled using pseudostatic analyses. These analyses allow for simulation of earthquake loading by application of static forces that represent seismic inertial forces resulting from potential ground accelerations caused by a seismic event.

16.2.1.5 *Probabilistic Geotechnical Parameters*

Probabilistic methods are characterized by statistical distributions of input parameters having some central tendency and some variation around that central tendency. The variations of the geomechanical properties were represented by probability density functions that were developed for each primary Hoek-Brown input parameter) used in the slope stability model analyses. For slope stability simulations, the software sampled each of the input parameters by randomly sampling discrete values of each parameter (from the probability density functions of that parameter) using the Monte Carlo technique. The sampling occurs at the beginning of each simulation and each simulation is typically conducted 1000 times. The following probabilistic geotechnical parameters were used:

- Discontinuity orientation data;
- Discontinuity spacing data;
- Unconfined compressive strength data; and
- Hoek-Brown failure criteria.

16.2.1.6 *Slope Stability Evaluation*

There are three main components to slope stability analysis in support of open pit evaluation. These include global scale slope stability analyses at the ultimate pit scale, bench scale slope stability analyses, and rockfall analyses.

The interramp angles (IRA) correspond to the angles of the open pit slopes measured from the toe to the crest of the pit slope that is not interrupted by haul roads, step-outs, or other mine infrastructure. The IRA can also be defined as the slope angle from a bench crest to a bench crest.

Bench face angles (BFA) were evaluated using the backbreak method and limit equilibrium analyses. Bench widths (BW) for rockfall catchment were developed using the Modified Ritchie. Recommended bench widths greater than those defined by the minimum required for rockfall catchment may be the geometric resultant of the critical interramp angle and critical bench face angle for a given design sector. The recommended slope angles, IRA and BFA, are typically based on the most critical (i.e. lowest) angles defined by these two methods of analysis

The limit equilibrium method was conducted using the commercially available slope stability evaluation software Slide2. The backbreak method predicts the bench face angle that will develop based on the sliding potential of the rock mass along discontinuities such as joints or faults at the bench scale using the Backbreak software.

Pit slope recommendations are the results of any of these methods, or combinations of these methods, such that all design criteria are satisfied that result in the most critical pit slope configurations, which are defined as having the greatest allowable probability of failure and the (typically) lowest allowable Factor of Safety (FOS).

Table 16-1 La Yaqui Grande Slope Angle Recommendations

Sector	Bench Height (m)	Interramp Angle (deg)	Bench Face Angle (deg)	Bench Width (m)
Sector 1a	9	43	69	6
	18	52	72	8
	27	52	67	10
Sector 1b	9	49	80	6
	18	54	74	8
	27	54	70	10
Sector 1c	9	48	78	6
	18	52	72	8
	27	52	67	10
Sector 1d	9	48	78	6
	18	52	72	8
	27	52	67	10
Sector 1e	9	48	78	6
	18	52	72	8
	27	52	67	10
Sector 2a	9	41	66	6
	18	45	73	12
	27	45	58	10
Sector 2b	9	37	58	6
	18	52	71	8
	27	52	67	10
Sector 2c	9	49	80	6
	18	51	71	8
	27	51	67	10
Sector 2d	9	43	70	6
	18	45	62	8
	27	45	58	10
Sector 2e	9	49	80	6
	18	52	72	8
	27	52	68	10
Sector 2f	9	34	52	6
	18	40	57	10
	27	40	65	20
Sector 3a	9	42	67	6
	18	52	72	8
	27	52	67	10
Sector 3b1	9	40	63	6
	18	49	67	8
	27	54	70	10
Sector 3b2	9	44	72	6
	18	52	72	8
	27	54	70	10
Sector 3c1	9	48	78	6
	18	52	72	8
	27	52	67	10
Sector 3c2	9	43	70	6
	18	43	59	8
	27	43	55	10
Sector 3d1	9	35	54	6
	18	44	59	8
	27	51	66	10
Sector 3d2	9	41	65	6
	18	50	68	8
	27	54	70	10

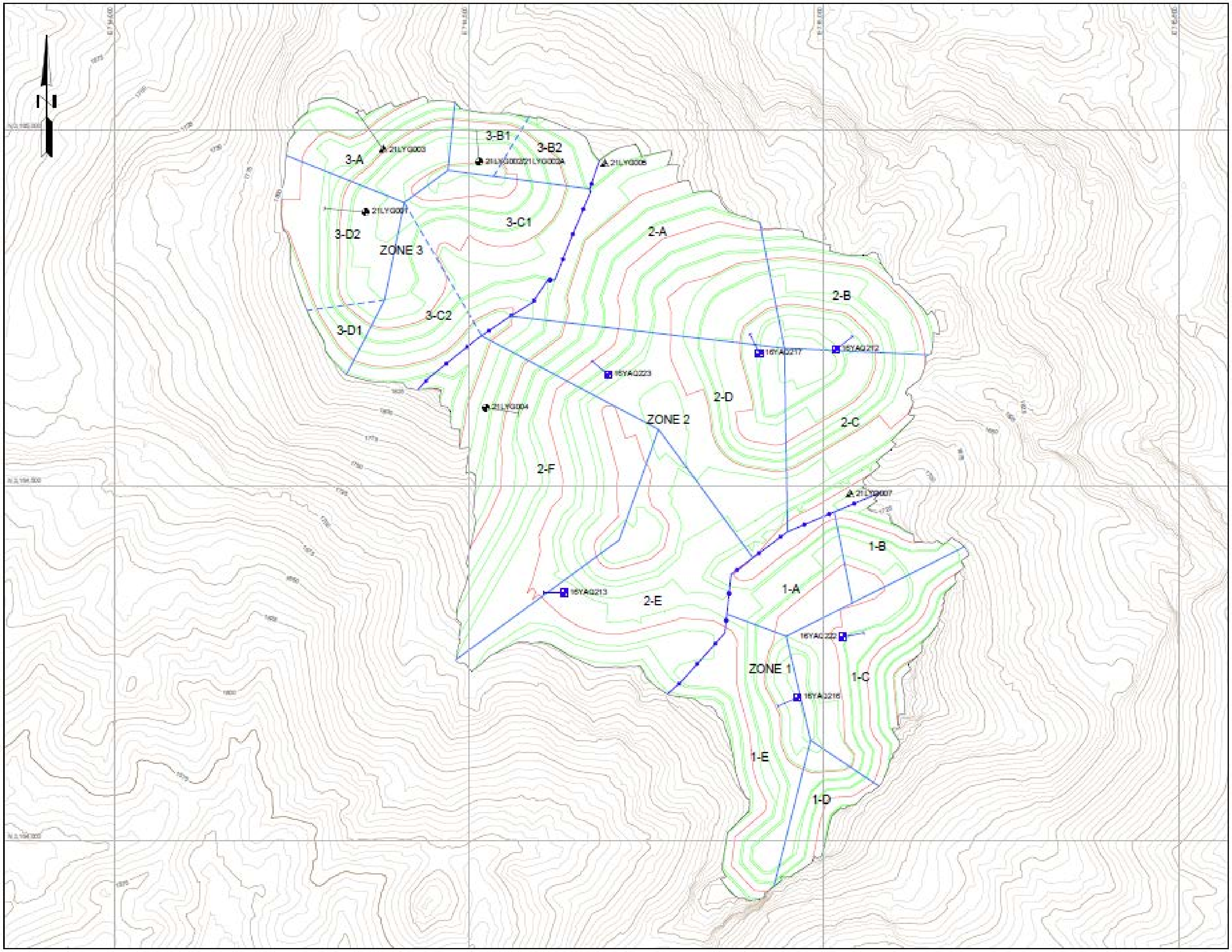


Figure 16-3 La Yaqui Grande Geotechnical Design Sectors

16.2.2 Mine Operations

Mining is undertaken by a contractor, different from that used at the main Mulatos pit, and is supervised by Mulatos staff. The contractor employs six CAT 992 front end loaders, 21 CAT 777 haul trucks, eight drills and 14 pieces of support equipment. Mining of the La Yaqui Grande open pit is expected to continue through 2027. Figure 16-4 depicts the final pit design and site layout for the La Yaqui Grande mine.

The bench height is nine metres, and a catch bench is employed every three benches. The contractor undertakes blasthole and pre-split drilling and explosives are supplied to the hole by an explosive's vendor. The contractor is also responsible for loading and hauling as well as road, bench, and waste dump maintenance. Survey and ore control are undertaken by Mulatos staff.

The primary waste dump is located to the north of the pit and is generally a relative flat haul, with a number of pit exits accessing the waste dump. The crushing plant is located adjacent to the heap leach pad, and both are west of the open pit and accessed via a downhill haul.

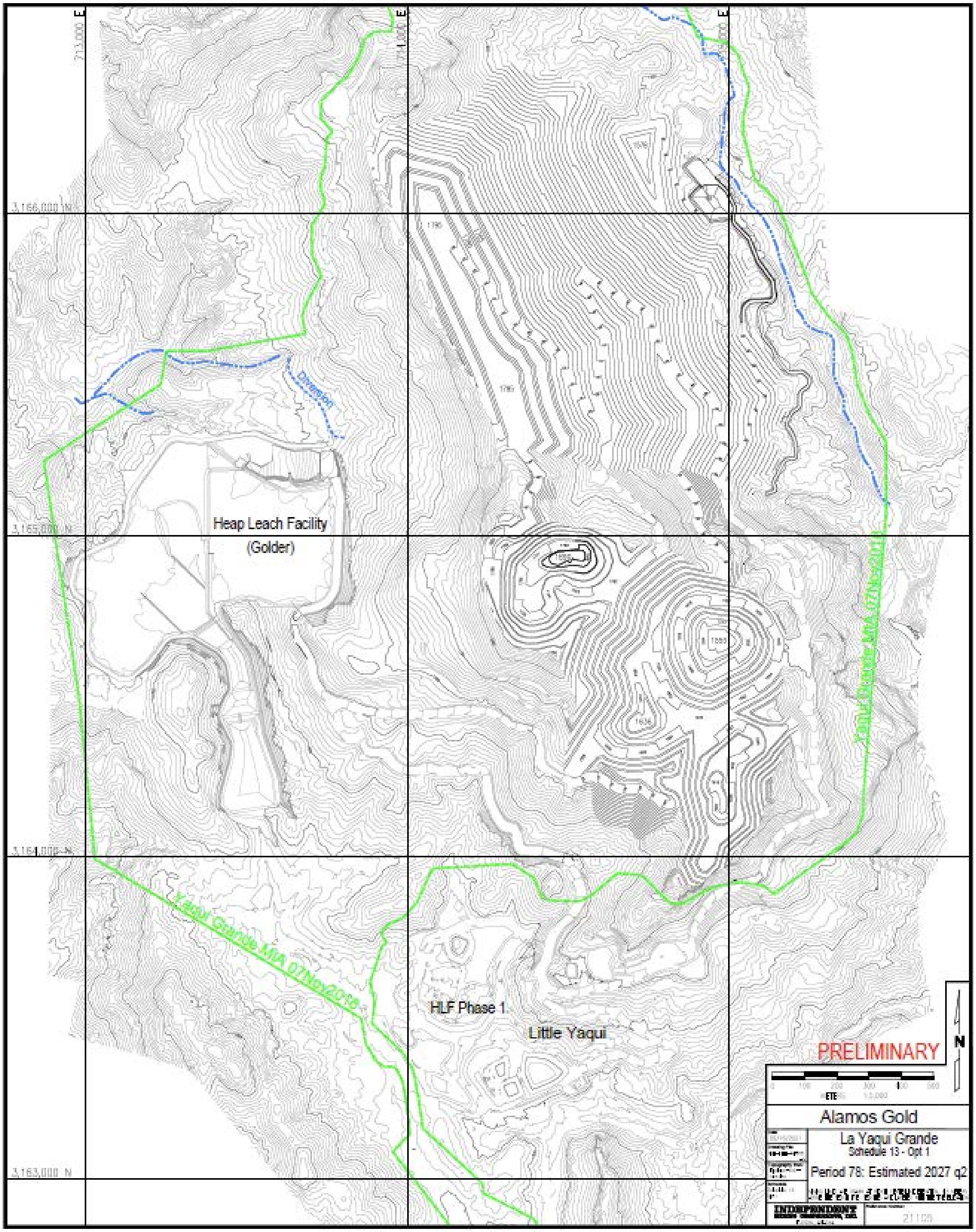


Figure 16-4 Yaqui Grande General Layout

16.2.3 Mine Schedule

Pioneering and pre-stripping commenced at La Yaqui Grande in December 2020 and continued through May of 2022 when the crushing and leaching systems were completed. Through December 2022, a total of 44.3 million tonnes of waste and 2.6 million tonnes of ore were mined. Going forward the mine plan is designed to support a nominal ore exposure rate of 10,000 tpd of ore. The current reserve supports a mine life to mid-2027 with heap leaching continuing through the end of 2027. Annual mining and crushing physicals are presented in Table 16-2. End of year pit face positions are shown in Figures 16-5 through Figure 16-10.

Table 16-2 La Yaqui Grande LOM Physicals

	2023	2024	2025	2026	2027	Total
Total Tonnes Mined	22,250,000	20,700,000	15,669,000	14,400,000	7,613,000	80,632,000
Waste Tonnes Mined	18,599,000	17,050,000	12,019,000	10,750,000	5,683,000	64,101,000
Ore Tonnes Mined	3,651,000	3,650,000	3,650,000	3,650,000	1,930,000	16,531,000
Strip Ratio	5.1	4.7	3.3	2.9	2.9	3.9
Grade Mined	1.30	1.43	1.14	1.33	0.90	1.25
Contained Ounces	152,905	167,940	133,779	156,555	55,821	667,000
Crushing TPD	10,003	10,000	10,000	10,000	5,288	
Tonnes Crushed	3,651,000	3,650,000	3,650,000	3,650,000	1,930,000	16,531,000
Grade Crushed	1.30	1.43	1.14	1.33	0.90	1.25
Produced Ounces	126,686	138,938	114,783	130,385	54,781	565,573
Recovery	82.9%	82.7%	85.8%	83.3%	98.1%	84.8%

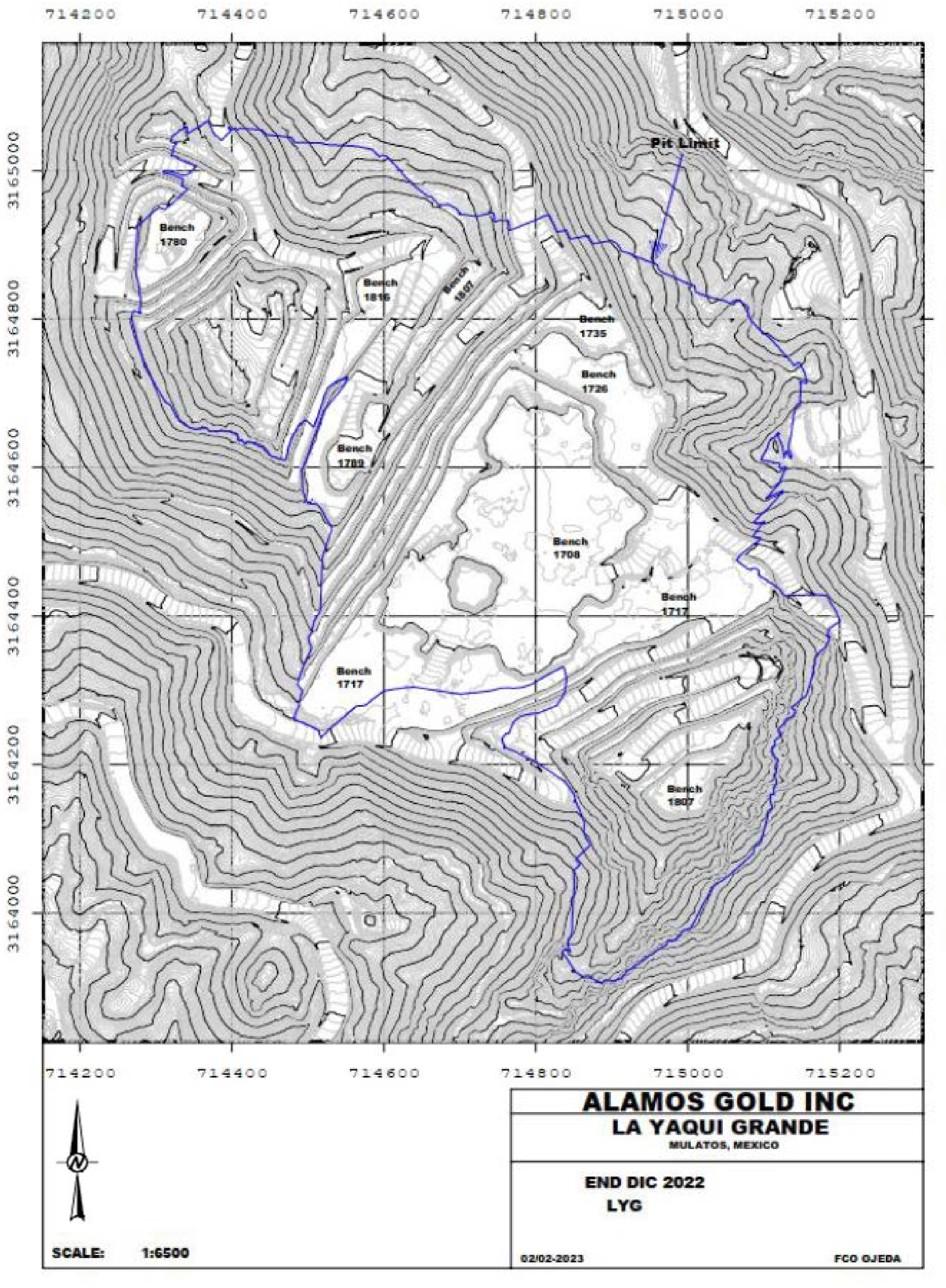


Figure 16-5 La Yaqui Grande Pit Plan, End of 2022

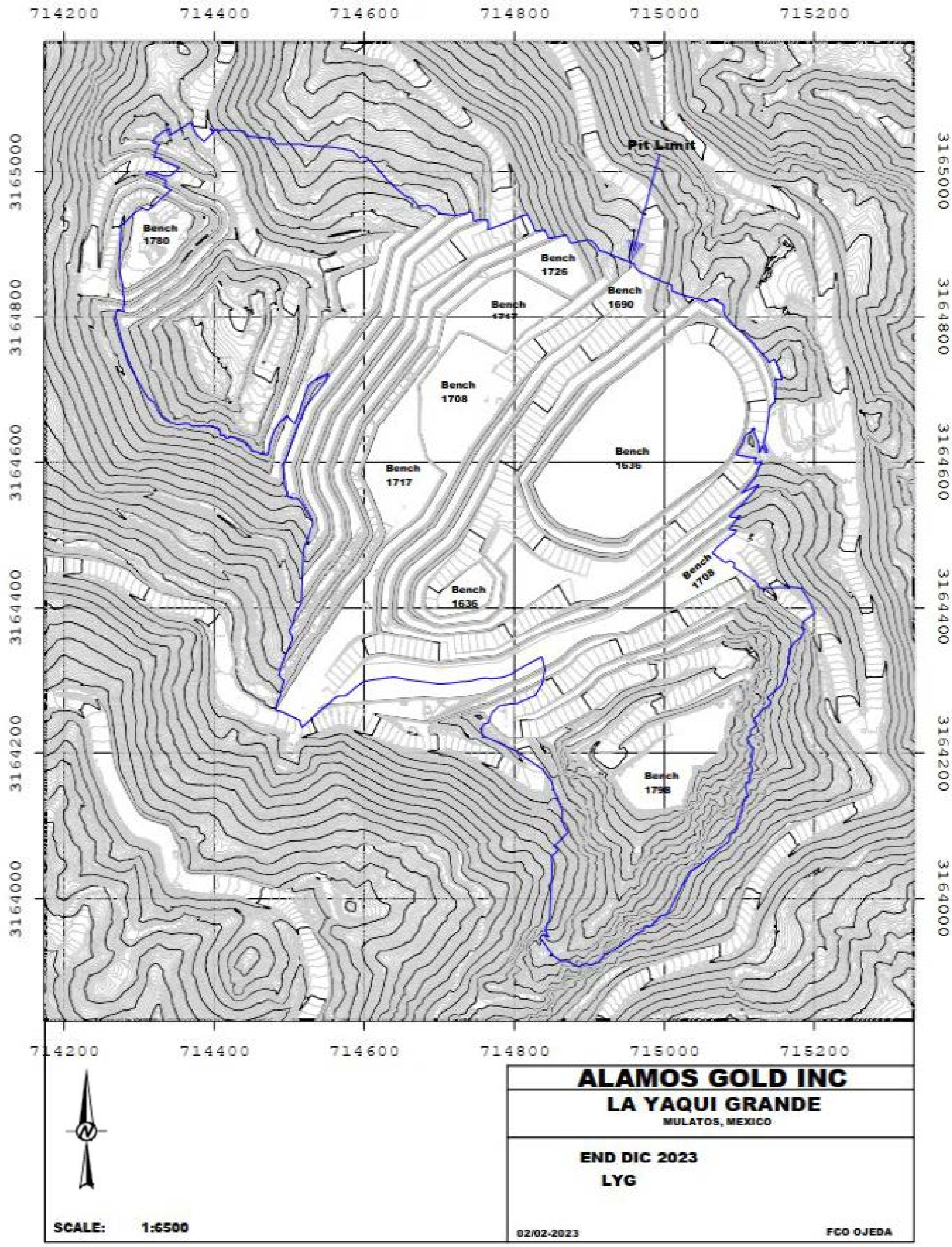


Figure 16-6 La Yaqui Grande Pit Plan, End of 2023

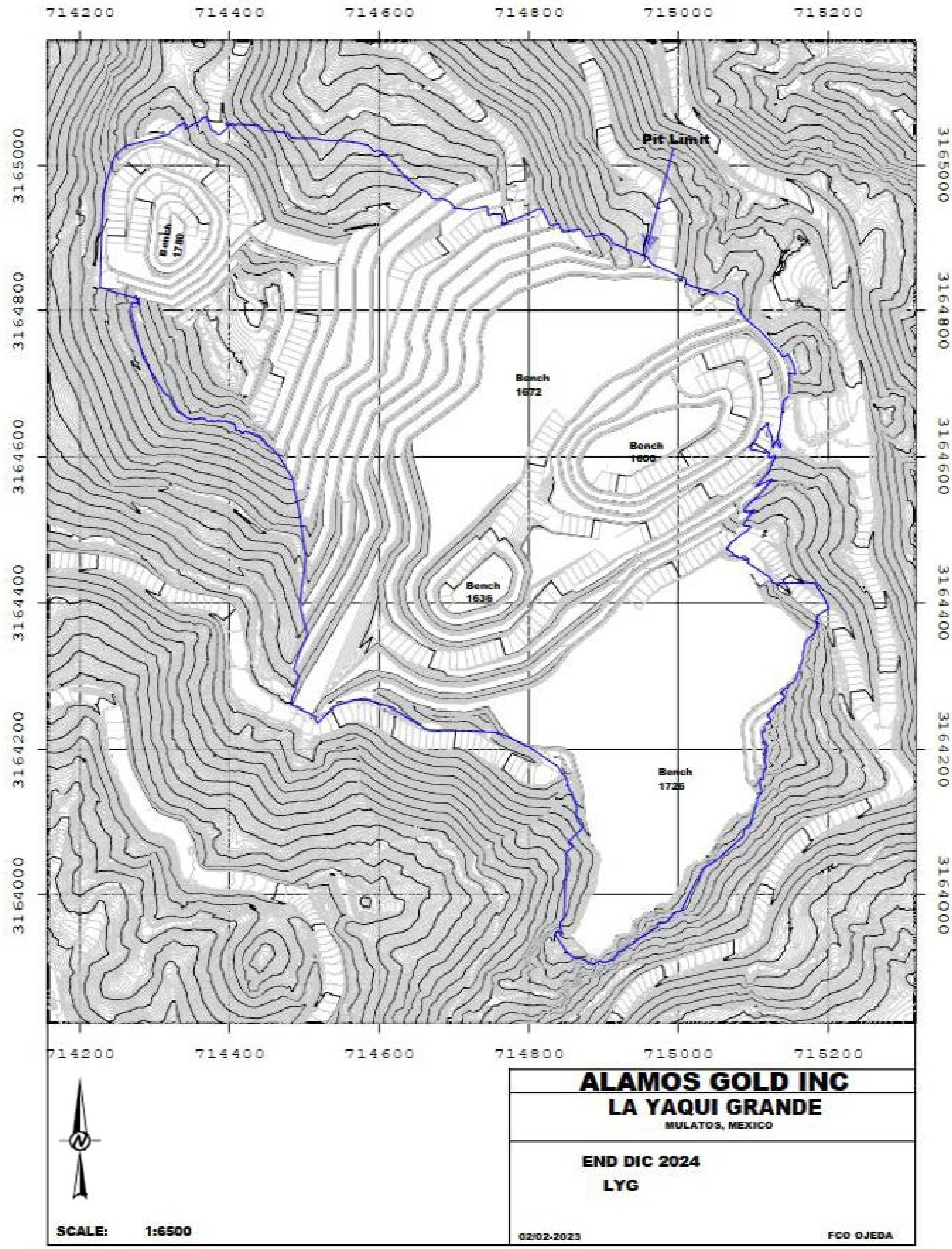


Figure 16-7 La Yaqui Grande Pit Plan, End of 2024

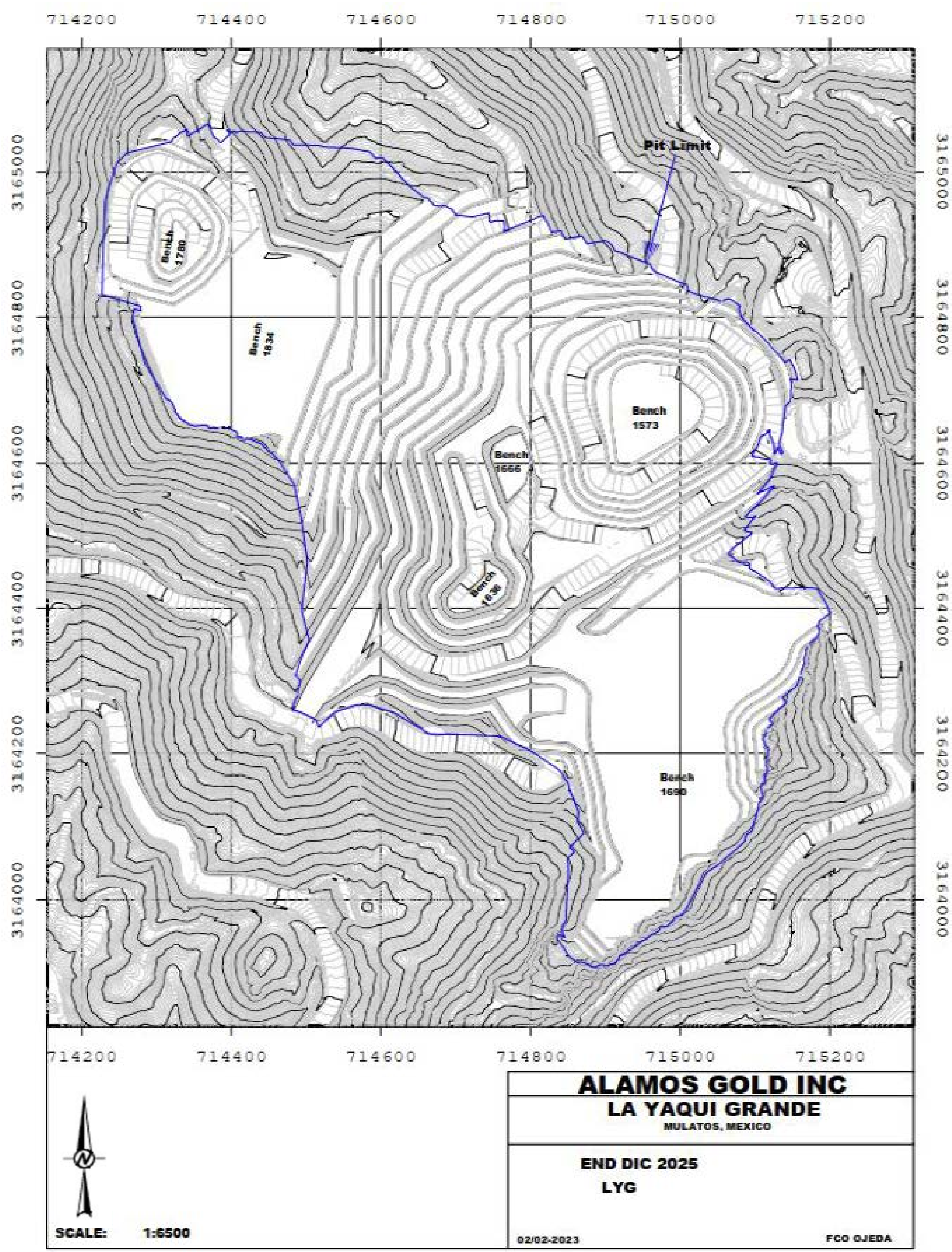


Figure 16-8 La Yaqui Grande Pit Plan, End of 2025

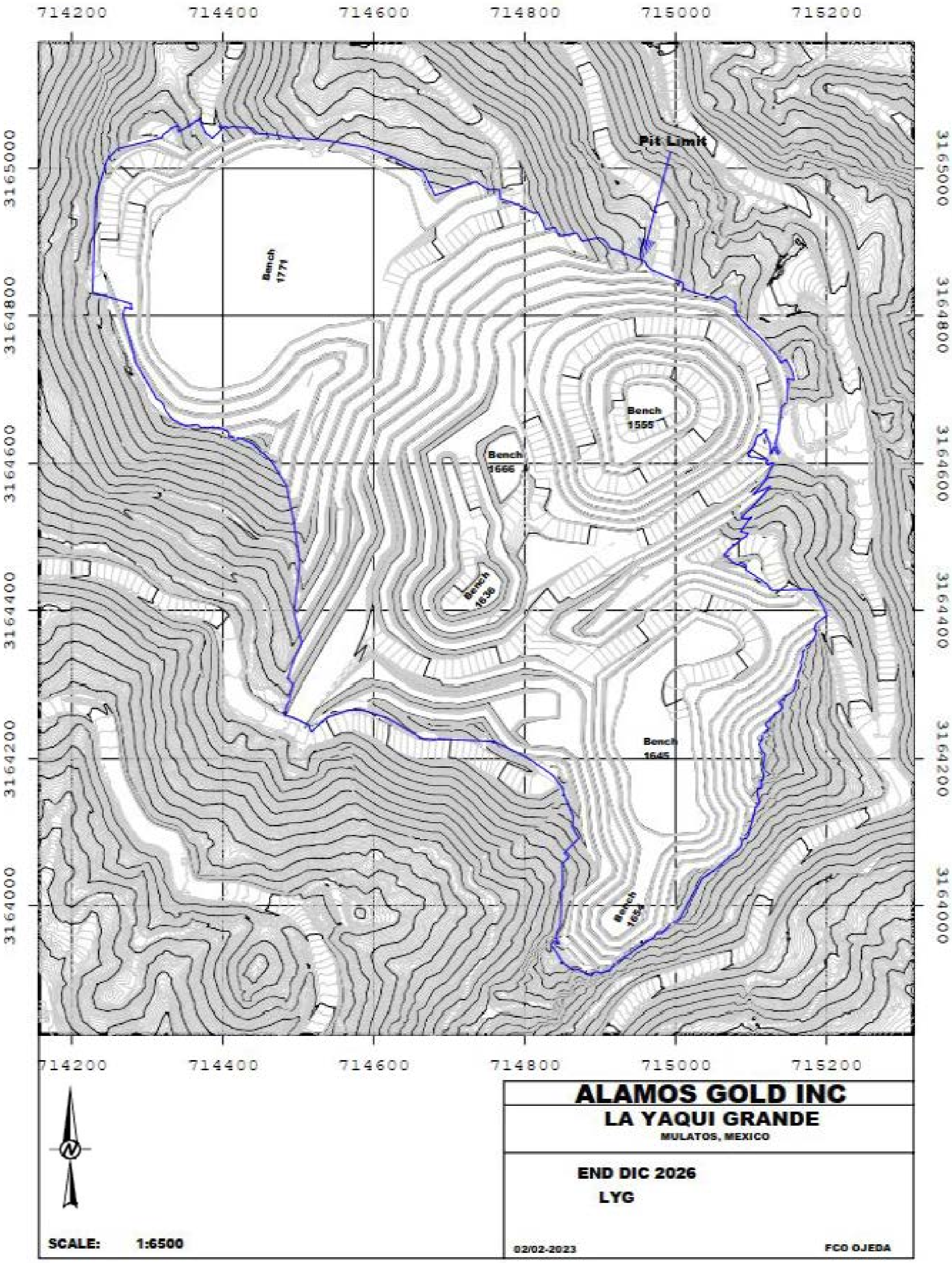


Figure 16-9 La Yaqui Grande Pit Plan, End of 2026

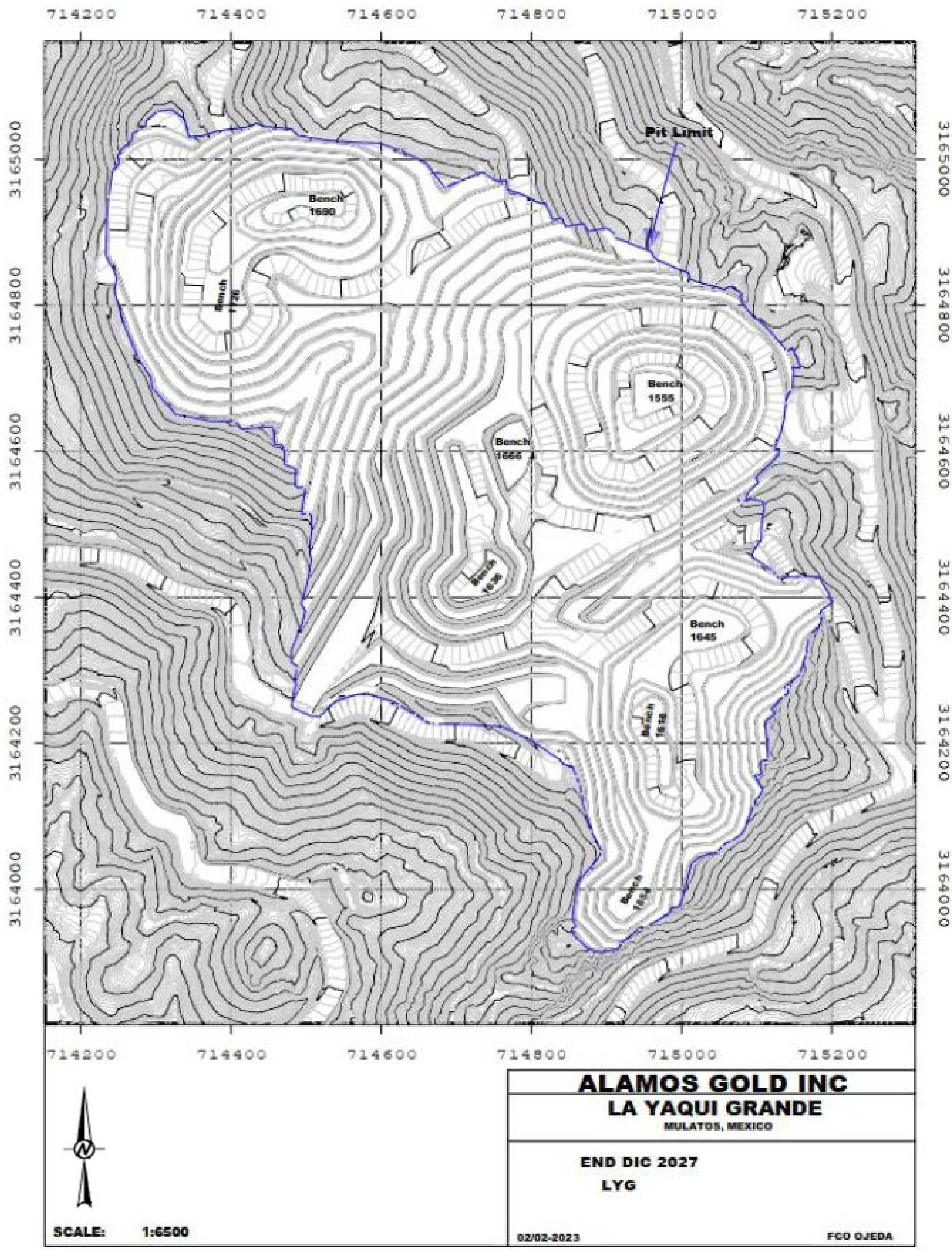


Figure 16-10 La Yaqui Grande Pit Plan, End of 2027

16.3 Puerto del Aire Sulphide Project

While a definitive plan for Puerto del Aire has yet to be developed, conceptual work on a mine plan was done in 2022. These conceptual plans (Practical Mining, 2022) were undertaken on the Mineral Resource as of December 31, 2021. These Mineral Resources have grown considerably since then.

16.3.1 Access

It is envisaged that underground access to Puerto del Aire will be through two portals located in the Estrella portion of the main Mulatos pit. Access points would be at the 1,114 and 1,216 masl levels and would be via 5m wide by 5 metre high development drifts grading no more than +/- 15%. These drifts will accommodate rubber-tired haulage equipment with a capacity of up to 30 tonnes.

Decline from each portal would continue approximately parallel to the northeast and will bracket the PDA mineralization on the southeast and northwest, Internal raises would connect the declines to provide flow through ventilation and secondary egress (Figure 16-11 and Figure 16-12).

The Gap and Victor area would be ventilated by two raises connected to the existing adit coming from the Victor pit.

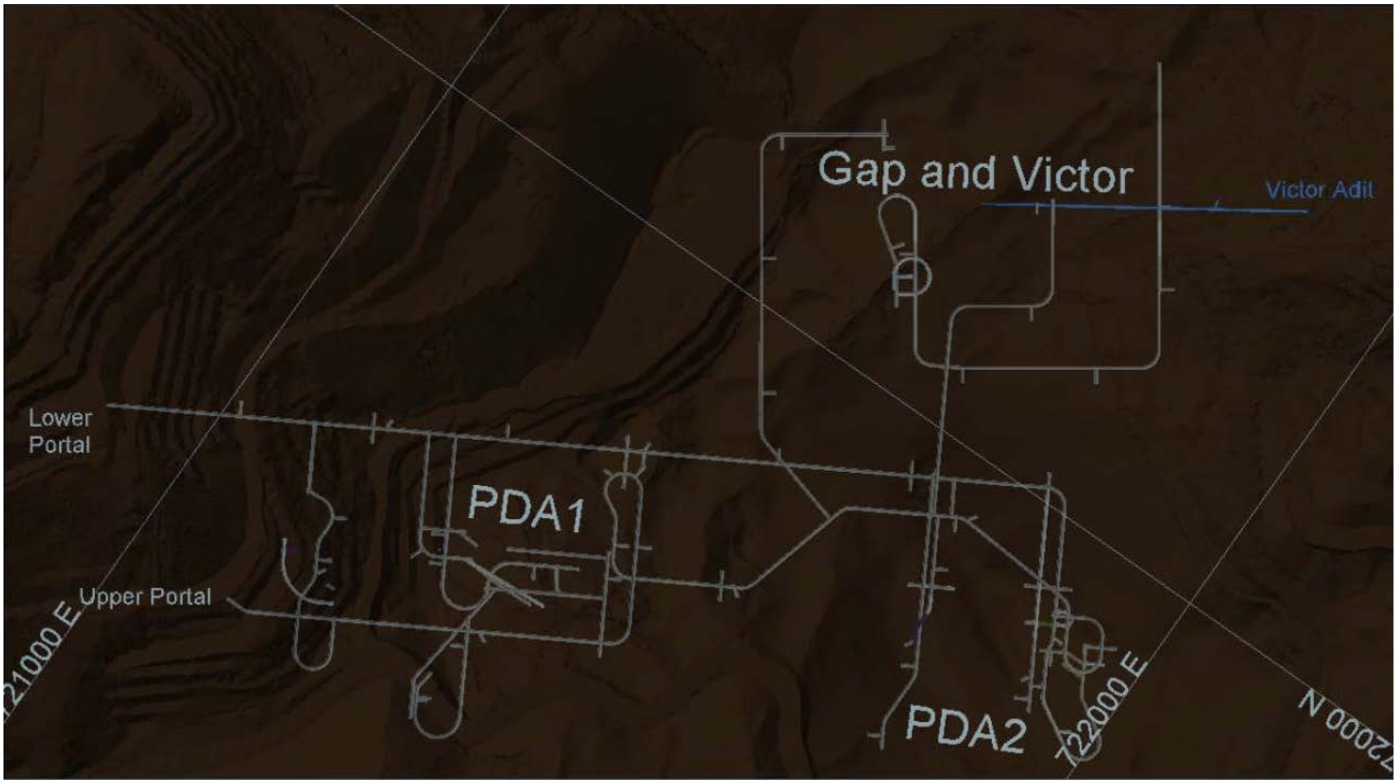


Figure 16-11 Plan View of Conceptual Puerto del Aire Development

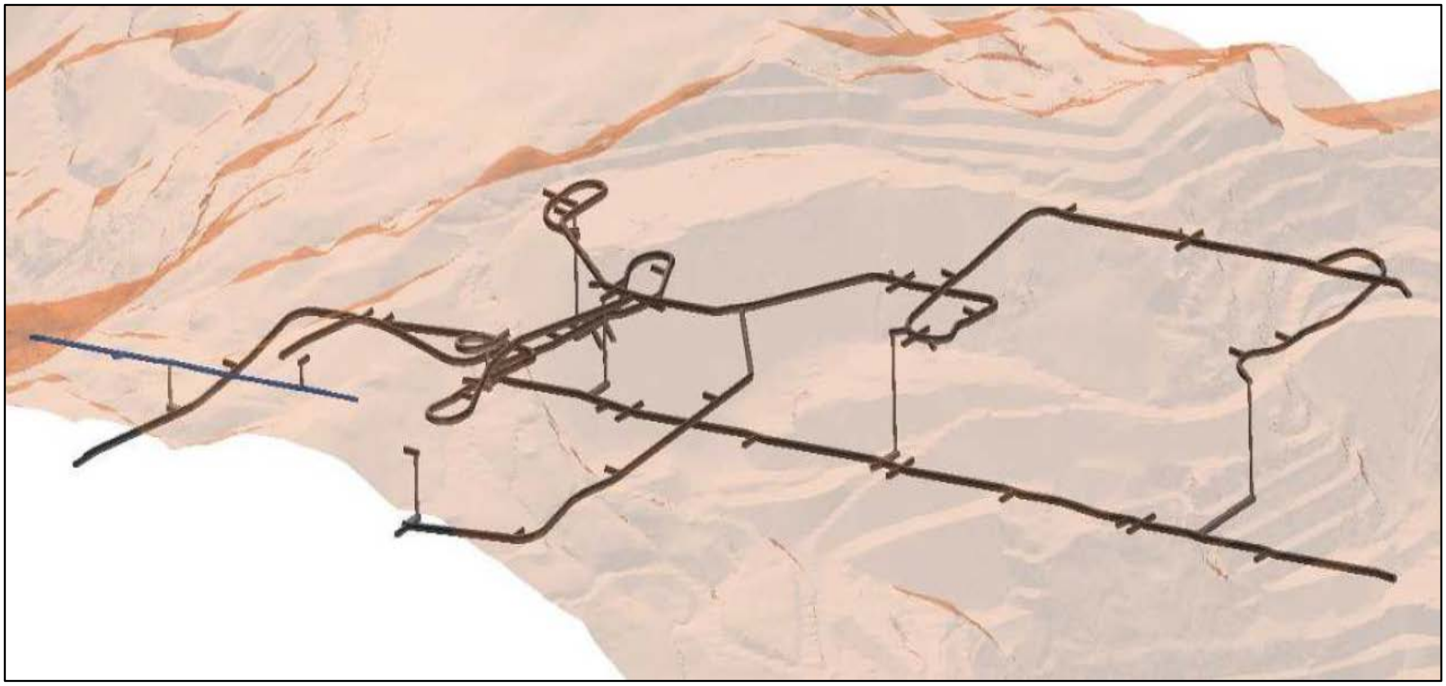


Figure 16-12 Perspective View of Conceptual Puerto del Aire Development

16.3.2 Mining Methods

16.3.2.1 *Long-hole Open Stoping*

Longhole open stopes will be orientated transverse to the mineralization strike, Stopes will be four to five metres in width, Stoping panels can reach one hundred metres if they are broken into shorter sections and backfilled prior to mining the next section. The preferred sequence for longhole stopes is to mine from the bottom up and for drift and fill to mine underhand from the top down.

The stope development drifts for longhole open stoping and for drift and fill would typically be from four to five metres high and four to five metres in width depending on the ground condition and geometry of the ore. The excavations would be created using conventional drill, blast, muck, and support techniques. All aspects of the mining cycle would be mechanized to provide the highest safety standards and productivity levels. Ground support would be like that used in development.

Stopes would be backfilled with low strength cemented rockfill where mining is planned alongside. When mining is planned only above the stope it could be backfilled with unconsolidated waste rock. If no adjacent mining is planned the stope could be left open.

16.3.2.2 *Floor Pull*

If the height of mineralization at the base of a stope sequence does justify another level below, a floor pull could be excavated benching or breasting up the sill. Blasted rock would be removed by ramping form the stope bottom cut. The gradient of the ramp could be up to the maximum gradeability of the loader. Floor pulls could remove up to 10 metres of mineralization in appropriate ground conditions. Where necessary the loader could be operated remotely. Additional ground support cold be applied to the ribs if necessary to protect personal and equipment and prevent excess dilution.

16.3.2.3 *Drift and Fill*

Drift and fill is a very selective mining method. A drift and fill stope is initiated by driving a waste crosscut from the access ramp to the mineralized zone. The initial drift is driven at four to five metres in width and four to five metres in height, with a maximum gradient up to +/- 20% to +/- 30%, depending on capabilities of the loader. The initial drift is driven follows the geometry of the mineralization as closely as practical, One the initial drift is driven, the floor may be pulled and/or the back may be breasted down to capture the full height of the lens. Where mining is planned adjacent to the drift, it would be backfilled with cemented rock fill prior to mining the adjacent drifts.

16.3.3 2023 Work Plan

With a conceptual plan already undertaken and a new and larger Mineral Resource and Reserve available, the following work will be undertaken in 2023:

- Undertake a geotechnical study to determine maximum span widths for stope and support requirements for development and stoping. This will require detailed geotechnical logging of existing exploration holes and the likely requirement for additional geotechnical drilling.
- Partly based on the geotechnical study, and the planned mining methods, refine the dilution and mining recovery assumptions.
- Develop a new mine design based on the expanded Mineral Reserve and Resource, refined geotechnical parameters and refined mining parameters.
- Develop a new mining sequence, with the goal of maximizing the active panels and stopes to support the optimal mining rate.
- Develop information packages to support requests for proposals from local underground mining contractors to support operating capital cost estimates.

17 RECOVERY METHODS

There are three primary recovery processes at Mulatos. The 18,500 tpd Mulatos heap leach facility, the 10,000 tpd La Yaqui Grande heap leach facility, and the 1,000 tpd mill processing plant for high grade ore. A description of these facilities is included below.

17.1 Mulatos Heap Leach Process

Ore is processed through four stages of crushing to a target crush size of 95 percent minus 3/8 inches. The Overall Flowsheet is shown below in Figure 17-1.

Run-of-mine ore is delivered to the primary crusher feed hopper by rear-dump haul trucks. A static grizzly screen above the hopper limits the top size of rock fed to the crusher. Below the hopper, a vibrating grizzly feeder transfers ore. Grizzly screen oversize feeds the primary jaw crusher. Grizzly screen undersize joins the crusher product on the primary crusher discharge conveyor (CV-01) which feeds the primary crushed product to the second stage of crushing. A rock breaker is installed to serve the static grizzly. Tramp iron is removed from the crushed product by way of a magnet mounted above the discharge of the discharge conveyor.

Primary crushed product is fed to the secondary cone crusher. Secondary crushed product is discharged onto a conveyor (CV-02) and delivers ore to the scalping screens by conveyors (CV-03A, CV-04A). Screen oversize reports to screen oversize conveyors (CV-05A, CV-06A) which feed the radial stacker (CV-03) which discharges into the coarse ore stockpile. Screen undersize reports to conveyors (CV-07A, CV-09A) which discharges onto conveyor (CV-15) which ultimately directs ore to the fine ore stockpile.

One reclaim tunnel is installed beneath the coarse ore stockpile. Ore is withdrawn from the coarse ore stockpile by two variable speed apron feeders. The feeders discharge to a conveyor belt (CV-04) which discharges to a surge bin which is installed to choke feed the three tertiary crushers, each with a dedicated vibrating feeder.

The tertiary crushed product is discharged onto conveyor (CV-07) and fed to a vibrating screen. Screen oversize is transferred by conveyors (CV-09, CV-10, and CV-11) and is crushed in the single quaternary cone crusher. The quaternary crushed product is discharged onto the crusher conveyor (CV-12) and re-circulates back to the vibrating screen. The screen undersize reports to the fine ore collection conveyor (CV-13) which discharges onto the fine ore transfer conveyor (CV-14). The fine ore transfer conveyors (CV-15, CV-16, CV-17, CV-18, and CV-19) deliver ore to the fine ore stockpile. Pebble lime is added on to conveyor CV-14 from three storage silos with the rate of lime addition varying with tonnage.

One reclaim tunnel is installed beneath the fine ore stockpile. Ore is withdrawn from the fine ore reclaim stockpile by a feeder. The feeder discharges to a tunnel conveyor belt (CV-20). Cement is added on the tunnel conveyor and delivers ore to the agglomerator feed conveyors (CV-21A and CV-21B) which feed a pair of agglomerators. After agglomeration, the final agglomerated product is transferred by conveyors (CV-22, CV-23, and CV-24), to a series of grasshoppers (portable conveyors), ending with a radial stacker. Ore is discharged from the radial stacker onto the heap leach pad.

Upon completion of crushing, the ore is delivered to the leach pad for stacking and leaching. An impermeable layer of plastic overlies a compacted clay layer beneath the leach heaps. Using a low-pressure irrigation sprinkler system, cyanide solution of low concentration is applied to the ore on the leach pad for gold extraction. The gold-bearing solution is directed to the pregnant solution pond and pumped to the carbon-in-column circuit for gold recovery.

Gold and silver recovery takes place in a carbon adsorption-desorption-recovery (ADR) plant. The adsorption, acid wash, reagent handling and carbon regeneration facilities are in the vicinity of the pregnant pond.

Pregnant solution is pumped to the plant, where gold adsorption on activated carbon takes place in two trains of cascade columns. Barren discharge from the final columns flows to the barren solution tank from which it is pumped to the heap for further leaching. High strength cyanide solution is injected into the barren solution to maintain the cyanide concentration at the desired concentration.

Desorption utilizes a pressure Zadra system, followed by recovery of gold and silver from pregnant eluant solutions in electrolytic cells containing stainless steel wool cathodes. The loaded cathodes are pressure-washed, and the resulting slurry is filtered. The filtered precipitate is dried, and then smelted in the propane furnace.

Transfer of carbon between the various operations is done by recessed impeller pumps. Facilities for adding new carbon and for the short-term storage of stripped and regenerated carbon are also provided. To maintain acceptable carbon activity, the carbon is acid washed. Hydrochloric acid is used for this service. Before carbon is returned to the CIC process, it is thermally reactivated.

Doré bars produced on site and are sent to third party refineries for final gold recovery.

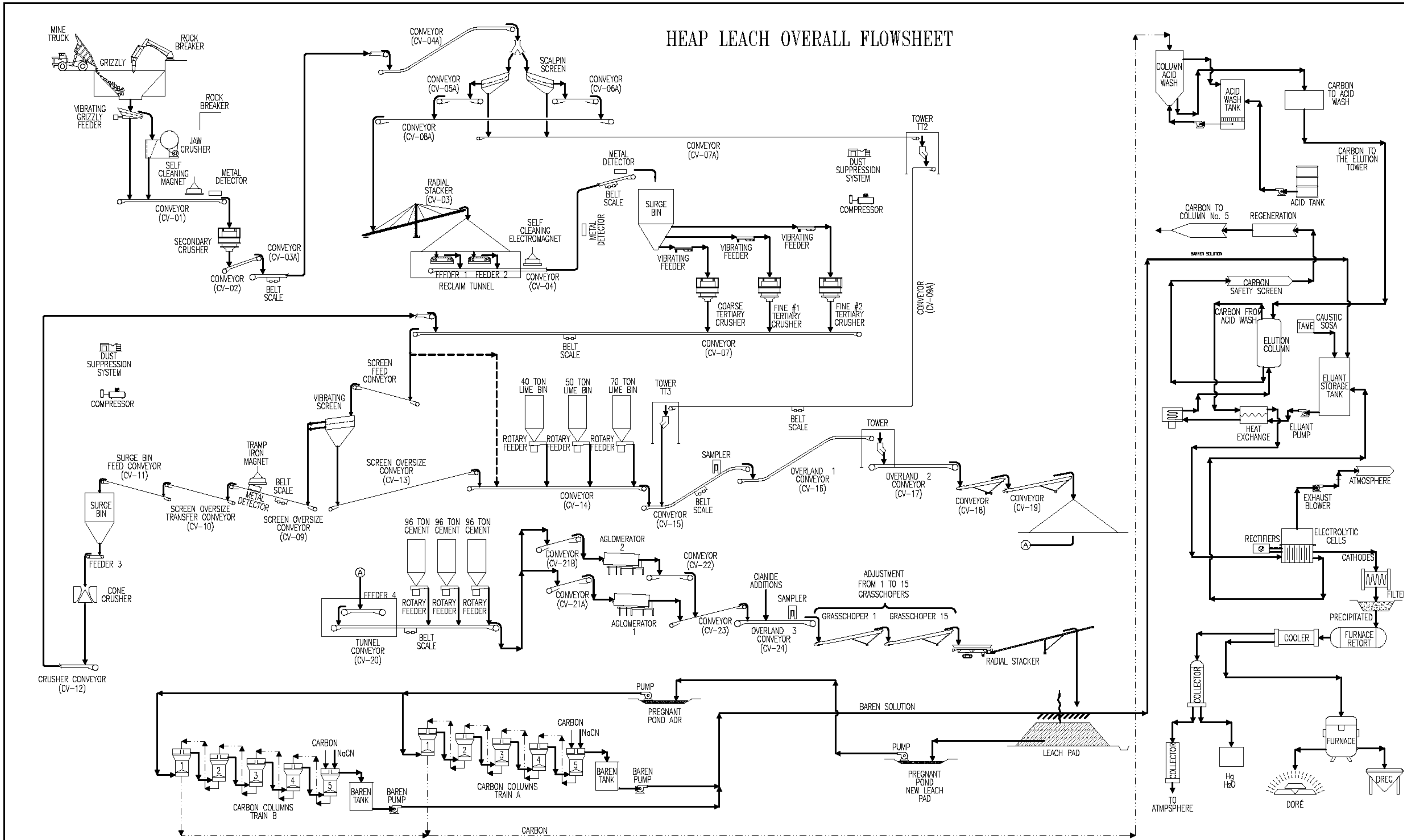


Figure 17-1 Mulatos Heap Leach Overall Flowsheet

17.1.1 Development History

The Mulatos Mine uses heap leach processing for metals recovery. The process involves crushing of the ore, stacking on a lined heap leach pad, and leaching through application of a weak sodium cyanide solution. The solution is collected on top of the leach pad liner which in-turn delivers the solution to a lined pond, then through an adsorption-desorption recovery (ADR) plant for final removal of precious metals from the solution.

AGRA Earth & Environmental, Inc. (now AMEC) prepared a design report, construction drawings, and technical specifications for the Heap Leach Facility (HLF) in 1997 (AGRA, 1997). The pad, as envisioned, would be constructed in two phases across a topographic saddle that separated two small valleys. Phase 1 (South Pad) would be constructed southeast of the saddle at the head of a southeast-sloping valley, and the Phase 1 leach pad would have a lined surface area of about 360,000 square meters (m^2). Pregnant solution would drain to a Pregnant Solution Pond (now referred to as Pond 1) located at the southwest end of the Phase 1 pad and would be processed in an adsorption-desorption recovery (ADR) plant located adjacent to, and east of, the Pregnant Pond. A Storm/Contingency Pond (now referred to as Pond 2) south of the Pregnant Pond would temporarily store water during upset conditions and/or after significant storm events, then stored water would be removed to the process circuit as make-up water. Under the AGRA design, Phase 2 (North Pad) would involve a 330,000 m^2 leach pad expansion adjacent to, and north of, the Phase 1 leach pad on the north side of the saddle. As described below, the Phase 2 expansion ultimately added 286,000 m^2 of leach pad. Both the lining systems and heap for Phases 1 and 2 would connect at the saddle on Phase 2 construction, creating one continuous leach pad. Since the Phase 2 pad expansion drains to the northwest away from the Phase 1 ponds, Phase 2 construction would add a lined pregnant solution pond (now referred to as Pond 4) in the valley north of the Phase 2 leach pad. The lined pond would be fitted with a pumping/piping system to deliver pregnant solution to the ADR plant, or to the Phase 1 Pregnant Pond 1 and subsequently through the ADR plant. The AGRA design provided a preliminary ore capacity for both Phases 1 and 2 of 47 million tonnes, assuming an average stacked dry unit weight of 1.6 tons per cubic meter and 2.5H:1V side slopes (AGRA, 1997).

As discussed below, adjustments to the pad limits, stacking height, and ore stacked density assumptions in subsequent design and construction phases resulted in an ultimate ore capacity of about 70 million tonnes. Figure 17-2 shows the general arrangement of the HLF as well as the final surface of the heap when fully stacked and prior to reclamation re- sloping.

Golder prepared detailed design drawings for Phase 1 in 2004 in support of a Feasibility Study led by M3 Engineering. The drawings incorporated the same design concepts that were developed by AGRA, including the two pond system at the toe of the Phase 1 leach pad (Golder, 2004). Construction of the Phase 1 leach pad started in 2004, but only a portion of the Phase 1 leach pad was constructed. About 224,000 m^2 of the Phase 1 leach pad was constructed during this initial construction period in 2004 and 2005, along with the ADR plant and Pregnant Pond (Pond 1). The Storm/Contingency Pond (Pond 2) was likewise constructed to be used both as an Intermediate Solution Pond and for storage of water during upset events. During this initial phase of pad construction, the pad lining and solution collection systems were installed in the base of the valley that hosts the Phase 1 facilities and extended up the southeast valley wall to the limits of the designed pad. Stacking and leaching in the Phase 1 pad started in July 2005.

In 2008, the remainder of the Phase 1 pad was constructed by extending the lining and solution collection system from the base of the valley up the northwest valley wall to the designed limits of the pad to add an additional 136,000 m^2 of lined pad, completing the planned Phase 1 pad area of 360,000 m^2.

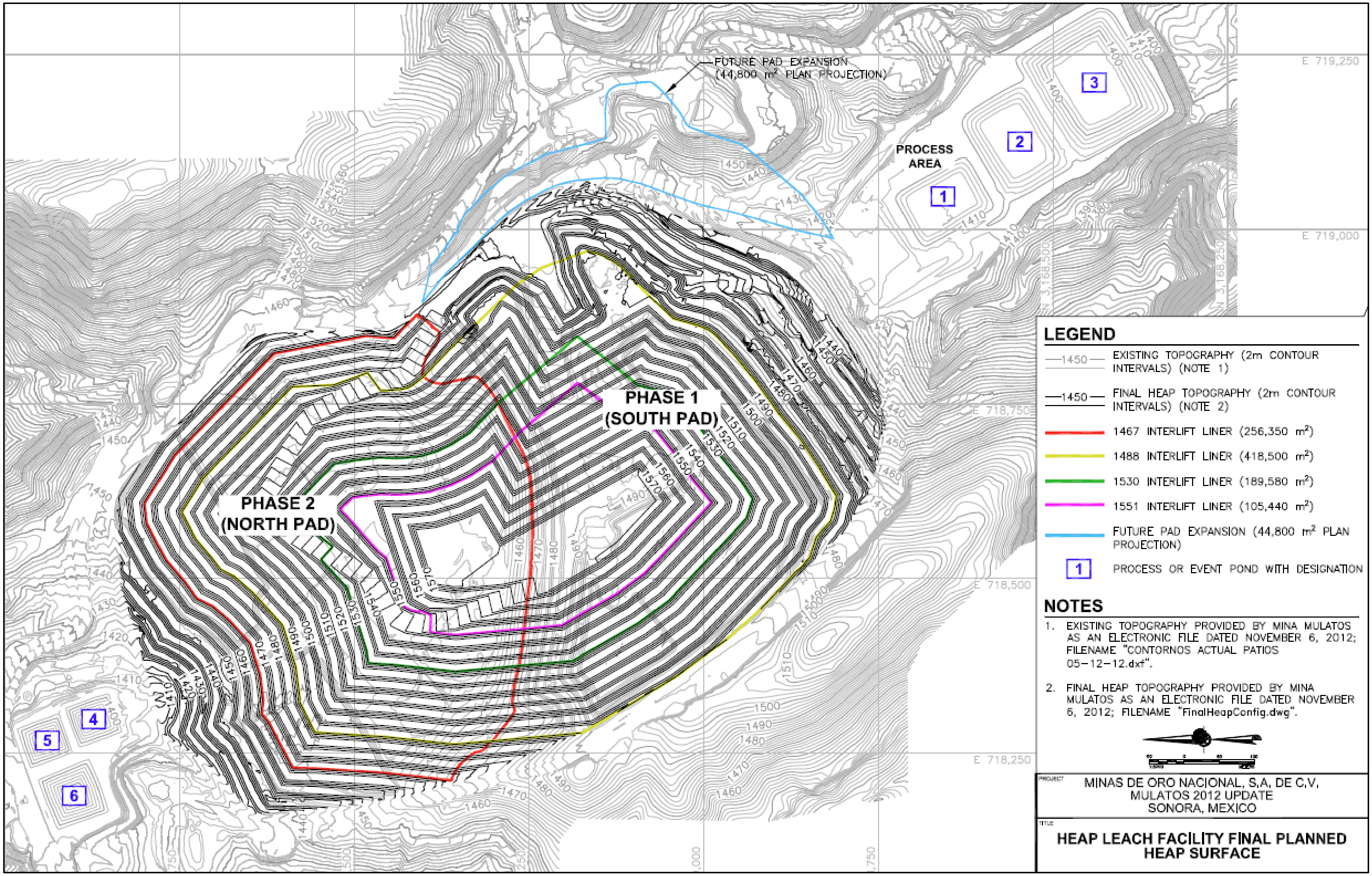


Figure 17-2 Mulatos Phase 1 and 2 Heap Leach Final Design

A third pond, the Storm Event Pond (now referred to as Pond 3), was added in 2008 south of the two existing Phase 1 ponds. With the addition of the Storm Event Pond 3, the existing Intermediate/Event Pond 2 became a dedicated Intermediate Solution Pond. While not included in previous design documents, Alamos designed and installed the Storm Event Pond 3 to both add surge capacity during the wet season and extended periods of rain, and to provide additional process make-up water to reduce the volume of make-up water pumped up from the Mulatos River.

The Phase 2 leach pad and ponds were constructed in the Spring and Summer of 2010 with substantial completion in the 4th quarter of 2010. Stacking started in early November 2010 using portable conveyors and the conveyor/stacker.

The Phase 2 pad expansion, while designed for 286,000 m^2, added about 312,000 m^2 of leach pad, to provide a total lined leach pad area of 672,000 m^2. With the Phase 2 pad expansion adding about 30 to 35 million tonnes of ore capacity and filling in old conveyor corridor on the Phase 1 pad, the Phases 1 and 2 leach pads under the SRK design had a combined capacity of about 60 million tonnes, assuming a placed ore density of 1.65 tonnes per cubic meter, 2.5H:1V overall heap side slopes, and ore stacked to El 1523 m.

Construction by Alamos subsequent to the SRK Phase 2 design included extending the heap upward from the planned elevation of 1523 m to a maximum elevation of 1572 m. At the new top elevation of 1572 m, the heap has a maximum height of about 130 m and an ultimate capacity of about 70 million tonnes assuming a placed ore density of 1.65 tonnes per cubic meter and 2.5H:1V overall heap side slopes.

Alamos identified and constructed a pad expansion area (Phase 3) to the southeast of the Phase 1 pad (shown in Figure 17-2) that holds an additional 9.5 million tonnes of ore.

In 2019, Phase 4 (Figure 17-3) of the leach pad was constructed to the northeast of Phase 1 and Phase 2. Phase 4 has sufficient capacity for the remainder of the Mulatos pit’s Mineral Reserves.

As of December 2022, 97 million tonnes of ore had been placed on the combined Phases 1, 2, 3 and 4 pads.

The HLF site is near the head of two minor watersheds tributary to the Mulatos River, and storm water diversion systems have been constructed around the perimeter of the facilities to divert flows developing from a 100-year, 24-hour storm event of 122 mm falling on tributary areas upstream of the HLF (SRK, 2009).

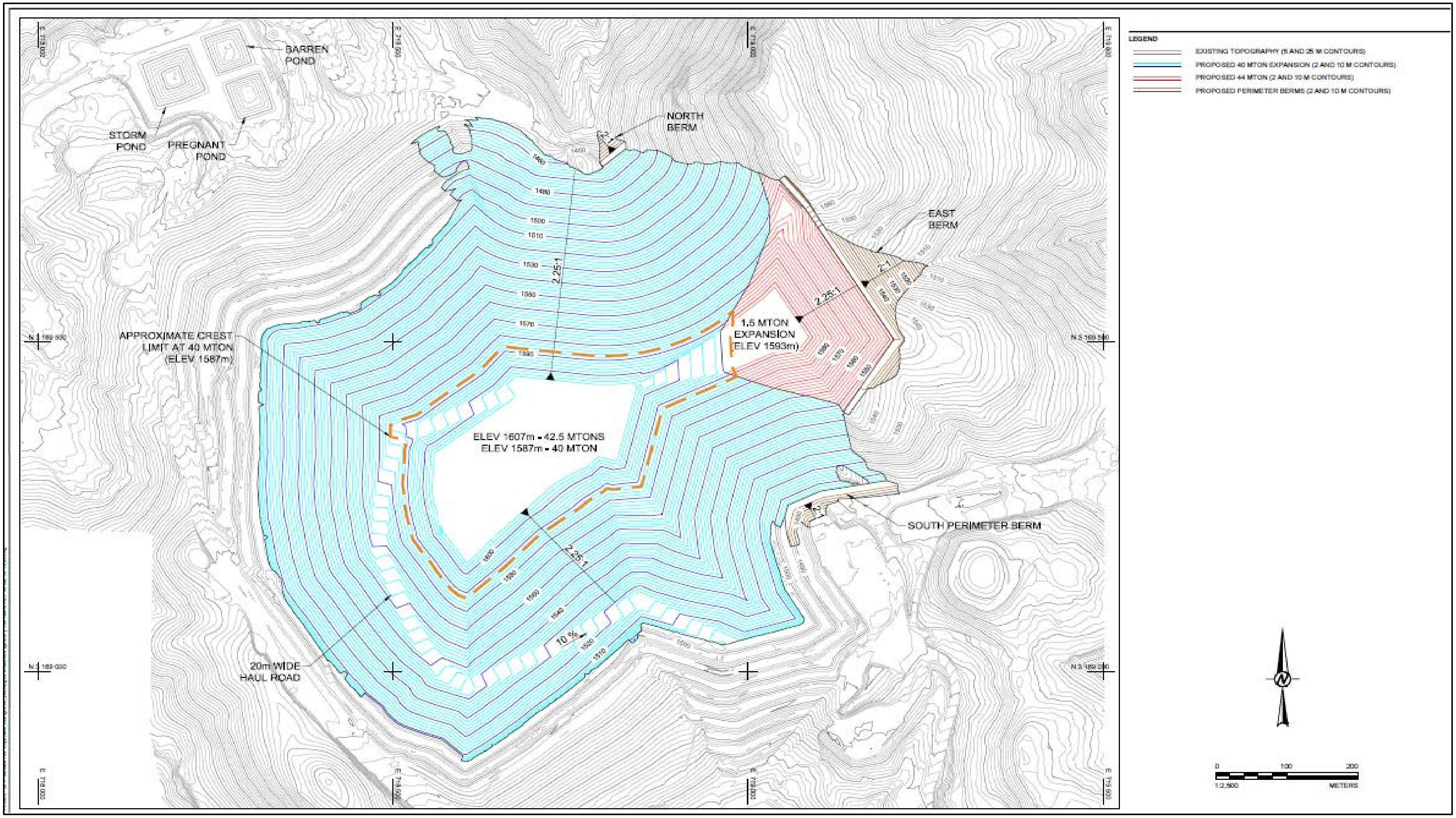


Figure 17-3 Mulatos Phase 4 Heap Leach Expansion

17.1.2 Lining Systems and Pad Overliner Solution Collection

Perched subsurface water was identified beneath the HLF prior to facility development at depths as shallow as 10 meters and to greater than 50 meters. Base lining systems were selected, designed, and constructed for both the heap leach pad and associated ponds that minimize the risk of impacting subsurface water with mining solution.

Underdrains were installed prior to mass grading of both phases of the HLF site and prior to liner construction in the base of the primary drainages that host the HLF. Underdrains were likewise installed in locations where springs were identified in valley walls during construction, with these drains tied to the main valley drains. Valley drains emerge from beneath the HLF downstream of both the Phase 1 and Phase 2 ponds.

The base lining systems for both Phases 1 and 2 of the heap leach pad were constructed using a composite liner and drain system. The composite liner consists of a 2.0 mm high density polyethylene (HDPE) geomembrane placed above a minimum of 30 cm of a clayey soil compacted to have a permeability of not greater than 1×10^{-5} centimeters per second (cm/sec) (SRK, 2009). The 2.0 mm HDPE liner used for both phases of the leach pad was tested during the original design for puncture using bedding and cover soils that were to be used in construction with results indicating adequate puncture resistance when tested under heap pressures equivalent to 200 meters of ore (AGRA, 1997).

A layer of crushed rock or ore placed on top of the leach pad geomembrane liner serves to both protect the geomembrane from mechanical damage and to direct solution as a drainage layer to a system of gravity collection pipes placed within the drainage layer above the geomembrane. The Phase 1 drainage layer was designed to be placed to a minimum thickness of 60 cm but in some areas has been placed to as thick as 2 meters. The material used for this drainage layer was manufactured on-site by screening a colluvial soil that was mined as pit overburden. Crushed ore manufactured in the mine’s production crushing facilities was placed to a minimum depth of 1 meter for the Phase 2 drainage layer. A permeability of 5×10^{-3} cm/sec was assumed for the drainage layer during Phase 2 design for gravity collection pipe design (SRK, 2009).

A gravity pipe network placed above the base liner (within the drainage layer) collects pregnant solution and coveys it to the ADR plant. Both corrugated polyethylene (CPE) and high density polyethylene (HDPE) pipe were used in the gravity collection pipe systems for both Phases 1 and 2. CPE pipe is dual wall, with an exterior corrugated wall and an interior smooth wall. In Phase 1, significant drainages were fitted with Primary/Secondary perforated CPE pipes of increasing diameters of 300 mm, 380 mm, 450 mm, and 600 mm, as areas tributary to the Primary/Secondary pipes increased. Two 600 mm diameter pipes exited the toe of the Phase 1 heap, with each pipe tight-lined into a 600 mm non-perforated HDPE pipe, that in-turn transmits flows to the Pregnant Pond. A network of 100 mm perforated CPE Tertiary pipes was installed for the Phase 1 pad at a spacing of 12 meters. For Phase 2, each leach pad cell has a Primary pipe that originates within the cell and carries flows to the ADR plant. The Primary pipe is either 300 mm or 380 mm diameter DR21 HDPE. Either 300 mm or 380 mm CPE pipe serve as Secondary collection pipes and extend out from the Primary pipe in each cell. Tertiary piping is distributed across the leach pad at a regular spacing of 10 meters (Phase 1) to 6 meters (Phase 2) and provides the primary means of collecting and distributing solution above the liner to the Primary and Secondary piping. Phase 2 Tertiary piping is 100 mm CPE pipe, like that used for Phase 1.

Inter-lift liners were constructed using 1.0 mm LLDPE geomembrane. After grading and sloping the leached ore for both drainage and stability, the crushed ore surface was smoothed, and the liner installed on the smoothed surface. A similar pipe and cover system was installed above the El. 1467 m. inter-lift liner as was used for the Phase 2 leach pad, which included installation of a network of Tertiary 100 mm perforated CPE pipes spaced at 5 meters, and feeding progressively larger Secondary 250 mm, 300 mm, and 380 mm diameter perforated CPE pipes. Collection piping was placed within a 1 meter thick layer of crushed and agglomerated ore. The 380 mm CPE pipes that exit each cell were tightlined to 400 mm non-perforated HDPE pipes at the cell outlet, and in-turn delivered pregnant solution from each cell to a Pregnant Pond (South Pregnant Pond 1 for Phase 1 and North Pregnant Pond 4 for Phase 2). The 1.0 mm LLDPE geomembrane used for the inter-lift liners may not be as robust as the Phases 1 and 2 lining systems, but it is not intended to serve as an environmental barrier, which is provided by the 2.0 mm HDPE base liner.

The Pregnant Solution (Pond 1), Intermediate Solution (Pond 2), and Storm Event Ponds (Pond 3) of Phase 1 were constructed with a double lining system fitted with a leak detection system between the two liners. After mass grading and shaping of the ponds had been completed, a 15 cm thick fine-grained soil was placed as bedding for the lining system. A 1.5 mm HDPE geomembrane was placed on the bedding layer as a secondary liner, and a 2.0 mm HDPE liner was used as the primary pond liner. An expanded HDPE geonet installed between the two geomembranes conveys flows by gravity to a sump from which fluids can be detected and removed as needed.

The North Pregnant Solution Pond 4, Intermediate Solution Pond 5, and North Storm Event Pond 6 of Phase 2 were constructed with 1.5 mm HDPE geomembrane for the primary liner, and the secondary liner is a 1.5 mm HDPE drain liner which provides the separation necessary for leak detection between the two liners. The lining system was installed over a 30 cm soil bedding layer.

17.1.3 Crushing and Stacking

When stacking of the leach pad was initiated in July 2005, the planned crushing and conveying system had not been completed. In this early period of stacking, Run-of- Mine (ROM) ore was stacked on the lower lifts of the leach pad by end dumping with the mine’s fleet of 100 tonne mine haul trucks in lifts of between 6 and 8 meters. A three- stage crushing circuit was brought on-line in the 4th quarter of 2005 which reduced the ore to a product with 60 to 65 percent passing 3/8 inches. With the new crushing circuit, ROM ore placement ended in 2006. The crushed ore was not being agglomerated, and mine haul trucks continued to haul and place crushed ore on the leach pad, an operation that continued through the 1st quarter of 2008.

In December 2008, Alamos commissioned two drum agglomerators, an overland conveyor, and mobile (“grass-hopper” type) conveyors on the heap coupled with a radial stacker. Stacking resumed in lifts of nominally 7 meters in thickness, and a stacking plan was formalized by Alamos in 2008 (SRK, 2008). Quaternary crushing started in December 2009.

Quaternary crushing currently produces a product with 90 to 94 percent passing 3/8 inches. Agglomeration with about 4 to 5 kilograms per tonne (kg/t) lime and 3 kg/t cement binds the naturally occurring and crusher-produced “fines” to the larger ore particles to enhance percolation, as well as raising the pH of the solution. Lime is added to the ore on the conveyor belt after quaternary crushing and before passing through one of two parallel drum agglomerators. The cement is added just prior to the drum agglomerators, and barren solution is added within the drum agglomerators.

Under current practices, the surface of each lift of ore is being ripped immediately prior to stacking the subsequent lift. Ripping extends to a depth of about 80 cm using a 3-shank ripper bar mounted on a CAT D-6 track-dozer.

With the progressive addition of crushing, conveyors, inter-lift liners, and more aggressive management of stacking and leaching, ore placement and processing has increased from 10,000 tonnes per day in 2005 to the current rate of about 18,500 tonnes per day.

17.1.4 Leaching and Solution Management

Ore is leached using an array of wobblers at a unit application rate of about 8 liters per hour per square meter. Production goals are to leach up to 120,000 square meters of ore at any time, and ore is typically leached in a single cycle for a period of at least 120 days. Pregnant solution is processed through the ADR plant at a total throughput process rate of 25,000 cubic meters per day. At this process rate, the solution draining from about 80,000 square meters under leach is passed through the ADR plant, while the solution draining from about 40,000 square meters reports to an Intermediate Solution Pond for re-application to the heap.

After draining through the heap, pregnant solution is collected in the above-liner drainage system separated into hydraulically-isolated cells. Solution from each cell is piped to a launder (switching system) that allows the operator to pass flows directly to the appropriate Pregnant Solution Pond (Pond 1 or Pond 4) for processing through the carbon-in-column train and ADR Plant, or to direct flows to the Intermediate Solution Ponds (Ponds 2 or 5) for re-circulation back to the heap. Flow into the North Pregnant Solution Pond (Pond 4) is pumped to the South Pregnant Solution Pond (Pond 1) and the ADR plant.

After metals are removed through carbon adsorption and subsequent stripping, barren solution is transferred to a Barren Tank at the ADR Plant site, sodium cyanide added, then pumped to the heap for application. A second train of carbon columns was added in the 4th quarter of 2010.

The Mulatos Mine is in a net-evaporation setting and the as-delivered ore moisture content of 3 to 4 percent requires significant water addition during processing and leaching to overcome the specific retention of the ore. Except during extended periods of precipitation, make-up water must be constantly added to sustain processing. In 2008, Alamos constructed an additional lined pond South of the Phase 1 process ponds (Pond 3) to store water during the wet season and during periods of high rainfall runoff from the leach pad. Make-up water is from accumulations in the new pond during wet weather, and from 5 to 6 pumps pumping from the Mulatos River, feeding two booster pumps, which in-turn send the water up to the process facility.

17.1.5 La Yaqui Grande Heap Leach Facility

Th La Yaqui Grande heap leach facility was commissioned in May 2022. Ore is processed through three stages of crushing to a target crush size of 80 percent minus 9.5 mm, at a rate of 10,000 tpd. The overall flowsheet is shown below in Figure 17-4 and described in the following sections.

17.1.6 Primary Crusher

Run-of-mine ore (ROM) is trucked from the mine by 100 tonne haul trucks to the crushing plant. The mine trucks normally direct dump onto a stationary grizzly located over the dump pocket. Alternatively, ROM ore may be trucked to a stockpile ahead of the primary crusher and later reclaimed using a front-end loader.

An apron feeder draws ore from the dump pocket at a controlled rate and dumps into a vibrating grizzly feeder with the feeder oversize reporting to the jaw crusher. The grizzly feeder undersize material bypasses the primary crusher and combines with the crusher product on conveyor belt No. 1 (CV-001), which discharges onto conveyor belt, No. 2 (CV-002).

Conveyor belt No. 2 discharges onto a coarse ore stockpile, with a 20,000 total tonne capacity.

A mobile hydraulic rock breaker is provided to break oversize ROM material.

A self-cleaning electric magnet is installed at the conveyor belt No. 1 transfer point to remove tramp metal.

A belt scale is installed on conveyor belt No. 2.

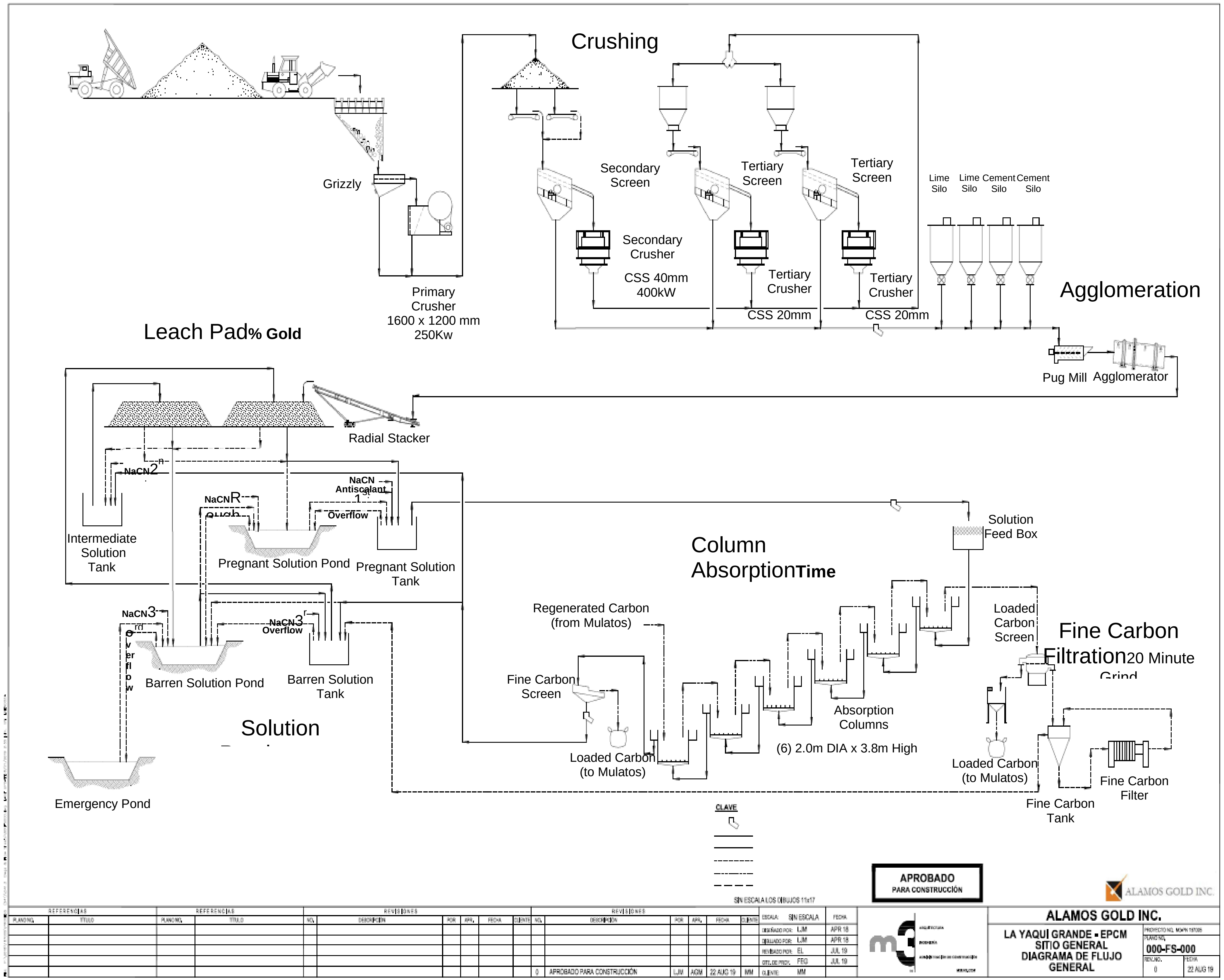


Figure 17-4 Yaqui Grande Heap Leach Overall Flowsheet

Water sprays are installed to suppress dust in ore feed streams, transfer points, dump pocket, and feeding the jaw crusher.

The crushing facility is equipped with an air compressor and air receiver for equipment maintenance and instruments.

17.1.7 Fine Crushing and Agglomeration

Ore is reclaimed using two variable speed belt feeders, which discharge onto conveyor belt No. 3 (CV-003).

Conveyor No. 3 discharges onto conveyor Belt No. 4 (CV-004), which discharges onto a double deck, vibrating, inclined screen. The undersize fraction from the screen bypasses the secondary and tertiary crushing circuit and reports to conveyor belt No. 10 (CV-010), and then onto conveyor belt No. 13 (CV-013). Oversize material from both decks is dumped directly into the secondary cone crusher.

Secondary crushed ore product is conveyed via conveyor belt No. 5 (CV-005), and conveyor belt No. 7 (CV-007) to a double cone tertiary feed bin. Two variable speed belt conveyors discharge ore onto the double deck tertiary screens.

The undersize fraction from the tertiary screens reports to conveyor belts No. 11 and No. 12 (CV-011/012) respectively, which discharge onto conveyor belt No. 13 (CV-013). Screen oversize reports to the two tertiary crushers. The tertiary crushed ore is conveyed back to the tertiary crushing circuit for re-classification via conveyor belt No. 5. The product of the fine crushing circuit, at approximately 80 percent passing 9.5 mm, is conveyed to the agglomeration circuit for the binding process.

Cement and lime are added to the ore on conveyor belt No. 14 (CV-014), which is discharged into a pug mill mixer. The pug mill discharges onto conveyor belt No. 15 (CV-015), which feeds the drum agglomerator. Barren solution is added in the drum to reach the desired moisture for agglomeration. Agglomerated ore is discharged onto conveyor belt No. 16 (CV-016). A series of grasshopper conveyors and a stacker place the ore on the heap leach pads.

A metal detector is installed over conveyor belt No. 3 (CV-003) to manually remove any scrap metal.

Two lime silos and two cement silos are utilized.

A belt scale is installed on conveyor belt No. 13 and provides a signal for adjusting lime, cement addition and water addition to ensure set moisture for agglomeration. A belt sampler is also installed on conveyor belt No. 13.

Water sprays are utilized for dust suppression at the fine crushing circuit.

17.1.8 Heap Leach

Ore is placed on the heap leach pad using grasshopper conveyors and a radial stacker (CV-021) and are irrigated with barren solution containing approximately 600 ppm sodium cyanide using barren solution pumps with variable speed drives from the barren solution tank. The average leach cycle is 120 days, using 7 m high lifts and irrigated at a rate of approximately 8 L/h/m^2. Solution is distributed to either the pregnant solution tank or barren solution tank using a solution distribution box. Overflow from the pregnant solution tank is sent to a pregnant solution pond.

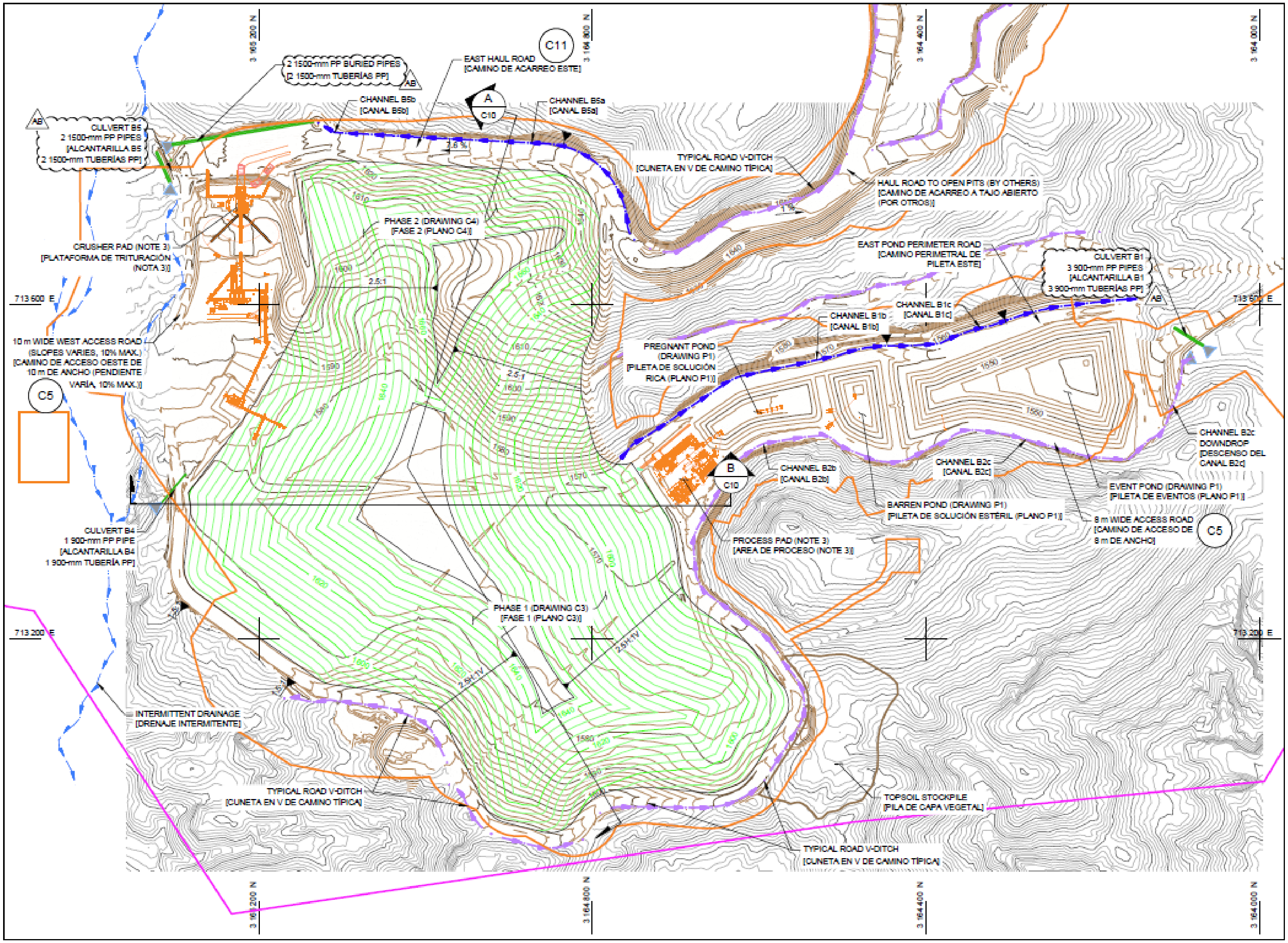


Figure 17-5 La Yaqui Grande Heap Leach Facility

Heap leach pads over 120 days old are considered old heaps and are irrigated with lean solution using lean solution pumps with variable speed drives from the lean solution tank, containing approximately 400 ppm of sodium cyanide. Solution is distributed to either the pregnant solution tank or barren solution tank using a solution distribution box. Overflow from the barren solution tank is collected in the barren solution pond. Heap leach design was undertaken by WSP-Golder and is depicted in Figure 17-5.

17.1.9 Carbon-In-Columns (CIC)

Pregnant solution is pumped to a head solution box using the pregnant solution pumps, the box includes a trash screen.

Pregnant solution cascades through a series of six 5.0 tonne carbon columns. Solution from column No. 6 discharges onto a column safety screen to collect any carbon that may have been carried over, loaded carbon overflowing from this screen is sent to the Mulatos processing facility. Solution flows by gravity into the barren solution tank and lean solution tank. The barren solution tank overflow discharges into the barren solution pond.

Regenerated carbon from the Mulatos processing facility is used. Regenerated carbon is first soaked then agitated in the carbon attrition tank and pumped using a carbon pump to a regenerated carbon screen to remove fines from the carbon. Overflow from the carbon screen flows to the regenerated carbon tank for use in the carbon columns. Underflow from the regenerated carbon screen flows by gravity to the carbon fines tank. Regenerated carbon is fluidized and siphoned using an eductor into carbon column No. 6, or into carbon column No. 5, if needed. Eductors are also installed to transfer carbon from the carbon attrition tank and regenerated carbon tank as backup. Eductors use barren solution.

Loaded carbon is transferred using a carbon pump. Eductors and barren solution are also provided to transfer carbon between columns as backup. Loaded carbon is discharged from carbon column No. 1 onto a loaded carbon screen and stored in the loaded carbon tank. Loaded carbon is taken to the Mulatos processing facility for stripping and regeneration. Carbon fines from the screen underflow flow into a carbon fines tank for settling.

Overflow from the carbon fines tank flow by gravity through an open channel, into the pregnant solution pond. Settled fines from the underflow are fed into a carbon fines filter using a carbon fines transfer pump. Filtrate is recirculated to the carbon fines tank.

Sodium cyanide is added into the head solution box using cyanide distribution pumps to maintain a cyanide concentration of 600 ppm entering the carbon columns.

Each carbon column is provided with two dart valves each to bypass flows.

A wire sampler is installed to sample pregnant solution, and a wire sampler is installed to sample solution discharge from the carbon columns.

A compressor for plant air is installed.

17.1.10 Ponds

Three ponds collect solutions at the La Yaqui Grande project.

A solution distribution box is located downstream from the leach pads to receive leach solution. Solution from this box is sent to either the pregnant solution tank or the barren solution tank, depending on the solution grade.

The pregnant solution tank, with the higher grade pregnant leach solution, will overflow into the pregnant solution pond. Two pregnant leach solution pumps are installed on a barge at this pond which feeds the pregnant solution tank or bypasses the pregnant solution tank to feed the carbon columns. Two variable speed solution pumps are installed on the pregnant solution tank, which pump pregnant solution to the carbon columns. Overflow from the pregnant solution pond flows into the barren solution pond.

Barren solution from the carbon columns flows into a barren solution tank and to the lean solution tank. The barren solution tank overflows into the barren solution pond. Two barren solution pumps are installed on a barge at this pond, which return solution to the barren solution tank or to the pregnant solution pond. Vertical barren solution pumps installed on the barren solution tank pump solution to the leach pads and to the cyanide mix tank. Horizontal barren solution pumps are installed on the barren solution tank to pump solution to the agglomerator and to the eductors at the process plant. Fresh water is added to the barren solution tank for solution makeup. Overflow from the barren solution pond flows into the emergency pond.

A lean solution tank is supplied to distribute lean solution from the carbon columns with the variable speed lean solution pumps to older leach pads.

Sodium cyanide solution is added to the barren solution tank and lean solution tank to maintain a 600 ppm concentration in the solution sent to the leach pads. Sodium cyanide solution may also be added to the barren solution pond, and to the pregnant solution tank.

An emergency pond is downstream from the pregnant and barren solution ponds. Two submersible pumps are installed at this pond with the help of a barge, which pumps solution back into the barren solution pond.

Antiscalant is added to the pregnant solution tank from the antiscalant distribution tank with the antiscalant transfer pump.

17.2 High Grade Mill

The following paragraphs describe the high grade mill (gravity plant) used to produce a primary gold concentrate which is followed by intensive leaching and direct electrowinning (DEW) processing to produce a final gold doré product. The plant was originally built to process ore from the high grade Escondida deposit (2012-2014) and was subsequently modified to process ore from the San Carlos underground mine (2015-2018).

The processing plant was designed to process up to 50 dry metric tonnes per hour (1000 tpd at 80 percent availability). The plant recovered the gold into a gravity concentrate, using rougher and cleaner Inline Pressure Jigs (IPJs) in combination with a batch centrifugal concentrator (BCC). The gravity tails were dewatered and conveyed to the heap leach stacking system, while the high grade gold concentrate was transported to a separate site, where it was intensively leached using Inline Leach Reactors to produce a pregnant solution that was treated using direct electrowinning. Any residual gold in solution was scavenged using the existing plant’s carbon circuit. The overall plant flowsheet is presented in Figure 17-6.

17.2.1 Stockpile

High grade ore, which is crushed to P80 75 mm, is diverted to a stockpile located near the gravity circuit. Ore is then withdrawn from the stockpile at the rate of 50 tph by one of three vibrating feeders located along a reclaim tunnel. The reclaim conveyor delivers ore to the gravity primary feed conveyor.

17.2.2 Secondary Crushing

The primary feed conveyor is equipped with a weightometer and a belt magnet to remove tramp metal. The ore is delivered to the cone crusher, operating in open circuit. The ore is discharged onto another belt conveyor where it is carried to the double-deck wet primary screen.

17.2.3 Tertiary Crushing and Screening

The wet primary screen oversize ore is transported via a conveyor to feed the vertical shaft impactor (VSI). The screen undersize reports to the rougher IPJ feed pump box. The VSI discharge is conveyed back to the primary screen feed conveyor.

17.2.4 Primary Gravity Concentration

The primary screen underflow pump delivers slurry to the rougher In Line Pressure Jig for concentration of coarse gold. The IPJ tailings are transported under pressure to the BCC where any fine gold that was not captured in the jig can be recovered. The rougher IPJ concentrate is transported by pressure to the cleaner IPJ and reduced to approximately 4.3 percent of the total feed mass. The heavy material is continuously discharged via the concentrate outlet. The lighter fraction, known as gangue or tailings, from the cleaner IPJ is discharged to the primary screen and exits the unit under pressure.

17.2.5 Gravity Tailings Dewatering & Handling

The tailings or gangue from the gravity circuit reports to the dewatering screen underflow sump, from where it is pumped to a bank of three 250 millimeter dewatering cyclones. The overflow solution from the cyclone is sent to a 6 meter high rate thickener, and the underflow is pumped to the screen feed box, while the thickener overflow is sent back to the process water tank. The cyclone underflow reports, along with the thickener underflow, to the dewatering screen. The dewatered screen oversize material can be diverted to either the main heap stacking conveyor if in operation or be diverted to a stand-alone stockpile where they can be later reclaimed if the heap stacking conveyor is stopped.

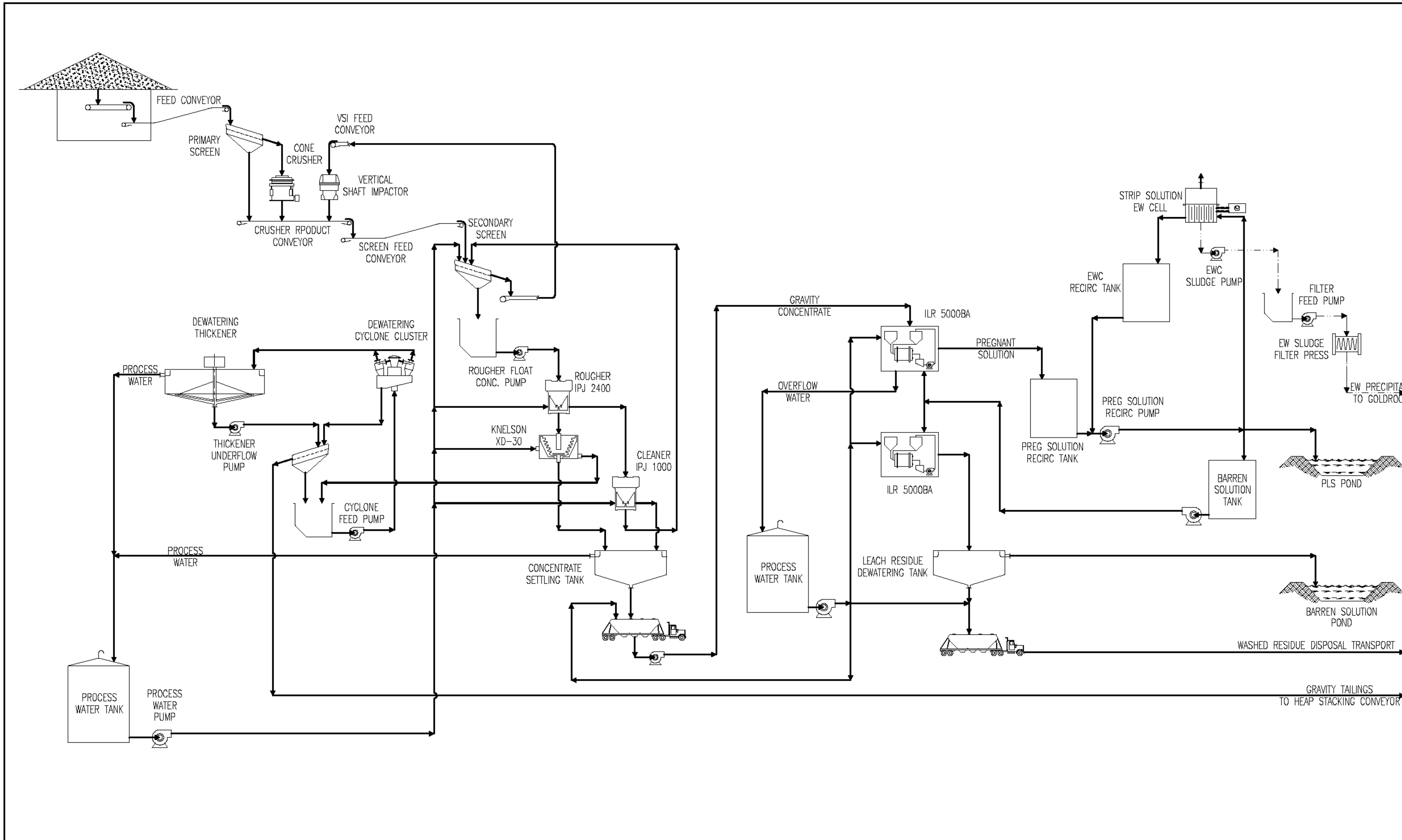


Figure 17-6 High Grade Mill (Gravity Plant) Overall Flowsheet

17.2.6 Concentrate Leaching and Electrowinning

Gravity concentrates from the IPJ and Falcon are combined in a concentrate holding tank prior to being loaded into tanker trucks and transported to the leach site. At the leach site they will be unloaded and leached in two batch Intensive Leach Reactors.

The concentrate is transferred from the concentrate transport truck (tanker) using an eductor and water injection system. The concentrate can be discharged to either of the two ILR feed cones.

The solids are first loaded into the drum then mixed with stored wash solution from the previous ILR batch. Leaching proceeds by circulating the solution through the rotating drum containing the solids while adding oxygen. After 6 hours the drum is stopped and the solids allowed to settle, while flocculant is added to produce a clear pregnant solution which is collected in the solution tank. The clear pregnant solution is transferred to the electrowinning feed tank. Wash solution is then added to the drum from the Electrowinning Barren Solution tank and mixed with the solids. After mixing the wash solution is clarified and stored in the solution tank to be used as leach solution in the next batch. The solids are then emptied from the drum by reversing the drums rotation and adding solution.

The leach tails are pumped to one of two residue cones from where it is transferred into a transmixer truck for haulage to the heap leach pad.

The pregnant solution from each batch is pumped from the EW Feed tank via the electrowinning cell and into the EW Barren Solution Tank. Once the EW Feed Tank is empty, the solution is recirculated from the Barren Solution through the cell until the gold is recovered. When the gold has been recovered from the solution, it is used as wash water in the ILR to make use of residual regents. Excess solution is pumped to the Heap Leach PLS system.

The electrowinning cell is a sludging cell using woven stainless steel cathodes and operates at 3,500 Amperes. The sludge is educted from the base of the cell into a collection cone below the cell and then filtered using a filter press.

The existing plant will be further modified and upgraded to process ore from the Puerto del Aire underground sulphide deposits. Further details will be provided in a subsequent update to this Technical Report.

18 PROJECT INFRASTRUCTURE

18.1 Access to the Property

Access to the property is described in Section 5.1.

18.2 Mulatos Mine

18.2.1 General Infrastructure

Following is a list of general infrastructure located at the Mulatos mine site:

- Guard shack and gate;
- Man camp for Mulatos employees, including rooms, kitchen, dining room, and recreational facilities;
- Man camp for contractor's employees;
- Mine clinic;
- 1,000 metre gravel airstrip, located adjacent to the mine camp;
- Pemex gas station;
- Diesel storage tanks;
- Heavy and light duty shops and vehicle wash bay;
- Generator rebuild maintenance building;
- Management, engineering and maintenance office and warehouse;
- Fresh water pumphouse at the Mulatos River and pipeline to site;
- Bridge over Mulatos River to San Carlos mine;
- Water treatment plant;
- Water management ponds and evaporators;
- Fire assay and metallurgical testwork laboratory
- Core logging building
- Core storage buildings
- Green house and nursery

In addition, an administration office, logistics office, and warehouse complex was constructed in Hermosillo in 2011 for Minas de Oro Nacional.

18.2.2 Electrical Power and Electrical Control System

18.2.2.1 *Current Diesel Generator Configuration*

Power supply for the Mulatos mine is currently being generated on-site with diesel generators but expects to transition to grid power in mid 2023. There are two generating stations in operation.

The original power station installed in 2004 is generating 8.7 MW at full capacity, supplying power to the ADR plant, Heap leach pad, Agglomeration, camp facility, overland and stacking conveyors. A second power generating station was installed in 2009 adjacent to the crushing plant and can generate 6.5 MW. This power is supplied to the offices, shops, freshwater pumping, gravity and crushing plants. There is space in the generator building to add an additional generator for future expansion.

There is also additional remote power generation capacity on site including the 300kW diesel generator which provides backup power to the camp site. There are also backup diesel generators installed at the ADR plant and the solution ponds. Most diesel generators are rated 4160V. The camp, ADR and solution pond backup generators are rated at 480V. Power is distributed on site via 4,160V or 13,800V overhead lines and underground duct-banks, and then stepped down to 4,160V or 480V as required.

A computer based data gathering system, Supervisory Control and Data Acquisition System (SCADA), is incorporated in the control and monitoring of all operations individually. The SCADA comprises of programmable logic controllers (PLC) for respective areas which collect and analyze input/output (I/O) signals from field instruments, switchgear, and motor control centers.

18.2.2.2 *Supply of Grid Power*

A 115kV 31 km powerline, to be connected to the Comisión Federal de Electricidad (CFE) grid, is currently under construction. All structures have been installed and tie-in to the grid is expected in the middle of 2023. Once tied-in, all electricity requirements for Mulatos and Yaqui Grande will be met with grid power. Existing generators will be kept on standby.

18.2.3 Fresh Water Supply

The freshwater delivery system was installed in 2004 with 500 gpm capacity from the Mulatos River to the mine facility. The original pumping system consisted of two pump stations, one at the well site and one booster pump station. This freshwater pumping system delivered water to the mine head tank as well as the fire water pond. The freshwater system was upgraded in 2012 to 700 gpm (44.2LPS) capacity to the mine head tank and the fire water pond.

18.2.4 Water Treatment Plant

The overall water treatment plant flowsheet is presented in Figure 18.1.

Acid mine drainage (AMD) from the Mulatos area is collected and neutralized with lime at the water treatment plant. The treated water is released, and metals precipitated from the water during the treatment process are hauled to a mine waste dump for disposal. The following describe the process in more detail.

The installed water treatment plant is designed to operate as a “high density sludge” metals removal system using sludge recycle to increase the density of the precipitates resulting from the lime neutralization process. Influent water is neutralized in Neutralization Tank #1 by adding a lime /sludge mix from the alkalization tank. The AMD water pH is raised to 8.0 to 8.5 in Neutralization Tank #1 and a final pH of 8.5 in Neutralization Tank #2. Each neutralization stage is mechanically agitated with an operating volume of 216 cubic meters. The pH 8.5 slurry discharges neutralization tank #2 and flows by gravity to a 24.4 meter diameter clarifier where solids are allowed to settle. A portion of the settled clarifier sludge is pumped to the mechanically agitated Alkalization Tank (17.7 cubic meter operating volume), and the clear treated clarifier overflow solution is discharged by gravity from the clarifier. Milk of lime is added to the clarifier underflow sludge in the Alkalization Tank and the tank discharge is then added back to neutralization tank 1 and or #2 as necessary to maintain the proper pH.

Lime is slaked to produce milk of lime slurry for use at the water treatment plant. Two milk of lime circulation pumps are available for redundancy. Average flow of Milk of Lime for plant operation was 11.56 cubic meter per hour at approximately 10 percent solids.

The feed water is pumped to the water treatment plant from the AMD pond. A centrifugal pump is used to transfer feed water to neutralization tank #1. The feed water pH is measured via an in-line pH probe in the line feeding the Neutralization Tank #1. During 2012, average plant feed was 1,000 gpm and 2.80 pH.

During 2012 the maximum clarifier underflow was 360 gpm. A portion of the clarifier underflow is pumped to the alkalization tank. The remaining clarifier underflow is pumped to filter press for solid-liquid separation. The filter cake is transferred by belt conveyors to a storage area near the water treatment plant before final disposal with the mine waste.

An anionic low molecular weight polymer is added to the clarifier feed to enhance the clarification process.

18.3 La Yaqui Grande

The La Yaqui Grande mine was developed as a standalone crushing and leaching facility. Some infrastructure is shared with the main Mulatos mine including the air strip, the ADR, and some maintenance facilities. Infrastructure facilities constructed specifically for La Yaqui Grande include:

- Man camp, kitchen, and recreational facilities for Mulatos employees;
- Man camp for mine contractors;
- Guard shack;
- Diesel generator;
- 13 km 34.5kV powerline to the Mulatos site. Power draw for La Yaqui Grande is 5.5MW;
- 5 km internal distribution power line;
- Fresh water transmission booster station located between La Yaqui Grande and Cerro Pelon;
- Maintenance shops;
- Water treatment plant, currently under construction;
- Fire assay laboratory; and
- Offices.

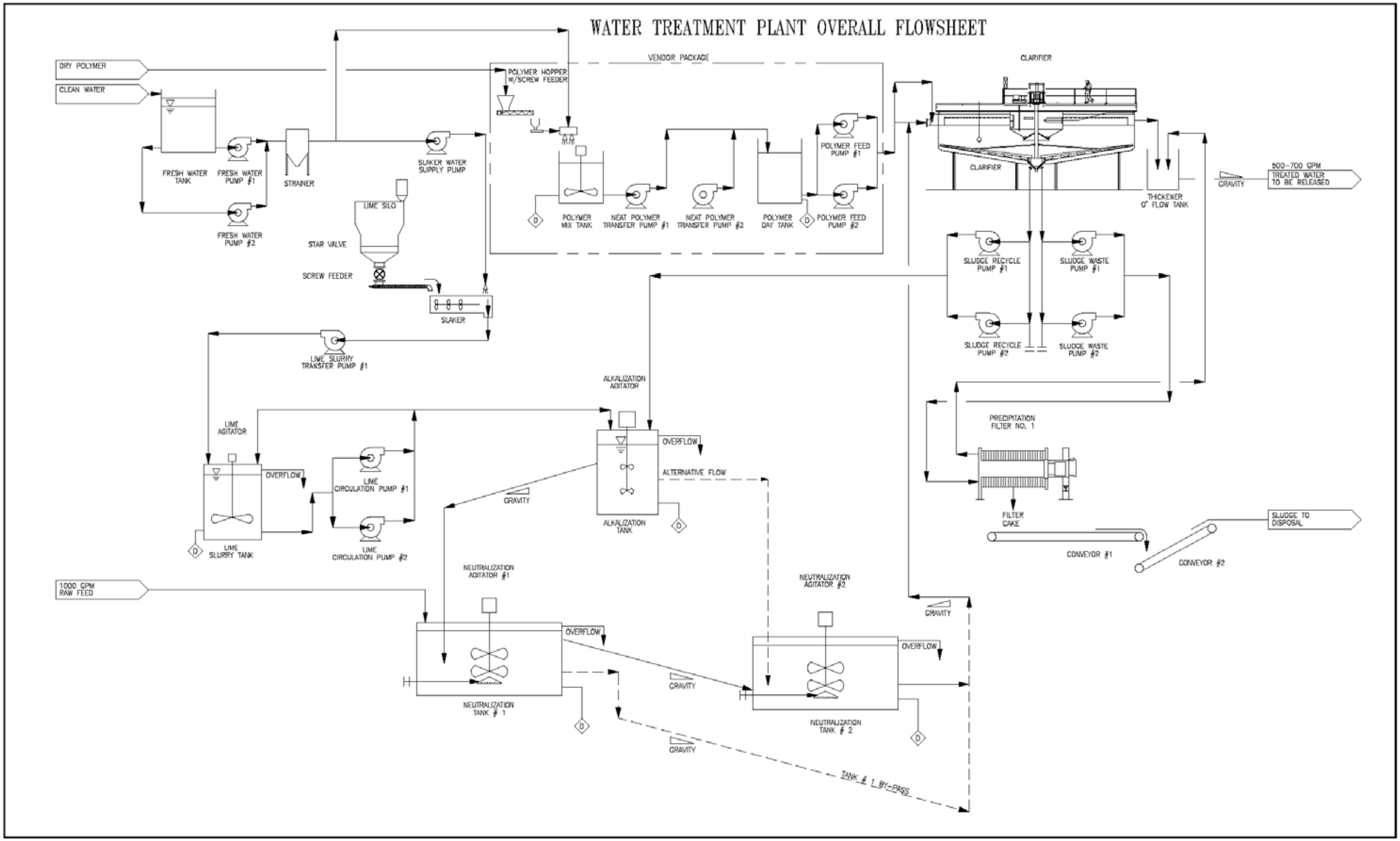


Figure 18.1 Water Treatment Plant Overall Flowsheet

19 MARKET STUDIES AND CONTRACTS

19.1 Market studies

No market studies were conducted by Alamos. Gold is a freely traded commodity on the world market for which there is a steady demand from numerous buyers.

19.2 Contracts

Mulatos has several contracts placed at market rates for various bulk commodities and supplies. There are two mining contracts in place:

- Mulatos open pit mining is undertaken by Grupo Construcciones Planificadas S.A. de C.V. (Construplan) with a life of mine mining contract. Pricing is based on cost per tonne basis for loading, hauling, and support and on price per metre basis for drilling. Mulatos supplies explosives and diesel fuel.
- La Yaqui Grande open pit mining is undertaken by Grupo Desarrollo Infraestructura S.A. de C.V I (GDI) with a life of mine mining contract. Pricing is based on cost per tonne basis for loading, hauling, and support and on price per metre basis for drilling. Mulatos supplies explosives and diesel fuel.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

This chapter outlines the major environmental and socio-economic issues that might result from and/or affect the mine operations. The current environmental conditions at the site plus the potential environmental impacts from mining operations are summarized in Section 20.1. The waste and water management programs are summarized in Section 20.2. The regulatory framework and permit status are described in Section 20.3. The socio-economic program is described in Section 20.4. Reclamation and mine closure planning is discussed in Section 20.5.

20.1 Environmental Conditions and Potential Impacts

The Mulatos Mine is in a rural area of the State of Sonora, Mexico, in a ranching area that has a low population density. Potential environmental impacts to surface soils, water, the ecology, and air quality are mitigated as part of the mining operations.

Environmental baseline studies were prepared to characterize the environmental conditions of the area, including climate, fauna, flora (AGRA Ambiental, 1995) and hydrology (Water Management Consultants, 1997), and were summarized in the Feasibility Study prepared by M3 Engineering & Technology Corp (2004d). Additional studies were completed in 2017 and 2018 as part of the mine expansion for Cerro Pelon and La Yaqui Grande mines. The environmental conditions are summarized below.

20.1.1 Climate

The INEGI 2010 Climatic Units Chart indicates that the climate is Temperate sub-humid (C(w0)(x1) and C(w1)(x1). Below is a description of the two types of climates:

• Temperate subhumid

- C(w0)(x1): average annual temperature between 12°C and 18°C, temperature of the coldest month between -3°C and 18°C and temperature of the warmest month less than 22°C. Precipitation in the driest month less than 40 mm, summer rains with a P/T index less than 43.2 and percentage of winter precipitation less than 10.2% of the annual total.

- C(w1)(x1): average annual temperature between 12°C and 18°C, temperature of the coldest month between -3°C and 18°C and temperature of the warmest month less than 22°C. Precipitation in the driest month less than 40mm, summer rains with a P/T index between 43.2 and 55.0, percentage of winter precipitation less than 10.2% of the annual total.

The project area lies in a temperate sub-humid climate zone. The lowest temperature occurs between December and February, while the highest temperature occurs between June and August, according to the climate data provided by MON. The lowest minimum temperature recorded between December and February during the 20 years of data from the weather station at the Mulatos Town was -11º C (in February 2011).

Rainfall at the site shows marked seasonal variation that is characteristic of all northwestern Mexico. Dry westerly airflow dominates for most of the year except from late June to October, during which time about 75 percent of mean annual rainfall occurs. This seasonal precipitation regime is attributed to the Mexican summer storm season that starts in late June and generates intense rainstorms. The western flank of the Sierra Madre Occidental receives most of the rainfall.

20.1.2 Temperature

To establish the climate according to the Köppen classification with the modifications of Enriqueta García, the climatological base of the Mulatos station published on the page of the National Water Commission (CNA), which has data from 1943 to 2005 has the following results:

The climate in the project area is moderate with summer temperatures averaging 24.7°C and winter temperatures averaging 13.8°C (CNA). The temperature at the mine site ranges from 39.7°C to -5°C with a mean of 19°C, as shown in Table 20-1.

Table 20-1 Mean Temperatures – Mulatos Mine (1945-2005)

Month	Mean Temperature (°C)
January	11.9
February	13.8
March	16.0
April	19.5
May	22.9
June	26.7
July	25.1
August	24.5
September	23.8
October	21.0
November	15.7
December	12.0
Average	19.4

Note:

- *Reference: CNA web site Mulatos Station*

20.1.3 Precipitation

Precipitation data was collected from the Mulatos Mine weather station. The mean annual rainfall is estimated to be 816.9 mm. Precipitation varies widely in the region depending on location relative to mountainous areas and elevation. Year- to-year fluctuations can be extreme. Total annual precipitation based on the data recorded collected over 66 years ranges from 477 mm/year to 1,434 mm/year with a mean precipitation value of 816 mm. Maximum monthly rainfall occurs in July and August. The mean July and August rainfalls for the synthetic record represent 26.4 and24.8 percent of the annual total and are estimated to be 216 and 203 mm respectively. April is the driest month; with estimated mean rainfall of 7.3 mm. Roughly 68 percent of precipitation occurs during relatively short periods of intense rainfall when precipitation intensity can reach 0.35 mm/min.

As data is limited, a synthetic data record (Table 20-2) was generated between 1956 and 2003. This record has been supplemented with additional data up to 2022, supplied by Minas de Oro Nacional personnel.

Table 20-2 Precipitation Monthly Averages – Mulatos Mine (mm)

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	Annual 1-Day Max.
1956	41.3	0.0	0.0	0.0	0.0	41.0	84.6	109.6	75.8	82.3	18.8	24.6	478.0	29.8
1957	162.6	3.7	98.5	0.0	36.2	73.4	179.3	292.1	71.6	83.6	26.0	9.3	1036.3	74.3
1958	69.7	79.0	135.6	0.0	44.0	89.2	148.2	173.3	150.5	75.3	76.7	0.0	1041.3	60.4
1959	0.0	48.3	0.0	32.1	22.3	45.2	190.7	309.4	50.2	82.8	26.0	81.8	888.8	47.5
1960	146.8	3.6	0.0	0.0	0.0	32.5	171.0	161.2	96.6	24.2	20.4	76.7	732.9	79.0
1961	170.5	4.2	0.0	0.0	0.0	112.4	137.5	179.3	84.1	34.4	48.3	66.9	837.6	49.2
1962	119.9	5.1	30.7	0.0	0.0	59.5	188.6	112.4	136.6	25.1	22.3	132.9	833.0	67.8
1963	26.5	20.4	0.0	0.0	0.0	0.0	208.1	212.3	104.0	50.6	52.0	83.6	757.6	75.3
1964	4.7	6.5	40.0	0.0	11.9	14.9	141.7	311.7	221.8	41.8	0.0	44.6	839.5	82.7
1965	17.2	100.8	26.9	2.8	0.0	0.0	107.3	249.0	209.0	5.6	0.0	177.6	896.1	65.0
1966	19.1	50.2	8.4	12.1	8.4	89.2	174.7	271.3	123.6	4.7	2.8	5.6	769.8	63.2
1967	7.4	0.0	0.0	0.0	0.0	117.1	179.3	139.4	59.5	67.8	148.7	156.1	875.2	91.0
1968	53.9	123.6	101.3	61.3	0.0	35.3	251.8	168.3	50.2	69.7	102.2	27.9	1045.3	80.8
1969	31.6	61.3	0.0	0.0	15.3	0.0	279.2	184.0	47.4	46.9	50.2	77.1	792.9	79.0
1970	7.4	1.9	73.9	5.6	0.0	70.6	187.7	118.9	204.7	0.0	0.0	21.4	692.0	65.0
1971	0.0	40.0	0.0	0.0	0.0	61.3	126.4	222.0	93.8	186.7	48.3	39.5	818.0	79.9
1972	3.7	0.0	20.5	0.0	5.6	70.6	144.9	161.7	66.9	106.8	32.5	54.8	668.1	61.3
1973	93.8	92.0	57.6	0.0	14.9	18.6	268.6	179.3	150.5	4.0	0.0	8.4	887.6	102.2
1974	8.8	30.7	2.8	0.0	0.0	42.7	230.7	187.5	130.4	33.4	61.3	30.7	759.0	69.0
1975	33.5	12.1	24.2	0.0	0.0	3.7	159.0	144.3	67.0	43.8	37.2	0.0	524.7	37.2
1976	7.4	71.5	0.0	17.2	16.7	75.3	174.7	74.8	158.4	33.5	28.8	9.8	668.0	37.2
1977	39.0	0.0	28.3	0.0	0.0	34.4	208.6	188.1	87.3	57.1	7.4	0.0	650.4	33.4
1978	7.4	71.5	56.7	0.0	0.0	56.7	182.1	150.5	63.7	114.7	24.2	111.5	839.0	77.1
1979	112.4	21.5	13.0	0.0	14.9	0.0	97.6		102.2	0.0	0.0	8.4		55.7
1980	8.8	30.7	0.0	0.0	5.6	61.3	170.5	337.7	32.8	2.8	15.3	8.4	673.8	72.5
1981	24.2	18.7	54.1	16.7	16.7	62.2	61.5	167.8	82.1	131.9	0.0	0.0	635.7	40.0
1982	42.7	0.0	0.0	0.0	2.4	6.5	249.0	105.5	67.4	0.0	108.2	117.3	698.9	55.9
1983	59.5	40.9	119.1	40.7	11.2	0.0	145.9	157.0	223.6	184.1	65.0	23.1	1070.0	85.7
1984	27.0	0.0	93.8	10.2	62.6	142.2	198.9	232.7	74.7	110.0	36.5	290.4	1279.0	88.7
1985	118.5	34.0	11.2	31.1	15.8	25.4	325.8	167.7	99.0	31.2	77.8	0.0	937.5	64.4
1986	12.5	40.0	11.0	13.5	0.0	81.8	159.7	181.0	97.8	85.5	45.7	90.3	818.7	70.1
1987	18.1	10.2	9.3	24.2	48.1	20.9	140.7	240.2	33.9	10.6	7.0	41.8	604.9	56.7
1988	18.1	3.9	0.0	22.8	0.0	5.6	346.5	162.3	63.0	40.9	0.0	40.0	703.0	59.5
1989	31.5	24.8	13.1	0.0	0.0	30.0	50.2	205.1	23.4	0.0	21.3	114.3	513.7	50.9
1990	5.2	80.8	15.5	1.9	0.0	72.5	412.8	195.8	108.0	69.7	40.6	169.6	1172.3	70.6
1991	28.2	55.3	65.0	0.0	0.0	27.1	222.2	326.0	208.0	3.9	56.5	107.4	1099.6	66.4
1992	83.6	58.3	45.5	31.4	36.7	36.7	222.5	333.4	86.4	35.9	1.9	111.7	1084.0	53.9
1993	86.1	109.0	1.9	4.2	24.8	42.3	218.7	255.3	101.0	56.0	25.7	19.3	944.2	64.6
1994	6.6	29.0	6.4	0.0	42.7	0.0	218.7	89.2	36.2	3.2	25.8	19.4	477.1	33.4
1995	17.0	102.0	24.0	0.0	0.0	15.0	192.0	248.0	83.0	0.0	81.0	15.0	777.0	40.0
1996	0.0	9.0	5.0	0.0	0.0	61.0	225.0	202.0	93.0	16.0	34.0	1.0	646.0	32.0
1997	4.0	7.0	37.0	41.0	38.0	48.0	176.0	198.0	146.0	43.0	54.0	110.0	902.0	40.0
1998	0.0	59.0	36.0	0.0	0.0	45.0	325.0	197.0	50.0	32.0	11.0	5.0	760.0	40.0
1999	1.0	1.0	2.0	0.0	0.0	86.0	268.0	170.0	93.0	6.0	4.0	11.0	642.0	40.0
2000	1.2	0.1	4.2	0.0	5.1	144.3	217.6	131.6	74.6	195.2	28.5	1.5	803.9	40.0
2001	19.0	43.0	9.0	0.0	16.0	125.0	207.0	146.0	110.0	5.0	0.0	14.0	694.0	40.0

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	Annual 1-Day Max.
2002	18.0	54.0	0.0	0.0	0.0	33.0	147.0	173.0	56.0	14.0	0.0	66.0	561.0	40.0
2003	12.0	74.0	13.0	19.0	2.0	55.0	147.0	215.0	59.0	53.0	3.0	0.0	652.0	40.0
2004	45.0	43.0	57.0	58.0	0.0	12.0	227.0	100.0	88.0	95.0	77.0	45.0	847.0	41.0
2005	202.0	100.0	0.0	0.0	43.0	20.5	275.8	**345.3**	49.0	0.0	0.0	20.0	1055.5	75.0
2006	0.0	0.0	3.0	0.0	26.0	104.2	292.1	303.1	167.2	122.4	0.0	63.5	1081.5	83.3
2007	**278.3**	5.1	21.5	0.0	0.0	105.6	**507.0**	323.8	77.4	0.0	43.8	71.0	1433.5	116.4
2008	28.0	0.0	0.0	0.0	0.3	114.0	230.9	174.2	75.4	4.1	8.5	1.3	636.7	53.3
2009	19.9	4.6	17.0	0.0	22.9	58.4	217.6	114.1	32.0	132.0	13.0	18.3	649.8	46.5
2010	41.9	26.9	6.4	5.8	0.3	22.0	265.6	175.0	91.0	14.0	0.0	8.0	656.9	43.0
2011	7.0	0.0	0.0	0.0	0.0	18.0	403.0	170.0	82.0	8.0	80.0	22.0	790.0	90.0
2012	0.0	14.0	4.0	0.0	0.0	95.0	213.0	233.0	69.0	0.0	0.0	1.0	629.0	46.0
2013	11.0	0.0	0.0	0.0	4.0	58.0	303.0	115.0	115.0	115.0	11.0	50.0	782.0	56.0
2014	0.0	0.0	6.0	0.0	0.0	77.0	273.0	310.0	**228.0**	0.0	15.0	2.0	911.0	55.0
2015	55.0	41.0	57.0	30.0	0.0	167.0	322.0	215.0	86.0	76.0	8.0	3.0	1060.0	62.0
2016	15.0	0.0	15.0	0.0	0.0	**196.0**	369.0	268.0	140.0	0.0	0.0	11.0	1014.0	60.0
2017	23.0	13.0	0.0	0.0	0.0	47.0	205.0	171.0	6.0	22.0	0.0	90.0	577.0	42.0
2018	0.0	19.0	1.0	0.0	0.0	211.0	157.0	328.0	137.0	52.0	0.0	56.0	961.0	70.0
2019	24.0	26.0	40.0	0.0	0.0	8.0	177.0	269.0	207.0	54.0	93.0	57.0	955.0	66.0
2020	18.0	11.0	75.0	6.0	18.0	70.0	329.0	136.0	40.0	0.0	0.0	4.0	707.0	63.0
2021	30.0	26.0	2.0	0.0	0.0	83.0	263.0	242.0	159.0	25.0	10.0	49.0	889.0	70.0
2022	1.0	1.0	0.0	0.0	0.0	195.0	174.0	286.0	92.0	17.0	0.0	34.0	800.0	62.0
2023	14.0	0.0												
Avg.	39.2	30.8	23.9	7.3	9.4	60.2	216.0	203.3	99.2	46.9	28.9	48.2	816.9	

Notes:

- *Average based on data between 1956-2022 (Source Minas de Oro Nacional, S.A); data between 1956 and 1994 based on WMC Report, monthly synthetic record; data between 1995 and 2004 based on daily record for Mulatos town; data between 2005 and 2022 based on daily record of Mulatos mine rain gauge.*

20.1.4 Evaporation

The mean annual pan evaporation rate in the project area is estimated at 2,048 mm (Table 20-3). Evaporation generally coincides with an increase in temperature. The highest evaporation rates occurring in the summer months (May to July) have been attributed to an increase in cloud cover. The data is not precise but does indicate that the greater portion of the precipitation falling in the project area is lost to evaporation.

Table 20-3 Average Monthly Precipitation (historical Mulatos station) and Pan Evaporation

Month	Average Monthly Precipitation (mm) Mulatos 2022	Average Evaporation (mm)
January	39.2	74.4
February	30.8	96.2
March	23.9	157.5
April	7.3	222.7
May	9.4	284.3
June	60.2	315.3
July	216	219.8
August	203.3	185.7
September	99.2	171.6
October	46.9	149.2
November	28.9	98.7
December	48.2	72.6
Annual	816.9	2,048.0
Average	67.8	170.6

Source: Golder October 2020

20.1.5 Soils

A detailed assessment of the suitability of the soils for reclamation has not been finalized for the project area and much of the area has been disturbed. However, the undisturbed parts of the project area support a good plant cover, which suggests that at least the surface soils should be suitable for reclamation purposes. Where examined during the baseline studies, the soils are medium textured. They are alkaline, particularly at depth, and acid at the surface (pH 4.5). Since the pH of the mixed soils that have been salvaged and stored on site had a pH of 7.2, the mixing of the subsoil with the surface soils should improve the reaction (pH) of the soils, resulting in a better material for reclamation purposes.

Based on this information, the upper 50 cm of soils should be suitable as topsoil. Soil material below 50 cm should also be salvaged for reclamation. The deeper soil material can be used as a base for the topsoil or may be required to be used as a cover material as there will likely be insufficient topsoil to provide an adequate cover of the waste dump and heap leach facilities. Soil salvage depth is variable across the project area as much of the mine site area occurs on steeply sloping topography, leaving little opportunity for soil salvage. Slopes range from 22 to 70 percent. Boulders and bedrock exposure were noted on steeper slopes.

Topsoil/subsoil has been salvaged during development of the mine facilities and stored where it will not be disturbed until required for reclamation. As much of the site is already disturbed, the goal will be to conserve as much of the topsoil (and subsoil) as possible from areas of future development. Other sources of soil material that can be used for reclamation include those from the graded areas along the roads. Due to the acidic nature of a great part of the waste materials, all soils in the vicinity of the mine will be sampled for acidity as they may be receiving dust high in acids and metals. As these are not acid generating, they can be effectively treated with lime. Where salvaged material is excessively stony, this material will be sieved. The sieved coarse fragments could potentially be used as a capillary break barrier.

20.1.6 Geology

The project geology is discussed in an earlier section of this report and is not reproduced here.

20.1.7 Geochemistry

The expected lithologies of the final pit was characterized by Placer Dome geologists as occurring in a reduced (sulphide) versus an oxidized state, and as showing argillaceous versus siliceous alteration.

For geochemical classification, the lithologies, oxidation states, and alteration types have been assembled into 12 domains. Acid-Base Accounting (ABA) results have been given by the laboratory in terms of these domains. Maps of expected final pit geology show that about half of the wall and floor area will be underlain by sulphide rock, and about half by mixed oxide-sulphide rock. Only a small area on the upper walls will be underlain by oxide rock. About two-thirds of the final wall and floor area is underlain by argillized rock, while about one-third has silicified rock. The areas of silicified rock correspond roughly to those in the mixed oxide-sulphide zone. The sulphide zone is roughly coextensive with the rhyodacite flowdome unit (Trf), but otherwise there is little correspondence between lithology and either alteration or oxidation state.

All samples had Net Neutralization Potential values less than zero, meaning that all rock represented by these samples is expected to be net acid generating (Morin and Hutt, 1995). Pyrite is visible in most of the samples and buffering carbonate minerals are absent. If each of the samples represents the geochemistry of its domain, then nearly all the rock exposed in pit walls and floor is expected to be net acid-generating. Only the oxides at the pit rim (about 12.2 percent of the total pit area) are an exception. Morin and Hutt (1995) observed that "the potential for net acid generation and acidic drainage is obviously high”.

20.1.8 Seismicity

Located atop three of the large tectonic plates, Mexico is one of the world's most active seismic regions. The relative motion of these crustal plates causes frequent earthquakes and occasional volcanic eruptions. Most of the Mexican landmass is on the westward moving North America plate. The Pacific Ocean floor south of Mexico is being carried northeastward by the underlying Cocos plate. Because oceanic crust is relatively dense, when the Pacific Ocean floor encounters the lighter continental crust of the Mexican landmass, the ocean floor is subducted beneath the North America plate, creating the deep Middle America trench along Mexico's southern coast. Also, because of this convergence, the westward moving Mexico landmass is slowed and crumpled, creating the mountain ranges of southern Mexico and earthquakes near Mexico's southern coast. As the oceanic crust is pulled downward, it melts, and the molten material is then forced upward through weaknesses in the overlying continental crust. This process has created a region of volcanoes across south-central Mexico known as the Cordillera Neovolcánica.

20.1.9 Hydrology

As for any typical mining operation, the Mulatos Mine uses a fresh water source and influences the local hydrologic system. The local surface water and groundwater system were characterized prior to operations and is currently monitored on a routine basis for impacts. Surface water quality monitoring points are shown in Figure 20-5. The surface water and groundwater conditions are described below.

20.1.9.1 *Mine Water Balance*

A water balance model was prepared by SRK Consulting using the GoldSim software program (SRK, 2012b) with a separate analysis of the impact of a power outage on the operation of the process ponds (SRK, 2012c), subsequently Golder (Golder 2018), prepared an update of the balance incorporating the expansion of the yard in its East zone. The water balance model incorporated all inflows and outflows of natural and mining-related sources, and simulated changes in the storage in the water-retaining structures, such as the Heap Leach Facility, pregnant leach solution ponds, intermediate solution ponds, stormwater ponds, process plant, Plaza de Toros reservoir, Tanque Gris, Fresh Water Pump Station, the three open pits, Waste Rock Dump area, Tabacote dam, North dam, and Water Treatment Plant. A regional hydrological analysis compared precipitation measurements from gauges in the region to the Mulatos gauges, and estimated the precipitation associated with a range of return periods, allowing for the water balance to consider the uncertainty and variability of the area's precipitation events.

In 2021, Golder re-analyzed the water balances (Figure 20-1, Figure 20-2, and Figure 20-3) and updated the model issuing the following recommendations:

- The results of upset conditions calculation indicate 746 m3 of solution, in addition to the pond's minimum operating volume of 105,600 m3, will be permitted in the ponds at the start of the monsoon season in late June, assuming an annual sludge buildup of 84,000 m3in the ponds;

- The South and North Process Ponds are currently operated with excess water and sludge year-round. The solution in the ponds should be drawn down to their minimum operating levels in addition to removing all the sludge prior to the start of the monsoon season in late-June. Freshwater makeup should only be used when the ponds are near or below their operating levels;

- After the North and South Leach Pads are combined, the combined North Ponds should be operated to a maximum volume of 51,400 m3 to allow available storage to contain the 24-hr drain down event;

- During rinsing operations, the ponds will not be capable of handling the runoff volumes produced from average year climate conditions. Therefore, more aggressive measure should be taken to remove the excess water; and

- Ensure the maximum pumping rate from the North Process Ponds to the South Process Ponds is capable of handling 25,100 m3/day. This represents the 100th percentile of the calculated pumping rate between the two sets of ponds.

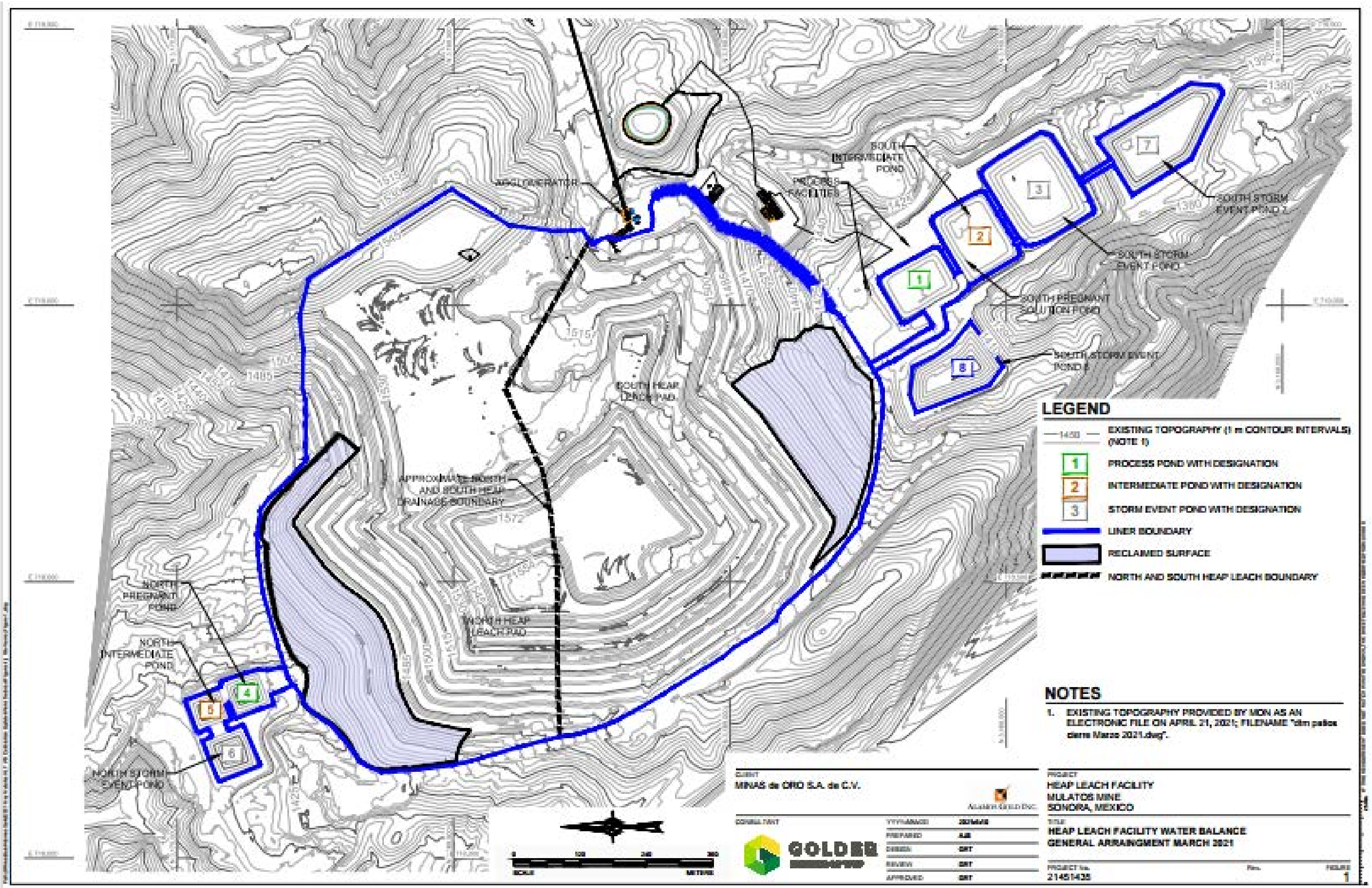


Figure 20-1 Mulatos Heap Leach Facility

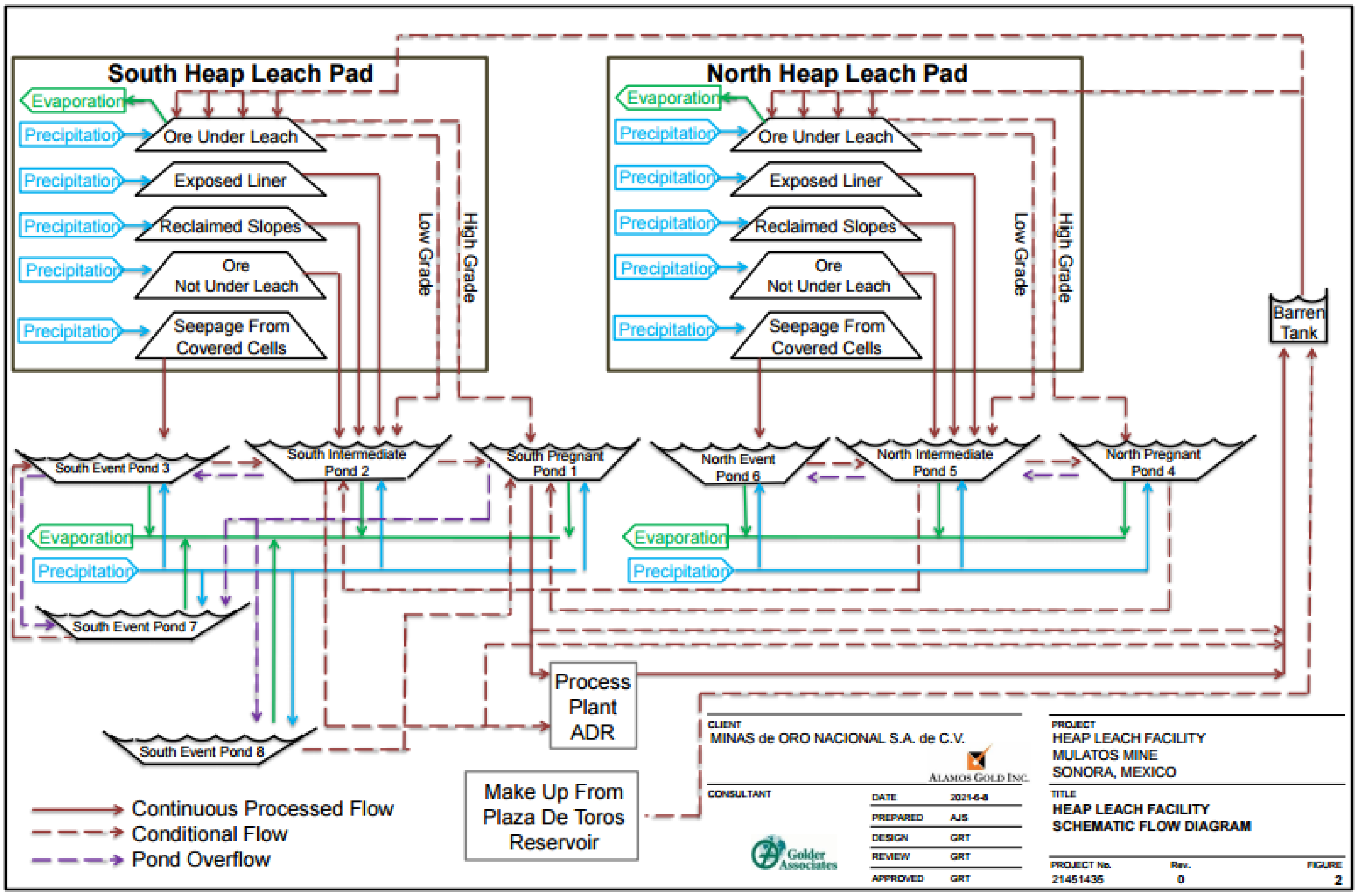


Figure 20-2 Mulatos Flow Diagram of Heap Leach Facility

In turn, before the start of the planning of the La Yaqui Grande project, Golder, in 2020, developed the same procedure to issue a water balance for that leaching system. Golder's LYG water balance was developed based on input variables calibrated from the water balance model for the Mulatos HLF, so it has certain considerations and recommendations to consider.

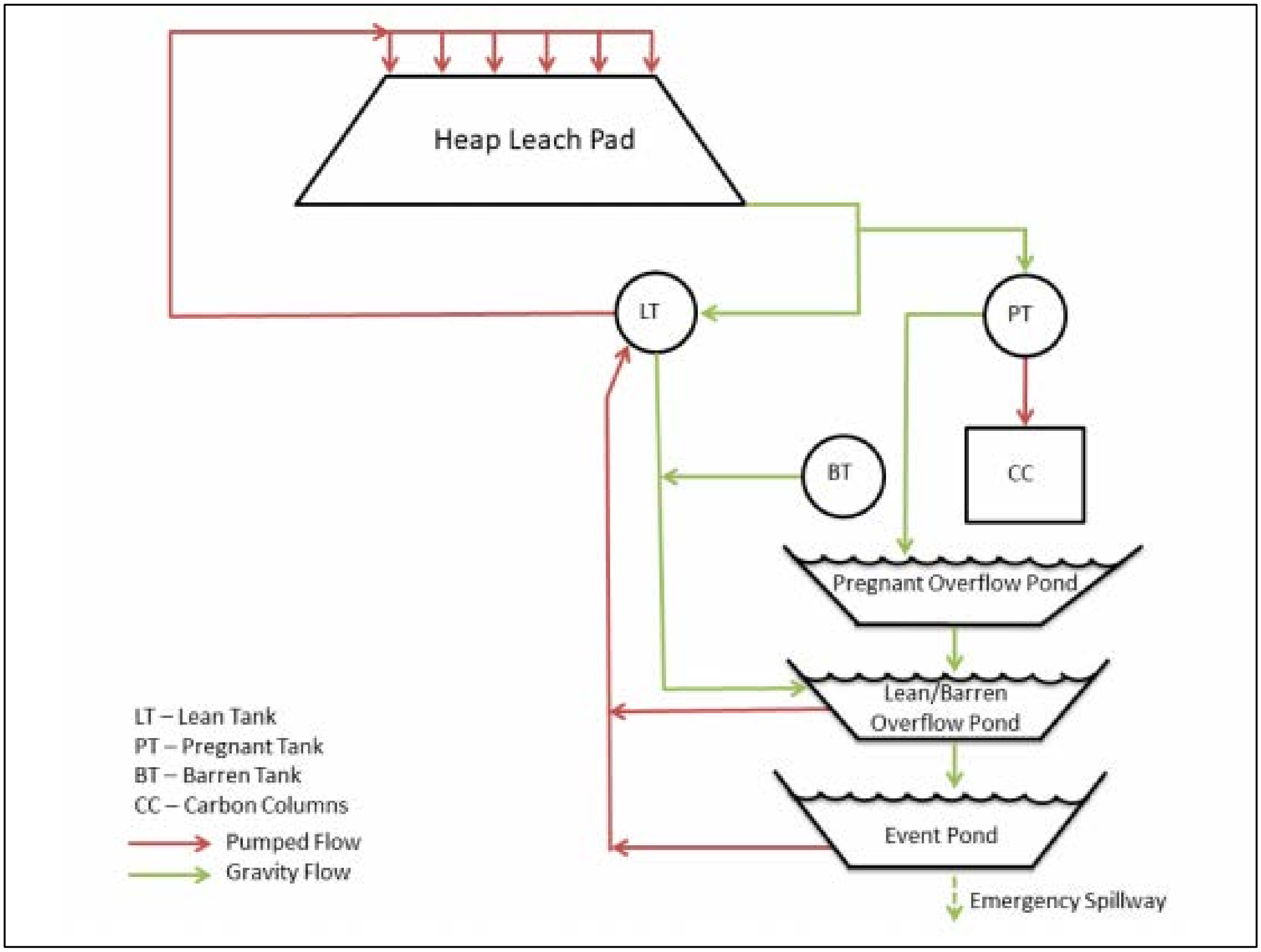


Figure 20-3 Heap Leach Facility in Yaqui Grande

20.1.9.2 *Surface Water*

The Rio Yaqui watershed (Figure 20-4) is one of the major river basins in northwestern Mexico. It is about 73,590 km² in area and includes three large watersheds: Rio de Bavispe, Rio Aros, and Rio Moctezuma. The Rio Aros rises high in the Sierra Madre Occidental near the border between Sonora and Chihuahua. On some maps, the Rio Aros is named Rio Tutuaca above the Rio Mulatos confluence. Below that confluence, the Rio Aros flows west-northwest to the Rio de Bavispe confluence, creating the Rio Yaqui. The Rio Yaqui continues north and then southwest, and discharges into the Gulf of California. The Mulatos Mine is located within the Rio Mulatos basin, a mountainous watershed with an area of about 3,340 km².

The project is located approximately in the middle of the Mulatos basin. The main controls on regional groundwater flow are meteorology, topography, vegetation, and hydrogeologic units. Each of these controls is discussed in general terms below. Beyond the project site itself, specific hydrogeologic data are not available. However, useful generalizations may be made about the regional groundwater regime based on meteorological, geomorphologic, and other data.

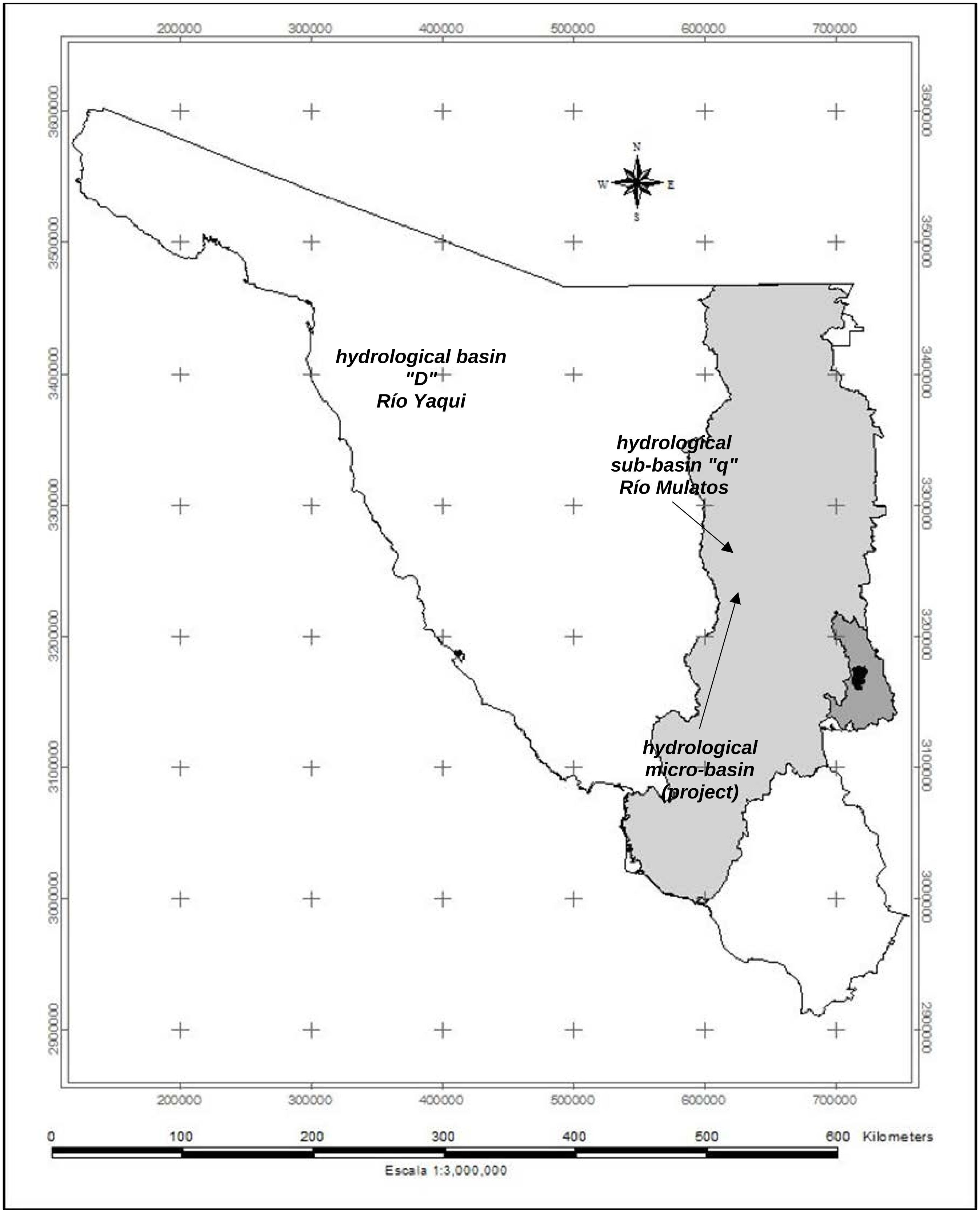


Figure 20-4 Hydrological Basins

The Rio Mulatos flows northward 35 km to join the Rio Aros at Guadalupe. Prior to 1994, no hydrologic monitoring had been carried out on the Rio Mulatos. There is no historic stream discharge or hydrochemical data for the river. In June 1994, stream discharge measurements were made, and water samples taken along the Rio Mulatos within the project area. Additional water sampling and stream discharge gauging has been carried out since then.

20.1.9.3 *Surface Water Quality*

A baseline characterization of surface water resources in the project area was performed by collecting water samples from streams, springs, and adits. The results of the baseline sampling conducted in 1994 are discussed by area below. The sampling locations were selected based on facility layout and on known existing or potential sources of contamination. Potential existing sources of contamination include the following:

- Mulatos town and various ranches;
- Historic tailing deposits;
- Seeps from existing mine adits; and
- Springs that discharge from naturally mineralized rocks.

Water samples were collected from nine of the seventeen micro basins in the mine area. The first set of samples was collected in June 1994. Since then, water samples have been collected approximately quarterly.

Samples were collected following standard operating procedures (SOPs) developed for the project. Unfiltered, unpreserved samples are collected by fully submerging the sample container 2 to 3 inches below the water surface. Samples for dissolved metals analysis were filtered using a 0.45 micron filter. Filtered and unfiltered samples were shipped in bottles that contained appropriate preservatives for the analyses desired.

Analyses were routinely made for dissolved metals. In addition, analyses were made for total recoverable metals in samples collected during July 1994, to assess the water's suitability for drinking. The primary laboratory contract for the project was originally with SGS Laboratories in Hermosillo. The samples were analyzed by a subsidiary laboratory, Commercial Testing and Engineering Company (CTE), located in Denver, Colorado. This laboratory was audited in July 1994 by WMC and in October 1994 by Mr. Calvin Price of Placer Dome Inc. At the time of both audits, the laboratory met the required quality control criteria.

Other laboratories were used for analysis of field duplicate samples. Initially, duplicate samples were analyzed by Unison Laboratory in Hermosillo. This laboratory is owned and operated by the University of Sonora. Due to laboratory limitations in detection limits and suspected laboratory contamination, duplicate samples were then sent to ACZ Laboratory in Steamboat Springs, Colorado.

In later years, prior to the start of the projects in the Cerro Pelón and Yaqui Grande area, a laboratory accredited by the Mexican Accreditation Entity (EMA) took samples and they were analyzed as part of the baseline of these areas; the laboratory is Analítica del Noroeste.

20.1.9.4 *Rio Mulatos Baseline Water Quality*

The major ion chemistry of the Rio Mulatos shows minimal variation between upstream and downstream sampling locations. The Mulatos River contains calcium bicarbonate type water. pH values range from 5.46 to 9.51. Alkalinity oscillates between 30 and 152 mg/l, total dissolved solids (TDS) between 60 and 894 mg/l Sulfate concentrations show a greater variation and a maximum concentration of 445 mg/l at the MON-2 station located downstream above the mining unit.

Sulfate concentrations at one upstream station range from 6.0 to 445 mg/l, at another station from 7 to 320 mg/l, and at the downstream station from 6 to 956 mg/l, with a more recent concentration of 72 mg/l. These concentrations indicate the seasonal contribution of sulfate from the mineralized zone during periods of low flow when the relative contribution from groundwater and/or surface water seepage is greatest.

Total Suspended Solids (TSS) are generally more variable at downstream locations with higher maximum concentrations. For example, TSS range from 0 to 268 mg/L and from 0 to 1340 mg/L in a couple of seasons.

20.1.9.5 *Arroyo Mulatos Baseline Water Quality*

The chemistry of water in the Arroyo Mulatos varies along the length of the stream and with time at a given sampling location. Water samples collected along the Arroyo Mulatos show variation downstream from calcium bicarbonate to calcium sulfate water type. Sulfate concentrations generally increase downstream, and pH generally decreases.

The trend of increasing sulfate downstream reflects the increasing influence of the mineralized zone. The sulfates are probably derived from both surface weathering of sulphide minerals, and mine adits and natural springs carrying subsurface weathering products.

TSS levels generally increase downstream in the Arroyo Mulatos. Maximum concentrations are like those measured in the Río Mulatos.

20.1.9.6 *Baseline Water Quality of Minor Drainages (1994)*

- **Cerro Pelon** - Water samples indicate good water quality. The pH ranges from 7.26 to 8.19, bicarbonate from 40 to 302 mg/l, TDS from 120 to 368 mg/l, and sulfate from <1 to 97 mg/l;
- **El Metate** - The water quality is generally good. The pH ranges from 6.93 to 8.12, bicarbonate from 21 to 208 mg/l, TDS from <1 to 682 mg/l, and sulfate from 1 to 368 mg/l;
- **Los Bajios** - The water quality is good. The pH ranges from 6.5 to 6.95, bicarbonate from 16 to 30 mg/l, TDS from 85 to 122 mg/l, and sulfate from 28 to 49 mg/l;
- **Los Paredones** - The water quality is generally good. The pH ranges from 6.68 to 7.95, bicarbonate from 16 to 61 mg/l, TDS from 85 to 490 mg/l, and sulfate from 28 to 245 mg/l;
- **Nuevo Mulatos** - The samples from station NM-1 are good quality. The pH ranges from 6.64 to 7.01, bicarbonate from 12 to 25 mg/l, TDS from 54 to 112 mg/l, and sulfate from 34 to 47 mg/l; and
- **WD Drainages** - The samples from these areas indicated variable water quality. The pH ranges from 3.07 to 8.55 but is generally less than 7 except from one station. Bicarbonate is generally low or below detection. TDS ranges from about 500 to 3,000 mg/l. Sulfate ranges from 369 to 2,410 mg/l. In general, the water quality in the waste rock area is low, probably because of its proximity to the ore body.

20.1.9.7 *Surface Water Quality Monitoring*

Currently, follow-up monitoring is carried out every six months, one in the rainy season and another in the dry season; Based on the results of the surface water quality of the last comparison between the reference values in 2005 and 2022, it was determined that the surface water quality in the Arroyo Mulatos area (MON-3) has had changes over time, derived from the generation of acid water in the area of the Mulatos pit. Tables 20-4 to Table 20-8 present the sampling results for February 2012 and April and September 2022.

In the La Yaqui area, quarterly monitoring has been maintained since 2016, showing various water qualities depending on the area; In the part of Arroyo las Moritas (to the East) the pH is variable according to the season of the year with values ranging from 3.7 to 9 and in Arroyo La Yaqui (to the south) from 6.4 to 8.5. In the Southwest area, there is a spring that maintains an acid pH, with values from 2.4 to 4.4. This is closely related to the mineralization of the area. It should be noted that many of these values are prior to the company's mining activity.

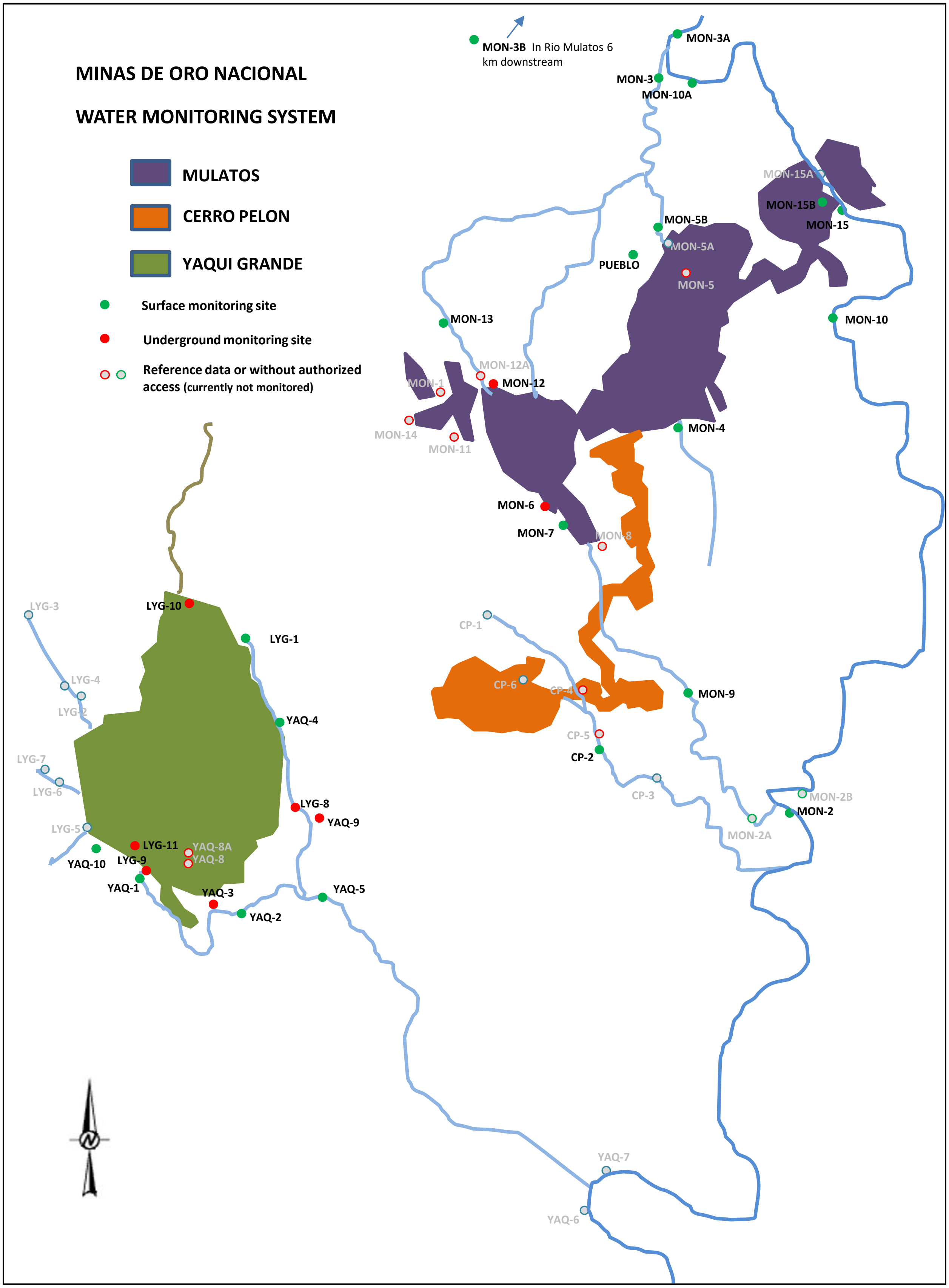


Figure 20-5 Locations of Surface Water Monitoring Points and Groundwater Monitoring Wells

Table 20-4 Water Quality Results for February 2012 Sampling Event

REFERENCE	PARAMETER	UNITS	NOM-127 LIMITS	MON 1 (UG)	MON 2 (SURFACE)	MON 3 (SURFACE)	MON 3A (SURFACE)	MON 4 (SURFACE	MON 5A (SURFACE)	MON 6 (UG)	MON 7 (SURFACE	MON 8 (UG)	MON 9 (P. GUILAR)	MON 10 (SURFACE	MON 10A (SURFACE	MON 11 (UG)	MON 12 (UG)	MON 12A (UG)	MON 13 (SURFACE)	MON 14 (UG)	PILA DE MULATOS
NMX-AA-007-SCFI-2000	Temperature	°C	NA	19.70	15.00	21.00	18.60	12.70	14.80	20.10	13.50	25.20	13.00	17.70	18.30	23.10	18.20	18.40	11.00	24.70	8.60
NMX-AA-093-SCFI-2000	Conductivity	mS/m	NA	25.40	25.80	162.10	30.90	39.00	467.00	44.40	17.40	34.00	39.00	26.40	25.30	26.60	38.60	55.70	56.90	24.90	12.10
NMX-AA-036-SCFI-2001	Alcalinity	mg/L	NA	73.48	121.10	<20.00	103.50	201.83	<20.00	75.55	62.10	166.63	69.35	114.89	111.78	109.71	153.18	65.21	92.12	102.47	<20.00
NMX-AA-073-SCFI-2001	Chlorides	mg/L	250.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	46.06	35.71	<10.00	<10.00
NMX-AA-077-SCFI-2001	Florides	mg/L	1.50	0.22	<0.15	1.70	0.24	0.28	3.63	<0.15	<0.15	0.23	0.23	<0.15	0.16	<0.15	<0.15	<0.15	<0.15	0.15	0.16
EPA-60108	Total Phosphorus	mg/L	NA	<0.20	<0.20	<0.20	<0.20	<0.20	0.70	0.26	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2
NMX-AA-006-SCFI-2000	Floating Material		NA	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
SMEWW-4500-NH3 F	Ammoniacal	mg/L	0.50	0.06	0.09	<0.01	<0.01	<0.01	1.59	0.35	<0.01	<0.01	<0.01	0.02	0.01	0.03	<0.01	<0.01	0.020	<0.01	<0.01
NMX-AA-079-SCFI-2001	N-Nitrates	mg/L	10.00	0.10	0.10	0.30	<0.10	<0.10	0.20	0.70	0.20	<0.10	<0.10	<0.10	0.10	0.40	1.80	1.10	1.80	<0.10	<0.10
NMX-AA-099-SCFI-2006	N-Nitrites	mg/L	1.00	<0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010
NMX-AA-008-SCFI-2000	pH	U	6.5 - 8.5	8.48	8.48	3.18	7.57	7.21	2.38	6.20	7.73	6.99	8.11	8.21	8.46	7.19	7.34	6.28	7.31	9.16	6.35
NMX-AA-034-SCFI-2001	Total Dissolved	mg/L	1000.00	188.00	160.00	1999.00	197.00	263.00	9046.00	351.00	149.00	246.00	238.00	165.00	158.00	185.00	246.00	372.00	362.00	132.00	84.00
NMX-AA-034-SCFI-2001	Total Suspended	mg/L	NA	0.00	0.00	1.00	3.00	5.00	0.00	243.00	11.00	0.00	0.00	5.00	0.00	1.00	0.00	0.00	28.00	0.00	0.00
NMX-AA-034-SCFI-2001	Total Solids	mg/L	NA	188.00	160.00	2000.00	200.00	268.00	9046.00	594.00	160.00	246.00	238.00	170.00	158.00	186.00	246.00	372.00	390.00	132.00	84.00
NMX-AA-074-1981	Sulfates	mg/L	400.00	47.13	8.85	1363.63	48.20	15.63	3264.60	123.93	23.43	11.54	103.97	13.58	13.20	30.24	25.63	136.72	131.09	17.04	42.01
NMX-AA-084-1982	Sulfides	mg/L	NA	<0.01	<0.01	<0.01	<0.01	0.30	<0.01	0.030	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
NMX-AA-038-SCFI-2001	Turbidity	UTN	5.00	2.00	4.00	247.00	5.00	4.00	3.00	28.00	183.00	2.00	1.00	9.00	3.00	12.00	0.00	1.00	28.00	1.00	1.00
NMX-AA-058-SCFI-2001	Total Cyanide	mg/L	0.07	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
SMEWW-4500-CNI	WAD Cyanide	mg/L	NA	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
EPA-6010B	Aluminum	mg/L	0.20	<0.050	<0.050	55.00	1.23	<0.050	384.00	0.865	<0.050	0.145	<0.050	0.113	<0.050	<0.050	<0.050	<0.050	0.536	<0.050	<0.050
EPA-6010B	Antimony	mg/L	NA	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPA-6010B	Arsenic	mg/L	0.025	0.050	0.009	0.060	0.011	<0.005	0.301	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.021	0.039	0.005	<0.005	0.050	<0.005
EPA-6010B	Barium	mg/L	0.700	<0.050	<0.050	0.064	<0.050	0.094	<0.050	0.139	<0.050	<0.050	<0.050	<0.050	<0.050	0.082	0.165	0.269	0.113	<0.050	0.054
EPA-6010B	Berilium	mg/L	NA	<0.005	<0.005	0.011	<0.005	<0.005	0.042	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
EPA-6010B	Boron	mg/L	NA	0.081	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.076	<0.050	<0.050
EPA-6010B	Cadmium	mg/L	0.005	<0.0025	<0.0025	0.039	<0.0025	<0.0025	0.188	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
EPA-6010B	Copper	mg/L	2.00	<0.020	<0.020	3.36	0.040	<0.050	18.00	0.209	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
EPA-6010B	Chrome Total	mg/L	0.05	<0.005	<0.005	0.010	<0.005	<0.005	0.055	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
EPA-6010B	Iron	mg/L	0.30	<0.020	0.031	3.49	0.11	<0.020	259.00	1.04	<0.020	0.026	<0.020	0.102	0.052	1.45	<0.020	<0.020	0.207	0.041	0.363
EPA-6010B	Manganese	mg/L	0.15	<0.010	0.015	16.80	0.44	<0.010	76.90	0.060	<0.010	<0.010	<0.010	0.023	0.025	0.033	<0.010	0.06	0.051	<0.010	<0.010
NMX-AA-051-SCFI-2001	Mercury	mg/L	0.001	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
NMX-AA-051-SCFI-2001	Nickel	mg/L	NA	<0.020	<0.020	0.174	<0.020	<0.020	0.866	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
EPA-6010B	Silver	mg/L	NA	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.015	<0.0025	<0.0025	<0.0025
EPA-6010B	Lead	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
EPA-6010B	Selenium	mg/L	NA	<0.020	<0.020	0.080	0.020	<0.020	<0.020	0.030	0.022	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
EPA-6010B	Zinc	mg/L	5.00	<0.010	<0.010	4.74	0.106	<0.010	30.00	0.257	<0.010	0.040	<0.010	<0.010	<0.010	0.022	<0.010	0.322	<0.010	<0.010	<0.010

Table 20-5 Water Quality Results for April 2022 Sampling Event

REFERENCE	PARAMETER	UNITS	NOM-127	MON 1 (UG)	MON 2 (SURFACE)	MON 3 (SURFACE)	MON 3A (SURFACE)	MON 6 (UG)	MON 7 (SURFACE)	MON 8 (UG)	MON 10 (SURFACE)	MON 10A (SURFACE)	MON 11 (UG)	MON 12 (UG)	MON 12A (UG)	MON 13 (SURFACE)	MON 15B (SURFACE)
NMX-AA-007-SCFI-2000	Temperature	°C	NA	22	28	19	23	25	25	25	25	23	25	22	21	24	24
NMX-AA-093-SCFI-2000	Conductivity	mS/m	NA	9130	286	1291	325	1007	544	388	254	289	372	949	0.1073	1136	6980
NMX-AA-036-SCFI-2001	Alcalinity	mg/L	NA	<C.M.C	120	<C.M.C	111	38	140	175	119	115	147	112	50	<C.M.C	<C.M.C.
NMX-AA-073-SCFI-2001	Chlorides	mg/L	250	<C.M.C	<C.M.C	13	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C.
NMX-AA-077-SCFI-2001	Florides	mg/L	1.5	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-60108	Total Phosphorus	mg/L	NA	0.574	<L.C.	<L.C.	<L.C.	0.12	0.12	0.18	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	2.21
NMX-AA-006-SCFI-2000	Floating Material		NA	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
SMEWW-4500-NH3 F	Ammoniacal Nitrogen	mg/L	0.5	----	----	----	----	----	----	----	----	----	----	----	----	----	----
NMX-AA-079-SCFI-2001	N-Nitrates	mg/L	10	----	----	----	----	----	----	----	----	----	----	----	----	----	----
NMX-AA-099-SCFI-2006	N-Nitrites	mg/L	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----
NMX-AA-008-SCFI-2000	pH	U	6.5 - 8.5	5.1	6.6	4.3	8	5.6	6.8	6.9	7.8	8.2	7.2	6.6	6.2	6.4	2.4
NMX-AA-034-SCFI-2001	Total Dissolved	mg/L	1000	80.8	162	2260	194	956	396	292	152	164	211	1100	1320	1610	18900
NMX-AA-034-SCFI-2001	Total Suspended	mg/L	NA	25.2	<C.M.C	15.6	6.2	53.6	<C.M.C	<C.M.C	<C.M.C	<C.M.C	6.6	<C.M.C	26	28.8	8
NMX-AA-034-SCFI-2001	Total Solids	mg/L	NA	106	162	2280	200	1010	396	292	152	164	218	1100	1350	1640	18900
NMX-AA-074-1981	Sulfates	mg/L	400	20	8	1400	50	<C.M.C	130	9	10	30	29	480	600	850	12000
NMX-AA-084-1982	Sulfides	mg/L	NA	>C.M.C.	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C.
NMX-AA-038-SCFI-2001	Turbidity	UTN	5	5.8	7.5	0.55		29	0.65	0.65	0.8	0.8	1	0.35	0.65	0.85	0.65
NMX-AA-058-SCFI-2001	Total Cyanide	mg/L	0.07	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	----
SMEWW-4500-CNI	WAD Cyanide	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	----
EPA-6010B	Aluminum	mg/L	0.2	0.139	<L.C.	<L.C.	0.125	1.81	<L.C.	0.069	<L.C.	<L.C.	0.098	<L.C.	0.067	1.08	825
EPA-6010B	Antimony	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Arsenic	mg/L	0.025	0.136	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.029	<L.C.	<L.C.	0.32
EPA-6010B	Barium	mg/L	0.7	0.099	<L.C.	<L.C.	<L.C.	0.098	<L.C.	<L.C.	<L.C.	<L.C.	0.095	0.067	<L.C.	<L.C.	<L.C.
EPA-6010B	Berilium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.081
EPA-6010B	Boron	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Cadmium	mg/L	0.005	<L.C.	<L.C.	0.0028	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.4311
EPA-6010B	Copper	mg/L	2	<L.C.	<L.C.	0.082	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	27.9
EPA-6010B	Chrome Total	mg/L	0.05	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.078
EPA-6010B	Iron	mg/L	0.3	3.87	0.067	0.324	0.224	1.1	<L.C.	0.085	<L.C.	0.257	0.258	<L.C.	<L.C.	0.252	1420
EPA-6010B	Manganese	mg/L	0.15	0.821	0.058	3.18	0.072	1.09	<L.C.	<L.C.	<L.C.	0.064	<L.C.	<L.C.	<L.C.	0.123	216
NMX-AA-051-SCFI-2001	Mercury	mg/L	0.001	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
NMX-AA-051-SCFI-2001	Nickel	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	1.29
EPA-6010B	Silver	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Lead	mg/L	0.01	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Selenium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Zinc	mg/L	5	0.123	<L.C.	0.193	<L.C.	0.38	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	51.5

Table 20-6 Water Quality Results for September 2022 Sampling Event

REFERENCE	PARAMETER	UNITS	NOM-127 LIMITS	MON 2 (SURFACE)	MON 3 (SURFACE)	MON 3A (SURFACE)	MON 4 (SURFACE)	MON 6 (UG)	MON 7 (SURFACE)	MON 9 (P. GUILAR)	MON 10 (SURFACE)	MON 10A (SURFACE)	MON 11 (UG)	MON 12 (UG)	MON 13 (SURFACE)	MON 15 (SURFACE)	MON 15B (SURFACE)
NMX-AA-007-SCFI-2000	Temperature	°C	NA	28	28	29	27	27	28	28	24	30	23	26	27	23	23
NMX-AA-093-SCFI-2000	Conductivity	mS/m	NA	175	554	149	670	655	145	----	70	73	297	1027	280	72	3440
NMX-AA-036-SCFI-2001	Alcalinity	mg/L	NA	4.47	32	37	27	42	47	28	41	37	111	90	29	40	<C.M.C.
NMX-AA-073-SCFI-2001	Chlorides	mg/L	250	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	19	<C.M.C	<C.M.C.	<C.M.C.
NMX-AA-077-SCFI-2001	Florides	mg/L	1.5	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-60108	Total Phosphorus	mg/L	NA	0.16	0.158	0.374	<L.C.	0.117	<L.C.	<L.C.	0.35	0.369	<L.C.	<L.C.	0.14	0.41	2.24
NMX-AA-006-SCFI-2000	Floating Material		NA	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
SMEWW-4500-NH3 F	Ammoniacal Nitrogen	mg/L	0.5	0.05	0.05	0.07	0.08	0.05	0.07	0.06	0.11	0.06	0.1	<L.C.	0.12	0.11	1
NMX-AA-079-SCFI-2001	N-Nitrates	mg/L	10	0.2	0.7	0.2	1.4	1.5	0.3	0.3	0.1	0.2	0.3	19.4	2	0.1	0.2
NMX-AA-099-SCFI-2006	N-Nitrites	mg/L	1	0.006	0.006	0.005	0.013	<L.C.	<L.C.	<L.C.	<L.C.	0.005	<L.C.	0.015	0.009	<L.C.	<L.C.
NMX-AA-008-SCFI-2000	pH	U	6.5 - 8.5	7	7.1	7.4	7	5.9	7.7	7.4	7	7.8	6.9	6.8	6.5	7.4	2.6
NMX-AA-034-SCFI-2001	Total Dissolved	mg/L	1000	154	586	170	546	531	108	197	117	168	215	<C.M.C	286	111	13000
NMX-AA-034-SCFI-2001	Total Suspended	mg/L	NA	40.4	52.5	176	12.2	35.2	<C.M.C	10.6	171	168	12.6	<C.M.C	76	223	6.2
NMX-AA-034-SCFI-2001	Total Solids	mg/L	NA	194	638	346	558	566	108	208	288	296	228	1210	362	334	13000
NMX-AA-074-1981	Sulfates	mg/L	400	64	300	72	300	<C.M.C	32	110	8	9	44	580	160	3	7000
NMX-AA-084-1982	Sulfides	mg/L	NA	<C.M.C	<C.M.C	<C.M.C	1	<C.M.C	1	1	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C	<C.M.C.	<C.M.C.
NMX-AA-038-SCFI-2001	Turbidity	UTN	5	29	50	70	4.2	2.6	7.3	8.8	65	60	4.4	0.45	80	80	1.3
NMX-AA-058-SCFI-2001	Total Cyanide	mg/L	0.07	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	----	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	----	----
SMEWW-4500-CNI	WAD Cyanide	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	----	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	----	----
EPA-6010B	Aluminum	mg/L	0.2	<L.C.	4.71	11.5	0.351	0.408	1.04	1.64	7.57	<L.C.	0.538	<L.C.	7.46	8.62	561
EPA-6010B	Antimony	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Arsenic	mg/L	0.025	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.023	<L.C.	<L.C.	0.678
EPA-6010B	Barium	mg/L	0.7	0.052	0.088	0.114	0.074	0.0555	<L.C.	<L.C.	0.082	0.099	0.103	0.073	0.083	0.095	<L.C.
EPA-6010B	Berilium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Boron	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Cadmium	mg/L	0.005	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.4702
EPA-6010B	Copper	mg/L	2	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.055	<L.C.	18.8
EPA-6010B	Chrome Total	mg/L	0.05	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	0.086
EPA-6010B	Iron	mg/L	0.3	2.280	2.000	7.070	0.163	0.346	0.31	0.423	5.65	6.330	1.190	<L.C.	2.640	6.52	1050
EPA-6010B	Manganese	mg/L	0.15	0.109	0.339	0.298	0.701	0.11	<L.C.	0.206	0.202	2.14	2.19	<L.C.	0.614	0.244	138
NMX-AA-051-SCFI-2001	Mercury	mg/L	0.001	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
NMX-AA-051-SCFI-2001	Nickel	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Silver	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Lead	mg/L	0.01	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Selenium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Zinc	mg/L	5	<L.C.	361	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	<L.C.	44.8

Table 20-7 Water Quality Results for January 2022 Sampling Event of Cerro Pelon

REFERENCE	PARAMETER	UNITS	NOM-127 LIMITS	CP 1 (SURFACE)	CP 2 (SURFACE)	CP 3 (SURFACE)	CP 5 (UG)
NMX-AA-007-SCFI-2000	Temperature	°C	NA	18	20	20	21
NMX-AA-093-SCFI-2000	Conductivity	mS/m	NA	343	986	1099	941
NMX-AA-036-SCFI-2001	Alcalinity	mg/L	NA	40	43	29	72
NMX-AA-073-SCFI-2001	Chlorides	mg/L	250	<C.M.C	<L.C.	<C.M.C	<C.M.C
NMX-AA-077-SCFI-2001	Florides	mg/L	1.5	<L.C.	<L.C.	0.5	<L.C.
EPA-60108	Total Phosphorus	mg/L	NA	<L.C.	<L.C.	<L.C.	0.16
NMX-AA-006-SCFI-2000	Floating Material		NA	Absent	Absent	Absent	Absent
SMEWW-4500-NH3 F	Ammoniacal Nitrogen	mg/L	0.5	0.04	0.08	<L.C.	0.1
NMX-AA-079-SCFI-2001	N-Nitrates	mg/L	10	<L.C.	0.1	<L.C.	<L.C.
NMX-AA-099-SCFI-2006	N-Nitrites	mg/L	1	<L.C.	0.004	<L.C.	0.005
NMX-AA-008-SCFI-2000	pH	U	6.5 - 8.5	6.8	7.6	7.2	7.6
NMX-AA-034-SCFI-2001	Total Dissolved Solids	mg/L	1000	214	1100	1010	1090
NMX-AA-034-SCFI-2001	Total Suspended Solids	mg/L	NA	9.6	215	20.4	238
NMX-AA-034-SCFI-2001	Total Solids	mg/L	NA	224	1100	1010	1090
NMX-AA-074-1981	Sulfates	mg/L	400	224	1100	1010	1090
NMX-AA-084-1982	Sulfides	mg/L	NA	120	540	260	460
NMX-AA-038-SCFI-2001	Turbidity	UTN	5	<L.C.	1.4	0.7	3.3
NMX-AA-058-SCFI-2001	Total Cyanide	mg/L	0.07	<L.C.	<L.C.	<L.C.	<L.C.
SMEWW-4500-CNI	WAD Cyanide	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Aluminum	mg/L	0.2	<L.C.	2.68	2.44	3.18
EPA-6010B	Antimony	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Arsenic	mg/L	0.025	<L.C.	0.051	0.01	0.356
EPA-6010B	Barium	mg/L	0.7	0.054	0.09	<L.C.	0.238
EPA-6010B	Berilium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Boron	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Cadmium	mg/L	0.005	<L.C.	<L.C.	0.0028	<L.C.
EPA-6010B	Copper	mg/L	2	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Chrome Total	mg/L	0.05	<L.C.	<L.C.	<L.C.	0.014
EPA-6010B	Iron	mg/L	0.3	<L.C.	3.800	1.040	43.600
EPA-6010B	Manganese	mg/L	0.15	<L.C.	2.22	0.93	1.03
NMX-AA-051-SCFI-2001	Mercury	mg/L	0.001	<L.C.	<L.C.	<L.C.	<L.C.
NMX-AA-051-SCFI-2001	Nickel	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Silver	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Lead	mg/L	0.01	<L.C.	0.022	<L.C.	0.029
EPA-6010B	Selenium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Zinc	mg/L	5	<L.C.	0.064	0.232	0.135

Table 20-8 Water Quality Results for January 2022 Sampling Event of La Yaqui Grande

REFERENCE	PARAMETER	UNITS	NOM-127 LIMITS	LYG 08 (SURFACE)	LYG 09 (SURFACE)	LYG 10 (SURFACE)	LYG 11 (SURFACE)
NMX-AA-007-SCFI-2000	Temperature	°C	NA	25	25	25	25
NMX-AA-093-SCFI-2000	Conductivity	mS/m	NA	387	564	1450	32
NMX-AA-036-SCFI-2001	Alcalinity	mg/L	NA	134	<C.M.C.	70	<C.M.C
NMX-AA-073-SCFI-2001	Chlorides	mg/L	250	<C.M.C	<C.M.C.	<C.M.C	<C.M.C
NMX-AA-077-SCFI-2001	Florides	mg/L	1.5	<L.C.	<L.C.	<L.C.	<L.C.
EPA-60108	Total Phosphorus	mg/L	NA	<L.C.	<L.C.	<L.C.	1.18
NMX-AA-006-SCFI-2000	Floating Material		NA	Absent	Absent	Absent	Absent
SMEWW-4500-NH3 F	Ammoniacal Nitrogen	mg/L	0.5	0.05	<L.C.	0.09	0.07
NMX-AA-079-SCFI-2001	N-Nitrates	mg/L	10	<L.C.	0.7	<L.C.	0.4
NMX-AA-099-SCFI-2006	N-Nitrites	mg/L	1	<L.C.	<L.C.	0.006	0.005
NMX-AA-008-SCFI-2000	pH	U	6.5 - 8.5	6.5	3.7	5.8	5.3
NMX-AA-034-SCFI-2001	Total Dissolved Solids	mg/L	1000	289	757	2890	<C.M.C
NMX-AA-034-SCFI-2001	Total Suspended Solids	mg/L	NA	7	8.6	31.2	24000
NMX-AA-034-SCFI-2001	Total Solids	mg/L	NA	296	766	2920	24100
NMX-AA-074-1981	Sulfates	mg/L	400	92	440	1900	11
NMX-AA-084-1982	Sulfides	mg/L	NA	2	1	1	8
NMX-AA-038-SCFI-2001	Turbidity	UTN	5	5.8	2.6	42	1000
NMX-AA-058-SCFI-2001	Total Cyanide	mg/L	0.07	<L.C.	<L.C.	<L.C.	<L.C.
SMEWW-4500-CNI	WAD Cyanide	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Aluminum	mg/L	0.2	0.136	<C.M.C.	70	<C.M.C
EPA-6010B	Antimony	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Arsenic	mg/L	0.025	<L.C.	<L.C.	0.066	0.115
EPA-6010B	Barium	mg/L	0.7	0.055	<L.C.	<L.C.	4.36
EPA-6010B	Berilium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Boron	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Cadmium	mg/L	0.005	<L.C.	<L.C.	<L.C.	0.0035
EPA-6010B	Copper	mg/L	2	<L.C.	0.066	0.113	1.13
EPA-6010B	Chrome Total	mg/L	0.05	<L.C.	<L.C.	<L.C.	0.02
EPA-6010B	Iron	mg/L	0.3	1.97	0.904	15.3	121.0
EPA-6010B	Manganese	mg/L	0.15	0.14	1.79	3.42	3.74
NMX-AA-051-SCFI-2001	Mercury	mg/L	0.001	<L.C.	<L.C.	<L.C.	<L.C.
NMX-AA-051-SCFI-2001	Nickel	mg/L	NA	<L.C.	<L.C.	<L.C.	0.052
EPA-6010B	Silver	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Lead	mg/L	0.01	<L.C.	0.043	<L.C.	0.0326
EPA-6010B	Selenium	mg/L	NA	<L.C.	<L.C.	<L.C.	<L.C.
EPA-6010B	Zinc	mg/L	5	<L.C.	0.597	0.125	0.829

20.1.10 Groundwater

In the Mulatos region, groundwater flow on a regional scale (i.e., groundwater flow patterns that extend beyond local stream valleys) is minimal. The lack of regional flow results from structural dissection of the terrain (which gives topography dominant control over groundwater flow), and from the absence of laterally extensive porous and permeable geologic units. Despite this, general statements can be made about the controls and characteristics of local and sub-regional groundwater flow.

The most important hydrogeologic units are thin local mantles of soil and alluvium, and heavily fractured bedrock zones. The former is up to several meters thick along streambeds (mostly alluvium) and in flat uplands (mostly weathered bedrock), while in steep areas they are almost nonexistent. They are important because, while limited in extent, they have relatively high porosity and high permeability. Accordingly, these areas enhance groundwater recharge, and may provide groundwater storage.

In the Mulatos region, nearly all the bedrock consists of low porosity layered volcanic rock. Textures range from dense lava flows to moderately welded tuffs and few if any strata have enough porosity and permeability to be considered aquifers. Crystal inclusions have zero porosity, and intercrystalline porosity is very low. Where vesicular porosity exists, it is usually not interconnected.

Some of the denser volcanic units possess locally interconnected porosity due to cooling fractures. Where present above the general water table, such permeable zones may form local perched aquifers. In general, the volcanic units have appreciable porosity and permeability only where fractured (typically by faulting), or where intensely weathered within a few meters of the surface. The fractured bedrock zones can be important sources of water, especially where they are associated with groundwater discharge areas. Deep groundwater circulation may be limited by the horizontal to gently tilted strata, which promote lateral flow to the nearest stream valley. Deep circulation tends to occur only along steeply dipping fracture zones. Because stream valleys are also located preferentially along fracture zones, deep circulation may occur under stream valleys. Fracture zones may constitute secondary aquifers.

Based on the current understanding of the hydrogeologic setting of the Mulatos region, it is expected that the only significant aquifer is a water table aquifer. The piezometric surface forms a subdued reflection of the topography, lying at a depth of a few meters in flat spots to a hundred meters or more near hilltops. Along perennial streams, the water table is at or near the surface. Within the water table aquifer, water storage occurs in intergranular space in alluvium and weathered rock, and in fractures in competent bedrock.

Small, confined aquifers or perched aquifers may occur locally in the project area. Because of their limited extent, such aquifers would probably show rapid piezometric decline and drainage if water were extracted. A generalized conceptual model of water movement in the site area may be described as follows:

- Most rain is lost to evapotranspiration or will flow overland to streams;
- A small amount may infiltrate into shallow soils, alluvium, or weathered rock and then move laterally to streams as subflow on top of lower permeability rock;
- A very small percentage may infiltrate into weathered or fractured bedrock to recharge the water table aquifer;
- Groundwater in the bedrock will tend to move preferentially along fractures;

- The porosity of the fractured bedrock is low so there is little potential for groundwater storage; and
- Discharge from the water table aquifer occurs along perennial reaches of streams.

20.1.10.1 *Groundwater Quality*

A baseline study was conducted in 1995 (Water Management Consultants); the information contained in the following paragraphs represents a summary of said study. The chemistry of the miscellaneous groundwater samples taken at the site is variable. These samples generally come from undeveloped open holes that may be open to several groundwater production zones (e.g., alluvium and bedrock). This fact may account for the variability among samples at a particular site. In general, groundwater from the proposed leach pad area is of good quality (low TDS and neutral pH). The quality of groundwater in the pit area is poor (high TDS and low pH). Two samples from the waste dump area and one from the crusher area show high TDS and neutral pH values. Sulfate concentrations are maximum (about 800 mg/l) in the waste dump area, and minimum (300 mg/l) in the leach pad area.

In the La Yaqui area, the quality of groundwater in the pit area is also deficient (low pH) and this is due, even without human intervention, to the presence of minerals, mainly in the form of sulfates.

A groundwater quality plan has been developed and groundwater quality monitoring points are sampled routinely by Mulatos Mine (Figure 20-5). Based on the groundwater quality results from the latest comparison between the baseline values in 2005 and 2022, it was determined that the groundwater quality had no significant changes in the various monitoring points, although, small variations may be due to seasonal changes (drought or rain) (see Tables 20-4 to Table 20-8).

20.1.11 Flora

The vegetation of the Mulatos region is highly diverse, comprising many vegetation types, from thorn scrub to pine-oak forests. Vegetation type occurrence is modified by elevation, degree of soil alteration by past hydrothermal factors, slope aspect and slope inclination. These factors produce unique plant associations represented only along a narrow latitudinal strip on the western flank of the Sierra Madre Occidental. Vegetation cover is highly heterogeneous. North-facing oak forests are the denser stands, showing the highest cover values (more than 100 percent). Thorn scrub shows also high values of cover (ca. 100 percent). Open oak woodlands on south-facing slopes cover about 60 percent of the land, while vegetation on altered soils and derelict agricultural land have low values of arboreal cover. In most cases there is a grassland matrix or a rich shrubby understory. Major exceptions are anthropogenic disturbance areas, and areas in which the soils have been modified by past hydrothermal action. In these instances, large areas devoid of vegetation are common.

20.1.12 Wildlife

The state of Sonora holds the 15th place in diverse vertebrates endemic to Mesoamerica. There are 153 species in Mesoamerica. Seventy are endemic to Mexico, 8 endemic to the state and 6 have limited distribution.

If taken under consideration with the plant associations described, the communities are less affected by human action, which is the logical consequence of the prevailing weather conditions. The weather is generally not favourable for development of agriculture or intensive farming, and the use of wild plants is also limited. The density of human population remains generally low. Some regions are almost completely depopulated. For the state of Sonora, in the biomes represented in and around the project area, the literature reports fewer than 200 species of animals, including amphibians. Of this total, about 39 percent of the genre and 46 percent of the species corresponds to mammals, followed by birds represented with 48 genres.

Given the pressure exerted by human presence, minimal in quantity but extensive over time, the wildlife has been reduced, usually traveling to remote sites, where reproduction happens. These sites coincide with the area known as the Nacori Chico and the Aros River valley, north of the Mulatos Mine.

With respect to migratory species, mainly ducks come to the state and some other birds, such as the dwarf parakeet (Forpus cyanopygius), which spends winters in Mexico, without reproducing. Of all terrestrial vertebrates reported for the state of Sonora, about 19 percent have some level of protection under the NOM-059-SEMARNAT-2010. About 8.2 percent of all species are considered rare, a similar proportion is endangered, and 2 percent receive special protection and only one specie (0.5 percent) is considered in danger of extinction. The Thick-billed Parrot (Rhynchopsitta pachirhyncha) was not observed in the area, but some residents mentioned its existence in the mountainous area, to the southeast.

The group with the highest number of species listed in NOM-059-SEMARNAT-2010 is “reptiles”, with 51 percent of all protected species. The most common commercially exploited taxonomic group is that of birds, however, this does not occur locally. Of all the species of commercial interest, ten are considered as ornamental or songbirds, for which there are already defined periods to catch them. As in the case of vegetation, there are no species with value to the cultural ethnic groups or local groups, since the latter are nonexistent.

20.2 Waste Disposal, Site Monitoring and Water Management

Environmental considerations include protection of the environment from the wastes generated by the mining operations, monitoring to determine whether mining operations have impacted the environment and water management. These considerations are discussed below.

20.2.1 Waste Disposal

The wastes generated by the mining operations are waste rock (mining residue), heap leach pad residue (mining residue), as well as hazardous and non-hazardous waste; these are regulated by Mexican legislation.

Wastes are handled according to the provisions of the General Law for Prevention and Integrated Waste Management (“Ley General para la Prevención y Gestion Integral de los Residuos and its Reglamento”, last revised January 18, 2021). Waste management practices are implemented onsite through various disposal techniques to prevent any soil or water contamination in full compliance with NOM-052-SEMARNAT-2005, NOM-053-SEMARNAT-1993, and NOM-054-SEMARNAT-1993.

The mine's state environmental permit has authorized operations for the disposal of non-hazardous solid waste in a sanitary landfill. Waste is placed in cells and covered weekly. The site selected for this work was the waste dump because the site selection criteria established by the Official Mexican Standard make such selection difficult.

Waste rock is generated from the open pit. The expected lithologies of the final pit were characterized by Placer Dome geologists as occurring in a reduced (sulfide) versus an oxidized state, and as showing argillaceous versus siliceous alteration. For geochemical classification, the lithologies, oxidation states, and alteration types have been assembled into 12 domains. Acid-Base Accounting (ABA) results have been given by the laboratory in terms of these domains.

Maps of expected final pit geology show that about half of the wall and floor area will be underlain by sulfide rock, and about half by mixed oxide-sulfide rock. Only a small area on the upper walls will be underlain by oxide rock. About two-thirds of the final wall and floor area is underlain by argillized rock, while about one-third has silicified rock. The areas of silicified rock correspond roughly to those in the mixed oxide-sulfide zone. The sulfide zone is roughly coextensive with the rhyodacite flowdome unit (Trf), but otherwise there is little correspondence between lithology and either alteration or oxidation state.

All samples had Net Neutralization Potential values less than zero, meaning that all rock represented by these samples is expected to be net acid generating (Morin and Hutt, 1995). Pyrite is visible in most of the samples and buffering carbonate minerals are absent. If each of the samples represents the geochemistry of its domain, then nearly all the rock exposed in pit walls and floor is expected to be net acid-generating. Only the oxides at the pit rim (about 12.2 percent of the total pit area) are an exception. Morin and Hutt (1995) observed that "the potential for net acid generation and acidic drainage is obviously high.

In Mulatos zone, the greater part of the waste dump material is acid generating. The early kinetic tests (long-term testing) indicate that 7 percent of the waste material (oxides), representing approximately 3.6 million tonnes, has a relatively low potential to generate acidity with sulfate production at 1.65 mg/kg/wk. This compares to 128.5 mg/kg/week for material representing 47 percent of the waste rock (M3 2004d). However, static tests of this sample also indicated it was acid generating (M3 2004d).

Since that time, more detailed geochemical analyses have been conducted to guide the closure planning (see Section 20.5).

For Yaqui Grande, various studies of ABA tests, chemical composition, leaching tests and mineralogical composition were completed, through 245 samples (plus 27 duplicates). Due lo the general lack of NP in the LYG deposit, all waste rock samples were classified as PAG, with NPR values less than 3.0. The ABA results showed the waste rock samples contained variable amounts of sulfide, sulfate, and insoluble sulfur species. The distribution of the sulfide and sulfate species and the AP and NAG test results suggest that there are two types 01 PAG rack, differentiated by the release mechanism for acid. As such, there could be options for segregation within this PAG classification.

20.2.2 Site Monitoring

Mexican laws require mandatory monitoring programs that are implemented under the Mexican environmental agency (SEMARNAT). The following monitoring programs have been established at the Mulatos Mine (Table 20-9).

Table 20-9 Site Environmental Monitoring Program

Action	Criteria/Variables to Consider	Applicable Norms	Monitoring Point	Frequency
Groundwater quality monitoring	Parameters stated by applicable norm	NOM-001-SEMARNAT-2021	Monitoring wells	Annual
Surface water quality monitoring	In accordance with quality criteria which depend on the use of receiving body of water	NOM-001-SEMARNAT-2021	Monitoring sites at arroyos and Rio Mulatos	Biannual
Wastewater treatment system water quality	Parameters stated by applicable norm	NOM-001-SEMARNAT -2021	Authorized download points	Quarterly and/or semi-annually
Air quality monitoring	CO Particulates Lead and mercury metals PM10	NOM-085-SEMARNAT-2011 NOM-043-SEMARNAT-1993 NOM-165-SEMARNAT-2013 NOM-025-SSA1-2014	Fixed sources and perimeter monitoring sites	Annual (COA)
GHG Estimation	substances that generate greenhouse gases	Climate Change Law and its Regulations	GHG sources and processes generated	Annual
Perimetral noise	Decibels	NOM-081-SEMARNAT-1994	Project boundaries	When needed
Fauna registry	Species and amount	Compensation commitment	All project areas	When needed
Flora species rescue records nursery plant production	% of survival, amount and type of plants produced	Compensation/restoration commitment	Replanting and safeguard areas	Annual or when needed
Soil	Collection and storage of organic soils Erosion control works Application of remediation techniques on polluted soils.	Compensation commitment Construction of works for hydrological management of the site. General Law of Ecological Balance and environmental protection.	Soil conservation areas. Actions for soil retention Remediation sites. Roads and banks	When needed
Cleared surface and restores/reforested registry	Surface (hectares)	Compensation/restoration commitment		Biannual or when needed

20.2.3 Water Management

The Mulatos Mine manages water on the site through a variety of facilities, including ponds, tanks, and diversion structures. Water pumped from the Rio Mulatos and precipitation are used in the operations. At Mulatos, the only effluent from the site is via the waste rock dump, where run-off is captured at the North dam and then conveyed to the water treatment plant. The current pumpage to the plant is a maximum of 1,200 gpm.

The water treatment system includes a Sludge Densification Plant (SDP). It is located west of the Escondida Pit on a mid-elevation bench close to the village of Mulatos. Seepage and runoff water from the mine site are pumped from a collection pond to the plant. The treated water is released to Arroyo Mulatos, which flows to the Rio Mulatos. The discharge is to a concrete-lined spillway that has a series of baffles to dissipate energy and to reduce the water velocity prior to discharge off-site. The discharge is treated to meet the water quality concentrations equivalent to the baseline concentrations prior to entering the discharge point at the arroyo.

The pH of the source water has reached up to a pH of 1.86, it is increased by the addition of lime and flocculants, which promotes the precipitation of metals, such as aluminum, manganese, and iron in insoluble carbonates. The water is decanted, leaving the sludge as a waste product. The sludge is dropped from the bottom of the plant on a conveyor to a storage pile.

In 2017, to increase the storage capacity, 3 ponds were built on top of the waste dump; the runoff that reaches the pit is pumped into it and from there, by gravity, it is transported to the treatment plant.

In La Yaqui, a similar treatment plant is currently under construction, in which runoff from the waste dump will be treated and it is intended to use said water in the leaching process and in road irrigation services.

20.3 Regulatory Framework, Project Permitting Requirements and Status

There are several permitting requirements in Mexico for operating mines. The Mexican mining law and environmental regulations are described below, followed by a list of the current permits and licenses.

20.3.1 Mexican Mining Law

According to the Mexican Constitution, minerals are part of the national patrimony. The exploration and exploitation of minerals in Mexico has been regulated by the Mining Law since 1992, which established that all minerals found in Mexican territory are property of the Mexican nation and that private individuals can exploit these minerals (except oil resources and nuclear) through mining concessions granted by the federal government. The law was subsequently amended, with the most recent amendment dated April 20, 2022, where Lithium is declared to be of public utility (national heritage), for which reason concessions, licenses, contracts, permits or authorizations and its use will not be granted. reserves in favor of the people of Mexico.

Mining concessions may only be granted to Mexican nationals and companies, ejidos, agrarian communities and communes, and indigenous communities. In the case of companies, they must be based in Mexico and foreign participation in the ownership of such companies must comply with the Foreign Investment Law that allows companies to be owned by a foreign interest.

In accordance with the 2005 amendment, there is no difference between exploration and exploitation of mining concessions. The law allows owners of mining concessions to perform exploration works with the purpose of identifying mineral deposits and quantifying and evaluating economically usable reserves and conducting work to prepare and develop areas containing mineral deposits; and to exploit the deposits (that is, mine the mineral products). Mining concessions are valid for 50 years from the recording date and may be extended.

Requirements under the Mining Law include the following:

- To start operations of exploration or exploitation 90 days following the recorded date of the mining concession and incur and evidence certain minimum investment or obtain economically useful minerals;
- To pay mining concession fees (fiscal requirements include corporate income tax and value added tax, but no royalties);
- To comply with technical, safety and environmental standards;
- To maintain permanent fortification works, shoring and other installations needed for stability and safety;
- To preserve landmarks;
- To provide the Secretary of Economy with statistical, technical, and accounting reports;
- To allow inspections by the Secretary;
- To provide the Secretary with technical reports when the mining concession is cancelled;
- To provide the Mexican Geological Service, if the concession is granted through a bid process, with semi-annual reports on work and production; and
- To file annual reports detailing production statistics for the previous calendar year to the Secretary.

20.3.2 Land

A single mining concession exists in Mexico corresponding to phases of exploration, mining, and processing. This concession allows for the mapping, identification, and quantification of mineral resources. For mining activities, the concession allows for the development of the mineral resource, extraction of minerals and for water coming from the workings to be used in the mining operations for a fee. The surface area must be either acquired or leased from the landowner; the fee for water used in the process should be paid to the government. The processing concession allows for mineral processing through leaching, and use of water based on a fee (water used in the beneficiation process). Water rights for a production well need to be secured by a concession with an associated fee.

20.3.3 Mexican Environmental Law

Article 39 of the Mining law states that the mining activities must be in accordance with respective environmental legislation and rules. Environmental protection requirements were established by the Environmental Law of 1988 and its last reform of April 2022 (Ley General de Equilibrio Ecológico y Protección al Ambiente (LGEEPA) or General Law of Ecological Balance and Protection of the Environment). Specific broad requirements under the LGEEPA include the following:

- The need to preserve natural reserves and ecological reserves, including a description of the regulation and limitations to their utilization;
- Regulations to promote a more sensible use of natural resources and their protection. Specific references to water, atmosphere and soil are made, including exploration and mining activities;
- Regulation for an active participation of the general public in the protection of the environment; and
- Procedures of control and assurance, including sanctions to those not complying with the law.

The legal framework for environmental regulations is based in Article 27 of Mexico's Constitution, from which the LGEEPA is derived. The regulations are promulgated as "normas oficiales Mexicanas" (NOMs), which establish specifications, guidelines, technical standards, and ecologic criteria applicable to a process or activity. For example, maximum contaminant levels for water discharges are presented in regulation NOM-001-SEMARNAT-2021.

Mine operations and new projects must abide by other laws and regulations, including, but not limited to the Mining Law, National Waters Law, Forestry Law, Firearms and Explosives Law. Exploration activities are currently regulated by Regulation NOM-120-SEMARNAT-2020, which establishes allowable activities, the size of areas to be affected, and specific exploration conditions to be observed. Federal laws are the primary regulations for mining in Mexico; however, there are several permit programs subject to state and local jurisdictions.

20.3.4 Mine Reclamation

Mine reclamation is addressed in Article 27 of the Mexican Constitution, which sets two broad standards for reclamation:

- The Nation always retains ownership of the land and concession holders only have rights to mined materials. As such, the Nation may establish the conditions of reclamation.
- The Nation has an obligation to take mitigation measures to protect natural resources and restore the ecological balance.

20.3.5 Key Mexican Statutes and Regulations

Mine operations are subject to several federal regulations and sampling procedures. The key regulations applicable at Mulatos Mine are presented Table 20-10.

Table 20-10 Key Mexican Environmental Regulations

Regulation	Description
NOM-001-ECOL-2021	The maximum permissible limits of pollutants in wastewater discharges in national waters and assets
NOM-011-CONAGUA-2015	Conservation of Water Resources
NOM-043-SEMARNAT-1996	Maximum permissible levels of emission into the atmosphere of solid particles from fixed sources
NOM-052-SEMARNAT-2005	The characteristics, the identification procedure, classification, and listings of hazardous waste
NOM-059-SEMARNAT-2001	Environmental protection - native species of wild flora and fauna in Mexico - risk categories and specifications for their inclusion, exclusion, or change - list of species at risk
NOM-127-SSA1-1994	Environmental health, water for human use and consumption - permissible limits of quality and treatments to which water must be subjected for its purification
NOM-138-SEMARNAT/SS-2003	Maximum permissible limits of hydrocarbons in soils and the specifications for their characterization and remediation
NOM-141-SEMARNAT-2003	To characterize the tailings, as well as the specifications and criteria for the characterization and preparation of the site, project, construction, operation, and post-operation of tailings dams
NOM-147-SEMARNAT/SSA1-2004	That establishes criteria to determine the remediation concentrations of soils contaminated by arsenic, barium, beryllium, cadmium, hexavalent chromium, mercury, nickel, silver, lead, selenium, thallium and/or vanadium
NOM-155-SEMARNAT-2007	Establishing environmental protection requirements for gold and silver ore leaching systems
NOM-157-SEMARNAT-2009	Establishes the elements and procedures to implement mining waste management plans
NMX-AA-141-SCFI-2007	Soils – benzene, toluene, ethylbenzene, and xylenes (BTEX) by gas chromatography with mass spectrometry and photoionization detectors – test method
NOM-161-SEMARNAT-2011	That establishes the criteria to classify the Special Management Residues and determine which ones are subject to a Management Plan; the list of the same, the procedure for the inclusion or exclusion to said list; as well as the elements and procedures for the formulation of management plans
NOM-025-SSA1-2014	Permissible limit values for the concentration of suspended particles PM10 and PM2.5 in ambient air and criteria for their evaluation.
NOM-085-SEMARNAT-2011	Maximum permissible levels of smoke, particulate, carbon monoxide, sulfur dioxide and nitrogen oxygen emissions from combustion equipment
NOM-043-SEMARNAT-1996	Maximum permissible levels of emission into the atmosphere of solid particles from fixed sources

20.3.6 Permits

Environmental permits are granted by SEMARNAT (Secretaría de Media Ambiente y Recursos Naturales). The mine has permits for exploitation, construction, and operation of the mine, change of use of forest land to mining, use of explosives and as a generator of hazardous waste. The mine was certified as a clean industry by PROFEPA on two occasions, ISO 9001 and has a non-certified environmental management system. The Mexican subsidiary of Alamos Gold (Minas de Oro Nacional) was also a signatory and certified twice to the International Cyanide Management Code.

CONAGUA has permits for the exploitation of surface and underground water, for the use of the federal zone, and for the discharge of residual water in its camps.

At the state level, there is authorization for the comprehensive management of special handling waste.

A list of current permits for the Mulatos Mine and Yaqui Grande is provided in Table 20-11. Although some permits will expire before the end of the mine life, permits can be extended.

Table 20-11 Permits of Mulatos and Yaqui Mine

Environmental Licenses	License Authorization Number	First Issuance Expiration Date	Extension of the Permit
Environmental Impact Permits			
Authorization Environmental Impact "Mulatos Project"	No. D.O.O. DGOEIA.01935		
Building Permit	SGPA/DGIRA/DG-00058-22	05-Jan-22	13-ene-32
Operation permit	SGPA/DGIRA/DG-00059-22	05-Jan-22	13-ene-32
Authorization Environmental Impact Assessment "La Escondida" Project	S.G.P.A.-DGIRA-DG.1151.07	23-May-07	17-Jun-27
Environmental Impact Authorization Project "Treatment Plant and Dam"	S.G.P.A.-DGIRA-DG.0366.11	31-Jan-11	Authorization without expiration period
Authorization of Environmental Impact Project "Intensive Leaching Plant"	S.G.P.A./DGIRA/DG/6701	01-Sep-11	06/09/2021, extension in process
Authorization of Environmental Impact Project "Expansion Mulatos Project 2012" (Waste dump and road opening)	S.G.P.A./DGIRA/DG/01596	07-Mar-13	07/03/2023. extension in process
Environmental Impact Authorization Project "Integration to the Mining Processes of the El Victor and San Carlos Pits and two Underground Mines in the Mulatos Mining Unit"	DS-SG-UGA-IA-0765-13	09-Sep-13	12-Sep-26
Environmental Impact Authorization Project "Expansion Mulatos 2014"	DS-SG-UGA-IA-0786-14	19-Aug-14	25-Aug-27
Authorization of Environmental Impact of the Project "Circuit of Oxidation and Flotation of Minerals"	DS-SG-UGA-IA-0846-14	05-Sep-14	09-Sep-29
Environmental Impact Authorization of the "La Yaqui Open Pit Mines" Project	SGPA/DGIRA/DG/07207	27-Sep-16	03-Oct-26

Environmental Licenses	License Authorization Number	First Issuance Expiration Date	Extension of the Permit
Regional Environmental Impact Authorization of the "La Yaqui Expansion" Project	SGPA/DGIRA/DG/9332	20-Apr-18	20-Apr-32
Authorization of Private Environmental Impact of the Project "Expansion Mulatos 2018"	DS-SG-UGA-IA-0405-18	25-Jun-18	02-Jul-27
Autorización de Impacto Ambiental Particular del Proyecto "Tajo Cerro Pelón"	DS-SG-UGA-IA-0525-18	21-Aug-18	14-Sep-26
Regional Environmental Impact Authorization of the "Mulatos Electric Project"	SGPA/DGIRA/DG.08527		08-Nov-53
Regional Environmental Impact Authorization of "La Yaqui Grande"	DS-SG-UGA-IA-072-19	14-Feb-19	07-Mar-31
Regional Environmental Impact Authorization of the "La Sandia Waste Dump and Services" Project	DS-SG-UGA-IA-0291-2020	24-Sep-20	08-Oct-27
Land Use Change Authorizations			
Land use change authorization for the project "Pits El Victor and San Carlos, Waste dump and Roads"	DFS/SGPA/UARRN/0035/2013	01-Feb-13	08/02/2021, extension in process
Land use change authorization for the project "Expansion of areas of Roads, Camino San Carlos, Pits El Víctor, Estrella and Sanitary Landfill"	DFS/SGPA/UARRN/999/2014	08-Sep-14	24-Sep-24
Land use change authorization for the project "Cerro Pelón".	DFS/SGPA/UARRN/116/2019	23-Apr-19	02-Oct-24
Land use change authorization for the project "IMPROVEMENTS ON MULATOS SITE"	DFS/SGPA/UARRN/151/2022	08-Jul-22	07-Nov-23
Authorizations for the Use of Surface and Underground Water			
Underground water concession, vol. 78,000 m3, extraction point in La Yaqui Grande	02SON123988/09EMGR06 extension authorized in 16-nov-16	03-May-16	Relocated to Yaqui
Underground water concession, vol. 80,000 m3, extraction point in La Yaqui Grande	02SON124188/09EMOC07	16-May-07	Relocated to Yaqui
Surface Water Concession, 1,500,000 m3, (Mulatos River Filtering Gallery)	(02SON123903/09FAGR06)	17-Sep-99	Extension in process
Surface Water Concession, Volume de 50,368.90 m3, (Mulatos River Filtering Gallery)	02SON112109/09FAGR06	08-Jan-99	08-Jan-49
Underground water concession Mulatos, MON 11 (35,000 m3). wells without resource extraction currently	BOO.00. R03.04.02.4647	12-Oct-11	Authorization without expiration period
Underground water concession Mulatos, MON 14 (18,000 m3) wells without resource extraction currently	BOO.00. R03.04.02.4646	12-Oct-11	Authorization without expiration period
Authorizations for wastewater treatment plants			
Authorization for operation and discharge of the wastewater treatment system, Plant 1, Mulatos camp. (96,551.00 m3 anual)	02SON125194/09EMDA16	10-Oct-12	10-Oct-27

Environmental Licenses	License Authorization Number	First Issuance Expiration Date	Extension of the Permit
Authorization for operation and discharge of the wastewater treatment system, Plant 3, Mulatos, (27,561.60 m3 annual) Mulatos	02SON125367/09EMDA16	07-Jul-11	Extension in process
Authorization for operation and discharge of the wastewater treatment system, PTAR La Yaqui Grande (18,250 m3 annual)	B00.803.02.2.-164	04-Jul-18	10-Jul-28
Federal Zone Use Authorization 1,234 m2 Mulatos	02SON151789/09FADA15	10-Dec-15	10-Dec-30
Single Environmental License			
Single Environmental License Mulatos and Updates.	DS-SG-UGA-396-2006, DS-SG-UGA-0382-2013, DS-SG-UGA-04981-2021		Authorization without expiration period
Single Environmental License La Yaqui Grande	DS-SG-UGA-0263/2022		Authorization without expiration period
Authorizations of Waste Management Plans			
Hazardous waste management plan	26-PMG-I-1526-2015, of. DGGIMAR.710-000540		Authorization without expiration period
Special management waste management plan			Authorization without expiration period
Mining waste management plan	No. 26-PMM-I-0194-2019 con Of. No. DGGIMAR.710/0001955	07-Mar-19	27-Mar-29
Authorizations for the Management of Special Handling Waste			
Authorization for the Management and Final Disposal of Residues from your special Management	LAI No. DGGA-LAI-009/16	12-Jan-16	09-Feb-26
Authorization for the Construction, Operation and Maintenance of Confinement Cells for Urban Solid Waste and Special Management of the Mulatos Mine	LAI No. DGGA-LAI-079/19 (5 years)	11-Sep-19	22-Mov-24

20.4 Potential Social or Community Related Requirements and Plans

Mulatos has an established socio-economic program with the local community and supported it with social projects and financial assistance.

Examples of recent projects and assistance provided by the Company include the following:

- MON has a scholarship program for children and youth in the region (Mulatos, Matarachi, El Trigo, Yécora, Arivechi, Sahuaripa, Bacanora), for primary (6 to 12 years), secondary (12 to 15 years), preparatory (15 to 18 years) and university levels;
- Free medical services and medicine for nearby residents;
- Support for school infrastructure or supplies for the 5 schools in the region;
- Economic support for specialized medical services for the residents of Mulatos;

- Small business support for services that don’t qualify as local providers. Includes services for different areas of the mine;
- Education program at the high school level with a prestigious institution (Tecnológico de Monterrey); and
- Various programs in coordination with the government or with philanthropic institutions have been carried out such as:
    - Mental health check-up, vision health glasses endowment program, arts program such as painting, crafts, music, and film.

The mine has established procedures of dialogue and information availability are already established between Mulatos and the stakeholders. The process consists of 5 steps. The first step involves the request for information from an external source, and the following step in the process involves formally receiving the information request. At this point the request is assigned to the corresponding department and the response time will be determined in accordance with the type of request and the condition under which is requested. Management reviews the request, determines whether the information can be transmitted, and grants authorization. If the request is denied, the company prepares an explanation letter. If the information request is approved, then the information is sent to the inquirer.

20.5 Reclamation and Mine Closure Planning

The geology of the Mulatos deposits offers great challenges to reclamation and mine closure planning. The deposits contain several minerals including pyrite, enargite, chalcopyrite, chalcocite, molybdenite, gold, and copper oxides (M3 2004). Oxidation in the deposits range from totally oxidized to fresh sulfides with the oxide rock types occurring primarily near the surface because of surface weathering (M3 2004). Approximately 67 percent of the ore reserves contain sulfide zones (M3 2004). The sulfides are subject to oxidation resulting in the generation of acidic conditions. The dominant form of sulfur in the deposit is acid-generating pyrite (Morin and Hutt 1995). The potential for the rock in the project area to generate acid has been confirmed by the chemical analysis of various waste materials including fines, oxide, and reduced material. Acid generation can result in the degradation of water quality and compromise revegetation success. As well, the mine wastes contain metals such as arsenic, barium, copper, molybdenum, and lead.

The mine includes open pits, waste rock piles, leach pads, storage ponds, conveyors, a dam, roads, an air strip, a water treatment plant, buildings and other structures, and areas used for crushing, explosive storage, and numerous working areas (Figure 20-6). There are three major factors that have been considered in developing the closure plan for the Mulatos Property:

- Mine waste mineralogy;
- Environmental setting; and
- Mine facilities and disturbance type.

Specific reclamation and closure plans have been developed for each component of the site reflecting the varying disturbance types, characteristics of the materials, and the size of the footprints of the various facilities.

20.5.1 Regulatory Framework and Requirements

Closure of the site will follow the Mexican government regulations including:

- Ley General del Equilibrio Ecológico y la Protección al Ambiente y Leyes Complementarias; and
- Ley de Aguas Nacionales y su Reglamento.

Several permits are also required for the Project. These must be adhered to as part of the Project development.

The Mulatos and Yaqui Grande Projects uses cyanide in the leach pad operation. Alamos Gold is in alignment (although not currently certified) with the International Cyanide Management Code (ICMI 2009a) for the standards of practice for decommissioning the leach pads (ICM 2009b). The Code has standards of practice for transportation, handling and storage, operations, and decommissioning. The decommissioning standards of practice are relevant to the closure of the leach pads. This includes disposal of cyanide reagents, decontamination of equipment, and rinsing of leach pads.

20.5.2 Closure and Reclamation Objectives

Six major objectives have been identified for the closure of the Mulatos Property.

20.5.2.1 *Minimization of Acid Generation*

The major closure challenge will be to reduce the effects of acid generating materials on the environment, as much as possible. This can be carried out by mine waste handling, placement planning, and treatment of existing acid generating surfaces to reduce infiltration of precipitation and, therefore, the volume of contaminated water emanating from the site. This will require several techniques including water management.

20.5.2.2 *Re-Establishment of Productive Land Use*

The primary use of the land in the surrounding area is cattle grazing (M3 2004d). As well, native vegetation also supports wildlife. Therefore, the disturbed areas will be revegetated with native species, such that, the final land use will be cattle grazing and wildlife habitat.

20.5.2.3 *Provision of Stable Landforms*

Another important objective will be to provide stable landforms for safety reasons, as well as, to ensure that the reclamation will not be compromised and result in exposing covered surfaces.

20.5.2.4 *Protection of Aquatic Resources*

Mulatos and La Yaqui Grande are located west of the Rio Mulatos. The Arroyo Mulatos flows through the site, west of the Estrella pit and downslope to the north; in Yaqui Grande the Arroyo Las Moritas flows of the East of waste dump and pit. Water is sourced from the Rio Mulatos. The Rio Mulatos is used to provide water to agricultural animals and to crops downstream from the mine and the river also has a fish population. The objective will be to minimize sediment loading in the Rio Mulatos.

The objective will also be to minimize the contamination of the water that flows from the Arroyo Mulatos, in a northerly direction, downstream from the mine site, since from there, the Arroyo Mulatos joins the Río Mulatos. As well as minimizing the contamination of the water that flows from the Las Moritas Stream, also to the Mulatos River.

20.5.2.5 *Development of a Self-Sustaining Environment*

An important objective is to reclaim and close the site such that on-going management will be minimized. This will include a focus on minimizing the generation of acid mine drainage (AMD) to reduce the requirement for on-going water treatment. The revegetation of disturbances with native vegetation is also particularly beneficial as the plants are naturally climatized to the site. The use of native plants reduces the requirements for amendments and contributes to the long term sustainability of the site.

20.5.2.6 *Reduction of Visual Disturbance*

The Project area contains numerous structures and equipment. These represent a visual reminder of an industrial use. The objective will be to remove all structures and equipment not required for on-going monitoring and general maintenance.

20.5.3 Closure Planning

Around 875 hectares have been disturbed for the main and support facilities of the Mulatos Mine, La Yaqui Grande, and its predecessor La Yaqui. Table 20-12 shows only the main infrastructure:

Table 20-12 Surface Disturbance of Main Facilities

	Mulatos Mine	Yaqui Grande Mine	La Yaqui Mine
Area (ha)			
Waste Rock Dumps	138.9	111.7	0
Leaching system	74.2	35.1	7.9
Clay Pit	18.3	-	-
Perimeter (m)			
Pits	13,050	5,112	3,000

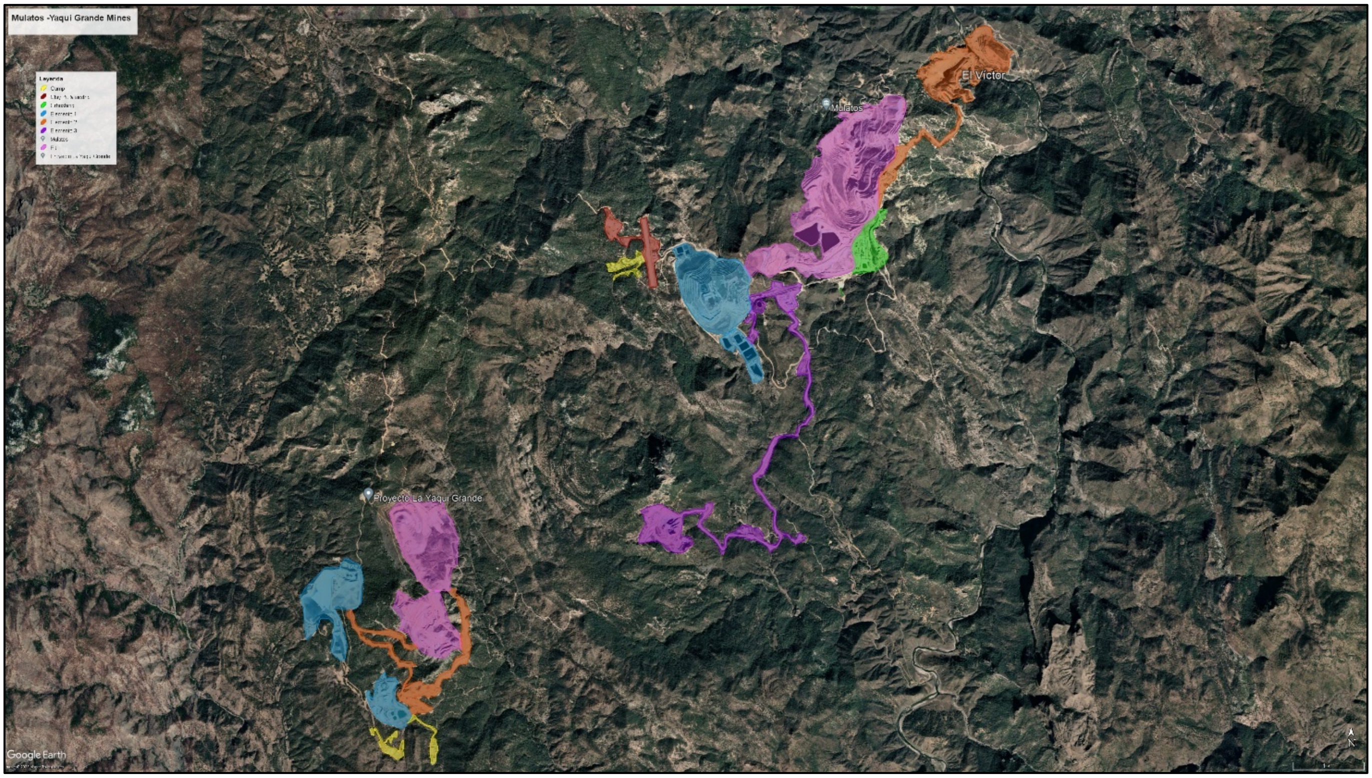


Figure 20-6 Mulatos Mine Site and Infrastructure – 2022

20.5.3.1 *Pits*

The Mulatos Mine is an open pit operation. The closure of the mining areas will involve fencing around the pits to prevent access. The perimeter along the fence will be just over 20,000m in length and vegetation is intended to be present to minimize water flow into the wall from the edge.

The closure plan is currently being updated for these sites to minimize acid water generation.

20.5.3.2 *Waste Rock Piles*

The waste rock piles are deposited by end-dumping resulting in the angle of repose. Most of the material is placed in 10 to 15 m lifts. This is designed to allow the face of the dump to be constructed with an overall slope of 2.25:1. This will provide stable slopes and slopes that can be reclaimed.

The Mulatos Mine is located in the east-central part of the State of Senora in northwestern Mexico, in the Sierra Madre Occidental mountain range. The climate is dry and the hot during the summer. The success of a store and release cover is dependent on several factors, but a major consideration is the amount of precipitation and evaporation occurring at a site. The cover will rely on high evaporation and evapotranspiration to extract water from the cover and, therefore, reduce infiltration of water into the waste rock dumps. Although the climate is relatively hot and dry, which is ideal for a store and release cover, the cover will be required to accommodate the increased rainfall occurring in July and August.

Except for the months of July and August, evaporation exceeds precipitation. With evaporation exceeding precipitation, there is an opportunity for a net upward migration of acids and metals towards the surface. That is, as the waste dumps materials are net acid generating, direct contact of the soil cover with the waste rock may result in acidification of the soil cover with time. This can occur through upward migration of moisture which has been in contact with the waste rock at the waste rock- soil interface. This is due to evaporation. Therefore, a 40 cm gravelly/rocky cover will be placed over the waste dump surfaces to ensure that net upward migration of acids and metals does not occur into the soils. As well, the gravel provides a capillary break which reduces downward flow into the gravel layer.

The side slopes of the waste dumps are generally loose while the level surfaces can be very compacted as the waste dumps are constructed using heavy equipment. The compacted waste dump surface may perch water during high precipitation events resulting in contamination of the perched water which could come in contact with the soil cover. To counter this, the gravel layer can be thicker, or the waste rock dump surface can be ripped to 50 cm depth to allow water to move below the surface, such that perching will not occur. The latter option results in more water entering the waste dump.

The gravel layer material will be blasted and excavated from clean rock located just north of the pit area. It will be crushed. Gravels between 4 cm and 12 cm should be suitable for this purpose.

Soil modeling using SoilCover has been carried out for the Mulatos Property. The results of sensitivity analysis for the Mulatos Mine indicate a soil cover between 30 cm and 90 cm will result in a net infiltration rate of 3 percent of total annual precipitation. A topsoil cover of 40 cm in depth has been selected. The depth should ensure that there will be a sufficient thickness to cover the rocky, uneven surface of the hydrologic barrier resulting in some loss of fines between fragments and still provide for the store and release benefits. This depth should also provide the required water holding capacity to accommodate local precipitation, allowing roughly 3 percent through the cover. The downward movement of water is held in the soil portion of the cover by the discontinuity of pore sizes, between the soils and gravel barrier. As well, this depth should provide sufficient water storage capacity for plant establishment and growth. The soil cover will be constructed from the soils that can be salvaged in the Project area and those currently stored.

The soils are subject to compaction when wet and erosion when dry and during high rainfall events, if denuded of vegetation. The soils should not be spread on the surface of the waste dumps when they are either excessively dry or wet nor in July or August, the wetter months of the year. They can be spread before and after this period. The goal will be to use light weight equipment during spreading, where possible, to reduce compaction. Compaction of the soils interferes with seedling development and growth and can result in surface puddling. A light cultivation of the soils will be beneficial on the benches. Once the soils are spread and the surface prepared, reclaimed areas will be vegetated with native seed and plant material. The plants extract water from the cover and protect the soils from wind and water erosion by shielding the soil surface and binding it by roots. A vegetative cover also provides wildlife habitat and potential browse for cattle grazing.

The vegetation communities occurring in the study area will guide the reclamation program. The topography in the area is complex and ranges from 900 m elevation at the Rio Mulatos to 2,000 m at the top of mountains. Oak-pine forests and thorn scrub vegetation commonly occur in the area. The dominant species are Acacia farnesiana, A. pennatula, and A. cochliacantha (AGRA 1995). Seed collection and reclamation has been carried out by Minas de Oro personnel on an on-going basis and these programs have been successful. Mine personnel continue to develop a large seed bank and have set up greenhouses for plant propagation for reclamation. Revegetation has also been carried out by direct planting of cacti.

If seeding and planting occurs during a dry period, light irrigation will be carried out to insure sufficient moisture for seedling establishment. The vegetated sites will be monitored to assess the success of revegetation and check for surface erosion. All eroded areas will be ameliorated.

20.5.3.3 *Leach Pads*

At Mulatos there are two heap leach pads located approximately 2 km southwest of the crushing plant. The base of the leach pads includes a 0.3 m layer of clay, which was excavated from the clay quarry. At La Yaqui there is a single leach pad, as at Yaqui Grande. In all of these areas, the clay has been compacted and covered with an 80-mil HDPE liner system and is consistent with the International Cyanide Management Code (ICMI 2009a). The pads are designed with a perforated pipe drainage system placed on the liner to collect the pregnant solution. Fine crushed ore is transported to the pad for leaching. Cyanide solution is applied for approximately 120 days. The leach material is stacked in 7.5 m lifts. The leach pads consist of an upper surface and side slopes with a series of benches at the south end which are two meters wide which have been incorporated into the leach pile at each six-meter lift. The process of layering and leaching the ore is repeated.

The pregnant solution is collected at the toe of each pad and directed by pipes located in lined ditches to a pregnant pond which is also lined with HDPE. An intermediate pond and a storm water pond to handle overflow due to a large precipitation event have also been constructed. In Mulatos there are eight ponds, three in Yaqui and three in Yaqui Grande associated with the leach pads. Reclamation will include the pads, the side slopes of the south pad, as well as all supporting infrastructure including the ditches and ponds.

Closure issues frequently associated with leach pads include the management of residual cyanide (ICMI 2009a; USEPA 1994a and 1994b). A general practice for closing a leach pad includes extensive rinsing to remove cyanide (ICMI 2009a). However, the leached material on the pad generates acid and the goal is to minimize the amount of AMD seepage and runoff from the pad. Therefore, when the last leach cycle of the process is complete in the last few lifts, the solution will only be recirculated for some time to recover the remaining gold and remove the cyanide. Following this, the irrigation lines will be removed and decontaminated. They will be removed off-site or in accordance with standard methods.

The leach pads will be closed off with an engineering cover, the same as the waste rock dumps. The ponds will be removed at the time of closure. Therefore, the designed cover will include a layer of clay or GCL placed on top of the leachate material. This will reduce the potential for contamination from any water that seeps through the cover.

A layer of coarse gravel will be spread over the layer of clay or GCL which will be covered with 40 cm of earth. The gravel layer will have a thickness of 30 cm. Any water that passes through the soil cover will enter the gravel layer and only come into contact with the clayey material and should therefore be suitable for release to the environment without treatment.

Like the waste dumps, the leach pads will be vegetated. The vegetation will become more effective with time, in the uptake of moisture in the cover due to an increase in ground surface coverage, leaf area index, and root mass. It is predicted that little water will enter the leach pad material because of the low infiltration rate of the clay layer. As well, the clay layer will also act as a capillary break. This will have a further effect of reducing water entering the leach pads.

The drainage pipes will remain in place following closure to allow the leach pad to drain. They will be covered with a coarse layer of material and covered with soil and vegetated. This coarse layer will prevent the upward migration of any free seepage around the pipes.

20.5.3.4 *Pregnant, Stormwater, and Emergency Ponds*

All the ponds will be removed at closure. All are lined. Any sediment in the bottom of the ponds will be removed and placed on the leach pad before the engineered cover is constructed on the pad. The liners will be removed to allow free drainage. They will be landfilled. The bottom of the ponds will be ripped to 30 cm depth to reduce compaction and ensure that the reclaimed areas will not become waterlogged. The ponds will be backfilled with broken concrete from other structures nearby that will be disassembled at closure and with material salvaged from the berms around the ponds. They will then be covered with topsoil or other mineral (non-mine waste) material and revegetated.

Infrastructure associated with the ponds will be removed and sold or recycled. The soils in the vicinity of the equipment will be assessed for contamination. Contaminated soils will be removed and placed on the leach pads before the engineered cover is installed.

20.5.3.5 *Water Pipeline System/Filtration Gallery*

The water system on the site includes a filtration gallery in the Rio Mulatos which brings water to the site. As well, several water tanks and water pumps are located on the site including in the camp area.

The water pipes located beneath the Rio Mulatos River bottom will be left in place as their excavation will cause an increase in sediment in the river which will have a detrimental effect on water quality and fish populations. The pump installation on the riverbank will be removed and taken off site for disposal and the site rehabilitated. Care will be taken to minimize disturbance to the riverbank. The riverbank will be rip rapped adjacent to the water to reduce sediment entering the river. The areas upslope will be vegetated with native vegetation collected near the river and propagated in preparation for reclamation. The booster pumps will be removed at closure and sold.

Soils in the vicinity of the equipment will be assessed for contamination from lubricants and fuels. They will be removed and disposed of based on local practices. All concrete will be removed and used to backfill the ponds that will be closed on site. The upper 20 cm of soil will be cultivated to remove compaction. The area will be seeded with native seed. As much of the areas associated with the pipeline requiring rehabilitation occur on sloping topography, care will be taken to prepare and seed the site before high rainfall events as these areas will be particularly sensitive to water erosion due to the sloping topography. As well, the soils along the slopes are moderately fine textured so they are also particularly subject to compaction and erosion, if handled or disturbed when they are wet.

The water storage tank, pipes, and accessory equipment will be dismantled and sold to local dealers. All bare surfaces will be broadcast seeded with native seed.

20.5.3.6 *Clay Pit*

The clay pit has been excavated to provide fine textured material for the base for the leach pads. The cut slopes of the clay pit are subject to erosion. The turnaround area at the pit base is highly compacted. This will be deep ripped. The cut slopes will then be resloped to result in a concave shape over the pit area to provide stability. The resloping will loosen the material which will provide a good seedbed. The soils in the clay pit are acidic, with a pH of 3.8. They will be broadcast limed and fertilized, as the subsoil material has low fertility. Liming should be successful, as the clay pit material is not acid-generating. Native seed will be broadcast. The resloping and the seeding will minimize surface dust and water erosion. The rehabilitated areas will be checked to assess plant establishment. Any bare spots will be reseeded and areas exhibiting erosion will be ameliorated.

20.5.3.7 *Conveyor*

The crushed ore is transported to the leach pads via a large conveyor system. This system consists of three conveyor belts. A road is located along the side of the conveyor. At closure, the conveyor system will be dismantled and sold. The concrete blocks will be disposed of in the leach pad ponds or ground to use in the gravel layer for the engineered covers. All ore spills will be cleaned up and the ore deposited on the leach pads before the engineered cover is installed.

Once the conveyor system has been removed, the surfaces on native soils will be ripped. The soils will be limed, if required, and broadcast seeded with native seed.

20.5.3.8 *Crusher*

The crusher operation, the lime bins, a scalping screen, a maintenance facility, a water pond, roads, and other disturbed areas. Once the crushers, lime bins, and structures have been removed, all excess mine waste and ore material will be removed and placed on the leach pads prior to the pads being reclaimed. The pond liner of Mulatos will be removed and disposed of, off-site. The pond will be backfilled with broken concrete from the buildings foundation and then backfilled with material surrounding the pond. The site will then be graded to achieve a level surface.

As the site has been exposed to the acid generating materials over the years, the soils will be limed. They will also be fertilized and seeded with native seed collected on-site.

20.5.3.9 *Agglomeration System*

The agglomeration system located close to the leach pads area removed. It includes the agglomerator, a conveyor system, cement silos, water and cyanide tanks, and other support infrastructure. As well, a storage building is located in the area. All these structures will be dismantled and removed at closure and sold or recycled. Any remaining cyanide will be removed from the tank and disposed of according to the International Cyanide Management Code (2009b). The agglomerator system is connected to the grasshopper which will also be dismantled, removed from the site, and sold or recycled.

Ore material deposited as dust and as spillage occurs over the area and on the slope where it is dropped from the conveyor. All the spilled and loose ore material will be removed from the surface and spread on the leach pads before they are reclaimed.

The ore dust and spillage are acid generating. Therefore, the soils following removal of the dust and spillage will be limed. The area will be compacted because of its use, so this area will be ripped to improve the site drainage and prevent ponding and surface water erosion. The reaction (pH) of the soils will be checked after lime application and ripping. They will then be broadcast fertilized, if required, and seeded with seeds collected on site. Shrubs and trees salvaged or grown for reclamation, will be planted in this area.

20.5.3.10 *Buildings and Structures*

There are number of different structures located on the site. These will be closed according to the nature of the structure. These are described below. Once the building and structures are removed, all the sites will be reclaimed.

Process Plant

The process plants are located adjacent to the leach pads. The plants will be dismantled at closure. This facility includes a concrete building, fencing, a parking area, and other ancillary components.

At closure, the metal fencing will be removed and used on site to provide barriers where required, for example, around the pit. The metal stairs and other metal components will be removed off-site and recycled or sold. The interior components will be removed off-site and sold or disposed of according to local practices. The concrete blocks will be dismantled and will be used for retaining walls where required, for example around the pit, or will be used as backfill in the storm and/or emergency pond. Any remaining fuel and their tanks will be removed off-site and disposed of in a regulated landfill or recycled. The concrete foundation will be broken up and used as backfill for the storm and/or emergency ponds.

When the structures have been removed, the site will be checked for contamination from fuel and lubricants from equipment. The contaminated material will be disposed of off-site in a regulated landfill. The infrastructure will be removed. The surface will be compacted so it will be ripped and revegetated like the other sites.

Gas Tanks and Fuel Station

Gas tanks are in various locations on the property. They are fenced and are located on concrete supports.

The fencing around the tanks will be removed and used on-site. The hoses and tank will be removed off-site and sold or used in another operation. The concrete supports will be broken up and used as backfill in the storm and/or emergency ponds. The sites will be checked for fuel contamination and any contaminated soils will be removed off-site and disposed of in a regulated facility. The sites will then be prepared and revegetated.

The gas station on site will be removed when it is no longer required. The fuel system for the gas station will be disconnected. The pumps and structure will be removed off-site. Efforts will be made to reuse and/or recycle any portions of the structure. The concrete will be removed, broken up and used as backfill where required on the site or will be ground to be used for the gravel barrier for the engineered covers for the leach pads or rock dumps. The belowground tank will be removed off site. The soils in the vicinity of the tank and pipes will be checked for fuel/hydrocarbon staining. Further investigation will be carried out if there is an indication of soil contamination. The site will be ripped and revegetated. Some topsoil and fertilizer will likely be required.

Power Plants

There three power plants on site, two at Mulatos and one at La Yaqui Grande. They each consist of a building and several generators. At closure, the buildings and generators will be removed and sold or disposed of off-site in a regulated facility. The concrete pad below the generators and any other concrete will be broken up and used as backfill in the storm or emergency ponds or as gravel for the engineered covers. Any contaminated soils will be removed and disposed of according to standard practices.

Buildings

There are several buildings located on the property including the office/warehouse/truckshop area, a cafeteria near the warehouse, and the old magazine buildings. There is a large storage area including for chemical storage. The soils lab is also located in this area.

At closure, all buildings, structures, and other materials will be removed and sold or recycled. Many of the buildings are made of metal and have metal roofs which will be recycled. Some buildings are made of concrete blocks. The concrete blocks will be broken and used as backfill or for the gravel barrier for the engineered cover. All chemicals will be removed off site and will be disposed of appropriately. The concrete foundations and the concrete building materials will be broken up and ground to be used to construct the gravel barrier for the engineered covers or will be disposed of in the ponds or on the waste dumps.

Any contaminated soil from the truck or equipment storage areas will be removed and disposed of according to standard practices. Once the various buildings are removed, the surface will be prepared ripped and revegetated.

Camps, Cafeteria, Recreational Area, and Core Shack

There is a main camp in each mine, as well as a camp at the site of the former clay pit in Mulatos. The mains camp consists of several buildings including individual buildings for sleeping, as well as, a hospital, cafeteria, an office area, common areas, and a parking lot. There is also a core shack, an outdoor court for sports, and an airstrip.

A portion of the mains camp will be dismantled at closure. Some buildings will be left for housing personnel who will remain on site for monitoring and other maintenance types of activities. The buildings which will not be required will be dismantled and removed from the site or sold to local buyers. The concrete foundations will be broken and ground and used to construct the gravel barrier for the engineered cover for the leach pads and the waste rock dumps or will be disposed of in the ponds or on the waste dumps.

Currently, the common areas between the buildings are reclaimed. The building sites and the portion of the parking lot that will no longer be used will be reclaimed. Gravel will be removed from the parking lot as part of site preparation for reclamation. This area and any areas below the former buildings will require ripping, topsoil, and fertilizer to promote successful revegetation.

The core shacks will be removed, as well as the sports court and the airstrip. The concrete pad of the core shacks will be ground up to be used for the gravel layer for the engineered cover. The playing surface, bleachers, and any other structures will be removed off site. These materials will be recycled, if possible. The fencing may be needed on-site to reduce access, where required. This area will be ripped and topsoil and fertilizer will be required. It will be revegetated.

The air strip is gravel. Any loose gravel from the air strip will be removed and placed where it is required, for example, on remaining roads. The surface will then be ripped and some topsoil from the area will be spread on the airstrip before it is revegetated.

The temporary camp at the former clay pit will be removed and the site reclaimed. All facilities associated with the aboveground portion of the camp, will be removed. This area will be ripped and will likely need fertilizer at revegetation.

Three sewage ponds are located on the east side of the airstrip and one more in Yaqui Grande. These will be allowed to dry out. The sediment will then be removed. Chemical analysis will be carried out on the sediment. If the sediment does not include any deleterious substances, it will be used as a soil amendment in reclamation. It will be mixed with the topsoil used in reclamation to increase the organic matter content of the soil. If the material is not suitable for use in reclamation, it will be removed and stockpiled next to the ponds. The pond liners will be removed and disposed of off-site or will be landfilled on-site. The sediment will then be redeposited back into the bottom of the ponds. The berms around the ponds will then be used to backfill the ponds. Once the ponds are at grade, they will be revegetated.

20.5.3.11 *Site Roads*

Roads occur throughout the Project area. Some roads will remain open for general monitoring of the site. The roads on the waste dumps will be closed like the other parts of the waste dump, that is, they will receive an engineered cover except where they are not required for monitoring.

Roads used in the mine operation, though they may not occur on mine waste materials, will have received dust from mine waste. It is likely that these roads may have a thin layer of dust that is acidic. Part of the preparation of the roads will include liming. Once the soils are limed, they will be ripped, fertilized, if required, and seeded with seed collected on-site.

The roads located in steep areas are subject to sloughing where the road cuts are vertical or nearly vertical. These eroding road banks are predominantly located along the road between the Rio Mulatos and the mine site. These banks are too steep for the establishment of vegetation. The cut banks will be resloped, where possible, to achieve a more stable slope and revegetated.

20.5.3.12 *Tabacote Dam*

The Tabacote Dam is lined at the north end of the structure with a HPDE liner and is fenced. Water pipes in the north end of the dam allow excess water from the adjacent uplands to the south, to flow through the pipes which exit the other side of the dam and continue below the waste dumps. This water flows through the pipes downstream to the Arroyo Mulatos. This dam will remain in place to reduce the amount of water that flows through the bottom of the dumps.

20.5.3.13 *Water Treatment Plant*

The water treatment system includes a Sludge Densification Plant (SDP) located west of the Escondida Pit on a mid-elevation bench. Water is pumped from the pond. The water meets Mexican discharge standards. The pond receives seepage and runoff water from the mine site. The treated water is released to the Rio Mulatos.

The source water pH is increased by mixing it with a lime slurry which promotes the precipitation of metals, such as, aluminum, manganese, and iron into insoluble carbonates The water is removed from the sludge. The sludge drops from the bottom of the plant onto a conveyor to a stockpile until it is ready for disposal in the waste rock piles or into the pit near the end of the mine life.

In 2017, to increase the storage capacity, three ponds were built on top of the waste dump; the runoff that reaches the pit is pumped into it and from there, by gravity, it is transported to the treatment plant.

In La Yaqui, a similar treatment plant is currently under construction, in which runoff from the waste dump will be treated and it is intended to use said water in the leaching process and in road irrigation services.

20.5.3.14 *Disturbance Areas*

There are areas which have not been mined but are extensively disturbed. These are the areas where the large infrastructure and buildings have been located, such as the crusher system. These areas will be reclaimed once all the infrastructure and buildings have been removed.

20.5.4 Monitoring and Reporting

Following closure of the site, a monitoring program will be set up. This will ensure that rehabilitation and reclamation are successful. An annual report will be produced on all monitoring activities and the results of the monitoring program. Reports will be submitted to the proper government authorities.

20.5.5 Closure Costs

The cost of the closure has assumed that the equipment required for dismantling of the structures, site preparation and reclamation will be on site. Labor costs are based on those in the region. Closing costs are calculated annually, updating these for inflation and including new areas or excluding those that no longer exist.

21 CAPITAL AND OPERATING COSTS

The Mulatos Property has been in production since 2005 and commercial production since 2006. Gold production has averaged over 150,000 ounces per year since 2008. To the end of 2022 over 2.5 million ounces of gold have been produced.

Table 21-1 contains selective 2022 operating and financial information by quarter, for the Mulatos and La Yaqui Grande operations.

Table 21-2 contains selective operating and financial information from the 2023 budget estimate. The main Mulatos open pit is expected to finish operations in late 2023. Processing of existing stockpiles and residual leaching will continue into 2024.

La Yaqui Grande has a mine life through 2027 and operating costs for the remainder of the mine life are expected to be similar to those budgeted for 2023.

La Yaqui Grande life of mine capital cost beyond 2023 is expected to be $10 million in total.

Table 21-1 2022 Quarterly Operating Performance

		2022			
		Q1	Q2	Q3	Q4
Mulatos Pit					
Ore Mined	Tonnes	613,813	1,227,625	759,339	1,065,739
Waste Mined	Tonnes	1,972,552	1,691,474	1,573,334	756,749
Total Mined	Tonnes	2,586,365	2,919,099	2,332,673	1,822,488
Ore Stacked	Tonnes	1,741,483	1,526,441	1,274,662	1,477,642
Grade	g/t	0.73	0.68	0.75	0.78
Contained Ounces	oz	40,852	33,197	30,916	37,362
Recovered Ounces	oz	22,495	15,169	17,416	11,782
Recovered/Stacked Ounces	%	55%	46%	56%	32%
Mining Cost	$/t mined	5.13	4.42	5.14	6.17
Processing Cost	$/t processed	15.77	17.41	16.18	15.33
G&A Cost	$/t processed	3.12	3.55	2.45	3.93
La Yaqui Grande					
Ore Mined	Tonnes	152,934	343,884	739,127	1,034,974
Waste Mined	Tonnes	5,881,231	6,260,883	5,327,341	6,133,308
Total Mined	Tonnes	6,034,165	6,604,767	6,066,468	7,168,282
Ore Stacked	Tonnes	96,402	333,166	794,127	1,020,449
Grade	g/t	0.88	1.57	1.23	1.43
Contained Ounces	oz	2,734	16,777	31,362	46,931
Recovered Ounces	oz	-	4,922	25,332	37,307
Recovered/Stacked Ounces	%	-	-	81%	79%
Mining Cost	$/t mined	-	1.99	2.05	1.98
Processing Cost	$/t processed	-	5.57	6.76	6.09
G&A Cost	$/t processed	-	1.77	4.69	2.82
Combined					
Ounces Produced	oz	22,500	20,200	42,700	49,100
Growth Capital	$ millions	21.7	20.7	5.1	2.6
Sustaining Capital	$ millions	4.3	0.4	3.9	1.2
Exploration Capital	$ millions	0.0	0.2	1.8	1.7
Cash Costs	$/oz	1,570	1,566	1,028	851
Mine-Site-All-in Sustaining Costs	$/oz	1,782	1,636	1,137	922

Table 21-2 2023 Budget Physicals and Costs

		2023 Budget		
		Mulatos	La Yaqui Grande	Combined
Ore Mined	Tonnes	3,068,840	3,651,000	6,719,840
Waste Mined	Tonnes	1,753,210	18,599,000	20,352,210
Total Mined	Tonnes	4,822,050	22,250,000	27,072,050
Ore Stacked	Tonnes	3,509,528	3,651,000	7,160,528
Grade	g/t	0.90	1.30	1.10
Contained Ounces	oz	101,663	152,905	254,568
Recovered Ounces	oz	53,373	126,686	180,059
Recovered/Stacked Ounces	%	53%	83%	71%
Mining Cost	$/t mined	5.34	2.37	2.90
Processing Cost	$/t processed	13.02	5.26	9.06
G&A Cost	$/t processed	3.87	2.70	3.27
Growth Capital	$ millions	-	-	7.5
Sustaining Capital	$ millions	-	-	10.0
Exploration Capital	$ millions	-	-	4.0
Cash Costs	$/oz	-	-	925
Mine-Site-All-in Sustaining Costs	$/oz	-	-	975

22 ECONOMIC ANALYSIS

Under NI 43-101, producing issuers may exclude the information required in this section on properties currently in production, unless the Technical Report includes a material expansion of current production. Alamos is a producing issuer, the Mulatos Property is currently in production, and a material expansion in gold production is not being planned. Alamos has performed an economic analysis of the Mulatos Property using the estimates presented in this report and confirms that the outcome is a positive after tax cash flow and net present value at a 5% discount rate at USD $1400 per ounce of gold price that supports the statement of Mineral Reserves.

23 ADJACENT PROPERTIES

The Mulatos Property Mineral Resources and Mineral Reserves are centered on a large claim block owned by Alamos. Adjacent properties containing significant gold mineralization include:

23.1 La India

The La India mine, 100% owned by Agnico Eagle Mines Ltd, is approximate 4 km west of the northeastern property extent of Alamos' Mulatos Property. The 629-square-km property includes the La India mine site, the Chipriona gold resource and several other prospective exploration targets situated in the Mulatos gold belt.

The La India mine hosts Proven and Probable Mineral Reserves of 81,000 ounces of gold and 429,000 ounces of silver (3.3 million tonnes grading 0.76 g/t gold and 4.01 g/t silver) as of December 31, 2022.

The Chipriona open pit, polymetallic deposit on the La India property hosts Indicated Mineral Resources of 346,000 ounces of gold, 37.1 million ounces of silver and 98,000 tonnes of zinc (12.9 million tonnes grading 1.26 g/t gold, 89.72 g/t silver and 0.76% zinc) and Inferred Mineral Resources of 20,000 ounces of gold, 1.0 million ounces of silver and 7,000 tonnes of zinc (1.0 million tonnes grading 0.63 g/t gold, 81.78 g/t silver and 0.72% zinc) as of December 31, 2022.

Agnico reports that internal studies are ongoing to evaluate the potential to develop Chipriona, which is 1 kilometre north of the La India operations, and other satellite zones in the area such as El Realito and Tarachi.

The La India mine lies within an extensive ancient volcanic field. It is in an area dominated by outcrops of andesitic, dacitic and felsic volcanic tuffs from different explosive volcanic events that were affected by large-scale north-northwest-striking faults and intruded by granodiorite and diorite stocks. Canyons cut through the uppermost layers to expose the Lower Series volcanic strata.

La India lies in a large area of intrusion-related alteration dominated by volcanic-hosted high-sulphidation epithermal-hydrothermal gold, silver, and porphyry-related gold deposits. Such deposits may be present as veins and/or disseminated deposits and/or breccias. The La India mine deposit area is one of several high sulphidation epithermal mineralization centres recognized in the region.

Epithermal high-sulphidation mineralization at the La India mine developed as a cluster of gold zones (Main, La India, El Cochi and North zones) aligned north-south, and El Realito aligned northeast, within a spatially related zone of hydrothermal alteration more than 20 sq. km in area. Gold mineralization is confined within zones of argillitic alteration originally containing sulphides, and subsequently oxidized.

Mineralization at Chipriona consists of what appears to be structurally controlled gold- and silver-rich veins, stringers and breccias with significant zinc, lead, and copper content in sulphides.

The El Realito mineralization is found in northeast-striking subvertical parallel structural corridors of breccia that appear to have acted as conduits, bringing gold and silver mineralization into the favourable subhorizontal volcanic rock layers (the lower porphyritic dacite). El Realito remains open along strike (northeast and southwest) and shows significant potential at depth.

Surface outcrop mapping and drill-hole data so far indicate that the gold system at the Tarachi deposit is likely best classified as a gold porphyry deposit.

24 OTHER RELEVANT DATA AND INFORMATION

There is no other relevant data or information that is material to this report.

25 INTERPRETATIONS AND CONCLUSIONS

The following interpretations and conclusions are made with respect to the project:

25.1 Resource Model Data

Alamos personnel reviewed and audited the historical exploration data available for the Island Gold Mine as well as the exploration methodologies adopted to generate the data. Exploration work is professionally managed, and procedures are adopted that meet accepted industry best practices. The author is of the opinion that the exploration data is sufficiently reliable to interpret with confidence the boundaries of the gold mineralization and support evaluation and classification of Mineral Resources in accordance with generally accepted CIM Estimation of Mineral Resource and Mineral Reserve Best Practices Guidelines and CIM Definition Standards for Mineral Resources and Mineral Reserves.

25.2 La Yaqui Grande Resource Model

The current study is an update of La Yaqui Grande's Mineral Resources from June 2018. A similar approach was selected for the estimation of grades, however all steps leading to the Mineral Resource were re-examined. The main features of this updated Mineral Resource comprise the addition of 6 new drill holes, a set of re-assayed samples on regular intervals replacing previously assayed "button" samples, new interpretations of the higher-grade silver domains, of the alteration, and of the redox units, and an updated interpretation of the higher-grade gold domains.

The re-interpretation of the higher-grade silver domains has shown better continuity of the mineralized zones, which are believed to be more realistic than the previous interpretations. The prior silver domain model was observed to be discontinuous and more single-hole based. Similar observations were made for the transition unit of the redox model.

It is believed that the drill hole spacing is adequate for the estimation of an Indicated Mineral Resource. Drill hole spacing is tighter in Zone 1, followed by Zone 2, and then Zone 3.

There are fewer AuCN/Au ratio data than for the other elements of interest. For such, in areas where other elements were estimated without any estimates for the AuCN/Au ratio, the average ratio by redox domain was assigned. This occurred for approximately 26% of the estimated blocks.

The capping of the high-grade outliers had only a minimal effect over the metal content and the average grade. In general, the metal content of the grade composites was reduced by 2% or less, and the average grade was reduced by 1% for gold, 2% for silver, and 1.4% for copper. The AuCN/Au ratios and total sulphur grades were not capped as they had an upper limit value of 1.0 and 10.0%, respectively.

The distribution of gold, silver, copper, and total sulphur grades, along with the AuCN/Au ratios, showed low coefficients of variation (CV) for each domain. CV values lesser than 3.0 were observed in general, indicating well-behaved populations. In turn, the low CVs suggest that no difficulties with the estimation of higher grades are anticipated.

Overall, the experimental variograms were of sufficient quality to interpret conclusive models of grade continuity. Only variograms for the AuCN/Au ratio of the transition redox unit were not conclusive due to the data's wider spacing. Nugget effects were found to be low overall.

The grade estimation strategy involved the usage of the ordinary kriging technique with capped composites. Grades were estimated within each modeled domain with a hard boundary. This approach is believed to be suitable for the estimation of the Mineral Resources.

The overall satisfactory results from the various validation tests are indicative of the adequate representativity of the updated Mineral Resources at La Yaqui Grande, considering the available drill hole data and latest geologic understanding.

25.3 Puerto del Aire Resource Model

The PDA, Estrella, and Gap-Victor sulphide deposits are presented as higher gold grade mineralized zones amenable to an underground extraction method with conventional milling, due to their lower heap leach recoveries (ratio of AuCN/Au).

Additional holes were drilled since the last April 2021 Mineral Resource estimate and incorporated into this update. Along with this additional information, changes in this update include the merging of the PDA1 and PDA2 mineralized zones into the PDA zone, the inclusion of silver into a gold equivalent grade for the modeling of the Estrella mineralized zone, and the estimation of silver grades.

With the new drilling, a larger mineralized zone was outlined at PDA and at Estrella. The Gap-Victor mineralized zone remained similar to the previous interpretation as only one new hole was added. As the grade estimation approach remained similar to the previous Mineral Resource estimate, it is believed that the main increases in tonnage and metal content stem from the larger mineralized zones, when compared to the April 2021 Mineral Resource estimate.

The coefficients of variation from each zone are low (< 3.0) with regards to the capped gold and silver grade composites, AuCN/Au ratios, and total sulphur composites. This characteristic is indicative of more homogeneous distributions of grades within each deposit and thus conducive to a more traditional grade estimation method such as ordinary kriging.

The modeling of the gold, silver, AuCN/Au ratio, and total sulphur variograms was found to be adequate overall. The best directions of grade continuity were found to be along strike and down plunge overall. A secondary trend to the northwest was observed for total sulphur grades.

The validation tests of the gold grade estimates within the PDA, Estrella, and Gap-Victor zones showed good results with no global or local bias observed. As such, it is believed that the Mineral Resource estimates are representative of the information currently available and most recent geologic understanding.

25.4 Mulatos Mineral Resources

December 31, 2022, Measured and Indicated Mineral Resources for the Mulatos pit, La Yaqui Grande, Puerto del Aire, and Carricito are presented in Table 25-1. December 31, 2022. Inferred Mineral Resources are presented in Table 25-2. Mineral Resources. Mineral Resources in the case of the Mulatos pit, La Yaqui Grande and PDA are net of Mineral Reserves. Carricito does not have Mineral Reserves.

Table 25-1 Mulatos Property Measured and Indicated Mineral Resources, December 31, 2022

	Measured Resources			Indicated Resources			Total Measured and Indicated		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	850	1.25	34	5,253	1.04	176	6,103	1.07	210
La Yaqui Grande	0	0.00	0	1,506	0.87	42	1,506	0.87	42
Puerto del Aire	146	5.28	25	1,192	4.95	190	1,338	4.98	214
Carricito	58	0.82	2	1,297	0.82	34	1,355	0.83	36
Total Mulatos	**1,054**	**1.79**	**61**	**9,248**	**1.49**	**442**	**10,302**	**1.52**	**502**

Table 25-2 Mulatos Property Inferred Mineral Resources, December 31, 2022

	Inferred Resources		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	560	0.92	17
La Yaqui Grande	175	1.31	7
Puerto del Aire	139	5.90	26
Carricito	900	0.74	22
Total Mulatos	**1,774**	**1.27**	**72**

Note to Table 25-1 and Table 25-2:

- *The Company's Mineral Reserves and Mineral Resources as at December 31, 2022 are classified in accordance with the Canadian Institute of Mining Metallurgy and Petroleum's "CIM Standards on Mineral Resources and Reserves, Definition and Guidelines" as per Canadian Securities Administrator's NI 43-101 requirements.*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.*
- *Mineral Resources are exclusive of Mineral Reserves.*
- *All Measured, Indicated and Inferred open pit Mineral Resources are pit constrained.*
- *With the exceptions noted following, Mineral Resource estimates assumed a gold price of $1,600 per ounce. Carricito estimates assumed a gold price of $1,400 per ounce.*
- *The Mulatos pit used a cut-off of 0.5 g/t of gold, Puerto del Aire used a cut-off of 2.5 g/t of gold, and La Yaqui Grande and Carricito used a cut-off of 0.3 g/t of gold.*

25.5 Mining Methods and Reserves

The current mining method used at Mulatos and La Yaqui Grande is open pit mining utilizing mining contractors. For Puerto del Aire it is planned to unitize longitudinal longhole open stoping and drift fill techniques, both employing cemented rock fill. The summary of Mineral Reserves is presented in Table 25-3.

Table 25-3 Mulatos Property Proven and Probable Mineral Reserves, December 31, 2022

	Proven Reserves			Probable Reserves			Total Proven and Probable		
	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)	Tonnes (000's)	Grade (g/t Au)	Ounces (000's)
Mulatos Pit	310	1.22	12	2,562	1.17	96	2,872	1.17	108
Stockpiles	2,658	2.06	176	0	0.00	0	2,658	2.06	176
La Yaqui Grande	268	0.89	8	16,263	1.26	659	16,531	1.25	667
Puerto del Aire	589	4.69	89	4,084	4.87	639	4,673	4.84	728
Total Mulatos	**3,825**	**2.32**	**285**	**22,909**	**1.89**	**1,394**	**26,734**	**1.95**	**1,679**

Notes:

- *The Company's Mineral Reserves and Mineral Resources as at December 31, 2022 are classified in accordance with the Canadian Institute of Mining Metallurgy and Petroleum's "CIM Standards on Mineral Resources and Reserves, Definition and Guidelines" as per Canadian Securities Administrator's NI 43-101 requirements.*
- *The gold price used for report Mineral Reserves is $1,400 per ounce of gold.*
- *Mineral Reserve cut-off grade for the Mulatos Pit, stockpile and the La Yaqui Pitt are determined as a net of process value of $0.10 per tonne for each model block. Cut-off grade for Puerto del Aire is 3.00g/t*

25.6 Processing

The current crushing plants, heap leach pads, and gold recovery plants are adequate to process the remaining open pit Mineral Reserves at the Mulatos Property. Modifications and an expansion of the high grade sulphide mill will likely be required to process Puerto del Aire high grade sulphides.

25.7 Infrastructure

With the completions of the La Yaqui Grande water treatment plant and the tie-in to the CFE electricity grid adequate infrastructure will exist for completion of mining of the open pit Mineral Reserves. Minor infrastructure additions are likely required for the proposed Puerta del Aire underground mine.

25.8 Environmental Considerations

The Mulatos Property is operating within environmental compliance.

Several operational permits will need to be amended or obtained to bring Puerto del Aire into production.

26 RECOMMENDATIONS

The following recommendations are being made for the Mulatos Property:

26.1 Mulatos Mine

- Continue to evaluate the suitability of the SAS 1 and SAS 3 stockpiles for processing.

26.2 La Yaqui Grande Mine

- Monitor monthly reserve to production reconciliations to ensure the Mineral Resource model continues to perform to expectations.

26.3 Puerto del Aire Project

26.3.1 Mining

- Undertake a geotechnical study to determine maximum span widths for stope and support requirements for development and stoping. This will require detailed geotechnical logging of existing exploration holes and the likely requirement for additional geotechnical drilling.
- Partly based on the geotechnical study, and the planned mining methods, refine the dilution and mining recovery assumptions.
- Develop a new mine design based on the expanded Mineral Reserve and Resource, refined geotechnical parameters and refined mining parameters.
- Develop a new mining sequence, with the goal of maximizing the active panels and stopes to support the optimal mining rate.
- Develop information packages to support requests for proposals from local underground mining contractors.

26.3.2 Metallurgy

- The optimum primary grind may be coarser than used (P80 of 100 micron) and needs to be re-examined,
- The flotation conditions maximized the recovery of sulfide minerals. The evaluation of selective depression of pyrite may be an option to evaluate. A significant percentage recovery of gold reported into the 1st cleaner tail for composite 4680-002.
- Cyanidation of the rougher concentrate is recommended. The percent recovery of gold into the rougher concentrate was 95% for both concentrates.
- Undertake mineralogical study to understand what is contained in each composite rougher concentrate.
- Based on the above additional testwork, finalize the Puerto del Aire Sulphide Project processing flowsheet.

26.3.3 Permitting

- Investigate and pursue requirements for permitting the Puerto del Aire underground mine.

- Investigate and pursue requirements for any additional permitting for the high grade sulphide plant.

26.4 General

- Continue to explore the remainder of the property area, focussing on near surface oxide targets as standalone projects or providing feed to the existing crushers, and higher grade sulphide ores to supplement feed to the high grade sulphide mill.

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APPENDIX A – LA YAQUI GRANDE VARIOGRAMS

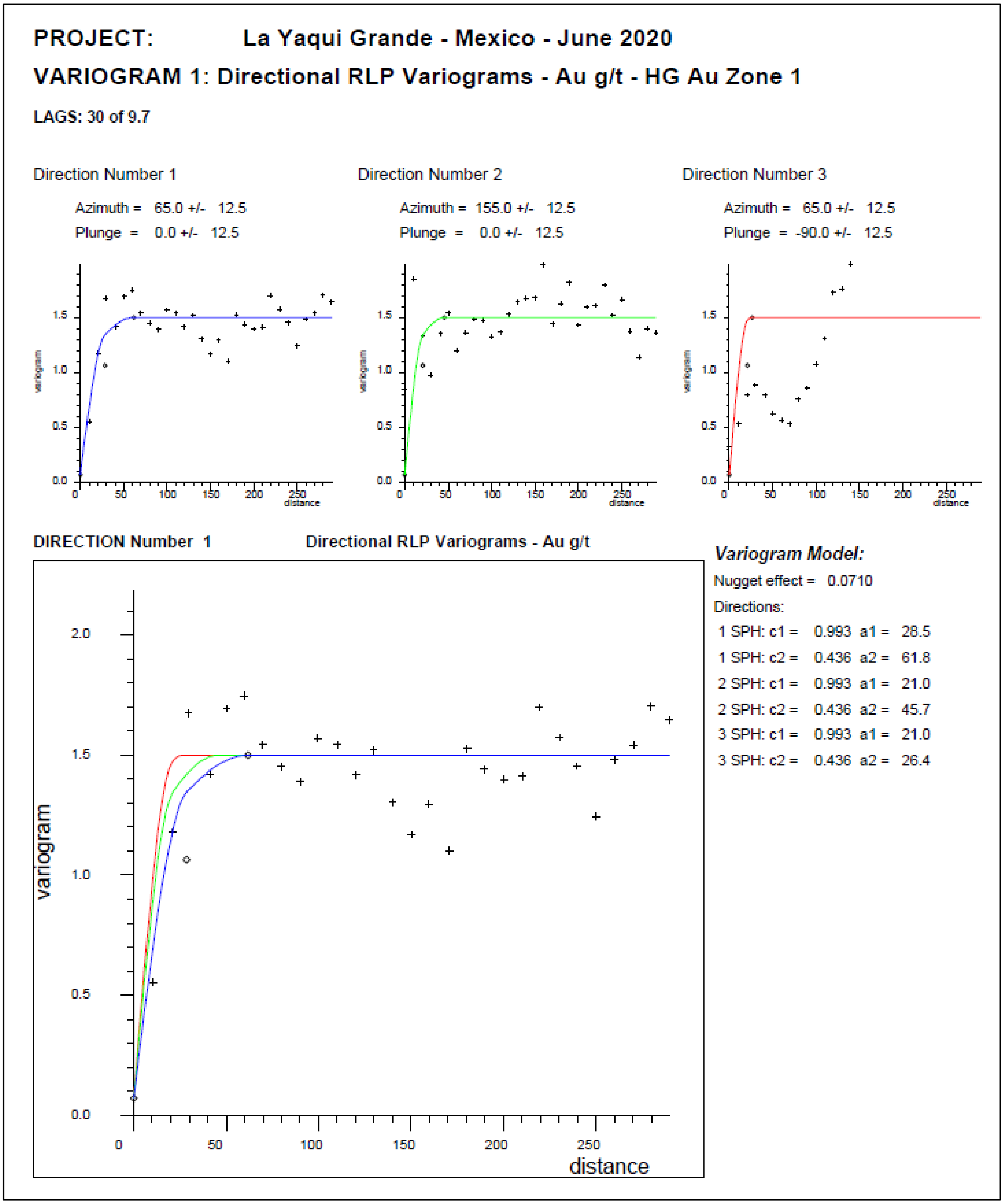


Figure A-1. Gold Variograms – Higher-Grade Gold Zone 1 – La Yaqui Grande

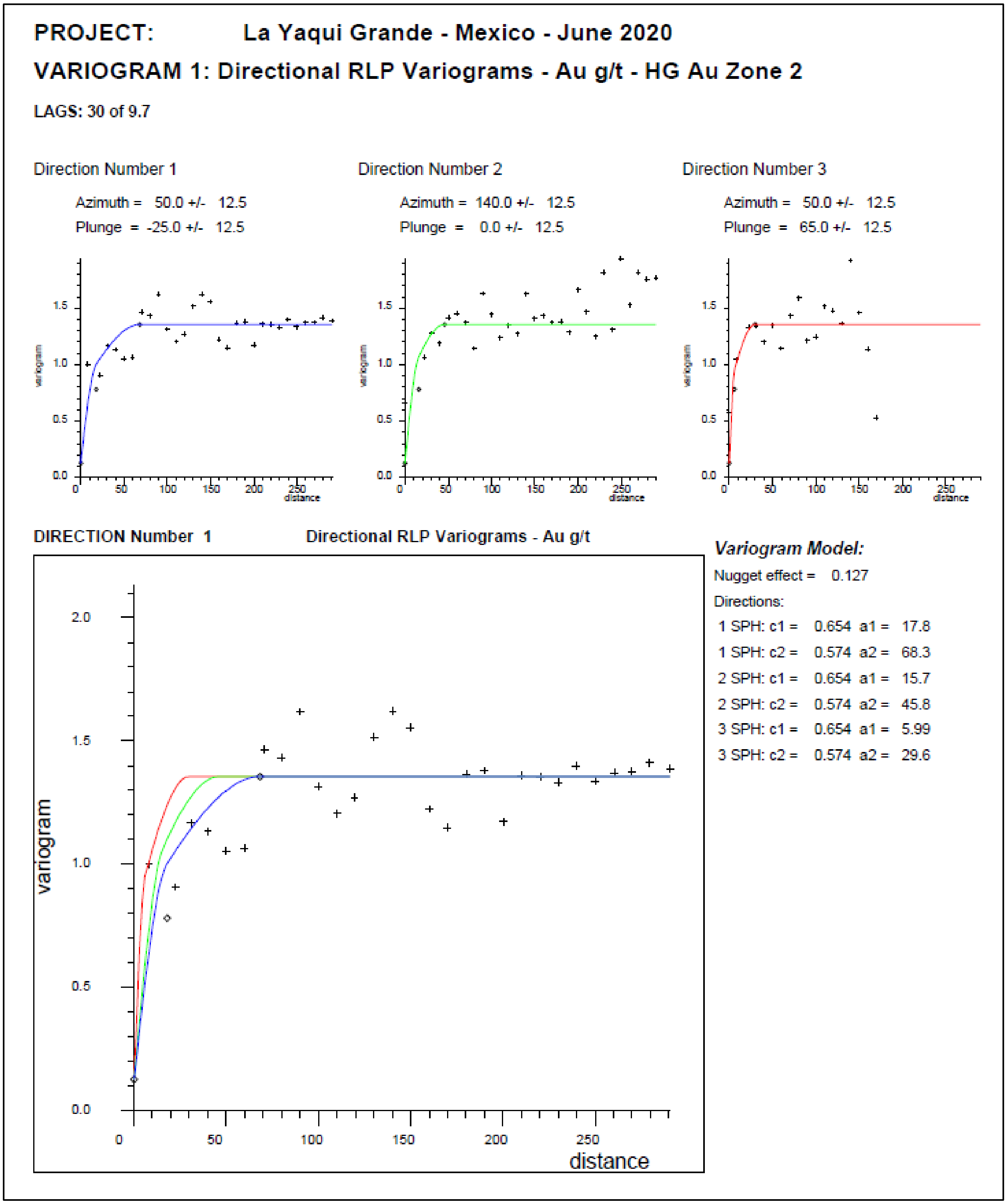


Figure A-2. Gold Variograms – Higher-Grade Gold Zone 2 – La Yaqui Grande

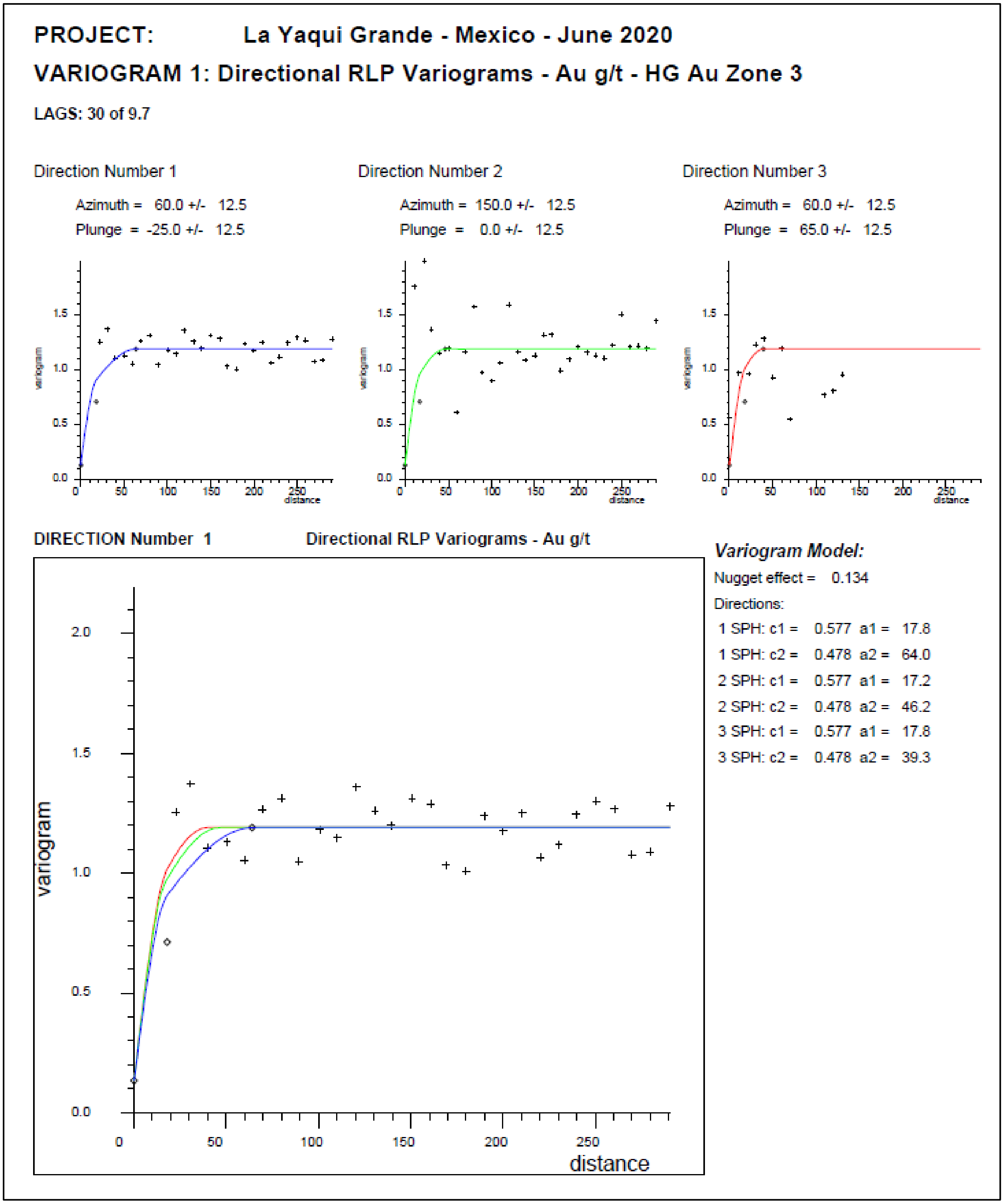


Figure A-3. Gold Variograms – Higher-Grade Gold Zone 3 – La Yaqui Grande

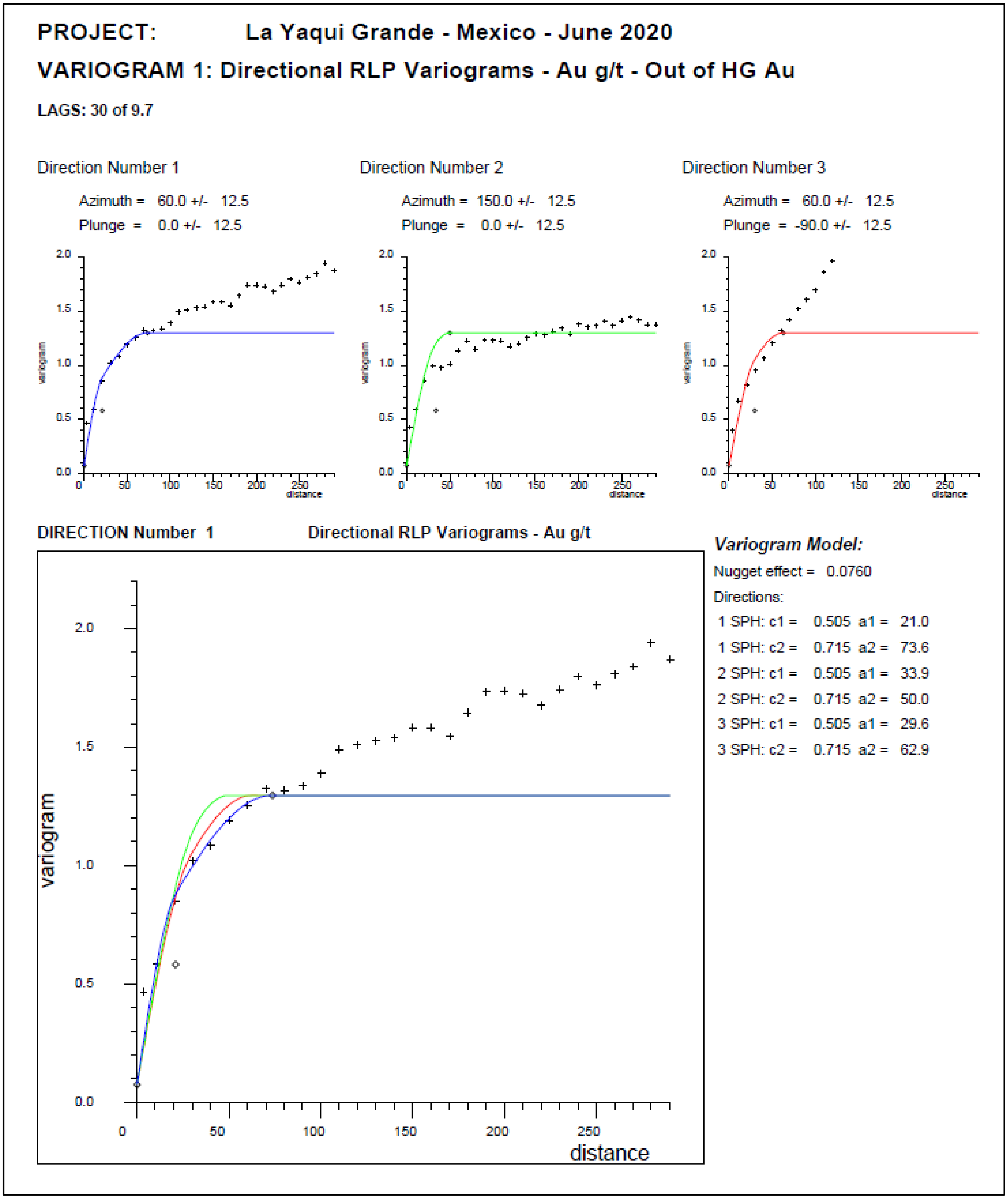


Figure A-4. Gold Variograms – Outside Higher-Grade Gold Zones 1+2+3 – La Yaqui Grande

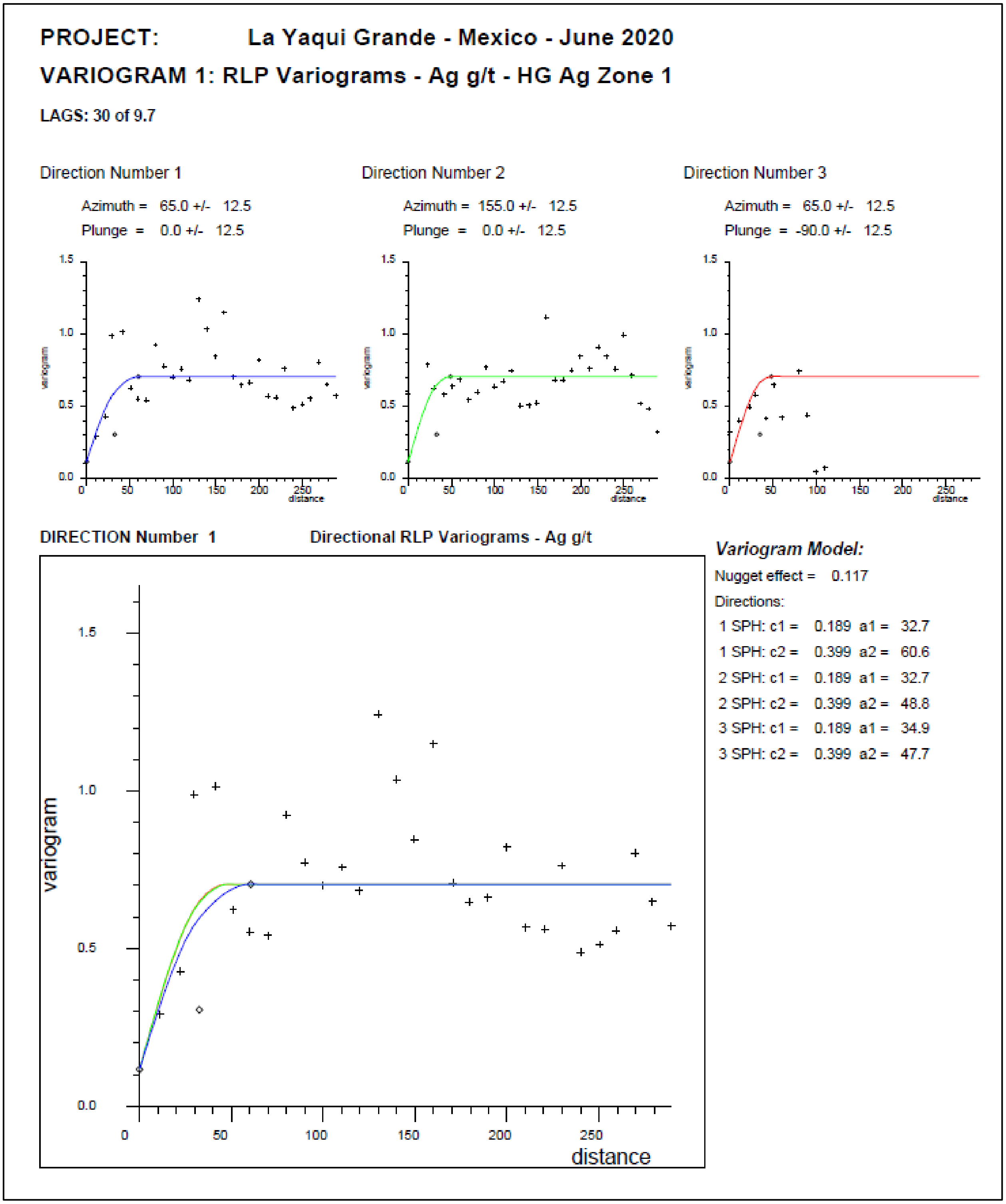


Figure A-5. Silver Variograms – Higher-Grade Silver Zone 1 – La Yaqui Grande

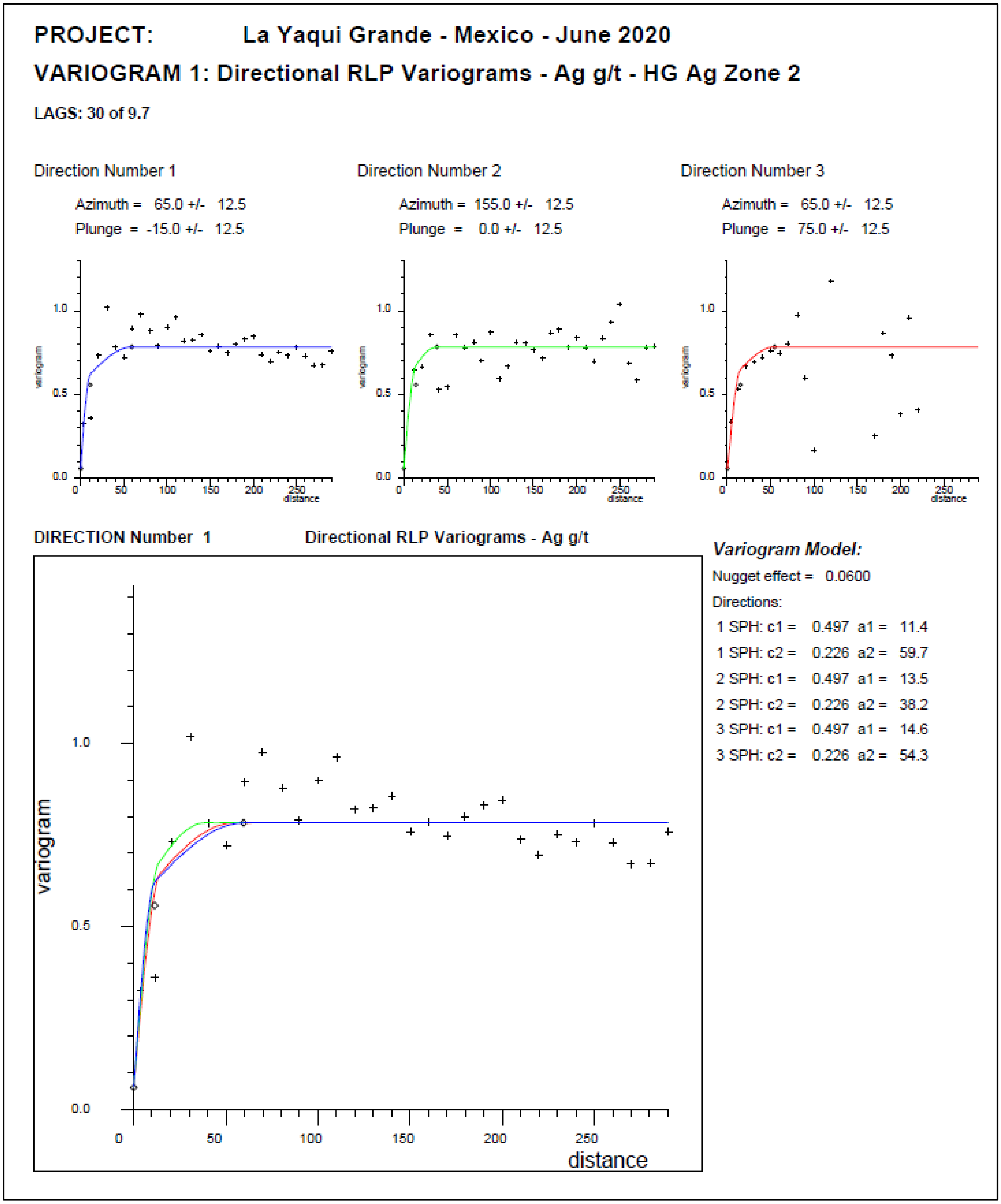


Figure A-6. Silver Variograms – Higher-Grade Silver Zone 2 – La Yaqui Grande

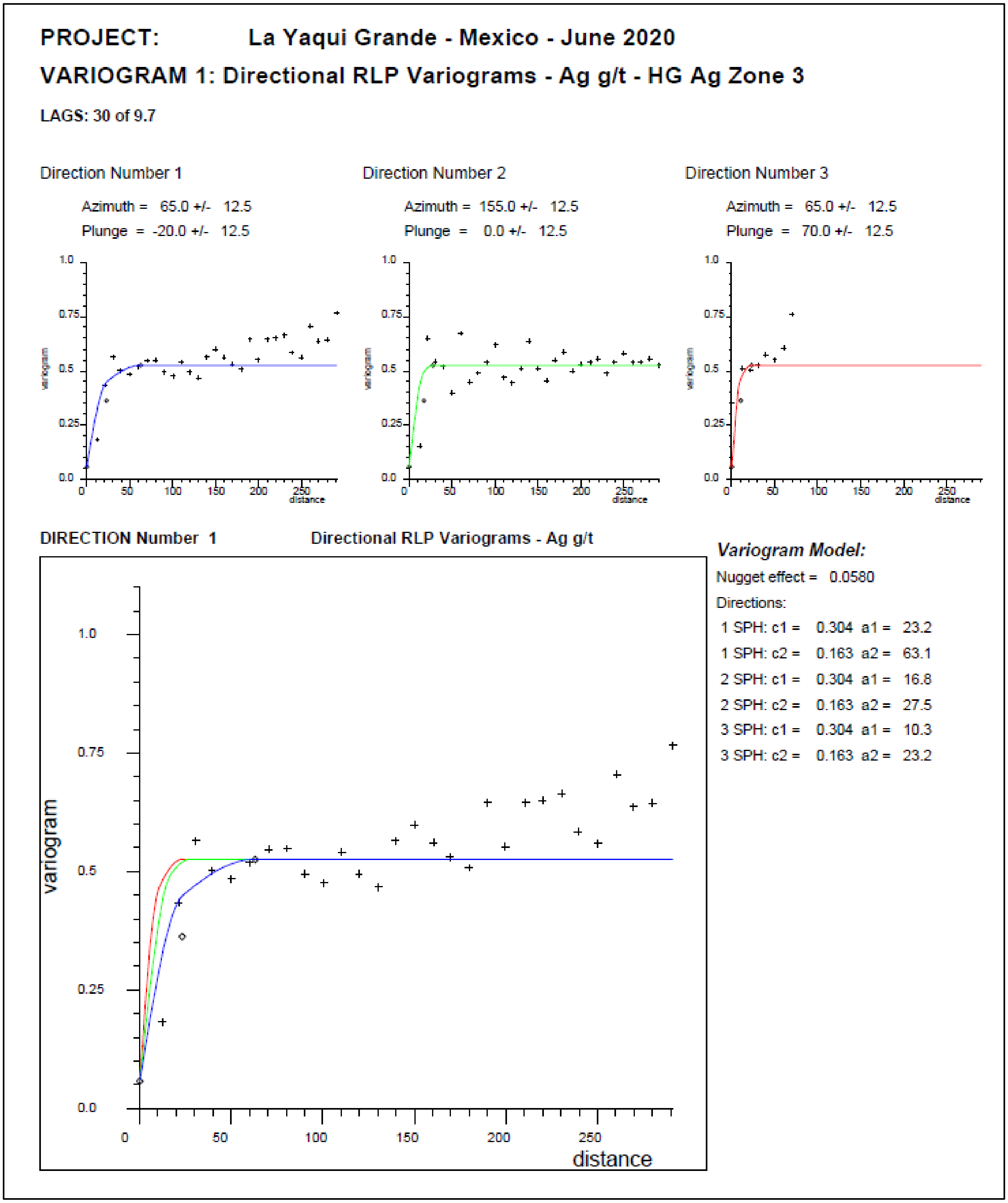


Figure A-7. Silver Variograms – Higher-Grade Silver Zone 3 – La Yaqui Grande

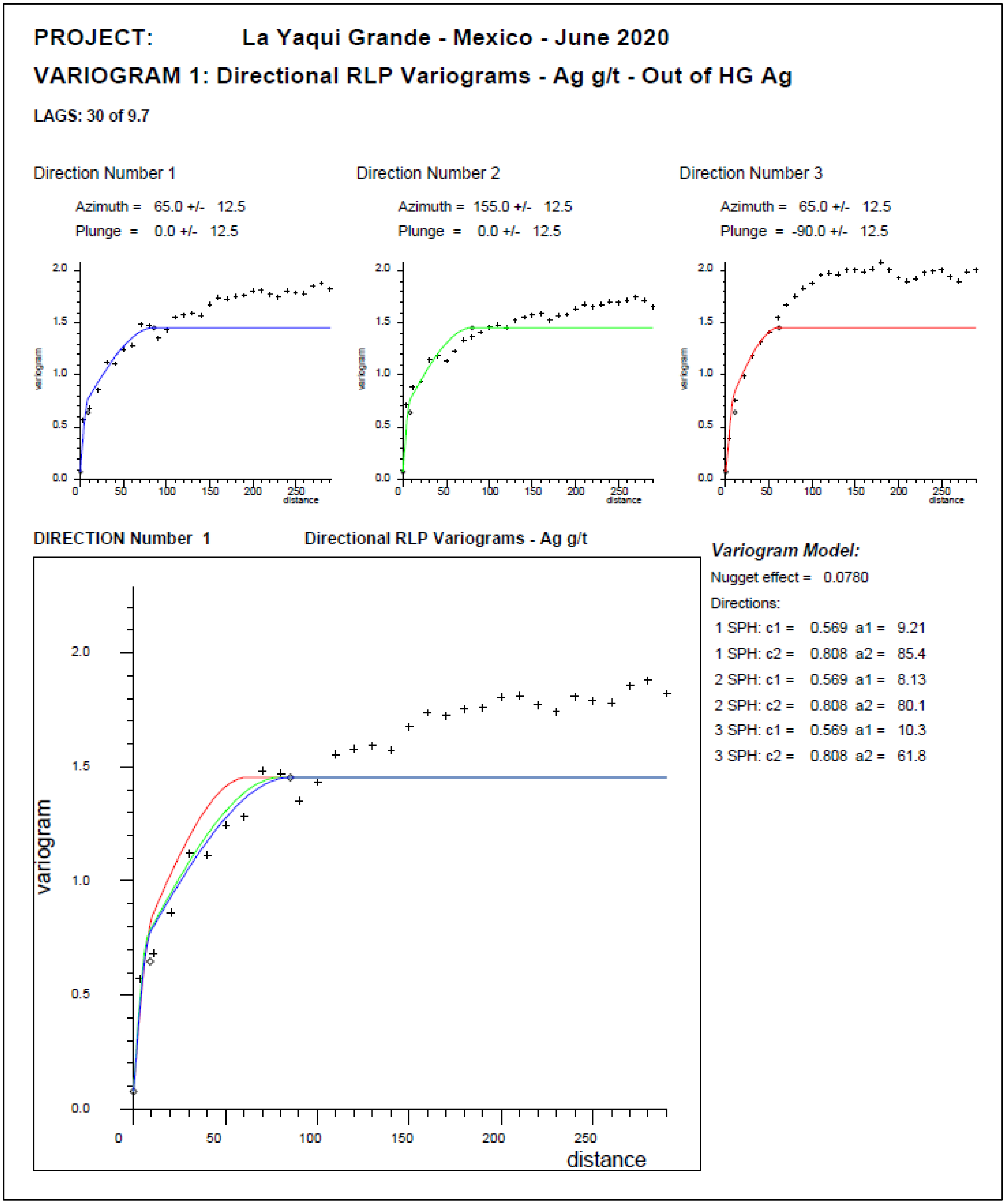


Figure A-8. Silver Variograms – Outside Higher-Grade Silver Zones 1+2+3 – La Yaqui Grande

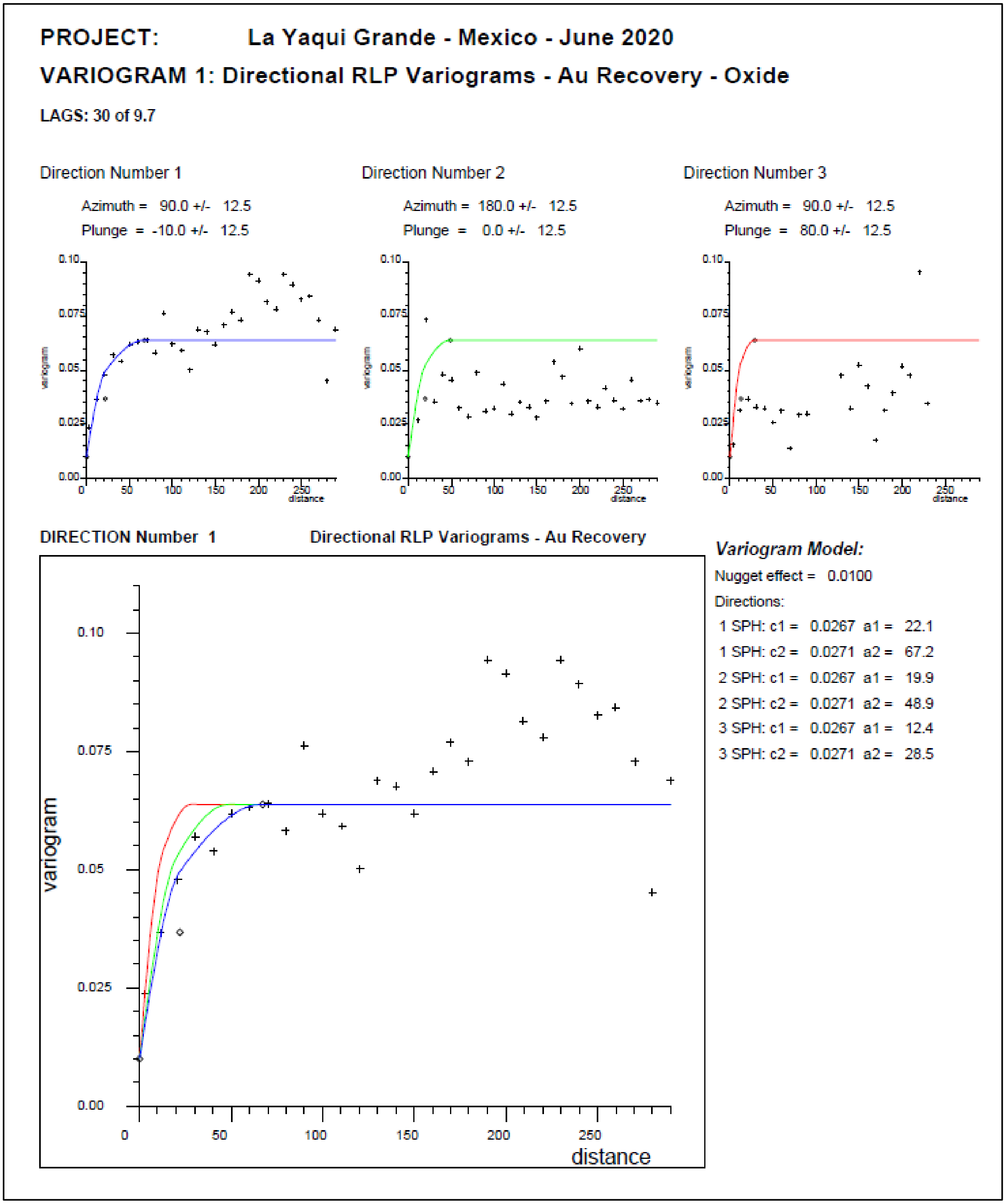


Figure A-9. AuCN/Au Variograms – Oxide – La Yaqui Grande

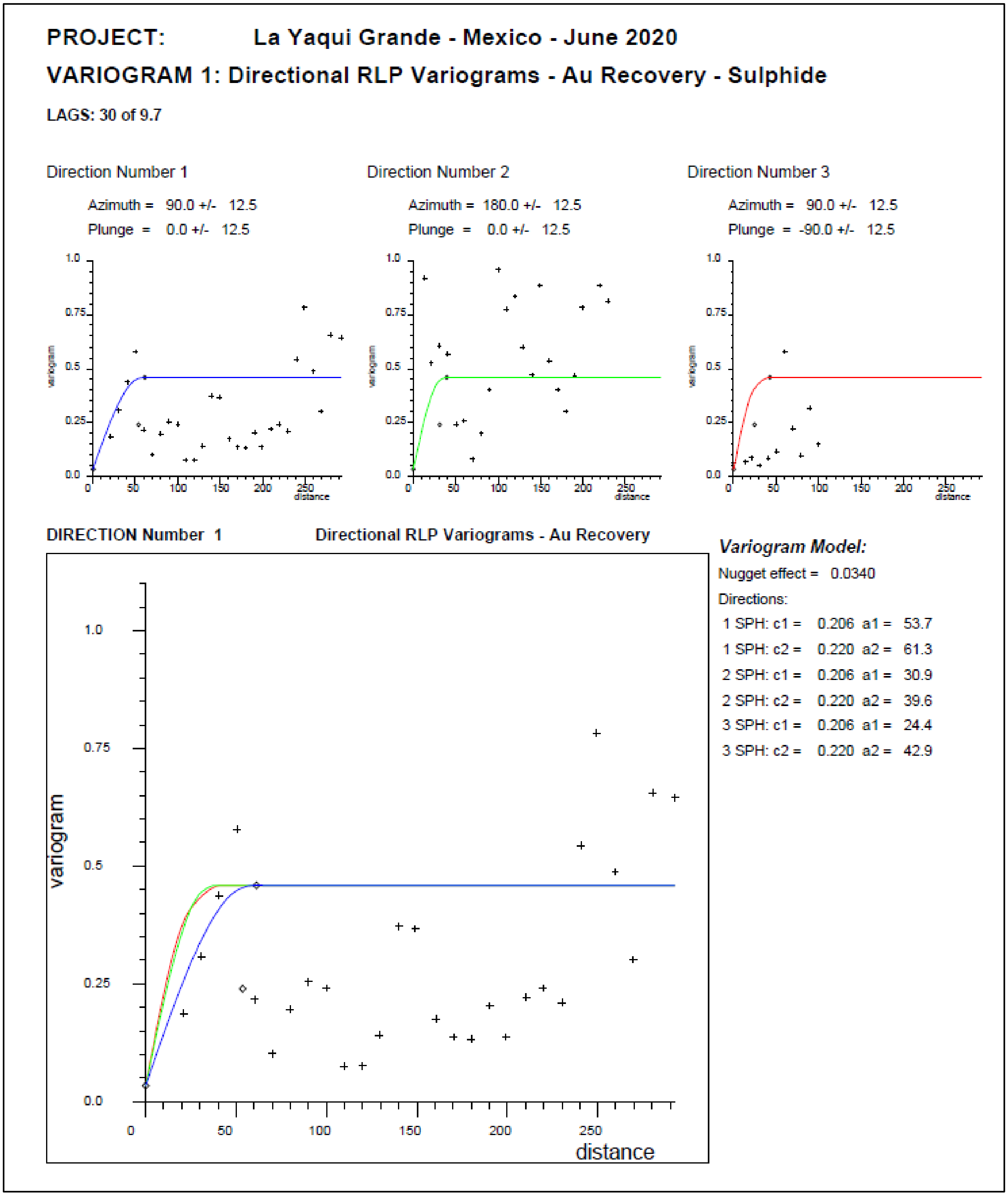


Figure A-10. AuCN/Au Variograms – Sulphide – La Yaqui Grande

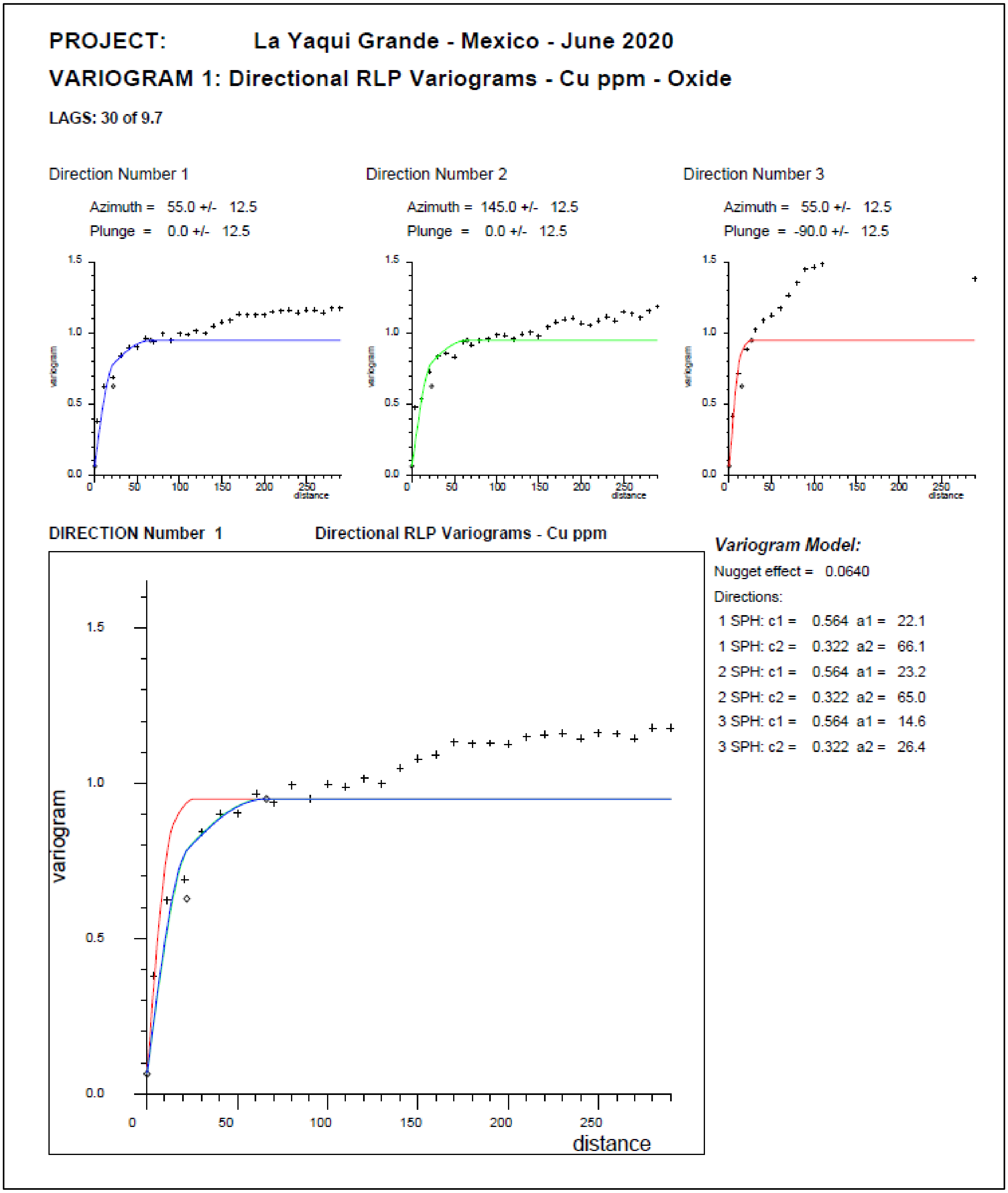


Figure A-11. Copper Variograms – Oxide – La Yaqui Grande

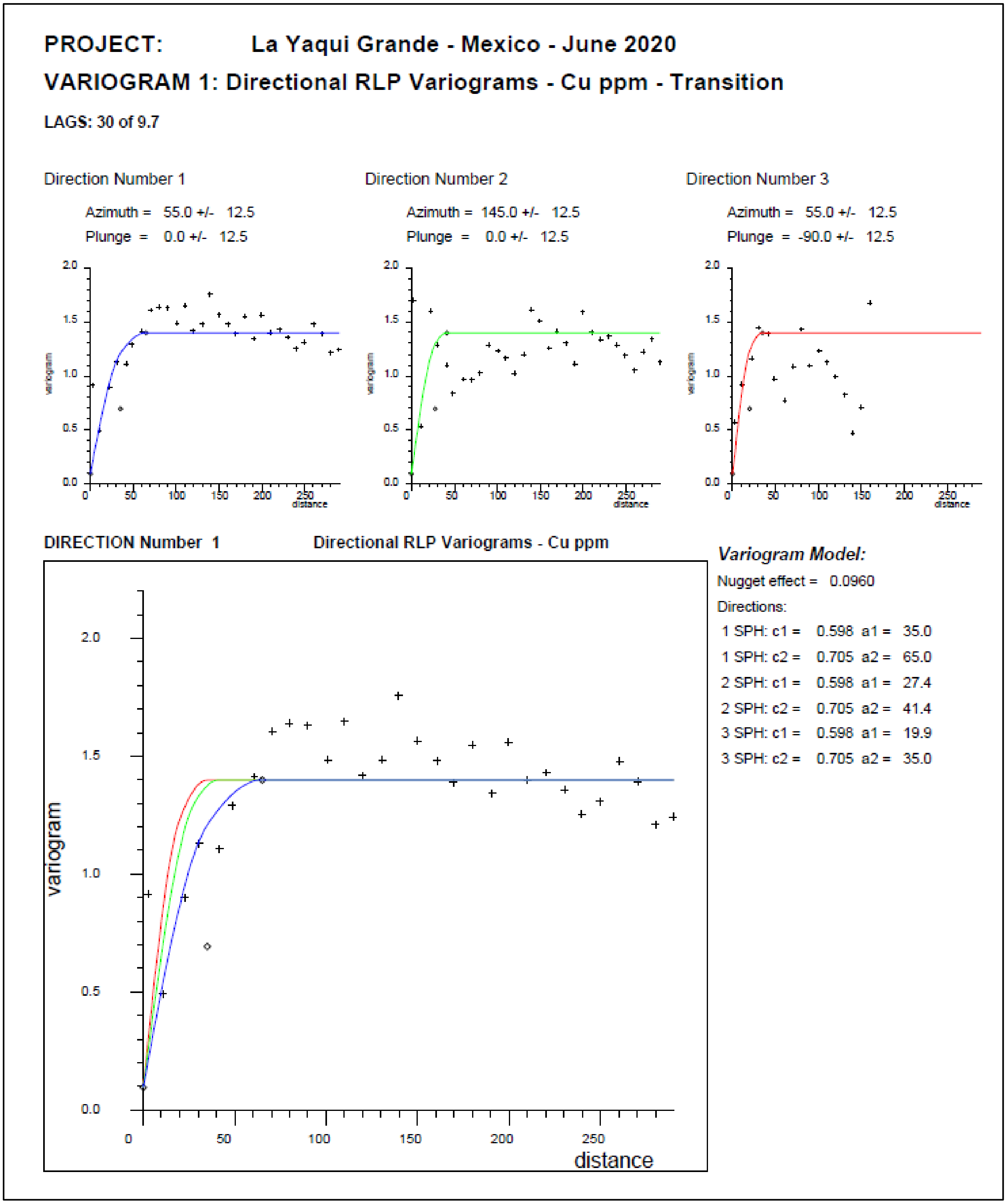


Figure A-12. Copper Variograms – Transition – La Yaqui Grande

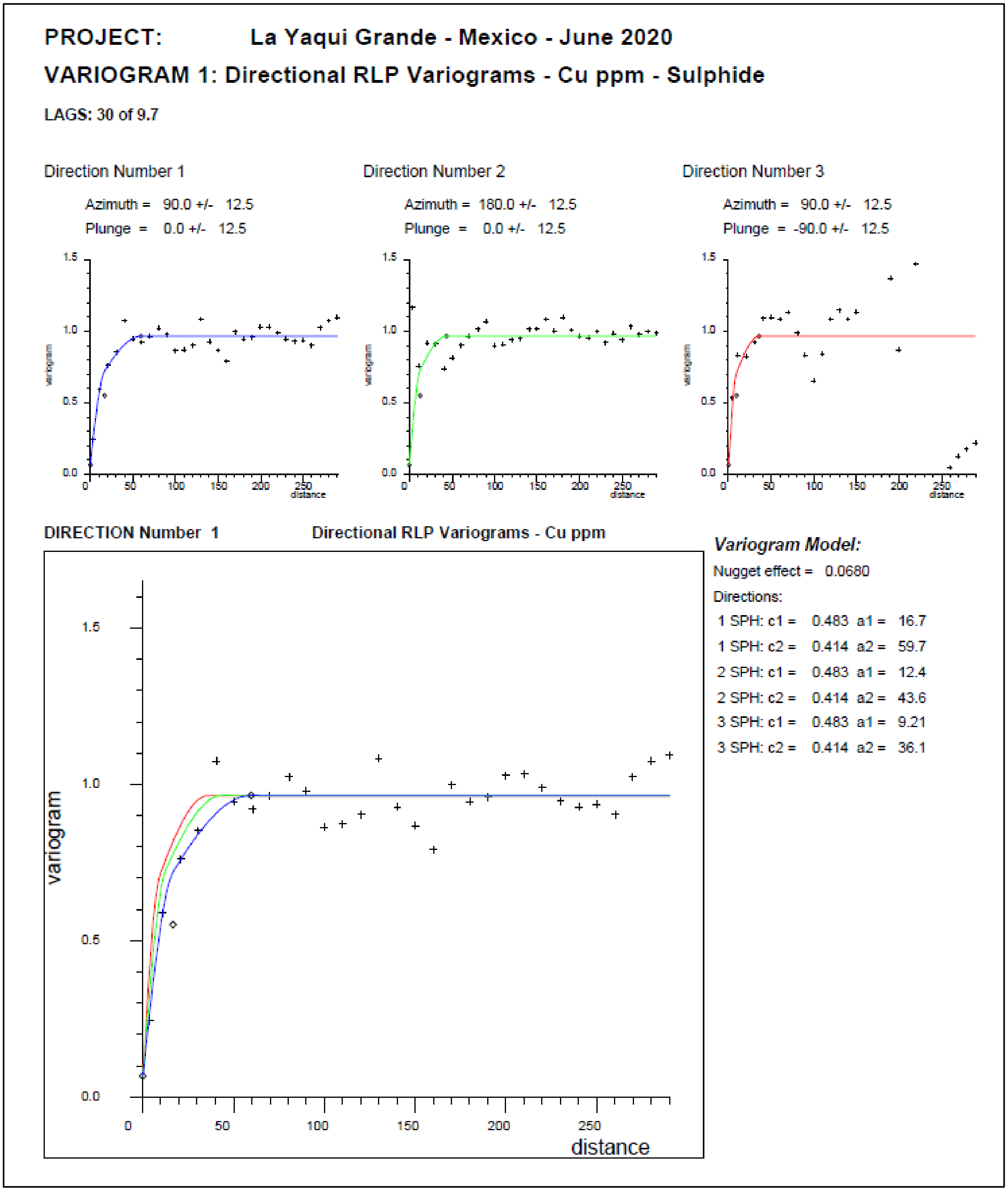


Figure A-13. Copper Variograms – Sulphide – La Yaqui Grande

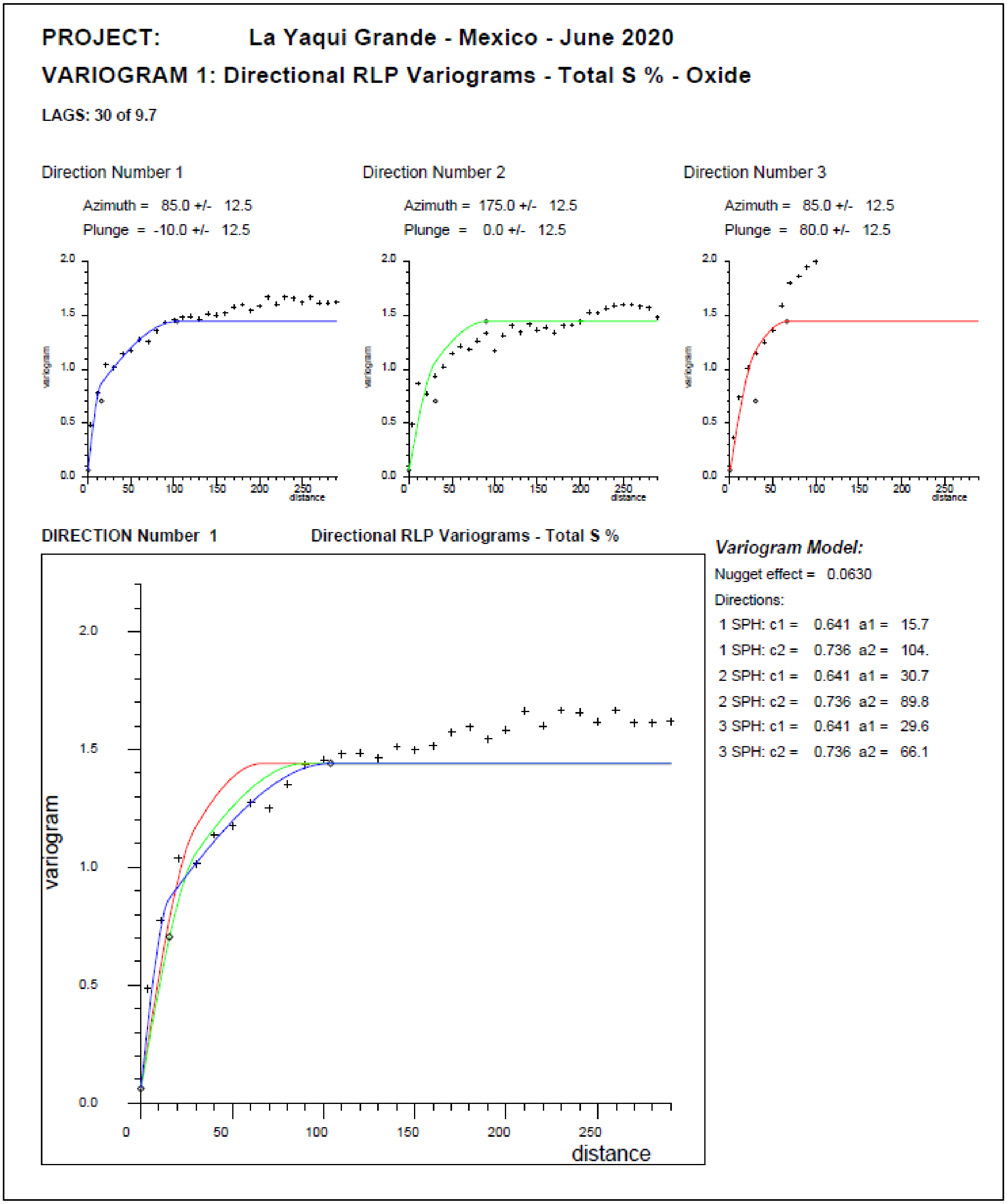


Figure A-14. Total Sulphur Variograms – Oxide – La Yaqui Grande

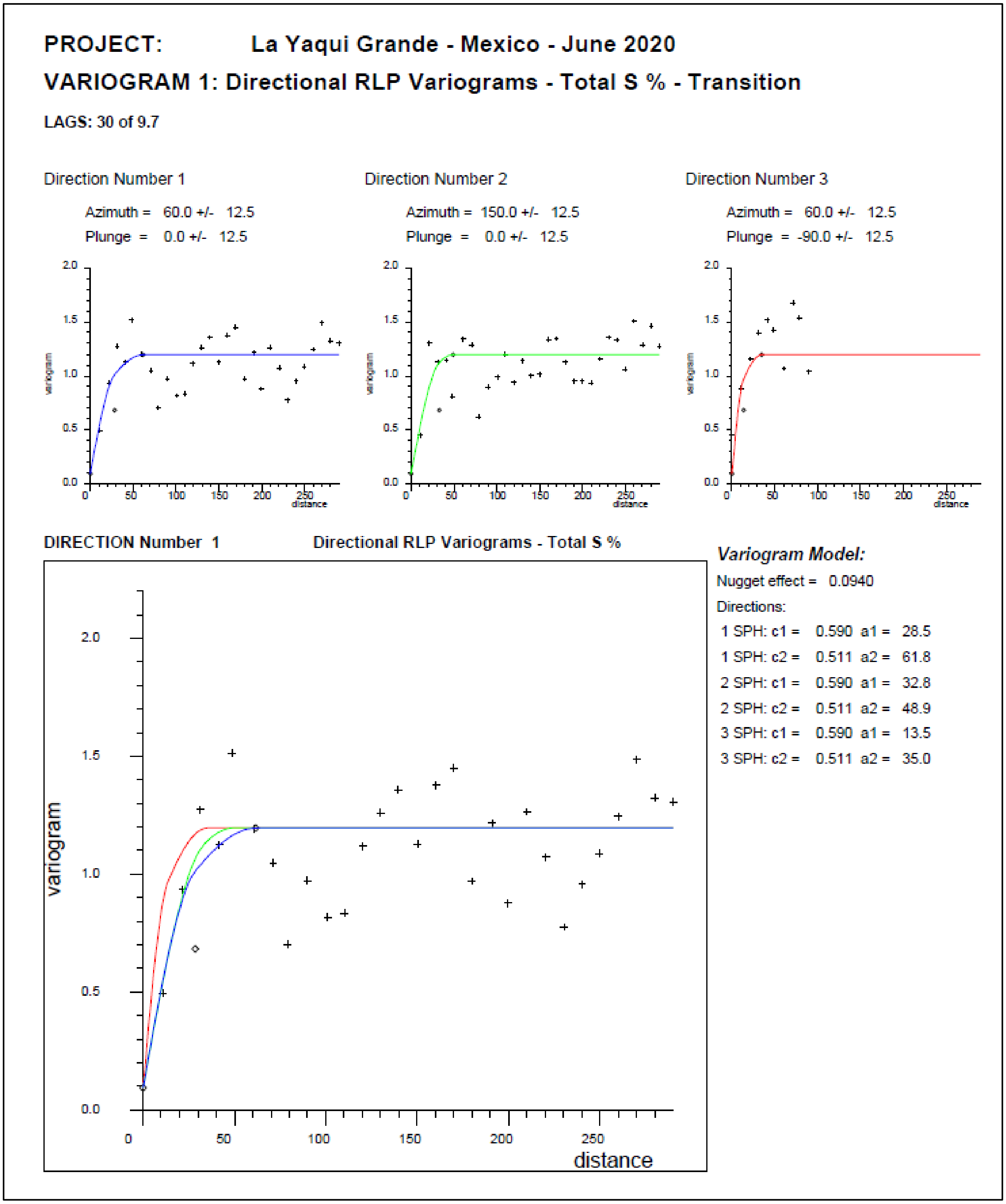


Figure A-15. Total Sulphur Variograms – Transition – La Yaqui Grande

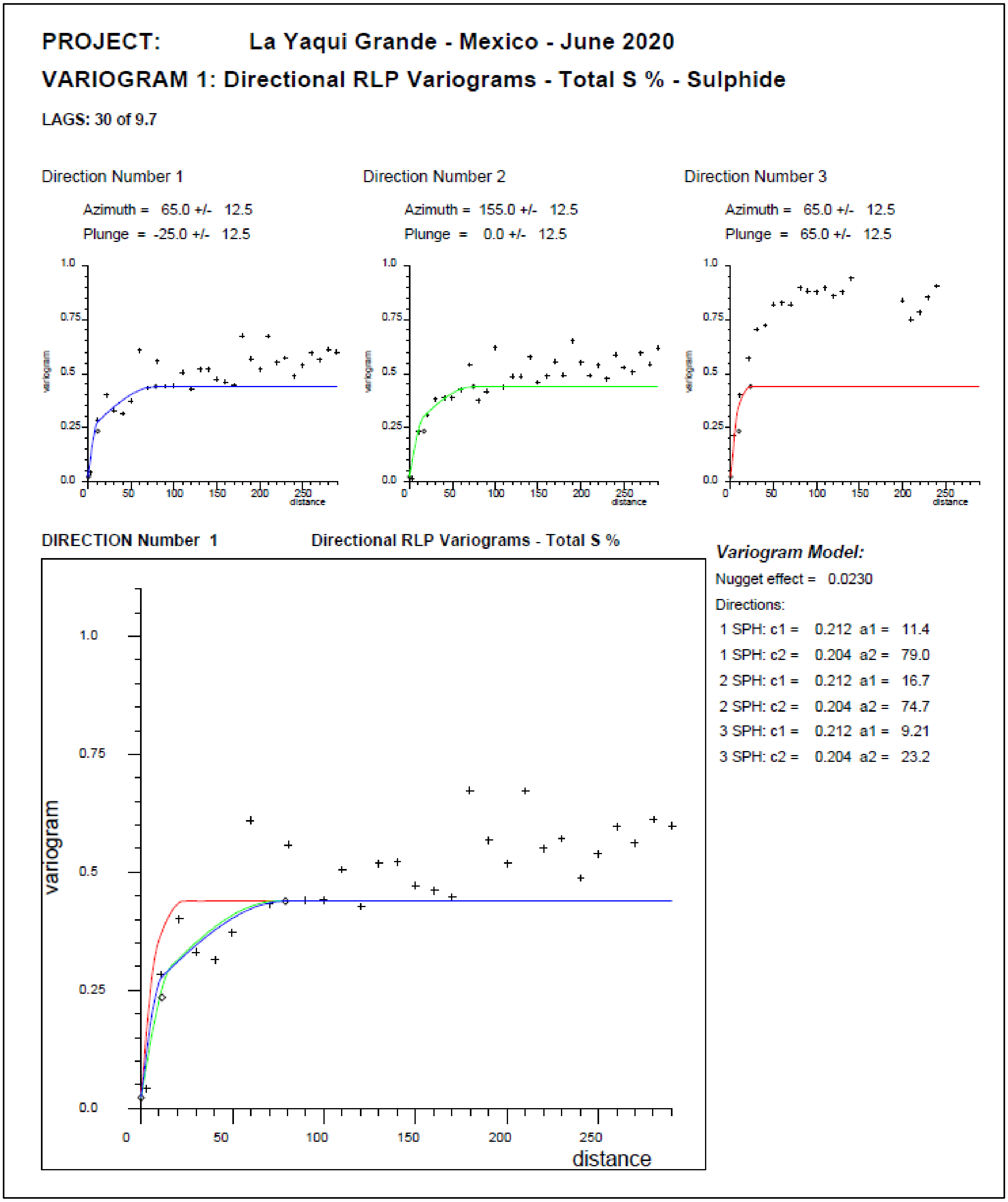


Figure A-16. Total Sulphur Variograms – Sulphide – La Yaqui Grande

APPENDIX B – PUERTO DEL AIRE VARIOGRAMS

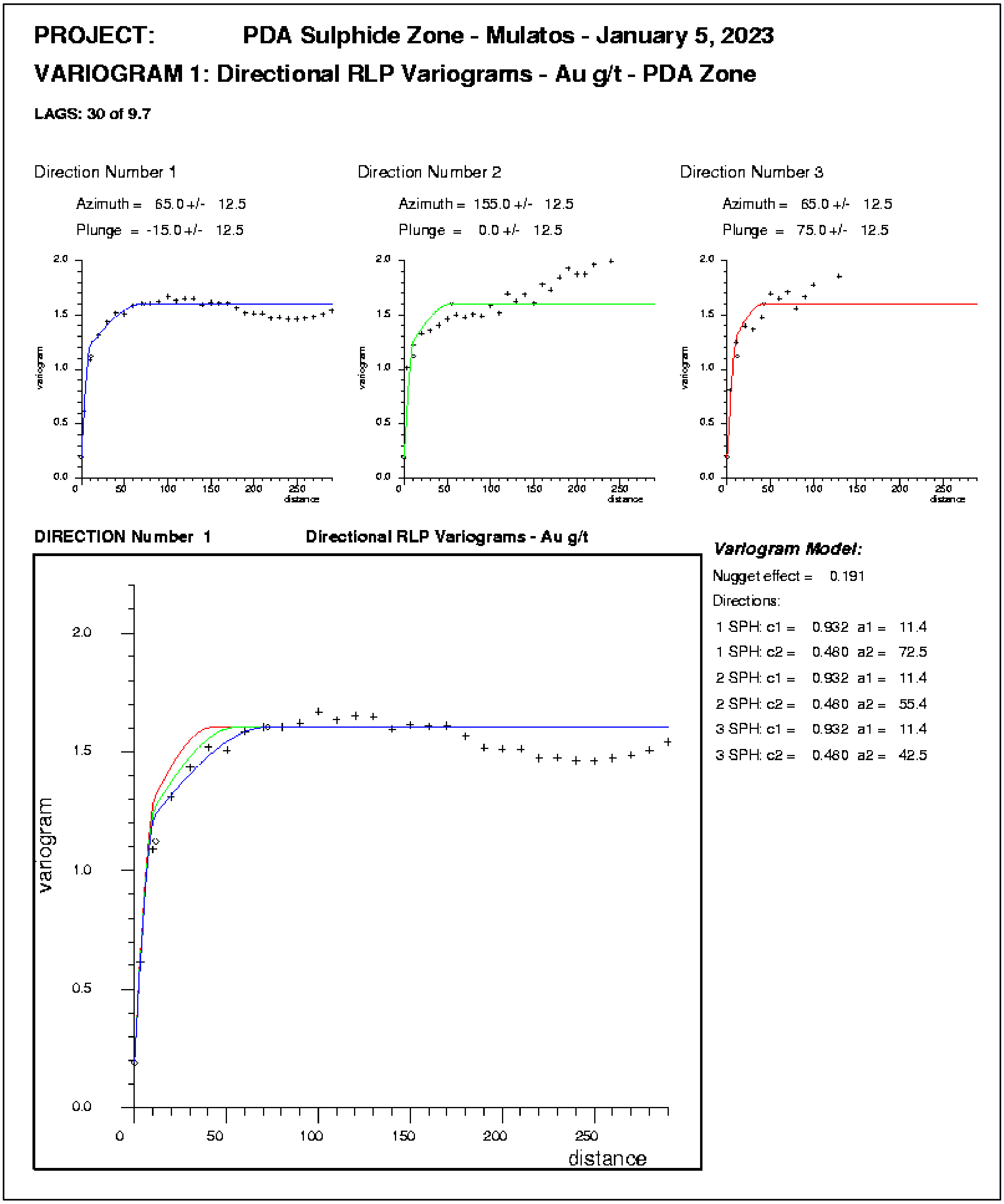


Figure B-1. Gold Variograms – PDA Sulphide Zone

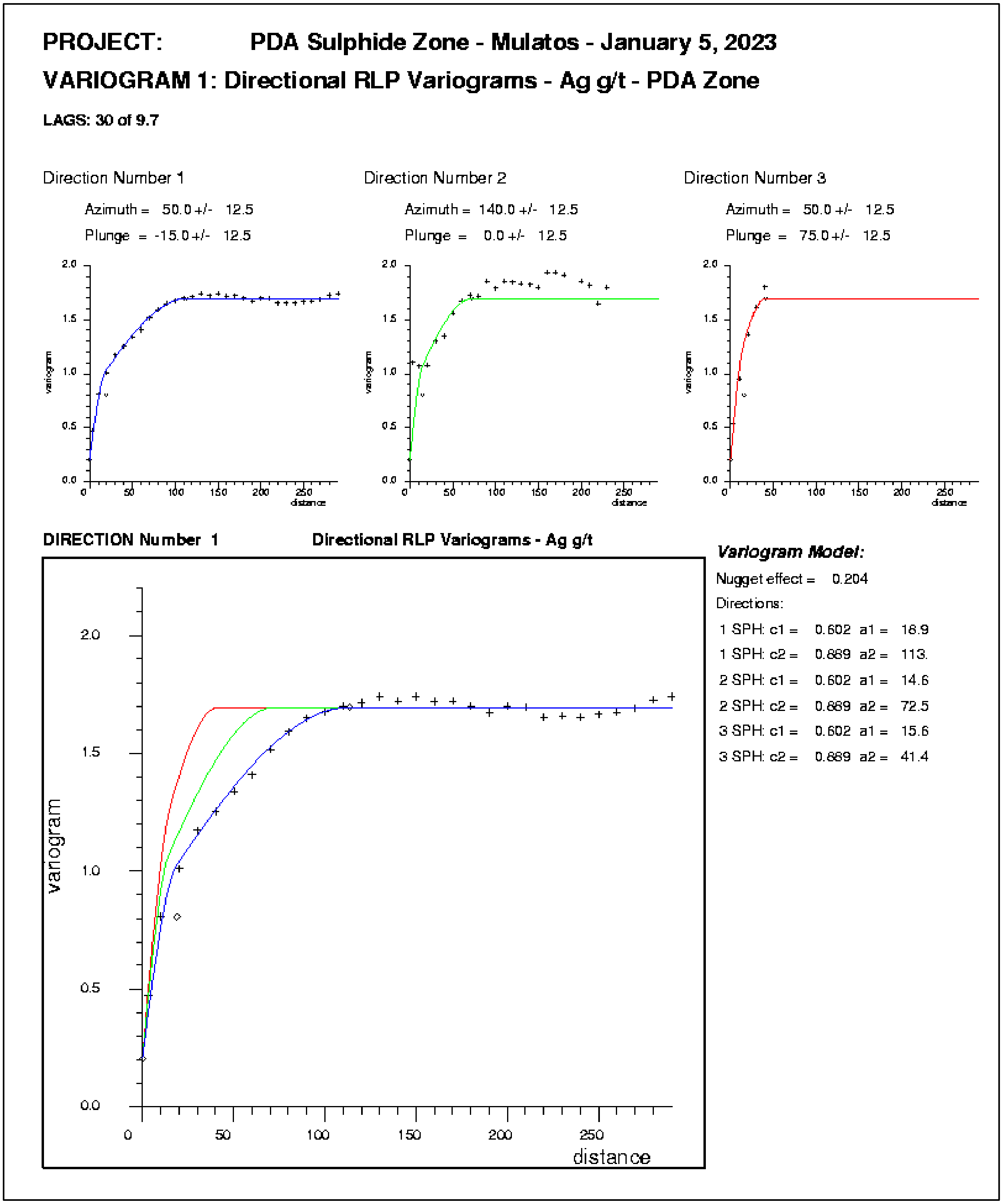


Figure B-2. Silver Variograms – PDA Sulphide Zone

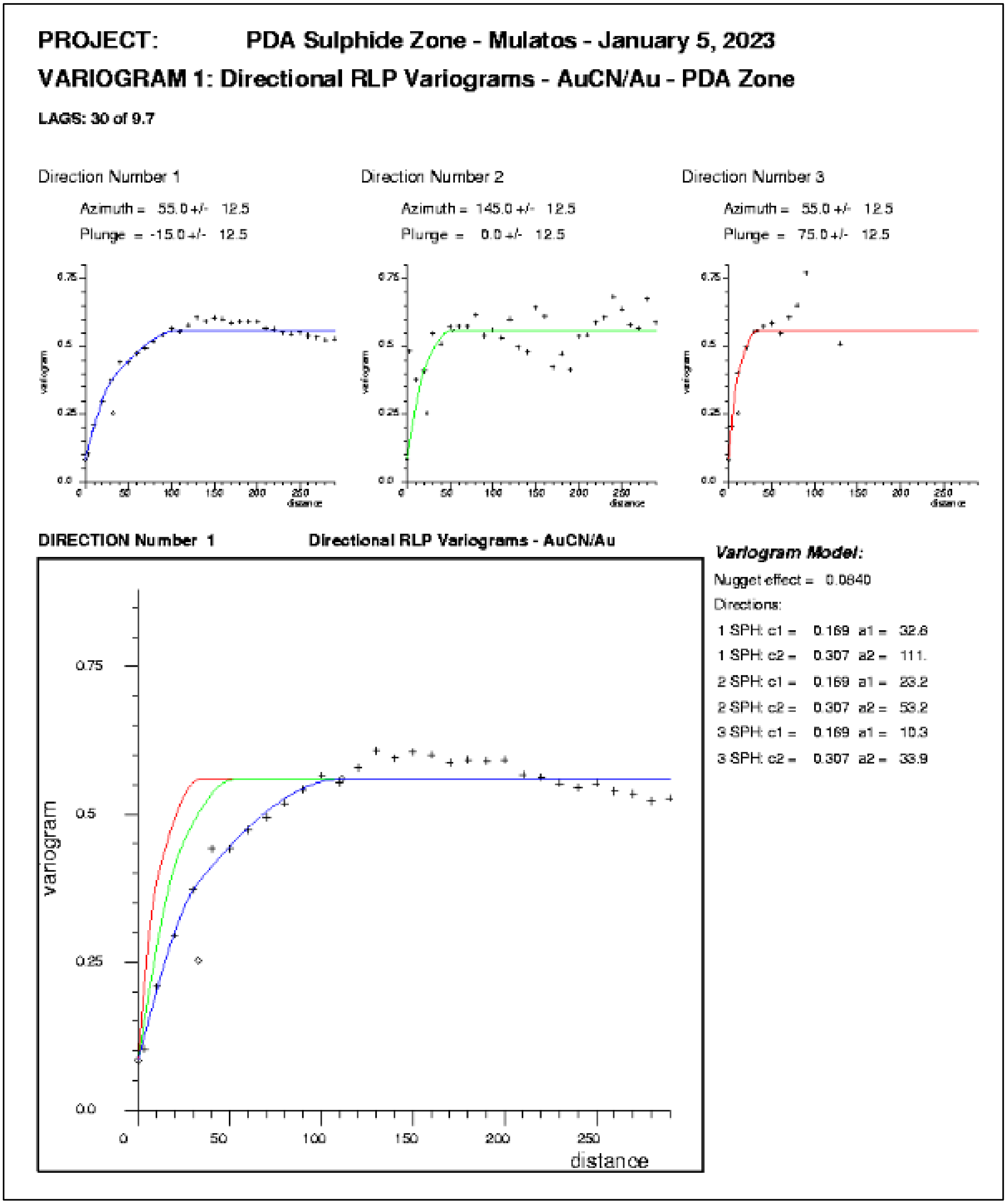


Figure B-3. AuCN/Au Variograms – PDA Sulphide Zone

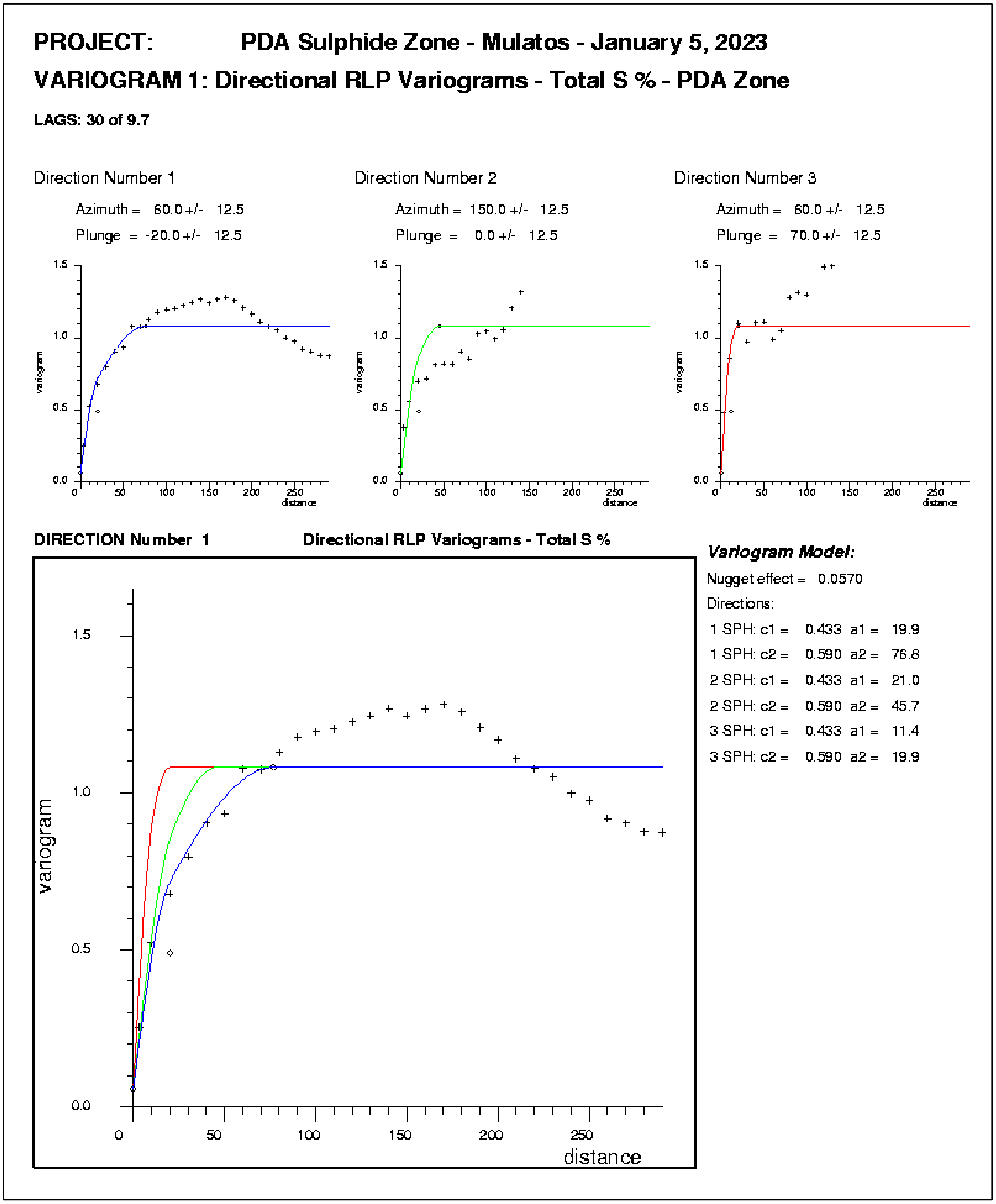


Figure B-4. Total Sulphur Variograms – PDA Sulphide Zone

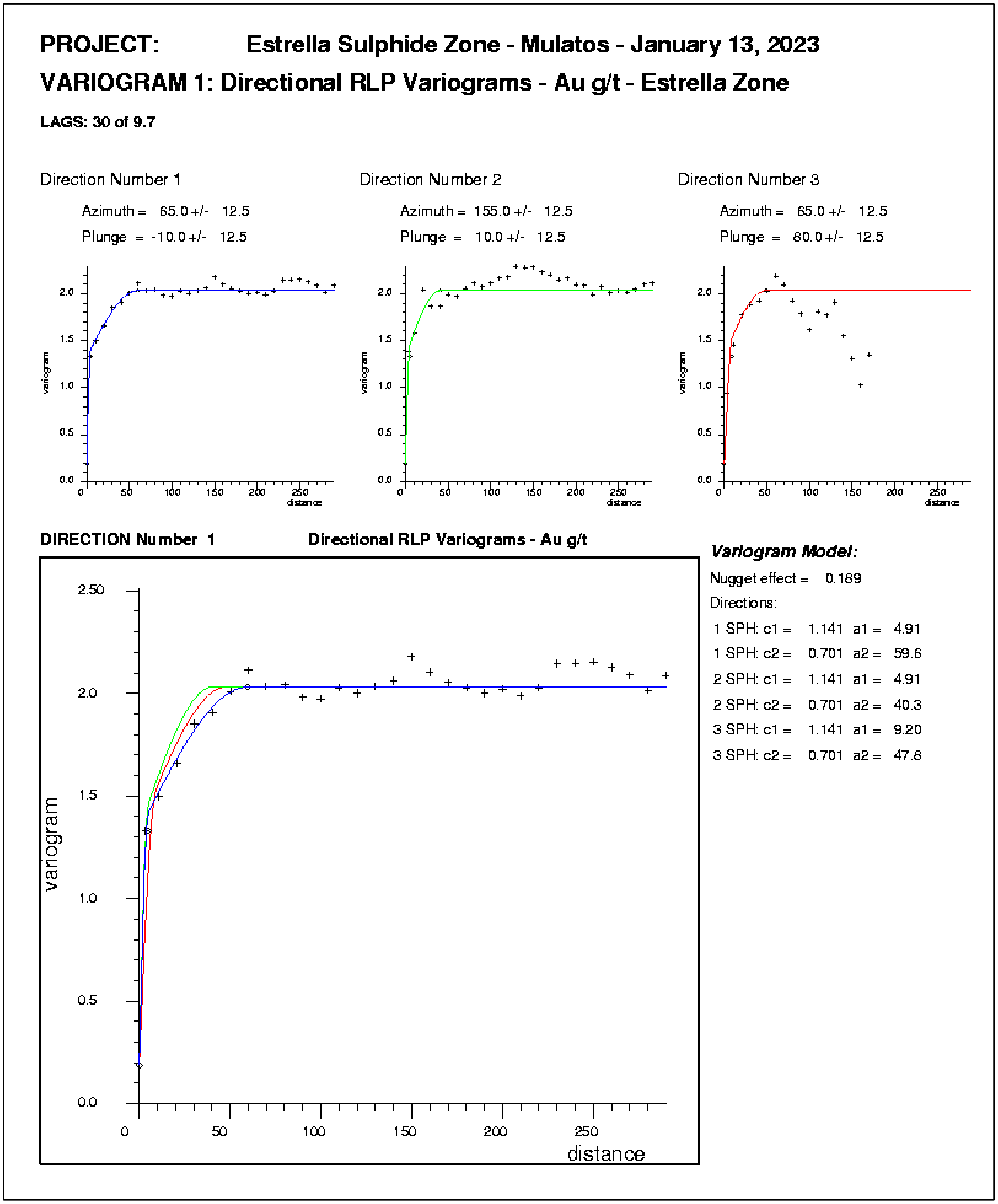


Figure B-5. Gold Variograms – Estrella Sulphide Zone

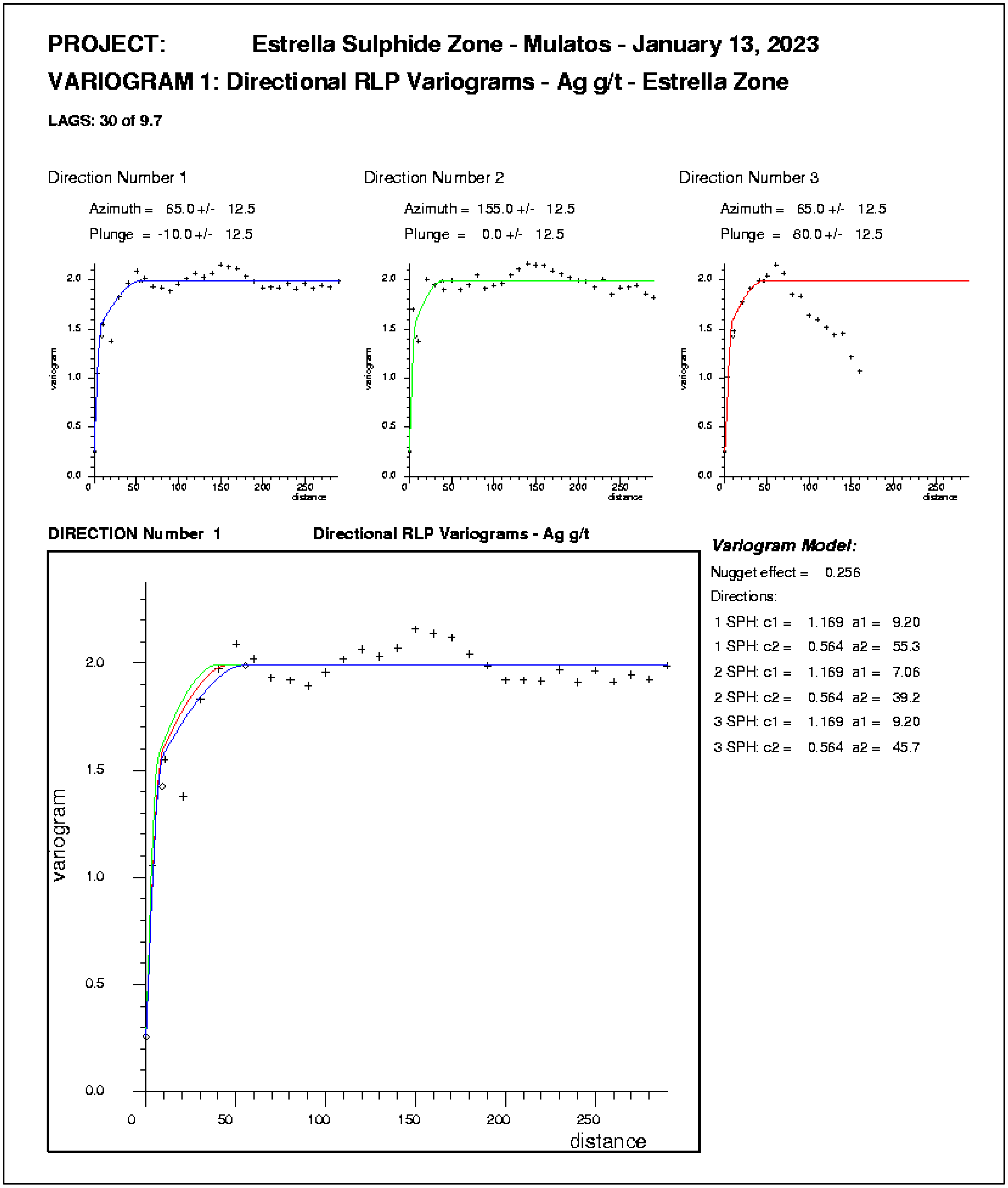


Figure B-6. Silver Variograms – Estrella Sulphide Zone

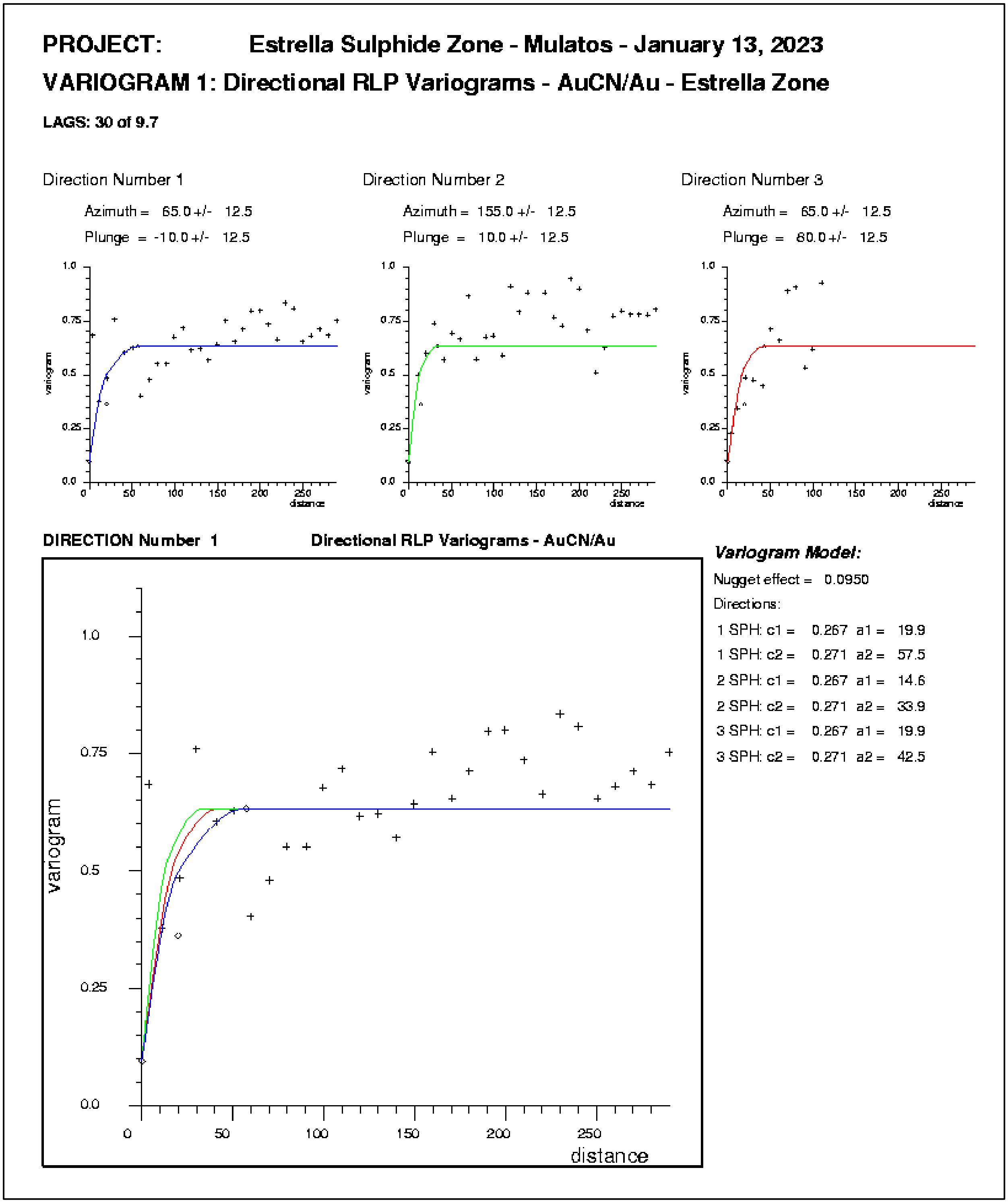


Figure B-7. AuCN/Au Variograms – Estrella Sulphide Zone

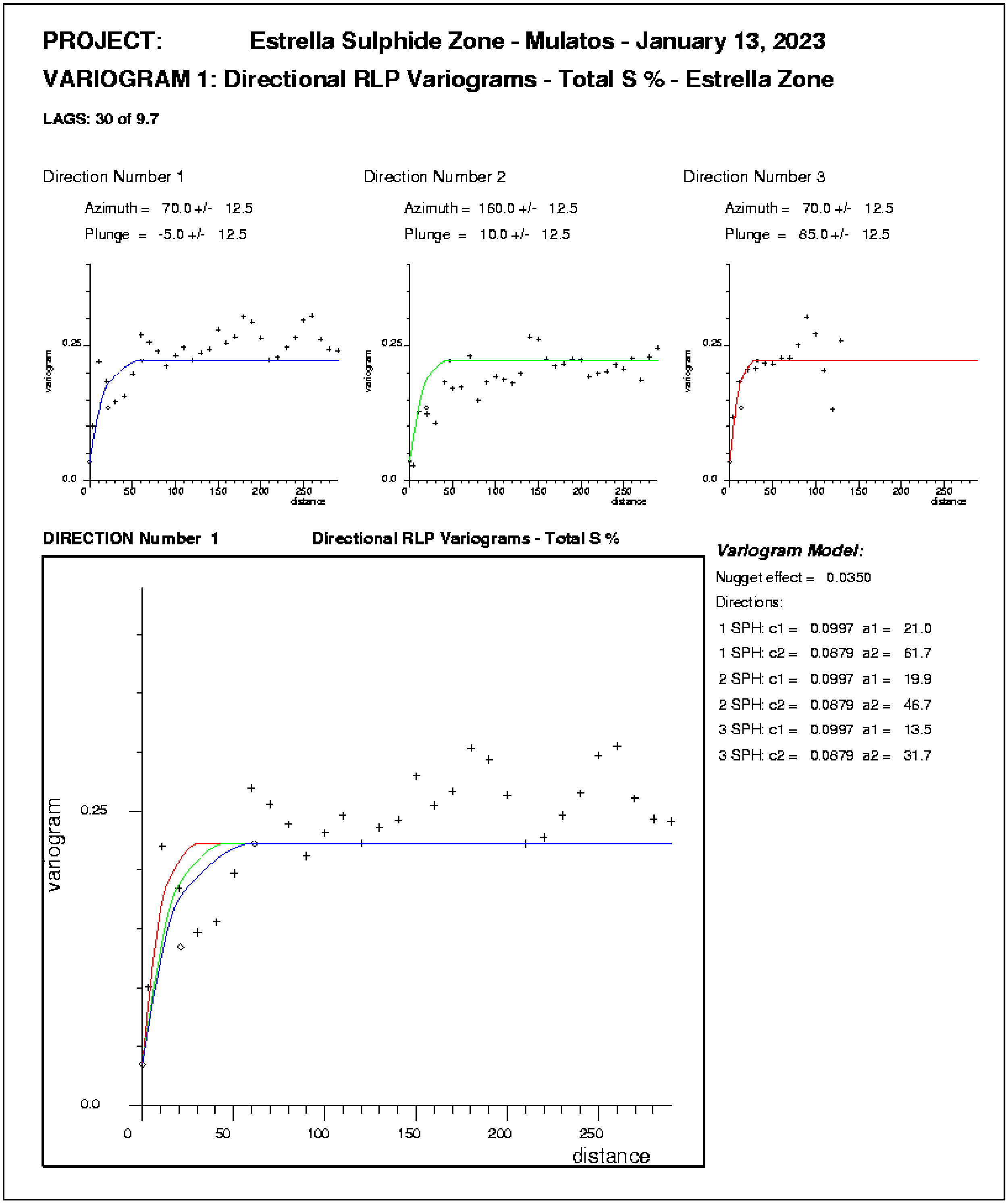


Figure B-8. Total Sulphur Variograms – Estrella Sulphide Zone

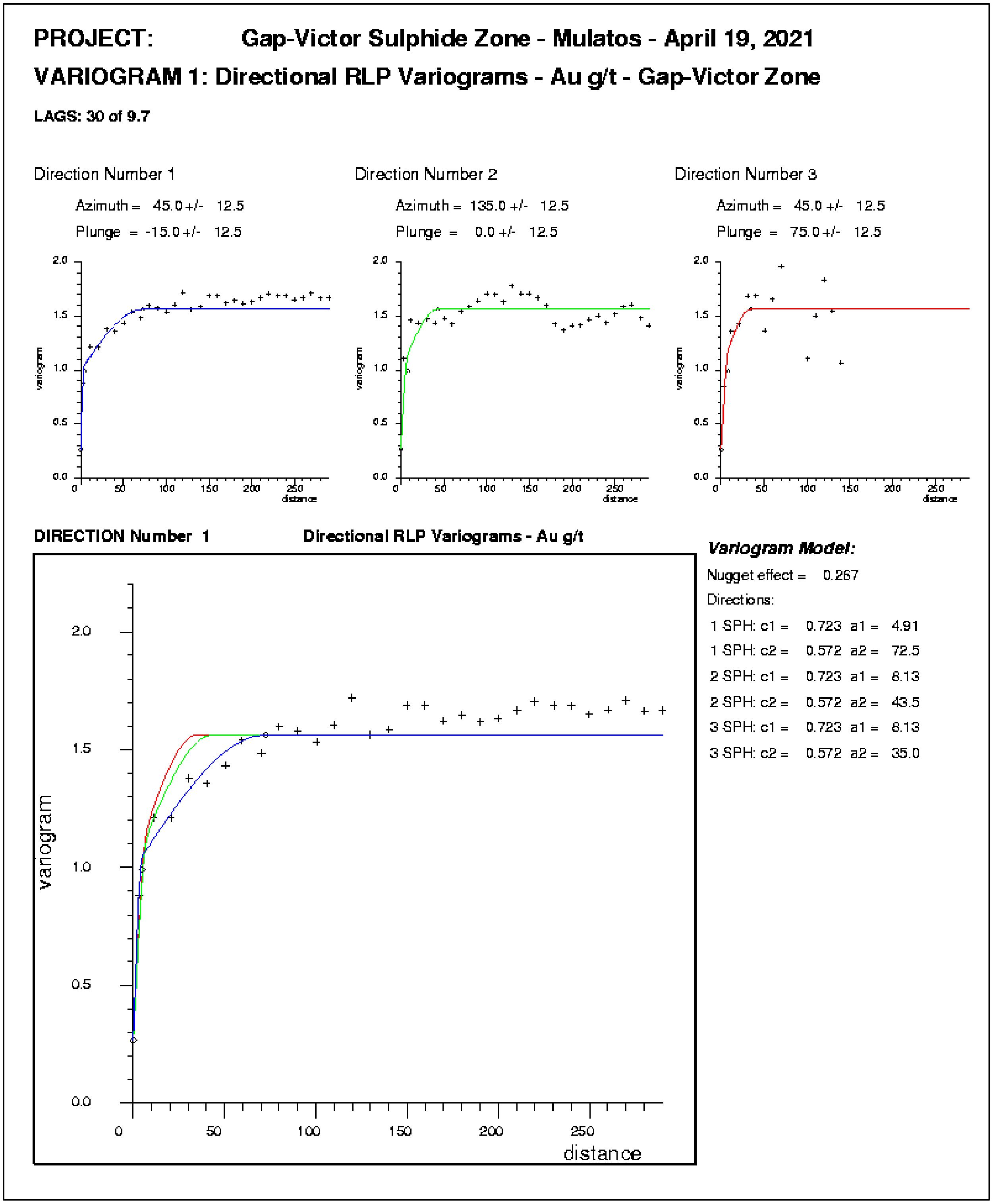


Figure B-9. Gold Variograms – Gap-Victor Sulphide Zone

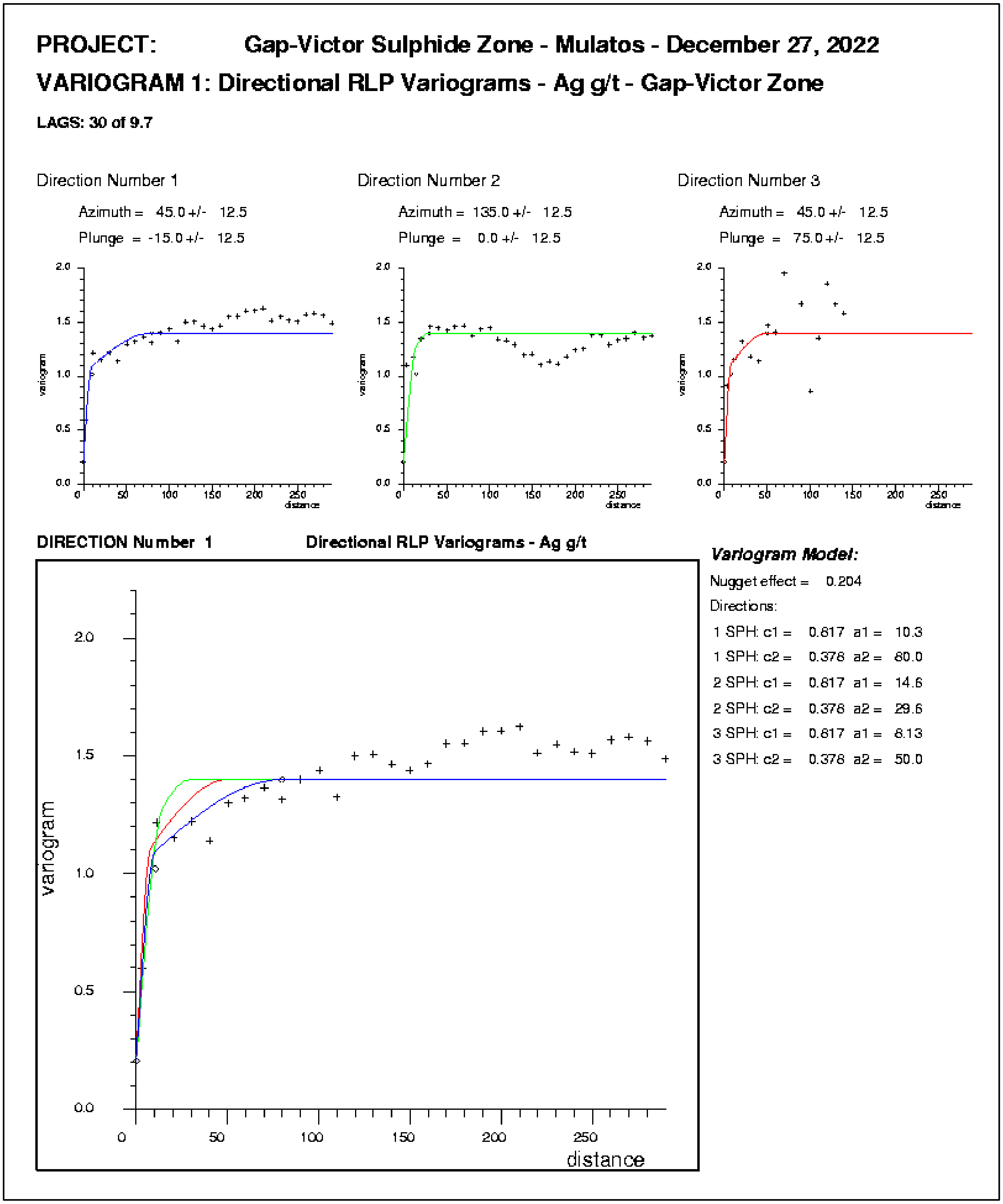


Figure B-10. Silver Variograms – Gap-Victor Sulphide Zone

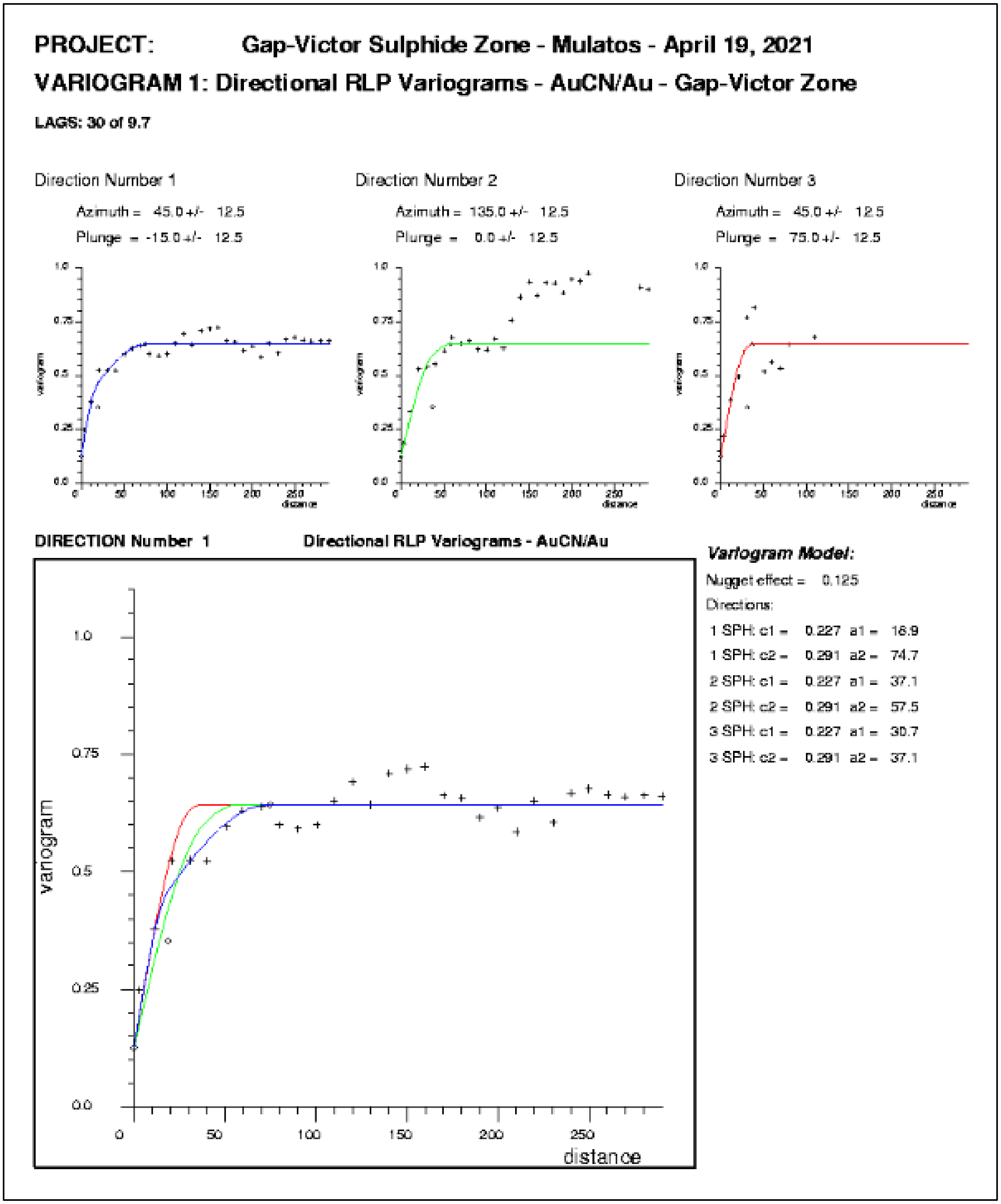
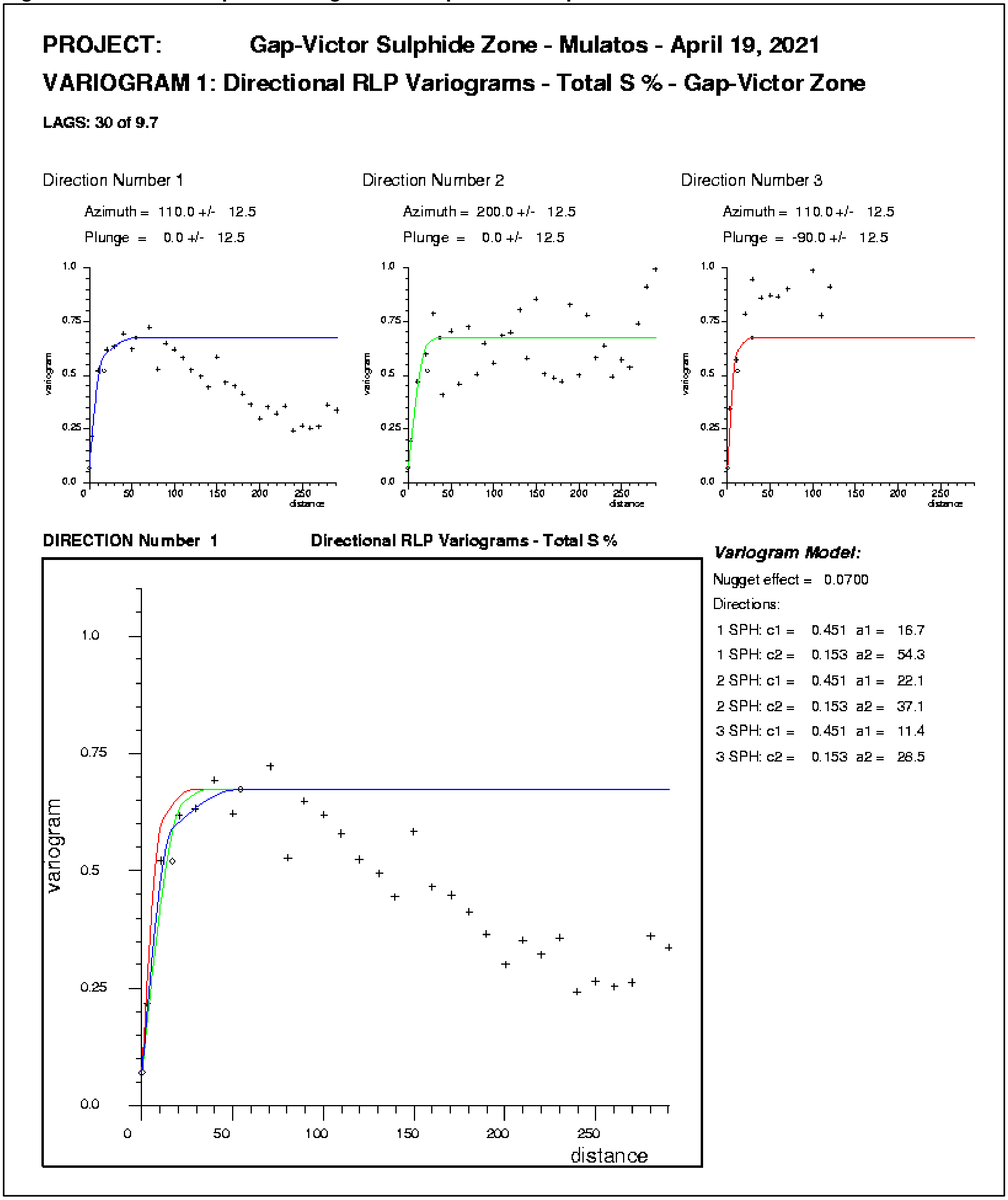


Figure B-11. AuCN/Au Variograms – Gap-Victor Sulphide Zone

Figure B-12. Total Sulphur Variograms – Gap-Victor Sulphide Zone



QUALIFIED PERSON CERTIFICATES

CERTIFICATE OF QUALIFIED PERSON

I, Christopher John Bostwick, FAusIMM, as an author of this report entitled "NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Sonora, Mexico" prepared for Alamos Gold Inc. and with an effective date of December 31, 2022, 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 project development, operations, 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 worked at Alamos Gold for the past fourteen years;
6. I visited the Mulatos Property most recently June 15-17, 2022.
7. I am the author of Sections 2, 3, 4, 5, 6, 13, 15, 16, 17, 18, 19, 21, 22, and 23, and co-author of Sections 1, 25, 26 and 27 of the NI 43-101 report entitled "NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Ontario, Canada " with an effective date of December 31, 2022;
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 have been an employee of Alamos Gold Inc. since January 2009, as Senior Vice President, Technical Services;
10. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
11. 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
12. 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 27th day of March 2023

(Signed & Sealed) "Christopher John Bostwick"

(Original signed)

Christopher John Bostwick, FAusIMM (FAusIMM no 306761)

CERTIFICATE OF QUALIFIED PERSON

I, Michele Lee Cote, PGeo, as an author of this report entitled “NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Sonora, Mexico” prepared for Alamos Gold Inc. and with an effective date of December 31, 2022, 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 VP 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 managing exploration at the Mulatos Property for 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 worked at Alamos Gold for five and half years;
6. I visited the Mulatos Property most recently February 24 to March 2, 2023.
7. I am the author of Sections 7, 8 ,9 ,10, 11 and 12 of the NI 43-101 report entitled “NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Ontario, Canada " with an effective date of December 31, 2022;
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 have been an employee of Alamos Gold Inc. since November 2017, as Chief Exploration Geologist, Corporate;
10. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
11. 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
12. 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 27th day of March 2023

(Signed & Sealed) “Michele Lee Cote”

(Original signed and sealed)

Michele Lee Cote, PGeo (No. 1671)

CERTIFICATE OF QUALIFIED PERSON

I, David Nicholas Bucar, M.Sc. P. Eng., as an author of this report entitled “NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Sonora, Mexico” prepared for Alamos Gold Inc. and with an effective date of December 31, 2022, do hereby certify that:

1. I am employed as Director, Environmental Sustainability for Alamos Gold Inc., located at 181 Bay Street, Suite 3910, Toronto, Ontario, M5J 2T3;
2. I received a Bachelor of Applied Science in Civil Engineering from Queen’s University (Ontario, Canada) in 1996 and Masters of Applied Science in Environmental Engineering from Queen’s University (Ontario, Canada) in 1997;
3. I am a registered Professional Engineer in Ontario, Canada, (P. Eng. no 90474008). I have worked for mine operating companies for more than 23 years since my graduation. I have worked mainly in environmental, project management, and operations, for Kinross, Placer Dome, Goldcorp, Newmont 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 worked at Alamos Gold for the past two years;
6. I visited the Mulatos Property most recently January 18-19, 2023;
7. I am the author of Section 20, and co-author of Section 1 of the NI 43-101 report entitled “NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Ontario, Canada " with an effective date of December 31, 2022;
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 have been an employee of Alamos Gold Inc. since January 2021, as Director, Environmental Sustainability;
10. I am not independent of the issuer, as described in Section 1.5 of NI 43-101;
11. 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
12. 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 27th day of March 2023

(Signed & Sealed) “David Nicholas Bucar”

(Original signed and sealed)

David Nicholas Bucar, M.Sc., P. Eng. (P.Eng. no 90474008)

CERTIFICATE OF QUALIFIED PERSON

I, Marc Jutras, P. Eng., M.A.Sc., do hereby certify that:

1. This certificate applies to the technical report entitled "NI 43-101 Technical Report for the Mulatos Property, Sahuaripa, Sonora, Mexico" prepared for Alamos Gold Inc. and with an effective date of December 31, 2022;

2. I am currently employed as Principal, Mineral Resources with Ginto Consulting Inc. with an office at 333 West 17th Street, North Vancouver, British Columbia, V7M 1V9;

3. I am a graduate of the University of Quebec in Chicoutimi in 1983, and hold a Bachelor's degree in Geological Engineering. I am also a graduate of the Ecole Polytechnique of Montreal in 1989, and hold a Master's degree of Applied Sciences in Geostatistics;

4. Since 1984, I have worked continuously in the field of mineral resource estimation of numerous international exploration projects and mining operations. I have been involved in the evaluation of mineral resources at various levels: early to advanced exploration projects, preliminary studies, preliminary economic assessments, prefeasibility studies, feasibility studies and technical due diligence reviews;

5. I am a Registered Professional Engineer with the Engineers and Geoscientists British Columbia (license # 24598) and Engineers and Geoscientists Newfoundland and Labrador (license # 09029). I am also a Registered Engineer with the Quebec Order of Engineers (license # 38380);

6. 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;

7. I have visited the project site at several times with the latest visit from May 12 to 17, 2018. During these site visits, the core logging and sample preparation facilities were visited. Core logging procedures and drill core were reviewed. A geologic tour of the outcrops and drill hole locations of the various deposits at Mulatos was also carried out, along with discussions with the geology staff. Overall, the site visits were beneficial in better understanding the geological setting of the gold mineralization at the Mulatos Property;

8. I am responsible for Section 14 of this Technical Report and for parts of Sections 1, 25 and 26;

9. I am independent of the Issuer, Alamos Gold Inc., and related companies applying all of the tests in Section 1.5 of the NI 43-101;

10. I have had prior involvement with the property that is the subject of this Technical Report, as I was an author and a Qualified Person of the previous technical report on the property, dated December 21, 2012;

11. As of the effective date of this Technical Report, to the best of my knowledge, information and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading;

12. I have read NI 43-101, and the Technical Report has been prepared in accordance with NI 43-101 and Form 43-101F1.

Dated this 27th day of March 2023

Marc Jutras, P. Eng., M.A.Sc.

(Original signed and sealed)

Principal, Mineral Resources, Ginto Consulting Inc.