M3-PN230002
Effective Date:
February 28, 2023
Issue Date:
March 9, 2023
Revision 1

Ana Paula Project

NI 43-101 Technical Report

Preliminary Feasibility Study Update

Guerrero, Mexico

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The effective date of this Technical Report is February 28, 2023. The issue date of this Technical Report is March 9, 2023. See Appendix A, Preliminary Feasibility Contributors and Professional Qualifications, for certificates of qualified persons.

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ANA PAULA PROJECT
FORM 43-101F1 TECHNICAL REPORT
PRELIMINARY FEASIBILITY STUDY UPDATE

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1 SUMMARY

Heliostar Metals Limited ("Heliostar" or "the Company"), has completed a Preliminary Feasibility Study (PFS) Update of its wholly owned Ana Paula Gold Project ("Ana Paula" or "the Project"), which is a gold resource development project located in the Guerrero Gold Belt in Guerrero, Mexico. This updated technical report replaces and supersedes the previous PFS published by Alio Gold Inc. (Alio Gold) for the Ana Paula Project in its entirety. The previous PFS was filed on the SEDAR website on June 07, 2017, and had an effective date of May 16, 2017. The highlights of this PFS Update include the following:

- Proven & Probable Mineral Reserves of 14.1 million tonnes at 2.38 grams of gold per tonne for 1,081,000 contained ounces of gold.
- NPV5% = $278.6 million and IRR of 30.5% after-tax at $1,600 per ounce of gold and $20 per ounce of silver.
- Initial Capital Cost of $233.6 million.
- Operating costs with cash costs of $546 per ounce of gold and site All-In Sustaining Costs of $573 per ounce of gold.
- Gold recovery of 85%.
- Mine life of 8 years from an open pit producing 919,000 ounces of gold.
- Underground potential highlighted with Measured & Indicated Resources below the proposed pit of 2.3 million tonnes grading at 2.81 g/t Au containing 207,800 ounces of gold.
- A rescoping study is planned to begin in March 2023 and take approximately 6 months to complete and will comprise a trade-off study between open-pit and underground mining and process flow sheet.
- A Feasibility Study will commence upon completion of the rescoping study and take approximately 12 months to complete.

1.1 INTRODUCTION

The Ana Paula Project is a gold resource development project located in Guerrero State, Mexico. The Project encompasses several gold occurrences within an exploration concession covering an area of more than 600 km^2. The Project was previously owned by Alio Gold, Inc. (Alio Gold), which published a PFS Technical Report on May 26, 2017 and an amended PFS technical report on June 7, 2017, both with an effective date of May 16, 2017.

Alio Gold (then Timmins Gold Corp.) acquired Ana Paula through its acquisition of Newstrike Capital Inc. in an arrangement that closed on May 26th, 2015. With the arrangement, Timmins Gold acquired ownership of all of the issued and outstanding common shares of Newstrike Capital Inc., its Canadian subsidiary Aurea Mining Inc. (Aurea Mining), and its Mexican subsidiary Minera Aurea S.A. de C.V. (Minera Aurea).

The shares of Aurea Mining and Minera Aurea were subsequently acquired by Argonaut Gold Inc. (Argonaut) in a merger with Alio Gold on July 1, 2020.

On December 5, 2022, Argonaut entered into a binding agreement with Heliostar for the sale of all of the issued and outstanding shares of Aurea Mining, a wholly owned subsidiary of Argonaut, which through Aurea Mining's wholly owned subsidiary Minera Aurea, holds a 100% indirect interest in and to the Ana Paula Gold Project (Argonaut press release, December 5, 2022).

M3 Engineering & Technology Corp. (M3) was commissioned by Heliostar Metals Limited to update the PFS pursuant to Canadian Securities Administrators' National Instrument 43-101 and Form 43-101F1 standards (collectively, "NI 43-101").

1.2 PROPERTY DESCRIPTION AND LOCATION

The Ana Paula Project is located in the north central part of the State of Guerrero in southern Mexico, roughly halfway between the major cities of Mexico City and the Port of Acapulco. The Project centroid is located at UTM Q14N, WGS84, 409,027.8E and 1,997,632.6N or 99° 51' 34.4 west longitude and 18° 3' 55.2" north latitude near the municipality of Cuétzala del Progreso and Apaxtla del Castregon. The Project lies within the Sierra Madre del Sur mountain range where topography can range from moderate to rugged with elevations varying from 900 to over 1,460 meters above sea level (masl). The Balsas River, which divides the Sierra Madre del Sur Mountains into north and south ranges, flows just south of the project area.

The climate in the region is warm and humid, with temperatures ranging from 4º to 42º Celsius (ºC). Precipitation averages at 874.3 millimeters (mm) per year, mostly occurring between June and October during the monsoon season, which is influenced by hurricanes from both the Atlantic and Pacific oceans. According to Mexican regulation NOM-141 SEMARNAT-2003, the Ana Paula site falls under seismic region D, where severe and destructive ground shaking is expected but not located close to a major fault.

Minera Aurea S.A. de C.V. exercised an agreement, dated May 11, 2010, (held by Newstrike Capital Inc., now Alio Gold) for a 100% interest in the concessions Aplaxtla 3, Tembo, Tembo Dos, and Tembo Tres from Desarrollos Mineros San Luis, S.A. de C.V. and Minera San Luis S.A. de C.V., wholly owned Mexican subsidiaries of Goldcorp Inc. The final documentation was submitted for registration in Mexico City on June 24, 2010.

Minera Aurea S.A. de C.V. has the obligations set forth below for the maintenance of the four concessions.

On October 18, 2017, Goldcorp and Alio Gold executed an agreement for Alio Gold to buy one-third of the 3% NSR royalty, as agreed upon, arising from the completion of the pre-feasibility study on May 16, 2017. The remaining 2% NSR royalty held by Goldcorp has been acquired by Maverix Metals Inc. (Maverix), as announced in a news release on September 21, 2020. On January 19, 2023, Triple Flag Precious Metals Corp. completed the acquisition of the Maverix Metals Inc. 2% NSR royalty.

As of December 30, 2020, Minera Aurea controls surface access to 2,235.45 hectares overlying and surrounding the Ana Paula Project area. Of these, 1,373.6 hectares are owned outright, 560.55 hectares are under contract in 30-year access agreements, and 301 hectares are under contract in 10-year access agreements.

1.3 GEOLOGY AND MINERALIZATION

Mineralization in the Guerrero Gold Belt (GGB) is characterized as a skarn porphyry mineralization related to an early Tertiary intrusive event. Ana Paula is located along the northwesterly trend of the GGB where it straddles a boundary between two older tectonic sub-terranes; a volcanic-volcaniclastic arc assemblage to the west and a thick carbonate platform sequence overlain by younger marine deposits to the east.

The stratigraphy of both sub-terranes was deformed during the compressive Laramide orogeny and subsequently intruded by a ±62-66 million year calc-alkali magmatic event that is currently thought to be associated with the timing of mineralization responsible for the gold deposits and showings of the GGB.

The geologic units underlying the Ana Paula Project are primarily sedimentary rocks composed of an interbedded limestone and shale unit and a carbonaceous limestone unit that have been intruded by intermediate sills, dikes and stocks. Six principal geological domains within Ana Paula Deposit have been recognized: (1) Complex Breccia domain that sits in the core of the main Ana Paula deposit is a steeply dipping sub-vertical plug stretched gently in an east-west direction and dipping to the south. (2) Intrusive Suite domain is a package of several different intrusive phases that in a general sense appear to be similar in composition and age. (3) Monolithic Breccia domain is essentially a brecciated intrusion composed of mostly monolithic fragments in a silica rich matrix with mixed sulphide-oxide mineralogy. It is located in the southern part of the deposit. (4) Sediments domain is characterized by light brown weathering, platy outcrops, with distinct gray and brown limestone beds which range from a few centimeters to as much as 25 centimeters thick. Also included is a massive to thin bedded laminated carbonaceous limestone that is present in this domain. The sediments domain is located in the eastern part of the deposit. (5) Skarn-Hornfels domain is found in the deeper zones of the deposits and shows a down dip zonation from unaltered sedimentary limestone-shale to skarn-hornfels metamorphic rock. (6) Semi-massive Sulphide domain is very localized and narrow, and it develops at the contacts between the skarn-hornfels domain and the Intrusive Suite domain.

In general, four gold depositional settings are recognized at Ana Paula, including:

1. Quartz-sulphide and quartz-carbonate-sulphide veinlets, stockworks with sulphide clots and disseminations in both intrusions and hornfels.
2. Narrow semi-massive sulphide contact replacement of limestone or hornfels/skarn at the intrusion contacts.
3. Sulphide clots, rims and masses in narrow contact replacement of breccia hosted in intrusions at or near the sedimentary contacts and/or fault contacts (detachment faults).
4. Associated with a sulphide constituent within breccia matrix and with sulphide replacement textures within structurally controlled breccia formed oblique to the dominant northerly trending westerly dipping stratigraphy.

The veinlets, stockwork, clots and disseminated mineralization, along with the contact replacement textures (settings 1, 2 and 3 above) are commonly observed within the intrusive and sediments domains that collectively make up a corridor of structurally controlled northerly trending and westerly dipping marine sediment and intrusive sill/dike stratigraphy that is host to a lower grade mineralization.

The bulk of the high-grade mineralization at Ana Paula occurs in the Complex Breccia domain. This lithological unit consists of a core of multi-lithic breccia in a steeply south plunging column surrounded by an alteration HALO bearing high grade mineralization which is characterized by veins, fracture zones, and massive sulphide contact replacements. The vertical extent of the Complex Breccia domain has been modelled to a depth of 950 m below surface and it is currently limited by drilling. Horizontally, the high-grade mineralization extends between 200 m to 250 m away from the center of the Complex Breccia domain near surface. The horizontal extent gradually reduces at depth, down to between 20 m to 30 m at the lower extremity of the Complex Breccia domain. Mineralization is continuous, and grade tends to be highest from the center of the complex breccia and extends into the sediments, intrusive, and hornfels lithology. Outside the HALO, the mineralization is lower grade and occurs in stockwork, with sulphide clots and disseminations mainly in the hornfels and intrusive.

1.4 EXPLORATION AND DRILLING

Active exploration of the Ana Paula Project began in 2005 and has taken place continuously since 2010. Exploration activities include surface mapping and sampling, geophysical surveys, and drilling. Surface mapping and sampling has been thorough and ongoing. Outcrop and road cut locations are registered on handheld GPS (WGS84 datum) and recorded along with lithologic, structure, mineralization, alteration and other relevant details on field map sheets of the same 1:2000 scale that are then transferred first by hand then digitally to the final map sheets. Geophysical surveys of the area have included aeromagnetics, airborne radiometrics (K, Th, U), induced polarization (IP), and an airborne Z-axis tipper electromagnetic (ZTEM) survey.

Upon acquiring the property in 2015, Alio Gold carried out an extensive review of the data delivered by Newstrike including field review of the existing geological maps by Alio Gold personnel and re-logging of 113 drill holes located in the vicinity of the pit design area and extending below the pit design. A total of 49,968.89 meters of core were re-logged by Alio Gold to provide detailed information across the entire mineralization system and unified lithological, structural and mineralized criteria with the goal to improve support for the geological model.

The primary means of exploration were by core drilling from the surface. Drilling began with Goldcorp in 2005, continued with Newstrike 2010-2015, and finally with Alio Gold from 2016 to 2018. Table 1-1 shows the drill hole summary by year and company.

Table 1-1: Drill Hole Summary by Year and Company

Year	Company	Number of Holes	Total Length (m)
2005	Goldcorp	11	3,689
2010	Newstrike	12	5,227
2011	Newstrike	57	29,697
2012	Newstrike	72	41,260
2013	Newstrike	78	33,925
2014	Newstrike	2	1,518
2015	Alio	10	2,008
2016	Alio	31	7,304
2017	Alio	58	13,478
2018	Alio	8	4,337

The average drill hole spacing is approximately 50 m in the main part of the Ana Paula deposit, with a range from 20-50 m in the high-grade Breccia Zone and 50-150 m to the north and south pit extremities.

Drilling by Alio Gold at the Ana Paula property consisted of a program in 2015 with two components: confirmation drilling and infill drilling. The 2015 program was followed by a major program in 2016-2018 consisting of four main components: Infill drilling, geotechnical drilling, condemnation drilling and twinning of holes for the collection of metallurgical testing material.

The 2015 confirmation drilling consisted of a total of 606 m of core in three twinned drill holes. The results from the confirmation drilling were consistent with those from previous programs.

The infill drilling results were encouraging, as they continued to display Ana Paula's high-grade gold mineralization and allowed for a greater understanding of the deposit.

The 2016-2018 infill drilling program significantly increased the delineation of the high-grade breccia zone and the mineralization HALO surrounding the high-grade breccia. A total of 8 drill holes were added in 2018 targeting the mineralization in proximity below the PFS pit bottom.

1.5 METALLURGY

A series of metallurgical test programs were conducted at Blue Coast Research Ltd on Ana Paula material in support of this technical report. Composites were selected to be representative of the main lithological domains: intrusive suite (granodiorite, GD); complex breccia (high-grade breccia, HGB); sediments + skarn-hornfels mix (LS); monolithic breccia (low-grade breccia, LGB). These composites were subjected to a variety of metallurgical tests including comminution testing, gravity concentration, whole ore flotation, whole ore cyanidation and pre-oxidation.

1.5.1 Comminution Tests

Comminution results suggest that Ana Paula material is moderately hard to hard. Comminution testwork consisted of JK RBT Lite tests, Bond Ball Work Index Tests, SMC tests and Abrasion index tests. Results are presented in Table 1-2. The SMC results indicate the material is somewhat harder than that suggested by the JK RBT Lite work. The SMC results represent a more conservative approach to grinding circuit design. Abrasion testing results indicate that the Ana Paula material is mildly abrasive and that mill liner wear will not be extreme.

Table 1-2: Comminution Test Results

Domain Composite	JK RBT Lite Unscaled Parameter (Axb)	SMC Results (Axb)	BWI (kWh/t)	Abrasion Index (Ai)
Granodiorite (GD)	43.3	34.8	19.4	0.189 0.203
High Grade Breccia (HGB)	44.0	33.3	16.0	0.194
Limestone Shale (LS)	39.6	N/A	15.1	0.078
Low Grade Breccia (LGB)	55.6	N/A	16.2	0.081

1.5.2 Flotation Tests

A comprehensive flotation testwork program was completed on the three predominant domains (GD, LGB, and LS). The study evaluated the impacts of primary grind size, reagent scheme, pH, retention time, and pulp density. The following outcomes are summarized from this technical report.

- Gold recoveries ranged from 93% for LS to 96% for GD and HGB.
- Primary grinds ranging from 75 to 160 micrometers (µm) were evaluated. The primary grind size had no impact on final flotation recoveries so the coarsest primary grind, 80% passing (P_{80}) 160 µm, was selected for the process design criteria.
- All composites required the addition of copper sulphate for pyrite and arsenopyrite activation. Copper sulphate was added at the rate of 100 grams per tonne of material (g/t).
- Potassium Amyl Xanthate (PAX) was added as the primary sulphide mineral collector. Optimum dosage rates ranged from 60 to 110 g/t. PAX was necessary to ensure maximum gold recovery. Tests conducted with alternate primary collectors resulted in lower overall recovery.
- 3418A was added to the GD and HGB composites as a secondary collector. Highest recoveries were noted when dosage rates ranged from 40 to 50 g/t.
- F-131A was identified as the preferred frother. Optimum dosages ranged from 64 to 128 g/t.

1.5.3 Gravity Gold Recovery

Ana Paula material responded well to gravity concentration. Extended Gravity Recoverable Gold (EGRG) tests were conducted on each domain composite. These tests are conducted with successively finer grind sizes culminating with a final grind of 80% passing 75 µm. Anticipated gravity circuit performance is dictated by grinding and gravity circuit design. Given that the primary grind size required for adequate flotation was 160 µm it could be expected that gold recovery to gravity concentrate will be somewhat less than that reported by the EGRG results. Modelling of the gravity circuit was conducted by FLSmidth-Knelson and suggests that the average life-of-mine recovery of gold to the gravity concentrate will be approximately 20% at a P_{80} grind size of 160 µm, assuming the treatment of a 36% circulating load through the gravity circuit.

1.5.4 Whole Ore Cyanidation

A comprehensive set of whole ore cyanidation tests were conducted on the three main domain composites (GD, HGB and LS). This test program evaluated the effects of primary grind size, cyanide concentration, lead nitrate addition, dissolved oxygen content, pre-aeration, and residence time. Leach recoveries ranged from 59% to 70% for GD, 62% to 68% for HGB and 6% to 50% for LS. Preg-robbing carbonaceous material identified in the LS composite was used to explain the low gold recoveries in initial testing. LS recoveries improved to the mid-to-high 40% range through the addition of activated carbon. The impact of this carbon addition is illustrated in Figure 1-1.

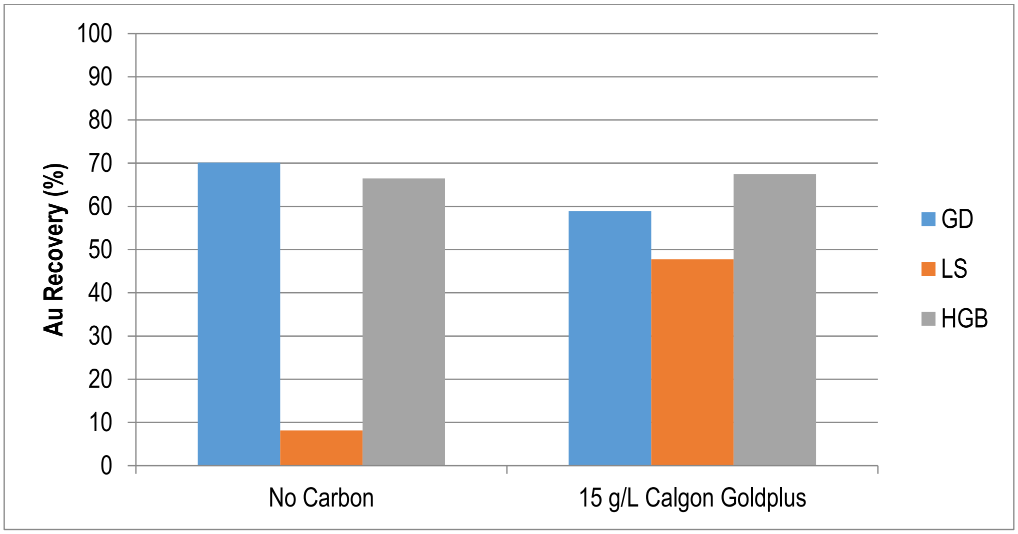


Figure 1-1: Effect of Adding Activated Carbon (Calgon Goldplus) during Whole-Ore Cyanidation

Ana Paula's material was largely insensitive to primary grind size, residence time, cyanide concentration, lead nitrate addition and preaeration. The whole ore leach tests underscore the fact that gold recovery is limited by the refractory gold content in the material.

1.5.5 Pre-Oxidation Tests

The primary sulphide minerals at Ana Paula, pyrite and arsenopyrite, were both identified as being carriers of refractory gold. Increasing overall gold recovery requires breaking down the crystal structure of the sulphide by oxidation to make the gold available to the cyanide solution. Pressure oxidation and atmospheric oxidation were evaluated and compared to select the preferred process for recovery of the refractory gold.

Acidic pressure oxidation of both whole ore and flotation concentrates displayed overall gold recoveries in excess of 95%. Sulphide oxidation in these tests ranged from 96% to 98%. Due to the amount of acid consuming carbonate present in Ana Paula material, an alkaline pressure oxidation test was conducted. However, oxidation was incomplete at 50% and gold recovery was limited to 75%.

An atmospheric oxidation process was tested at ambient pressure and temperature of 75ºC in open tanks with a sodium based neutralizing agent. An initial screening program highlighted that overall gold recovery from the atmospheric oxidation process would yield an average overall gold recovery of approximately 85% to 86% using soda ash as the neutralizing agent. M3 completed a trade-off study comparing pressure oxidation of flotation concentrates to atmospheric oxidation of flotation concentrates. The higher capital cost and additional technical complexity of pressure oxidation did not support the added recovery benefit. The atmospheric oxidation flowsheet was selected for further optimization.

Additional atmospheric oxidation testwork was focused on determining the optimum soda ash addition rates, verifying the concentrate regrind size and studying the effect of residence time on sulphide oxidation and gold recovery. A preliminary evaluation of domain specific oxidation tests was also carried out.

Soda ash addition had a direct relationship to gold recovery. This is highlighted in Figure 1-2 below. In the sample tested, which had a sulphur grade of 9.9%, 150 kg/t was sufficient to maintain a pH at the discharge of the oxidation test of approximately 7, suggesting that this dosage is sufficient to neutralize the acid produced. When lower soda ash dosages were applied, the pH within the oxidation circuit dropped below 7 for periods of time, and lower gold recoveries were noted. Carbonate, likely calcite, present in the flotation concentrate will dissolve in acidic conditions. The free calcium ions will release precipitate as gypsum in the sulphate rich environment. This gypsum precipitate coats the sulphide particles resulting in their passivation and reducing the overall sulphide oxidation and gold recovery.

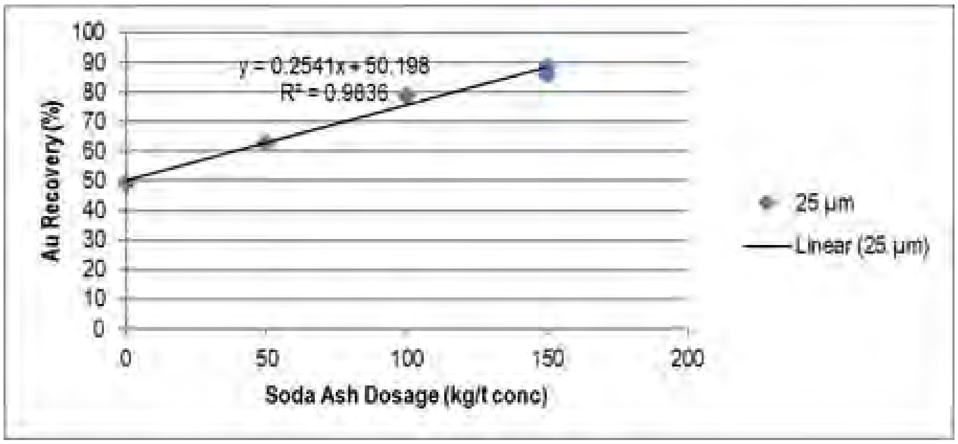


Figure 1-2: Relationship of Soda Ash Dosage and Gold Leach Recovery of Gravity Tail/Flotation Concentrates (25µm regrind size)

The impact of regrinding was tested at three soda ash addition levels. Other parameters, such as temperature and residence time were held constant. Finer regrind size yielded higher overall gold recoveries. This influence is stronger at lower soda ash dosages, possibly due to the passivating influence of insufficient soda ash, as shown in Figure 1-3.

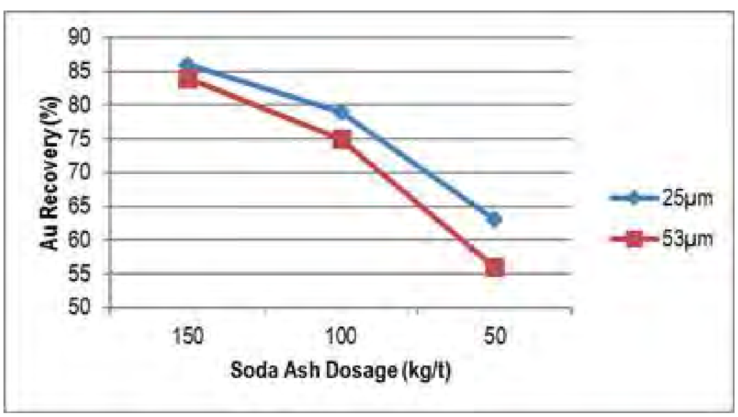


Figure 1-3: Effect of Regrind Size on Gold Leach Recovery of Gravity Tail/Flotation Concentrates

Oxidation kinetics are relatively quick. An oxidation versus recovery profile was generated using the standard 150 kg/t soda ash dosage, with temperature and regrind size held constant at 75°C and 25µm respectively. Gold recovery was measured from carbon-in-leach bottle rolls that were conducted on samples that had been oxidized for 8, 24, 48 and

72 hours. Gold recovery increased from 83% after 8 hours of oxidation to 88% after 48 hours. No additional recovery was recorded from the 72-hour residence time, indicating that 48 hours of retention time is sufficient.

Some of the arsenic present in Ana Paula flotation concentrates is solubilized and will remain in process liquors at the discharge of the atmospheric oxidation process. A number of small scoping tests were conducted to determine if the addition of ferrous sulphate would precipitate this arsenic. Some of these initial tests were encouraging, resulting in a reduction of soluble arsenic to levels less than 1.5 ppm. Further study is required to validate this process and to confirm the stability of these arsenic precipitates.

1.5.6 Overall Metallurgical Flowsheet

Based on the testwork described above, the Ana Paula process flowsheet includes the following:

- Primary grinding to 80% passing 160 µm
- Gravity concentration
- Intensive Leaching of Gravity Concentrates
- Flotation
- Regrinding of flotation concentrates to 80% passing 25µm
- Atmospheric Oxidation of flotation concentrates
- Carbon-in-Leach
- Carbon Elution
- Gold Electrowinning and Smelting

Approximately 20% of the gold is expected to be recovered in the gravity circuit. The remainder of the ground material will feed a flotation plant where approximately 20% of the mass and 95% of the remaining gold will be recovered to concentrate. This concentrate is reground to 80% passing 25µm prior to being treated through the atmospheric oxidation circuit. Soda ash will be added to maintain the oxidation pH above 7. Following oxidation, the pH will be adjusted to 10.5 with lime, prior to the addition of cyanide in a Carbon-in-Leach (CIL) circuit. Gold will be recovered from loaded carbon through a standard elution process. This flowsheet is expected to yield an average overall gold recovery of 85%.

1.6 MINERAL RESOURCE ESTIMATE

The Ana Paula updated Mineral Resource Estimate (MRE) was developed in December 2020 in conformance with the CIM Mineral Resource definitions referred to in the NI 43-101 Standards of Disclosure for Mineral Projects. This mineral resource estimate has an effective date of December 30, 2020 and is an update of the May 16, 2017 estimate completed by AGP Mining Consultants Inc. for the Ana Paula Project.

The estimate was completed based on the concept of a medium scale open pit, with a possible resource for an underground operation for the material remaining below the pit bottom.

The Ana Paula drill database was thoroughly validated prior to the resource estimate and was found to be error free. All drill core samples were analyzed at internationally recognized and accredited laboratories which were independent from Heliostar. Core handling, chain of custody, quality control and quality assurance were found to adhere to industry best practice.

The Ana Paula grade models were interpolated using 290 core holes completed by Goldcorp in 2005, Newstrike Capital from 2010 through 2015, and Alio Gold from 2015 through 2018. The database totaled 129,499 m of core and contained 89,816 assays.

The 3D wireframes developed to control the grade interpolation of the resource model were based primarily on lithology with a probabilistic approach used for the high-grade mineralized HALO and the high-grade zones in the lithologies outside the HALO. The deposit has been modeled using an Ordinary Kriging applied to 3 m drill hole composite lengths for gold and silver which respected lithology units.

Densities were determined from a suite of 5,946 representative core samples using industry standard methods. The density was then interpolated in areas where the data was sufficiently abundant to honor localized variations. For the remaining areas, the average density for each of the lithological domains was applied.

The block model matrix size of 5 m x 5 m x 6 m (width x length x height) was selected in consultation with the engineering team from AGP and was based on the size deemed suitable for a medium size open pit mining scenario with possible underground mining components below the pit.

The interpolation was carried out in multiple passes with increasing search ellipsoid dimensions. The classification was based primarily on the pass number and the average distance to the composites, followed by an adjustment based on diamond drilling density (core area), and the kriging efficiency.

Under CIM definitions, Mineral Resources must have a reasonable prospect of eventual economic extraction. A gold price of $1,400/ounce and a silver price of $20/ounce was used for the cut-off determination. For open pit resources, a cut-off of 0.6 g/t gold was used.

To further assess reasonable prospects of eventual economic extraction, a Lerchs-Grossman optimized shell was generated to constrain the potential open pit material. Parameters used to generate this shell included:

- 49.5° overall slopes for the pit shell
- US$2.25/t mining, US$19/t milling, US$2.49/t G&A operating costs
- 88% gold recovery, and 30% silver recovery
- Gold price of $1,400/ounce and $20/ounce silver price
- Above criteria was applied to Measured, Indicated, and Inferred resources

To further assess reasonable prospects of eventual economic extraction for the material below the resource constraining shell, a break-even cut-off of 1.6 g/t gold was selected based on the following parameters:

- US$36/t mining, US$19/t milling, US$2.49/t G&A operating costs
- 88% gold recovery and 30% silver recovery
- Gold price of $1,400/ounce and $20/ounce silver price
- Dilution considered for cut-off determination 5%
- Above criteria was applied to Measured, Indicated, and Inferred resources

Based on the geometry of the deposit, the material amenable to underground extraction will possibly be using a bulk mining method such as long-hole or modified Avoca mining method. The break-even cut-off stated above is only applicable to the material in the vicinity of the mineralized HALO due to increase in development cost reaching blocks further away. A mining plan does not exist for the material amenable to underground extraction; therefore, stope size, level spacing and other underground mining criteria have not yet been established.

With an effective date of December 30, 2020, and based on the above criteria, a summary of the mineral resource is presented in Table 1-3, tabulated at a cut-off of 0.6 g/t gold within the resource constraining shell and 1.60 g/t gold below the shell.

Table 1-3: Ana Paula Resource Statement Effective December 30, 2020

Area	Category	Cut-off (Au g/t)	Tonnes	Au (g/t)	Gold (ounces)	Ag (g/t)	Silver (ounces)
Resource Amenable to Open Pit Extraction	Measured	0.6	9,095,000	2.39	698,000	5.6	1,629,000
	Indicated		9,810,000	1.79	563,000	5.3	1,677,000
	Measured & Indicated		**18,905,000**	**2.07**	**1,261,000**	**5.4**	**3,306,000**
	Inferred*		63,000	0.86	2,000	10.5	21,000
Resource Amenable to Underground Extraction	Measured	1.6	85,000	2.15	5,800	2.8	8,000
	Indicated		2,212,000	2.84	202,000	4.0	286,000
	Measured & Indicated		**2,297,000**	**2.81**	**207,800**	**4.0**	**294,000**
	Inferred*		322,000	2.09	21,700	4.2	43,000
Total Resource	Measured	OP 0.6 and UG 1.6	9,180,000	2.38	703,800	5.5	1,637,000
	Indicated		12,022,000	1.98	765,000	5.1	1,963,000
	Measured & Indicated		**21,202,000**	**2.16**	**1,468,800**	**5.3**	**3,600,000**
	Inferred*		385,000	1.89	23,700	5.2	64,000

Source: AGP (2020)

The quantity and grade of reported Inferred resources in this estimation are conceptual in nature and are estimated based on limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. For these reasons, an Inferred Mineral Resources has a lower level of confidence than an Indicated Mineral Resources and it is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Rounding of tonnes as required by reporting guidelines and may result in apparent differences between tonnes, grade, and contained metal content.

1.7 MINERAL RESERVE ESTIMATE

The reserves for Ana Paula are based on the conversion of the Measured and Indicated resources within the current technical report mine plan. Measured resources are converted directly to Proven Reserves and Indicated resources to Probable Reserves. The total reserves for Ana Paula are shown in Table 1-4, dated effective as of February 1, 2023.

Table 1-4: Proven and Probable Reserves – Ana Paula- Effective February 1, 2023

Category	Tonnes (kt)	Gold Grade (g/t)	Gold (ounces)	Silver Grade (g/t)	Silver (ounces)
Proven	7,126	2.75	630,000	5.77	1,322,000
Probable	6,996	2.00	451,000	5.45	1,226,000
Total	**14,122**	**2.38**	**1,081,000**	**5.61**	**2,547,000**

The reserves are based solely on the Ana Paula open pit. The underground resources have not been converted and remain resources only for this technical report.

1.8 MINING

The Ana Paula Project will be mined by open pit methods with a contractor using conventional truck and loader production equipment. Pit optimization and mine planning was carried out on that basis to support a plant capacity of 5,000 tonnes-per-day. The mine design work used only measured and indicated resources provided in the latest resource model dated December 30, 2020. Inferred material was considered as waste with zero grade applied.

A series of pit optimizations were examined at various metal prices with a base price of US$1200/oz for gold. Metal prices lower than this were examined to determine the best mixture of resource utilization, strip ratio and project economics. The pit design was created using a gold price of US$976/oz after completing the analysis.

The geologic model provided was a whole block, internally diluted grade model. AGP considered that contact dilution would also play a role in the ore sent to the mill. Dilution is calculated for each contact side using a 0.5 m contact dilution distance. If one side of the block is touching waste, then it is estimated that dilution of 9.1% would result. If two sides are contacting, it would rise to 16.7%, three sides are 23.1% and four sides is 28.6%. Four sides represent an isolated block of ore. The model was examined, and the appropriate dilution percentage added to the model blocks at the contact dilution grade. Comparison of the in-situ to the diluted value for the design pit optimization shell showed ore tonnage dilution of 4.5% and gold grade dilution of 3.9% and silver grade dilution of 2.0%. Tonnes and grade for the pit designs and reserves are reported with the diluted tonnes and grade.

Three pit phases were designed for Ana Paula. Due to the topography present at the project site, access to each of the phases was considered crucial and was incorporated into the designs. Slopes for the pit design were based on Knight Piésold recommendations. They have safety benches of 8.1 m in width every 18 m vertically with an 80 degree bench face angle. This provides for a 58 degree inter-ramp angle in all sectors of the pit.

Equipment sizing for ramps and working benches is based on the use of 63 t rigid frame trucks although the final contractor will use 56-tonne trucks. Single lane access is 17.8 m (2 x operating width plus berm and ditch) and double lane widths are 23.5 m (3 x operating width plus berm and ditch). Ramp gradients are 10% in the pit for uphill gradients and 8% uphill on the dump access roads. Working benches are designed for 35 to 40 m minimum on push backs.

The project life will extend over a period of 10 years, including two years of pre-stripping followed by 8-years of production operations as shown in the mine production schedule provided in Table 1-5. The cut-off for the mine schedule is based on a gold only cut-off of 0.67 g/t gold. The LOM schedule delivers 14.12 Mt of ore grading 2.38 g/t gold and 5.61 g/t silver. Waste totals 36.0 Mt for a LOM operating strip ratio of 2.55:1.

The plant is anticipated to take 3 months to commission in Year 1. Lower grade material will be sent initially as the plant starts. Month 4 will see the plant at full capacity. Ore grades will fluctuate monthly depending on material available in the pit. Higher grade material is directly shipped to the mill with lower grade material stockpiled for later use to maximize the feed grade to the plant in the early years.

All mine equipment is modelled as provided by contractors. Total material movement peaks at approximately 9.4 million tonnes per year, which requires a modest production fleet of up to 10 conventional 56-tonne class haul trucks and 1-6.4 m^3 class wheel loader and 3-6.0 m^3 excavators. Drilling can be completed with two DTH drill rigs a single rotary machine capable of drilling 127 mm diameter holes.

During the mine life, two stockpiles will be required to manage the mill throughput. One will be a temporary location on the Valley WSF to be used in Year 1. The second will be located adjacent to the primary crusher for use as required during the mine life.

Underground mining was not considered for this PFS update but warrants further investigation. It has the potential to add additional high-grade tonnage to the mine plan.

Table 1-5: Pre-Strip and Mine Production Schedule by Year

Year	Mill Feed (Mt)	Au (g/t)	Ag (g/t)	Waste (Mt)	Mine to Mill (Mt)	Mine to Stock (Mt)	Stock To Mill (Mt)	Total Material (Mt)	Strip Ratio (W:O)
Pre-strip (Waste is Capitalized)									
-2	-	-	-	2.13	-	0.16	-	2.29	-
-1	-	-	-	4.83	-	0.34	-	5.17	-
Total				6.96		0.50		7.46	
Mine Operations									
1	1.70	2.15	7.98	7.12	1.22	0.56	0.47	9.37	3.99
2	1.80	1.96	6.19	7.06	1.80	0.15	-	9.00	3.62
3	1.80	2.60	7.28	7.24	1.66	0.07	0.14	9.12	4.19
4	1.80	2.20	5.26	7.26	1.77	-	0.03	9.06	4.09
5	1.80	3.15	5.50	4.53	1.80	0.09	-	6.42	2.39
6	1.80	2.05	3.47	2.14	1.80	0.12	-	4.07	1.11
7	1.80	3.17	3.88	0.53	1.80	0.05	-	2.37	0.29
8	1.63	1.68	5.41	0.13	0.72	-	0.90	1.76	0.18
Total	**14.12**	**2.38**	**5.61**	**36.01**	**12.58**	**1.03**	**1.54**	**49.63**	**2.55**
Overall Totals (Pre-strip and Operations)									
Total	**14.12**	**2.38**	**5.61**	**42.97**	**12.25**	**1.54**	**1.54**	**57.10**	**3.04**

1.9 MINE ROCK MANAGEMENT

Rock management facilities (RMF) will be constructed during operations in various locations surrounding the open pit. As required, material mined in year 1 and onwards will also be used for tailing management facility (TMF) embankment construction. The various RMF will be designed at later stages to be reclaimed concurrent with operations to reduce ultimate liability upon mine closure.

In pre-production, 7.0 million tonnes of mine rock and 0.5 million tonnes of mill-feed will be pre-stripped. Life- of-mine (LOM), a total of 43.0 million tonnes of mine waste rock will be moved.

1.10 RECOVERY METHODS

The Ana Paula processing facility will recover gold and silver by gravity concentration, flotation, oxidation of flotation concentrate and cyanidation of the oxidized concentrate by the carbon-in-leach process. The mill is designed at a nominal capacity of 5,000 t/d at 92% availability. Gold and silver adsorbed on activated carbon are desorbed into solution and then recovered by electrowinning. The recovered metals are smelted into doré bars, which are the final product of the operations.

Figure 1-4 is a simplified schematic of the process for the Ana Paula process plant. The design of the plant and sizing of equipment were aided by the process mass balance that was developed using MetSim software.

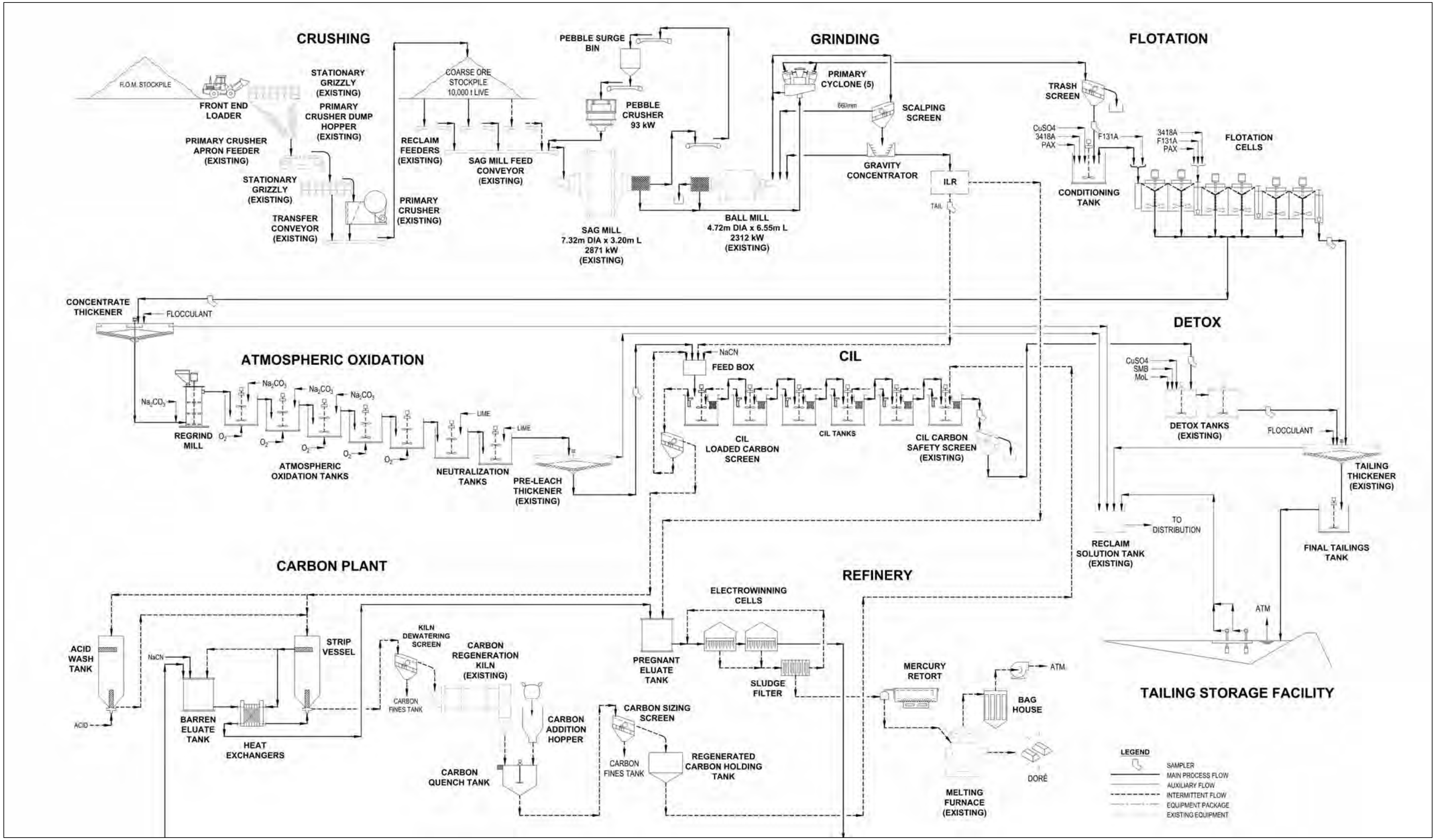


Figure 1-4: General Process Flowsheet

1.10.1 Comminution and Stockpile

Run-of-Mine is delivered to the 42” x 48” Kolberg-Pioneer jaw crusher (187 kW or 250 hp) for primary crushing at a closed-side setting of 150 mm. Oversized rocks are removed from the feed with a stationary grizzly (opening: 800 mm). This is followed by a scalping grizzly, which bypasses rocks smaller than 100 mm to the transfer conveyor. The oversize of the second grizzly reports to the primary crusher, to where the crushed ore is discharged.

The transfer conveyor is also the stacking conveyor feeding the coarse-ore stockpile. The live capacity of the stockpile is 10,000 tonnes, which is nominally two days’ worth of feed to the mill.

Crushed ore is reclaimed via a reclaim tunnel beneath the stockpile, with three reclaim feeders (two operating and one standby) onto the SAG mill feed conveyor.

1.10.2 Grinding and Pebble Crushing

The grinding circuit for the Ana Paula Project is a conventional SABC circuit with one SAG mill, a pebble wash screen, one ball mill, one cyclone cluster, and a pebble crusher. The SAG mill is in a closed circuit with the screen and pebble crushing. The ball mill is in a closed circuit with the hydrocyclone cluster.

The SAG mill is an FFE Minerals mill, 7.32 m diameter by 2.74 m effective grinding length (24 ft x 9 ft EGL), powered by a new 2,872 kW (3,850 hp) drives on VFD. The ball mill was also supplied by FFE Minerals, 4.72 m diameter and 6.55 m long, driven by a fixed-speed 2,313 kW (3,100 hp) motor. Pebbles from the SAG mill are crushed by a cone crusher similar to a Metso HP100.

The SAG mill and ball mill share a common discharge sump. The combined discharge slurry is pumped from this sump to the hydrocyclone cluster by a 260-kW (350-hp) centrifugal pump on variable frequency drive. A second pump is installed as standby. The hydrocyclone cluster has five 26-inch hydrocyclones, with four operating and one on standby. The target grind size for the grinding circuit product is 80 percent finer than 160 microns.

1.10.3 Gravity Concentration

A split from the hydrocyclones overflow is processed for gold recovery by gravity concentration and intensive cyanidation. Gravity concentration is achieved using a centrifugal concentrator. The gravity concentrate is then leached with cyanide in the presence of an oxidizer using an intensive leach package. The pregnant solution produced is sent to the same electrowinning circuit serving the oxidized concentrate leach circuit.

1.10.4 Flotation

Sulphides in the ore are floated at the ore’s natural pH using potassium amyl-xanthate (PAX) as collector, AERO 3418A as promoter, copper sulfate as activator, and F131A as frother.

Flotation of sulphides is accomplished in a single rougher flotation stage. Cyclone overflow is first sent to a 41.2 m^3 conditioning tank, then to a bank of six 70 m^3 tank flotation cells. Each flotation cell mechanism is driven by a 93 kW (125 hp) motor through a gear reducer. Flotation air is supplied by a 70-kW (94-hp) blower, which can deliver 95 Nm^3/min of air.

The flotation tailing slurry is pumped to a flotation tailing thickener (28 m diameter high-rate thickener) to be thickened to 55% solids, in preparation for pumping to the tailing storage facility.

1.10.5 Concentrate Thickening and Regrind

Concentrate from the rougher flotation circuit is dewatered in the 10.5 m diameter high-rate thickener to a pulp density of 55% solids. Underflow from the concentrate thickener is pumped using variable speed horizontal centrifugal slurry pumps to the regrind mill feed box. The thickener overflow is pumped to the reclaim solution tank.

The concentrate regrind mill is a 900-kW tower mill with ceramic grinding media. It operates in open circuit while being monitored by an online particle size analyzer. The target grind of 80% finer than 25 microns is attained by controlling mill speed with a variable frequency drive. The reground concentrate is pumped to the atmospheric oxidation feed box.

1.10.6 Atmospheric Oxidation

Atmospheric oxidation (AOX) of the sulphide concentrate is conducted in five agitated tanks. Each tank is 9 meters in diameter and 10 meters high (operating volume of 608 m^3), made of 2205 duplex stainless steel. Each agitator is powered by a 56-kW (75-hp) motor through a gear reducer. Oxygen is injected into each tank through fine bubble spargers.

The reaction kinetics was found to be optimized in the laboratory at around 75°C. The reaction is exothermic so the process is expected to be autothermic if the feed concentrate grade is kept at 10% sulphide sulphur or higher. However, during cold startup, for example after a long shutdown, pulp in the first, and possibly the second AOX tank, will need to be preheated to get the reaction started and provide its own heat. The preheat temperature may be as low as 50°C up to the actual minimum reaction temperature of 75°C. The required preheat temperature will have to be established at the start of actual operation.

1.10.7 Carbon-in-Leach (Cyanidation)

The oxidized slurry is neutralized to pH 10 to 10.5 with milk of lime. The neutralized slurry is then pumped to a pre-leach thickener (10.5 m diameter) to increase the pulp density to 55% solids. Once thickened, slurry is pumped to the carbon-in-leach feed tank where it combines dilution water, sodium cyanide reagent feed, and other process streams, into the first CIL tank.

Cyanide leaching is achieved in six CIL tanks (9.8 m diameter, 9.8 m high, 696 m^3 operating capacity) for 48 hours. Each equipped with 30 kW (40 hp) agitators with two narrow-blade hydrofoil impellers. Air is delivered by a pipe under an inverted cone located directly below the agitator. After leaching, loaded activated carbon is sent to the carbon plant for stripping and electrowinning.

1.10.8 Carbon Handling Plant – Carbon Elution and Metal Recovery by Electrowinning

Loaded carbon is first acid washed with a dilute solution of hydrochloric acid to remove scale from the carbon, rinsed, and then pumped to the carbon stripping vessel. Five tonnes of carbon is stripped per batch, following the pressure Zadra procedure. Hot strip solution (135°C) is introduced at the bottom of the carbon bed and overflows at the top of the vessel, carrying with it gold and silver that desorbs from the loaded carbon. Because of the elevated temperature, the strip vessel is kept at about 550 kPa to prevent boiling. The filtered residue is finally dried in retorts to remove and collect any mercury and smelted in a tilting furnace. Metallic gold and silver melt is then poured into bar molds to produce the final product of the operations – doré bars.

1.10.9 Cyanide Destruction

Residual weak-acid dissociable (WAD) cyanide in the leached tailing is destroyed (detoxified) by oxidation using oxygen (from air) and sodium metabisulfite. Milk-of-lime is added to maintain a slurry pH in the range of 8.0 to 8.5. The reaction is catalyzed by copper (5 ppm), which will need to be supplied if the ore does not contain enough cyanide-soluble copper. The detoxified slurry is sampled prior to thickening to ensure that the WAD cyanide content meets the target discharge level (<50 ppm WAD cyanide, per the Cyanide Code).

Slurry discharged from the detoxification circuit overflows into a discharge box, from where it is pumped to the tailing thickener (28 m diameter thickener).

1.10.10 Tailing Slurry Transport

Thickened tailing is discharged to a final tailing tank, from which the slurry is pumped to the tailing storage facility (TSF). The tailing pipeline will be a DN250/PN16 PE100 high-density polyethylene (HDPE) pipe, which is 2,700 m long, 250 mm bore, and will distribute tailing to Zone A spigots as well as to the dump spigot. This pipe connects to a 600 m long, 150 mm bore DN150/PN10 PE100 HDPE distribution header that will deposit tailing through Zones B and C spigots.

Solution from the pond reservoir is reclaimed by barge-mounted turbine pumps, one operating, and one standby to the reclaim solution tank) through a 700-m long DN225/PN20 PE100 HDPE pipe.

1.10.11 Sodium Carbonate Handling

Sodium carbonate is delivered to the site by trucks and off loaded to two 1700-tonne silo systems. The aim is to provide enough storage capacity to supply 28 days of operation. This would provide sufficient buffer capacity for the supply and transport of sodium carbonate from the supplier to the mine site.

Sodium carbonate is added as a solution to the regrind ball mill and to the oxidation tanks, sodium carbonate is diluted in an automatic dilution system located bellow the silos.

1.10.12 Mill Power Consumption

The average annual power consumption in the process plant is 63.1 million kWh, excluding the first and last years of operation. The total estimated life-of-mine consumption is 495.5 million kWh, which translates to about 35.1 kWh/tonne of ore processed.

1.11 PROJECT INFRASTRUCTURE

1.11.1 Roads

The current mine access road is off of the main road between Cuétzala del Progreso and Nuevo Balsas. The access road is approximately 4.5 km from the main road to the plant site. The road from Cuétzala to the mine site will need to be improved to provide access for the larger loads required to construct the project.

1.11.2 Process Plant Facilities

The process plant is located east of the waste rock management (WRM) facilities and southeast of the mine pit. Process facilities include the laydown area, initial crushed ore stockpile, primary crusher, mine support buildings, mill area, gravity concentrator, reagents area, flotation, regrind, concentrate thickener, atmospheric oxidation (AOX) leach tanks, carbon-in-leach (CIL) tanks, carbon plant, refinery, cyanide treatment, tailing thickener, oxygen plant, generator area, and electrical substation. Adequate warehouse and office space have been accounted for along with sewage treatment and potable water treatment facilities.

1.11.3 Camp and Ancillaries

Support and ancillary buildings for the site include a covered, partially enclosed equipment maintenance shop, administration office building, fuel storage/dispensing system, truck scale, warehouse, security gate and guard house.

The main exploration camp and powder magazine have been built. Some additional facilities may be brought in by the contract miner.

Mine support buildings include a warehouse, truck shop, and two mine shops.

The mine scenario evaluated in this technical report includes the construction of an on-site camp capable of housing up to approximately 790 people. The site camp area is intended to be developed initially for the construction camp and evolve into the permanent operations camp.

1.11.4 Power

Line power is available within 2.5 km of the proposed plant site and is supplied via a 115 kV line running generally east-west adjacent to the site property. A 1.5 km power line will be constructed with appropriate tie-ins and switching to deliver power at 115 kV to a substation that will be constructed in close proximity to the plant site. The substation will drop the supply voltage to 4,160 V for general distribution around the site and for distribution to the large motor loads such as the crusher facilities. Design power load has been estimated at approximately 15 megawatts (MW). The power supply for the operation of the well system will be carried out by an existing 34.5 kV overhead line.

1.11.5 Water

An average of 83.9 m^3/h of raw water will be required, which will comprise 31.0 m^3/h from the well field and 52.9 m^3/h from the rainfall diversion channel runoff.

Well water will be used for camp site potable water (5.0 m^3/h), mine dust suppression (10 m^3/h), gland seal water (11.6 m^3/h), and crushing dust suppression (1.8 m^3/h). Fire protection water is also derived from well water.

All runoff water is used as mill makeup water. It is introduced to the mill through the tailing thickener and reaches the reclaim water tank with the tailing thickener overflow.

A wastewater treatment plant will handle sewer discharge; the effluent will discharge to the tailing storage facility. A smaller specialized treatment system will be installed at the food preparation facilities to mitigate oils and food solids entering the wastewater treatment plant.

1.11.6 Tailing Storage Facility

The tailing storage facility was designed to contain tailing and storm water runoff. It has been sized to provide storage capacity for approximately 15.5 million tonnes of tailing and the 0.1 percent chance of exceedance water volume. The maximum height of the dam will be approximately 100 m, which will be constructed in four stages over the life of the mine. The dam will be a zoned earthfill/rockfill structure, with the upstream face lined with 80-mil HDPE geomembrane. The dam will be constructed using conventional downstream methods, and the zone behind the upstream 80-mil HDPE geomembrane liner will consist of, from upstream to downstream: (1) Core zone, (2) Filter/drain zone, (3) Transition zone, and (4) Rockfill Zone. Both upstream and downstream slopes will be 2H:1V. Based on the geochemical characterization and a preliminary surface geology assessment, the basin is not expected to require a liner; however, characteristics of leached concentrate tailing are needed prior to finalizing management needs of these materials. Geotechnical analysis shows that the structure will be stable under static conditions and will suffer acceptable deformations under design seismic events.

1.11.7 Waste Rock Facility

Two waste rock facilities (WRFs) have been located downgradient and south of the pit area which will have sufficient capacity to store 53 million tonnes of waste rock. Configurations for the WRFs (East and West WRFs) were developed by AGP Mining Consultants Inc. based on the mine plan for the project. The East facility will have the downstream toe at 840 meters above sea level (masl) and will reach a final elevation of 980 masl. The West facility will have the downstream toe at 848 masl and will reach a final elevation of 1,050 masl. Waste rock material in both facilities will be placed to form slopes of approximately 1.4H:1V. Slope stability and deformation analyses confirm that the proposed configurations meet commonly accepted minimum factors of safety and the estimated seismic-induced deformations for both facilities are acceptable. Geochemical analysis of waste rock samples tested indicate that this material will contain an excess of neutralization potential (NP) over acid potential (AP), with capacity to neutralize potential production of acid solutions; seepage from the waste rock may contain mobilized metals at levels of concern; this will be further assessed during the Feasibility Engineering stage.

1.12 ENVIRONMENTAL CONSIDERATIONS AND PERMITTING

Mc. Terra Emprendimientos Sustentables (Terra) completed an environmental baseline study for the Ana Paula Project (Terra, 2016). The study summarized the flora and fauna, climate, surface and groundwater hydrology and geochemistry, seismology, and soil and geotechnical properties of the project area. No known environmental condition exists that would preclude development of the project.

The climate is warm and moist with temperatures ranging from 4° to 42°C, averaging 23°C. Average rainfall is approximately 874 mm per annum.

The project lies within the Tlacotepec aquifer basin, which exhibits a heterogeneous and anisotropic unconfined aquifer. The upper portion is composed of alluvial and fluvial sediments and the lower portion is hosted by a sequence of marine sedimentary rocks, primarily limestone from the Morelos formation and sandstone from the Mezcala formation. This aquifer is presumed to provide the water supply for the project, which would be under permits issued by Comisión Nacional del Agua (CONAGUA).

Studies by Knight Piésold (2017a; 2017b) investigated the geochemistry of water interacting with waste materials generated by the proposed project. Those studies indicate that the flotation tailing storage facility (TSF) and waste rock facility (WRF) would be composed of materials with a net neutralizing potential (NNP) and would not have dissolved metal contents above the maximum permissible limits (límites máximos permisibles (LMPs)). Synthetic liners are not anticipated for the waste management facilities. Management of the detoxified residues from leached sulphide concentrates is still being evaluated.

In April 2017, the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) approved the “Manifestación de Impacto Ambiental” (MIA), Environmental Impact Statement, submitted by Minera Aurea. Other permits with federal and municipal entities will need to be acquired.

A socio-economic study was conducted by Minera Aurea (2017) for the project impact area. The area has approximately 5,900 inhabitants. Local workers for prefeasibility stage activities are sourced primarily from Cuétzala del Progreso, the largest town in the area with a population of around 2,500 located 7.5 km from the mine site. Minera Aurea employs 38 workers from the local communities. There is a locally accepted process for labor hiring opportunities in the project. It is anticipated that about 35 percent of the area’s population is actively working and could be employed in the proposed mining operations as general labor, domestic help, technicians, and office employees.

Reclamation and closure plans have been developed on a conceptual level by M3 and Knight Piésold (2017b). The plans are predicated on concurrent reclamation taking place during the operation. Reclamation is expected to be completed in three years.

1.13 CAPITAL COSTS

The PFS capital cost estimate was completed by obtaining budgetary quotations for major equipment not already owned by Heliostar. Installation costs were based on M3's experience building mines in Guerrero State. The estimate is considered a Class 3 estimate which implies a level of accuracy of -10% to +30%. The capital cost estimate is shown in Table 1-6. An allowance for working capital is incorporated into the financial model assuming a 15-day receipt delay of revenue and 30-day payment delay of payables. All working capital is recaptured by the end of the project and is not shown in Table 1-6.

Table 1-6: Capital Cost Estimate

Area	Initial Capital (US$M)
Mine Capital	
Pre-Strip and Mine Establishment	24.2
Mining Equipment	0.5
Miscellaneous Mine Capital*	5.3
First-year capital expense	3.5
Total Mine Capital	**33.5**
Process Plant Capital	
Process Plant, General, Site Utilities	98.3
Tailings/Waste Facilities	13.6
Permanent Camp	4.2
Mobilization, Bussing and Construction Camp	6.0
EPCM	17.1
Owner's Costs**	37.8
Commissioning Cost	1.9
Contingency***	21.2
Total Process Plant Capital	**200.0**
Total Capital	**233.6**

* Miscellaneous mine capital includes engineering office equipment, dewatering systems, RC rental and mine roads
** Used equipment refurbishment and transport to site, misc. other owner's costs
*** Contingency calculated as 15% of Directs + Indirects + EPCM

1.14 OPERATING COSTS

The operating cost estimates are based on a combination of first-principles build-up, reference projects, budgetary quotes and escalation factors as appropriate for a preliminary study.

These costs include direct mining and re-handle by a contractor, and processing and disposal of the mineralized feed to the plant including doré produced on-site and transportation and refining charges and shown in Table 1-7.

Table 1-7: Operating Costs Summary

Operating Cost	$/t ore processed	LOM $M
Mining	11.18	157.8
Processing	21.02	296.8
G&A	2.44	34.4
Refining Charge	0.26	3.7
Total	**34.90**	**492.7**

‡Mining Cost is based on $3.08/t material mined

1.15 ECONOMIC ANALYSIS

An engineering economic model was developed to estimate annual cash flows and sensitivities of the project using a discounted cash flow (DCF) methodology. Pre-tax estimates of project values were prepared for comparative purposes, while after-tax estimates were developed to approximate the true investment value. It must be noted that tax estimates involve many complex variables that can only be accurately calculated during operations and, as such, the after-tax results are approximations to represent an indicative value of the after-tax cash flows of the project.

Mineral Resources that are not mineral reserves do not have demonstrated economic viability. It includes Inferred Mineral Resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves. There is no certainty that the preliminary economic assessment will be realized.

The results of the economic analysis are shown in Table 1-8.

Table 1-8: Results of the Economic Analysis

Summary of Results	Unit	Value
Mine Life	Years	8
Total Reserve	M tonnes	14.1
Total Waste	M tonnes	43.0
Total Capitalized Waste	M tonnes	7.0
Total Mined	**M tonnes**	**57.1**
Strip Ratio (Operations)	w:o	3.04
Mining Rate (Maximum)	t/d	24,658
Plant Throughput (Maximum)	t/d	4,932
Average Head Grades		
Au	g/t	2.38
Ag	g/t	5.61
Metal Produced		
Au	LOM k oz	919
	k oz/yr	115
Ag	LOM k oz	1,402
	k oz/yr	175
NSR (Net of Royalties)	$M	1,468
	$/t processed	104
Operating Costs	$M	492.7
	$/t processed	34.90
Cash Cost	$/ oz	546
Au All-In Sustaining Costs	$/Au oz	573
Capital Costs		
Initial Capital excluding Contingency	$M	212.4
Initial Capital Contingency	$M	21.2
Working Capital	$M	14.0
Total Initial Capital (excl. Working Capital)	$M	233.6
	$/t processed	16.57
Sustaining & Closure Capital	$M	24.0
Total Capital Costs Incl. Contingency	$M	257.5
	$/t processed	18.23
Pre-Tax Cash Flow	$M	700.5
Taxes	$M	263.32
After-Tax Cash Flow	$M	437.1

Summary of Results	Unit	Value
Economic Results		
Pre-Tax NPV5%	**$M**	**463.9**
Pre-Tax IRR	**%**	**40.9%**
Pre-Tax Payback	**Years**	**2.5**
After-Tax NPV5%	**$M**	**278.6**
After-Tax IRR	**%**	**30.5%**
After-Tax Payback	**Years**	**3.0**

Sensitivity analyses were performed on the Base Case economics shown in Table 1-9 to determine which factors most affected the project performance. The analysis revealed that the project is most sensitive to metal prices. Followed by operating costs and initial capital.

Table 1-9: Project Sensitivity to Metal Prices

Gold Price (US$/oz)	1,280	1,360	1,600	1,840	1,920
Silver Price (US$/oz)	16	17	20	23	24
Pre-Tax $NPV_{5\%}$ ($M)	250.8	304.1	463.9	623.7	677.0
After-Tax $NPV_{5\%}$ ($M)	140.1	174.8	278.6	382.2	416.7
Pre-Tax IRR (%)	26.2	30.0	40.9	51.1	54.3
After-Tax IRR (%)	18.8	21.9	30.5	38.4	40.9
Pre-Tax Payback (Years)	3.6	3.2	2.5	2.1	2.0
After-Tax Payback (Years)	4.2	3.9	3.0	2.5	2.4

1.16 CONCLUSIONS

It is the conclusion of the Qualified Persons preparing this technical report that the information contained within adequately supports the positive economic results obtained for the Ana Paula Project. The Project contains 14.1 million tonnes of gold-bearing sulphide mineralization that can be mined by open pit methods and recovered using common processing methods consisting of milling, gravity, flotation, atmospheric oxidation and cyanide leaching of flotation concentrates.

Based on the information contained in this technical report, the Project is technically and economically viable; further study at a feasibility level should be performed in order to verify these conclusions.

As with any mining project, there are risks that could affect the economic viability of the Project, as well as opportunities to improve the economics, timing, and/or permitting potential of the Project. These risks and opportunities are detailed in Section 25 of this technical report.

1.17 RECOMMENDATIONS

M3 recommends that the Ana Paula Project advance to a feasibility-level study, including associated testwork, engineering and exploration. These recommendations, as provided by the Qualified Persons, are detailed in Section 26 of this technical report.

The feasibility study (FS) would encompass the following items:

- Metallurgical testwork including pilot plant testing described herein to optimize the process flowsheet and quantify operating parameters and reagent consumptions.
- Complete TSF and WRF engineering including hydrology model and site wide water balance.

- Optimization studies on WRF (waste rock facility) design and sequencing should be completed, including design updates based on further geochemical and geotechnical information.
- Heliostar should consider exploring the underground mineralization beneath the proposed pit. The high-grade breccia mineralization extends to depth with multiple intercepts with grade sufficient to support underground mining.
- A surface exploration drilling program should be carried out to the north-east section of the proposed pit where potential resources have been identified.

Geochemical characterization of cyanide leach tailing must be completed to generate a basis for further engineering of storage methods and design.

Detailed costs of the recommended work are included in Section 26. Estimated costs for a FS-level study specific to the Project total $4.63M and itemized in Table 1-10.

Table 1-10: Feasibility Study Estimated Costs

Item	Cost ($000)	Description
Metallurgical Testwork	1,500	Metallurgical Core Sampling, Pilot Plant Testwork, Analysis, and Interpretation
Tailing Management and Waste Rock, Facilities and Water Supply	570	Geotechnical and Design Engineering for Tailings Management and Waste Rock Facilities. Hydrogeology and Geochemical
FS Engineering & Services	700	FS-Level Mine, Infrastructure and Process Designs
Other Studies	386	Mining, Geology & Peer Review
Local Infrastructure Engineering	350	Access Roads, Power Studies
EPCM Engineering	750	Infrastructure & Plant Design and Engineering
Subtotal	4,256	
Contingency (10%)	376	
Total	**4,632**	Excludes Owner's Costs

2 INTRODUCTION

2.1 BASIS OF TECHNICAL REPORT

This technical report was compiled by M3 Engineering & Technology Corporation (M3) for Heliostar and comprises a Preliminary Feasibility Study (PFS) Update of Heilostar's wholly owned Ana Paula Gold Project, which is a gold resource development project located in the Guerrero Gold Belt in Guerrero, Mexico. The Ana Paula Project is controlled by Minera Aurea S.A. de C.V., which is a wholly-owned subsidiary of Heliostar Metals Limited. This technical report summarizes the results of the Preliminary Feasibility Study (PFS) Update and was prepared following the guidelines of the Canadian Securities Administrators' National Instrument 43-101 and Form 43-101F1. This updated technical report replaces and supersedes the previous PFS published by Alio Gold Inc. (Alio Gold) for the Ana Paula Project in its entirety. The previous PFS was filed on the SEDAR website on June 07, 2017, and had an effective date of May 16, 2017. Heliostar has agreed to acquire all the issued and outstanding shares of Aurea Mining, which through its wholly-owned subsidiary Minera Aurea, indirectly holds the title and permit to mine the Ana Paula Gold Project.

2.2 TERMS OF REFERENCE

The previous technical report on the Project, entitled "Ana Paula Project, NI 43-101 Technical Report, Amended Preliminary Feasibility Study, Guerrero, Mexico", was authored by M3 and other consultants with an effective date of May 16, 2017. The 2017 technical report was filed on the System for Electronic Document Analysis and Retrieval (SEDAR, www.sedar.com).

The effective date of this Technical Report is February 28, 2023.

2.3 SCOPE OF WORK

This technical report summarizes the work carried out by the Consultants, who are all independent of Heliostar. The scope of work for each company is listed below. Combined, this comprises the total Project scope.

M3's scope of work included:

- Compiling the technical report which includes the data and information provided by other consulting companies.
- Designing required site infrastructure and identifying proper sites, plant facilities and other ancillary facilities.
- Estimating the OPEX and CAPEX for the Project.
- Interpreting the results and developing conclusions that lead to recommendations to improve value and reduce risks.
- Reviewing the environmental studies, permitting and social impact chapter that was previously prepared by Alio Gold using reports prepared by external consultants.
- Updating the financial model and conducting an economic evaluation, including sensitivity and project risk analysis.

Blue Coast Research's (BCR) scope of work included:

- Designing and carrying out the metallurgical test program and flowsheet development program.

Knight Piésold's (KP) scope of work was completed in 2017 for this study and included:

- Design of the waste rock management and tailing storage facilities.
- Designing and overseeing the pit slope stability (geotechnical) study.
- Carrying out the site-wide water balance.
- Designing and overseeing the geochemical characterization of waste / tailing testing program.

AGP Mining Consultants, Inc. (AGP) scope of work included:

- Reviewing Minera Aurea's drilling and exploration programs, including sample preparation, analysis, security and data verification protocols.
- Preparing the mineral resource and mineral reserve estimates and mine plan.
- Pit design, optimization, and production schedule.
- Mining equipment selection.
- Establishing potentially mineable resources.

Prospección y Desarrollo Minero del Norte S.A. de C.V. (ProDeMin) scope of work included:

- Information on the Project's exploration from 2010 to 2015.
- Geological description of the deposit area and the mineralization.
- Summarize data validation carried out by Newstrike for the initial 2014 resource estimate.
- Description of access, physiography, climate, and resources and infrastructure around the Project.
- Review of the status of land tenure and surface access agreements.

2.4 QUALIFIED PERSON RESPONSIBILITIES AND SITE INSPECTIONS

The Qualified Persons (QPs) preparing this technical report are specialists in the fields of geology, exploration, mineral resource and mineral reserve estimation and classification, geotechnical, environmental, permitting, metallurgical testing, mineral processing, processing design, capital and operating cost estimation, and mineral economics.

None of the QPs or associates employed in the preparation of this technical report is an insider, associate, affiliate or has any beneficial interest in Heliostar. The QPs are considered to be independent of Heliostar as independence is described in Section 1.5 of NI 43-101. The results of this technical report are not dependent upon any prior agreements concerning the conclusions to be reached, nor are there any undisclosed understandings concerning any future business dealings between Heliostar and the QPs.

The following individuals, by virtue of their education, experience and professional association, are considered QPs as defined in the NI 43-101, and are members in good standing of appropriate professional institutions. The QPs are responsible for specific sections as follows in Table 2-1.

Table 2-1: Qualified Person Responsibilities

Qualified Person	Company	Site Visit Date	Report Sections of Responsibility
Daniel H. Neff	M3	January 2023	Sections 1.1, 1.11, 1.13, 1.14, 1.15, 1.16, 1.17, 2, 3, 18, 19, 21.1, 21.1.2, 21.1.3, 21.2.2, 21.2.3, 22, 23, 24, 25.1, 25.2, 25.7 and 27
Art Ibrado	Fort Lowell Consulting PLLC	N/A	Sections 1.10, 12.5, and 17
Richard Zimmerman	M3	N/A	Sections 1.12, 20, and 26.5
Craig Gibson	ProDeMin	January 2021	Sections 1.2, 4, 5, 6.2.4, 7.3, 12.3
Andrew Kelly	Blue Coast	N/A	Sections 1.5, 12.4, 13, 25.6, and 26.4
Gordon Zurowski	AGP	December 2016	Sections 1.7, 1.8, 1.9, 15, 16.1, 16.2, 16.4-16.11, 21.1.1, 21.2.1, 25.4, and 26.2
Paul Daigle	AGP	January 2023	Sections 1.3, 1.4, 1.6, 6 (except 6.2.4), 7, 8, 9, 10, 11, 12.1, 12.2, 14, 25.3, and 26.1
Gilberto Dominguez	Knight Piésold	N/A	Sections 18.2, 18.3, 21.1.3, and 26.3
James A. Cremeens	Knight Piésold	September 2016	Sections 16.3, 16.12, 25.5, and 26.2

2.5 UNITS OF MEASURE, CURRENCY, AND ROUNDING

This technical report was conducted using mainly metric units following the International System of Units (SI) for unit terms and prefixes where possible. Unless otherwise noted, all weights are reported on a dry basis. Gold and silver grades are expressed in grams per metric tonne (g/t).

2.6 UNITS, CURRENCY AND ROUNDING

Unless otherwise specified or noted, the units used in this technical report are metric. Every effort has been made to clearly display the appropriate units being used throughout this technical report. Currency is in United States dollars (US$ or $). Exchange rates are current as of the first quarter of 2023.

Table 2-2 summarizes the units of measure used in this technical report. Table 2-3 is a glossary of terms used in this technical report.

Table 2-2: Units of Measure

Prefixes	M	mega	million
	k	kilo	thousand
	c	centi	one hundredth
	m	milli	one thousandth
	μ	micro	one millionth
Weight	g	gram	
	kg	kilogram	1,000 grams
	t	tonne, metric, dry basis	1,000 kilograms
	st	short tonne, dry basis	2,000 pounds
	kt	kilotonne	1,000 tonnes, metric
	g/t	grams/tonne (metric)	
	oz	troy ounce	31.103477 grams
	koz	kilo ounce	1,000 troy ounces
	Moz	Million ounce	
	lb	US pound	
	klbs	kilo pounds	1,000 US pounds
	Mlb	million pound	1,000,000 US pounds

Length	m km	meter kilometer	 1,000 meters
Volume	li m^3	liter cubic meter	1,000 ml or cm^3 1,000 liters
Temperature	°C	degrees Celsius	
Pressure	Pa kPa MPa psi	pascal kilopascal megapascal pounds per square inch	
Power & Energy	W kW MW kWh	watts kilowatt megawatt kilowatt-hour	 1,000 watts 1,000,000 watts

Table 2-3: Glossary of Terms

Term	Description
%	Percent
<	Less than
>	More than
±	More or less
#N	UTM grid measurement in meters north of the equator
#E	UTM grid measurement in meters east of the central Meridian
Ag, As, Au, Bi, Co, Cu, Fe, Hg, K, Mo, Pb, Sb, Te, U, and Zn	Chemical symbols from the periodic group of elements. silver (Ag), arsenic (As), gold (Au), bismuth (Bi), cobalt (Co), copper (Cu), iron (Fe), mercury (Hg), potassium (K), molybdenum (Mo), lead (Pb), antimony (Sb), tellurium (Te), uranium (U) and zinc (Zn).
AuEq	Equivalent gold calculated as g/t gold + g/t silver/160, with the silver divisor calculated from the cost, price and recovery data listed
ALS	ALS Chemex, a division of ALS Global Ltd through Chemex de Mexico, S.A. de C.V., the primary analytical laboratory for the Ana Paula Project located in Guadalajara, Mexico.
Alteration	Physical and chemical changes to the original composition of rocks due to the introduction of hydrothermal fluids, of ore forming solutions, to changes in the confining temperature and pressures or to any combination of these. The original rock composition is considered “altered” by these changes, and the product of change is considered an “alteration”. (From Hacettepe University online dictionary, after AGI)
Ana Paula Project	The area inside the boundaries of the two contiguous mineral rights concessions known as the Tembo and Apaxtla 3 concessions, accruing 4,238 Ha in total. Referred to also as “Ana Paula” and the “Project”.
ANFO	Ammonium Nitrate and Fuel Oil
Anomalous (anomaly)	a. A departure from the expected or normal. b. The difference between an observed value and the corresponding computed value (background value). c. A geological feature, esp. in the subsurface, distinguished by geological, geophysical, or geochemical means, which is different from the general surroundings and is often of potential economic value; e.g., a magnetic anomaly. (From Hacettepe University online dictionary, after AGI)
Minera Aurea	Minera Aurea S.A. de C.V., Heliostar’s wholly owned Mexican operating subsidiary
Aurea Norte Property	Means the contiguous group of claims totaling 46,278 hectares and including the claims named: Tembo Dos (T225486), Tembo Tres (T231106), El Coyote (T222224), Cosmos I (T244793), Cosmos II (T244794), La Morinita (T224383), Don Jesus (T231103), R. Estefania (T244792), Estafania Frac. I (T2331105), R. Coyopancho (T244795), R. Cuétzala (T244796).
Aurea Sur Property	Means the contiguous group of claims totaling 5,819 hectares and including the claims named: Ottawa (T221781), El Consorcio (T222399), R. Coyopancho (T244795), R. Cuétzala (T244796).
Background	A measured or calculated geochemical, geophysical, petrological or other threshold considered representative of an area. The “Normal” or “not anomalous”.

Term	Description
Breccia	Means fragmental rocks whose components are angular and, therefore, as distinguished from conglomerates as not water worn. May be sedimentary or formed by crushing or grinding along faults or by hydrothermal explosions.
CAD$	Canadian dollars
Calc Hd	Calculated head grade
calc-silicate alteration	An alteration consisting mainly of calc-silicate minerals
Constancia de Vigencia	An official "statement of good standing" provided by the Mexican Government as a confirmation to holders of mineral concessions that the mineral rights and concessions are active and in good standing according to Mexican Mining Law as published in the Official Mexican public journal ("Diario Oficial") dated October 12, 2012
CRM, SGM	Consejo de Recursos Minerales (also Coremi). The former Mexican Geological Survey now renamed the Servicio Geológico Mexicano or "SGM"
Consp	Consumption
DCF	Discounted Cash Flow
E14A87, E14C17	Mapping index system for Mexico
epithermal	Said of a hydrothermal mineral deposit formed within about 1 km of the Earth's surface and in the temperature range of 50 to 200 degrees C, occurring mainly as veins. Also, said of that depositional environment.
FeOx	Iron oxide
G&A	General and Administrative [Operating Costs]
GGB	The Guerrero Gold Belt. A linear array of gold iron skarn and gold skarn developed at the contacts between platform carbonate rocks and early Tertiary intrusions.
g/t	Grams per Tonne. Where a gramme (also gram) is a unit of measure equal to 1/1000th of a kilogram. A Tonne is a metric Tonne having a unit weight of 1,000 kilograms.
GPS	An electronic device that records the data transmitted by the geographic positioning satellite system.
High Grade Breccia Zone	A discrete structurally controlled body of irregular dimensions including a structurally controlled core breccia that trends oblique to the stratigraphic fabric and that is surrounded by a mineralized alteration HALO of sediment, intrusions and other breccia, that is delineated in drill core and tends to host a higher-grade mineralization with a composite average grade of 5.38 grams per tonne gold and 6.49 grams per tonne silver
Higher grade gold/ higher grade mineralization	Averages greater than or equal to 2.0 grams per tonne gold ("High grade"), unless specifically specified
IMC	Independent Mining Consultants Inc. of Tucson, Arizona
JV	Joint venture
l/m	liters per minute
Ltd, Inc	Limited, Incorporated
Low Grade Breccia	A discrete structurally controlled intrusion hosted breccia body of irregular dimensions delineated in drill core and that tends to host a lower grade gold mineralization with a composite average grade of 0.92 grams per tonne gold and 5.1 grams per tonne silver.
lower grade gold	Averages less than or equal to 1.0 grams per tonne gold ("Low grade"), unless specifically specified
M, Ma, Mt, Moz	million, million years, million tonnes, million ounce
M3	M3 Engineering & Technology Corporation
Mex$	Mexican Peso
MIA	Manifestación de Impacto Ambiental
Mineralization (mineralizing)	The presence of minerals of possible economic value – and the process by which concentration of economic minerals occurs.
N, S, E, W, NW, NE, etc.	North, south, east, west, northwest, northeast etc.

Term	Description
No.	Number
NQ, HQ Core	Specifies the diameter of a cylinder of drill core, HQ has a 54mm diameter. NQ has a 45 mm diameter.
NAG	Non-Acid Generating
NI 43-101	National Instrument 43-101 Standards of Disclosure for Mineral Projects of the Canadian Securities Administrators
Nonels	Non-Electric Blasting Cap
North-South Corridor	A 1.5 by 0.7 kilometer North-South trending corridor of stratigraphic and structurally controlled mineralization that collectively make up a lower grade mineralization with a composite average grade of 1.0 grams per tonne gold and 3.9 grams per tonne silver. Corresponds to the sediment-intrusive domain described in Section 7.3.2.
NSR	Net Smelter Return
nT	Nano Tesla. The international unit for measuring magnetic flux density.
PFS	Preliminary Feasibility Study
ProDeMin	Prospección y Desarrollo Minero del Norte S.A. de C.V.
QA/QC	A quality assurance and quality control program
QP	Qualified Person
S.A de C.V	Sociedad Anónima de Capital Variable
SEDAR	System for Electronic Document Analysis and Retrieval
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales
SGS	SGS SA, the secondary laboratory for the Ana Paula Project through SGS de México located in Durango, Mexico.
showing	A location where alteration and/or mineralization occurs at surface.
skarn	A metamorphic rock rich in calcium bearing silicate minerals (calc-silicates), commonly formed at or near intrusive rock contacts by the introduction of silica rich hydrothermal fluids into a carbonate rich country host rock such as limestone and dolomite. Also, part of an alteration process for the introduction and formation of mineralized material forming mineralization and a common host for mineralization/ore.
SRK	Steffen, Roberts & Kirsten Consulting of Denver Colorado
target	A focus or loci for exploration
threshold	In geochemical prospecting, the limiting anomalous value below which variations represent only normal background effects and above which they have significance in terms of possible mineral deposits. (From Hacettepe University online dictionary, after Hawkes)
TSF	Tailing Storage Facility
US$	United States dollars
UTM	Universal Transverse Mercator
WGS84	An ellipsoid model of the earth
WRF	Waste Rock Facilities

3 RELIANCE ON OTHER EXPERTS

The authors of this updated technical report have relied on ownership information provided by Heliostar. Heliostar has obtained a title opinion from ALN Abogados Consultores, August 19, 2022, which certifies the legal status of the mineral concessions described in Sections 4.2 and 4.3 of this updated technical report. None of the authors of this updated technical report has researched or verified property title or mineral and land access rights for the Ana Paula property.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 LOCATION

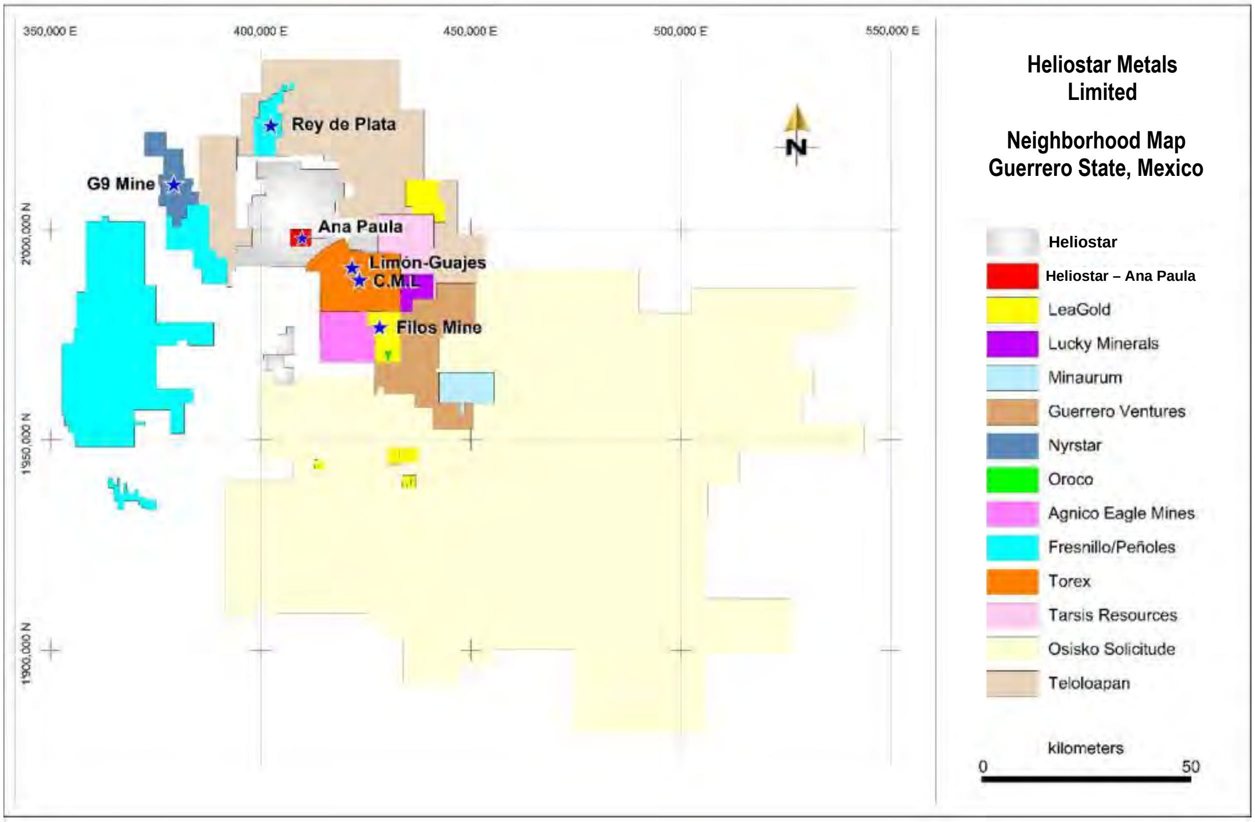
The Ana Paula Project is located in the north central part of the State of Guerrero in southern Mexico, roughly halfway between the major cities of Mexico City and the Port of Acapulco. The Ana Paula Project centroid is defined by UTM Q14N, WGS84, 409,027.8E and 1,997,632.6N or by 99° 51' 34.4 west longitude and 18° 3' 55.2 north latitude, Figure 4-1.

Figure 4-2 shows the location of the Ana Paula Project in relation to other mines, deposits and concession holdings in the Guerrero Gold Belt (GGB). Figure 4-3 shows Heliostar's GGB mineral rights concession holdings, including the Ana Paula Project location.

Source: IMC (2014)

Figure 4-1: Heliostar's Property Location and Access Map, Guerrero State, Mexico

The Ana Paula Project (red) is internal to Minera Aurea's (Heliostar) mineral concessions (blue).



Source: Alio Gold (2017)

Figure 4-2: Property and Mineral Showings Location Map

The Ana Paula Project is highlighted in red. Stars denote the location of operating mines and active projects.

4.2 MINERAL TITLES

The Ana Paula Project comprises two mining concessions held by Minera Aurea S.A. de C.V. comprising 4,238 ha. In addition, Minera Aurea S.A. de C.V. holds nine concessions surrounding the project area which form the Aurea Norte Property plus an additional four concessions south of the project area which form the Aurea Sur Property. The Ana Paula Project area and surrounding concessions comprises a total area of 56,334 ha. A map of the mining concessions is shown in Figure 4-3.

Mexico is a constituted federation of independent states that is now part of the United States-Mexico-Canada Agreement (USMCA) which entered into force on July 1, 2020. The USMCA has substituted the North America Free Trade Agreement (NAFTA).

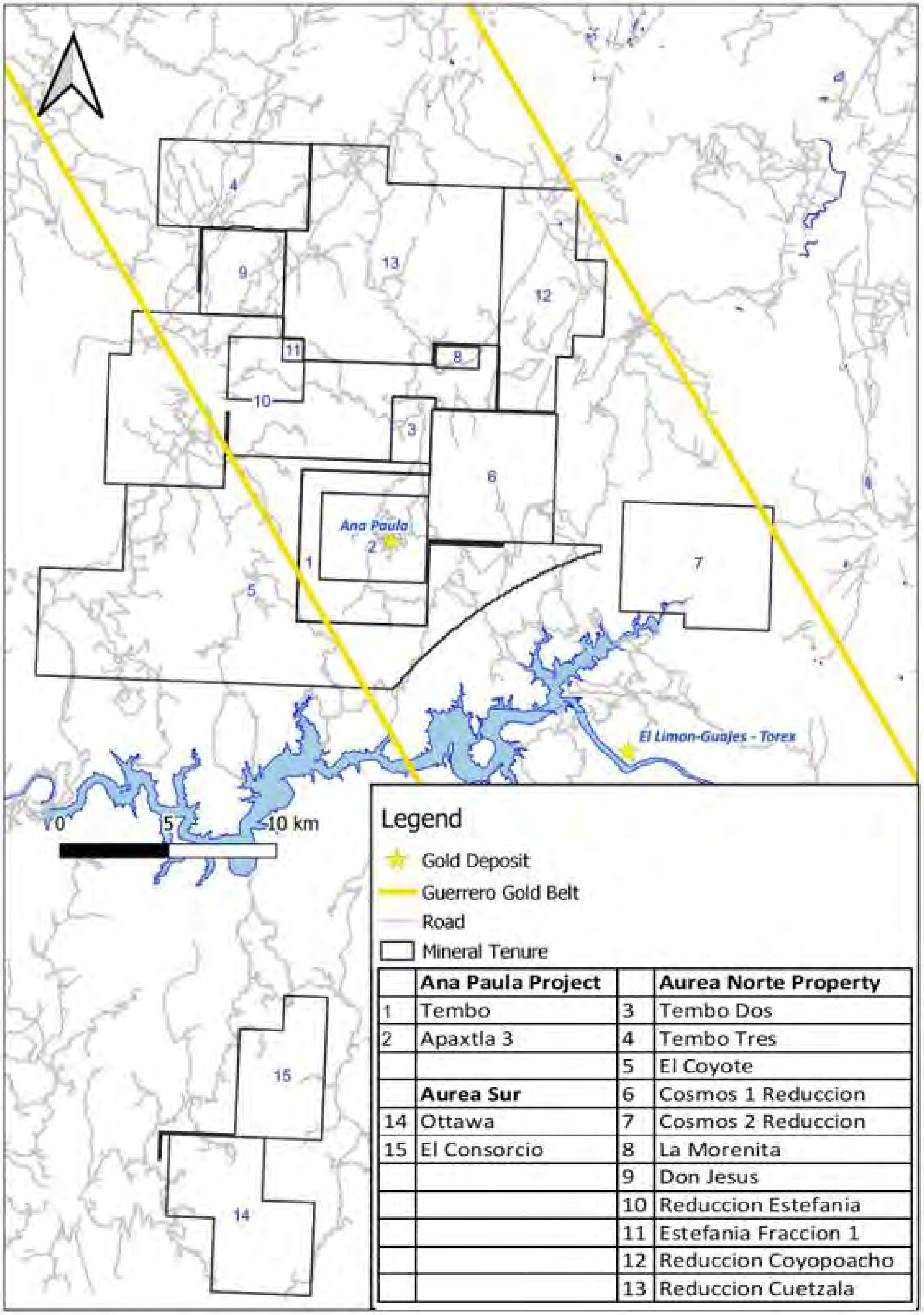
The Mexican Constitution maintains a direct non-transferable ownership of the nation's mineral wealth (considered a national resource) that is governed under established Mining Law. The use and exploitation of such national resources is provided for through clear title to a mineral rights concession (lot or concession) that is granted by the Federal Executive Branch for a fee and under prescribed conditions. Mining concessions are only granted to Mexican companies and nationals or ejidos, (agrarian communities, communes, and indigenous communities). Foreign companies can hold mining concessions through their 100% owned Mexican-domiciled companies. A number of Government agencies have responsibility for enforcing mining laws and its applicable regulations that must be complied with; non-compliance may result in cancellation of a concession.

Mining concessions confer rights with respect to all mineral substances as listed in their Registry document (the title) provided the concessions are kept in good standing. The main obligations to maintain title to a concession in good standing are performance of work expenditures, payment of mining fees and compliance with environmental laws. Mineral rights fees are paid bi-annually in January and July, and annual proof of exploration work expenditures is done via a work report filed by the end of May of the following year (assessment report or "comprobación de obras"). The amount of the mineral rights fees and the amount of expenditures required varies each year. It is calculated based on a per hectare rate that typically increases annually in line with annual inflation rates. The new rates are published each year in advance in the Official Gazette of the Mexican Federation (Diario Oficial).

The application process to acquire mineral rights is established under the Mining Law. Title is granted following a due diligence investigation of a mineral rights application as filed by the qualified party. Mineral rights fees and assessment works are required as of the date a concession title is issued. Following changes to the Mining Law in 2006, there is no longer any difference in Mexico between an exploration concession and a mining concession. The term of a mineral rights concession is 50 years, with the term commencing on the date recorded by the Public Registry of Mining, which is the date the title is granted. A second 50-year term can be granted if the applicant has abided by all appropriate regulations and makes the application within five years prior to the expiration date of the original title. Title to the Ana Paula Project concessions is owned by Minera Aurea S.A. de C.V., the 100 percent owned Mexican subsidiary of Heliostar, with underlying royalties as described in the Section 4.2.1 of this technical report.

The Mining Department in Mexico issued new Regulations, by Presidential decree, regarding mining concessions effective from January 1, 2006, whereby all the Exploration and Exploitation mining claims that existed in good standing under the old system were automatically transformed to a unique type of Mining Concession valid for 50 years, beginning from the date of their registration in the Mining Public Registry.

Because of this decree, the expiry dates of the mining concessions acquired from Goldcorp, including those concessions comprising the Ana Paula Project that were initially titled as exploration concessions in 2002, and 2003 were automatically extended to conform with the new decree and will now expire in 2052 and 2053, respectively. See Table 4-1 for the expiration date of all mineral concessions. Under the new decree, all claims in good standing are renewable for an additional 50-year term.



Source: Heliostar (2023)

Figure 4-3: Minera Aurea Mineral Rights Concession Map

4.2.1 Nature and Extent of Issuer's Interest

Minera Aurea S.A. de C.V. is 100% owner of the 15 mining concessions. Table 4-1 contains the list of the mining concessions, area covered, title number, expiration date and ownership. Heliostar has agreed to acquire all the issued and outstanding shares of Aurea Mining, which through its wholly-owned subsidiary Minera Aurea, indirectly holds the title and permit to mine the Ana Paula Gold Project, in consideration for:

- A cash payment to Argonaut US$10,000,000 at closing;
- On the earlier of receiving an extension to the existing Ana Paula open-pit mining permit and the granting of a new underground mining permit, the issuance of such number of common shares in the capital of Heliostar (each, a "Heliostar Share") as have an aggregate value of US$5,000,000 to Argonaut divided by the volume weighted average closing price ("VWAP") of the Heliostar Shares for the ten trading days ending on the last trading day immediately prior to the date of the Purchase Agreement;
- On the earlier of (a) the date of completion of a feasibility study for the Ana Paula Gold Project and (b) July 1, 2024, a cash payment to Argonaut of US$2,000,000;
- On the date that Heliostar announces a construction decision for the Ana Paula Gold Project, it will pay to Argonaut an additional cash payment of US$3,000,000 and US$2,000,000 in cash or Heliostar Shares at a deemed price equal to the VWAP of the Heliostar Shares for the ten trading days immediately prior to announcement of the construction decision; and

On the date that Heliostar commences commercial production at the Ana Paula Gold Project, it will pay to Argonaut an additional US$5,000,000 in cash and US$3,000,000 in cash or Heliostar Shares at a deemed price equal to the VWAP of the Heliostar Shares for the ten trading days immediately prior to announcement of the commercial production.

Table 4-1: Minera Aurea Mining Concessions

Claim	Hectares	Title	Expiration	Owner
Ana Paula Project				
TEMBO	2,243	220693	29/09/2053	Minera Aurea S.A. de C. V.
APAXTLA 3	1,995	217559	30/07/2052	Minera Aurea S.A. de C. V.
Subtotal	4,238			
Aurea Norte Property				
TEMBO DOS	563	225486	12/09/2055	Minera Aurea S.A. de C. V.
TEMBO TRES	2,822	231106	16/01/2058	Minera Aurea S.A. de C. V.
El COYOTE	13,536	222224	14/06/2054	Minera Aurea S.A. de C. V.
COSMOS I	3,480	244793	13/01/2055	Minera Aurea S.A. de C. V.
COSMOS II	3,765	244794	13/01/2055	Minera Aurea S.A. de C. V.
LA MORENITA	200	224383	02/05/2055	Minera Aurea S.A. de C. V.
DON JESUS	1,519	231103	16/01/2058	Minera Aurea S.A. de C. V.
R. ESTEFANIA	8,177	244792	15/01/2058	Minera Aurea S.A. de C. V.
ESTEFANIA FRAC. I	100	231105	16/01/2058	Minera Aurea S.A. de C. V.
R. COYOPANCHO	3,834	244795	02/02/2055	Minera Aurea S.A. de C. V.
R. CUÉTZALA	8,282	244796	13/06/2055	Minera Aurea S.A. de C. V.
Subtotal	46,278			
Aurea Sur Property				
OTTAWA	3,452	221781	25/03/2054	Minera Aurea S.A. de C. V.
El CONSORCIO	2,367	222399	05/07/2054	Minera Aurea S.A. de C. V.
Subtotal	5,819			
Total	**56,334**			

4.3 LAND TENURE

As of December 30, 2020, Minera Aurea S.A. de C.V. controls surface access to 2,235.45 hectares overlying and surrounding the Ana Paula Project area. Of these, 1,373.6 hectares are owned outright, 560.55 hectares are under contract in 30-year access agreements, and 301 hectares are under contract in 10-year access agreements. Figure 4-4 is a map of the land positions that Heliostar holds.

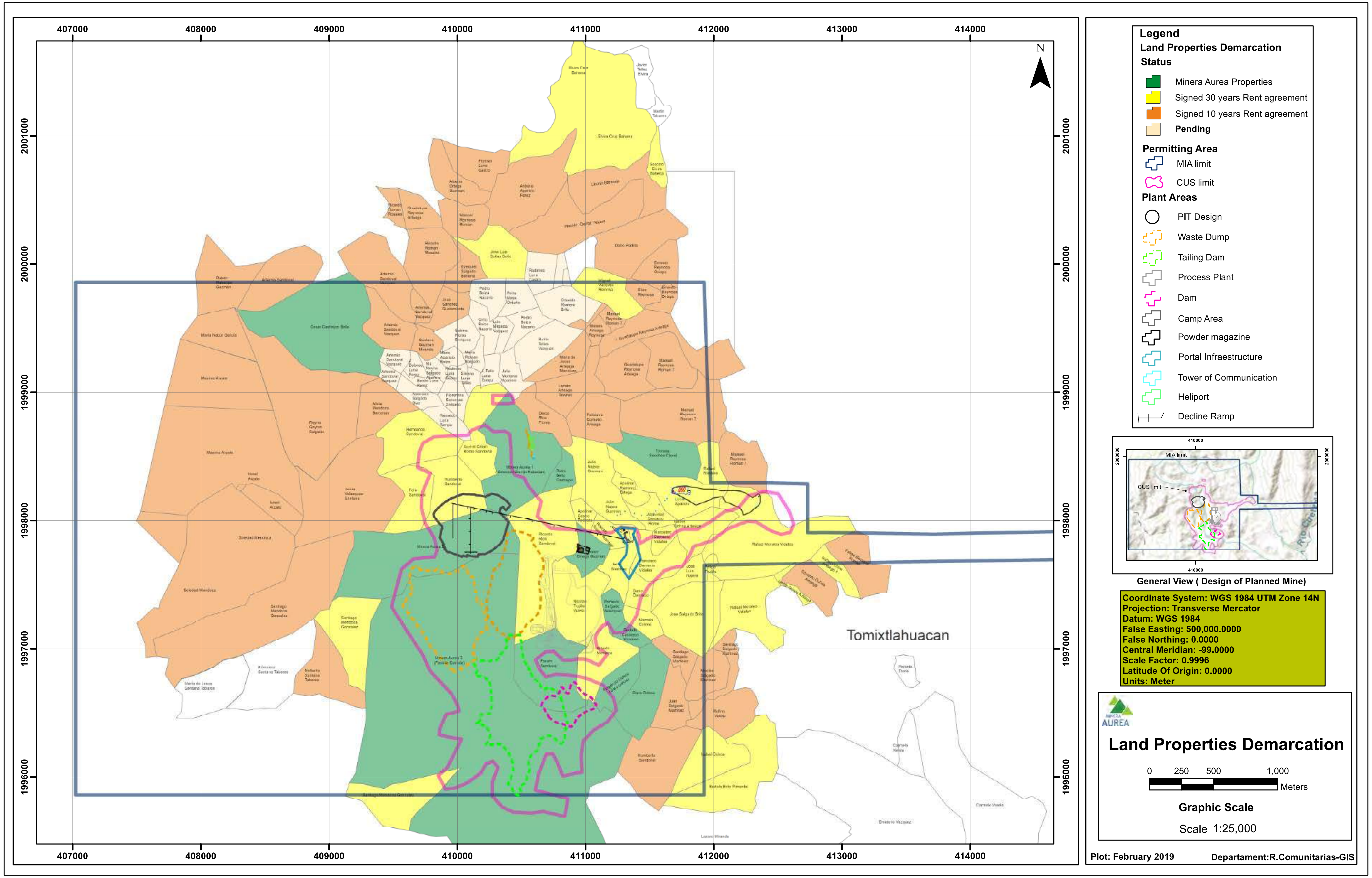


Figure 4-4: Land Properties Demarcation Map

4.4 ROYALTIES, AGREEMENTS AND ENCUMBRANCES

Minera Aurea S.A. de C.V. exercised an agreement, dated May 11, 2010, (held by Newstrike Capital Inc., then Alio Gold) for a 100% interest in the concessions Aplaxtla 3, Tembo, Tembo Dos, and Tembo Tres from Desarrollos Mineros San Luis, S.A. de C.V. and Minera San Luis S.A. de C.V., wholly owned Mexican subsidiaries of Goldcorp Inc. The final documentation was submitted for registration in Mexico City on June 24, 2010.

Minera Aurea S.A. de C.V. has the obligations set forth below for the maintenance of the four concessions.

On October 18, 2017, Goldcorp and Alio executed an agreement for Alio to buy one-third of the 3% NSR royalty, as agreed upon, arising from the completion of the pre-feasibility study on May 16, 2017. The remaining 2% NSR royalty held by Goldcorp had been acquired by Maverix Metals Inc., as announced in a news release on September 21, 2020. On January 19, 2023, Triple Flag Precious Metals Corp. (Triple Flag) completed the acquisition of the Maverix Metals Inc. 2% NSR royalty.

Minera Aurea S.A. de C.V. has a 2.5% NSR payable to Industrias Miral S.A. de C.V. and others for the remaining mining concessions in the Aurea Norte and Aurea Sur areas. These concessions are not part of the Ana Paula Project Area.

Tax Reform changes in Mexico became effective January 1, 2014 and affect operating mining companies in Mexico. The changes include: the corporate income tax remaining at 30 percent; a new mining royalty fee of 7.5 percent on income before tax, depreciation and interest; an extraordinary governmental fee on precious metals, including gold and silver, of 0.5 percent of gross revenues; and changes affecting the timing of various expense deduction for tax purposes. This implies an effective combined tax and royalty rate of 35.25 percent depending on how deductions will be applied. The new rates put Mexico in line with the primary mineral producing nations of the world.

Title to mineral properties involves certain inherent risks due to the difficulties of determining the validity of certain claims as well as the potential for problems arising from the frequently ambiguous conveyance history characteristic of many mineral properties. Minera Aurea S.A. de C.V. has investigated the title to all of its mineral properties and maintains them in accordance with Mexican mining law, which provides for the rights to carry out the works and development required for mining and related activities.

Mexican Mining Law requires mineral rights payments to be paid each January and July. The required amounts are subject to modification as annual fee schedules are released for publication by the Mines Office.

Also required is an annual minimum exploration work obligation which is filed each May for the preceding year.

Minera Aurea has assumed all environmental liabilities related to the concessions.

Mining concession licenses do not automatically grant surface access rights, which are treated separately under Mexican law. Permission for surface access must be negotiated with the relevant communities and individuals who hold surface titles to the areas affected by the mining concessions. These negotiations typically provide for the purchase or lease of the surface rights. Surface rights in Mexico are held as individually titled parcels or communally owned lands (ejidos) that overlie the mineral rights concessions that are granted separately by the Federal Government. These are separate legal estates where individually titled parcels are governed under Mexican property laws. Ejido surface rights are governed under Mexico's Agrarian Laws while Mineral Rights are administered under established Mining Laws that have precedence over Agrarian laws.

Heliostar recognizes surface access as a potential risk to maintaining unencumbered entry to their mineral exploration properties and cannot guarantee to have continual access. As part of the Company's policy of good corporate citizenship in the communities in which it operates and with the objective of Project sustainability, the Company has reduced potential risk to exploration and development through 10-year and 30-year lease agreements with affected surface owners, in addition to land it owns outright. No communally-owned land will be affected by the Project.

4.5 ENVIRONMENTAL LIABILITIES AND PERMITTING

4.5.1 Environmental Liabilities

All permissions and applications required for the exploration process are being performed in accordance with the applicable Mexican Official Laws and Standards (Normas Oficiales Mexicanas). According to Mexican Federal Law for the Protection of the Environment, existing environmental conditions caused by past operations are not liabilities for the Ana Paula Project or its present owners. Minera Aurea's Ana Paula Project does not fall within any protected area or special jurisdiction and there are no known existing environmental liabilities located on the Project other than those associated with exploration activities.

4.5.2 Required Permits and Status

Minera Aurea has an approved MIA, from the Secretariat of Environment and Natural Resources (SEMARNAT), for the operation of the mine, plant and power line. The MIA was approved in April 2017.

The major permits required for the Ana Paula Project are shown in Table 4-2.

Table 4-2: Major Permits and Status

Permit	Relevant to	Status
Permit for Change of Land Use in Forested Area issued by the State Delegations of Secretariat of SEMARNAT	Transitional	Received
Environmental Impact Assessment (Manifestación de Impacto Ambiental)	Development	Received
Risk Analysis (Estudio de Riesgo)	Development	Received
PPA (Accident Prevention Program)	Development	Completed
Explosives Permit (Secretaría de la Defensa Nacional)	Development	Mining contractor to file
Water Use Permit (Comisión Nacional del Agua)	Development	Pending a development decision
Archaeological land 'liberation' based on authorization by the Instituto Nacional de Antropología e Historia (INAH)	Development	Filed

Source: Heliostar (2023)

4.6 OTHER SIGNIFICANT FACTORS AND RISKS

The Ana Paula Project is located in the Guerrero Gold Belt, which includes operating mines including Torex's Morelos Property and Leagold's Los Filos mine both located within 40 km of the Project site. The Project site is easily and safely accessed. The Company has good relations with the local communities and the social license is considered more than adequate for the pre-construction activities. During the feasibility stage, the Company will study alternative access routes, and develop and implement a construction ready community and social relations (CSR) program that includes a trained CSR team.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 TOPOGRAPHY, CLIMATE, PHYSIOGRAPHY

The Ana Paula Project is located in the Sierra Madre del Sur mountain range of southern Mexico where topography can range from moderate to rugged with elevations varying from 900 to over 1,460 meters above sea level (masl). The Company's exploration drilling activities are conducted primarily between 900 to 1,200 masl. The Project lies north of the Balsas River, which divides the Sierra Madre del Sur Mountains into north and south ranges.

The climate in the region is classified as warm and humid, with an average temperature of 23 degrees Celsius (ºC) (range of 4º to 42º C) and average precipitation of 874.3 mm per year. Rainfall occurs from June through October during a monsoonal tropical wet season that includes the influence of hurricanes from both the Atlantic and Pacific oceans. Winters are dry with occasional light rains in February.

Knight Piésold (KP) completed a preliminary site-specific seismic hazard assessment for the Project. According to the Mexican norm, NOM-141 SEMARNAT-2003, the Ana Paula site is classified under seismic region D where seismic events are common, including major historical earthquakes (SEMARNAT 2003, Norma Oficial Mexicana, NOM-141). A Probabilistic Seismic Hazard Analysis (PSHA) was conducted for the site by GeoPentech, which considered earthquakes on active seismic sources within 200 km of the site, including subduction interface, deep intraslab, and shallow crustal sources. The results of the PSHA were used to calculate the mean horizontal uniform hazard spectra for the site at various average return periods.

5.2 VEGETATION

Thorny plants and cacti dominate the vegetation at the Project at low elevations, giving way uphill to a patchy oak forest above 1400 masl. Vegetation is barren and desert-like during the dry winter months, with tropical growth during the wet summer season. Vegetation is mixed with no dominant species. The Project area is classified in the neotropical realm. Surface land use in the immediate area of exploration interest within the Ana Paula Project is devoted to cattle grazing and limited agriculture but is primarily non-arable and is uninhabited.

5.3 ACCESSIBILITY

The town of Iguala, with a population of about 200,000, is a three-hour drive from Mexico City and about four hours from the port city of Acapulco (Figure 5-1). The Ana Paula Project concessions are accessible from Iguala via paved highways and good quality all season unpaved roads. Driving time from Iguala is about 1.25 hours to the Ana Paula Project headquarters located at Cuétzala del Progreso. The Company maintains offices, residences, and storage facilities in Cuétzala del Progreso. Access to the Project site, approximately 9 km south of Cuétzala del Progreso, is via a series of secondary unpaved roads, built and maintained by the Company and many are passable by two-wheel drive vehicles year-round. Four-wheel drive vehicles are required on drill access roads during rainy periods. All exploration and potential mining activities are carried out year-round.

5.4 LOCAL RESOURCES AND INFRASTRUCTURE

The area offers an established infrastructure with a good road network, and an available unskilled and skilled work force. All major supplies and services are available from the cities of Iguala (1.25 hours by road), Cuernavaca (2.5 hours by road), and Chilpancingo, the State capital which is a three-hour drive from the Project (Figure 5-1).

Basic supplies are available from the towns of Nuevo Balsas and Cuétzala del Progreso, among other small town suppliers. The nearest available international airport is in Cuernavaca with a landing strip suitable for large aircraft (a 45 by 2,772 m airstrip), with major international airports located at Acapulco and Mexico City. The Mexico City Airport is a four to five hour drive depending on traffic.

A small craft gravel airstrip is located in nearby Apetlanca, 20 minutes from Cuétzala del Progreso. Iguala has a paved airstrip suitable for small aircraft (1,685 m in length). Heliostar employs several semi-technical and non-technical residents of Cuétzala del Progreso where the Project headquarters and field offices are located. Skilled labor and heavy equipment are available in Iguala. Local geologists are available from the nearby town of Taxco el Viejo, where the Universidad Autónoma de Guerrero maintains a satellite university within 20 minutes of Iguala devoted to the earth sciences. The economy has been dominated by small scale agriculture and agriculture related services. The local economy is improving as mining projects including Rey de Plata, Campo Morado-G9, Morelos, Los Filos, and Torex became the principal regional employers. Availability of skilled miners has also improved.

Source: JDS (2014)

Figure 5-1: Project Location Road map in Guerrero State, Mexico

5.5 INFRASTRUCTURE AVAILABILITY AND SOURCES

5.5.1 Power

The nearby Balsas River is a source of hydroelectric power and 115 kV high tension lines transect the Ana Paula Project site. The 115 kV power line is approximately 2.5 km from the plant site.

The Company has installed a power line to its facilities on site at the mine location and is connected to the National Grid with permission from the Centro Nacional de Control de Energía (CENACE), the Mexican power Authority.

5.5.2 Water

Process plant water demand is estimated to be 704.4 m^3/h based on production rates. Plant water will be supplied primarily (90.6%) by water recycled from the three process thickeners and the TSF (75-80%) and supplemented by wells and runoff water to the TSF (9.4%). Make-up water supply from the wells would be delivered via a 2.5 km overland pipeline from the wellhead to the plant site.

5.5.3 Mining Personnel

In 2020, Mexico was listed as the eighth largest gold producing country after China, Australia, Russia, United States, Canada, Peru and South Africa. Mine activities in Mexico date back more than 1,000 years. As a result of Mexico's long history of mining activities, skilled mining personnel are available in Mexico. The mine operation is planned to use contract miners with quotations received from three contractors.

Minera Aurea currently employs 38 workers from the local communities. There is a locally accepted process for labor hiring opportunities in the Project.

5.5.4 Installations

The Company maintains an office and living quarters for technical personnel in the village of Cuétzala del Progreso. Core storage and handling facilities with 24 hour security are located in a rented area at the edge of the village. Several installations have also been constructed in the vicinity of the deposit, including a gatehouse to restrict access to the area, a 60 room man camp, a powder magazine and mine shop facilities at the site of a partly completed decline.

6 HISTORY

The Ana Paula Project is within the Guerrero Gold Belt which has been mined commercially for gold and silver since the early 1920's. Today, the trend includes producing gold mines, several known deposits in various stages of development and exploration, and numerous early stage exploration prospects. Since modern exploration began 20 years ago in response to changes in Mexican foreign ownership and mining laws, and signing of the North American Free Trade Act (NAFTA), the trend has evolved into one of Mexico's most prolific gold producing belts.

The Ana Paula Project area is contained within two concessions, namely Aplaxta 3 and Tembo.

6.1 PRIOR OWNERSHIP AND OWNERSHIP CHANGES

In July 2002, the concession Aplaxta 3 was issued to Nafta S.A. de C.V., a subsidiary of Miranda Mining Corp.

In September 2003, the concession Tembo was issued to Miralpaz S.A. de C.V., a subsidiary of Miranda Mining Corp.

Wheaton River Minerals Inc. (Wheaton) purchased 100% of Miranda Mining Corp. in 2003, thereby acquiring a 100% interest in the concessions.

Goldcorp's acquisition of Wheaton in 2005 included acquisition and transfer of the concessions to Goldcorp's operating subsidiary Desarrollos Mineros San Luis, S.A. de C.V.

On July 30, 2010, Newstrike Capital Inc., operating through its 100% Canadian owned subsidiary Aurea Mining Inc., through its 100% owned Mexican operating subsidiary Minera Aurea S.A. de C.V. (Minera Aurea), acquired a 100% interest in the concessions from Desarrollos Mineros San Luis, S.A. de C.V. a wholly owned Mexican subsidiary of Goldcorp Inc. Minera Aurea S.A. de C.V. is the current holder of the concessions.

Alio Gold (then Timmins Gold Corp.), acquired Ana Paula through its acquisition of Newstrike Capital Inc. in an arrangement that closed on May 26th, 2015. With the arrangement, Timmins Gold acquired ownership of all of the issued and outstanding common shares of Newstrike Capital Inc., its Canadian subsidiary Aurea Mining Inc. (Aurea Mining), and its Mexican subsidiary Minera Aurea.

The shares of Aurea Mining and Minera Aurea were subsequently acquired by Argonaut Gold Inc. (Argonaut) in a merger with Alio Gold on July 1, 2020. On September 11, 2020, Pinehurst Capital II Inc. (Pinehurst) announced that it has entered into a purchase agreement with Argonaut to acquire the Ana Paula Project. The sale was not completed as Pinehurst did not fulfill its obligations in relation to financing and receipt of certain regulatory and other approvals (Argonaut press release April 1, 2021).

On December 5, 2022, Argonaut entered into a binding agreement with Heliostar for the sale of all of the issued and outstanding shares of Aurea Mining, a wholly owned subsidiary of Argonaut, which through Aurea Mining's wholly owned subsidiary Minera Aurea, holds a 100% indirect interest in and to the Ana Paula Gold Project (Argonaut press release, December 5, 2022).

6.2 PREVIOUS EXPLORATION AND DEVELOPMENT RESULTS

6.2.1 SGM (1970-2002)

The Morelos National Mineral Reserve (47,600 ha), which was located to the west and outside of the Project area, was created during the Administration of President Miguel de la Madrid. The Consejo de Recursos Minerales (the "CRM", today known as the "SGM") carried out exploration throughout the Reserve and surrounding areas. The exploration campaign included regional and detailed mapping, airborne and ground geophysics, geochemical sample programs, and drilling. In 1979, SGM built an access road to the artisanal Guadalupana gold mine located on the Ana Paula Project.

6.2.2 Miranda Mining Corp. (2002-2004)

In 1998, Miranda collected 726 regional stream sediment samples west of the Morelos Mineral Reserve, including samples from the Project area. Results from the sampling campaign led to the staking of the claims.

6.2.3 Goldcorp (2005-2010)

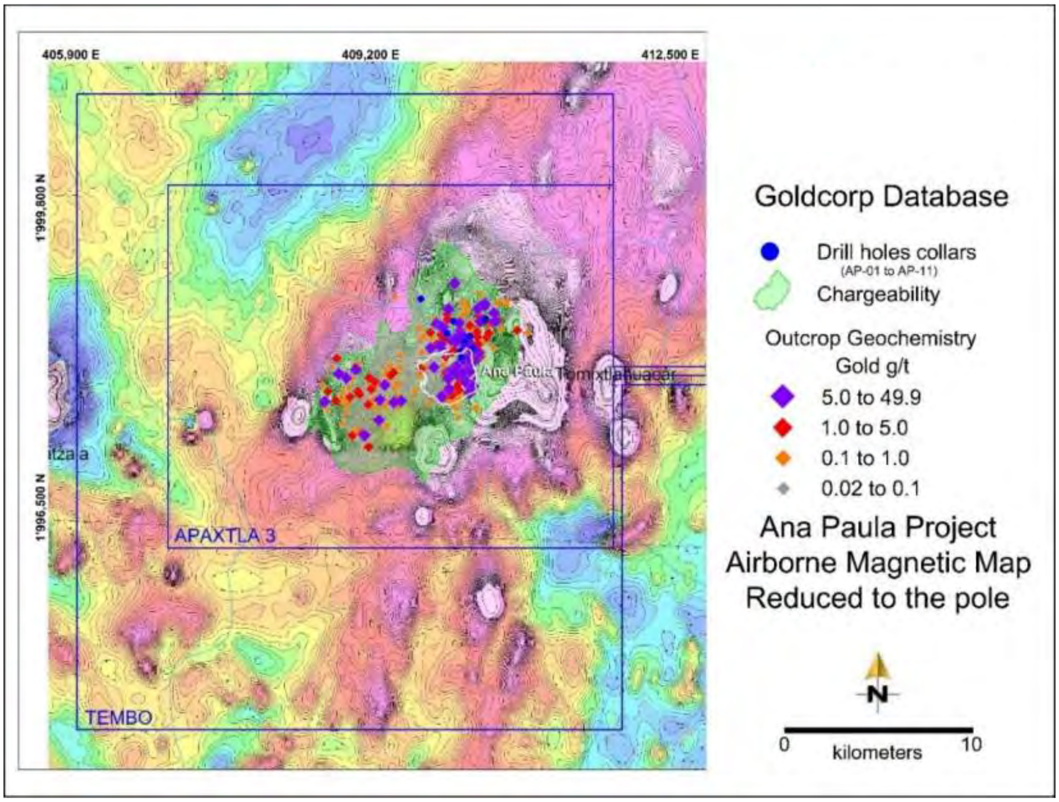
Goldcorp conducted the first detailed exploration on the Tembo and Apaxtla 3, as well as the non-contiguous concessions Tembo Dos and Tembo Tres, between 2005 and 2009. The Goldcorp work represents the first detailed exploration within the Project area.

Work programs included regional and detailed geologic mapping (1:1,000, 1:5,000, and 1:10,000 scale), road building, stream sediment sampling, trench and road cut sampling, age dating of the intrusion, an airborne multispectral and magnetic survey, a ground pole-dipole induced polarization survey, portable infrared mineral analyzer (PIMA) alteration mapping, structural interpretation, petrologic and microprobe studies.

Reconnaissance Exploration and Trenching

Goldcorp conducted trench and road cut sampling during 2005. Goldcorp's work outlined a 1- by 2-km exploration target in the Ana Paula Project area defined by anomalous outcrop gold geochemistry (>0.2 to 49.9 g/t) returned from grid and road-cut samples with coincident underlying geophysical anomalies, as shown in Figure 6-1.

Samples collected from road cuts at San Jerónimo (within Ana Paula) include intervals of up to 70 m of 1.1 g/t Au and 120 m of 2.01 g/t Au (Medina, 2010).

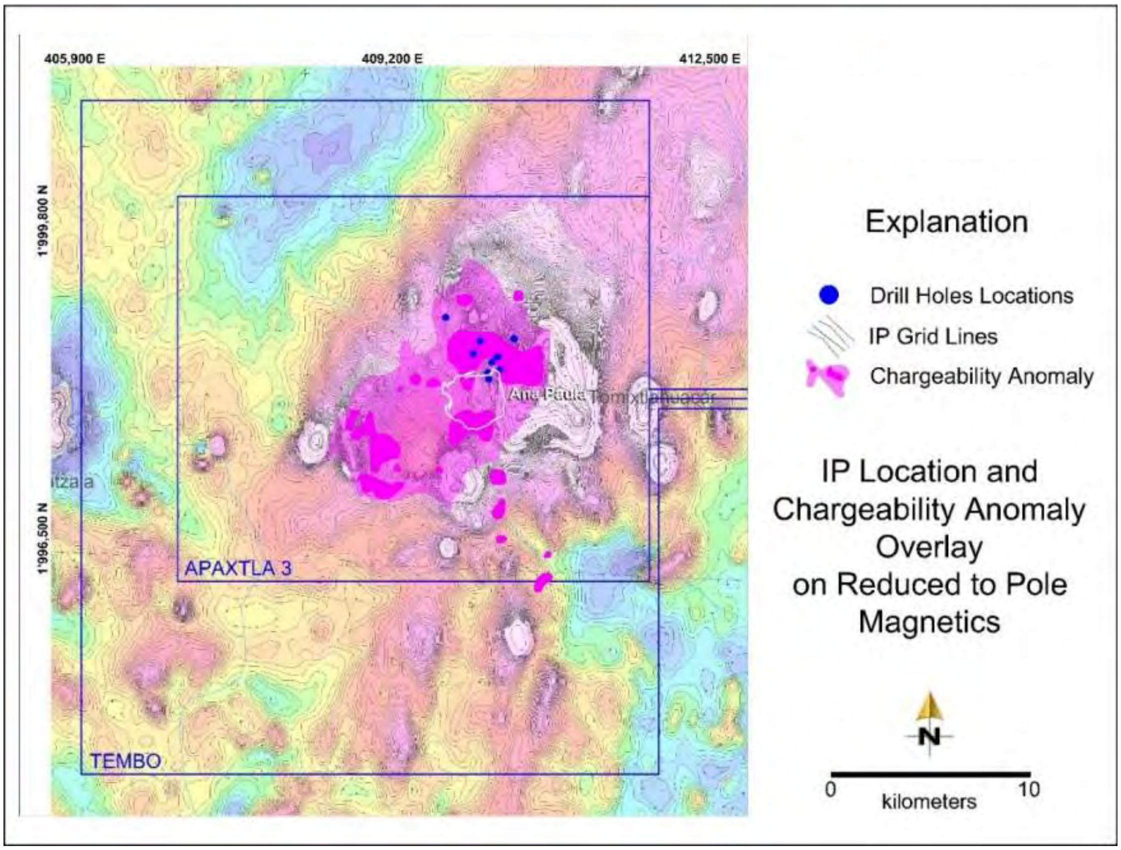


Source: JDS (2014) (modified from IMC 2014)

Figure 6-1: Coincident Geophysical and Geochemical Anomalies as Defined by Goldcorp

Studies and Surveys

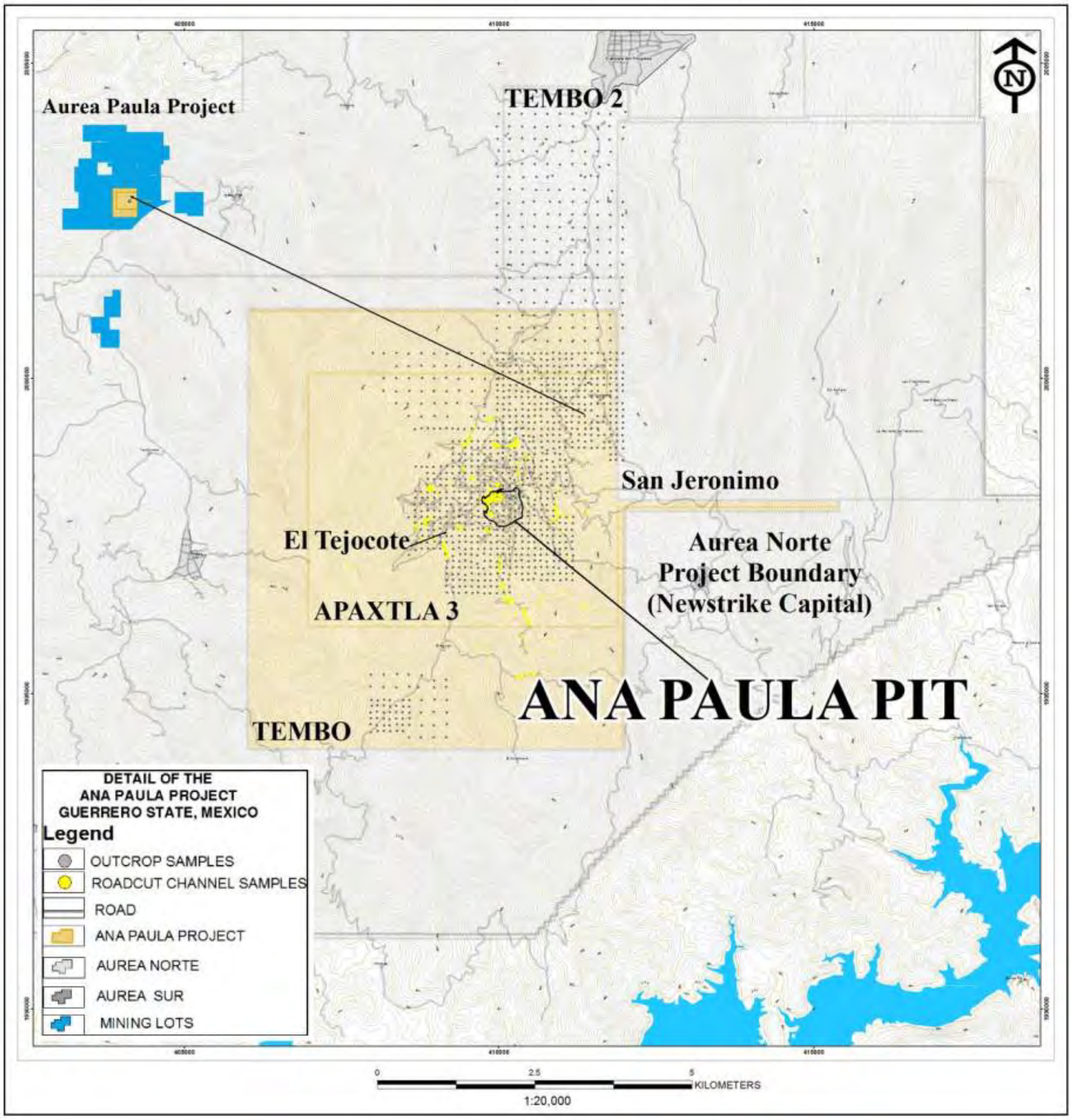
In 2005, 11 rock samples were collected for petrographic study within, just north and west of the Apaxtla 3 concession. The igneous suite was reported to mainly consist of aphanitic rocks with porphyritic textures and was classified as dacite porphyry, granodiorite, and porphyritic basaltic trachyandesite. Porphyritic rocks contain phenocrysts of plagioclase, quartz and biotite, and exhibit potassic alteration, which consists of secondary K-feldspar with replacement of the sample matrix as well as the plagioclase phenocrysts (Mauler and Thompson, 2005). McPHAR Geoservices (Phil.), Inc. (based in Manila, Philippines) to complete an aeromagnetic and radiometric (K, Th, U) survey (30 m elevation, 100 m lines, 1.5 km in length) covering a 225 km^2 area.



Source: JDS (2014) (modified from Lunceford 2010)

Figure 6-2: IP Chargeability Anomaly over RTP Magnetic Anomaly

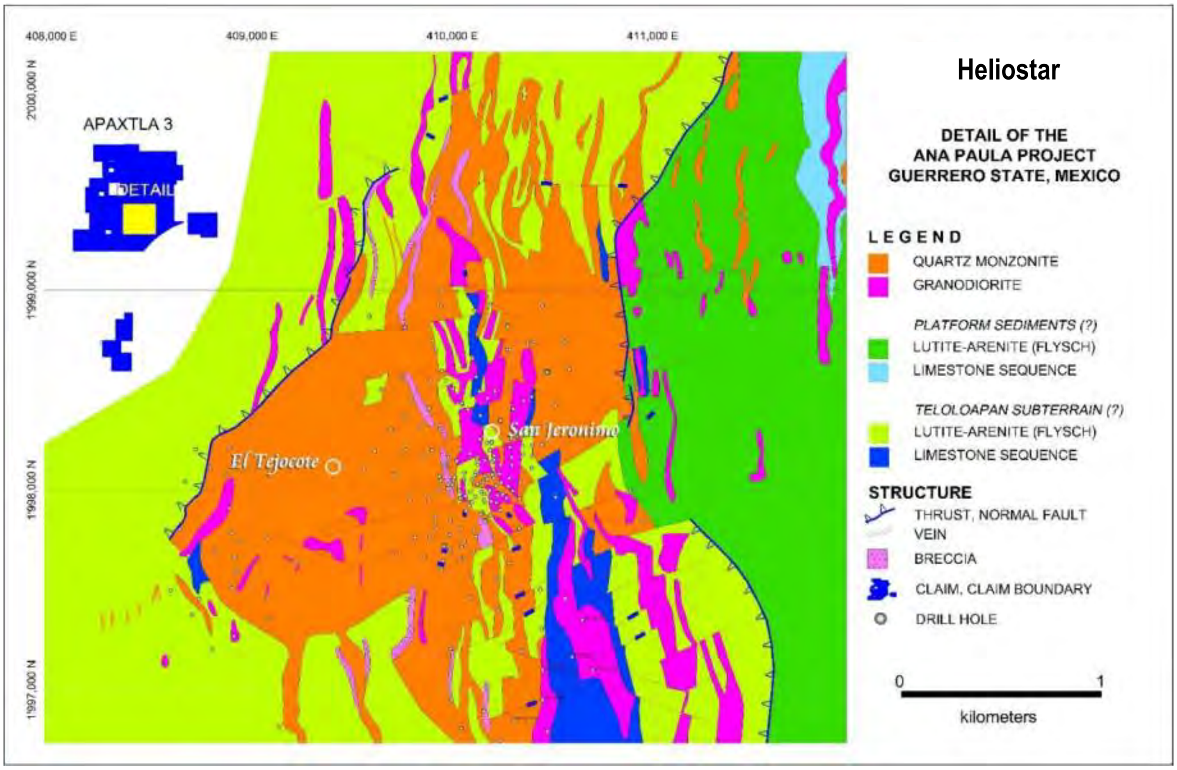
Systematic and expanded litho-geochemical sampling continued in 2006. Additionally, SJ Geophysics Ltd. was contracted to provide an Induced Polarization (3 dimensional) geophysical survey (Figure 6-2). Survey parameters included 3.5 km long lines oriented northwest, every 200 m with 100 m dipole spacing. Road construction, road-cut sampling (Figure 6-3), and geologic mapping (1:1000, 1:5000) continued (Figure 6-4). Intrusive samples were submitted for age dating. Petrographic and microprobe studies were conducted on a suite of volcanic and intrusive rocks and a structural interpretation utilizing satellite imagery was completed.



Source: JDS (2014) (modified from Lunceford 2010)

Figure 6-3: Outcrop Grid, Geochemical Sampling Ana Paula Project

In 2007, Dr. Victor Valencia of the University of Arizona (Tucson) conducted U-Th-Pb age dating on zircons collected from granodiorite exposures in and around the San Jerónimo area. All samples indicated age dates ranging from 66.0 to 66.7 (+0.7 to 1.8 Ma) (Valencia-Gomez and Ruiz, 2008). Geologic mapping indicated linear breccias along contacts within quartz monzonite and monzonite including a large elliptical body up to 150 m in diameter west of San Jerónimo. The breccias exhibit strong argillic alteration, stockwork, disseminated sulphide, and elevated gold mineralization (Medina, 2010).



Source: JDS(2014) (modified from Lunceford 2010). Key Exploration Targets: San Jerónimo and El Tejocote Identified

Figure 6-4: 1:5000 Scale Geological Map

In 2008, work activities were reduced because of protracted negotiations with surface owners. Interpretive, schematic cross sections were constructed on a 1:5000 geologic map base to augment drill hole planning. Grid sampling (to 100 m) was completed on parts of the Tembo and Tembo Dos concessions. Litho- and stream sediment sampling continued. Additional samples were collected for PIMA analysis. Core was re-logged to reconcile alteration nomenclature with geochemical and geologic map bases. Goldcorp suspended work on the Ana Paula Property in June 2008.

In summary, 6,764 geochemical samples were collected, including 5,965 channel chips and regional outcrop litho-geochemical samples, 690 grid geochemical samples of intrusive rocks, and 109 stream sediment samples.

6.2.4 Newstrike (2010-2015)

The following exploration work programs were completed on the Ana Paula Project by Newstrike from 2010 to 2015 under the direction of Dr. Craig Gibson, a qualified person under NI 43-101:

- Regional and semi-detailed outcrop mapping and sampling.
- Road cut outcrop mapping and sampling.
- ZTEM and airborne magnetic geophysical surveys, modelling and interpretation.
- 111,627.67 m of core drilling in 221 drill holes, from AP-10-12 started October 22, 2010 through AP-13-232 completed on July 2014.
- 3,353 On-site density measurements have been completed from 123 drill holes.

- 96,212 geochemical samples from surface and core, including QA/QC and check samples.
- Orthophotography and topographic contouring (to 1 m contours).
- Petrographic and short-wave infrared (SWIR) spectroscopic studies of 34 core samples.
- Structural and alteration studies.
- Environmental studies including water quality and weather monitoring.
- Pit slope, metallurgical, process design and other engineering studies.
- Deposit modelling.

Geologic outcrop mapping was conducted continuously since June 2010 to December 2014. A local map sheet grid was devised across the Project that is used to systematically plot all Project data, informally subdividing the Project area into nine 1:2000 scale map sheets, designated from north to south and west to east as A1-A2-A3, B1-B2-B3, and C1-C2-C3. The local grid covers an area defined by UTM coordinates 408,000-413,000 m easting by 1,985,000-2,000,000 m northing (WGS 84 datum), Figure 6-5. Virtually all sampling, geologic mapping and drilling has been conducted within the A1-A2 and B1-B2 map sheets, informally described sometimes as the northwest, northeast, southwest and southeast quadrants respectively. These four map sheets cover the approximately two by two km exploration target area defined in Figure 6-5.

6.2.4.1 Surface Mapping and Sampling Methodology

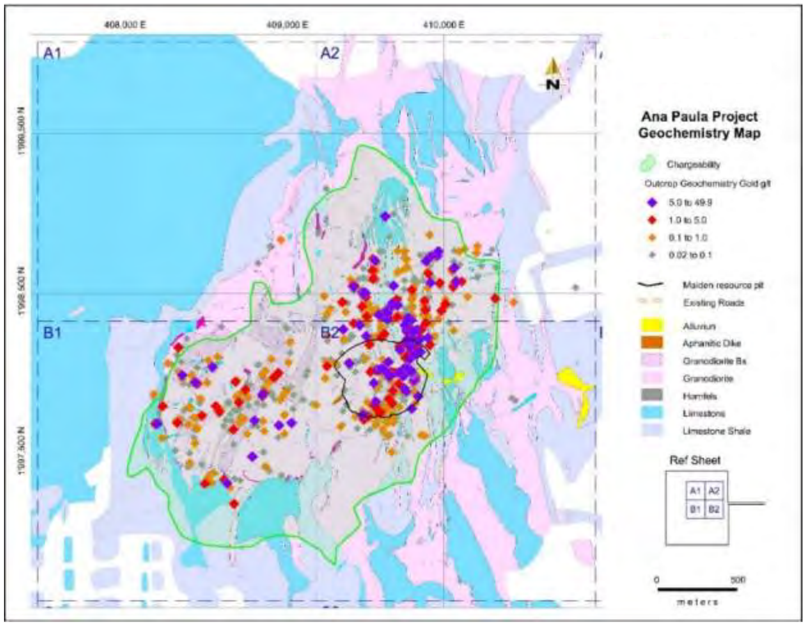
Surface mapping and sampling methods and protocols have remained the same since work on the Project began in mid-2010. Outcrop and road cut locations are registered on handheld GPS (WGS84 datum) and recorded along with lithologic, structure, mineralization, alteration and other relevant details on field map sheets of the same 1:2000 scale that are then transferred first by hand then digitally to the final map sheets. These map sheets are composited into the final Project-wide geologic map shown in Figure 7-4.

Prior to sampling, road cut and outcrop exposures are carefully cleaned and intervals to be sampled are measured, numbered with paint, and marked with an aluminium tag. Road cut samples are collected as continuous channels and/or as representative chips, carefully collected along intervals of 1.5 m or less depending on structural/lithologic breaks. Outcrop samples are collected as random or selective chips or panel samples depending on the exposure. Sample material is placed in plastic bags along with a sample tag, which is numbered and sealed at the site, and then double bagged with the corresponding sample number to prevent tearing and sample loss during transport. Samples are transported to the Company's field offices and secure storage facilities where the individual sample bags are put into appropriately labeled rice sacks, about 5 to 10 per sack to await transport.

Storage facilities are enclosed and kept under 24 hour security. Samples are picked up at scheduled intervals directly by trucks sent from the two respective contracted analytical laboratories, ALS and SGS. All descriptive data collected in the field is recorded daily into the Company's database under the supervision and control of a database manager. Hand drawn and digital maps are prepared as a permanent record. Once geochemical assay results are received from the laboratory, the assay certificates are digitally merged with the descriptive database and verified by the geologist.

6.2.4.2 Road Cut Outcrop Mapping and Sampling

Road cuts are outcroppings of rock exposed during road building activities. Road cut exposures are systematically mapped and cataloged using the same methodology described in Section 6.2.4.1. The greatest density of road cuts from existing and new road building has occurred over map sheets A2 and B2 where drill density is also greatest. The objective of the road cut mapping and sampling is to identify new areas of potential mineralization and to refine structural and lithologic controls to mineralization and new road cuts are mapped and systematically sampled as they are built. If warranted, newly identified zones of possible gold mineralization resulting from this program are then proposed for testing by core drilling. An outcrop sample location map showing anomalous gold distribution is shown on Figure 6-5.



Source: Alio Gold (2017). The A1, B1, A2 and B2 map sheets location within the Ana Paula Project (blue inset).

Figure 6-5: Road Cut and Outcrop Sample Map

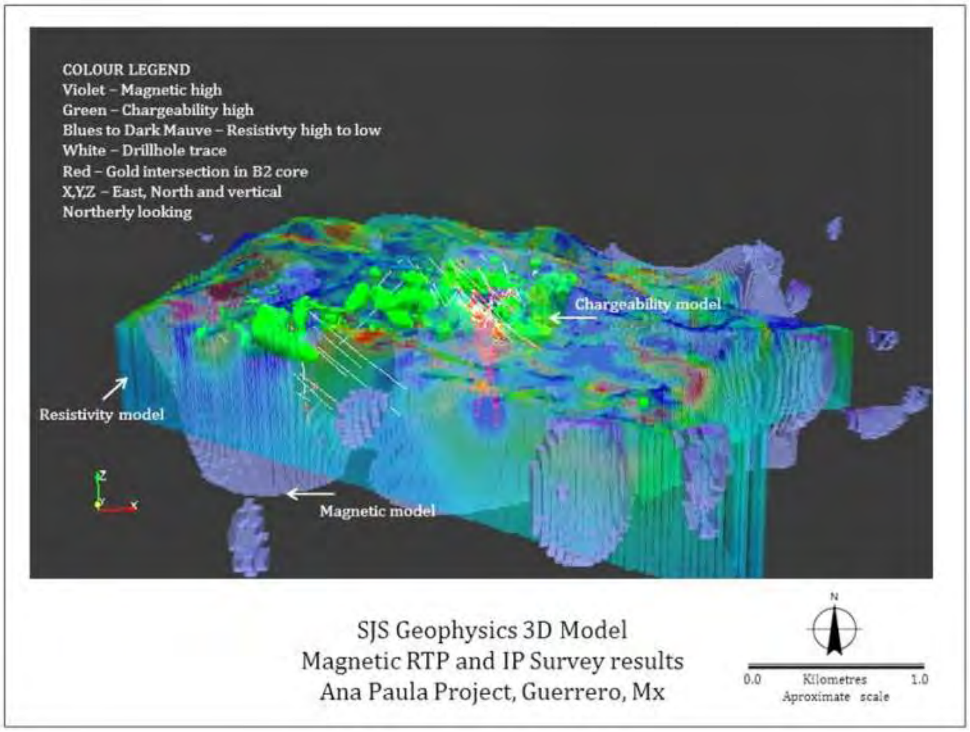
None of the outcrop and roadcut samples have been used in the resource estimation they were used solely for exploration activity.

6.2.4.3 Geophysics

In 2012, Newstrike contracted SJ Geophysics Ltd (SJ) of Vancouver, Canada to undertake certain 3 dimensional modelling interpretations using the existing database acquired from Goldcorp to compare it with the results of drilling. The database includes an aeromagnetic and radiometric (K, Th, U) survey by McPHAR Geoservices Inc. of Manila, Philippines that covers a 225 km^2 area over the Ana Paula Project area, and an Induced Polarization (3 dimensional) geophysical survey by SJ. Results of this interpretation indicate a strong correlation between mineralization and resistivity and magnetic responses (Figure 6-6).

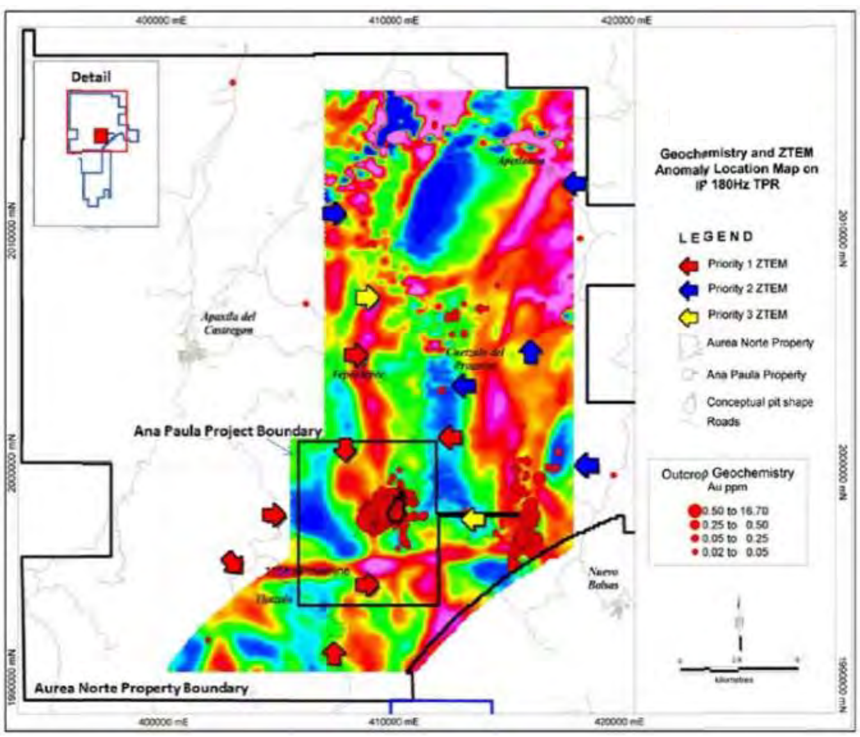
In 2013, Geotech Ltd of Aurora, Ontario, Canada was contracted to complete a Z-axis tipper electromagnetic (ZTEM) survey of approximately 250 km^2 encompassing 1,298 flight line km flown at a line spacing of 200 m. The survey area encompassed the entire Ana Paula Project area and the eastern portion of the surrounding Aurea Norte Property, also owned 100% by Newstrike. The ZTEM survey is recognized for its ability to map resistivity contrasts associated with the structure and alteration typically associated with porphyry-skarn deposits or with structurally controlled epithermal deposits. ZTEM is capable of penetrating to a depth that can exceed 1-2 km and is useful in identifying “blind” exploration targets (a buried target that does not outcrop at surface).

The objective of the survey was to locate potentially buried intrusive bodies associated with the GGB mineralization model and to confirm controlling structures along the mineralized San Luis Trend. The new anomalies identified by the ZTEM survey (Figure 6-7) include resistivity contrasts typical of buried silicified intrusions and with alteration commonly associated with skarn-porphyry and epithermal style deposits (Legault, 2013).



Source: Alio Gold (2017), from SJ (2012)

Figure 6-6: 3D Model Overlay of Resistivity, Chargeability and RTP Magnetic Survey Results



Source: modified from Legault (2013)

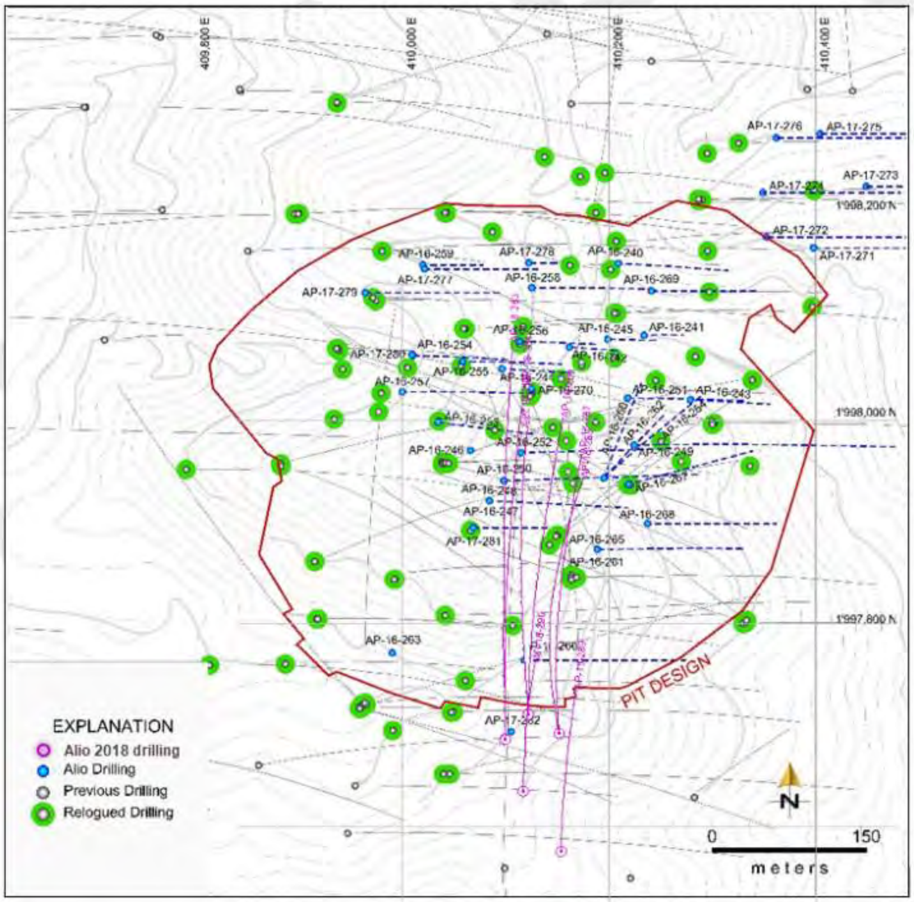
Figure 6-7: ZTEM in Phase 180Hz TPR with Priority Target Locations

6.2.5 Alio Gold (2015-2018)

Upon acquiring the property in 2015, Alio Gold carried out an extensive review of the data delivered by Newstrike and includes:

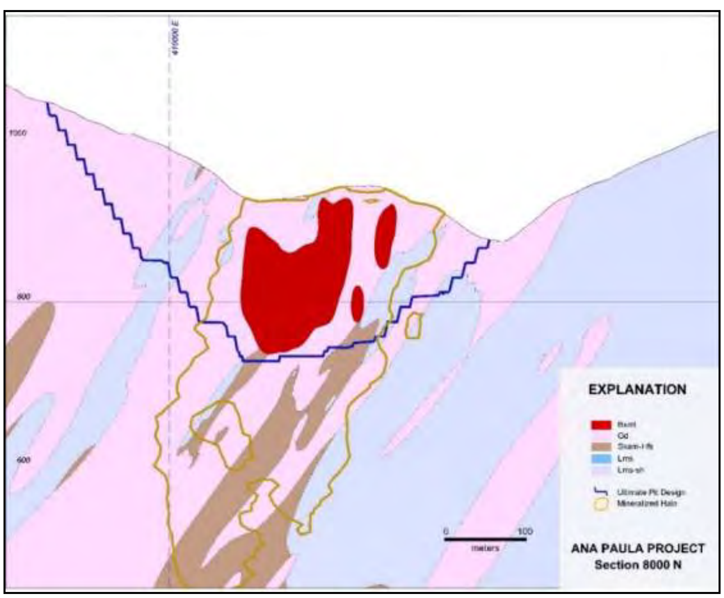
- Field review of the existing geological maps by Alio Gold personnel.
- Re-logging of 113 drill holes located in the vicinity of pit design area and extending below the pit design. A total of 49,968.89 meters of core was re-logged by Alio Gold to provide detailed information across the entire mineralized system and unified lithological, structural and mineralized criteria with the goal to improve support for the geological model (Figure 6-8 and Figure 6-9)
- Alio Gold has conducted two drilling campaigns: 2015 drill campaign of 2,008.05 m of core in 10 drill holes which includes 3 twin holes drilled to collected samples for the metallurgical testwork.
- In 2016, an assessment of the drill holes geochemical data over the main Ana Paula deposit was performed by Alio Gold personnel to provide detailed geochemical information across the deposit. The geochemistry approach was mainly aimed at investigating the possible stages of mineralization, and the dispersion mineralized HALOs from the main ore body.
- From October 2016 to February 2017, Alio Gold started the second drilling campaign of 9,663.17 m of in 43 drill holes. This infill drilling program allowed the delineation of the high-grade complex breccia zone and the mineralization HALO surrounding the breccia.
- From March 2017 to April 2017, Alio Gold completed 5,960 m of reverse circulation (RC) condemnation drilling in 20 drill holes at designs plant, waste dumps and tailing areas.
- From March 2017 to April 2017, Alio Gold completed 1,895.00 m of geotechnical drilling was conducted in 6 pit sectors defined by the Knight Piésold using HQ3-size drilling tools.
- From October 2017 to December 2017, Alio Gold completed a 2,018 m drill program to twin previous drill holes within the proposed open pit to collect metallurgical testwork samples.
- From December 2017 to May 2018, Alio Gold completed 4,337 m of infill drilling to further define the complex breccia and surrounding mineralized HALO below the 2017 resource constraining shell.
- 3D geological re-interpretation of Ana Paula deposit was performed by Alio Gold which is the base for the resource model. The wireframes were constructed in LeapFrog™ software using the logged lithologies.
- In 2016, an assessment of the drill holes geochemical data over the main Ana Paula deposit was performed by Alio personnel to provide detailed geochemical information across the deposit. The geochemistry approach was mainly aimed at investigating the possible stages of mineralization, and the dispersion of mineralized HALOs from the main ore body.
- Alio also began a decline planned at about 1.2 km in length to access the high grade breccia body within the limits of the proposed open pit. The decline was advanced about one third of the planned length.

Drill results from the Alio Gold exploration program are discussed in Section 10 of this technical report.



Source: AGP (2020), modified from Alio Gold (2017)

Figure 6-8: Map Showing the Re-Logged Drill holes at Pit Design Area



Source: Alio Gold (2017)

Figure 6-9: Geological Re-Interpretation Cross-Section Showing the Lithological Domains

6.3 HISTORICAL MINERAL RESOURCE ESTIMATES

The 2013, 2014, 2016, and 2017 mineral resource estimates described in this section are now considered historical in nature. They are provided here for historical context only. Heliostar is not treating these historical estimates as current mineral resources or reserves, and the QP has not undertaken any independent investigation of the mineral resource estimates; therefore, the mineral resource estimates in Table 6-2, Table 6-4, and Table 6-6 should not be relied upon. These historical mineral resource estimates are no longer current and have been superseded by the mineral resource estimate described in Section 14 of this technical report.

6.3.1 2013 Newstrike Resource Estimate

In 2013, H. E. Welhener, R. A. Lunceford, & Winckers, issued a technical report and Initial Resource Estimate for the Ana Paula Project and included an initial resource estimate. The resource estimate was based on 130 diamond core drill holes aggregating 67,943 meters and containing 45,512 assay intervals, of which effectively were all assayed for gold and silver.

The estimated resources were based on an internal cut-off of 0.45 g/t gold equivalent (AuEq). The calculation of AuEq includes the gold and silver prices and recoveries presented in Table 6-1.

The Ana Paula deposit was modeled using an inverse distance to the tenth power (ID10) operator applied to 10 m equal length gold and silver composites. Grade estimation was constrained by lithologic domain boundaries. Model blocks were classified as measured, indicated or inferred based on kriging variance, the number of holes inside the search ellipsoid and distance from the closest hole. Tonnages were estimated using density data supplied by Newstrike.

Table 6-1: Input Parameters to Define the 2013 Mineral Resources in Floating Cone Pit Shape

	Process Recovery	Metal Price
Gold Price	85%	$1450/oz.
Silver Price	27.3%	$28/oz.
Costs:		
Process + General and Administrative	$17.27/t	
Mining	$2.05/t, plus $0.02/t per bench below 900 m elevation	
Pit overall slope angles	45 to 55 degrees depending on aspect	

Source: H. E. Welhener, R. A. Lunceford, & Winckers (2013)

The resources were constrained within a floating cone shell. Parameters for the shell assumed that all of the mineralization at Ana Paula occurs in the form of sulphide. The 2013 resource estimate shown in Table 6-2 was the first published estimate for the Ana Paula Project. The 2013 Newstrike resources are no longer current since they have been superseded by the resources presented in Section 14 of this technical report.

Table 6-2: Ana Paula 2013 Historical Resource Estimate

Category	Tonnage & Grades ≥ 0.46 g/t AuEq Cut off			Contained Ounces (000,000's)	
	Mtonnes	Au, g/t	Ag, g/t	Gold	Silver
Measured	18.4	2.21	6.2	1.31	3.7
Indicated	24.6	1.13	7.6	0.89	6.0
Sum M&I	43.0	1.59	7.0	2,20	9.7
Inferred	1.8	0.78	18.7	0.05	1.1

Source: H. E. Welhener, R. A. Lunceford, & Winckers (2013)

6.3.2 2014 Newstrike Resource Estimate

In August 2014, JDS Energy and Mining issued an NI-43-101 Technical Report entitled “Preliminary Economic Assessment on the Ana Paula Project, Guerrero State Mexico” and incorporated an estimate of the mineral resource. The mineral resources used for the study had an effective date of August 8, 2014. The estimated resources were based on an internal cut-off of 0.46 g/t gold equivalent (AuEq) based on the gold and silver prices and recoveries presented in Table 6-3. The AuEq is calculated by adding the gold grade to the silver grade multiplied by a factor of 0.011.

Table 6-3: Input Parameters to Define the 2014 Mineral Resource Open Pit Shell Geometry

	Process Recovery	Metal Price
Gold Price	80%	$1450/oz.
Silver Price	55%	$23/oz.
Costs:		
Process	$15.60/t	
General and Administrative	$1.65/t	
Mining	$1.85/t, plus $0.02/t per bench below 900 m elevation	
Pit overall slope angles	55 degrees on west 45 degrees on all others	

Source: H. E. Welhener, R. A. Lunceford, & Winckers (2014)

The resource estimate was based on 113,535 m of drilling aggregating 85,523 assay intervals in 230 diamond core drill holes aggregating 113,535 m and containing 85,523 assay intervals, of which effectively all were assayed for gold and silver. The resource shown in Table 6-4 was constrained within a resource constraining shell using parameters listed in Table 6-3.

Table 6-4: 2014 Ana Paula Measured, Indicated, and Inferred Historical Resource Estimate

Category	Tonnage & Grades ≥ 0.46 g/t AuEq Cut-off			Contained Ounces (000’s)	
	ktonnes	Au, g/t	Ag, g/t	Gold	Silver
Measured	22,767	1.608	4.9	1,177	3,587
Indicated	18,243	1.163	5.95	682	3,489
Sum M&I	41,010	1.41	5.37	1,859	7,076
Inferred	1,904	1.113	10.85	68	664

Source: JDS (2014)

The 2014 Newstrike resources are no longer current since they have been superseded by the resources presented in Section 14 of this technical report.

6.3.3 2016 Timmins Resource Estimate (in the Preliminary Economic Assessment Study)

The 2014 Preliminary Economic Assessment was updated in 2016 to account for CAPEX changes. The published resource remained unchanged from that presented in Section 6.3.2 and are no longer current since they have been superseded by the resources presented in Section 14 of this technical report.

6.3.4 2017 Alio Gold Mineral Resource Estimate (used in Pre-Feasibility Study)

In June 2017, M3 prepared an NI 43-101 Technical Report for Alio Gold entitled “Ana Paula Project, NI 43-101 Technical Report, Amended Preliminary Feasibility Study, Guerrero, Mexico” that incorporated a revised mineral resource estimate. The mineral resources used for the study had an effective date of May 16, 2017. The estimated resources were based on an internal cut-off of 0.6 g/t Au for material amenable to open pit extraction and a cut-off of 1.65 g/t Au for the material amenable to underground extraction below the resource constraining shell.

Table 6-5: Input Parameters to Define the 2017 Mineral Resources

	Process Recovery	Metal Price
Gold Price	88%	$1350/oz.
Silver Price	30%	$17/oz.
Costs:		
Process	$19.00/t	
General and Administrative	$2.49/t	
Mining OP/UG	$2.25/t / $36.00/t	
Dilution considered for underground cut-off determination	5%	
Pit overall slope angles	49.5 degree	

Source: M3 (2017)

The Mineral Resources were supported by 276 core holes amounting to 123,268 m of drilling containing 86,013 assay intervals. The mineral resource shown in Table 6-6 was constrained within a resource constraining shell using parameters listed in Table 6-5.

Table 6-6: May 2017 Alio Gold Historical Mineral Resource Statement

Area	Category	Cut-off (Au g/t)	Tonnes	Au (g/t)	Gold (ounces)	Ag (g/t)	Silver (ounces)
Resources amenable to open pit extraction	Measured	0.6	7,541,000	2.43	590,000	5.1	1,236,000
	Indicated		10,491,000	1.79	605,000	4.8	1,629,000
	Measured & Indicated		**18,032,000**	**2.06**	**1,195,000**	**4.9**	**2,865,000**
	Inferred*		249,000	1.27	10,000	8.8	70,000
Resources amenable to underground extraction	Measured	1.65	41,000	2.07	2,800	4.3	6,000
	Indicated		2,925,000	2.81	264,000	4.2	398,000
	Measured & Indicated		**2,967,000**	**2.80**	**266,700**	**4.2**	**404,000**
	Inferred*		621,000	2.07	41,400	3.9	79,000
Total Resources	Measured	OP 0.6 and UG 1.65	7,582,000	2.43	592,800	5.1	1,242,000
	Indicated		13,416,000	2.01	869,000	4.7	2,027,000
	Measured & Indicated		**20,998,000**	**2.17**	**1,461,800**	**4.8**	**3,269,000**
	Inferred*		870,000	1.84	51,400	5.3	149,000

Source: M3 (2017)

The 2017 Alio Gold mineral resources are no longer current since they have been superseded by the resources presented in Section 14 of this technical report.

6.3.5 Previous Production

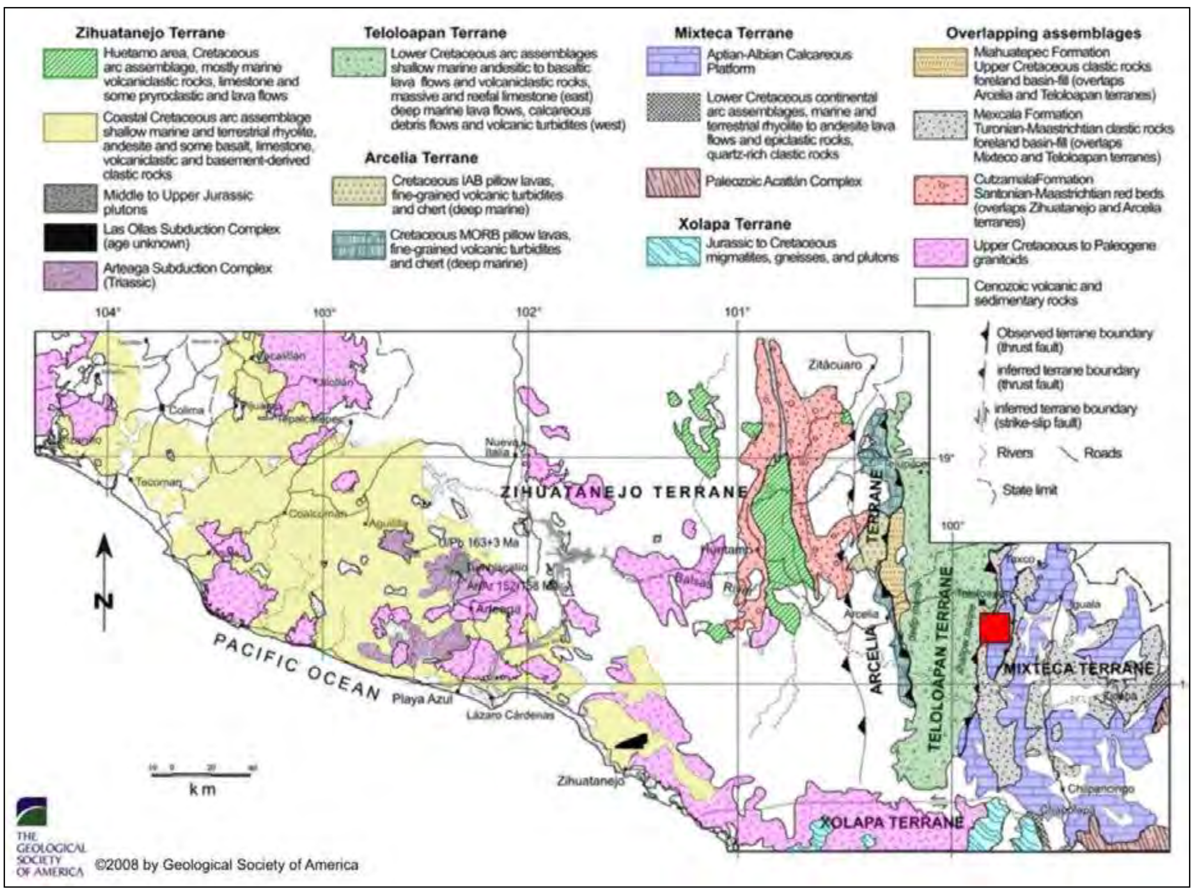
No significant production occurred on the Project site. Some small-scale artisanal extraction took place during the period between 1950–1980.

7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 TECTONIC SETTING

Southern Mexico is underlain by a basement stratigraphy that includes the greenschist facies Early Jurassic Tierra Caliente Metamorphic Complex. This mega-terrane includes two major sub-terranes in the Project area, the Mixteca Terrane comprising the Morelos-Guerrero Platform sediments as a sub-terrane (Platform), and the Guerrero-Composite Terrane, which includes submarine arc rocks of the Teloloapan Sub-terrane (Teloloapan). The eastern boundary of the Teloloapan sub-terrane is in contact with the western Platform Sub-terrane, as shown in Figure 7-1.

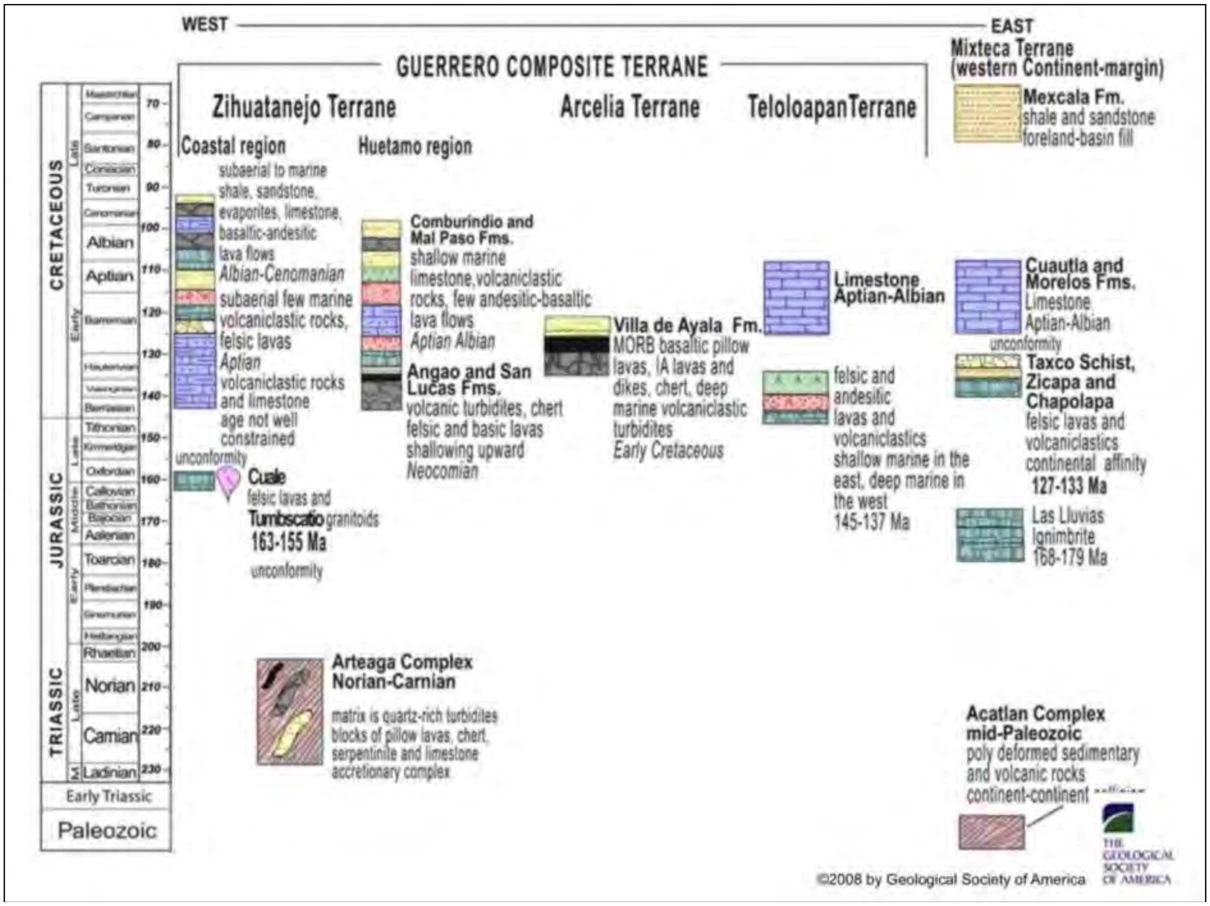
A discussion of the nature of the contact between the two sub-terranes is not within the scope of this technical report; however, both are thought to have been highly deformed during Laramide Compressional Orogeny (Laramide) and share a common basement in the Guerrero terrane based on $^{206}Pb/^{204}Pb$ versus $^{87}Sr/^{86}Sr$ isotopic studies (Valencia and Ruiz, 2008). A series of intrusions and sub-volcanic rocks were emplaced during or following this orogenic event along a northwesterly trend. The intrusions are interpreted to share a common provenance in a deep seated plutonic body derived from a mixing of two possible magma sources: a depleted mantle and an enriched crust (Valencia and Ruiz, 2008). A trace element study completed in 2003 proposed the pluton formed within a post collision tectonic framework of a volcanic arc related to the interaction between the Farallon and North America plates (Gonzalez-Partida et al, 2003, 2004).



Source: Alio Gold (2017) modified from GSA (2008)

Figure 7-1: Geologic Map of Southwestern Mexico

A simplified geology map that shows the Mixteca, Teloloapan, Arcelia, and Zihuatanejo Sub-Terranes. The red square shows the location of the Guerrero Gold Belt within the Tectono-Stratigraphic Terranes of southwestern Mexico, (Alio Gold 2017 modified from 2008 Geological Society of America).



Source: Alio Gold (2017) modified from GSA (2008)

Figure 7-2: Stratigraphic Column; Mixteca Sub-Terrane and Guerrero Composite Terrane

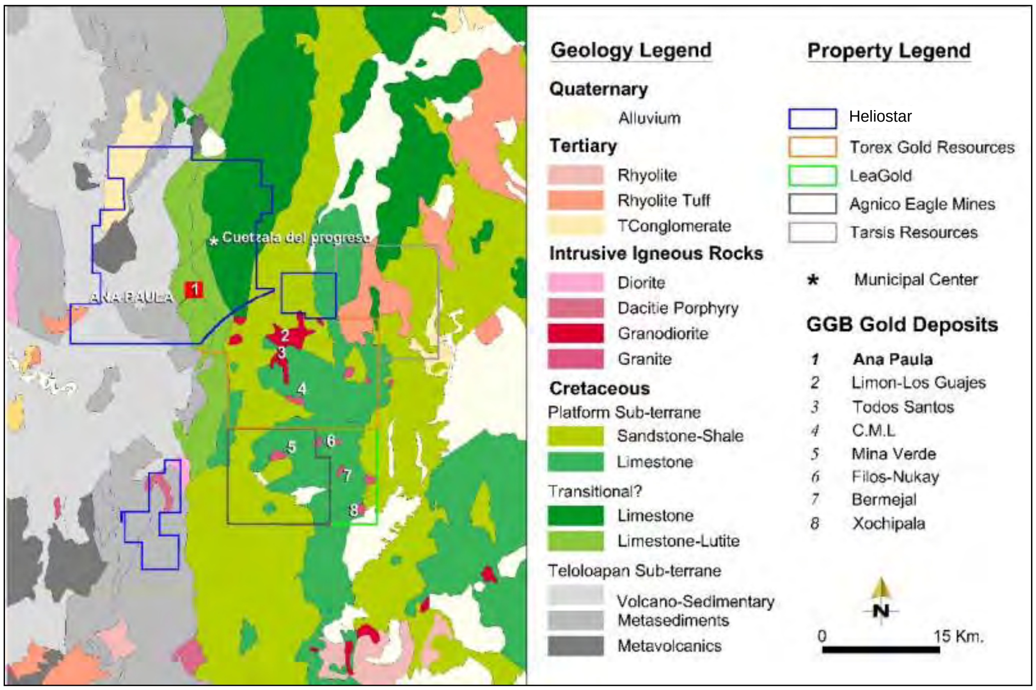
7.2 REGIONAL GEOLOGY

Ana Paula lies along the northwestern extension of the GGB and straddles the proposed tectonic boundary between the Teloloapan and Morelos Guerrero platform sub-terranes, as shown in Figure 7-3. The following discussion of regional geology is reliant on Werre-Keeman et al., 1999; Valencia-Gomez, et al., 2001; Levresse et al., 2004; Centeno-García et al., 2008; and Valencia and Ruiz, 2008.

The regional geology includes stratigraphy belonging to the two proposed tectonic sub-terranes. The stratigraphy of the Teloloapan sub-terrane includes a volcanic-volcaniclastic arc assemblage that overlies a basement schist of the Guerrero composite terrane, both of Upper Jurassic to Lower Cretaceous age. This assemblage is in turn overlain by an undifferentiated limestone, shale, and sandstone sedimentary sequence of Cretaceous age that, on the scale of the Project, forms a North-South trending corridor separating in apparent fault contact the Morelos Guerrero Platform sediments on the east from the Teloloapan volcanic-volcaniclastic belt on the west. The volcanic sequence associated with the Teloloapan sub-terrane is observed to outcrop immediately outside the western boundary of the Ana Paula Project. The stratigraphy attributed to the Morelos Guerrero platform includes a thick carbonate sequence of thick-to-thin-bedded limestone and dolomite overlain by younger thinly bedded flysch-like deposits. Outcrops of this stratigraphic assemblage are observed outside the boundaries of the Ana Paula Project, underlying the eastern portion of the surrounding Aurea Norte Property.

The stratigraphy of both sub-terranes was intruded by at least two intrusive events. The earliest is a ±62-66 million years (Ma) calc-alkali intrusive complex that is related to the Laramide Orogeny and the mineralizing event recognized as the Guerrero Gold Belt. These intrusive bodies are observed to outcrop for at least 55 km through the district on a northwesterly trend. Zirconium $^{206}Pb/^{238}U$ age dating of the intrusions at Ana Paula show they average 66.0-66.8Ma ± 1.8Ma in age, placing them within the same intrusive event as the Filos, Filos Deep and Morelos projects (Valencia-Gomez et al., 2001 and Valencia-Gomez and Ruiz, 2008).

The second intrusive event are ±30Ma calc alkali to alkali volcanic rocks related to the onset of continental volcanism that may be associated with overprinting of an epithermal style mineralization observed within the Project. Quaternary volcanic units and lacustrine sediments outcrop regionally as local eroded remnants that overlie all older stratigraphy.



Source: Alio Gold 2017, modified from 1:250,000 scale Cartas Geológico Minero sheets E14-4; E7-10; E14-5 and E14-8; Mexican Geological Service (SGM), 2000

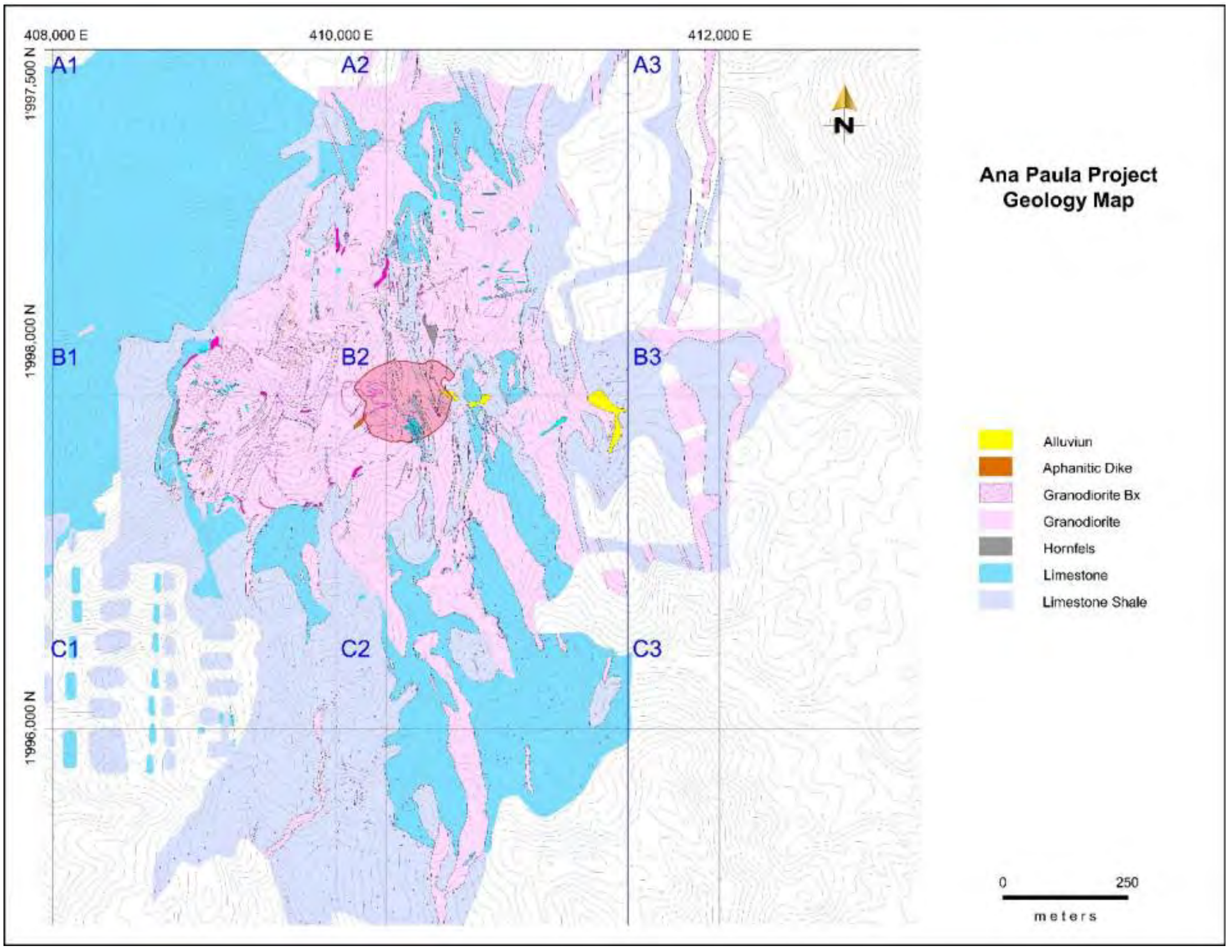
Figure 7-3: Regional Geologic and Property Location Map

7.3 PROJECT GEOLOGY

Much of the geologic information at the Project scale was developed by ProDeMin, contractor to Newstrike Capital. The geologic units underlying the Ana Paula Project are primarily sedimentary rocks composed of an interbedded limestone and shale unit and a carbonaceous limestone unit that have been intruded by intermediate sills, dikes and stocks, as shown in Figure 7-4. A large body of intrusive rocks underlies the Ana Paula deposit as currently defined in quadrants A2, B1, and B2 in Figure 7-4. Six principal geological domains within Ana Paula Deposit have been recognized:

(1) Complex Breccia domain that sits in the core of the main Ana Paula deposit. This domain is a sub-vertical plug elongated in the east-west direction and steeply dipping to the south. (2) Intrusive suite domain is a package of several different intrusive phases that in a general sense appear to be similar in composition and age and host the majority of

the ore grade of the Ana Paula deposit. (3) Monolithic Breccia domain is essentially a brecciated intrusion composed of mostly monolithic fragments in a silica rich matrix with mixed sulphide-oxide mineralogy. It is located in the southern part of the deposit. (4) Sediments domain is characterized by light brown weathering, platy outcrops, with distinct gray and brown limestone beds which range from a few centimeters to as much as 25 cm thick. Also, a massive thin bedded laminated carbonaceous limestone is present in this domain. The sediments domain is located in the eastern part of the deposit. (5) Skarn-Hornfels domain is found in the deeper zones of the deposits and shows a down dip zonation from unaltered sedimentary limestone-shale to skarn-hornfels metamorphic rock. (6) Semi-massive Sulphide domain is localized and narrow, and it develops at the contacts between the skarn-hornfels domain and the intrusive suite domain.



Source: Alio Gold (2017)

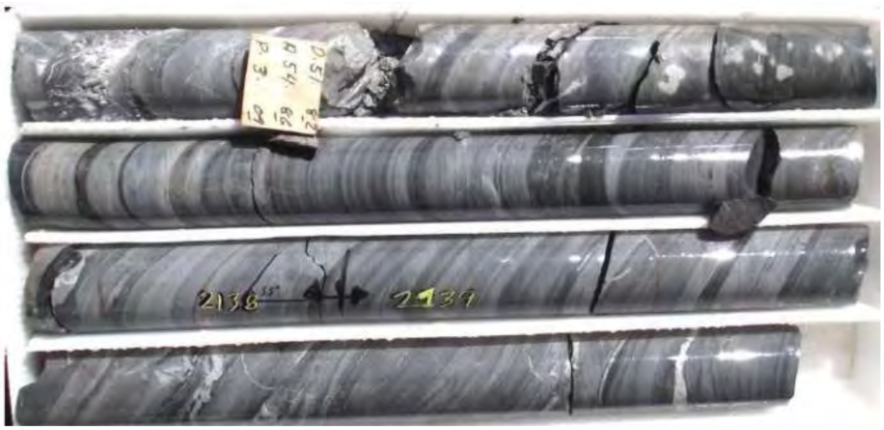
Figure 7-4: Ana Paula Project Geology Map

7.3.1 Sedimentary Rocks

Geologic mapping by ProDeMin completed during 2010 to 2013 has shown that the sedimentary rocks underlying the Ana Paula deposit are dominantly carbonaceous limestone within a more regionally extensive unit of interbedded limestone, shale and sandstone. These sedimentary rocks generally strike northerly and dip westerly and are distinct from the Morelos platform sediments, which lie outside of the eastern Project boundary, and from the volcaniclastic sediments of the Teloloapan Sub-terrane which lie to the west.

7.3.1.1 Limestone-Shale (LS-SH)

A unit of Inter-bedded shale and limestone surrounds the deposit area. This unit is characterized by light brown weathering, platy outcrops, with distinct gray and brown limestone beds ranging from a few centimeters to as much as 25 centimeters thick. Sandstone layers may be present in this unit, Figure 7-5.

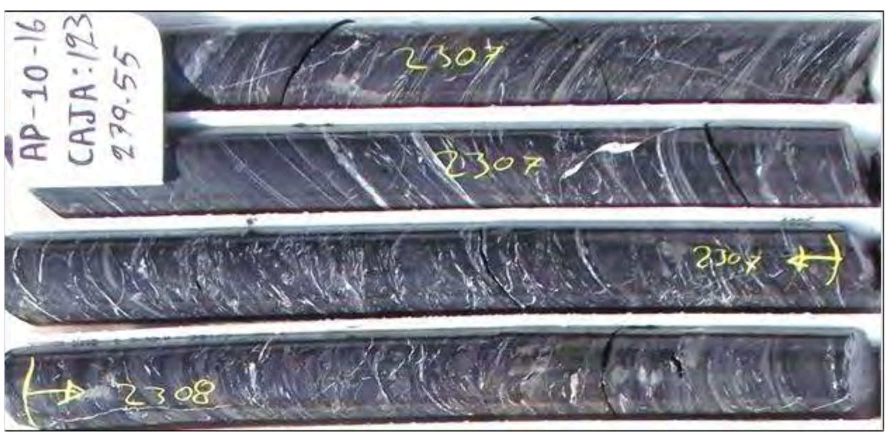


Source: Alio Gold (2017). Drill hole AP-10-16 from 52.44 - 59.15 m; no significant assay.

Figure 7-5: Limestone-Shale Unit

7.3.1.2 Carbonaceous Limestone (LS)

Massive to thin-bedded, fine- to medium-laminated carbonaceous limestone is present in the area of the main Ana Paula deposit where it is the dominant sedimentary lithology. In drill core the unit locally presents a phyllitic to schistose deformation that varies from strongly carbonaceous to locally graphitic. This unit is known to include local pockets of breccia, stockwork or contact replacement mineralization but is generally not mineralized, Figure 7-6.



Source: Alio Gold (2017). Drill hole AP-10-16 from 272.78 - 279.55 m; no significant assay.

Figure 7-6: Carbonaceous Limestone Unit

7.3.2 Intrusive Domain

Intrusive phases within this domain include a series of dikes and/or sills that coalesce to form a stock-like body that has been drilled over an area approximately 1.2 km by 1.2 km. Rafts or slivers of limestone-shale and hornfels intersected in drill core do not necessarily outcrop at surface. Several intrusive phases are observed in drill core that are essentially similar to those of the sediment intrusive domain. The main intrusive phase is a plagioclase-biotite porphyry, locally with small amounts (< 1%) partly resorbed quartz, in a fine-grained groundmass. Samples studied to date have pervasively altered groundmass so the original composition could not be determined. Amphibole is also reported as phenocrysts. Plagioclase phenocrysts are commonly large, as much as 5-7 mm in largest dimension, but a wide range of grain sizes and phenocryst percentages is observed. Intrusive contacts between fine and coarse phases have been observed, mainly in core, but have not been mapped or traced over appreciable distances. In addition, several different phases are observed, including a fine-grained intrusive phase that commonly exhibits apparent flow banding, and locally resembles a stratified unit such as a tuff (Figure 7-8). Another phase that appears unique to this domain is a dense, silicified intrusive breccia unit that is host to a consistent low-grade mineralization (Figure 7-9).

Observed minerals in this domain include primarily pyrite and arsenopyrite, with traces of pyrrhotite, sphalerite, and native gold and/or gold tellurides. Magnetite, galena, stibnite, realgar and bismuthinite are observed rarely. Chalcopyrite and bornite are identified in thin section.

Source: Alio Gold (2017). Drill hole AP-12-90 from 239.28 - 245.80 m; no significant assay.

Figure 7-7: Plagioclase-Biotite Porphyry

Source: Alio Gold (2017). Drill hole AP-11-56 from 220.71 – 223.5 m; no significant assay.

Figure 7-8: Banded Fine Grained Intrusive Phase, Intrusive Domain

Source: Alio Gold (2017). Drill hole AP-12-93: Sample 34437 with 0.344 g/t Au from 235-236.0 m
Sample 34438 with 0.386 g/t Au from 236.0-237.15 m
Sample 34439 with 0.367 g/t Au from 237.15-238.5 m.

Figure 7-9: Intrusive Breccia Phase, Intrusive Domain (Tejocote)

7.3.3 Metamorphic Rocks

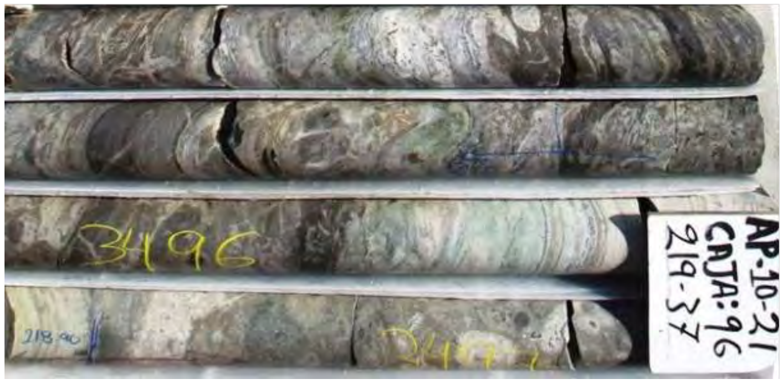
7.3.3.1 Hornfels-Skarn

The sediments are locally metamorphosed to hornfels and skarn (Figure 7-10 and Figure 7-11), occurring frequently as narrow contact replacement of the sediment-intrusive contacts. More regional scale hornfels crops out to the northeast of the Project area and is encountered in most drill holes at increasing depth to the southwest. The altered rock is often transitional and termed hornfels where individual mineral grains are not recognizable and termed skarn where they are coarser, and garnet and pyroxene become visually identifiable at a macroscopic scale. Skarn tends to be more common at depth to the southwest.

The mineralogy is composed of calc-silicate minerals (garnet, wollastonite, tremolite-actinolite, diopside, and idocrase) and is termed "silication", and is generally not silicification (Gibson, 2012). They are both a common host to replacement disseminated to massive sulphides (arsenopyrite + pyrite/marcasite ± pyrrhotite) mineralization that can contain high gold grades over narrow intervals (Figure 7-12 and Figure 7-13).

Source: Alio Gold (2017). Drill hole AP-12-90: Sample 34690 with 0.767 g/t Au from 632.0-633.5 m
Sample 34691 with 0.364 g/t Au from 633.5-635.0 m.

Figure 7-10: Metamorphic Alteration to Hornfels

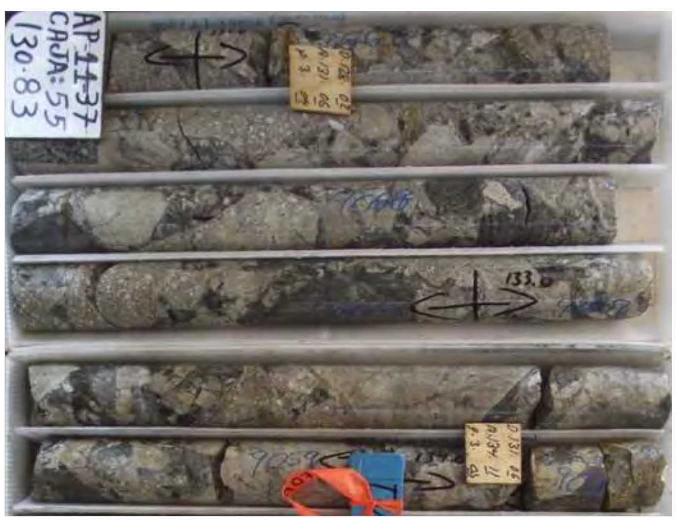


Source: Alio Gold (2017). Drill hole AP-10-21 from 212.61-219.37 m; no significant assay.

Figure 7-11: Metamorphic Alteration in Sediment to Skarn

Source: Alio Gold (2017). Drill hole AP-12-111: Sample 46830 with 13.6 g/t Au, 40.3 g/t Ag from 98.17-99.00 m
Sample 46831 with 11.45 g/t Au, 67.4 g/t Ag from 99.0-99.88 m
Sample 46832 with 9.8g/t Au, 42.4 g/t Ag from 99.88-100.68 m

Figure 7-12: Contact Replacement Mineralization in Hornfels



Source: Alio Gold (2017). Late arsenopyrite, pyrite and gold in massive sulphide replacement in multilithic breccia in drill hole AP-11-37.
Sample 9068 with 16.35 g/t Au,15.8 g/t Ag from 131.0-133.0 m
Sample 9069 with 28.0 g/t Au and 27.4 g/t Ag from 133.0-134.0 m

Figure 7-13: Contact Replacement Mineralization in Intrusion

7.3.4 Breccias

Several breccia types were identified upon review of the Ana Paula Project geology of the Project during the audit conducted in 2010 and were deemed to be important for the geological model and were added to the logging nomenclature. These consist of multi-lithic breccias that commonly occur at the contacts of intrusive rocks and sedimentary rocks, as well as monolithic breccias within intrusive rocks. Breccia nomenclature was designed to be descriptive of the style and location and not interpretive as to the origin (Gibson, 2012). Two large discrete breccia bodies with important gold mineralization were identified during the Ana Paula exploration program, the complex breccia that hosts high-grade gold mineralization and the monolithic breccia that contains lower grade gold mineralization. These two breccias occur close to each other but do not appear to be spatially connected and are currently interpreted as separate entities in the Ana Paula deposit. For that reason, they are logged as distinct lithologies.

7.3.4.1 Complex Breccia

The Complex Breccia, also referred to as the High Grade Breccia, consists of a core of multi-lithic breccia (Figure 7-14) in a steeply south-plunging column surrounded by a HALO of mineralization and alteration characterized by veins, fracture zones, and massive sulphide contact replacements in country rock that includes limestone, hornfels and intrusive rocks along with other breccia. The breccia core and the surrounding alteration have the same sulphide assemblage as matrix filling, replacements of the breccia fragments, as well as vein filling in stockwork mineralization in the surrounding altered wallrock. Late quartz and quartz-carbonate veins crosscut the entire unit and may represent a late or a second mineral event.

This breccia, Figure 7-14, consists of angular to rounded plagioclase-biotite porphyry and angular fragments of hornfels, limestone, shale and other very fine-grained to aphanitic fragments range from less than a centimeter to over 10 cm in size. Brecciation appears to be relatively high energy but non-dynamic, exhibiting strong fracturing and angular fragmentation (locally crackle) and no obvious fault features such as gouge. Rock fragments are variably cemented within a matrix of silica (locally chalcedonic) and sulphide minerals (mostly arsenopyrite and pyrite/marcasite). In some areas, the matrix appears to be finely ground rock or intrusive material; the latter may be more prevalent with the deeper drill intersections.

The breccia core occurs near a change in orientation or jogs in the stratigraphic and structural fabric of the surrounding sediment-intrusive domain and is interpreted as being partly controlled by the intersection of at least two planar structures, forming a steeply plunging body that obliquely crosses the main structural grain (Gibson, 2012). The Breccia Zone comes to surface around UTM grid line 1998050 mN at the center of the pit and extends at least 700 m vertically from surface where it remains open at depth. Insufficient drilling has been completed to fully delineate the breccia at depth. The complex breccia core is irregular in its dimensions, average width is about 55 m – 80 m, and plunges southerly. The breccia core appears to be tapering at depth; however, this could be due to lack of drilling.

The alteration HALO surrounding the lithologic breccia extends laterally between 100 m to 180 m from the breccia core, is also irregular in shape and is hosted within the altered limestone and intrusions. The orientation of the mineralized HALO is dominantly controlled by the steeply dipping structural intersection of the breccia core, and partly controlled by existing stratigraphy and structures, especially along contacts. Grades in the mineralized HALO typically decrease away from the high-grade core breccia unit.

7.3.4.2 Monolithic Breccia

This breccia (Figure 7-15) has a dense siliceous matrix with locally abundant sulphide minerals, mainly pyrite/marcasite and arsenopyrite, and these minerals are observed to rim or react with the breccia clasts. Fragments may be angular or rounded and there may be evidence of rock flour and brittle fracturing. Hydrothermal brecciation can occur in all rock types but is dominantly observed in intrusive rocks and is locally observed to re-brecciate the Complex breccia.

The breccia may be part autobreccia developed during intrusion emplacement and crackle breccia is locally dominant (Gibson, 2012). The alteration style is distinct from the rest of the mineralization at Ana Paula with strong clay alteration and local advanced argillic mineralogy. This breccia zone requires further delineation as mineralization remains open.

Source: Alio Gold (2017). Plagioclase-biotite porphyry and hornfels fragments in a matrix that is partly silica rich, partly intrusive rich in drill hole AP-11-70 (Lunceford, 2012).
Sample 22236 with 18.44 g/t Au, 22.4 g/t Ag from 688.0-689.5 m
Sample 22237 with 2.03 g/t Au, 11.2 g/t Ag from 689.5-691.0 m

Figure 7-14: Complex Breccia

Source: Alio Gold (2017). Drill hole AP-12-53: Sample 12589 with 1.22 g/t Au, 38.1 g/t Ag from 82.5-84.0 m
Sample 12590 with 2.31 g/t Au, 27.9 g/t Ag from 84.0-85.5 m
Sample 12591 with 2.10 g/t Au, 19.2g/t Ag from 85.5-87.0 m.

Figure 7-15: Monolithic Breccia

7.3.5 Mineralization

At least two, and possibly three, mineralizing events are observed at the scale of the property, but the relationships and timing of these events is not currently known.

7.3.5.1 Mineral Deposition

In general, four gold depositional sites are recognized at Ana Paula (Gibson, 2012):

1. Quartz-sulphide and quartz-carbonate-sulphide veinlets, stockworks with sulphide clots and disseminations in both intrusions and hornfels.

2. Narrow semi-massive sulphide contact replacement of limestone or hornfels/skarn at the intrusion contacts.
3. Sulphide clots, rims and masses in narrow contact breccias hosted in intrusions at or near the sedimentary contacts and/or fault contacts.
4. Mineralization associated with a sulphide constituent within breccia matrix and with sulphide replacement textures within structurally controlled breccia formed oblique to the dominant northerly trending westerly dipping stratigraphy.

Mineralization at Ana Paula occurred during at least two different events or stages. The first event is characterized by gold-arsenic-(bismuth-tellurium), (or Au-As-(Bi-Te)), where mineralization is associated with intermediate intrusions emplaced into limestone. The second event locally cuts the first and is characterized by gold-silver-lead-zinc-mercury-antimony (or "Au-Ag-Pb-Zn-Hg-Sb"), containing locally zoned coarse sphalerite. There are also various quartz-calcite veins with epithermal textures, but the relative timing of these veins remains unclear.

7.3.6 Structures

The boundary between the Teloloapan and Platform terranes underlies the Ana Paula and surrounding mineral concessions. Medina (2010) described the contact zone as characterized by intense deformation and faulting, and placed the boundary on the eastern margin of the Ana Paula Project where it is interpreted as a north-striking left-lateral fault. Detailed structural work to verify this interpretation is currently underway.

Several structural observations may be important (Gibson, 2012).

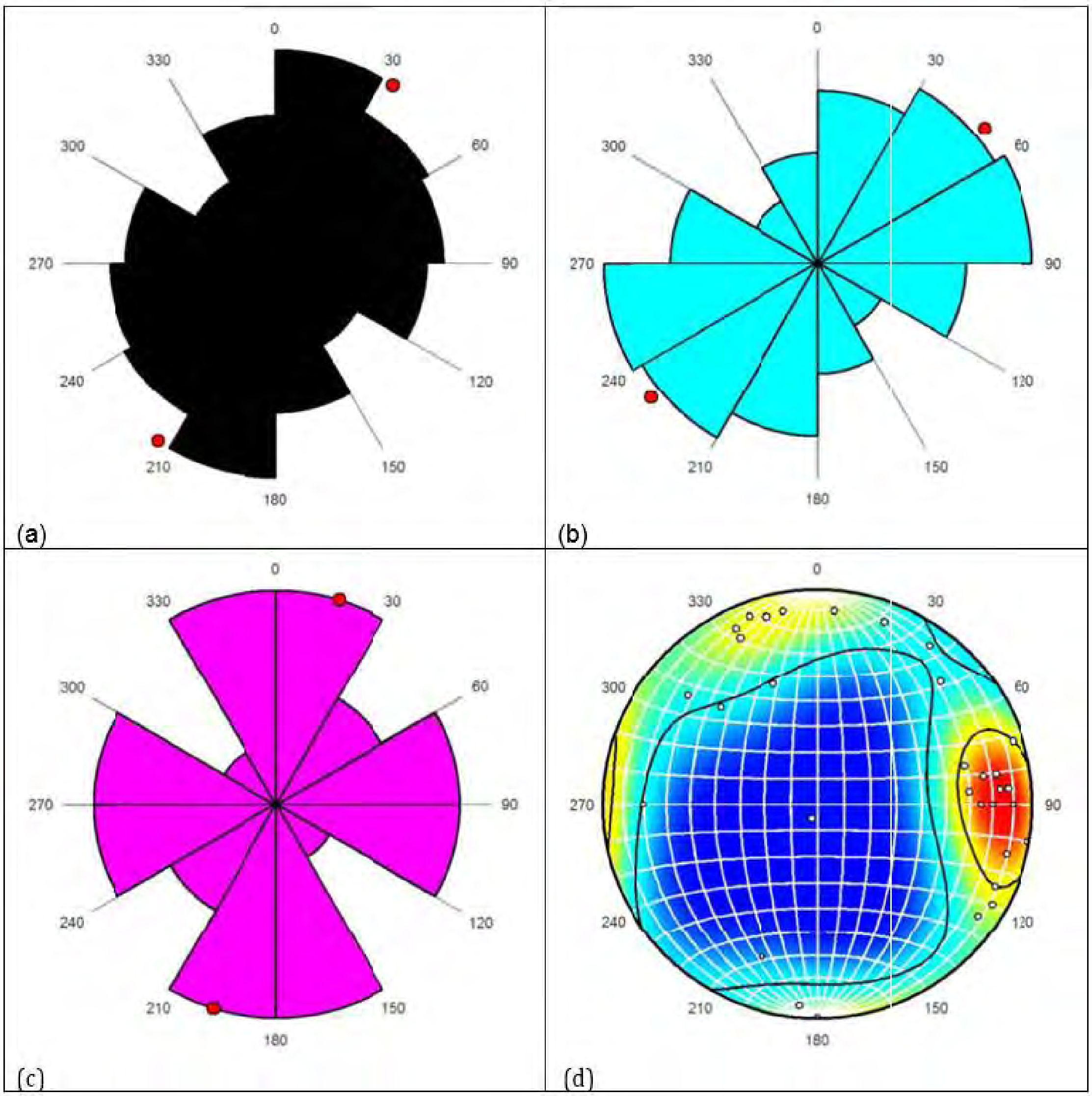
1. Sedimentary rocks strike north to north-northwest with westerly dips of 45º to 75º.
2. Intrusive contacts are generally parallel to bedding in the sedimentary rocks.
3. Most of the structures observed at the surface in the area of drilling consist of folds in sedimentary rocks that are surrounded by intrusive rock.
4. Apparently minor faults are common at low angles to the bedding, in many cases located along contacts between sedimentary and intrusive rocks.
5. Larger-scale faults are not observed at surface nor have they been intersected in core, other than the faults commonly seen at and parallel to sedimentary-intrusive contacts.
6. Larger northeast and easterly trending structures (breccia, veins) are observed northeast of the main Ana Paula mineralization.

A structural orientation analysis of veinlets and mineralized contacts was undertaken by collecting structural information at the site of mineralized outcrop chip samples (n, being the number of observations) that revealed patterns described in the following (Johnson, 2014). All measurements are in azimuth and use the right hand rule for dips.

1. A rose diagram of the strikes of all veinlets (n=812) show that there are more veinlets in the NE and SW quadrants of the Project area than in the NW and SE quadrants (Section 9.0, Figure 9-1), with maximum frequency in the (diametrically opposite) ranges 000°-030° and 180°-210° (Figure 7-16a). Only a few veinlets strike in the minimum-frequency ranges 120°-150° and 300°-330°. Veinlets that carry anomalous gold (>200 parts per billion [ppb]) show well-defined north easterly strikes and near-vertical dips. This includes everything in the range 200 ppb to 5000 ppb Au. In contrast, veinlets and mineralized contacts at sample sites that returned assays of more than 5000 ppb Au mostly strike north-south and dip steeply west.
2. A rose diagram of all sampled veinlets with anomalous gold (n=318) shows a well-defined NE-SW strike maximum (Figure 7-16b), and the data have a statistical mean orientation of 231°, 88°. The NE-SW strike is

especially prominent in the range 750 to 5000 ppb Au, as shown by a more-detailed analysis not illustrated here.

3. For samples with >5000 ppb Au (n=32), a rose diagram shows a generally N-S strike maximum and a slightly weaker E-W spike (Figure 7-16c).
4. A spherical projection of poles to the 32 veinlets and mineralized contacts in this category shows a prominent point maximum corresponding to a strike and dip of 178°, 75° (Figure 7-16d). This steep westerly dip is similar to the orientation of most contacts between the sedimentary rocks and intrusions and of bedding in the sedimentary units, suggesting that the highest-grade gold is controlled by contacts and layering. The second, weaker cluster of poles corresponds to a strike and dip of approximately 080°, 85°.



Source: Alio Gold (2017)

(a) Rose diagram showing the strikes of all veinlets (n=812) at sites of surface rock-chip samples in the Ana Paula and Tejocote areas; (b) Rose diagram of all sampled veinlets with anomalous gold (n=318); (c) Rose diagram of sampled veinlets with >5000 ppb gold (n=32), and; (d) Equal-area spherical projection of poles to sampled veinlets with >5000 ppb gold (n=32). All diagrams in this section were produced using Orient 2.1.2 software (Vollmer, 2012).

Figure 7-16: Structural Assessments of Mineralized Veins

7.3.7 Alteration

All lithology's underlying the Project exhibit some degree of alteration. A study undertaken by Mauler and Thompson (2005) on a suite of specimens submitted in 2005 identified skarn alteration that is patchy, selective, and comprised aggregates of garnet, calcite-hematite replacing K-feldspar and muscovite, or chlorite or clay replacing biotite and commonly fracture controlled calcite. They also describe a main alteration phase within intrusive rocks that includes replacement of plagioclase phenocrysts and matrix K-feldspar by carbonate and minor sericite. Biotite phenocrysts are altered to carbonate ± chlorite ± pyrite ± titanite with minor muscovite, clay and rutile. Mauler and Thompson (2005) concluded that corrosion of quartz phenocrysts and hornblende rims suggest a compositional imbalance of the system during crystallization, possibly caused by assimilation or contamination of the host rocks and/or by a flow of magma (magma mixing). Furthermore, they conclude that the high titanium oxide content in biotite suggests a basic source of magma, suggesting the granitoid rocks originated in a Type-I arc environment. The composition of the samples submitted for the 2005 study is meta-aluminous, calc-alkaline and is high in potassium. Silica varies from 58-65%, placing the magma as diorite to granodiorite in composition.

Thirty four mineralized samples were collected from drill core that were submitted to Vancouver Petrographics Ltd. of Langley, BC, Canada for petrographic study in 2012. The samples were selected to determine the alteration and mineral associations for each rock type submitted. A representative selection of results is presented in Table 7-1.

The intrusion samples display various alteration, mineralogy and textural characteristics. Within the intrusive domain quartz-sericite alteration tends to highlight the porphyritic texture of intrusive rocks (bleaching); and argillic alteration, represented by feldspar phenocrysts altered to clay, locally swelling clay, appears to overprint other alteration types. Vancouver Petrographics also identified free gold in polished section where gold was precipitated on the boundary between euhedral arsenopyrite and the silica matrix. This agrees with early work by Thompson (2008), who determined that gold is associated with arsenopyrite as free grains on or around the grains of arsenopyrite (Figure 7-17).

Within the monolithic breccia, strong argillic alteration is observed with some petrological evidence for advanced argillic alteration present in the finer grained intrusive units (Colombo, 2012). Staining of these samples highlighted the presence of abundant potassium-bearing minerals; however, the very fine-grained nature of the groundmass/ matrix hampered the identification of the minerals and some doubts remained between K-feldspar and illite in some of the samples. Short wave infrared (SWIR) spectroscopy was used to verify this fine-grained assemblage, and the results are highlighted in Table 7-2. The analysis was carried out with a Terraspec 4 at the Mineral Deposit Research Unit (MDRU), Department of Earth and Oceanic Sciences – University of British Columbia, Vancouver. The interpretation of the SWIR-reflectance spectroscopy was conducted by Colombo (2012) with dedicated software (Specmin-ASD).

Table 7-1: Selected Petrology Results

DRILL HOLE	METERS	LITHO	CODE	V.P. NO.	SI	DESCRIPTION
AP-11-37	121.3	BX1	62	9	0. 452 x 10 -3	Gold-bearing adularia-quartz-calcite-arsenopyrite hydraulic breccia Fragments of intensely altered (adularia-clay-white mica) plagioclase- phyric andesitic(?) rock
AP-11-37	180.9	BX1	62	33	0. 466 x 10 -3	Strongly altered (clay-white mica) plagioclase-phyric andesitic rock Arsenopyrite- quartz-adularia breccia
AP-10-19	153.15	GD	20	31A, B	0. 597 x 10 -3	Strongly altered [K-feldspar(?)-calcite-clay] quartz-plagioclase-phyric felsitic rock. Calcite-pyrite-arsenopyrite vein.
AP-10-19	153.8	GD	20	29	0. 666 x 10 -3	Brecciated arsenopyrite-pyrite-chalcopyrite-bornite replacement zone Calcite vein
AP-10-20	207.94	GD	20	5A	0. 595 x 10 -3	Strongly altered (clay-calcite±quartz?) plagioclase-phyric andesite, Quartz veinlets. Calcite-pyrite-arsenopyrite±quartz veins
AP-11-37	67.2	GDBD	22	11A	0. 505 x 10 -3	Strongly altered (clay-white mica) plagioclase-phyric andesite (Domain A)
AP-11-37	448.72	GDBX	21	10A	0. 602 x 10 -3	Strongly altered (chlorite-calcite-clay) biotite-plagioclase-phyric andesite
AP-11-37	448.72	GDBX	21	10B	0. 626 x 10 -3	Calcite±adularia±pyrrhotite±chalcopyrite±galena veins
AP-11-37	317.3	HFL	41	12	0. 573 x 10 -3	Clay-calcite/dolomite-epidote-andalusite schist. Calcite-epidote-andalusite-garnet vein
AP-11-76	611.75	SK	40	24	0. 594 x 10 -3	Calcite-clay-grossular granofels
AP-11-36	78.75	BXH	61	8	0. 572 x 10 -3	Quartz-pyrite-arsenopyrite-rutile hydraulic breccia Fragments of: intensely altered (clay- white mica/illite?) plagioclase phyric andesitic rock?
AP-11-53	111.73	BXH	61	17	0. 503 x 10 -3	Pyrite-quartz-arsenopyrite hydraulic breccia Strongly altered (quartz-clay) plagioclase- phyric andesitic(?) rock
AP-10-22	96.91	GD	20	32A	0. 527 x 10 -3	Calcite-pyrite-sphalerite-chalcocite hydraulic breccia
AP-10-22	43.62	GDBD	22	7	0. 702 x 10 -3	Clay-quartz-dolomite/calcite-pyrite-arsenopyrite-adularia replacement zone
AP-11-53	183.7	GDBD	22	18	0. 457 x 10 -3	Strongly altered (quartz-clay-calcite) plagioclase-phyric andesitic rock
AP-11-65	306.64	BXML	60	20A	0. 536 x 10 -3	Strongly altered (clay-white mica-clay) intrusive polymict breccia
AP-11-67	66.1	BXML	60	26	NA	Strongly to intensely altered (calcite-adularia-quartz) intrusive (?) breccia Fragments of intensely altered grossular-bearing granofels
AP-10-13	306.73	GD	20	1	0. 717 x 10 -3	Strongly altered (clay-chlorite-amphibole-quartz-titanite-calcite-pyrite) plagioclase-phyric andesite
AP-10-14	294.05	GD	20	3	0. 502 x 10 -3	Strongly altered (clay-white mica-calcite-chlorite-quartz) plagioclase- phyric andesite Calcite-arsenopyrite-quartz vein Pyrite-calcite vein
AP-10-15	195.17	GD	20	28A	0. 598 x 10 -3	Calcite-sphalerite-pyrite-quartz-white mica replacement domain
AP-10-16	102	GD	20	34	0. 508 x 10 -	Strongly altered (clay-white mica-calcite-K-feldspar?) plagioclase-phyric andesitic rock Calcite-arsenopyrite-quartz-pyrite vein
AP-11-39	67.8	GD	20	13	0. 611 x 10 -3	Weakly to moderately altered (clay-quartz-calcite-chlorite) plagioclase- phyric andesite
AP-11-65	250.54	GD	20	21	0. 634 x 10 -3	Strongly altered (clay-white mica-quartz) plagioclase-phyric andesite
AP-10-21	169.78	GDBX	21	6	0. 500 x 10 -3	Clay-calcite-quartz-pyrite replacement zone
AP-11-65	101.54	GDBX	21	19A	0. 502 x 10 -3	Polymict breccia. Strongly altered (clay-calcite-white mica) plagioclase-phyric andesitic
AP-10-12	76	SK	40	25	0. 459 x 10 -3	Quartz-pyrite-arsenopyrite-calcite-adularia replacement zone
AP-11-67	607.7	SK	40	27	0. 673 x 10 -3	Garnet-calcite-quartz layered granofels

Source: Alio Gold (2017)

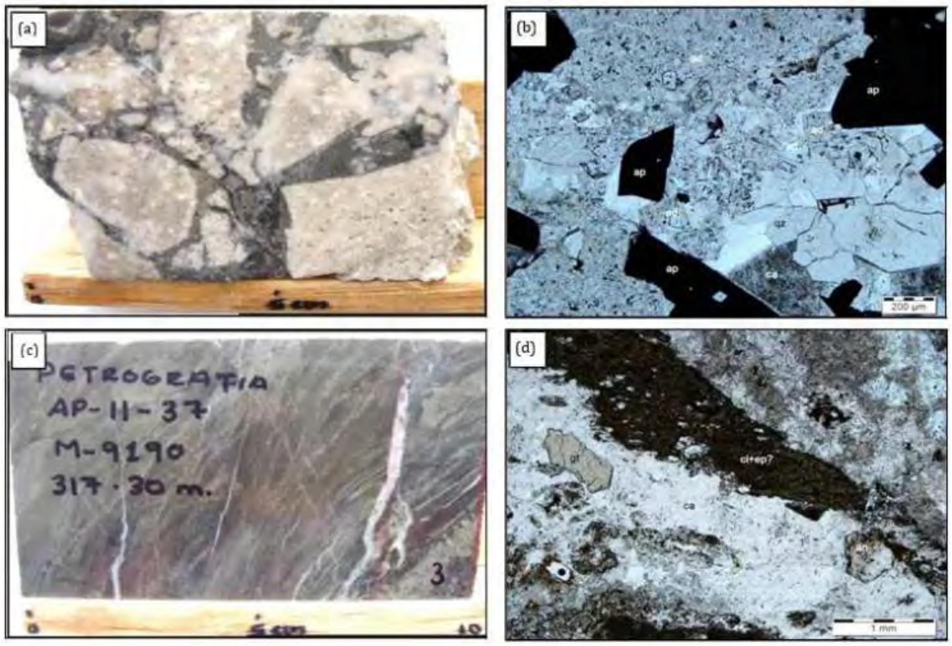
Table 7-2: Summary of the Mineral Analysis with SWIR-Spectroscopy

V.P. No	Mineral 1	Mineral 2	Mineral 3	Mineral 4
1	Illite	Actinolite	Calcite	Chlorite
2a	Illite	Kaolinite	Muscovite	Chlorite
3	Illite	Muscovite	Chlorite	Calcite
5a	Illite	Kaolinite	Calcite	Chlorite
6	Illite	Kaolinite	Calcite	
7	Illite	Dickite?		
8	Kaolinite	Illite/Smectite		
9	Illite	Dickite?	Calcite	
10a	Chlorite	Calcite	Illite/Smectite?	
11a	Illite	Smectite	Muscovite	
14	Kaolinite	Illite/Smectite	Muscovite	
15a	Illite	Kaolinite/Dickite, Calcite?		
16	Illite	Kaolinite/Dickite		
17a	Illite	Kaolinite		
18	Kaolinite/Dickite	Illite?		

Source: Alio Gold (2017)

In some of the samples, the alteration paragenesis indicated low-sulfidation epithermal conditions. In one case, the gold mineralization was associated with the alteration within a gold-bearing adularia-quartz-calcite arsenopyrite hydraulic breccia (AP-11-37, 121.30 m) (Figure 7-17(a) and (b) and Table 7-1). In another sample, a contact metamorphic assemblage was characterized by calcite-epidote-andalusite-garnet (AP-11-37, 317.30 m) (Figure 7-17(c) and (d) and Table 7-1). In some cases, the alteration was overprinted by adularia-bearing assemblages (adularia-calcite-quartz±pyrite±arsenopyrite). In one of the samples affected by this alteration, gold was spatially associated with arsenopyrite which in most of its occurrences tends to replace pre-existing pyrite, Figure 7-18.

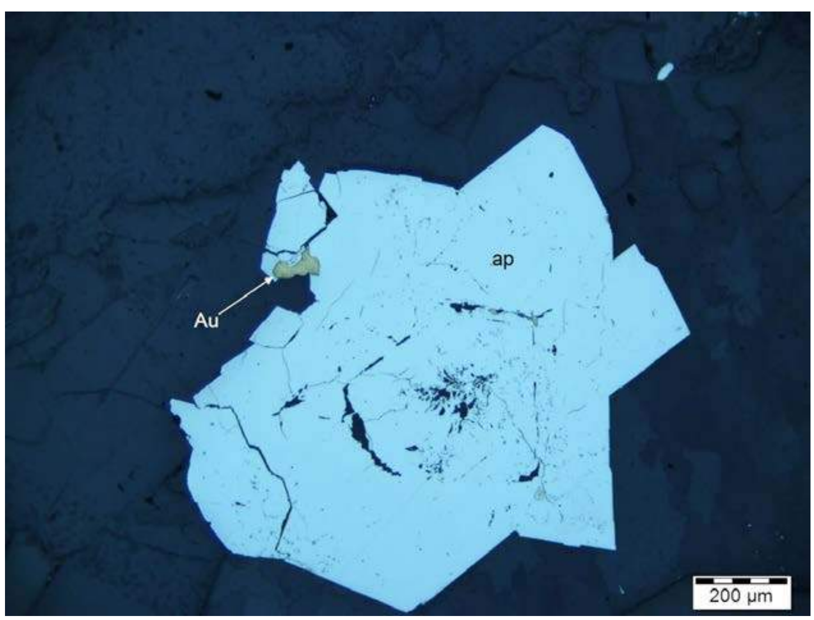
Colombo (2012) observed that it seems evident that the mineralization is associated with hydraulic brecciation, intense alteration, and precipitation of pyrite and arsenopyrite. The sulphide deposition is typically accompanied by a strong alteration (clay-calcite±quartz) which selectively replaces plagioclase phenocrysts within the plagioclase-phyric intermediate rock. White mica and clay replaced the biotite, which in some rare cases was observed as relict within the less intensely altered samples. The groundmass was intensely replaced by illite±kaolinite±smectites±calcite±quartz.



Source: Alio Gold (2017)

(a) High grade breccia longitudinal split core hand specimen, AP-11-37, 121.30 m, 18.6 g/t Au and 17.5 g/t Ag, Sample #9063; (b) Photomicrograph of (a) shows the contact between the intensely altered rock fragment and the quartz-calcite-arsenopyrite infill (qz, ca, and ap) is populated by rhombic adularia (ad). Plane polarized transmitted light; (c) Hornfels, AP-11-37, 317.30 m, longitudinal split core hand specimen; 0.192 g/t Au, 0.2 g/t Ag, Sample #9190; and; (d) Photomicrograph of (c) shows clay-epidote(?)-rich septa occurs within the calcite-rich vein (ca) which crosscuts the clay-rich schist and hosts andalusite (an) and garnet (gt) crystals. Plane polarized transmitted light.

Figure 7-17: Petrographic Sections



Source: Alio Gold (2017)
Plane polarized reflected light. Photomicrograph 9b, Colombo, 2012.

Figure 7-18: Gold Grain (Au) Located Between Euhedral Arsenopyrite (ap) and Quartz

8 DEPOSIT TYPES

Numerous gold deposits are located in present or ancient subduction zones of plate boundaries. Gold deposit types associated with convergent plate boundaries include: Au porphyry, sediment hosted, intrusion related, epithermal, and orogenic gold deposits.

Orogenic deposits are characterized by a strong structural control of the gold deposits and orebodies at all scales. Veins in the orogenic gold deposits are dominated by quartz with subsidiary carbonate and sulphide minerals. Gold occurs in the veins and in adjacent wallrocks and is usually intimately associated with sulphide minerals, including pyrite, pyrrhotite chalcopyrite, galena, sphalerite, and arsenopyrite. In greenschist and amphibolite grade host rocks, pyrite and pyrrhotite are the most common sulphide minerals while arsenopyrite is the predominant sulphide mineral in ores hosted by sedimentary rocks.

The orogenic deposit model for gold mineralization in the Guerrero Gold Belt (GGB) is considered to be associated with a Pacific Rim style of mineralization as described by Corbett (1998, 2009) and shown in Figure 8-1. GGB mineralization is related to a late Cretaceous to Early Tertiary age skarn porphyry continuum emplaced during a 62 to 66 million year old intrusive event associated with Laramide Compressional Orogeny. Early-stage, essentially barren calc-silicate skarn alteration associated with one or more intrusive phases is thought to have developed as a contact metamorphic aureole surrounding hydrated intrusive bodies.

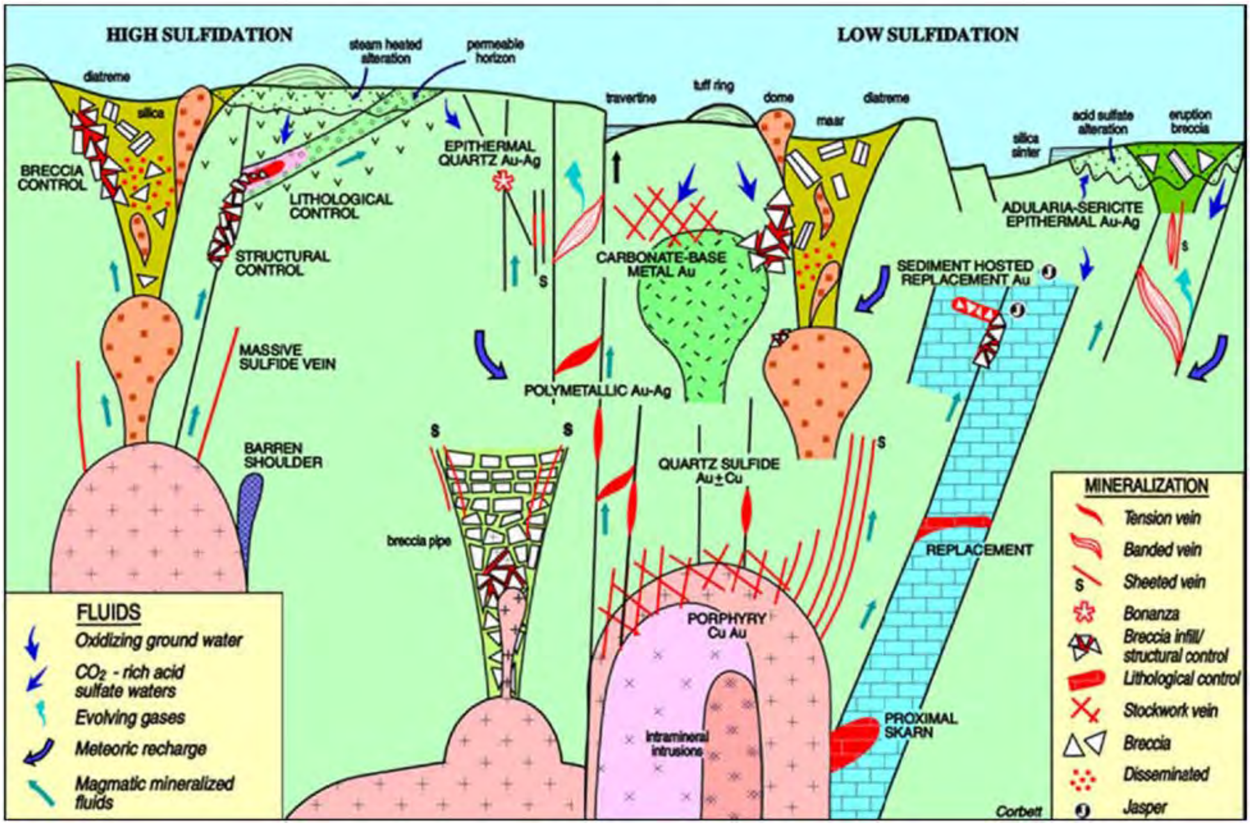
Gold deposition at Ana Paula tends to occur, both contemporaneous with and post intrusion, exhibiting at least two mineralizing events. The earliest consists of Au-As-(Bi-Te) disseminated mineralization characterized by progressive mineralization over time through deposition of gold in breccias, stockworks, contact skarn (both endoskarn and exoskarn) and other replacement bodies.

The second mineralization event (Au-Ag-Pb-Zn-Hg-Sb) perhaps related to the epithermal style of alteration discussed in Section 7.3.7 may be a later hydrothermal phase of the earliest intrusive event or may be younger.

The exact timing of gold deposition and the mechanism of deposition within the GGB and at Ana Paula are not yet fully understood and appears to vary among the known deposits, where each deposit shares important characteristics and differences. Intrusions at Ana Paula have been dated at 66.0 – 66.7 Ma ± 0.7-1.8 Ma (Valencia et al, 2008), which may also date the earliest onset on mineralization.

Results from Ana Paula suggest that the bulk of the gold deposition occurs with the dominant Au- As-(Bi-Te) mineralization, and is largely hosted in a northerly trending and westerly dipping corridor of intrusive rocks, at the contacts with sedimentary rocks and hornfels, and within important breccia bodies. Gold deposition within the high-grade core of the deposit is structurally controlled, located at the intersection of at least two fault structures and the host stratigraphy described in Section 7. Both skarn type massive and disseminated sulphide (arsenopyrite + pyrite) replacements and some epithermal overprinting have occurred but the extent and relationship to the oldest intrusive rocks have not been studied in detail.

Economically significant gold deposits in the GGB are hosted within a variety of structural, lithological and/or geochemical traps and frequently occur in clusters about a northwesterly trend of intrusions of similar age and provenance which are defined by a co-incident northwest trend of magnetic anomalies. The trend is known to exceed 55 km along strike and has become known the Guerrero Gold Belt.



Source: IMC (2014)

Figure 8-1: A Pacific Rim Model of Mineralization

This diagram illustrates the different styles of mineralization in a magmatic arc porphyry and epithermal Cu- Au-Mo-Ag system (Corbett, 2008).

9 EXPLORATION

Heliostar has not conducted its own exploration activities on the Ana Paula Project since acquisition of the Property.

Since exploration began in 2010-2015 by Newstrike and from 2015 to 2018 by Alio Gold, samples have been collected from road cuts, outcrop chip and channel samples, stream and soil samples, drill core and from RC drilling.

This section summarizes the exploration work carried out by Newstrike and Alio Gold. Goldcorp exploration effort prior to Newstrike is considered historic and described in Section 6 of this technical report. Heliostar has yet to conduct any exploration work on the property.

9.1 EXPLORATION WORK ARGONAUT GOLD (2020-2022)

No exploration work was carried out by Argonaut Gold from 2020 to 2022.

10 DRILLING

Neither Argonaut nor Heliostar has not conducted any drilling activities on the Property.

10.1 DRILL SUMMARY

The updated database that forms the basis of this resource estimate includes 142,442 total meters in 339 diamond drill hole aggregating results from 98,285 sample intervals with an average length of 1.4 m. Virtually all samples were assayed for gold and silver. This includes drill holes from Goldcorp, Newstrike, and Alio Gold (Timmins Gold) (Table 10-1).

Table 10-1: Drill Hole Summary by Year and Company

Year	Company	Number of holes	Total length (m)
2005	Goldcorp	11	3,689
2010	Newstrike	12	5,227
2011	Newstrike	57	29,697
2012	Newstrike	72	41,260
2013	Newstrike	78	33,925
2014	Newstrike	2	1,518
2015	Alio	10	2,008
2016	Alio	31	7,304
2017	Alio	58	13,478
2018	Alio	8	4,337

Source: M3 (2020)

The average drill hole spacing is approximately 50 m in the main part of the Ana Paula deposit, with a range from 20-50 m in the high-grade Breccia Zone and 50-150 m to the north and south pit extremities

10.2 DRILL METHODOLOGY

The previous operator's drilling and sampling program was planned and executed by experienced professionals under the supervision of a qualified person as defined by NI 43-101. Drill hole nomenclature was originally designed by Goldcorp and has continued in the same fashion consecutively between subsequent operators. Hole naming convention uses the prefix "AP" which refers to the Ana Paula Project followed by two digits for the year and two or more digits for the consecutive drill hole number. For example, AP-05-11, indicates that it was drilled in 2005, and would have been the 11th hole drilled on the Project; AP-10-12 was drilled in 2010 and would have been the 12th hole drilled on the Project. All core is stored at the core logging facility along with pulps and coarse laboratory rejects. The facility is locked and monitored 24/7 by a security guard.

Goldcorp and Newstrike (2005-2015)

The drill holes were collared with HQ diameter core rods with a 77.8 mm inner diameter, reducing to NQ diameter core rods, a 60.3 mm inner diameter, only if downhole conditions warrant.

After the core was pulled from the drill rod, it was boxed and transported via flatbed truck to a secure core logging facility. Top boxes were secured with strong rubber retention straps to prevent spillage. At the logging facility, the core was geologically described, and recovery (percentage) and rock quality designation (RQD) were recorded. Geological logging was conducted at a graphical scale of 1:100. The core was then marked for sampling with wax crayons and sample characteristics (lithology, alteration, structures, mineralization, gangue, etc.) were coded for later digital compilation. Samples were marked during the core logging procedure and sample divisions were based on geologic features. Within homogeneous zones, samples were divided into relatively equivalent lengths of 1 to 2 m, with 0.5 m samples taken when mineralization characteristics warranted. Insertion of quality control samples was also planned at this stage.

Alio Gold (2015 -2018)

Prior to initiating a drill campaign at Ana Paula, an audit of historic drill results was completed by Newstrike in 2010 on all drill and surface data collected prior to 2010 by Goldcorp. The audit included statistically proportional re-sampling of selected pulps, rejects, ¼ core splits, and in some cases ½ core splits to verify Goldcorp's reported drill results and for QA/QC purposes to serve as check assays on Goldcorp's drill results.

All drill holes are planned and sited based on cross section and plan projections using a UTM based local grid system with east trending grid lines stepping out every 50 to 100 m to the north as shown on Figure 10-1, Figure 10-2, Figure 10-3, and Figure 10-4. The final drill site is adjusted in the field depending on topography or local conditions and paint is used to mark the specific collar location in the field. Each drill hole is assigned a specific sequential number and the location is marked with an azimuth and length. Following completion of the drill hole, the final drill hole location is recorded in the field using a Trimble GPS R6 Model 1 noting UTM location coordinates as northerly, eastwardly, and elevation.

The drilling programs were carried out using drill contractor AP Explore Drilling for infill drilling and Globexplore for condemnation drilling. All drilling was supervised by Alio Gold technical staff and general industry standards in all matters were followed.

Drill holes are mostly inclined east at angles of 45º or 60º varying to 90º (vertical). All drilling was completed with HQ (63.5/96.9 mm) diameter diamond core drill core rods, reducing to NQ (45.0/75.7 mm) diameter core barrels if needed. Deeper drill holes (greater than 1,000 m) used PQ (85.0/122.6 mm) diameter core rods reducing to HQ or NQ diameter, as necessary. Core rod dimensions given include inner and outer rod diameters in millimeters. Core recovery averages 97%. Ground conditions are very good in general and only a few holes were lost or reduced due to poor ground conditions.

Down hole inclination and azimuth are recorded every 50 m with a REFLEX EZ-shot that also includes temperature and magnetic measurements. A geologist supervises the drilling operation, completing a "quick log", including visible mineralized zones, structures, and lithology units. A geologist is always present at the planned completion of the drill hole to avoid terminating the hole in a mineralized interval. Drill core is boxed and secured before it is transported at the end of each 12-hour drill shift to the Company's secure core logging facility for processing by personnel of the Company or their contractors.

Argonaut Gold (2020 - 2022)

No drill programs were carried out by Argonaut Gold from 2020 to 2022.

10.3 TRUE WIDTH

True thickness is defined as the distance measured perpendicular to the upper and lower contact of a tabular unit. Outside the complex breccia and surrounding HALO, the true thickness can be calculated by using a predominant strike of 000° Azimuth and a westerly -60° dip. Table 10-2 shows the adjustment factor that can be applied to the interval length to estimate the true width of the intersection.

Table 10-2: True Width Factor for Holes Not Targeting the Mineralized HALO

Drill Collar Azimuth Range (° Az)	Drill Angle Range (°)	True Width Adjustment Factor
North Az (300 – 359 and 000 -045)	≥ -45 to < -60	0.37
	≥ -60 to < -80	0.41
	≥ -80	0.50
East Az (045-120)	≥ -45 to < -60	0.95
	≥ -60 to < -80	0.80
	≥ -80	0.61
South Az (120-210)	≥ -45 to < -60	0.56
	≥ -60 to < -80	0.65
West Az (210-300)	≥ -45 to < -60	0.22
	≥ -60 to < -80	0.15
	≥ -80	0.34

Source: M3 (2020)

Alio Gold's preferred drill angle was due east between -45° to -80° dip and was designed to cut approximately perpendicular to stratigraphy, which yields a true width adjustment factor of 0.80 to 0.95 (80% to 95% of the interval length is true width). Unfortunately, for the complex breccia/surrounding HALO mineralization and the monolithic breccia, the calculation of a true width is inappropriate since these units are not tabular. Therefore, the true width adjustment factor in Table 10-2 is valid only for drill holes outside the complex breccia/mineralized HALO and outside the monolithic breccia.

In the Alio Gold database, several holes targeting the complex breccia and HALO mineralization were collared outside the HALO and were oriented to target the center of the complex breccia plug. Due to the steeply dipping plug, the holes are generally considered to be drilled "down the plunge" of the mineralization. Consequently, the mineralized interval length tends to be long and the qualified person cautions the reader that these intersects are reflective of the overall vertical extent of the complex breccia and HALO mineralization which have a limited horizontal span of 230 m or less.

10.4 DRILL RESULTS

10.4.1 2005 Drilling

In 2005, Goldcorp completed 3,687 m of diamond core drilling in 11 holes focusing on the San Jeronimo target which lies within the Ana Paula area. These drill holes remain relevant to the resource estimate described in Section 14 of this technical report and therefore are considered current by the QP. Drill holes varied from 184.25 m to 520.25 m in depth; in total 2,854 core samples were submitted for analysis. All drill holes intercepted are frequently tightly folded, thick, sedimentary sequences invaded by intrusive sills and sill-like bodies. Significant intervals with weighted averages greater than 1.0 g/t gold over downhole intervals of 5.0 m or greater (>1.0 g/t Au and >5.0 m) are summarized in Table 10-3 below.

Table 10-3: Selected Drill Intersections for 2005 Goldcorp Diamond Drill holes

Drill hole	Depth (m)	Angle (°)	Az (°)	Mineral Drill Intersections			
				From (m)	To (m)	Interval (m)	Au (g/t)
AP-05-01	252.1	-48	90	62.35	75.65	13.3	2.049
AP-05-02	300.76	-65	90	91	104.1	13.1	1.195
AP-05-03	398.5	-65	90	20.25	29.15	8.9	1.244
AP-05-05	413.3	-65	305	41.7	49.9	8.2	1.489
				62.4	73.5	11.1	5.55
				120	128.55	8.55	1.336
				136	141.12	5.12	1.56
				197.45	203.25	5.8	4.358
				230.25	211.9	8.65	1.223
AP-05-09	327.85	-65	90	250.5	277.1	26.6	1.175

Source: Alio Gold (2017)

10.4.2 2010-2013 Drilling

Newstrike commenced drilling on October 15, 2010, and discovery hole AP-10-19 was drilled in December of the same year, with assay results announced by Newstrike's press release on January 18, 2011. This led to an expanded drill campaign that resulted in publication of Newstrike's initial resource estimate on March 27, 2013. This mineral resource is considered historic and is not the subject of this report.

Table 10-4 provides a selection of the best calculated grade-width intersections showing all drill core assay results with greater than 50 gram-meters gold, defined as the weighted gold grade intersection in grams per tonne multiplied by the downhole length of the same intersection and whose sum is equal to, or greater than, 50. Intersections may include barren internal intervals and are reported according to protocol. Holes targeting the mineralized HALO and complex breccia are appropriately identified in the table.

Table 10-4: Selected Drill Intersections for AP-12-131 through AP-13-232, Ana Paula Project

Drill hole	Depth (m)	Angle	Az (°)	Section Line	Mineral Drill Intersections				
					From (m)	To (m)	Interval (m)	Au g/t	Ag g/t
AP-12-137 (HALO)	427.05	-60	330	7850	224.4	368.18	143.78	2.57	2.8
				includes	320.6	368.18	47.58	5.45	4.1
				and	322.14	342.26	20.12	11	5.5
AP-13-162 (HALO)	1407.9	-77	161	8050	3.85	217.3	213.45	3.45	6.9
				includes	23	171	148	4.67	7
				and	123	143	20	16.92	7.6
					243.82	285.75	41.93	2.54	2.7
				includes	249.43	281.54	32.11	3.21	3.4
					417.35	550.22	132.87	1.5	1.1
				includes	418.32	505.4	87.08	2.08	1.4
				and	479.4	502.82	23.42	4.15	2.6
				and	479.4	485.2	5.8	11.14	3.8
					621.8	713.1	91.3	0.74	1.6
AP-13-170	686.5	-45	80	7400	378.94	430	51.06	1	2.6
AP-13-174	525.45	-90	0	8250	305.79	341.45	35.66	1.44	1.1
AP-13-185	415.6	-65	87	8200	414.2	415.6	1.4	46	10.4
AP-13-186 (HALO)	296.95	-90	0	8200	0	64.4	64.4	4.32	5
				includes	8.99	20.06	11.07	12.4	6.8
				and	12.06	13.14	1.08	52.8	19.1

Drill hole	Depth (m)	Angle	Az (°)	Section Line	Mineral Drill Intersections				
					From (m)	To (m)	Interval (m)	Au g/t	Ag g/t
AP-13-188 (HALO)	1049.35	-70	288	7800	107.5	155	47.5	1.39	12.7
					162.26	183.05	20.79	2.85	13.1
				includes	164.23	174	9.77	5.42	24.3
AP-13-190 (HALO)	87.5	-90	0	8000	25.4	87.5	62.1	3.13	5.2
				includes	73.83	87.5	13.67	6.82	5.9
AP-13-192 (HALO)	354.55	90	0	8050	134.74	158.38	23.64	2.25	6.6
AP-13-193	460.4	-80	270	8150	403.15	458.5	55.35	1.24	2.9
				includes	428.69	432.5	3.81	0.12	0.7
AP-13-211	208.4	-60	90	8200	7	42.5	35.5	1.72	9.4
				includes	9.8	19.85	10.05	5.06	18.6
AP-13-213	416.35	-50	90	7750	5.35	109.2	103.85	0.78	4.8
AP-13-215 (HALO)	990.15	-50	0	7450	574.1	598.6	24.5	2.15	3.2
					675.75	747.94	72.19	3.92	5.9
				includes	677.1	716.49	39.39	6.42	9.7
				and	680.4	681.82	1.42	43.82	35.4
AP-13-219 (HALO)	519.65	-70	90	7850	316	342.57	26.57	1.98	3.7
				includes	325.15	327.37	2.22	0.09	1.9
				and	328.48	330.73	2.25	0.14	2.2
AP-13-229 (HALO)	415.85	-90	0	7950	263	303.24	40.24	1.92	2.8
				includes	266.88	295.4	28.52	2.45	0.1

Source: Alio Gold (2017)

The reported mineralized intervals in core tend to be separated by barren intervals that may or may not contain narrow anomalous sections and local high-grade spikes that are not included in the calculations of mineralized intervals. Unless specified otherwise, reported intersections are calculated according to an established written protocol that uses a 0.20 g/t Au cut-off for bounding and internal assays. Reported grade intervals are based on the original uncut assay certificates as received from the assay labs.

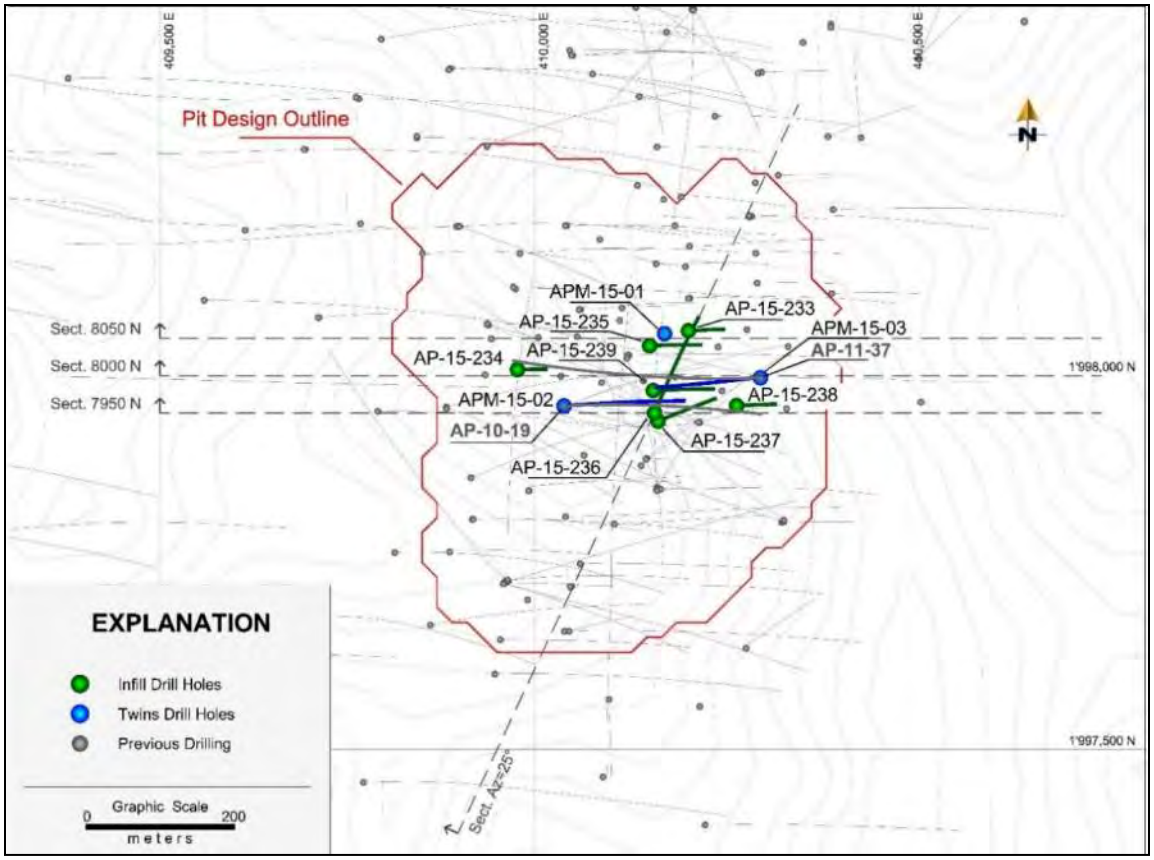
10.4.3 2015 Drilling

In 2015, shortly after acquiring the Ana Paula Project, Alio Gold carried out confirmation drilling (to verify results of previous programs) and infill drilling. As part of the verification process, Alio Gold twinned three existing core holes. Half of the length of the core was sent for analysis and assay verification, and the other half length of the core was archived for metallurgical testing. These three twin holes totalling 606 m were drilled at the center of the Ana Paula deposit and were representative of the life-of-mine plan as described in the 2014 Preliminary Economic Assessment (Years 1 to 8) (JDS, 2014).

Hole APM-15-01 twinned hole AP-12-101, hole APM-15-02 twinned hole AP-10-19 and hole APM-15-03 twinned hole AP-11-37. Results from this limited twinned drill hole program indicated that the twinned hole replicated the grade seen in the original hole reasonably well.

Approximately 1,403 m of infill drilling was conducted in seven holes at the Ana Paula deposit with the goal of upgrading Inferred resources to Indicated (and Indicated to Measured), and to confirm the approximate dimensions of the high-grade breccia zone. Figure 10-1 shows the significant gold intercepts from both the twin and infill drilling, above an internal cut-off grade of 0.63 g/t Au.

All drilling was completed with HQ (63.5/96.9 mm) diameter diamond core drill core rods. Core recovery averaged plus 95%. In general, ground conditions are very good to excellent, and collars are surveyed using GPS Trimble R6 Model 1. To note, the inclination of the hole AP-15-237 was changed 25° azimuth with objectives to test the true thickness of the complex breccia.



Source: M3 (2020)

Figure 10-1: Ana Paula Plan View showing the 2015 Drill Program

Table 10-5: Significant Mineral Interceptions of the Core Drilling Program Ana Paula, 2015

Drill Hole Number	Depth (m)	Angle (°)	Az (°)	Section Line	Mineral Drill Interceptions				
					From (m)	To (m)	Interval (m)	Au g/t	Ag g/t
AP-15-233 (HALO)	150.00	-70°	90°	8050	13.40	62.50	49.10	3.293	4.2
				And	76.00	98.50	22.50	0.920	1.2
				And	106.65	107.65	1.00	3.360	16.3
AP-15-234	121.25	-90°	70°	8000	80.00	86.00	6.00	0.6645	22.7
AP-15-235 (HALO)	200.75	-90°	70°	8050	11.00	21.50	10.50	0.948	5.1
				and	87.00	166.40	79.40	1.248	2.5
				Includes	87.00	107.00	20.00	2.473	2.7
AP-15-236 (HALO)	286.15	-60°	25°	7950	27.50	29.00	1.50	1.545	35.2
				And	52.20	53.35	1.15	3.500	11.9
				And	80.25	202.50	122.25	4.452	10.1
				And	214.50	237.00	22.50	1.486	8.6
				And	255.00	284.00	29.00	2.864	6.9
AP-15-237 (HALO)	252.10	-70°	70°	7950	14.50	16.30	1.80	0.734	14.3
				And	35.00	36.50	1.50	2.540	50.7
				And	50.00	108.50	58.50	1.963	16.5
				And	143.00	250.00	107.00	1.977	5.6

Drill Hole Number	Depth (m)	Angle (°)	Az (°)	Section Line	Mineral Drill Interceptions				
					From (m)	To (m)	Interval (m)	Au g/t	Ag g/t
AP-15-238	151.85	-90°	0°	7950	33.00	35.00	2.00	6.570	289.0
				And	53.00	59.00	6.00	0.981	2.0
				And	74.00	95.00	21.00	1.107	2.1
				And	134.50	136.00	1.50	1.045	2.2
				And	142.00	143.50	1.50	3.250	8.4
AP-15-239 (HALO)	240.40	-70°	90°	8000	34.50	157.50	123.00	5.337	11.1
				And	178.00	227.50	49.50	1.340	4.8

Source: M3 (2020)

10.4.4 2016-2017 Drilling

The 2016-17 drilling was a major program with four main components: (1) Infill Drilling (2) Geotechnical Drilling, (3) Condemnation Drilling, and (4) Twinning of existing holes for the collection of metallurgical testing material.

Infill Drilling

Infill drilling was carried out to support an updated, significantly more robust, resource estimate. The infill drilling program significantly increased the delineation of the high-grade breccia zone and the surrounding mineralization HALO. Approximately 9,663 m of infill drilling was completed in 37 holes at the Ana Paula deposit with the goal of upgrading the classification model, and to confirm and refine the dimensions and location of the high-grade breccia zone.

Table 10-6 shows the significant gold intercepts from both the twin and infill drilling, above an internal cut-off grade of 0.63 g/t Au and using a pit shell gold price of US$1,200 ounce.

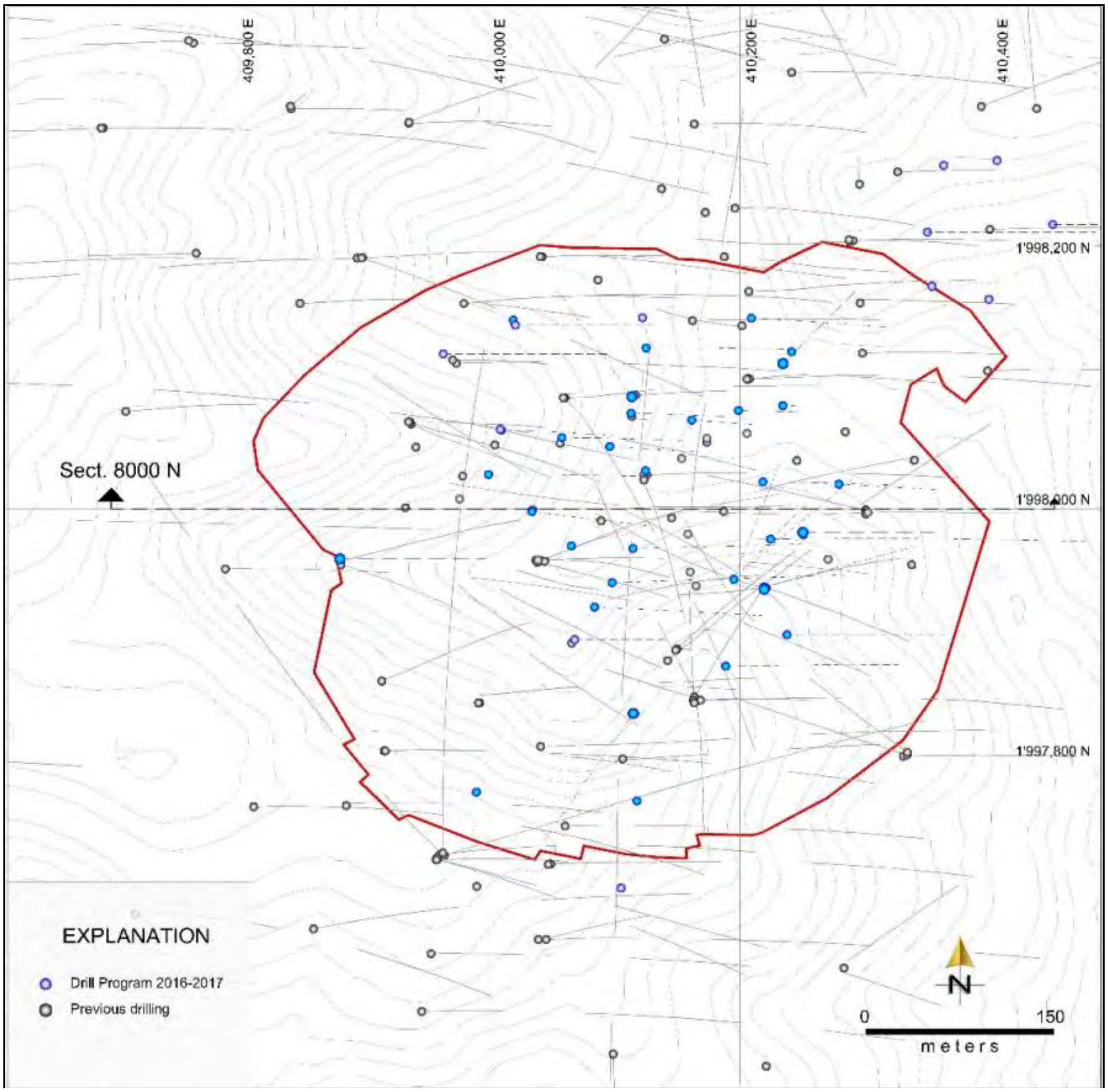
Table 10-6: Significant Mineral Interceptions of the Core Drill Program Ana Paula, 2016-2017

Drill Hole Number	Depth (m)	Angle (°)	Az (°)	Section Line	Mineral Drill Interceptions			
					From (m)	To (m)	Width (m)	Au g/t
AP-16-243 (HALO)	133.00	-55	90	8025 N	0.00	33.20	33.20	1.225
					47.50	*74.55*	*27.05*	*1.866*
AP-16-244 (HALO)	202.65	-70	90	8050 N	61.60	85.00	23.40	1.069
					118.00	144.95	26.95	1.157
					154.50	*201.00*	*46.50*	*2.760*
AP-16-246 (HALO)	374.75	-90	0	7975 N	*104.55*	*143.10*	*38.55*	*5.190*
					161.10	*183.10*	*22.00*	*2.211*
					238.84	256.50	17.66	0.789
					364.60	373.60	9.00	0.744
AP-16-247 (HALO)	276.90	-90	0	7925 N	63.00	66.00	3.00	4.533
					123.45	127.40	3.95	3.930
					135.40	149.40	14.00	1.255
					165.40	*231.40*	*66.00*	*1.320*
					241.40	251.65	10.25	1.505
					263.50	274.15	10.65	0.896
AP-16-249 (HALO)	350.00	-45	90	7975 N	22.30	27.00	4.70	1.381
					56.30	*96.15*	*39.85*	*2.722*
					157.40	*166.70*	*9.30*	*4.195*
AP-16-250 (HALO)	302.00	-50	90	7950 N	48.17	53.30	5.13	2.182
					74.95	81.10	6.15	2.905
					109.10	*131.95*	*22.85*	*1.490*

Drill Hole Number	Depth (m)	Angle (°)	Az (°)	Section Line	Mineral Drill Interceptions			
					From (m)	To (m)	Width (m)	Au g/t
					151.90	183.30	31.40	1.180
					209.95	250.80	40.85	4.083
					269.70	300.55	30.85	2.230
AP-16-251 (HALO)	193.40	-55	90	8025 N	2.00	79.00	77.00	2.680
					139.60	162.00	22.40	0.806
AP-16-252 (HALO)	285.20	-50	90	7975 N	53.50	61.00	7.50	1.959
					69.00	75.00	6.00	0.750
					87.00	89.00	2.00	16.350
					97.00	128.40	31.40	2.376
					135.65	184.05	48.40	12.156
					216.84	225.24	8.40	1.793
					250.87	272.10	21.23	1.843
AP-16-253 (HALO)	261.60	-70	95	8000 N	4.15	28.32	24.17	0.601
					105.00	256.07	151.07	8.089
					Including			
					156.00	233.10	77.10	15.149
AP-16-255 (HALO)	281.30	-70	90	8050 N	87.60	195.60	108.00	1.153
					217.30	220.30	3.00	2.353
					243.30	252.30	9.00	1.820
AP-16-257 (HALO)	236.20	-60	90	8025 N	116.95	131.25	14.30	5.413
					150.00	236.20	86.20	2.214
AP-16-259	182.50	-70	90	8150 N	124.50	179.70	55.20	1.110
AP-16-260 (HALO)	200.90	-60	20	7950 N	19.00	30.00	11.00	0.656
					94.50	197.00	102.50	3.803
					Including	-	-	-
					123.00	164.00	41.00	8.091
AP-16-262 (HALO)	252.10	-70	45	7950 N	70.80	86.80	16.00	1.019
					124.52	**156.00**	**31.48**	**3.365**
					Including	-	-	-
					147.63	156.00	8.37	9.680
					166.00	170.00	4.00	2.805
					183.03	219.85	**36.82**	7.323
					Including			
					183.03	201.77	18.74	13.622
AP-16-264 (HALO)	256.30	-60	50	7950 N	90.60	93.30	2.70	2.880
					110.20	139.05	28.85	11.591
					Including	-	-	-
					110.20	122.00	11.80	26.508
					149.00	188.00	39.00	2.478
					233.50	241.50	8.00	0.875
AP-16-270 (HALO)	222.60	-70	90	8025 N	4.00	41.60	37.60	3.874
					67.00	93.25	26.25	11.938
					Including			
					82.50	91.22	8.72	32.62
					121.20	164.00	42.80	4.78
					Including			
					121.20	133.40	12.20	12.44
					203.00	**213.46**	**10.46**	**1.308**
AP-17-278	160.7	-80	90	8150 N	75.15	96.85	21.70	2.200
					Including			
					93.80	94.85	1.05	12.400
AP-17-280	255.4	-90	0	8075 N	226.00	255.40	29.40	0.935

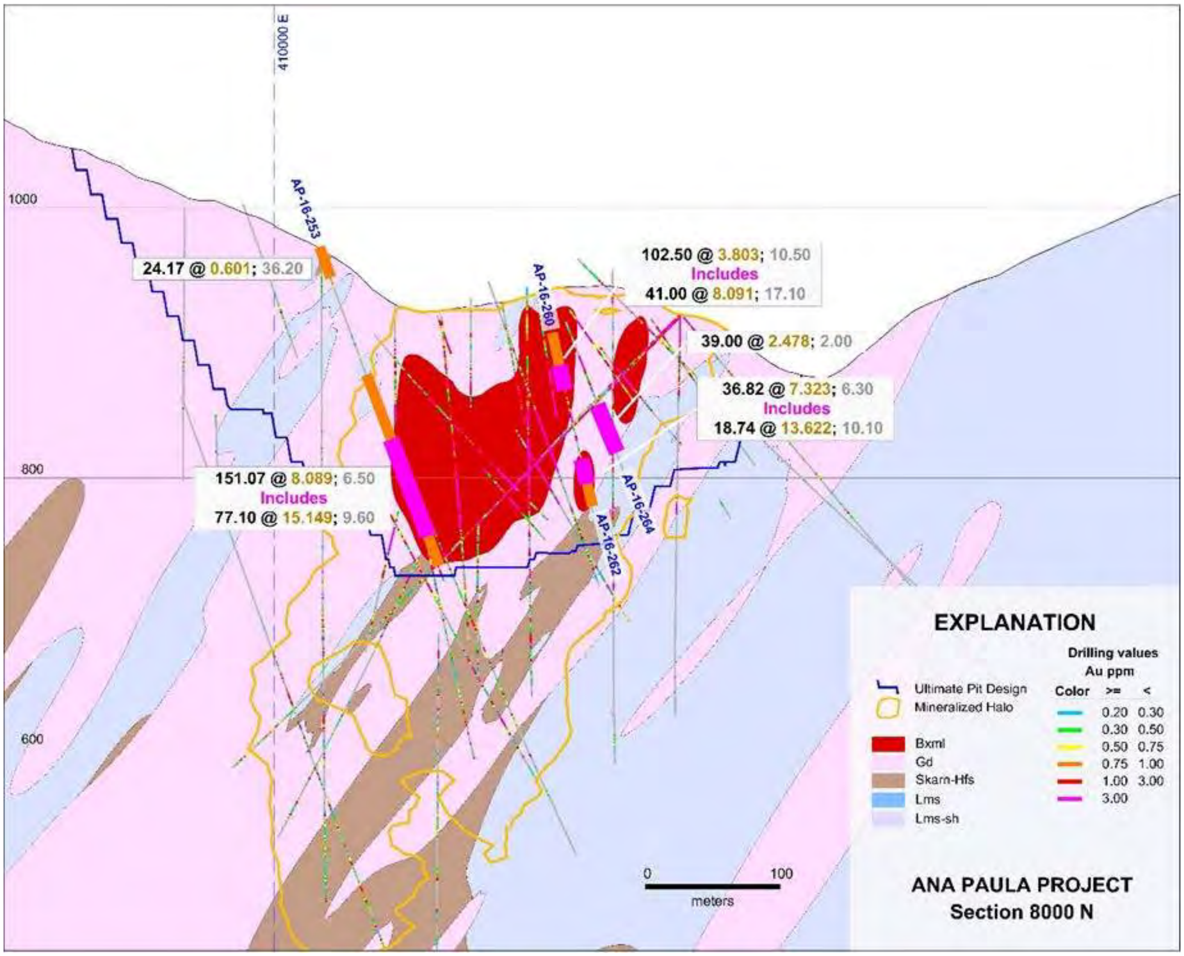
Drill Hole Number	Depth (m)	Angle (°)	Az (°)	Section Line	Mineral Drill Interceptions			
					From (m)	To (m)	Width (m)	Au g/t
AP-17-281 (HALO)	210.1	-70	90	7700 N	*161.00*	*181.00*	*20.00*	*0.913*
AP-17-282	102.1	-90	0	7900 N	*81.00*	*96.48*	*15.48*	*1.682*

Source: M3 (2020)



Source: Alio Gold (2017)

Figure 10-2: Ana Paula Plan View showing the 2016-2017 Drill Program



Source: Alio Gold (2017)

Figure 10-3: Geological Interpretation and Drill Section on Section 8000N

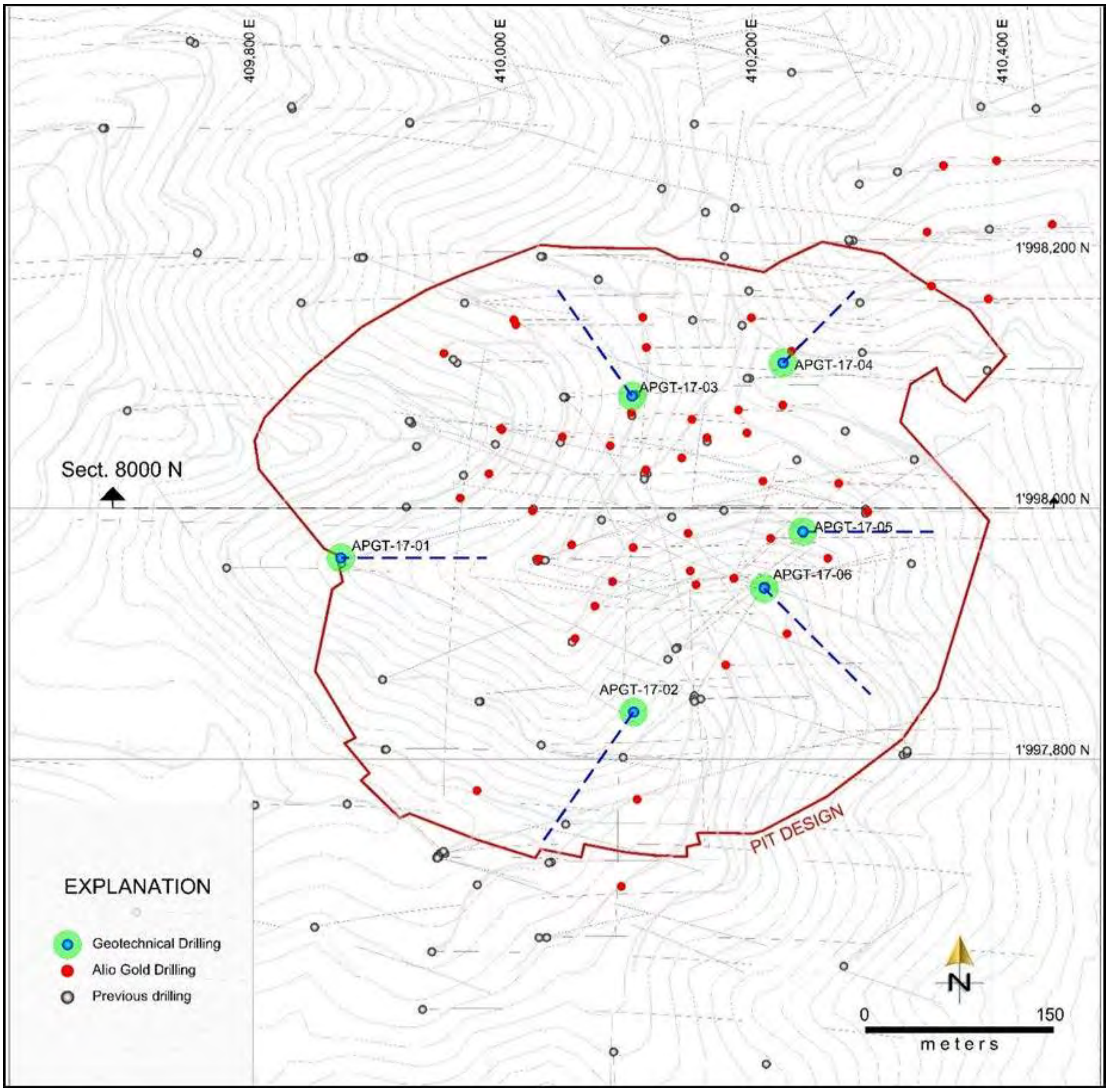
Geotechnical Drilling

Pit slope design analyses were based on field data collected by Knight Piésold personnel. Geotechnical drilling of 1,895 m was conducted in six pit sectors defined by Knight Piésold. The figure below includes collar locations and horizontal traces of the geotechnical core-holes drilled that were logged and sampled by Knight Piésold personnel. Figure 10-4 shows the location of the geotechnical drilling.

The core-holes logged by Knight Piésold personnel were drilled using HQ3-size drilling tools. A 1.5 m long, triple tube core barrel was used for the intervals drilled using HQ-size drilling. The core orientation tool used for the entire length of the core-hole (every run) was the REFLEX ACT II.

The core had been transported to the core facility from the drilling locations by Knight Piésold personnel. The log core was at the drill rig while the core was in the split tubes.

The information logged by Knight Piésold personnel included rock type, alteration type and degree, rock strength, and discontinuity spacing. The geotechnical data was used by Knight Piésold to facilitate rock mass characterization in support of the development of a geotechnical model suitable for a pit slope evaluation.

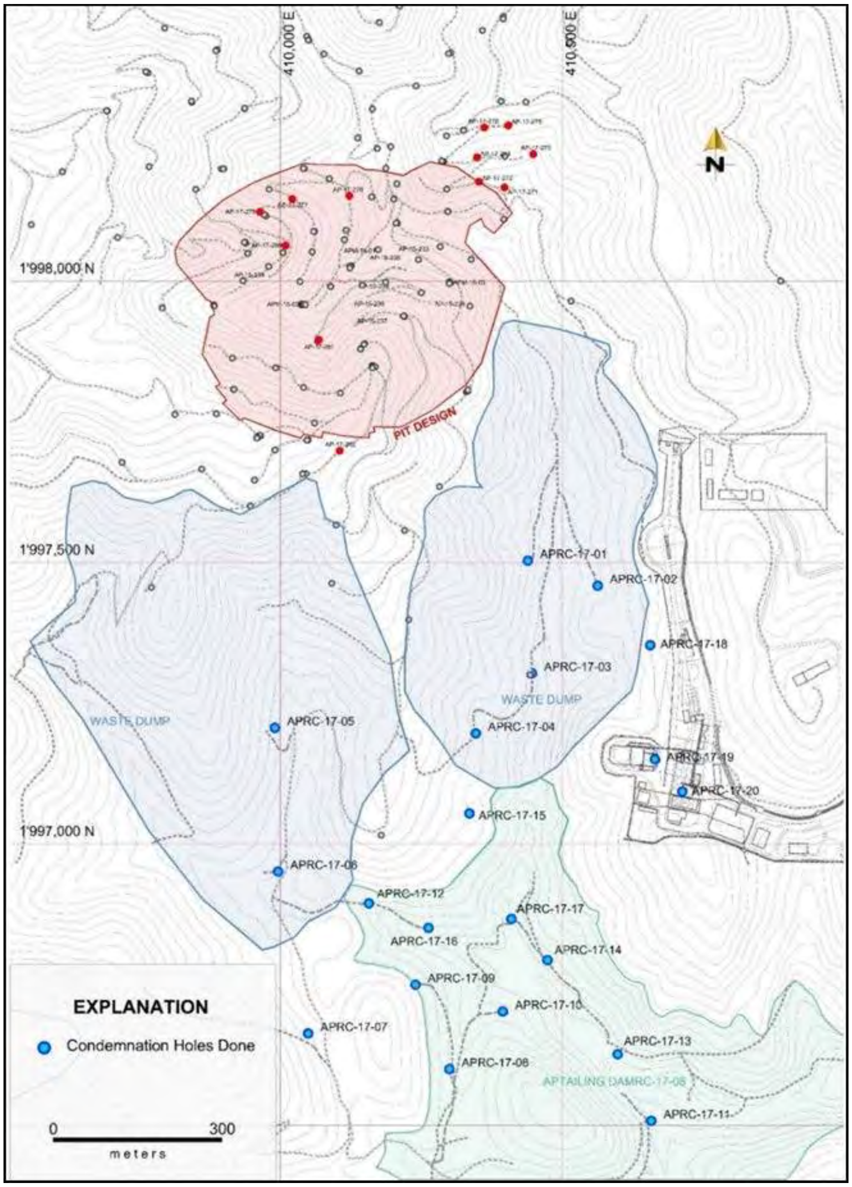


(Source: Alio Gold, 2017)

Figure 10-4: Ana Paula Plan View showing the Pit Slopes Geotechnical Drilling

Condemnation Drilling

Approximately 5,060 m of condemnation drilling was conducted in 20 RC drill holes at the Ana Paula Project. Drill holes were planned by using an east-west cross-section set stepping out every 100 m with collar centers between holes of approximately 150 m. The orientation of the drilling primarily inclined to 90° Azimuth at angles of 45º to 55° degrees and average depths of 250 m, with the objective of intercepting the contact between the intrusive sill and the sedimentary rocks at approximately 150 m below the surface. None of the drill holes south of coordinate 1,997,555N bear any significant mineralization. The negative results should allow Heliostar to construct the proposed plant facilities, a tailings dam, and waste dumps in the current layout located to the south east of the Ana Paula open pit design.



Source: Alio Gold (2017)

Figure 10-5: Ana Paula Plan View showing the Waste, Tailings and Plant Condemnation Drilling

Metallurgical Testing

A total of 14 PQ sized (85 mm core diameter) drill holes were completed to supply sufficient material for metallurgical testing. Table 10-7 lists the significant intercepts encountered during this drill program. AGP compared the intervals with their respective twin holes. The gold grade of the new holes, while different from their twin, were generally within reasonable limits when considering the nugget effect seen at Ana Paula. Charted together, the high-grade peaks of the new holes were well represented in the twin hole. The exception to this was hole AP-17-15 which encountered much higher-grade mineralization over the entire hole length when compared to its twin (AP-15-235).

Table 10-7: Significant Results of the Metallurgical Core Holes

Drill Hole Number	Material	Az (°)	Dip (°)	From (m)	To (m)	Au (g/t)	Interval (m)	Estimated True Width (m)	Twin Hole Number	Au grade of twinned interval (g/t Au)
APM-17-06	SED	0	-90	6.5	19.1	2.15	12.6	6.3	AP-11-35	1.13
APM-17-07	No significant assays									
APM-17-08	MBX	90	-45	8.6	14.5	1.1	5.9	N/A	AP-11-31	0.65
APM-17-08	SED			33.9	38	0.87	4.1	3.9	AP-11-31	1.24
APM-17-08	INTRS			197.6	200.7	2.11	3.1	2.9	AP-11-31	0.01
APM-17-09	HALO	0	-90	38.5	63.4	6.12	24.9	N/A	AP-13-190	1.04
including				53.5	57.9	27.24	4.4	N/A		
APM-17-09	HALO			75.2	88.3	4.55	13.1	N/A	AP-13-190	7.25
APM-17-10	HALO	90	-65	28.6	41.8	1.5	13.2	N/A	AP-13-172	0.82
APM-17-11	HALO	90	-60	124	136	6.84	12	N/A	AP-16-257	5.68
including				129.6	130.5	20.9	0.9			
and including				133.3	134.7	37.5	1.4			
APM-17-11	HALO			153.2	180	2.67	26.8	N/A	AP-16-257	3.08
including				155.1	156.4	20.8	1.3			
APM-17-11	HALO			210	232	3.37	22	N/A	AP-16-257	1.65
APM-17-12	HALO	90	-50	71.1	76	2.55	5	N/A	AP-16-250	0.202
	HALO			161.2	164.8	2.03	3.7	N/A		
APM-17-13	HALO	90	-45	8	120	3.85	112	N/A	AP-11-47	2.5
Including				31.5	33	39.1	1.5			
and including				93.5	95.3	52.7	1.8			
APM-17-14	HALO	90	-50	53.5	63	0.76	9.5	N/A	AP-16-252	1.32
	HALO			116.9	150	7.07	33.1		AP-16-252	3.87
Including				125.4	126.9	34.4	1.6			
APM-17-15	HALO	90	-75	11.6	66.2	7.19	54.6	N/A	AP-15-235	1.08
APM-17-16	HALO	90	-50	22	34	1.09	12	N/A	AP-16-269	0.503
APM-17-17	INTRS	90	-80	78.8	84.8	0.76	6	3.7	AP-17-17	1.295

Source: AGP (2020)

10.4.5 2018 Drilling

The 2018 drilling consisted of a limited infill drill program targeting the Complex Breccia and Mineralized HALO below the 2017 resource constraining shell.

The infill drilling confirmed the presence of the complex breccia and the position of the contacts with the adjoining lithologies with relatively minor adjustments. Grades were found to correlate well with the existing drilling. Table 10-8 lists the significant intercepts encountered during drilling.

Table 10-8: Significant Mineral Interceptions of the Core Drill Program Ana Paula, 2018

<table>
<tr><th>Hole NB</th><th>Material</th><th>Azimuth</th><th>Dip</th><th>Depth From</th><th>Depth To</th><th>Au (g/t)</th><th>Interval length (m)</th><th>Estimated True Width</th></tr>
<tr><td>AP-18-283</td><td>MBX/INTRS</td><td rowspan="7">0</td><td rowspan="7">-50</td><td>57.6</td><td>113.3</td><td>1.3</td><td>55.7</td><td>20.6</td></tr>
<tr><td>AP-18-283</td><td>MBX/INTRS</td><td>120.03</td><td>132.1</td><td>0.77</td><td>12.07</td><td>4.5</td></tr>
<tr><td>AP-18-283</td><td rowspan="3">HALO</td><td>341</td><td>386.23</td><td>3.41</td><td>45.23</td><td rowspan="3">N/A</td></tr>
<tr><td>including</td><td>341</td><td>358.1</td><td>1.74</td><td>17.1</td></tr>
<tr><td>and including</td><td>367.25</td><td>386.23</td><td>6.45</td><td>18.98</td></tr>
<tr><td>AP-18-283</td><td>HALO</td><td>472.9</td><td>476.3</td><td>0.93</td><td>3.4</td><td>N/A</td></tr>
<tr><td>AP-18-283</td><td>HALO</td><td>516.3</td><td>520.25</td><td>1.92</td><td>3.95</td><td>N/A</td></tr>
<tr><td>AP-18-284</td><td>INTRS/MBX</td><td rowspan="4">0</td><td rowspan="4">-55</td><td>62</td><td>106.2</td><td>0.94</td><td>44.2</td><td>16.4</td></tr>
<tr><td>AP-18-284</td><td>BXH/GD</td><td>120.2</td><td>135.5</td><td>1.29</td><td>15.3</td><td>5.7</td></tr>
<tr><td>AP-18-284</td><td>BXH</td><td>153.4</td><td>167.7</td><td>0.9</td><td>14.3</td><td>5.3</td></tr>
<tr><td>AP-18-284</td><td>GD (HALO)</td><td>339</td><td>392.5</td><td>1.34</td><td>53.5</td><td>N/A</td></tr>
</table>

Hole NB	Material	Azimuth	Dip	Depth From	Depth To	Au (g/t)	Interval length (m)	Estimated True Width
including				355	357	10.35	2	
and including				376.8	378	8.86	1.2	
and including				392	392.5	5.73	0.5	
AP-18-284	LS-SH/HFL (HALO)			414	423	1.63	9	N/A
AP-18-284	GD (HALO)			427	429	0.95	2	N/A
AP-18-284	GD (HALO)			436.3	438.3	5.16	2	N/A
including				437.3	438.3	9.02	1	
AP-18-284	BXML/HFL (HALO)			456.2	497.1	1.91	40.9	N/A
including				461	462.5	8.8	1.5	
and including				495.1	497.1	15.5	2	
AP-18-284	HFL (HALO)			526.7	549.7	1.15	23	N/A
AP-18-284	GD			567	572.4	1.02	5.3	2
AP-18-285	BXH	0	-63	17.1	49.5	0.9	32.4	13.3
including				17.1	25.9	0.7	8.8	3.6
and including				31.9	41	1.39	9.1	3.7
and including				44	49.5	1.08	5.5	2.3
AP-18-285	BXH			102.6	120.2	0.68	17.6	7.2
AP-18-285	GD/BXF			178.7	182	0.85	3.3	1.3
AP-18-285	GD			300.7	308.7	0.86	8	3.3
AP-18-285	GD (HALO)			339.7	348.8	5.36	9.2	N/A
including				339.7	341.1	24.1	1.5	
and including				347.3	348.8	5.85	1.5	
AP-18-285	LS-HF/HFL			393.7	399.7	0.65	6	2.5
AP-18-285	HFL/GD			416.1	418.9	1.62	2.8	1.1
AP-18-285	HFL			435.1	437.1	5.31	2	0.8
AP-18-285	SULF			449	450	2.78	1	0.4
AP-18-285	BXML/HFL/GD (HALO)			497.7	545.9	2.03	48.2	N/A
including				499.2	500.7	10.95	1.5	
and including				515.4	519.4	4.05	4	
and including				535.7	536.7	12.35	1	
and including				542.9	544.3	9.2	1.4	
AP-18-286	BXH	357	-63	16.3	50.8	0.89	34.5	14.1
AP-18-286	BXH/GD			56	66.6	0.72	10.6	4.3
AP-18-286	BXH			107.5	127	0.77	19.5	8
AP-18-286	GD			206.4	211.6	1.56	5.2	2.1
AP-18-286	GD			272.8	277.4	0.67	4.6	1.9
AP-18-286	GD (HALO)			320.4	343.4	1.98	23	N/A
AP-18-286	GD (HALO)			351.4	359.1	0.96	7.7	N/A
AP-18-286	GD/HFL (HALO)			373.2	385.2	0.65	12	N/A
AP-18-286	LS-SH (HALO)			415.3	424.2	1.67	8.9	N/A
AP-18-286	HFL (HALO)			434.5	447.7	0.92	13.2	N/A
AP-18-286	BXML/GD (HALO)			478.3	532	1.03	53.7	N/A
including				478.3	481	2.29	2.7	
and including				485	488.2	1.88	3.2	
and including				497	515.4	1.33	18.4	
and including				522.4	528	1.78	5.6	
AP-18-286	GD (HALO)			552	558	0.92	6	N/A
AP-18-286	HFL (HALO)			576	582	2.03	6	N/A
including				580	581	7.74	1	
AP-18-287	BXH/GD	355	-65	27	68	1.4	41	16.8
AP-18-287	BXH/GD			79	90.8	0.62	11.8	4.8
AP-18-287	GD			206	208	1.92	2	0.8
AP-18-287	GD			219	223	0.98	4	1.6
AP-18-287	GD			278	306	2.98	28	11.5
including				278	290	5.28	12	4.9
which includes				279	280.3	20.1	1.3	0.5

Hole NB	Material	Azimuth	Dip	Depth From	Depth To	Au (g/t)	Interval length (m)	Estimated True Width
which includes				288	290	10	2	0.8
and including				298	306	2.36	8	3.3
which includes				304	306	6.22	2	0.8
AP-18-287	LS-SH			410	418.3	0.66	8.3	3.4
AP-18-287	GD/SULF (HALO)			500.5	502.9	1.88	2.4	N/A
AP-18-287	BXML (HALO)			526.7	527.4	3.7	0.7	N/A
AP-18-287	HFL (HALO)			568.3	572.3	1.93	4.1	N/A
AP-18-288	BXH	350	-72	33.1	97.7	1.24	64.5	26.5
including				33.1	82.7	1.41	49.5	20.3
and including				89.7	97.7	0.96	8	3.3
AP-18-288	GD			234.8	236.2	9.59	1.3	0.5
AP-18-288	GD			254.5	261.2	1.04	6.7	2.7
AP-18-288	GD			279.3	280.7	4.65	1.4	0.6
AP-18-288	HFL/SULF			478.5	481.7	1.89	3.3	1.3
AP-18-288	HFL/GD			551.1	553.2	0.77	2.1	0.9
AP-18-288	GD/SULF (HALO)			577.3	585	3.02	7.7	3.2
including				584.4	585	25.3	0.6	0.2
AP-18-288	GD (HALO)			592.5	594.5	2.43	2	N/A
AP-18-288	BXML/GD (HALO)			598.9	620.8	0.92	21.9	N/A
including				598.9	601.7	0.77	2.8	N/A
and including				609.6	620.8	1.53	11.2	N/A
which includes				609.6	611	4.6	1.4	N/A
which includes				618.3	619.8	3.43	1.5	N/A
AP-18-288	BXML (HALO)			641.8	646.3	1.43	4.5	N/A
AP-18-288	HFL (HALO)			690.8	728.5	1.14	37.7	N/A
including				690.8	695.3	0.65	4.5	N/A
including				700	701	8.88	1	N/A
including				705.8	719.3	0.66	13.5	N/A
including				723.8	728.5	4.2	4.7	N/A
which includes				727.2	728.5	12.8	1.3	N/A
AP-18-289	GD/BXH	0	-60	258.5	261.3	1.1	2.8	1.1
AP-18-290	BXH/GD	0	-65	79.3	88.3	0.67	9	3.7
AP-18-290	BXH/GD			96.4	99.9	0.75	3.6	1.5
AP-18-290	BXH			112.5	115.5	0.73	3	1.2
AP-18-290	BXH			123	128.6	0.95	5.6	2.3
AP-18-290	BXH/GD			141.8	161.6	1.49	19.8	8.1
including				141.8	145.9	3.27	4.1	1.7
and including				147.4	151.4	2.07	4.1	1.7

Source: AGP (2020)

10.5 QUALIFIED PERSON'S COMMENTS

The drill hole orientation was found to be appropriate for the deposit style and the orientation of the mineralization.

Drill spacing in the pit area is less than 25 m and is deemed sufficient to adequately define the grade of the mineralization and the spatial grade distribution. Outside the pit area and to the north, the spacing increases to 50 m or more, and requires more in-fill. The southwest portion of the property could not be estimated because the spacing is currently too wide. This area remains an exploration target for Heliostar.

Drill core logging is appropriate for the mineralization style and carried out to industry standards. Drill core handling, surveying, and chain of custody from the rig to the core logging facility was found to meet or exceed industry standards.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

11.1 SAMPLING METHODS

Neither Argonaut nor Heliostar has conducted any exploration nor sampling on the property.

11.1.1 Goldcorp and Newstrike (2005-2015)

All core samples marked during the logging procedure and sample divisions were based on geologic features. Within homogeneous zones, samples were divided into relative lengths of 1 to 2 m, with 0.5 m samples taken when mineralization characteristics warranted. Insertion of quality control samples was also planned at this stage.

After logging and sample marking was completed, the core was photographed in grouping of three in the core boxes and then sawed longitudinally in half according to the sample intervals marked by the geologist. A one half split was double bagged in plastic sample bags and secured with plastic ties. The remaining half core split was retained in the original core box, ordered by drill hole number and stored in the enclosed core facility in metal storage racks.

Quality control samples were inserted into the sample stream, and the samples were bagged in rice sacks labelled with the company name, project name, drill hole number, and sample numbers. A laboratory transmittal sheet was prepared listing the number of bags and included samples.

ProDeMin geologists, on behalf of Newstrike, were responsible for the collection and preparation of all core prior to pick up. Core was collected directly from the Ana Paula core logging facility, by the analytical laboratory that transported the samples directly to their sample preparation facilities and who were responsible for all subsequent security following collection from site.

11.1.2 Alio Gold (2015-2018)

The sampling methodology is similar for the core processed by Newstrike. All samples collected by Alio Gold staff during drill programs were subjected to a quality control procedure that ensured a best practice in the handling, sampling, analysis and storage of the drill core. All drill cores were sampled and collected on a timely basis. Samples intervals were selected by the field geologist and most typically varied between 1.0 and 2.0 m in length. Sample intervals were not less than 0.50 m on specific, narrow geological features, and not greater than 2.0 m on wide intervals of barren granodiorite and/or limestone-shale.

Samples of drill core were cut by a diamond blade rock saw, with half of the sawn core placed in individual sealed plastic bags with a zip tie with the remaining half placed back in the original core box. Samples were prepared by local contract workers trained and supervised by Alio Gold personnel, at Cuétzala del Progreso. Once logged and split, the core was stored on racks in a secure storage facility at Cuétzala del Progreso.

Condemnation RC chip samples were collected, at the drill site and then sealed in plastic bags. The RC drill samples were collected continuously at 1.5 m intervals. The splitter was cleaned between each sample with a compressed air hose. The RC drill samples were taken by Alio Gold personnel with supervision of Alio Gold geologist. From the RC drilling, a portion of the material generated for each sample interval was retained in a plastic specimen tray created specifically for the reverse circulation program. The samples in specimen trays constitute the primary reference for the hole. The specimen tray was marked with the drill hole number and each compartment within the tray was marked with both the interval and number for the respective sequential sample. Tray chip samples are stored at Cuétzala del Progreso in a secure building.

Company geologists and technicians were responsible for collection and shipment preparation of the core to the laboratories. Similar to the Newstrike program, core sample shipment bags are collected directly from the Ana Paula core logging facility, by the analytical laboratory that transports the samples directly to their sample preparation facilities and who were responsible for all subsequent security following collection from site.

ALS-Chemex shipped the collected core to their preparation laboratories in Guadalajara, Jalisco, Mexico. After these samples were processed, the pulps were sent to Vancouver, Canada ALS-Chemex Lab for analysis. Rejects and pulps are returned to the Project site and stored at the Alio Gold, Cuétzala del Progreso core logging facility. No problem was encountered in transport during the program. Notification of receipt of sample shipments by the laboratory is confirmed by electronic mail.

11.1.3 Argonaut Gold (2020-2022)

Argonaut Gold did not submit any samples to the laboratory.

11.2 ANALYTICAL AND TEST LABORATORIES

11.2.1 Goldcorp and Newstrike (2005-2015)

ALS Global Ltd., through Chemex de Mexico, S.A. de C.V. was the primary analytical laboratory for the Ana Paula Project. ACME laboratory at Guadalajara, Mexico was used as a primary laboratory for 11 holes during the 2013 drill campaign. SGS SA, (SGS) was the secondary laboratory for the Ana Paula Project through SGS de México located in Durango, Mexico.

BSI Inspectorate was used for the preparation and/or verification of blanks, standards and for check assay works. All laboratories are internationally recognized and accredited to ISO 17025 or ISO 9001:2008 or better.

11.2.2 Alio Gold (2015-2018)

ALS Global Ltd., through Chemex de Mexico, S.A. de C.V. is still the primary analytical laboratory for the Ana Paula Project. Bureau Veritas laboratory, located in Hermosillo, Sonora, Mexico, is now the secondary laboratory for check samples.

11.3 SAMPLE PREPARATION AND ANALYSIS

11.3.1 Goldcorp and Newstrike (2005-2015)

ALS Chemex prepared samples at its lab facility in Guadalajara, Mexico. Individual core samples typically ranged from 4 to 8 kg in weight. The entire sample was crushed to 2 mm size. Approximately a 250 g split is pulverized. Coarse reject is bagged and stored. From Guadalajara, prepared sample pulps were shipped by air to ALS Vancouver Laboratory for analysis.

All core samples and geochemical samples were assayed using the multi-element inductively coupled plasma-optical emission spectroscopy (ICP-OES) assay 41-element assay method (ME-ICP41), with gold assayed by fire assay with an AA finish (Au-AA24), using a 50 gram aliquot. Mercury was analyzed separately by code CV41, since the detection limit in the ICP analysis is too high to be meaningful.

A small proportion of the samples was sent to SGS Laboratory in Durango, Mexico. Individual core samples typically ranged from 4 to 8 kg in weight. The entire sample was crushed to 2 mm size. Approximately a 250 g split is pulverized. Coarse reject is bagged and stored. Samples were analyzed at the SGS Laboratory in Durango.

SGS also employed a fire assay/atomic adsorption spectrophotometry (AAS) determination for gold and an ICP-OES analysis to determine multi-element values. The 50 g aliquots were analyzed by fire assay with an atomic absorption finish (Au-FAA515). Assays grading over 10 g/t were re-assayed by fire assay with a gravimetric finish using a 30g aliquot (Au-FAG303). Samples were also analyzed with an aqua regia digestion and a combination of inductively coupled plasma emission spectrometry (ICP-OES) to provide a multi-element analysis.

A small number of samples were also prepared at ACME at Guadalajara, Mexico and Inspectorate Laboratory.

ACME Laboratory used 50 g aliquots analyzed by fire assay with an atomic absorption finish (G6-50) with samples assaying greater than 10 g/t Au and then re-assayed by fire assay with a gravimetric finish (G6Gr-50).

11.3.2 Alio Gold (2015-2018)

ALS Chemex prepared samples at its facility in Guadalajara, Mexico. Individual core samples typically ranged from 4 to 8 kg in weight, while RC chip samples ranged from 4 kg to 10 kg. The entire sample was crushed to 2 mm size. Approximately a 250 g split is pulverized. Coarse reject is bagged and stored. From Guadalajara, prepared sample pulps were shipped by air to ALS Chemex's Vancouver laboratory for analysis.

At ALS, 50 g aliquots were analyzed by fire assay with an atomic absorption finish (Au-AA24) with samples assaying greater than 10 g/t Au, and then re-assayed by fire assay with a gravimetric finish (Au-GRAV22) using a 30g aliquot). Samples were also analyzed with an aqua regia digestion and a combination of inductively coupled plasma emission spectrometry (ICP-OES) and/or inductively coupled plasma mass spectrometry (ICP-MS) to provide a multi-element analysis. The elements As, Cu, Pb, and Zn were determined by ore grade assay for samples that returned values >10,000 ppm by ICP analysis. Final certificates were issued electronically and delivered to Alio Gold via email. These assay certificates arrived in Excel™ or as comma-separated text (.csv) format and were merged electronically into the database and verified for accuracy. A hard copy of all certified assay certificates was delivered by courier to the company office where they are kept on file for review.

11.4 QUALITY ASSURANCE AND QUALITY CONTROL

11.4.1 Goldcorp and Newstrike (2005-2015)

Quality control samples included standards for gold and other elements and blanks. Standard reference materials ("SRM") originated from pulps and are from two sources: (1) commercially prepared and certified samples from CND Resource Laboratories; and (2) those provided by ProDeMin which is a geological services contractor engaged by Newstrike. ProDeMin provided two types of SRM: (1) in-house SRM derived from material obtained in unrelated projects; and (2) in-house SRM made from Ana Paula mineralized rock and analyzed by a number of certified laboratories.

11.4.1.1 Blank

A total of 1,108 blank samples were inserted during the Newstrike drilling program (holes AP-10-12 through AP-13-230), representing the insertion of a blank into the sample stream approximately once every 70th sample. The protocol for blank insertion included alternating blanks and standards every 20th sample, as well as insertion of a blank within or immediately after mineralized zones. The blanks are numbered sequentially, and samples of quartered or half core with low or below detection limit values were used so that the preparation facility could not identify the sample as a blank. For the most current drilling campaign (AP-12-131 to AP-13-230), there were 499 blank samples, which represents the insertion of a blank into the sample stream approximately once every 70th sample. No data were available for Goldcorp holes AP-05-01 through AP-05-11 or for two short Newstrike holes that did not include a blank, AP-13-183, AP-13-189.

Assays on blank samples should ideally return grades at or below the lower detection limit, but even allowing for outliers (again probably a result of mislabelling or data entry errors) approximately 35 percent of the ALS gold assays, 45 percent of the SGS gold assays and 40 percent of the ACME gold assays exceed the 0.005 g/t gold detection limit.

Results for silver indicated the same problem. It was noted that the fact that all three labs, ALS, ACME, and SGS show comparable exceedances for gold indicates that the problem lies with the blank material and not with the assays. The blank sample material used during the Newstrike campaign originated from Ana Paula core material previously assayed as below detection and is not a certified blank material. This material will return values greater than a true blank due to the inherent grade variability of the deposit.

11.4.1.2 Quarter Core Duplicate

A total of 1,217 assays on duplicate samples prepared by ALS and SGS from second-split core from holes AP-10-12 through AP-12-81, representing one duplicate assay approximately every 20th sample. No data were available for Goldcorp holes AP-05-01 through AP-05-11 or for Newstrike holes AP-12-82 through AP-13-230.

Results from this program indicated that the mean duplicate gold grade for all samples is 14% higher than the mean original gold grade (0.33 versus 0.38 g/t) and the silver grade is 2% higher (4.0 versus 4.1 g/t). This suggests that the first splits may be biased low relative to the second splits, but assay1>assay2 counts meet criteria for randomness, suggesting that there is no bias between the splits. The level of scatter on XY plots of duplicate versus original assays; however, is large and it is doubtful that a bias would be detectable even if one were present.

11.4.1.3 Standards

During the Newstrike drill campaign, control samples, consisting of standard pulps and blanks, were inserted into the drill sample stream every 20th sample. The control samples were numbered consecutively and generally consisted of alternating 4 standards and blanks. A total of 3,297 assays were run on the fourteen standards that were used during the Newstrike drilling program (holes AP-10-12 through AP-14-232), representing the insertion of a standard into the sample stream approximately once every 24th sample. No data were available for Goldcorp holes AP-05-01 through AP-05-11.

Results of the program indicated that gold compares to within 5% in all cases except for ACME on standards AP-03, AP-06, and AP-07. These three ACME comparisons are a total of 20 samples thus representing 0.6% of the total checks on standards. The silver comparisons, however, are within 5% in only seventeen of the thirty cases listed. Silver is not a large contributor to the overall project economics. The repeatability of standard assays with time was also investigated, Gold remains stable with time and the assays exhibited low scattered. Silver also remains stable with time, but the assays exhibit considerable scatter and are not a good match to the standard mean grades.

11.4.1.4 Check Assays from the Umpire Laboratory

A total of 5,707 check assays from holes AP-10-12 through AP-14-232, representing a check assay at an average of approximately once every 14th sample. No check assays were available for the Goldcorp holes AP-05-01 through AP-05-11, although some samples were re-analyzed by Newstrike during its audit program. Check assays were also missing for drill holes AP-11-41, AP-13-162, AP-13-168, AP-13-171, AP-13-172, AP-13-174, AP-13-176, AP-13-177, AP-13-182, AP-13-187, AP-13-189, AP-13-190 and AP-13-221. No check assays were available for the Goldcorp holes AP-05-01 through AP-05-11, although some samples were re-analyzed by Newstrike during its audit program.

Gold and silver check assays were run by ALS. Inspectorate, and SGS on pulps or rejects supplied by SGS when SGS was the primary laboratory and by SGS, Inspectorate, ACME and ALS on pulps or rejects supplied by ALS when ALS was the primary laboratory, generating ten separate comparisons for gold and eight for silver.

11.4.2 Alio Gold (2015 – 2018)

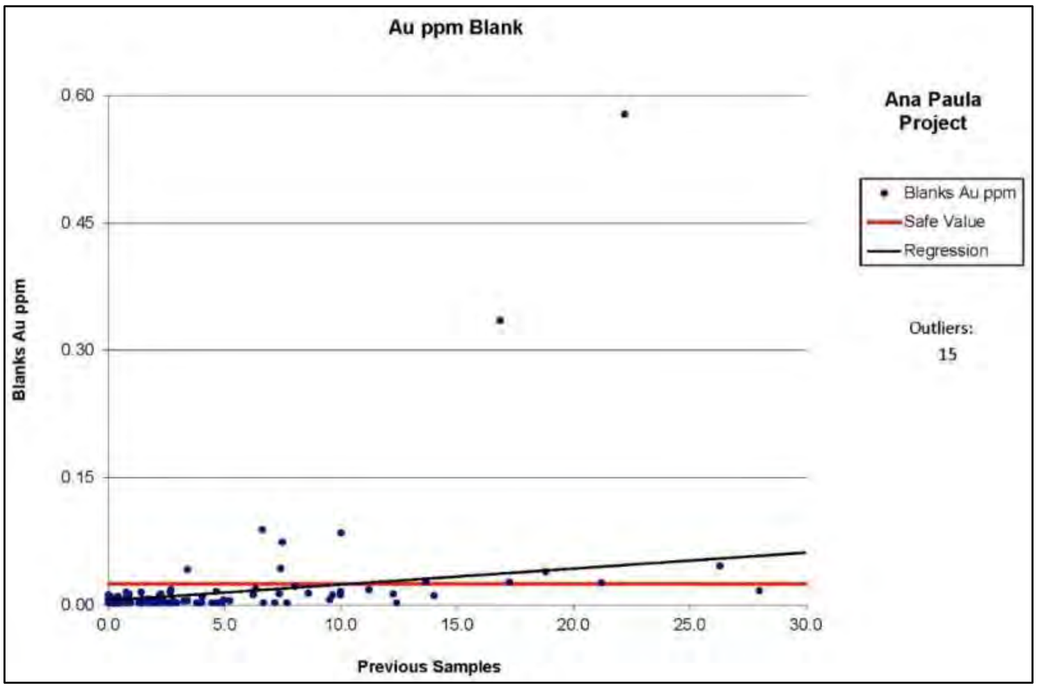
Alio Gold routinely inserted quality control/quality assurance samples ("QA/QC") in the sampling chain to monitor cross contamination, precision and repeatability of the assays. QA/QC samples were generally inserted at a rate of 1 sample in 20 approximately for each of the QA/QC sample types amounting to a 5% insertion rate or 10%.

Four types of QA/QC samples were used by Alio Gold.

11.4.2.1 Blank

Blanks consist of non-mineralized basalt rock chip that are suitable for monitoring cross contamination at the sample preparation step. The blanks were inserted into the sequences approximately every 20 samples. Additionally, blanks were specifically added following zones with expected gold grades.

A total of 224 blanks were analyzed during the 2015-2017 drill program. The result of this analysis is presented below in Figure 11-1.



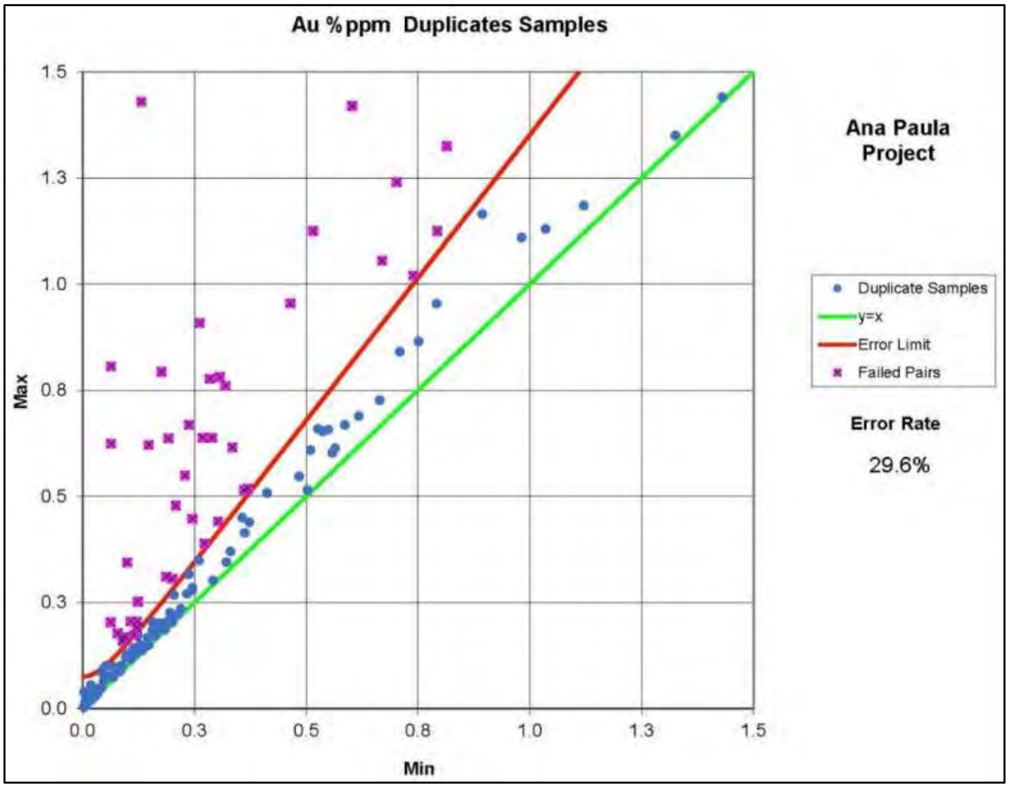
Source: M3 (2020)

Figure 11-1: Blank Correlation for Ana Paula Samples

The samples below the detection limit of 0.005 g/t Au were set at 0.0025 g/t Au (half the detection limit). Values are accepted within five times the detection limit (0.025 g/t Au). Results from the blanks indicated 7 failures exceeding the 5 times the lower detections limits and all were not clustered in a specific batch that indicates that the assays were likely free of cross-contamination.

11.4.2.2 Quarter Core Duplicate

Filed duplicates consist of quarter cores duplicate directly collected from core boxes. They are collected every 25 samples. A total of 126 duplicates were analyzed during the 2015-2017 drill program. The result of this analysis is presented in Figure 11-2. The QP comments that quarter core duplicate “failures”, as shown in Figure 11-2, are indicative of the typical nugget effect in gold deposits and cannot be considered as true failure.



Source: M3 (2020)

Figure 11-2: Field Duplicate Correlation for Ana Paula Samples

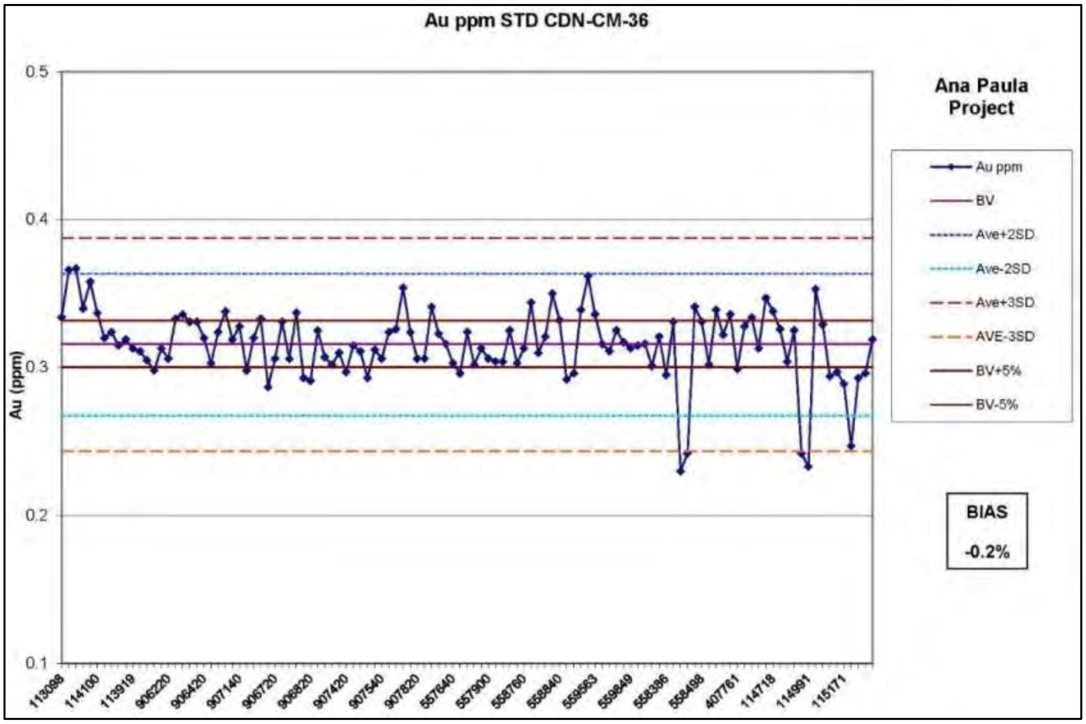
11.4.2.3 Standard

A number of different standards from CDN Resource Laboratories Ltd. were used. The standards purchased include: CDN-CM-36, CDN-GS-1P5K, and CDN-ME-1101.

Table 11-1: CDN Resource Laboratories Ltd Standards

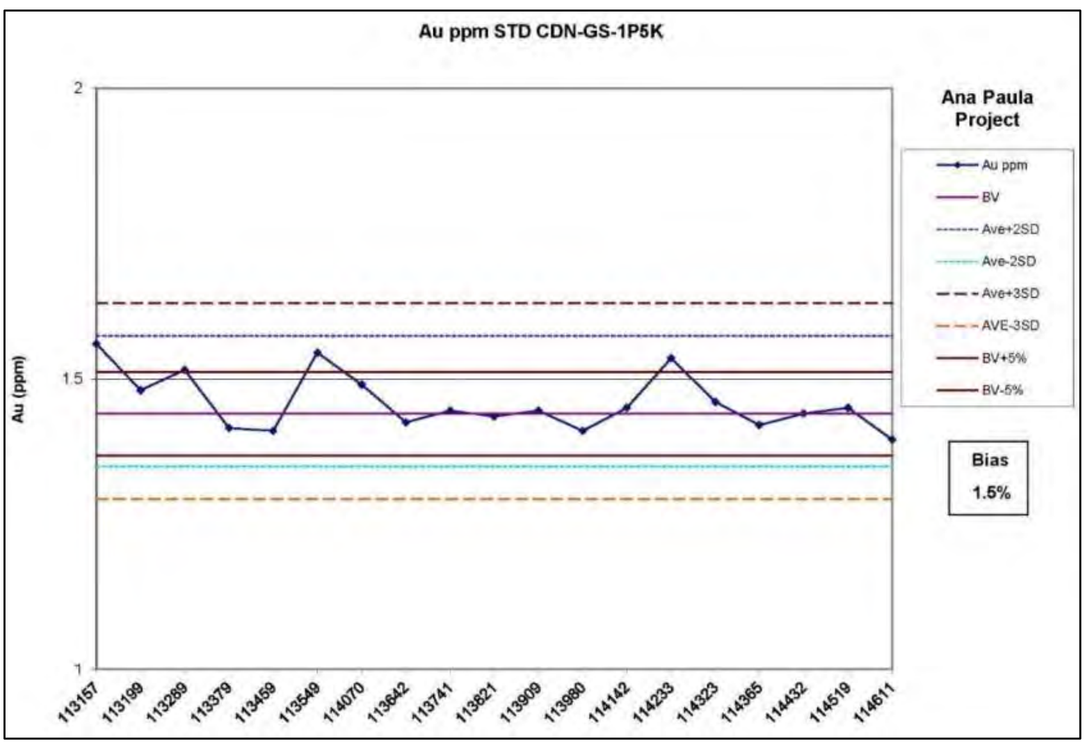
Standard	Gold				Silver			
	Mean g/t	St. Dev	St. Dev 2	St. Dev 3	Mean g/t	St. Dev	St. Dev 2	St. Dev 3
CDN-CM-36	0.316	0.034	0.068	0.102	2.1	0.20	0.40	0.60
CDN-GS-IP5K	1.440	0.130	0.260	3.390				
CDN-GS-5K	3.840	0.280	0.560	0.840				
CDN-ME-1101	0.564	0.056	0.112	0.168	68.20	4.60	9.20	13.80

The standards were inserted into the sequences approximately every 20 samples. Additionally, standards were specifically added to zones with expected gold grades. A total of 289 standards were analyzed between 2015-2017. The QA/QC results are given in Figure 11-3 to Figure 11-6.



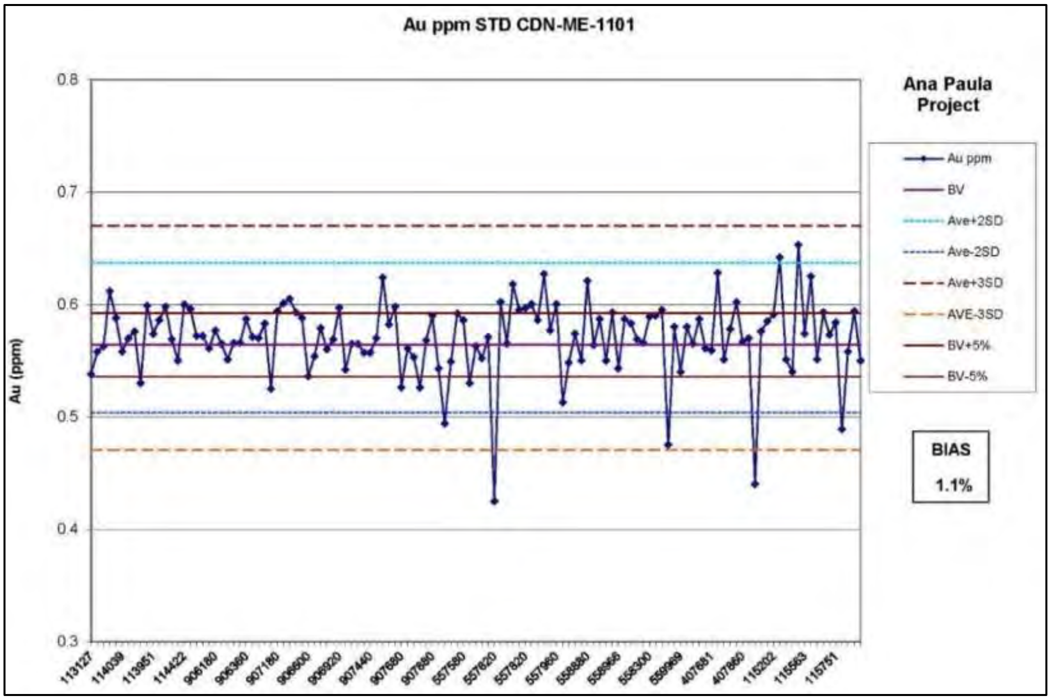
Source: M3 (2020)

Figure 11-3: QA/QC Results of Standard Samples from Ana Paula



Source: M3 (2020)

Figure 11-4: QA/QC Results of Standard Samples from Ana Paula

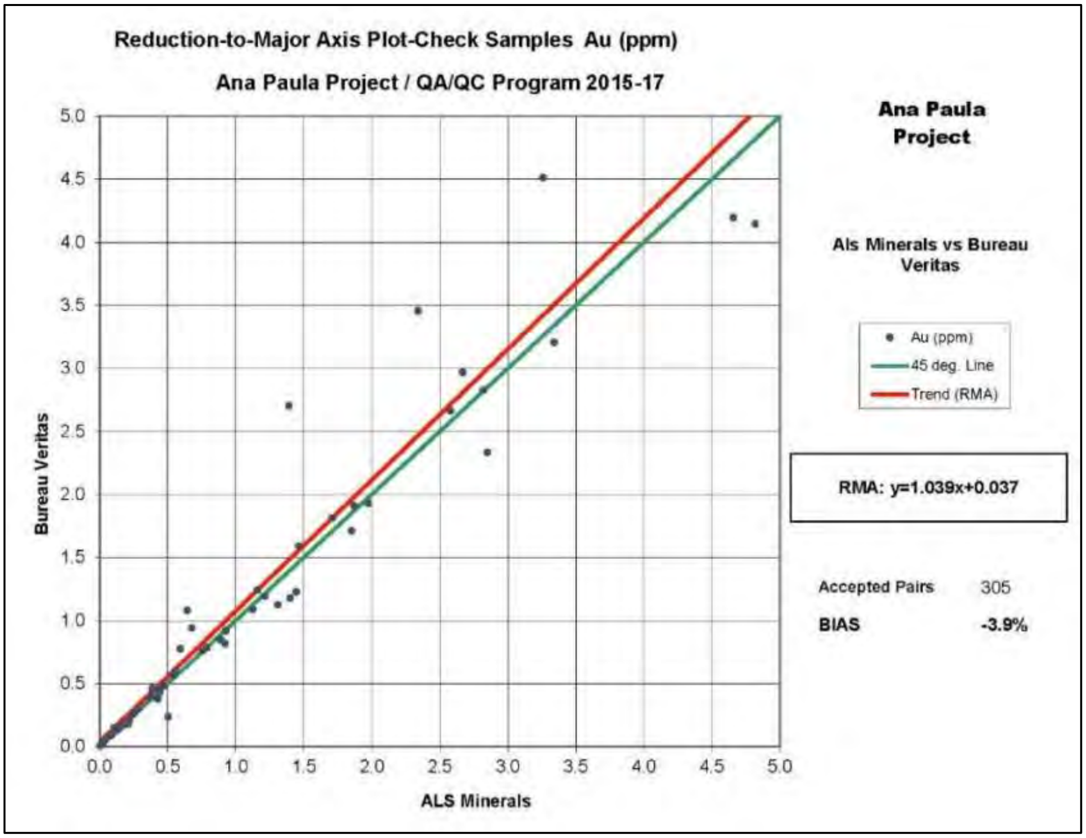


Source: M3 (2020)

Figure 11-5: QA/QC Results of Standard Samples from Ana Paula

11.4.2.4 Check Assays from the Umpire Laboratory

Additional pulps samples were sent to a secondary laboratory as a check on the primary laboratory. Samples assayed at ALS-Chemex lab were sent to a secondary laboratory Bureau Veritas lab. Samples for the check assaying program were selected randomly and were analyzed by fire assay with an atomic absorption finish (FA-430). Assays grading over 10 g/t were re-assayed by fire assay with a gravimetric finish using a 30g aliquot (FA-530). Samples were also analyzed with an aqua regia digestion and a combination of inductively coupled plasma emission spectrometry (ICP-OES) to provide a multi-element analyses. These results were paired with the original assays from the primary laboratory and plotted on relative difference plots and scatter diagrams to look for evidence of bias.



Source: M3 (2020)

Figure 11-6: Relative Error Diagram – Pulp Duplicates

11.4.3 QA/QC Results

Two major failures outside the blanks safe value were encountered on batches GU16215927 and GU17026523. For the GU16215927 batch, the failure was a result laboratory preparation contamination and for the GU17026523 batch, the failure resulted from a sample mix-up. In both cases, the laboratory was requested to do formal investigation and both batches were re-assayed. The laboratory re-issued the assays certificated, and the new results were incorporated to the database.

11.5 DENSITY DETERMINATION

Bulk density samples are measured on a regular basis and consist of approximately one density sample every 10 m in mineralized sections and one in every 20 m in un-mineralized wall rock. The drill core sample is cut to a length of 10-15 cm. The sample is dried in an oven for about 15 minutes (230°F) then after cooling is wrapped in plastic. The sample is weighed dry and wet on a scale and both measurements are registered on a spreadsheet.

11.6 QUALITY CONTROL AND QUALITY ASSURANCE VALIDATION

Prior to the resource estimate, the QP reviewed the results of the QA/QC program provided by Alio Gold.

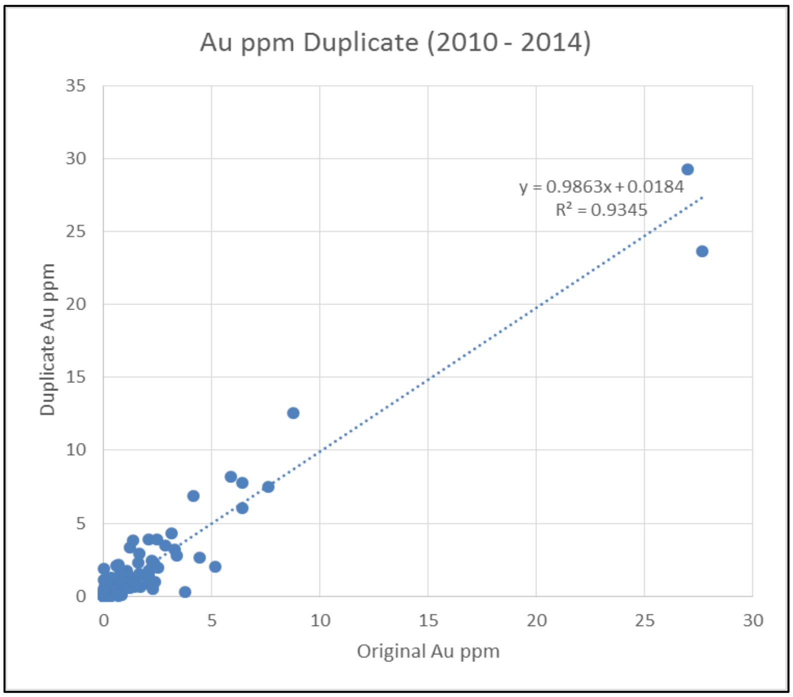
11.6.1 Blanks

The QP reviewed a total of 1,361 blank samples from all drill campaigns from 2010 to 2017. From this total, 75 blank samples exceeded 5x the detection limit, amounting to 6% of the total. The QP notes that the blank material used prior to the 2015 data was not considered totally "blank" as reported by IMC.

Of the 75 blanks exceeding 5x detection, only 9 of the samples were inserted immediately after a high-grade sample which could be indicative of a cross-contamination. The QP did not identify a reproducible pattern of cross contamination in the data reviewed. For the 2015-2017 dataset, blanks were found to be inserted at a rate of approximately 1 in 28 samples (3.6% of the assays).

11.6.2 Duplicates

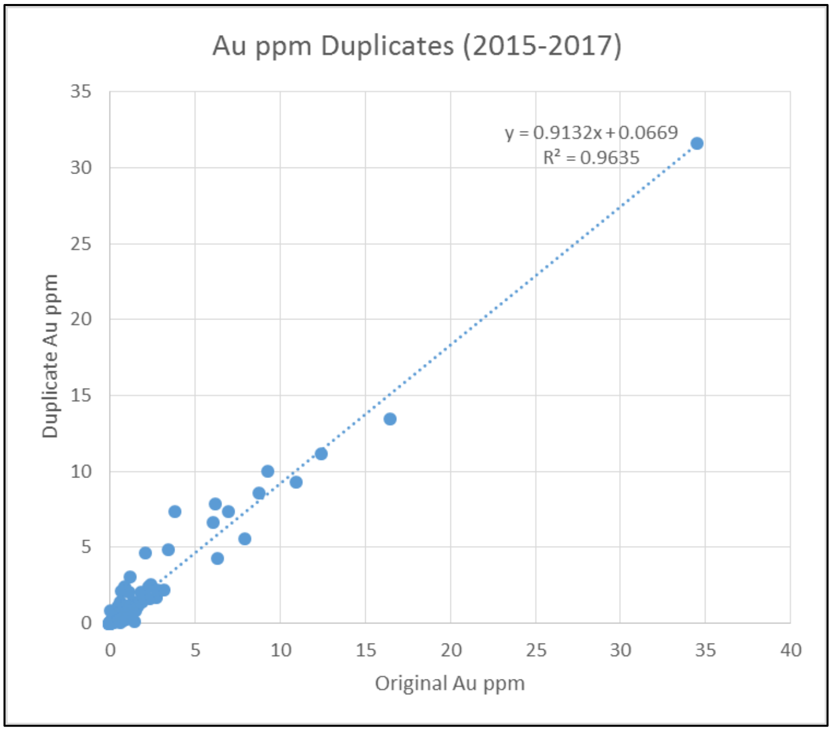
A total of 1,217 duplicate samples were collected from the 2010-2014 drill campaigns and are shown in Figure 11-7 below; 9 outliers were removed. For the 2015-2017 dataset, quarter core duplicates were found to be inserted at a rate of approximately 1 in 31 samples (3.2% of the assays). The protocol for duplicates of this type generally calls for no more than 10% of samples outside of specification (OOS). The percentage of OOS duplicate pairs for gold were within the 10% limit where 9 out of 1,217 pairs are considered OOS.



Source: AGP (2020)

Figure 11-7: Gold 1/4 Core Duplicate – 2010-2014

Results shown indicate the percentage of OOS duplicate pairs for gold were within the 10% limit where 3 out of 203 pairs are considered as OOS.



Source: AGP (2020)

Figure 11-8: Gold 1/4 Core Duplicate – 2015-2017

Once a few outliers were removed, the plots indicated a reasonable agreement between the original and duplicate value considering that a ¼ core duplicate typically shows more drift than a pulp or crush reject duplicate. The scatter about the parity line is good. The slope of regression is close to 1 indicating no material bias. The QP noted that with the outliers, the slope of regression is not as good; the 2010-2014 data indicated a R^2 of 0.75 and a slope of 1.11 and for the 2015-2017 data the regression showed a R^2 of 0.88 and a slope of 0.82.

11.6.3 Standards

Throughout the years, Ana Paula employed several standards. Standard AP01 to AP08 were internally prepared by ProDeMin during the Newstrike drill campaign. The mean grades for these standards were determined from assays run at the ALS, SGS, Inspectorate Vancouver, and Inspectorate Reno laboratories and standard deviations are calculated from the assay means measured by these laboratories. Standard AP09 through to AP13 were commercially produced standard reference materials (SRM or Standards) originating from CDN Resource Laboratories. These Standards are summarized in Table 11-2.

Table 11-2: Summary of Standard Reference Materials

Standard Name	Manufacturer	Au (ppm) Value	Conf. Limit	No. Sample	Nb of samples in excess of 2x Stdev	% of samples in excess of 2x Stdev
2015 – 2017 Drill Programs						
AP-1	ProDeMin/Newstrike	0.317	0.016	300	9	3.00%
AP-2	ProDeMin/Newstrike	0.536	0.026	255	12	4.70%
AP-3	ProDeMin/Newstrike	0.689	0.02	190	7	3.70%
AP-4	ProDeMin/Newstrike	1.283	0.112	50	2	4.00%
AP-5	ProDeMin/Newstrike	0.32	0.006	567	6	1.10%
AP-6	ProDeMin/Newstrike	0.493	0.026	693	26	3.80%
AP-7	ProDeMin/Newstrike	0.863	0.035	255	16	6.30%
AP-8	ProDeMin/Newstrike	1.225	0.057	72	5	6.90%
AP-9	CDN Resource Laboratories Ltd.	0.564	0.56	392	18	4.60%
AP-10	CDN Resource Laboratories Ltd.	0.62	0.062	314	11	3.50%
AP-11	CDN Resource Laboratories Ltd.	0.564	0.056	63	3	4.80%
AP-12	CDN Resource Laboratories Ltd.	0.62	0.062	66	3	4.50%
AP-13	CDN Resource Laboratories Ltd ?	0.799	0.05	26	0	0.00%
1F	Early standard – origin unknown	1.17	0.117	9	0	0.00%
EXM-STD-1	Early standard – origin unknown	1.17	0.117	22	1	4.50%
EXM-STD-2	Early standard – origin unknown	0.76	0.076	15	1	6.70%
EXM-STD-3	Early standard – origin unknown	0.34	0.034	18	1	5.60%
P2	Early standard – origin unknown	0.5448	0.054	7	0	0.00%
P7B	Early standard – origin unknown	0.85	0.085	8	0	0.00%
2015 – 2017 Drill Programs						
CDN-CM-36	CDN Resource Laboratories Ltd.	0.316	0.034	115	7	6.10%
CDN-GS-1P5K	CDN Resource Laboratories Ltd.	1440	0.13	37	0	0.00%
CDN-ME-1101	CDN Resource Laboratories Ltd.	0.56	0.056	125	7	5.60%
CDN-GS-5K	CDN Resource Laboratories Ltd.	3.84	0.28	17	0	0.00%

Source: M3 (2020)

The results were plotted in chronological order on graphs for each standard depicting the 'recommended value' as well as plus/minus two and three times the standard deviation of the dataset. This provides a check of the precision of the assays. For the 2015-2017 dataset, standards were found to be inserted on average, at a rate of approximately 1 in 27 samples (3.7% of the assays).

Although some failures (of greater than 3 standard deviations) have occurred, there were generally no two consecutive failures observed; except in the Standard CDN-CM-36 where two instances of two consecutive failures existed. Standards were underestimated in both instances.

11.7 COMMENTS ON SECTION 11

The QP is of the opinion that the QA/QC protocols and verification of the results, meet or exceed industry norms and believe the data verification is adequate for this type of deposit. Insertion rate for QA/QC samples for the 2015-2018 drill program conducted by Alio Gold is within industry standard.

Prior insertion rate during the early Newstrike drill program was low since the QA/QC sample insertion rate was quoted in the literature as 1 in 20 alternating between QA/QC sample types. This equated to a rate of 1 in 60 for each of the QA/QC type.

Additional protocols including the blind submission of pulps and reject in the sampling chain could be added to enhance the QA/QC program.

12 DATA VERIFICATION

Field inspection and database validation was previously carried out by C. Gibson P.Geo., Ph.D. of ProDeMin as part of the PEA study authored by JDS. A summary of the field inspection and data validation carried out can be reviewed in Section 9.3 of this technical report.

AGP conducted two site visits to the Ana Paula Project. The first site inspection was completed by Mr. Pierre Desautels, P. Geo., former Principal Resource Geologist for AGP in December 2017. The second visit was completed by Mr. Paul Daigle, P.Geo., Principal Resource Geologist for AGP in January 2023.

12.1 FIELD INSPECTION – JANUARY 2023

Mr. Paul Daigle, P. Geo. visited the property between 10 and 14 January, 2023, for three days. No exploration or drilling activities were underway on the property since activities were halted in 2018. The site visit included an inspection of core logging, sampling, and core storage facilities, checking of drill hole collar coordinates, and reviewing drill core logs against selected drill core.

Minera Aurea rents several houses in Cuetzala del Progreso, to serve as accommodations, exploration offices, and storage facilities.

12.1.1 Drill Core Logging, Sampling and Storage Facilities

Drill core for the Ana Paula Project was logged, sampled, and stored at a dedicated compound situated approximately 2 km south of Cuetzala del Progreso. The facility consists of four steel frame buildings covered with tin rooves. The buildings are only partially covered on the walls due to the hot climate. One building serves as the principal logging facility in one half, with steel racks for core box storage on other (Figure 12-1 and Figure 12-2). One building has two core saws located outside (saws are operational) and also serves as a parking shelter/garage and equipment storage (Figure 12-3). The two remaining buildings serve as core box storage.

The facility is well built, clean and in good condition. The compound is fenced and only one core storage buildings is fully enclosed with a locked door and considered secure (Figure 12-4 and Figure 12-5). The other core storage building is open on two sides (Figure 12-6).

The sample rejects, and pulps are also stored at the second building (Figure 12-7). The sample rejects are stored outside and are almost completely destroyed due to exposure to the sun and elements. The sample pulps are stored inside the core box storage buildings and are in good condition.

It is noted that the plastic core boxes closest to the doors or open sides of some the buildings are deteriorating and need replacing. Some of the older boxes with black marker labels are fading or are ineligible. It is recommended that these boxes be replaced, and any box markings be re-written on the boxes.

Source: AGP (2023)

Figure 12-1: Core Logging Shelter and Core Storage

Source: AGP (2023)

Figure 12-2: Core Logging Shelter and Core Storage; interior

Source: AGP (2023)

Figure 12-3: Core Sampling Facility and Parking Shelter

Source: AGP (2023)

Figure 12-4: Core Box Storage Facility

Source: AGP (2023)

Figure 12-5: Core Box Storage Facility, interior

Source: AGP (2023)

Figure 12-6: Core Box Storage Facility 2

Source: AGP (2023)

Figure 12-7: Core Box Storage Facility 2; with rejects piles (foreground and back ground)

12.1.2 Mine Camp Facilities

At the Project site, the previous operators had installed a permanent mining camp situated approximately 1.5 km, straight line, east of the Ana Paula deposit. The camp had been commissioned and used only weeks before work ceased in August 2018. Minera Aurea maintains security for the facility and is kept in very good condition. Figure 12-8 shows the mine camp facilities at Ana Paula.

Source: AGP (2023)

Figure 12-8: Mine Camp Facilities; showing offices and accommodations

Additionally, the previous owners had driven an exploration decline to the Ana Paula deposit, from the east to the west. The portal is situated in the valley to the east of the Ana Paula deposit, roughly 1.1 km east in a straight line. Approximately, 400 m of the decline were completed before work was halted in 2018. Figure 12-9 shows the decline portal.

Source: AGP (2023)

Figure 12-9: Ana Paula Decline Portal

12.1.3 Drill Hole Collars

Drill hole collars are mostly marked by a PVC pipe in the collar of the hole and held in place with a cement square block around the base of the pipe. Most of the older collars are overgrown (Figure 12-10) and some of the PVC pipes are cracked or broken. The cement block is etched with the drill hole number, Azimuth and dip of the hole, and total depth in meters (Figure 12-11).

The QP located 27 drill hole collars at Ana Paula. At the time of the site visit, drill roads and trails were overgrown, and most drill hole collars were accessed on foot. The locations of diamond drill hole collars were recorded in the field using a hand-held Global Positioning System (GPS) device (Garmin GPS map 62s) using WGS84 datum, the same datum used for the Ana Paula Project.

The collar coordinates measured by the QP fell within a 6 m tolerance of those in the Ana Paula database. It is the QP's opinion the coordinates are acceptable, given the accuracy of the handheld GPS used to review the drill hole collar locations.

Table 12-1 presents the comparison of the AGP and Ana Paula coordinates for the located drill holes.

Source: AGP (2023)

Figure 12-10: Overgrown Drill Pad; drill holes AP-12-100, APM-15-03, AP-11-71, AP-11-37 and AP-13-186

Source: AGP (2023)

Figure 12-11: Drill Hole Collars AP-11-71 and APM-17-05

Table 12-1: Collar Coordinate Field Validation

Hole-ID	GPS-Easting	GPS-Northing	DB-Easting	DB-Northing	Δ Easting	Δ Northing
AP-10-17	410210.3	1998104.0	410207.5	1998103.4	-2.7	-0.7
AP-10-18	410205.7	1998108.4	410205.5	1998103.3	-0.3	-5.1
AP-11-37	410304.7	1998001.1	410301.7	1997997.1	-3.0	-4.0
AP-11-47	410126.4	1998025.2	1998027.1	410125.9	-0.5	1.9
AP-11-71	410304.6	1998005.2	410299.9	1997999.0	-4.7	-6.2
AP-11-80	410219.6	1997940.1	410220.2	1997937.8	0.6	-2.3
AP-12-100	410302.2	1998002.9	410301.1	1997997.1	-1.1	-5.8
AP-12-101	410170.0	1998059.2	1998056.1	410173.5	3.6	-3.1
AP-12-102	410249.8	1998042.3	410245.2	1998038.4	-4.6	-3.9
AP-12-106	410338.6	1997959.1	410336.5	1997955.7	-2.1	-3.5
AP-12-107	410332.1	1997805.8	410329.9	1997803.5	-2.2	-2.4
AP-12-111	410189.3	1998002.9	1997998.1	410187.1	-2.2	-4.8
AP-12-81	410220.8	1997940.3	410218.5	1997937.6	-2.3	-2.7
AP-12-84	410219.6	1997942.3	410220.8	1997937.4	1.3	-5.0
AP-12-86	410220.3	1997939.5	410219.0	1997938.0	-1.3	-1.6
AP-13-177	410187.5	1998202.2	1998200.4	410187.4	-0.1	-1.7
AP-13-186	410301.1	1997997.9	410300.0	1997995.9	-1.1	-2.1
AP-13-190	410089.6	1997991.5	1997990.5	410089.6	-0.1	-1.0
AP-13-193	410204.5	1998151.6	1998145.7	410201.6	-2.9	-6.0
AP-15-237	410164.0	1997940.5	410165.0	1997939.0	1.0	-1.5
AP-16-245	410198.7	1998081.6	410198.8	1998078.2	0.1	-3.4
AP-16-250	410099.1	1997947.4	1997941.4	410098.3	-0.8	-6.1
AP-16-252	410112.6	1997966.8	1997968.4	410114.9	2.3	1.6
AP-16-268	410235.7	1997898.4	410238.5	1997897.4	2.8	-1.0
AP-16-269	410240.6	1998121.9	1998120.7	410245.4	4.8	-1.2
APGT-17-06	410217.7	1997938.6	410219.2	1997936.2	1.5	-2.4
APM-15-03	410299.7	1997999.3	410301.7	1997997.1	1.9	-2.1
APM-17-05	410181.8	1997947.4	410185.5	1997945.7	3.7	-1.6
APM-17-13	410128.6	1998021.4	1998021.0	410125.4	-3.3	-0.4

Source: AGP (2023)

12.1.4 Drill Core Log Review

The site visits included a review of the database logs and comparison to selected drill core intervals. The lithology descriptions and sample intervals in the drill logs were consistent with the drill core intervals and lithological contacts reviewed. Logged mineralization and high grade assay values were consistent with the logged mineralization. Lithological boundaries are clearly evident and are properly recorded in the database. Table 12-2 lists the selected drill core intervals examined during the site visit

Table 12-2: Collar Coordinate Field Validation

Hole-ID	From (m)	To(m)	Interval	Boxes	Lithology
AP-11-37	115.34	176.34	61.00	48-74	GS, CBX contact
AP-11-50	278.32	319.00	40.68	124-144	LS-SH, CBX contact
AP-11-52	309.14	373.59	64.45	139-167	GD, HFL, LS-SH contacts
AP-12-114	38.40	61.32	22.92	18-27	GD
AP-12-137	330.61	349.39	18.78	153-161	CBX, GD contact
AP-13-162	122.23	142.25	20.02	73-84	CBX, SULF, GD contacts
AP-15-239	125.85	148.20	22.35	59-68	CBX
AP-16-252	148.70	166.45	17.75	70-77	CBX
AP-16-253	175.30	197.30	22.00	82-91	CBX, GD contact
AP-16-262	0.00	252.10	252.10	1-118	GD, CBX, LS-SH contacts
AP-16-264	108.90	121.80	12.90	52-57	CBX, GD contact
AP-18-283	361.95	389.10	27.15	171-183	GD, SULF, LS-SH contacts
APM-15-03	134.90	170.05	35.15	60-75	CBX
APM-17-04	83.30	110.65	27.35	42-57	CBX

Source: AGP (2023)

12.1.5 Independent Samples

The QP did not collect independent samples during this site inspection, as this was completed by AGP in 2017 site visit (M3, 2020).

12.2 DATABASE VALIDATION

Prior to the current resource evaluation, the QP carried out an internal validation of the drill holes in the drill database.

12.2.1 Collar Coordinate Validation

All holes drilled by Alio Gold were laid out in the field using a hand-held GPS unit. Once the holes were completed, the collar was surveyed using a high precision Trimble R6 instrument.

During the site visit, seven collar coordinates were validated by the QP with the aid of a hand-held Garmin GPS Map, Model 60CSx. Collars were randomly selected, and the GPS position was recorded. The difference with the GEMS database was calculated as an X-Y 2-D plane using the following formula:

$$\boldsymbol{X-Y\ difference} = \sqrt{(\Delta\boldsymbol{East})^2 + (\Delta\boldsymbol{North})^2}$$

As shown in Table 12-3, results indicated an average difference in the X-Y plane of 1.60 m. On the Z plane, an average difference of 61 m was recorded.

Table 12-3: Collar Coordinate Field Validation

Hole-ID	GPS-East	GPS-North	GPS-Elev.	DB-East	DB-North	DB-Elev.	X-Y Plane Diff.	Elev. Diff.
AP-12-107	410331	1997804	1043	410329.9	1997803.5	959.3	1.27	84
AP-12-131	410513	1998423	1144	410514.0	1998423.3	1075.7	1.01	68
AP-12-135 & 127	410161	1997848	1150	410162.9	1997847.8	1046.4	1.89	103
AP-16-270 (Drill rig)	410121	1998023	997	410120.6	1998024.2	920.5	1.21	77
AP-11-59	409964	1997724	1106	409963.7	1997726.6	1094.0	2.62	12
AP-12-145	410888	1998002	964	410887.6	1998000.4	939.6	1.62	24
Average Difference							**1.60**	**61.44**

Source: AGP (2017)

APG notes that at the AP-11-59 drill hole location, 6 other holes were drilled from that same location within 2 m of the AP-11-59 set-up. (AP-10-96, AP-12-99, AP-12-109, AP-12-94, AP-11-55, AP-11-56).

Collar elevations were also validated by the QP against the topography surface provided by Alio Gold and no adjustment was made to the elevation of the holes.

12.2.2 Down-hole Survey Data

During the validation process, the down hole survey data was found to have an incorrect magnetic declination applied to the drill rig Reflex azimuth data. Alio Gold corrected all the azimuth measurements prior to the resource estimate. The corrected data now considers the changes in the magnetic declination for the year the hole was drilled. For the 2017 drill holes, the magnetic declination used is 5° 5' at the Project latitude of 18° 5' and longitude of 99° 50'.

With the corrected data, the QP reviewed the down-hole deviation data comparing each entry with the previous ones. There was no obvious erroneous entry noted on the holes inspected.

12.2.3 Assay Certificate Validation

In addition to the verifications by the previous author, the QP validated the gold and silver assays prior to interpolating the resource estimate. The selection of the certificates was heavily weighted toward the highest-grade assays in the database. The selection also ensures that all years were covered by the selection. In total, 268 certificates were requested from Alio Gold, and 256 were used in the validation. The signed Adobe Acrobat Portable Document Format (PDF) was provided along with a copy of the data in comma delimited format (CSV) ready for manipulation using Microsoft Excel™. Several certificates in CSV format were cross referenced with the signed PDF version to ensure they were the same. In total, 38% of the assay database was validated as indicated in Table 12-4.

Table 12-4: Assay Validation by Year

Year	Assays Validated	Assays Not Validated	Percent Validated
2005	0	2,862	0%
2010	1,788	1,369	57%
2011	9,316	9,561	49%
2012	7,995	21,481	27%
2013	9,314	16,745	36%
2014	197	1,041	16%
2015	1,322	81	94%
2016	3,226	884	78%
2017	764	1735	31%
2018	2571	0	100%
Total	**36,493**	**55,759**	**40%**

Source: AGP (2018)

For gold, the validation indicated several errors related to the selection of the best value for the ACME certificate as noted by the previous author (Gibson, 2014). The QP requested the assays be corrected with the best analytical technique regardless of the grade. This work was completed prior to the resource estimate. Out of the 36,493 assays validated, 18 gold assays showed a discrepancy with the certificate value. These were investigated, and the issue was related to the samples that were re-assayed, and the results received on a different certificate. In the final database used for the resource described in this technical report, no gold assays were found to be erroneously entered in the database for the 36,493 samples reviewed. For silver, a total of 143 certificate values were different than the value in the database. These were investigated and the issue was related to the samples that were re-assayed by Inspectorate Laboratory and the results which were received on a different certificate. In total, no silver assays were found to be erroneously entered in the database however, Alio Gold commented that the 148 silver assays in the database will be reverted to the SGS or ALS assays in the near future.

12.2.4 Opinion

Core logging field procedures observed during the site visit meet or exceeded industry standard. The only issue noted was the core saw using recycled water for the core cutting procedures.

Following the corrections of some of the problems related to the downhole survey azimuths and the ACME laboratory results, there is no other material issue related to sampling and assaying that was identified during the review of the drill data and accompanying assays. The QP finds the data that was collected by Alio and previous operators adequately represents the style of mineralization present on the Ana Paula property without a restriction on resource classification. The error rate in the Ana Paula drill database, for the data that was validated by the QP, was found to be non-existent.

12.3 C. GIBSON, PH.D., CPG FIELD INSPECTION AND DATA VALIDATION

12.3.1 Site Inspection September 2014

The following is a summary of the data validation carried by Mr. C. Gibson, Ph.D., CPG prior to completing the Newstrike 2014 estimate.

At the time, the Ana Paula database was being maintained by Newstrike in a set of Excel spreadsheets which was regularly updated as new information became available. It is reported that Newstrike forwarded its master assay file to Independent Mining Consultants (IMC) for use. IMC reportedly does internal checks on the database as it converts it into the IMC software. As part of the data validation, IMC reviewed 11% of the drill holes in the Ana Paula database against the assay certificates. This represented about 13% of the assayed intervals and at that time it was found that the data in the database was the same as the data on the assay certificates. IMC also reviewed the results of assays for standard and check samples and found them to be within acceptable industry standards.

12.3.1.1 Assays Certificate Check

For the 2016 PEA study, 25 drill holes were selected from the Ana Paula database for certificate checks covering holes that were drilled from 2005 to 2013. This sub-set of the database was analyzed by three different laboratories, namely ALS, SGS, and ACME. The data was sorted by the laboratories and results of the comparison between the certificate value and the database value indicated the following:

- There was no error for gold, silver, copper, and zinc for samples analyzed at ALS. It was noted that over limits for arsenic and lead were obtained from Inspectorate Laboratories.
- For assays analyzed at the SGS laboratory, IMC noted that detection limit values for silver were truncated to 0.2 (silver detection limit is 0.5, ½ of this value is 0.25). As with the ALS comparison, some values for arsenic and lead have been set to the Inspectorate lab value. Silver assays showed a few minor errors (< 0.35% of the data reviewed) related to selecting the values from the less precise analytical method. No other errors existed in the data reviewed.
- One drill hole had ACME listed as its primary lab. Gold was assayed by ACME using two different methods (G6-50 – fire Assay/AAS with over-limits method G6Gr-50 – fire assay/gravimetric and 1F30 fire assay/ICP-ES). During the review of the assays, it was found that the database contained the value of the assay method which had the greatest gold value instead of using the value from the best analytical method.

12.3.1.2 QA/QC Verification

During the Newstrike drill campaign, control samples consisting of standard pulps and blanks were inserted into the drill sample stream every 20th sample. The control samples were numbered consecutively and generally consisted of alternating four standards and blanks. The data provided to IMC consisted of 4,725 sample analyses of the fourteen standards that were used during the Newstrike drilling program (holes AP-10-12 through AP-13-230), representing the insertion of a standard into the sample stream approximately once every 24th sample.

Results from the analysis indicated the following:

- Gold compared within 5% in all cases except for ACME on 3 of the standards (AP-03, AP-06, and AP-07). These three ACME comparisons totaled 20 samples thus representing 0.6% of the total checks on standards.
- The silver comparisons were within 5% in only 17 of the 30 cases listed. It was noted by IMC that silver is not a large contributor to the overall project economics.

For blanks, the data provided consisted of 1,108 sample analyses of blank material during the Newstrike drilling program, representing the insertion of a blank into the sample stream approximately once every 70th sample. At the time, the protocol for blank insertion included alternating blanks and standards every 20th sample, as well as insertion of a blank within or immediately after mineralized zones. Blank material consisted of ½ or ¼ core duplicates originating in zone(s) previously assayed as near or below detection limit. There were numerous failures for gold and silver that were related to the type of material used for the blanks. At the time, Newstrike preferred to use this material as a 'blank' so that it had an appearance similar to the other material being assayed. Unfortunately, the material often returned values greater than a true blank, due to the grade variability of the deposit.

For ¼ core duplicate, the data provided to IMC consisted of 1,214 sample analyses of duplicate samples prepared by ALS and SGS representing one duplicate assay approximately every 20th sample. IMC found that the level of scatter on XY plots of duplicate versus original assays, was large and IMC concluded that it would be doubtful that a bias would be detectable even if one were present.

Newstrike conducted a check assay program consisting of re-submitting pulps and rejects. A total of 2,642 assays originally analyzed at ALS, were re-submitted to ALS (65%), SGS (12%), ACME (4%), and inspectorate (29%). Additionally, a total of 1,608 assays originally analyzed at SGS samples were re-submitted to SGS (68%) and ALS (33%). At the time, IMC considered a check/original mean grade comparison within 5% or less to be acceptable; all the comparisons met this criterion except for ALS vs ALS rejects. IMC noted that the check assays run on rejects acted as an independent check on the primary lab's sample preparation procedures of generating a well homogenized sample, as well as its analytical procedures.

12.3.1.3 Goldcorp Holes (2005)

Since no QA/QC data was available for these earlier holes, IMC compared 5 m composites of gold and silver grades in the Gold Corp. holes versus 5 m composites in adjacent Newstrike holes with a separation distance of less than 30 m. The resulting data was compared on probability plots and IMC concluded that the grade distribution showed no evidence of systematic bias.

12.3.1.4 Conclusions and Recommendations (IMC/Gibson September 2014)

IMC concluded that the gold and silver assays in the database supplied meet the criteria for use in developing a NI 43-101 compliant resource estimate in support of the initial 2016 PEA study by JDS. IMC noted however, that no check assay was available for several holes. Samples from Goldcorp holes AP-05-01 through 11 were assayed by ALS and IMC considered these assays were compliant but recommended to confirm by running additional check assays.

The blank material used by Newstrike, was found not to be entirely blank, and IMC recommended efforts should be made to ensure the material is as barren as possible.

The basic purpose of duplicate assays is to demonstrate that core-splitting procedures are not biasing first split grades relative to second-split grades. Because of high levels of scatter, IMC concluded the duplicate samples were not capable of detecting such biases and therefore recommend the program be discontinued.

It was also recommended that check assays be conducted on fresh pulps prepared by the Umpire Laboratory from rejects in order to validate both the primary lab's sample preparation and the analytical procedures. Submission of blanks or standards along with the check assay samples was deemed not necessary. Mr. Gibson recommended the following sample submission guidelines:

- one standard every 20th sample alternating with blanks
- additional blanks inserted after or within visibly mineralized intervals
- one check assay every 20th sample on new pulp material

Lastly, it was recommended that drill holes that have been assayed by ACME Laboratory should have the gold values set to the G6-50 assay value, except when an overage occurs (au value > 10), then the gold value should be set to the G6Gr-50 value, if it exists.

12.3.2 Site Inspection November 2020

Craig Gibson visited the Ana Paula Project site on November 20, 2020, to provide a current site inspection for an updated NI 43-101 report that was not disclosed. The visit was made in the company of Arnulfo Rodriguez, site administrator and former accountant of Minera Aurea, along with several of the local workers. The following tasks were completed:

The paved road from Iguala and Cocula to Cuétzala is in very good condition. The approximately 7 km long dirt road to the Project from the village of Cuétzala is not as well maintained as previously but is in good condition considering that the rainy season has just passed. The roads on the Project that access the main facilities constructed by Alio Gold are in good condition, but other roads are in moderate to poor condition; the Mina Guadalupe area including the area of outcrop of the high grade breccia can be accessed by vehicle, but some of the Project cannot currently be accessed by vehicle due to rockfalls and washouts.

Three of the drill holes completed by Alio Gold were located with a handheld GPS. Several older (Newstrike) holes were observed, but the cement plates of many were partly to completely covered by alluvium, but it appears that the locations of most of the holes are recoverable.

The organization of the camp and core storage facilities has been maintained. The core is well cared for and the methodology for organization of the information for the core holes in notebooks started by ProDeMin has been continued facilitating inspection of the core.

Core from two of Alio Gold's drilling on the high-grade breccia (AP-15-239 and AP-16-253) were examined at the well maintained and organized core storage and handling facility originally constructed by ProDeMin.

The facilities constructed by Alio Gold in the area of the resource are in good condition and include a main access gate with 24 hour security, a man camp for an estimated 60-100 workers, a decline that was begun to intersect the high grade breccia within the planned open pit and the powder magazine. Access to the decline is restricted due to a locked gate, but the first 50 m that are visible from the portal are in good condition. There has not been any maintenance during the last two years or so.

In general, the security in the region seems to be good. Several checkpoints with local defense forces are in place on the drive in from Iguala and it is recommended to travel with Minera Aurea magnetic signs on vehicles. Covid-19 protocols are being followed by the personnel of the Company at the Project.

12.4 MINERAL PROCESSING AND METALLURGICAL TESTING

Section 13 was prepared under the supervision of Mr. Andrew Kelly, who is President and Senior Metallurgist with Blue Coast Research Ltd., in Parksville, British Columbia. Mr. Kelly has reviewed the information in this section and believes it is a reasonable summary of the mineral processing, metal recoveries, and metallurgical testing for the Ana Paula Project. Mr. Kelly planned, designed and supervised the metallurgical testing at Blue Coast Research and performed daily quality control and data analysis. Mr. Kelly attended the regular meetings with the clients and M3 Engineering during the preparation of the study.

12.5 RECOVERY METHODS

Section 17 was prepared under the supervision of Mr. Art Ibrado while employed as a process engineer by M3 Engineering and Technology Corporation. Mr. Ibrado is now a consulting metallurgical engineer with Fort Lowell Consulting PLLC. The design of the processing facilities was based on comminution data, projected oxidation, leach times, and recoveries derived from the results of metallurgical tests presented in Section 13. Mr. Ibrado has reviewed the section and believes it is a reasonable description of the mineral processing plant and support facilities that will successfully treat materials from the Ana Paula deposit based on available information.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

Metallurgical testwork for this technical report is based primarily on testwork conducted at Blue Coast Research Ltd. (BCR) of Parksville, BC. Mineralogical analysis was conducted at Process Mineralogical Consultants of Maple Ridge, BC. An analysis of submicroscopic gold was conducted by Surface Science Western of London, ON. Grindability testwork was performed at BCR, Autec Innovative Extractive Solutions of Vancouver, BC, and ALS Minerals of Kamloops, BC. FLSmidth Knelson of Langley, BC modelled the response of the gravity circuit. A detailed summary of all the testwork may be found in the BCR report, as referenced in Section 27.

13.1 SAMPLES AND COMPOSITE CHARACTERIZATION

Samples from the four main lithological domains ("domains") present within the Ana Paula mine plan were selected by Alio Gold and arrived at Blue Coast Research in July 2016. The domain composites, and the corresponding metallurgical sample codes and approximate weight proportions (%) in the mine plan are shown in Table 13-1.

Table 13-1: Domain Composites, Sample Codes and Approximate Life-of-Mine Proportions

Domain composite	Metallurgical Sample Code	Approximate Proportion LOM
Intrusive suite (Granodiorite)	GD	65-70%
Complex Breccia (High-grade Breccia)	HGB	15-20%
Sediments (Limestone-Shale) + Skarn/Hornfels	LS	~10%
Monolithic Breccia (Low-grade Breccia)	LGB	<5%

These composites formed the basis of the pre-feasibility level metallurgical testwork. Chemical characterization was performed at Blue Coast Research (Au, Ag, As Fe) and Autec Innovative Extractive Solutions (Sulphur, Carbon speciation). Gold content was measured by fire assay with an atomic adsorption finish. Silver, arsenic and iron were measured with an aqua regia digestion followed by an atomic adsorption finish. Sulphur and carbon analysis was measured through a LECO analysis. Careful attention was paid to ensure the average gold grades of the composite lots lined up as close as possible to the average gold grades of each domain in the mine plan. The composite head assays are summarized in Table 13-2 through Table 13-5.

Table 13-2: GD Composite Head Assays

Head Assay GD	Au (g/t)	Ag (g/t)	As (%)	Fe (%)	S (%)	C(tot) (%)	C(inorg) (%)	C(org) (%)
GD - 1	1.69	5.70	1.03	3.07	1.73	1.35	1.34	0.01
GD - 2	1.44	5.87	1.00	3.07	1.59			
GD - 3	1.63	7.00	0.99	2.97	1.55			
Average	1.59	6.19	1.00	3.04	1.62			

Table 13-3: HGB Composite Head Assays

Head Assay HGB	Au (g/t)	Ag (g/t)	As (%)	Fe (%)	S (%)	C(tot) (%)	C(inorg) (%)	C(org) (%)
HGB - 1	4.44	9.10	3.47	7.17	4.99	1.43	1.40	0.03
HGB - 2	4.84	8.30	3.47	7.18	5.05			
HGB - 3	5.05	8.40	3.36	7.02	4.95			
Average	4.78	8.60	3.43	7.12	5.00			

Table 13-4: LS Composite Head Assays

Head Assay LS	Au (g/t)	Ag (g/t)	As (%)	Fe (%)	S (%)	C(tot) (%)	C(inorg) (%)	C(org) (%)
LS - 1	2.92	9.42	2.26	7.32	5.56	4.48	4.37	0.11
LS - 2	3.5	8.63	2.27	7.33	5.43			
LS - 3	3.37	9.10	2.33	7.48	5.81			
LS - 4	2.92							
LS - 5	3.50							
LS - 6	3.78							
LS - 7	2.96							
Average	**3.29**	**9.05**	**2.29**	**7.38**	**5.60**			

Table 13-5: LGB Composite Head Assays

Head Assay LGB	Au (g/t)	Ag (g/t)	As (%)	Fe (%)	S (%)	C(tot) (%)	C(inorg) (%)	C(org) (%)
LGB - 1	0.89	17.10	0.71	4.83	3.9	0.59	0.54	0.05
LGB - 2	0.95	17.50	0.75	5.28	4.22			
LGB - 3	0.94	20.90	0.75	5.44	4.4			
Average	**0.92**	**18.50**	**0.74**	**5.18**	**4.17**			

Modal mineralogy of the three composites (GD, HGB, LS) was completed by Process Mineralogy Consultants (PMC) of Maple Ridge, BC. Arsenopyrite and pyrite are the major sulphide species in each of the composites. Non-sulphide gangue was dominated by feldspars and quartz. Carbonates were detected in each composite, but were a markedly greater proportion of the limestone shale (29.6%) compared to the granodiorite (7.8%) and high grade breccia (7.0%) composites.

Table 13-6: Modal Mineralogy of GD, LS and HGB Composites

Mineral Mass	GD Comp	LS Comp	HGB Comp
Arsenopyrite	3.64	7.40	8.03
Pyrite	1.55	6.59	4.77
Sphalerite	0.05	0.24	0.04
Galena	0.10	0.03	0.02
Chalcopyrite	0.01	0.05	0.04
Tetrahedrite	0.00	0.00	0.04
FeTi-Oxides	0.74	0.87	0.61
Mica	6.47	5.90	4.7
Quartz	16.5	20.0	20.5
Feldspars	56.2	17.8	47.38
Mg-Silicates	4.13	7.34	3.52
Other minerals	2.07	4.00	3.10
Carbonates	7.95	29.57	7.01
Phosphates-Sulphates	0.52	0.18	0.00
Total	**100**	**100**	**100**

Samples of flotation concentrates were sent to Surface Science Western Ltd. where they were analyzed by Dynamic SIMS for colloidal and solid solution gold content. This technique allows for an understanding of the refractory gold content. To expose this gold for ultimate recovery the sulphide minerals must be broken down, often by oxidation of the sulphides. A total of 270 measurements were conducted across the three domain composites and the following findings are presented:

- Optical microscopy scans on polished section mounts and the D-SIMS profiles revealed the presence of significant numbers of visible gold grains and high grade colloidal gold inclusions in both the pyrite and arsenopyrite mineral phases.
- Both pyrite and arsenopyrite were found to be carriers of submicroscopic gold, and the pyrite/arsenopyrite was grouped into three categories; coarse, porous and microcrystalline, each containing various ppm levels of gold per the summary tables.
- Arsenopyrite contained higher concentrations of gold than pyrite. The findings were consistent across each rock type and morphology.

Combining the modal mineralogy with the solid solution gold content shown in Table 13-7 indicates that roughly 61% to 71% of the gold should be cyanide soluble with the balance present as refractory gold.

Table 13-7: Concentrations of Gold in Pyrite and Arsenopyrite

Concentrate	Morphology	Pyrite Au (ppm)	Arsenopyrite Au (ppm)
GD Flotation Concentrate	Coarse	7.34	14.03
	Porous	8.28	22.77
	Microcrystalline	6.25	11.49
HGB Flotation Concentrate	Coarse	6.09	15.10
	Porous	4.20	9.26
	Microcrystalline	4.80	20.11
LS Flotation Concentrate	Coarse	4.82	10.32
	Porous	5.10	10.43
	Microcrystalline	3.14	9.73

13.2 GRINDABILITY TESTWORK

Grindability testing consisted of JK RBT Lite and Bond Ball Mill work index testwork. JK RBT Lite results suggest ore that is moderately hard to hard.

Table 13-8: JK RBT Lite and Bond Ball Work Index Test Results

Sample ID	JK RBT Lite Un-Scaled Parameters			BWI (kWh/t)
	A	b	A x b	
GD	50.8	0.85	43.3	19.4
HGB	58.5	0.75	44.0	16.0
LS	61.1	0.65	39.6	15.1
LGB	82.7	0.67	55.6	16.2

Additionally, JK RBT Lite rejects were used to conduct Abrasion Index tests and SMC tests at ALS Minerals in Kamloops, BC. These results are presented in the Table 13-9 and Table 13-10.

Table 13-9: SMC Test Results

Sample ID	SMC Results (Axb)
GD	34.8
HGB	33.3

The SMC results indicate the material is somewhat harder than that suggested by JK RBT Lite work. The SMC samples therefore represent a more conservative approach to grinding circuit design.

Table 13-10: Abrasion Index Test Results

Sample ID	Abrasion Index (Ai)
GD-1	0.189
GD-2	0.203
HGB	0.194
LGB	0.081
LS	0.078

Abrasion testing results indicate that the Ana Paula material is mildly abrasive and that mill liner wear will not be extreme.

13.3 FLOTATION

A comprehensive flotation program was completed on the three predominant domains (GD, HGB and LS). The study evaluated the impacts of primary grind size, reagent scheme, pH, retention time and pulp density. The following outcomes are summarized from this technical report:

- Gold recoveries ranged from 93% for LS to 96% for GD and HGB.
- Primary grinds ranging from 75μm to 160 μm were evaluated. The primary grind size had no impact on final flotation recoveries, and the coarsest primary grind was selected; 80% passing 160 μm.
- All composites required the addition of copper sulphate for pyrite and arsenopyrite activation. Copper sulphate was added at 100 g/t. Tests conducted without copper sulphate saw slightly lower flotation gold recoveries, with the impact being most pronounced for the LS composite.
- Potassium Amyl Xanthate (PAX) was added as the primary sulphide mineral collector. Optimum dosage rates ranged from 60-110 g/t. PAX was necessary to ensure maximum gold recovery. Tests conducted with alternate primary collectors saw lower overall recovery.
- 3418A was added to the GD and HGB composites as a secondary collector. Highest recoveries were noted when dosage rates ranged from 40 -50 g/t.
- F-131A was identified as the preferred frother. Optimum dosages ranged from 64-128 g/t.

Table 13-11 summarizes the optimum whole ore flotation response from each of the three domains.

Table 13-11: Optimum Whole Ore Flotation Response

Domain	Test ID	Au Rec (%)	Mass Pull (%)	Flotation Conditions							
				Grind p80 (μm)	$CuSO_4$ (g/t)	PAX (g/t)	3418A (g/t)	F131A (g/t)	pH	Pulp Density (%)	Ret. Time (mins)
GD	F-17	**96**	20	160	100	80	50	128	Natural	22	16
HGB	F-55	**96**	20	160	100	60	40	78	Natural	22	7
LS	F-30	**93**	21	160	100	110	-	64	Natural	22	12

13.4 GRAVITY GOLD RECOVERY

Ana Paula material responds well to gravity concentration methods. Extended gravity recoverable gold (E-GRG) tests were conducted on each domain with recoveries to gravity concentrates of 53%, 49%, 40% and 12% for GD, HGB, LS and LGB, respectively. The EGRG tests may be considered best case tests as they treat material through successively finer grind sizes culminating with a final grind size of 80% passing 75 µm. Given that primary grinds necessary for adequate flotation were much coarser at 160 µm, one may expect that deportment of gold to gravity concentrate would be somewhat lower than the EGRG tests report.

To this end, a modelling exercise was conducted by FLSmidth Knelson. This exercise evaluated the recovery to gravity concentrate at differing treatment volumes, specified as a percent of the ball mill circulating load, and differing grind sizes. Lower recovery to gravity concentrates is predicted at coarser grind sizes as some of the gravity recoverable gold is not liberated at the coarser grind size. Table 13-12 is extracted from the FLSmidth Knelson report and summarizes the modelling results.

Table 13-12: Modelled Gold Recovery to Gravity Concentrate at Specified Grind Sizes

% Circulating load to gravity	Domain	Gold Recovery (%)		
		100 µm	125 µm	160 µm
36	GD	40	29	23
	HGB	25	19	16
	LS	15	11	9
50	GD	42	32	26
	HGB	28	21	18
	LS	17	12	10
93	GD	46	36	30
	HGB	31	25	22
	LS	20	16	13

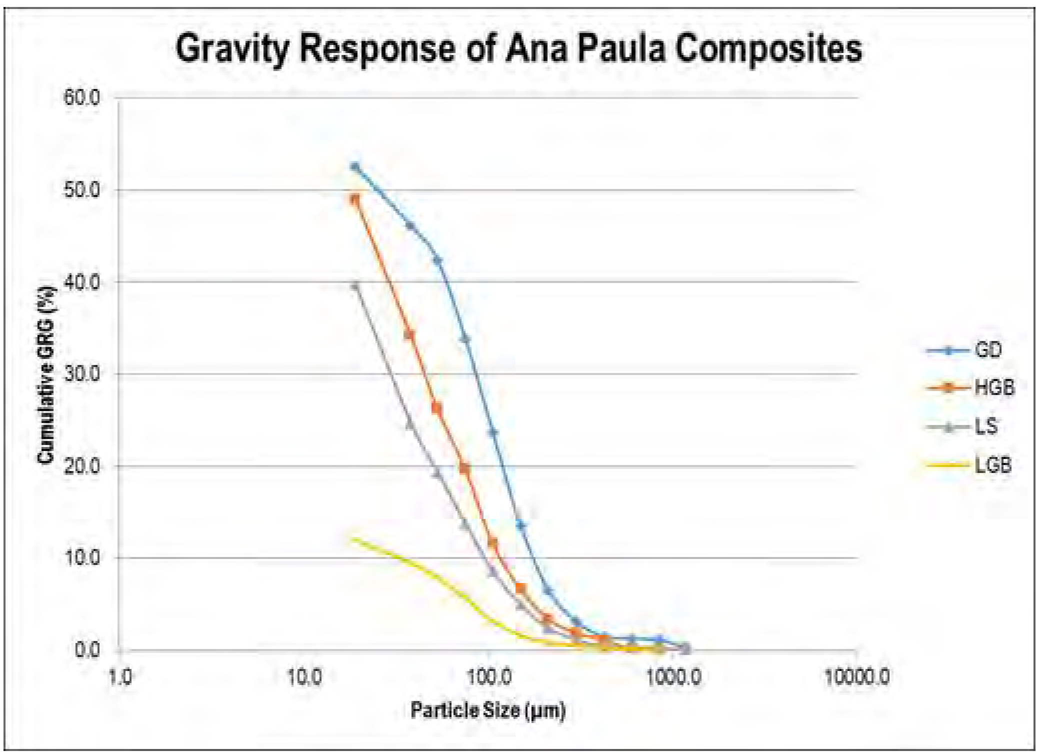


Figure 13-1: Cumulative Uncorrected Gravity Recovery from Ana Paula Domain Composites

13.5 WHOLE ORE CYANIDATION

A battery of whole ore cyanidation tests was conducted, examining the leach response of the domain composites. Each bottle roll test maintained pH between 10.5 and 11 and a standard pulp density of 40% solids was used. Parameters including primary grind size, cyanide concentration, lead nitrate addition, dissolved oxygen content, preaeration and residence time were investigated.

Leach recoveries ranged from 59% to 70% for GD, 62% to 68% for HGB and 6% to 50% for LS. Preg-robbing carbon was identified in the LS composite, explaining the low initial recoveries. LS recoveries improved to the mid to high 40% through the addition of activated carbon. As highlighted in Table 13-13 through Table 13-15, gold and silver recoveries were largely insensitive to primary grind size, residence time, cyanide concentration, preaeration, lead nitrate addition or elevated dissolved oxygen. Some scatter was observed in the data, likely as a result of the presence of some coarse gold and the resultant "nugget effect".

The whole ore leach tests highlight that gold recovery is limited by the refractory gold content in the material. There is broad agreement between the amount of solid solution gold associated with pyrite and arsenopyrite and the whole ore leach recoveries reported above.

Table 13-13: Whole Ore Cyanidation Recoveries – GD Composite

Test ID	Grind P80 (µm)	NaCN Dosage (g/L)	Residence Time (hrs)	NaCN Consumed (Kg/t)	CaO Consumed (Kg/t)	$PbNO_3$ (g/t)	Carbon (g/L)	O_2 Sparging?	Pre aeration?	Au Recovery (%)	Ag Recovery (%)
CN-1	160	1.00	48	1.88	0.80	-	-	-	-	70.1	32.9
CN-2	125	1.00	48	2.78	0.46	-	-	-	-	61.1	30.7
CN-3	75	1.00	48	3.15	0.55	-	-	-	-	61.8	30.3
CN-4	160	0.50	48	0.98	0.85	-	-	-	-	63.8	29.6
CN-5	125	0.50	48	0.98	0.85	-	-	-	-	66.0	35.1
CN-6	75	0.50	48	1.50	0.86	-	-	-	-	68.3	31.8
CN-7	160	1.00	192	2.30	2.04	400	-	-	0.5hr	64.4	N/A
CN-8	160	1.00	72	2.14	2.38	400	-	-	0.5hr	63.9	38.2
CN-9	160	1.00	48	2.14	1.44	-	15.0	-	-	58.9	31.9
CN-70	160	1.00	48	1.30	0.88	-	-	Yes	-	63.1	31.4
CN-71	160	3.34	48	1.27	0.78	-	-	-	-	61.9	32.3
CN-72	160	1.00	72	1.92	1.00	100.0	-	Yes	4hr	62.4	N/A

Table 13-14: Whole Ore Cyanidation Recoveries – HGB Composite

Test ID	Grind P80 (µm)	NaCN Dosage (g/L)	Residence Time (hrs)	NaCN Consumed (Kg/t)	CaO Consumed (Kg/t)	$PbNO_3$ (g/t)	Carbon (g/L)	O_2 Sparging?	Pre aeration?	Au Recovery (%)	Ag Recovery (%)
CN-45	160	1.0	48	3.67	0.96	-	-	-	-	66.5	20.9
CN-46	125	1.0	48	4.27	0.95	-	-	-	-	67.4	20.3
CN-47	75	1.0	48	4.19	0.98	-	-	-	-	65.8	19.3
CN-48	160	0.5	48	1.43	1.49	-	-	-	-	65.0	17.0
CN-49	125	0.5	48	1.59	1.54	-	-	-	-	66.5	18.2
CN-50	75	0.5	48	1.82	1.69	-	-	-	-	65.2	18.5
CN-51	160	1.0	192	3.04	2.36	-	-	-	0.5hr	64.2	N/A
CN-52	160	1.0	72	2.06	1.98	400	-	Yes	0.5hr	62.2	21.3
CN-53	160	1.0	48	2.07	1.44	-	15	-	-	67.5	29.3

Table 13-15: Whole Ore Cyanidation Recoveries – LS Composite

Test ID	Grind P80 (µm)	NaCN Dosage (g/L)	Residence Time (hrs)	NaCN Consumed (Kg/t)	CaO Consumed (Kg/t)	$PbNO_3$ (g/t)	Carbon (g/L)	O_2 Sparging?	Pre aeration?	Au Recovery (%)	Ag Recovery (%)
CN-23	160	1.0	48	2.53	1.32	-	-	-		8.16	20.4
CN-24	125	1.0	48	4.51	1.01	-	-	-	-	8.34	22.0
CN-25	75	1.0	48	4.28	0.99	-	-	-	-	8.78	22.5
CN-26	160	0.5	48	1.54	1.51	-	-	-	-	6.69	17.4
CN-27	125	0.5	48	1.77	1.44	-	-	-	-	7.36	18.6
CN-28	75	0.5	48	1.93	1.37	-	-	-	-	7.47	19.0
CN-29	160	1.0	192	3.88	1.83	-	15	Yes	-	41.9	N/A
CN-30	160	1.0	72	2.55	1.58	400	15	Yes	0.5 hr	47.7	76.6
CN-31	160	1.0	48	2.21	1.62	-	15	-	0.5 hr	49.7	35.1

13.6 PRE-OXIDATION TESTWORK

The presence of refractory gold in solid solution with pyrite and arsenopyrite (noted in Table 13-7) limits overall gold recovery. Improving the overall gold recovery requires breaking down the pyrite/arsenopyrite matrix to expose the gold and enable its recovery through conventional cyanidation. Two processes were evaluated:

1. Pressure oxidation of whole ore or flotation concentrates. The material is treated at elevated pressure and temperature in the presence of oxygen to oxidize the sulphide mineral and expose the gold. A series of benchtop autoclave tests and corresponding bottle rolls were conducted at Autec Innovative Extractive Solutions in Vancouver, BC.
2. Atmospheric oxidation of flotation concentrates. The material is treated at atmospheric pressures and temperatures in the presence of oxygen and a non-calcium neutralizing agent. Atmospheric oxidation testwork was conducted at Blue Coast Research Ltd., in Parksville, BC.

Initial screening tests were conducted to evaluate both pressure and atmospheric oxidation. These tests were conducted on blended composite representing life-of-mine averages of each of the respective domains.

Table 13-16: Composition of Life-of-Mine Blend

Domain	Proportion of Life-of-Mine Blend (%)
Granodiorite (GD)	70%
High Grade Breccia (HGB)	15%
Sediments (Limestone-Shale) + Skarn/Hornfels (LS)	10%
Low Grade Breccia (LGB)	5%
Total	100%

13.6.1 Pressure Oxidation Screening Tests

The pressure oxidation work evaluated both acid and alkaline conditions. Each test was conducted in a 2 liter laboratory autoclave for 60 minutes at 100 psi of oxygen overpressure. Gold recovery was evaluated with a 24 hour bottle roll conducted on autoclave residue with 1.5g/L NaCN and 20 g/L of carbon addition. Acidic pressure oxidation resulted in extremely high sulphide oxidation values for both rougher concentrate and whole ore feed. In turn, gold recoveries in excess of 95% were observed.

Due to the quantity of carbonate present in the life-of-mine blend (measured at 8.25%), an alkaline pressure oxidation test was conducted. Unlike acid pressure oxidation, this carbonate does not have to be pre-treated with acid prior to being fed to the autoclave. This has the benefit of acid cost savings; however, passivating layers may form on sulphide mineral surfaces slowing down the overall oxidation reaction. As a result, alkaline pressure oxidation will often have a lower sulphide oxidation extent. Alkaline oxidation of Ana Paula material resulted in 50% sulphide oxidation and a corresponding gold recovery of 75%.

Table 13-17: Pressure Oxidation Screening Tests

Test ID	Test Type	Sample Description	Grind Size (µm)	Pulp Density (%)	Temp (°C)	Acid Addition (kg/t)	Sulphide Oxidation (%)	Au Recovery (%)	Ag Recovery (%)
T1	Acid POX	Whole Ore	54	45	220	131.53	98.0	95.1	3.6
T4	Alkaline POX	Whole Ore	54	45	225	N/A	50.2	75.0	N/A
T3	Acid POX	Whole Ore	173	45	220	121.76	96.8	95.9	11.0
T2	Acid POX	Rougher Conc	94	45	220	113.00	96.9	96.6	8.8

13.6.2 Atmospheric Oxidation Screening Tests

Atmospheric oxidation takes place in open tanks using a non-calcium neutralizing agent. Oxygen is injected into a pulp and sulphide minerals react to form sulphuric acid in the process. The acid is consumed by the neutralizing agent and the pulp pH is generally maintained above 7. An initial atmospheric oxidation screening program was conducted which evaluated different neutralizing agents (soda ash, trona and limestone) as well as differing grind sizes (25 and 53 µm). pH was maintained above 7 during each of these tests, however some tests were conducted with excess alkali and accordingly these should be considered unoptimized results. The testwork was conducted in a 3 liter stirred reactor. Oxygen was injected at 0.1 l/min through a ceramic porous media sparger and the temperature was maintained with a heating jacket. Pulp density during the screening tests was 30% solids. Results of these initial screening tests are presented in Table 13-18.

Table 13-18: Atmospheric Oxidation Screening Tests

Test ID	Alkali Type	Alkali Dose (kg/t conc)	Regrind Size (µm)	Temperature (°C)	Sulphide Oxidation (%)	Au Recovery (%)
AO-2 / CN-75	Trona	475	53	80	71	80
AO-3 / CN-76	Soda ash	296	53	80	72	90
AO-4 / CN-77	Limestone	200	53	80	42	64
AO-5 / CN-78	Soda ash	296	75	80	43	74
AO-6 / CN-79	Soda ash	296	25	80	57	86
AO-7 / CN-80	Soda ash	148	53	80	46	85

This initial round of testwork identified the following points:

- Limestone did not yield any additional gold recovery, confirming that calcium present in the neutralizing agent results in passivation of sulphide surfaces.
- Soda ash (sodium carbonate) was identified as the preferred neutralizing agent. It provided the best overall recovery and was readily available in the local area.
- Gold recovery appeared to be favored at finer regrind sizes.
- Gravity gold was not removed prior to this initial testwork. The presence of free gold in the oxidation tests resulted in some scatter in the results. In subsequent optimization work, testing was conducted on flotation concentrate with gravity gold removed, thus allowing for a better study of the impact of the refractory gold component.

M3 Engineering conducted a trade-off study between pressure and atmospheric oxidation. The higher capital cost associated with the pressure oxidation circuit did not support the additional recovery benefit and as a result the atmospheric oxidation flowsheet was selected for further optimization.

13.6.3 Atmospheric Oxidation Optimization

An optimization program was completed to further refine the atmospheric oxidation process and to gain a preliminary understanding of some of the variability between the major domains. Feed for the optimization program was first treated by gravity concentration and then flotation using the basic flowsheet identified during the previous flotation program. Removal of free, gravity recoverable gold results in oxidation test feed that contains a higher proportion of refractory gold. This enables a better understanding of the factors which influence the refractory gold recovery. Recovery of gold to the laboratory gravity concentrator during these tests averaged 41%. A chemical characterization of this concentrate is presented in Table 13-19. Table 13-20 provides a summary of test conditions and results observed during this optimization program.

Table 13-19: Gravity Tail/Flotation Concentrate Characteristics of Atmospheric Oxidation Optimization Program

Sample ID	Au	Ag	As	S(tot)
1 of 3 (A)	5.44	29.7	5.36	9.92
2 of 3 (B)	5.47	30.6	5.46	9.82
3 of 3 (C)	5.45	30.1	5.41	9.85
Average	**5.45**	**30.1**	**5.41**	**9.86**

Table 13-20: Summary of Atmospheric Oxidation Optimization Program Test Results on Gravity Tail/Flotation Concentrates

AO Test ID	CN Test ID		Conditions			S^{2-} Oxidation	Au Leach Recovery*	Ag Leach Recovery*
		Feed	Soda Ash	Grind Size	Retention Time			
			(kg/t)	(µm)	(Hours)	%	%	%
AO-10	CN-84	LOM	100	~25	**48**	44	79	55
AO-11	CN-85	LOM	50	~25	**48**	26	63	N/A
AO-12	CN-86	LOM	50	~53	**48**	10	56	N/A
AO-13	CN-87	LOM	0	~25	**48**	10	49	N/A
AO-14	CN-88	LOM	150	~25	**48**	53	86	54
AO-15	CN-89	LOM	150	~25	**8**	48	83	N/A
AO-16	CN-90	LOM	150	~25	**24**	50	86	N/A
AO-17	CN-91	LOM	150	~25	**48**	58	88	55
AO-18	CN-92	LOM	150	~25	**72**	50	88	54
AO-19	CN-93	LOM	150	~53	**48**	47	84	N/A
AO-20	CN-94	LOM	100	~53	**48**	35	75	N/A
AO-21	CN-95	GD	150	~25	**48**	80	88	N/A
AO-22	CN-96	HGB	280	~25	**48**	42	84	N/A
AO-23	CN-97	LS	220	~25	**48**	33	78	N/A

*Note: Leach recoveries shown are on gravity tail/flotation concentrates. Total calculated leach recoveries will be higher with inclusion of leached gravity concentrates.

13.6.3.1 Effect of Soda Ash Addition

A significant focus of the optimization program was allocated to understanding the relationship between soda ash addition and metal recovery. Tests were conducted with standard conditions of 75°C, a regrind size of 25µm and 48 hour oxidation residence time. Figure 13-2 highlights this relationship and shows that higher soda ash dosages result in higher gold recovery. At soda ash dosages of 150 kg/t recoveries range between 86% and 88%, while zero soda ash addition saw a recovery of 49%. Gold recovery from the zero soda ash addition test was less than the whole ore leach results due to the removal of a substantial portion of the free, gravity recoverable gold prior to this testwork.

At 150 kg/t the soda ash dosage is high enough to ensure that the oxidation product has a neutral pH of about 7. Dosages less than this amount result in periods where the pH drops below 7, however upon conclusion of the test the pH increased again to neutral. Given that some carbonates are present in the concentrate it is postulated that with insufficient soda ash dosages acid generated through the oxidation reaction will consume some of the naturally occurring carbonate. This carbonate, likely present as calcite, will release free calcium which subsequently precipitates as gypsum in the sulphate rich environment. The gypsum precipitate coats the sulphide particles resulting in their passivation and reducing the overall sulphide oxidation and gold recovery. The extreme of this scenario was observed with the zero soda ash addition test, where sulphide oxidation was limited to 10% and gold extraction was low at 49%.

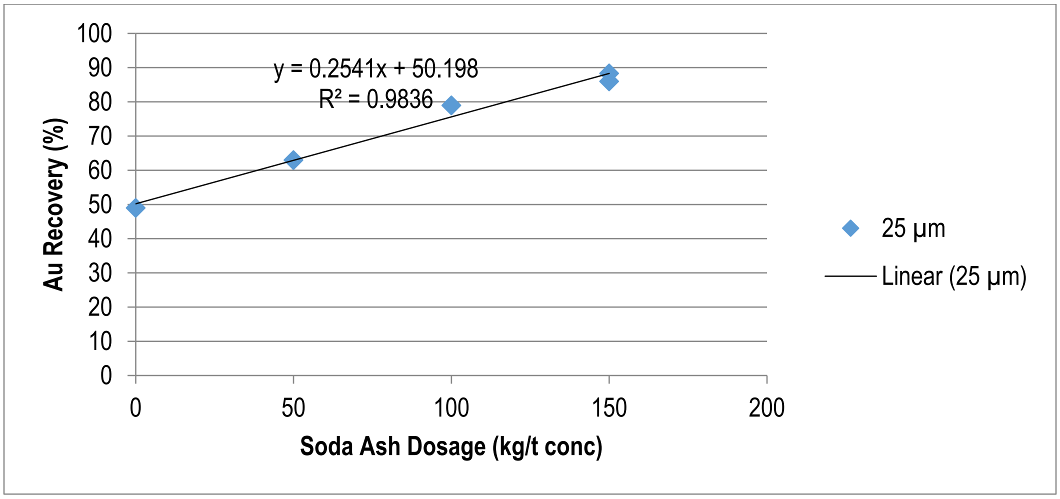


Figure 13-2: Relationship of Soda Ash Dosage and Gold Leach Recovery of Gravity Tail/Flotation Concentrates (25µm regrind size)

Given the interplay between naturally occurring carbonates and oxidation products it is important to note that the relationship described in Figure 13-2 is valid for a given range of sulphide to carbonate ratios. Concentrates with higher sulphur grades will require additional soda ash, or lower recoveries may be expected.

13.6.3.2 Effect of Regrind Size

The impact of regrinding was tested at three soda ash addition levels. Other parameters, such as temperature and residence time were held constant. Prior to each test, concentrate was reground in a laboratory jar mill. Figure 13-3 shows that a finer regrind size yields higher overall gold recoveries. This influence is stronger at lower soda ash dosages, possibly due to the passivating influence of insufficient soda ash. Passivation of coarser particles would leave larger particle cores unoxidized and subject to lower recovery.

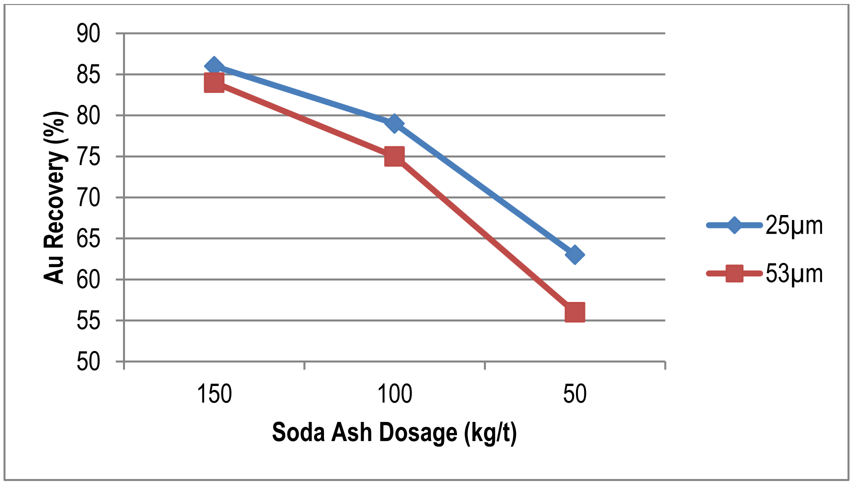


Figure 13-3: Effect of Regrind Size on Gold Leach Recovery of Gravity Tail/Flotation Concentrates

13.6.3.3 Effect of Residence Time

An oxidation versus recovery profile was conducted using the standard 150 kg/t soda ash dosage, with temperature and regrind size held constant at 75°C and 25µm respectively. Gold recovery was measured from carbon-in-leach bottle rolls that were conducted on samples that had been oxidized for 8, 24, 48 and 72 hours. Gold recovery increased from 83% after 8 hours of oxidation to 88% after 48 hours. No additional recovery was recorded from the 72-hour residence time. These results are highlighted in Figure 13-4.

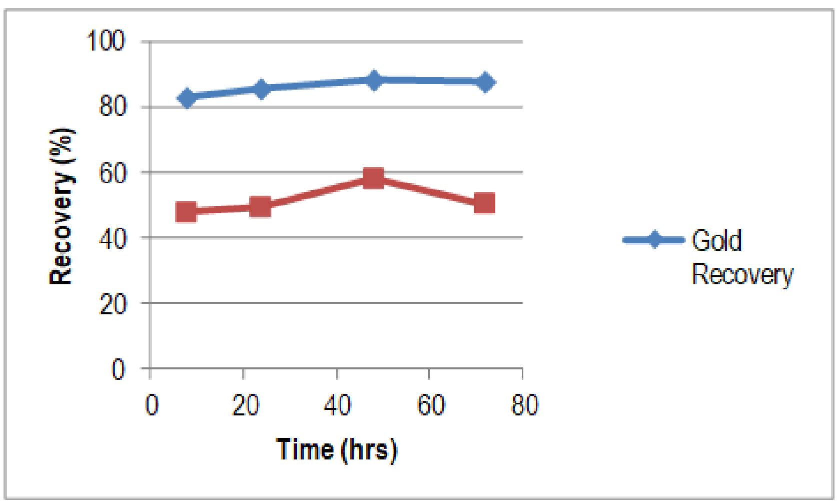


Figure 13-4: Effect of Oxidation Time on Gold Leach Recovery of Gravity Tail/Flotation Concentrates

13.6.3.4 Domain Oxidation Results

Three domain specific tests were conducted on GD, HGB and LS material to evaluate how each separate domain will respond to atmospheric oxidation. Tests were conducted using the 150 kg/t as a baseline soda ash dosage, however additional soda ash was added as necessary to maintain a pH greater than 7. Gold recovery from GD and HBG was 88% and 84% respectively. This recovery range bounds the LOM performance and provides additional confidence in those results. Higher sulphur content in the HGB concentrate (18.8%) required significantly more soda ash (280 kg/t) to maintain pH above 7. Likewise, the LS concentrate, with a sulphur grade of 20.3%, also required more soda ash

(220 kg/t). The GD composite by comparison had a slight excess of soda ash, observed by a discharge pH of 7.6 at the conclusion of the test. These results highlight the fact that soda ash requirements are determined primarily by the sulphur content available for oxidation. Higher sulphur feeds require more soda ash.

13.6.3.5 Mobilization of Arsenic during Atmospheric Oxidation

During atmospheric oxidation of Ana Paula concentrates, arsenopyrite is oxidized resulting in the mobilization of arsenic to process solutions. Some of this arsenic subsequently precipitates, however, the atmospheric oxidation process solutions may contain soluble arsenic concentrations as high as 8000 ppm. Arsenic concentrations of approximately 1000 ppm would be considered a more normal range. This arsenic must ultimately be precipitated into a stable compound for long term storage.

A small scoping study was conducted at BCR in 2017 to evaluate if the addition of ferrous sulphate to Ana Paula oxidation liquors could be used to precipitate arsenic from solution. During these tests, a sample of atmospheric oxidation process liquor was prepared by oxidizing a sample of Ana Paula concentrate for 48 hours with a soda ash addition rate of 150 kg/tonne. The resulting arsenic concentration of the liquor was 7200 ppm. A series of precipitation tests were then conducted where varying amounts of ferrous sulphate was added to the AOX liquor and mixed for a specified period of time. Air was sparged into the liquor for the duration of the reaction.

Results are summarized in Table 13-21. They highlight that when sufficient ferrous iron is added to the liquor, in the presence of oxygen, then the majority of the arsenic was precipitated from solution. The most promising tests resulted residual arsenic concentrations in solution of 1.5 ppm or less. During these tests iron added in excess of a molar ratio of 3:1 (Fe:As) produced the lowest residual concentrations of arsenic in solution. Unfortunately, these results were inconsistent and later tests on a different sample containing less arsenic in solution were not as successful (W-17 through W-21). Maintaining the pH at 5 (W-20 and W-21) through the addition of lime improved the arsenic removal in these later tests.

Table 13-21: Summary of Arsenic Precipitation Scoping Tests

Test ID	Fe/As Ratio[1]	Retention Time (mins)	Precip, As (ppm)	Solution, As (ppm)	Wash Water, As (ppm)
W-1	5	120	183,500	0.282	N/A
W-2	3	120	189,500	0.342	N/A
W-3	2	120	198,500	0.213	N/A
W-4	1	120	269,250	59.8	N/A
W-5	3	60	178,000	0.693	N/A
W-6	3	30	160,500	1.35	N/A
W-7	3	120	205,750	1.44	7.2
W-8	2	120	244,500	0.989	4.41
W-9	1	120	250,830	11.3	25.1
W-16	2	180	150,000	0.497	N/A
W-17	3	120	199,850	142.8	N/A
W-18	2.5	120	201,600	154.8	N/A
W-19	2	120	198,000	185.3	N/A
W-20[2]	3	120	164,000	0.661	N/A
W-21	2	120	204,000	2.708	N/A

Long term stability of the resulting arsenic precipitates is not understood at this time. Small scale water wash tests (W-7 to W-9) suggest that precipitates generated with higher iron addition are more stable. Some degree of arsenic

[1] Iron was added in the form of Ferrous Sulphate Heptahydrate, based on a molar ratio of iron to the amount of arsenic present in sample.
[2] Lime added to test W-20 and W-21 to maintain pH at 5.

remobilization was observed in each water wash test conducted (W-7 to W-9). No TCLP or SPLP tests have been conducted on these products to date. Future work must incorporate TCLP and/or SPLP analysis of arsenic precipitates to determine stability and potential for arsenic to remobilize.

13.7 OVERALL METALLURGICAL PERFORMANCE

Based on the metallurgical test results described above an overall gold recovery of 85% is reasonable. The basis for this is:

- Primary grind of 160 µm.
- Corrected extended gravity recoverable gold (GRG) at 160 µm is 40%.
- Treatment of 36% of mill circulating load resulting in 20% gold recovery to gravity concentrate.
- Gravity recoverable gold (GRG) is cyanide soluble. Free gold which does not report to the gravity circuit will still achieve comparable gold extraction in the downstream CIL circuit.
- Intensive leach extraction of gravity concentrates of 98%.
- Gold recovery to flotation concentrate of 95%.
- Leach recovery of 81% based on soda ash addition rates of 120 kg/t, on gold that is not gravity recoverable.
- Total gold recovery of 85% is thus reconciled as:
    - o 20% GRG to gravity / intensive leach x 98% leach recovery ≈ 20%
    - o 20% GRG to flotation concentrate x 95% flotation recovery x 98% leach recovery ≈ 19%
    - o 60% gold to flotation concentrate x 95% flotation recovery x 81% leach recovery ≈ 46%

Figure 13-5 describes the overall process flowsheet developed for Ana Paula.

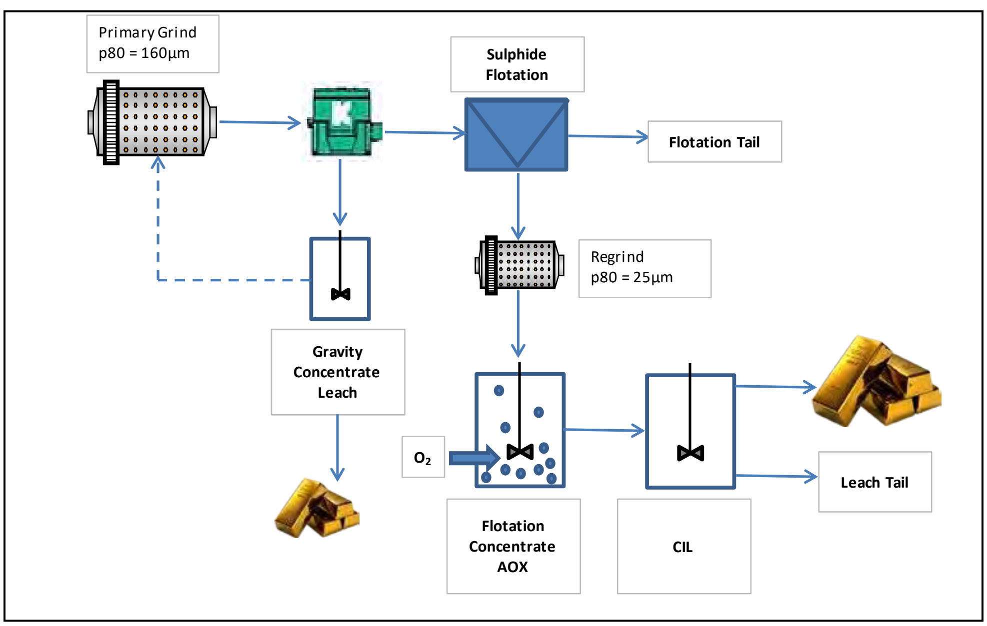


Figure 13-5: Ana Paula Process Flow Diagram

14 MINERAL RESOURCE ESTIMATES

In December 2020, the QP completed an updated Mineral Resource Estimate of the Ana Paula Project. The Project is located in Guerrero State, Mexico, approximately 58 km southwest of the city of Iguala. Geovia's GEMS Version 6.8™ software was used for the resource estimate. The metals of interest at the Ana Paula Project are gold and silver, with minor quantities of copper that were estimated for this pre-feasibility model but not reported as a pay element.

14.1 DATA

On March 15, 2017, the QP was provided with a project database consisting of:

- Drill data for the Ana Paula Project comprising the following:
  - Collar data
  - Down the hole survey
  - Logged lithology
  - Geochemistry/assays
  - Mineralization
  - Alteration
  - Structure
  - Veining
- Select suites of assay certificates as requested by the QP
- Specific density data
- Quality assurance and quality control data files
- Three dimensional wireframes for the lithological units
- Topography as a three-dimensional surface

During the data validation, issues with the downhole survey data and the gold assays analyzed at ACME Laboratory were uncovered. Corrections were made to the database and the drill data was updated along with the lithological wireframes on April 13, 2017.

All data was checked for overlapping, missing, and negative length intervals. No erroneous data was detected affecting the primary database table used in the resource estimation. Data was fully validated before being used in the resource estimate (described in Section 12 of this Technical Report).

No further additions were made to the database after May 31, 2018, which constitutes the official data cut-off date for this resource estimate. For the Ana Paula Project, a total of 339 core holes exist in the database; of these, 290 core holes contributed to the grade estimation.

Table 14-1 below shows a summary of the number of holes and assays used in the resource estimate.

Table 14-1: Summary of Number of Holes used in the Resource Estimate

Zone	Type	Number of Holes	Total Length (m)	Number of Assays	Comment
Holes used in resource estimation					
Ana Paula	Core hole	290	129,499	89,816	
Holes not used in the resource estimate					
Ana Paula	Core hole	5	2796	1772	Outside the block model extent
Ana Paula	Core hole	18	2,941	1,969	Twin holes – Mostly Met hole
Ana Paula	RC hole	26	7,205	4,728	Condemnation RC drilling
Subtotal		49	12,943	8,469	
Total in Database					
Grand Total		339	142,442	98,285	

Source: AGP (2020)

14.1.1 Sampling Length

The drill core was preferentially sampled in either 1.5 or 2 m intervals. For the Ana Paula lithological domains, sampling intervals ranged from 1.11 to 1.52 m in the Complex Breccia (CBX), Intrusive Suite (INTRS), Monolithic Breccia (MBX), Skarn-Hornfeld (SKNHF), and Sulphide (SULPH) Lithologies (25^{th} and 75^{th} percentile). Sampling intervals are longer in the low grade/waste Sediment (SED) domain which averaged 1.66 m. The upper third quartile of the sampling interval population is 2.0 m for the SED and approximately 1.5 m for the remaining domains.

14.2 GEOLOGICAL INTERPRETATION

At Ana Paula, the bulk of the mineralization is clustered in and around the CBX lithological unit. This lithological unit consists of a multilithic breccia core in a steeply south plunging column which is surrounded by a HALO of mineralization and alteration characterized by veins, fracture zones, and massive sulphide contact replacements in country rock that include limestone, hornfels, and intrusive rocks, along with other breccias.

The 3D lithological wireframes developed to control the grade interpolation of the resource model were based primarily on the logged lithologies. A second wireframe was created to model the mineralized HALO. Procedures used in the development of these wireframes are as follows:

1. The lithological wireframes were constructed by Alio Gold geologists using simplified logged lithologies and Leapfrog Geo™ software. The QP validated the wireframes against the logged lithologies in the database. While there was some mixing of lithologies, the wireframes provided honored the core logging information in the database to a high degree of accuracy (Table 14-2). Inspection of the domains, on sections and plans, showed a good correlation. The 3D model features a strong northerly trend coupled with a steep dip to the west, which is in part due to the parameters entered in Leapfrog to generate the 3D mesh. The trends displayed by the wireframes correlate well with the geological surface map provided for the area east of coordinate 409,700; however, it does not correlate with the north-easterly trend displayed by the mapping in the southwest portion of the deposit. The QP notes that this issue does not affect the resource model since no blocks were interpolated west of coordinate 409,575.

Table 14-2: Lithological Domains versus Logged Lithologies

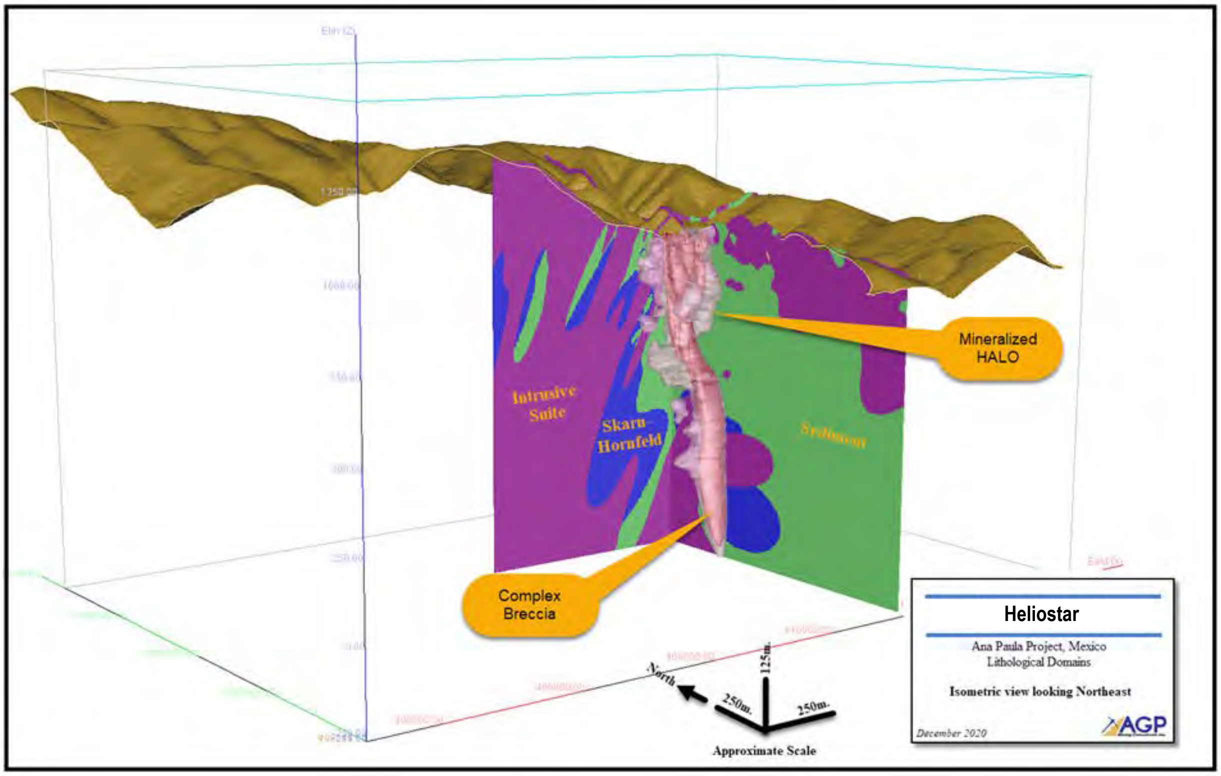
Lithological Domains	Logged Lithologies					
	BXH + BXML + BXOMC	GD + GDBD + BDBX + GDF	HFL + SK	LS-SH + LS	Sulph	Others
Complex Breccia (CBX)	74%	16%	4%	1%	5%	0%
Skarn-Hornfeld (SKNHF)	1%	20%	65%	12%	1%	1%
Intrusive Suites (INTRS)	3%	89%	4%	4%	2%	0%
Monolithic Breccia (MBX)	74%	25%	0%	1%	0%	0%
Sediments (SED)	1%	19%	3%	76%	0%	1%
Sulphide (SULPH)	4%	31%	25%	22%	17%	1%

Source: AGP (2020)

2. The bulk of the high-grade mineralization at Ana Paula is centered on the CBX lithology which is surrounded by a high-grade mineralized HALO that displays a strong relationship to bismuth (Bi) and iron-arsenic-sulphur (Fe-As-S) combination (Figure 14-2). In order to control the spread of the high-grade values, a 3D wireframe was modelled surrounding the CBX unit. This model was created within a coarse block model matrix of 10 x 10 x 12 m using 12 m bench composites to reduce variability. Steps taken to create the model are as follows:
   a. Create a probability model for bismuth using a threshold of 5.7 ppm.
   b. Create a probability model for gold using a threshold of 0.5 ppm.
   c. Create a probability for Fe + S + As using a threshold of 4.5%.
   d. The average probability was computed and then a reduction factor, based on the distance from the center, was applied to the average. The reduction factor ensures the “HALO probability” is reduced to zero beyond 230 m from the center of the CBX. The resulting “adjusted probability” model bears a value between 0 and 1 representing the probability of each individual block to be located within the HALO.
   e. The "adjusted probability" model was examined against the bench contour maps of the various elements and a probability threshold value was selected to coincide within reason with the bismuth, gold, and iron contours depicting the extent of the HALO. Blocks above the threshold value were converted to a code of 50. A block groomer was used to eliminate isolated blocks. The resulting model was used as a guideline to wireframe HALO conventionally with polylines on each of 12 m bench.
   f. The completed 3D shape fully encloses the CBX lithological domain. The resulting model is shown in Figure 14-1.
3. In addition to the HALO wireframe, a high-grade probability model was constructed within the INTERS, SKNHF, and SED lithology outside the HALO in order to prevent the smearing of the occasional higher grade values with the surrounding low grade. The probability model was constructed using 3.0 m composites. A threshold grade of 0.3 ppm Au was selected based on the start of the inflexion seen in the raw assays’ probability plot and a visual examination of the high-grade assays. All blocks above a probability value of 0.45 (representing 45% chance of the block being above 0.3 ppm Au) were flagged as blocks belonging to a high grade sub-domain. The high-grade probability model only applies to the material outside the mineralized HALO.
4. Topography was provided by Alio Gold as a 3D surface. It was derived from orthophotography and topographic contouring surveyed by PhotoSatTM. Precision should be in the order of 20 cm accuracy with 1 m elevation grids and 1 m contours.
5. The overburden thickness was evaluated, and it was determined that 191 drill holes were collared in bedrock. Twenty-three holes showed 4 m of poor core recovery at the collar, which could be a combination of weathered zone or alluvial material. The remaining holes showed an average of 5 m of alluvial material. Overall, the

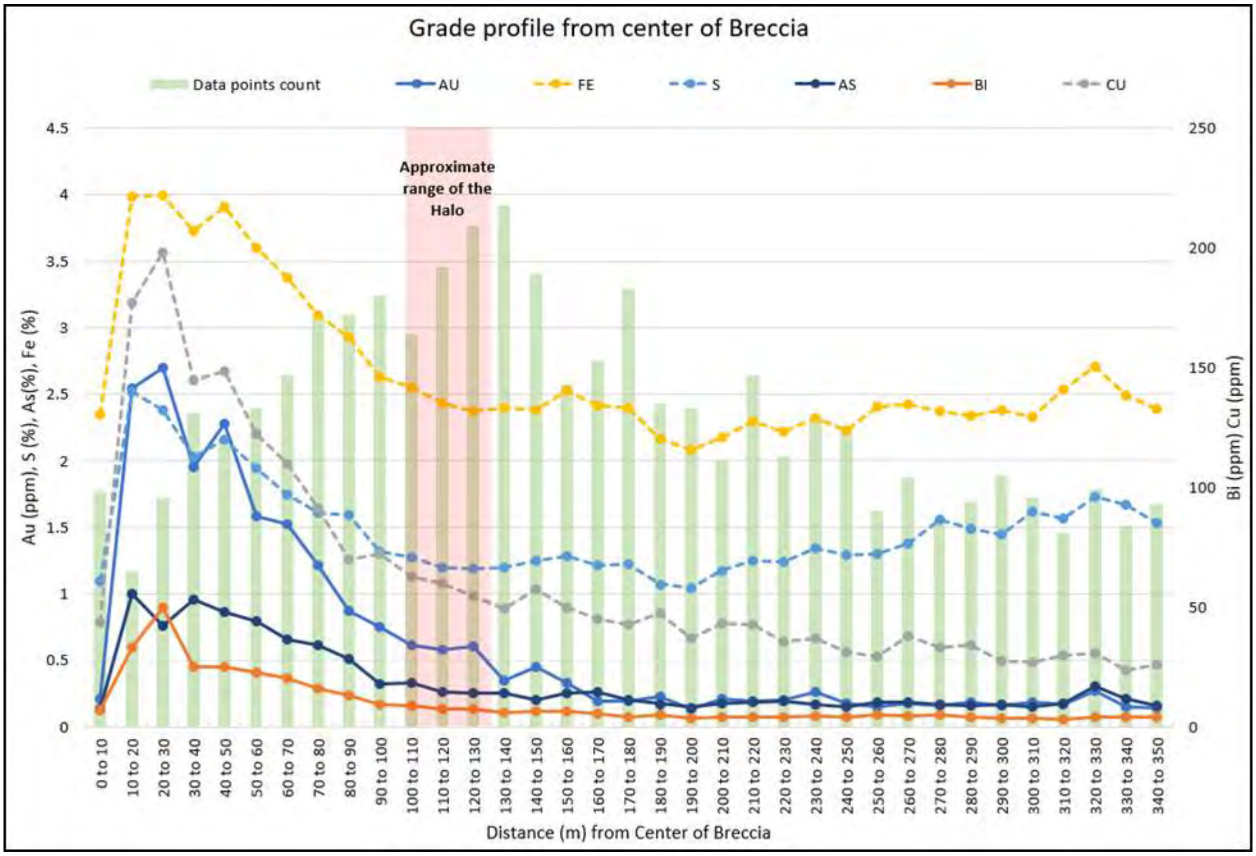
average alluvial cover was estimated to be 2 m and was deemed too thin to be significant for the purpose of the resource model.

6. The oxidation layer (leach zone) at Ana Paula is not considered material to the resource. Staff at the mine report that within the weathering zone, sulphides are routinely visible with a small oxidation rim. The depths of the oxidation layer within the pit shell average 9.2 m with a median of 6.3 m. The 25th percentile is 2.6 m and the 75th percentile is 12.8 m.



Source: AGP (2020)

Figure 14-1: Isometric View of the 3D Lithological Model, CBX and HALO



Source: AGP (2020)

Figure 14-2: Grade Profile of Various Elements surrounding the CBX Center (2017 Data)

14.3 EXPLORATION DATA ANALYSIS

Exploratory data analysis is the application of various statistical tools to characterize the statistical behavior or grade distributions of the data set. In this case, the objective is to understand the population distribution of the grade elements in the various domains using such tools as histograms, descriptive statistics, and probability plots.

14.3.1 Assays

The raw assay statistics were evaluated by grouping all assays intersecting the various lithologies in and out of the HALO. Table 14-3 provides descriptive statistics for raw, uncapped, gold values while Table 14-4 provides descriptive statistics for raw, uncapped, silver values.

Table 14-3: Gold Descriptive Statistics

Domain	ALL	INTRS	MBX	SED	SKNHF	SULPH	CBX	INTRS	SED	SKNHF	SULPH
		Outside the HALO					Inside the HALO				
Valid cases	89389	52821	1838	17096	7792	31	2675	4894	710	1452	80
Mean (ppm)	0.42	0.21	0.49	0.10	0.28	0.54	3.07	1.88	1.50	1.86	9.01
Variance	15.51	0.88	0.32	0.66	3.68	1.51	65.66	166.91	39.14	32.12	2406.70
Std. Deviation	3.94	0.94	0.56	0.81	1.92	1.23	8.10	12.92	6.26	5.67	49.06
Variation Coefficient	9.35	4.47	1.16	8.39	6.96	2.28	2.64	6.88	4.18	3.05	5.45
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Maximum	760	97.83	3.97	50.41	123	6.73	158.05	760	94.9	82.5	439
1st percentile	0.00	0.00	0.00	0.00	0.00	----	0.01	0.01	0.00	0.00	----
5th percentile	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.03	0.00	0.02	0.03
10th percentile	0.00	0.01	0.02	0.00	0.01	0.01	0.06	0.06	0.01	0.05	0.05
25th percentile	0.01	0.02	0.09	0.00	0.02	0.03	0.19	0.14	0.02	0.13	0.28
Median	0.06	0.06	0.31	0.01	0.06	0.19	0.58	0.39	0.13	0.36	1.07
75th percentile	0.19	0.16	0.67	0.03	0.17	0.56	2.02	1.22	0.74	1.13	4.69
90th percentile	0.58	0.39	1.16	0.12	0.45	1.10	8.60	3.50	3.02	3.73	11.16
95th percentile	1.27	0.69	1.64	0.29	0.83	3.89	14.95	6.49	6.29	8.63	22.44
99th percentile	6.61	2.51	2.78	1.58	3.59	----	34.13	21.50	21.44	28.08	----

Source: AGP (2020)

Statistically, the SULPH domain bears the highest gold grade but the volume in the model is very small which is reflected in the number of valid cases in Table 14-3. The CBX has the next highest grade, and, despite the high grade, the coefficient of variation (CV) indicates low variability in the assay distribution. From the CV values observed in the table, it appears that capping of outliers is required. Silver behaves similarly; the high-grade silver assays in the SULPH are likely due to the lead-zinc association (Table 14-4).

Table 14-4: Silver Descriptive Statistics

Domain	ALL	INTRS	MBX	SED	SKNHF	SULPH	CBX	INTRS	SED	SKNHF	SULPH
		Outside the HALO					Inside the HALO				
Valid cases	89389	52821	1838	17096	7792	31	2675	4894	710	1452	80
Mean (ppm)	2.9	3.0	6.1	1.6	2.6	2.0	5.0	3.8	4.7	3.5	8.9
Variance	168.5	190.3	461.6	66.0	225.7	7.1	98.1	86.6	455.4	113.1	341.0
Std. Deviation	13.0	13.8	21.5	8.1	15.0	2.7	9.9	9.3	21.3	10.6	18.5
Variation Coefficient	4.5	4.6	3.5	5.2	5.7	1.4	2.0	2.5	4.5	3.0	2.1
Minimum	0	0	0	0	0.05	0.25	0.051	0	0.1	0.1	0.1
Maximum	1120	1120	628	320	603	12.5	140	255	353	156	126
1st percentile	0.1	0.1	0.2	0.1	0.1	----	0.1	0.1	0.1	0.1	----
5th percentile	0.1	0.2	0.4	0.1	0.1	0.3	0.1	0.2	0.1	0.1	0.2
10th percentile	0.2	0.3	0.7	0.1	0.1	0.3	0.2	0.3	0.2	0.2	0.3
25th percentile	0.4	0.5	1.1	0.3	0.3	0.5	0.4	0.6	0.3	0.3	1.0
Median	1.0	1.0	2.0	0.5	0.6	1.1	1.4	1.3	0.8	0.7	3.1
75th percentile	2.1	2.3	4.3	1.1	1.6	2.4	5.4	3.2	1.9	1.7	8.7
90th percentile	5.0	5.1	12.1	2.2	3.9	6.7	13.5	8.1	7.4	7.6	17.6
95th percentile	9.3	9.0	23.1	3.9	7.8	9.4	20.3	15.7	19.5	17.4	32.5
99th percentile	33.8	31.7	63.7	18.2	34.7	----	46.2	43.0	73.4	46.3	----

Source: AGP (2020)

14.4 OUTLIER CONTROL

A combination of decile analysis and a review of probability plots was used to determine the potential risk of grade distortion from higher grade assays. A decile is any of the nine values that divide the sorted data into ten equal parts, such that each part represents one tenth of the sample or population. In a mining project, high-grade outliers can contribute excessively to the total metal content of the deposit.

Typically, in a decile analysis, capping is warranted if:

- The last decile has more than 40% metal.
- The last decile contains more than 2.3 times the metal quantity contained in the penultimate decile.
- The last centile contains more than 10% metal.
- The last centile contains more than 1.75 times the metal quantity contained in the penultimate centile.

The decile analysis results indicated that grade capping was warranted, although the QP noted that all domains (except SULPH and MBX), fell under the exception rule which was interpreted by the QP as domains not requiring aggressive controls on outliers. After conducting a careful examination of the data set, the QP elected to use a two-fold approach:

- Apply a high hard cap on the raw assay prior to compositing to reduce extreme high grade assays.
- Impose a sample search restriction on the "mild" outlier's population to control the range of influence.

The grade capping strategy used has the benefit of limiting grade distortion from extreme outliers while restricting the range of influence of the "mild" high-grade outliers and applying the principle that true outliers generally have restricted physical continuity and do not extend much beyond a short distance from where they are located. In summary, the high-grade values are acknowledged in the model, but their spatial influences are limited.

14.4.1 Raw Assay Capping

Table 14-5 and Table 14-6 show a summary of the treatment of high-grade outliers during the interpolation. The cap value selected for gold was generally above the 99.5th percentile of the raw assay distribution. For silver, the cap value selected was closer to the 99th percentile. The raw assay capping scenario for gold reduced the CV by approximately 30% on average (Table 14-7). The CV of the gold and silver capped raw assays remains high for linear interpolation methods for the INTRS, SED and SKNHF domains. Once that data was composited at 3.0 m (as described below), the CV was further reduced.

Table 14-5: Cap Levels for Gold and Search Restriction Grade Threshold by Domains

Domain (Domain Code)	Cap Level Au (g/t)	Total Number of Assay Affected	Total Number of Assays	Percent of Assays Affected (%)	Composite Grade Threshold Au (g/t)	Number of Composite Affected	Total Number of Composites	Percent of Composite Affected (%)
INTRS (2000)	11	175	52,821	0.33%	4.5	35	23,964	0.15%
MBX (6100)	no cap	0	1,838	0.00%	Not Needed			
SED (1200)	10	33	17,096	0.19%	1.8	38	9,458	0.4%
SKNHF (4000)	7	116	7,792	1.49%	4	7	3,694	0.19%
SULPH (6500)	no cap	0	31	0.00%	Not Needed			
CBX_HALO (6050)	55	12	2,675	0.45%	Not Needed			
INTRS_HALO (2050)	70	7	4,894	0.14%	20	15	2,498	0.6%
SED_HALO (1250)	25	6	710	0.85%	7	9	396	2.27%
SKNHF_HALO (4050)	30	13	1,452	0.90%	11	9	723	1.24%
SULPH_HALO (6550)	30	2	80	2.50%	Not Needed			

Source: AGP (2020)

Table 14-6: Cap Levels for Silver

Domain (Domain Code)	Cap Level Ag (g/t)	Total Number of Assay Affected	Total Number of Assays	Percent of Assays Affected (%)
INTRS (2000)	120	77	52,821	0.1%
MBX (6100)	60	23	1,838	1.3%
SED (1200)	60	44	17,096	0.3%
SKNHF (4000)	80	29	7,792	0.4%
SULPH (6500)	200	0	31	0.0%
CBX_HALO (6050)	50	23	2,675	0.9%
INTRS_HALO (2050)	60	21	4,894	0.4%
SED_HALO (1250)	50	12	710	1.7%
SKNHF_HALO (4050)	60	8	1,452	0.6%
SULPH_HALO (6550)	75	2	80	2.5%

Source: AGP (2020)

14.4.2 Search Restriction Threshold Grade and Range

The search restriction for mild gold outliers was applied to domains where the composite CV was above 2.0. For silver, the composite CV was sufficiently low that a high-grade search restriction was deemed unnecessary.

The threshold grade used was selected based on degradation analysis of the composite data. The values used are shown in Table 14-5. The maximum range of influence for composites above the threshold was 35 m for the more variable SED domain and 40 m for INTRS and SKNHF domains.

Table 14-7: CV Tracking between Assays and Composites by Domain for Gold and Silver

Domain (Domain Code)	Gold			Silver		
	CV before Assay Capping	CV after Assay Capping	CV after Compositing	CV before Assay Capping	CV after Assay Capping	CV after Compositing
INTRS (2000)	4.5	3.1	2.1	4.6	2.8	2.0
MBX (6100)	1.2	1.2	1.0	3.5	1.8	1.4
SED (1200)	8.4	5.7	4.1	5.2	3.2	2.4
SKNHF (4000)	7.0	2.9	2.0	5.7	3.2	2.4
SULPH (6500)	2.3	2.3	2.0	1.4	1.4	1.4
CBX_HALO (6050)	2.6	2.3	2.0	2.0	1.7	1.5
INTRS_HALO (2050)	6.9	3.0	2.3	2.5	2.0	1.7
SED_HALO (1250)	4.2	2.7	2.1	4.5	2.4	1.9
SKNHF_HALO (4050)	3.0	2.5	1.9	3.0	2.5	2.0
SULPH_HALO (6550)	5.4	1.7	1.2	2.1	1.7	1.4

Source: AGP (2020)

14.4.3 Total Metal Affected by the Treatment of Outliers

The total metal affected by the treatment of outliers was evaluated in the final model. At 0.5 g/t Au cut-off, the outlier control strategy removed 12.9% of the gold ounces and 13.2% of the silver ounces in the combined Measured and Indicated category (Table 14-8). The QP notes that only a small percentage of the assays and composites were affected by the treatment of outliers, yet the amount of metal removed is deemed substantial.

Table 14-8: Cumulative Metal Removed by Capping Strategy (Meas. + Ind. category)

Grade Cut-off Bins Au (g/t)	Gold Ounces Removed % Change	Silver Ounces Removed % Change
>1.50	-22.2%	-19.1%
>0.80	-16.4%	-18.1%
>0.5	-12.9%	-13.2%
>0.1	-8.8%	-7.7%

Source: AGP (2020)

14.5 COMPOSITES

From the sampling length statistics, the QP elected to use a composite length of 3.0 m. The composite size selected is above the third quartile and allows grade variations to be represented while reducing the variance.

Assays were length-weight averaged, and any grade capping was applied to the raw assay data prior to compositing. True gaps in sampling, and samples below detectable limits, were composited at zero grade. There was no stope void, drift, or other underground excavation that needed to be considered while compositing the raw assays.

The 3.0 m composite intervals were created moving downward from the collar of the holes toward the hole bottoms. Composite lengths are automatically adjusted by the software to leave no remnants. The adjustment resulted in composite lengths ranging between 1.51 m and 4.49 m, with mean and median of 3.0 m, and a standard deviation of 0.10. Table 14-9 and Table 14-10 show the descriptive statistics for gold and silver composites within the various domains.

Table 14-9: Gold Composite Statistics by Domains

Domain	ALL	INTRS	MBX	SED	SKNHF	SULPH	CBX	INTRS	SED	SKNHF	SULPH
		Outside the HALO					Inside the HALO				
Valid cases	42895	23964	940	9458	3694	16	1170	2498	396	723	36
Mean	0.34	0.18	0.49	0.06	0.20	0.53	2.83	1.45	0.96	1.32	3.63
Variance	2.06	0.15	0.24	0.06	0.16	1.15	30.55	11.22	3.94	6.11	20.30
Std. Deviation	1.44	0.39	0.49	0.25	0.40	1.07	5.53	3.35	1.98	2.47	4.51
Variation Coefficient	4.24	2.14	1.01	4.06	2.04	2.02	1.95	2.31	2.07	1.88	1.24
Minimum	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
Maximum	58.56	8.64	2.81	7.16	5.26	4.46	41.49	58.56	15.79	24.29	18.32
1st percentile	0.00	0.00	0.00	0.00	0.00	----	0.01	0.02	0.00	0.00	----
5th percentile	0.00	0.00	0.01	0.00	0.00	----	0.04	0.06	0.00	0.03	0.02
10th percentile	0.00	0.01	0.03	0.00	0.01	0.01	0.09	0.09	0.01	0.07	0.04
25th percentile	0.02	0.03	0.13	0.00	0.02	0.05	0.23	0.20	0.02	0.18	0.40
Median	0.07	0.08	0.35	0.01	0.07	0.22	0.72	0.50	0.17	0.46	2.65
75th percentile	0.21	0.18	0.67	0.03	0.20	0.57	2.24	1.31	0.88	1.29	5.18
90th percentile	0.60	0.39	1.12	0.12	0.47	1.88	8.66	3.31	2.96	3.50	10.64
95th percentile	1.18	0.64	1.53	0.26	0.79	----	14.93	5.30	5.15	5.54	15.70
99th percentile	4.90	1.75	2.33	1.08	1.95	----	28.36	15.21	10.79	11.33	----

Source: AGP (2020)

Table 14-10: Silver Composite Statistics by Domains

Domain	ALL	INTRS	MBX	SED	SKNHF	SULPH	CBX	INTRS	SED	SKNHF	SULPH
		Outside the HALO					Inside the HALO				
Valid cases	42895	23964	940	9458	3694	16	1170	2498	396	723	36
Mean	2.3	2.5	5.1	1.2	1.9	2.1	4.5	3.2	2.6	2.5	6.8
Variance	23.8	26.4	52.8	8.6	19.9	9.6	43.8	29.0	26.0	24.5	86.7
Std. Deviation	4.9	5.1	7.3	2.9	4.5	3.1	6.6	5.4	5.1	5.0	9.3
Variation Coefficient	2.1	2.0	1.4	2.4	2.4	1.4	1.5	1.7	1.9	2.0	1.4
Minimum	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.1	0.1	0.1	0.2
Maximum	98.7	98.7	46.3	63.9	70.8	12.7	48.4	90.7	40.3	37.6	48.1
1st percentile	0.1	0.1	0.2	0.1	0.1	----	0.1	0.1	0.1	0.1	----
5th percentile	0.1	0.2	0.5	0.1	0.1	----	0.2	0.2	0.1	0.1	0.2
10th percentile	0.2	0.3	0.8	0.1	0.1	0.4	0.3	0.3	0.2	0.2	0.3
25th percentile	0.4	0.6	1.4	0.3	0.3	0.5	0.5	0.7	0.4	0.3	1.2
Median	1.0	1.2	2.3	0.5	0.6	0.9	1.5	1.5	0.9	0.9	3.7
75th percentile	2.2	2.5	4.8	1.1	1.6	2.3	5.9	3.4	2.2	2.1	9.2
90th percentile	4.9	5.1	13.6	2.1	3.9	7.3	12.5	7.4	6.5	6.5	15.0
95th percentile	8.5	8.4	21.3	3.7	7.2	----	17.9	12.3	12.1	12.0	32.6
99th percentile	24.5	24.8	38.1	13.3	22.7	----	31.7	27.4	29.0	28.1	----

Source: AGP (2020)

The final composites coded use for the interpolation were created by adding the lithology code, HALO code and high grade probabilistic model code.

14.6 BULK DENSITY

Ana Paula provided 5,946 useable bulk density measurements. Samples were weighted using a traditional Sauter TB-2610 triple beam scale, equipped with an under hook to allow the samples to be weighed dry on the platen and then re-weighed suspended in water. Core samples were reportedly solid and did not require coating with paraffin or shellac.

The 5,946 samples collected, averaged 2.45 g/cm^3 in alluvial and between 2.51 g/cm^3 and 2.81 g/cm^3 in rock with sulphide being the exception at 3.36 g/cm^3. The mineralized zones contain significant sulphide minerals in various lithologies, and it was therefore deemed prudent to investigate the average bulk density for each of the lithological units. Since gold is in part related to sulphide, it is therefore not surprising that the density generally increased with the gold values and the bulk densities were found to be higher in the mineralized HALO. The use of a regression, to calculate the bulk density based on the gold values, was not advisable due to the low regression R^2. Since the bulk density data is well distributed throughout the model, the QP elected to assign a base bulk density for each domain and then interpolate a bulk density to honor local variations. Table 14-11 shows the base bulk density assigned to the domains. The interpolated bulk density relied on an inverse distance squared (ID^2) methodology carried out in one pass using a minimum of 4 samples / maximum of 15 samples, and a maximum of 3 samples originating from a single drill hole. The sample search ellipsoid was oriented at 355 azimuths with a 60-degree dip to the west. The maximum range was 90 m. Using these parameters, a total of 936,003 blocks were interpolated representing 4.3% of the model.

Table 14-11: Bulk Density by Domains

Domain (Domain Code)	Bulk Density (g/cm^3)
INTRS (2000)	2.60
MBX (6100)	2.52
SED (1200)	2.66
SKNHF (4000)	2.79
SULPH (6500)	3.31
CBX_HALO (6050)	2.78
INTRS_HALO (2050)	2.61
SED_HALO (1250)	2.70
SKNHF_HALO (4050)	2.74
SULPH_HALO (6550)	3.31

Source: AGP (2020)

14.7 SPATIAL ANALYSIS – VARIOGRAPHY

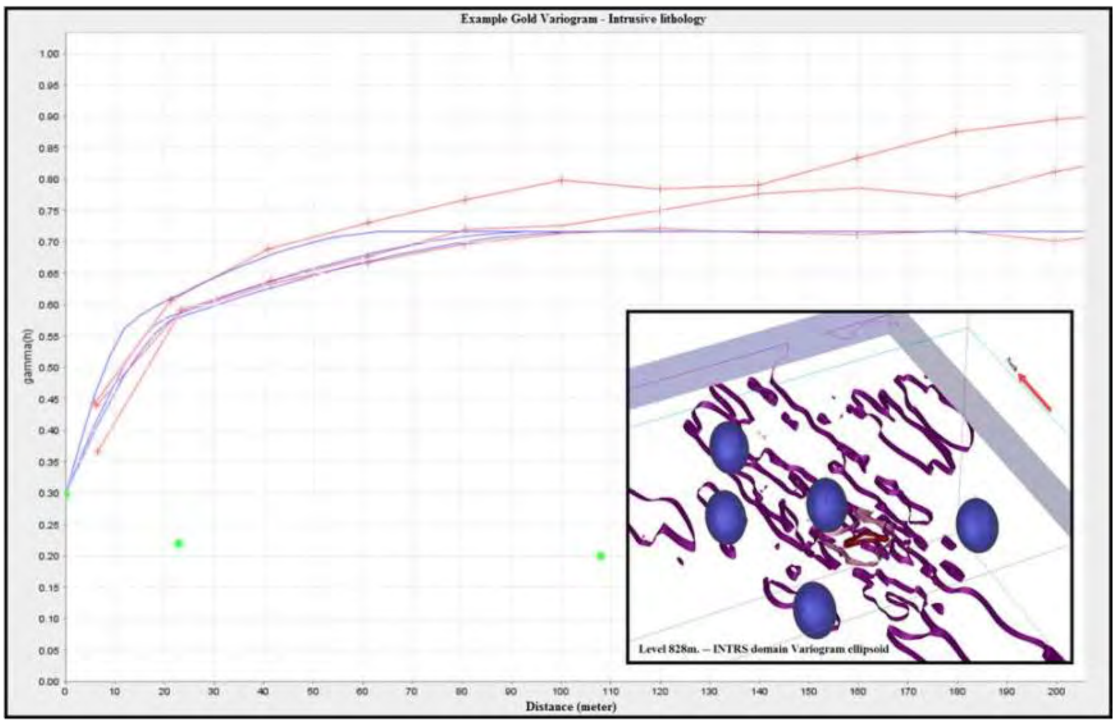
Geostatisticians use a variety of tools to describe the pattern of spatial continuity, or strength of the spatial similarity of a variable with separation distance and direction. If we compare samples that are close together, it is common to observe that their values are quite similar. As the distance between samples increases, there is likely to be less similarity in the values. The experimental variogram mathematically describes this process. It is commonly represented as a graph that shows the variance in measurements with distance between all pairs of sampled locations.

In all semi-variograms, the distance where the model first flattens out is known as the range. Sample locations separated by distances closer than the range are believed to be spatially auto-correlated. The sill is the value on the Y-axis where the model attains the range, while the nugget is the value at the location where the model intercepts the Y-axis. The nugget typically represents variation at a micro scale that can be attributed to measurement errors, sources of variation at distances smaller than the sampling interval, or both. Therefore, the shape of the semi-variogram describes the pattern of spatial continuity. A very rapid decrease near the origin indicates short-scale variability. A more gradual decrease moving away from the origin suggests longer-scale continuity.

Various semi-variogram types exist; using Geovia GEMS™ software, experimental pair-wise relative variograms for gold and silver were computed for the various lithological domains.

The resulting anisotropy models generated were visually inspected in GEMS™ software to ensure the ellipsoid model corresponded well with the expected orientation of the deposit.

For gold, the effective range at 97% of the sill along the apparent plunge of the mineralization averaged 80 m. The nugget effect is moderate, at approximately 40% of the sill value. At 100% of the sill, the maximum range is estimated to be between 74 m and 118 m. The definition of the variogram, near the origin, is good when the lag distances are adjusted to the drill angle. Figure 14-3 illustrates one example of a final variogram model, along with a plan view of the ellipsoid generated by GEMS software (Figure 14-3). The direction and plunge represented by the variogram coincide with the known interpreted plunge of the mineralization. The variography is considered representative of the trend of the mineralization. As a result, the QP elected to interpolate the grade model using ordinary kriging. For silver, the effective range is somewhat longer.



Source: AGP (2020)

Figure 14-3: Example Variogram INTRS Gold Domain

Table 14-12 and Table 14-13 list the variogram parameters used in the model for gold and silver respectively. The variograms were fitted using the GEMS "Azimuth-Dip-Azimuth" rotation method which is independent of the block model orientation. This method relies on the three axes to be orthogonal to each other. The first and second axis rotations represent true azimuth and dip of the Ax axis. The dip angle is non-zero and a negative figure points downward. The third rotation represents the azimuth of the Ay axis.

Table 14-12: Gold Variogram Parameters

Domain Code	Model	Nugget	C1	C2	ADA (degree)	C1 Range (m)	C2 Range (m)
1200, 1201	Spherical	0.334	0.255	0.210	297, -79, 265	23.4, 19.2, 18.0	105.6, 86.6, 81
2000, 2001, 6500	Spherical	0.372	0.273	0.249	14, 54, 144	22.8, 20.6, 14.1	108, 97.7, 67
4000, 4001	Spherical	0.851	0.309	1.051	346, -54, 206	26.3, 26.3, 9.9	121.2, 121.2, 45.6
6050	Spherical	0.491	0.702	0.607	26, 68, 163	25.3, 19.6, 20.7	122.7, 95.4, 100.3
1250, 2050, 4050, 6550, 6100	Spherical	0.369	0.209	0.298	20, 63, 78	19.2, 14.2, 9.2	81.9, 60.4, 39.2

Source: AGP (2020)

Table 14-13: Silver Variogram Parameters

Domain Code	Model	Nugget	C1	C2	ADA (degree)	C1 Range (m)	C2 Range (m)
1200, 1201	Spherical	0.142	0.295	0.133	304, -63, 282	51, 49.6, 44.5	165.9, 161.4, 144.8
2000, 2001, 6500	Spherical	0.218	0.153	0.172	45, 76, 159	22.9, 20.1, 9.7	96.3, 84.4, 40.8
4000, 4001	Spherical	0.300	0.258	0.109	315, -76, 171	47.8, 39.3, 25.5	114.1, 93.8, 60.8
6050	Spherical	0.267	0.141	0.174	12, 49, 132	26.9, 26.9, 11.8	143.4, 143.4, 63
1250, 2050, 4050, 6550, 6100	Spherical	0.288	0.215	0.210	26, 68, 72	24.8, 14.1, 15.8	136.9, 77.9, 86.8

Source: AGP (2020)

14.8 SEARCH ELLIPSOID DIMENSION AND ORIENTATION

While it is common to use the variogram model as a guide to set the search ellipsoids' ranges and attitudes, the geologist modelling the deposit must consider the strike and dip of the mineralized horizon, and the drill hole spacing and distribution. For this model, the QP used the overall geometry as confirmed by the variography as guiding principles to set the search ellipsoid orientation.

The first pass maximum range was sized to reach at least the next drill section. A 1.8x multiplier (from Pass 1) was used to set the range of the second pass. The maximum range for the second interpolation pass was set to be close to the range displayed by the variogram at 97% of the sill. Lastly, a 2.0 x multiplier (from Pass 2) was used to set the range for the third interpolation pass, which typically exceeded the maximum range displayed by the variograms.

The search ellipsoids dimension and orientation applied for both the gold and silver interpolation plan, was also kept consistent for all domains located within the high-grade HALO.

Table 14-14 lists the final values used in the resource model for the range of the major, semi-major, and minor axes. Rotation angles are based on the GEMS ZXZ methodology, which uses a conventional right-hand rule.

Table 14-14: Search Ellipsoid Dimensions and Orientation

Domain Code	ZXZ (degrees)	Pass 1 (m)	Pass 2 (m)	Pass 3 (m)
SED (1200)	-70, 60, -45	42, 35, 24	76, 63, 44	151, 125, 87
SED in HALO (1250)	12, -10, 0	30 20, 37	60, 40, 74	120, 80, 148
INTRS (2000)	-78, 60, 40	38, 43, 20	74, 82, 38	149, 164, 76
INTRS in HALO (2050)	12, -10, 0	30, 20, 47	60, 40, 74	120, 80, 148
SKNHF (4000)	89, 60, -45	52, 52, 14	94, 94, 24	187, 187, 49
SKNHF in HALO (4050)	12, -10, 0	30, 20, 27 (AG has 37)	60, 40, 74	120, 80, 148
CBX (6050)	12, -10, 0	38, 38, 50	68, 68, 89	136, 136, 178
MBX (6100)	12, -10, 0	38, 38, 50	68, 68, 89	136, 136, 178
SULPH (6500)	12, -10, 0	38, 38, 50	68, 68, 89	136, 136, 178
SULPH in HALO (6550)	12, -10, 0	38, 38, 50	68, 68, 89	136, 136, 178

Source: AGP (2020)

14.9 RESOURCE BLOCK MODEL MATRIX

The block model was constructed using GEMS™. An equidistant block size of 5 m horizontally, 5 m across, and 6 m vertically was selected based on mining selectivity considerations and the density of the dataset. This block matrix size assumed a small to mid-size open pit operation and is also suitable for long hole underground operation. The block matrix size is adequate for the area covering the resource constraining shell. Further away from the shell, the drill pattern is too wide to support the small matrix size. This will likely be resolved in the future with increased coverage of in-fill drilling.

The block model was defined on the Project coordinate system with a 0-degree rotation. Table 14-15 lists the upper southeast corner of the model and is defined on the block edge.

The final domain codes controlling the interpolation were coded by adding the lithological code with the HALO code and the high grade probabilistic code.

Table 14-15: Block Model Definition (Block Edge)

Resource Model Items	Parameters
Easting	409,500
Northing	1,997,000
Top relative elevation	1,406
Rotation angle (counterclockwise)	0
Block size (X, Y, Z in meters)	5 x 5 x 6
Number of blocks in the X direction	250
Number of blocks in the Y direction	400
Number of blocks in the Z direction	275

Source: AGP (2020)

Originally, the entire block model matrix was to be estimated in order to evaluate the upside potential of the south- west portion of the deposit. However, the drill density west of coordinate 409,550, was not sufficient to reliably estimate a grade. Additionally, there is an apparent change in the direction of the lithologies in the western portion of the deposit that was not yet represented with the wireframes received. As a result, the western part of the block model matrix remains outside of the block model extent.

14.10 INTERPOLATION PLAN

The resource model was created in GEMS 6.8™ with a single folder setup, using ordinary kriging for interpolating the gold and silver grade. A nearest neighbor (NN) model and inverse distance to the power of two (ID^2) were also interpolated to be used for validation. The interpolation was carried out in a multi-pass approach, with an increasing search dimension coupled with decreasing sample restrictions.

- Pass 1 used an ellipsoid search with 7 minimum / 15 maximum samples. A maximum of 3 samples per hole was imposed on the data selection, forcing a minimum of 3 holes to be used in the search.
- Pass 2 used an ellipsoid search with 5 minimum / 15 maximum samples. A maximum of 3 samples per hole was imposed on the data selection, forcing a minimum of 2 holes to be used in the search.
- Pass 3 used an ellipsoid search with 4 minimum / 18 maximum samples. A maximum of 3 samples per hole was imposed on the data selection, forcing a minimum of 2 holes to be used in the search.

Contact profiles for the MBX domain indicated a gradational contact with the SED and INTRS domains. The contact profiles also revealed that the boundary at the edge of the HALO displayed a short gradational contact with the lithologies outside the HALO. This was assumed by the QP to affect the high-grade composites for the lithologies outside the HALO. Therefore, for Pass 1 only, the interpolation plan blended the composite as indicated in Table 14-16.

Table 14-16: Boundary Treatment

Interpolated Domain Code	Pass 1 Composite Code Visible			Pass 2 or 3 Composite Code Visible
SED (1200)	1200	6100		1200
SED in High grade prob model (1201)	1201	1250		1201
SED in HALO (1250)	1250	1201		1250
INTRS (2000)	2000	6100		2000
INTRS in High grade prob model (2001)	2001	2050		2001
INTRS in HALO (2050)	2050	2001		2050
SKNHF (4000)	4000			4000
SKHHF in high grade probability model (4001)	4001	4050		4001
SKNHF in HALO (4050)	4050	4001		4050
CBX (6050)	6050			6050
MBX (6100)	6100	1200	2000	6100
SULPH (6500)	6500			6500
SULPH in HALO (6550)	6550			6550

Source: AGP (2020)

The interpolation plan mitigates high grade smearing in the relatively unrestricted lithological domains outside the HALO, while acknowledging the location HALO boundary is somewhat arbitrary. The plan also prevents blending of the composites as the sample search ellipsoid size increases since this would reflect a true soft boundary which was not seen in the contact profile. The boundary treatment was assumed to be the same for gold and silver for this pre-feasibility model; however, additional work is required to validate this assumption.

14.11 MINERAL RESOURCE CLASSIFICATION

Several factors are considered in the definition of a resource classification:

- Canadian Institute of Mining (CIM) requirements and guidelines (2014)
- Experience with similar deposits
- Spatial continuity
- Confidence limit analysis
- Geology

No environmental, permitting, legal, title, taxation, socioeconomic, marketing, or other relevant issues are known to the author that may currently affect the mineral resource estimate. Mineral resources, which are not mineral reserves, do not have demonstrated economic viability. Mineral reserves can only be estimated based on an economic evaluation used in a prefeasibility or feasibility study of a mineral project and are a subset of the mineral resources.

Typically, the confidence level for a grade in the block model is reduced with the increase in the search ellipsoid size, along with the diminishing restriction on the number of samples used for the grade interpolation. This is essentially controlled by the pass number of the interpolation plan, as described in the previous section. A common technique is to categorize a model based on the pass number and distance to the closest sample. For the Ana Paula deposit, in addition to using the pass number and the average distance to the composites, the QP adjusted the classification based on several factors such as kriging efficiency and proximity to surface exposures. Lastly, a core area model was used to adjust the classification outside the most densely drilled area. In this context, the core area is an area well covered by drilling (typically < 60 m drill spacing) where the QP believes the continuity of the mineralization has been well demonstrated.

Table 14-17 lists the parameters used to code the classification model, and Figure 14-4 illustrates a representative section of the block classification of the Ana Paula deposit.

Table 14-17: Classification Parameters

Pass Number	Retained As	Downgraded To
Pass 1	Measured in areas within 75 m of surface or average distance to composites < 40 m	Indicated if average distance to composites is > 40 m and < 75 m or kriging efficiency is < 0 or kriging efficiency outside the HALO is < 0.20
Pass 2	Indicated if average distance to composites is <75 m	Inferred if average distance to composites is ≥75 m and <150 m or if the krige efficiency is < -0.15
Pass 3	Inferred if average distance to composites is <150 m	Assigned Code 4 if the average distance to composites is ≥150 m or if the krige efficiency is < -0.15. These blocks were removed from the resources.

Source: AGP (2020)

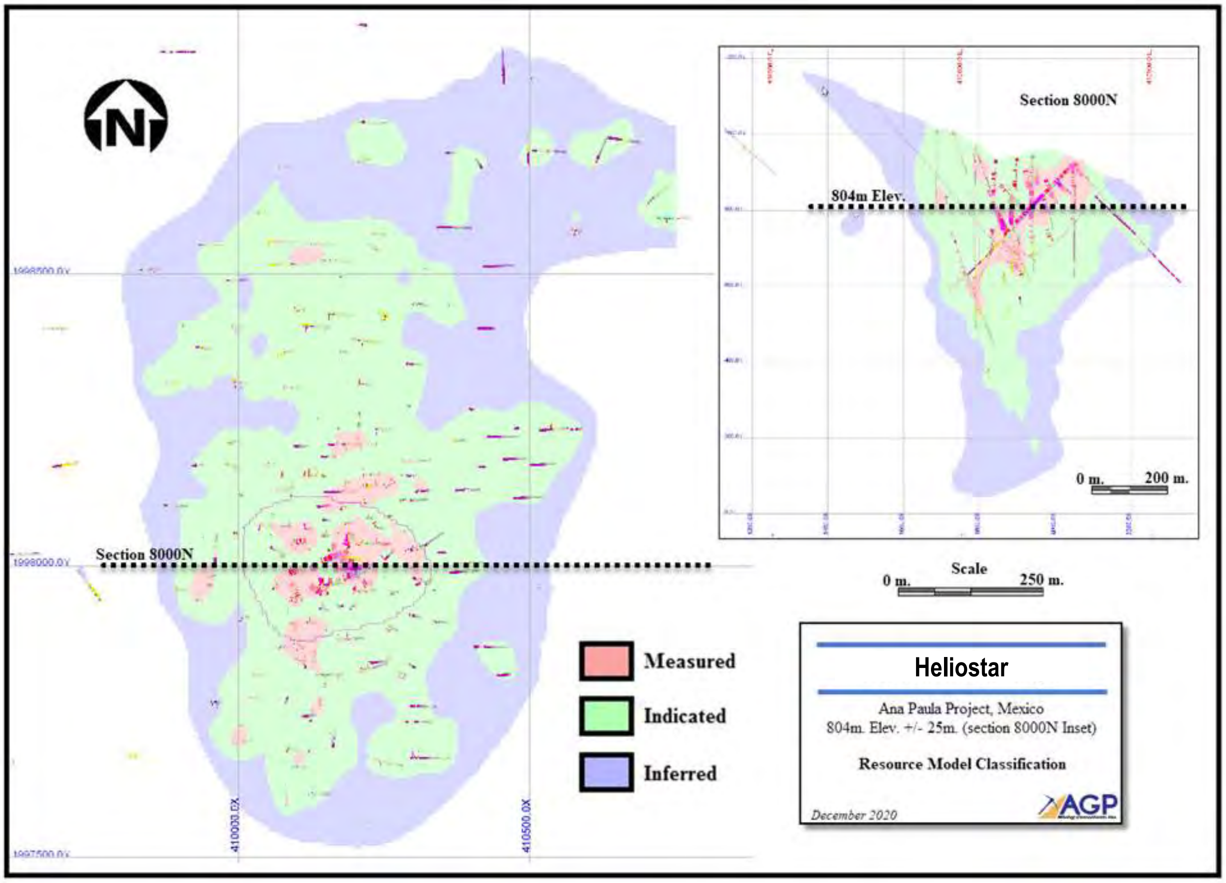
Additional modifiers were used in addition to the above parameters:

- Indicated blocks supported only by two drill holes were downgraded to Inferred.
- Blocks located outside the core area were downgrade from Indicated to Inferred; and Inferred were removed from the resources.

Final adjustments to the classification of individual block values are often required to create areas suitable for mine planning. This is accomplished by using a GEMS™ Cypress-enabled script that adjusts, or "grooms", the confidence category of isolated blocks to create contiguous resource blocks with reasonably smooth class values. The classifications of isolated blocks were adjusted using an aggressive 125-block smoothing algorithm that was run in two passes. the QP also generated histograms of the distance to the closest composites versus the class model value to evaluate the class model for reasonability.

Three confidence categories exist in the model. The usual CIM guideline classes of Measured, Indicated, and Inferred are coded 1, 2, and 3, respectively. A special Code 4 represents material that was outside of the criteria used to classify the resources. The Code 4 blocks were kept in the resource model files solely to assist exploration staff in targeting its exploration activity.

Within the resource model, 12% of the blocks were classified as Measured, Indicated, or Inferred. The remaining blocks were either interpolated and Coded 4 or not interpolated and therefore bore no grade. For the blocks classed as Measured, Indicated, and Inferred the proportion of each category is 3.2% Measured, 43.9% Indicated, and 52.9% Inferred (Figure 14-4).



Source: AGP (2020)

Figure 14-4: Model Classification

14.12 BLOCK MODEL VALIDATION

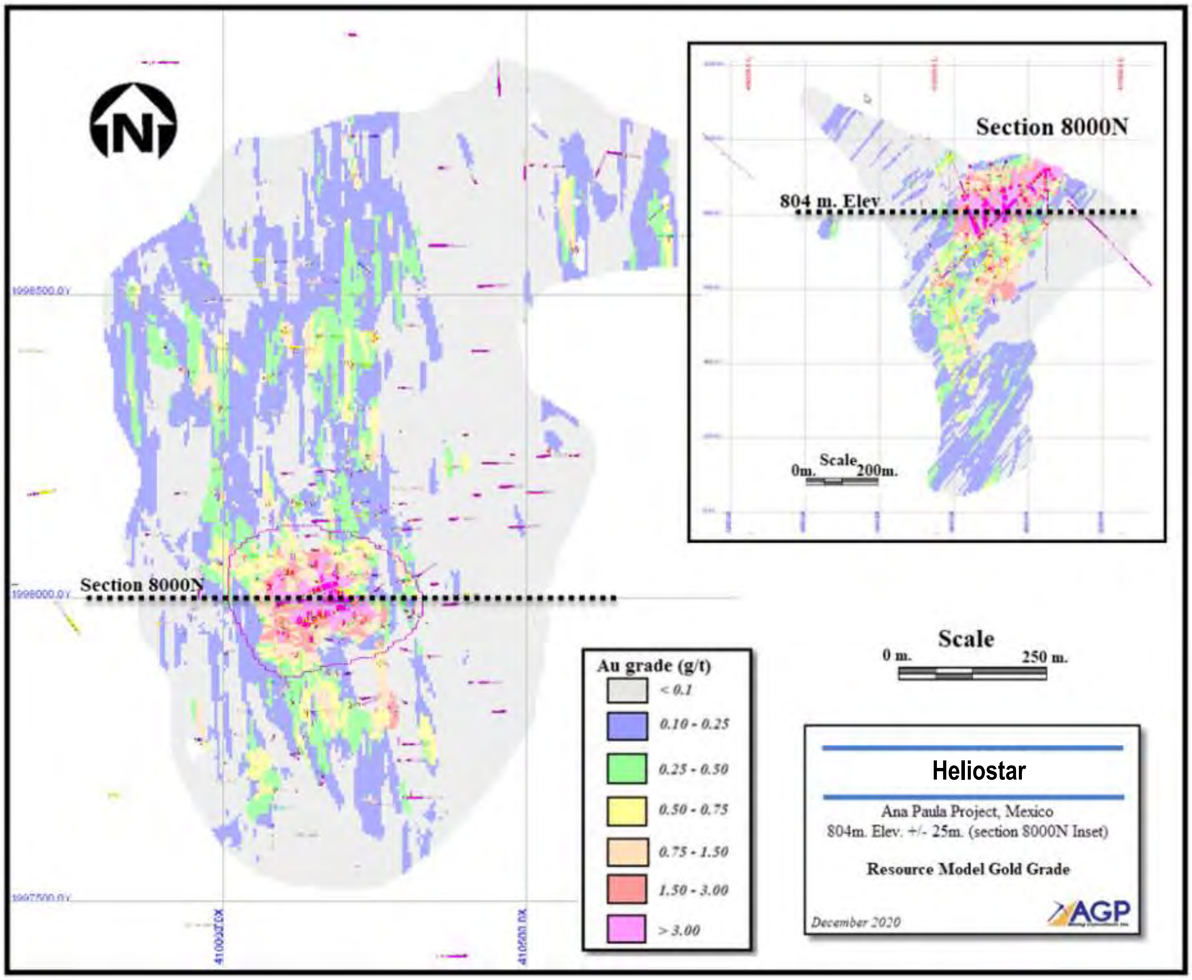
The Ana Paula grade models were validated by four methods:

- Visual comparison of color-coded block model grades with composite grades on sections and plans
- Comparison of the global mean block grades for OK, ID^2, NN models, composite, and raw assay grades
- Comparison using grade profiles to investigate local bias in the estimate
- Naïve cross-validation tests with composite grade versus block model grade

14.12.1 Visual Comparison

The visual comparison of block model grades on sections and plans indicated a good correlation between drill hole grade and resource model grade (Figure 14-5), especially near the CBX and surrounding HALO.

While the grade correlation is good, visually the gold grade model appears somewhat boxed in by the lithological contacts. This is in part due to the grade transition at the boundaries which are driven by the contact profile. Within the HALO, the grade interpolation is carried out independently for each lithology, which also promotes a reduction of the grade smoothing. For the feasibility study, the QP recommends investigating if a revised high-grade probabilistic model may be used as a surrogate to the HALO, subsequently simplifying the procedure.



Source: AGP (2020)

Figure 14-5: Gold Grade Model Distribution

14.12.2 Global Comparison

Table 14-18 shows the grade statistics for the raw assays, composites, NN, ID^2, and OK models. Statistics for the gold and silver composite mean grades compare well to the raw assay grades, with a normal reduction in values due to smoothing, related to volume variance. The block model mean grade, when compared against the composites, showed a normal reduction in values. More importantly, the grade of the NN, ID^2, and OK models are within 2% of each other, indicating the methodology used did not introduce a local bias into the estimate.

Table 14-18: Global Comparisons (Measured, Indicated, and Inferred)

Methodology	Au (g/t) @ > 0.0 cut-off (Class 1-3)	Ag (g/t) @ > 0.0 cut-off (Class 1-3)
Raw assays uncapped at 0.0 Cut-off (clustered/declustered)	0.421 / 0.330	2.9 / 2.6
Composite capped at 0.0 Cut-off (clustered/declustered)	0.338 / 0.278	2.3 / 2.2
Nearest neighbor (NN)	0.177	1.99
Inverse distance squared using true distance (ID)	0.176	1.98
Ordinary kriging (OK)	0.176	1.98

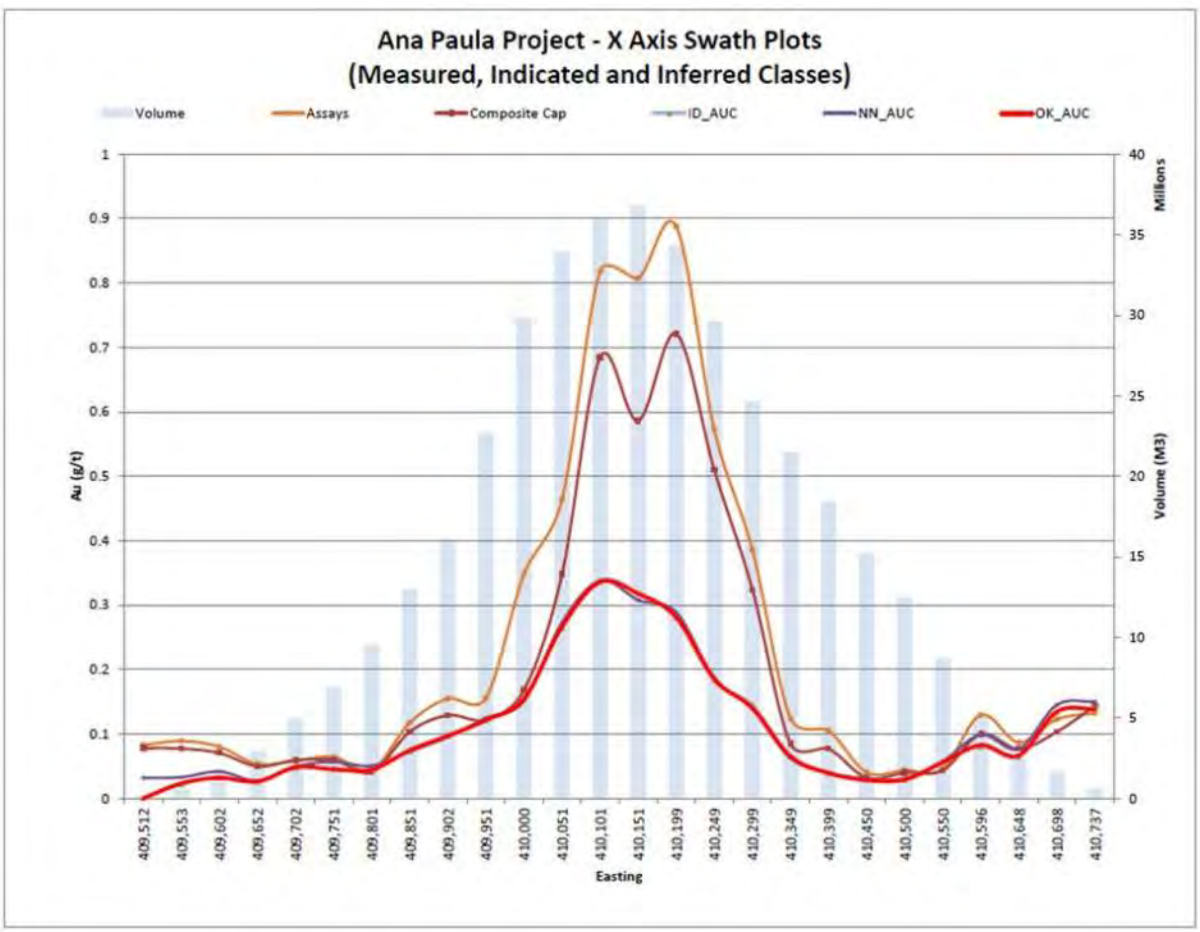
Source: AGP (2020)

14.12.3 Local Comparisons – Grade Profiles

Comparison of the grade profiles (swath plots) of the raw assay, composites, and estimated grades allow for a visual verification of an over or under estimation of the block grades at the global and local scales. A qualitative assessment of the smoothing and variability of the estimates can also be observed from the plots. The output consists of three swath plots, generated at 50 m intervals in the X direction, 50 m in the Y direction, and 50 m vertically.

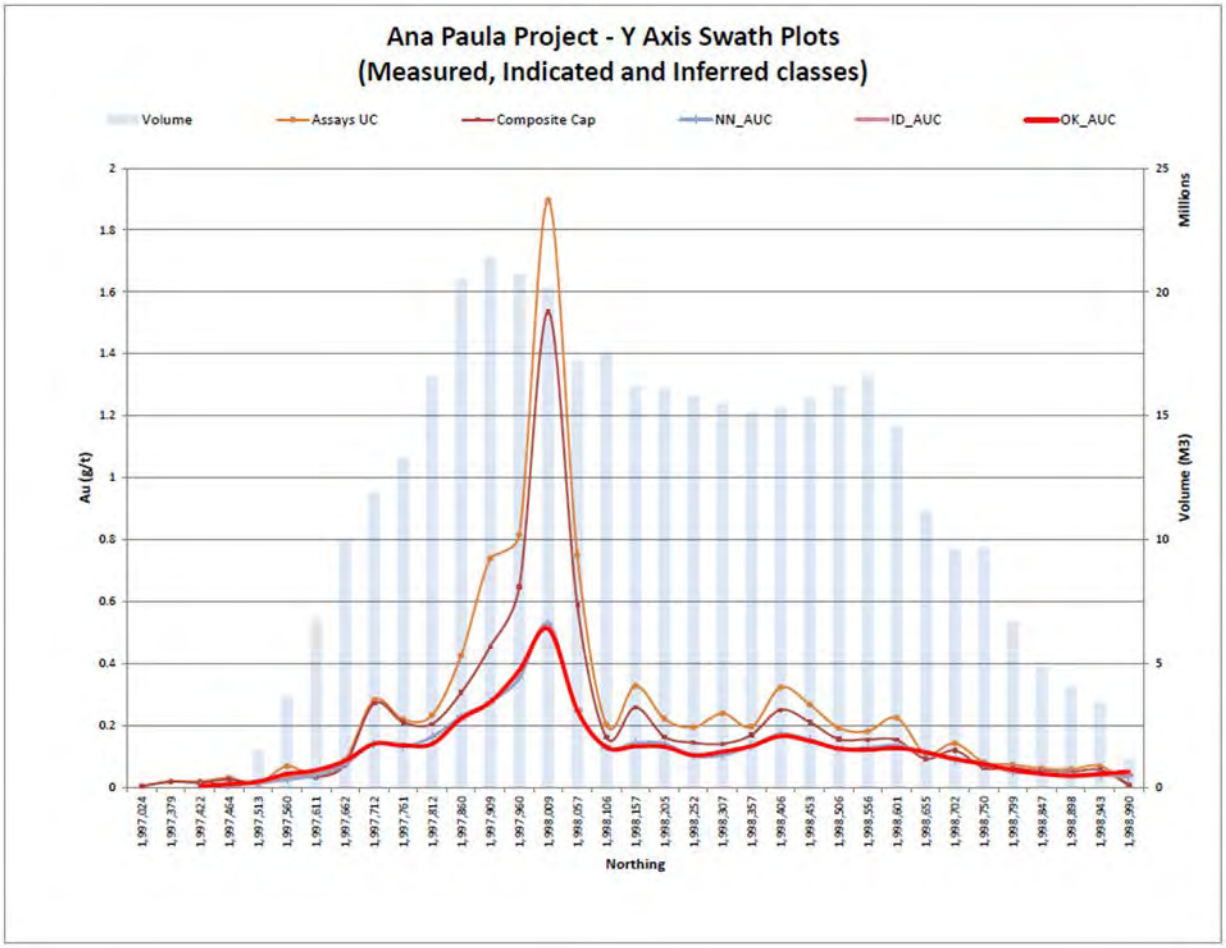
The OK and ID^2 estimates should be smoother than the NN estimate; the NN estimate should fluctuate around the OK and ID^2 estimates on the plots or display a slightly higher grade. The composite line is generally located between the assay and the interpolated grade. A model with good composite distribution should show very few crossovers between the composite and the interpolated grade line on the plots. In the fringes of the deposit, as composite data points become sparse, crossovers are often unavoidable. The swath size also controls this effect to a certain extent; if the swaths are too small, fewer composites will be encountered, which usually results in erratic lines on the plots.

In general, the swath plots show good agreement, with the three methodologies showing no major local bias. The peaks and valleys on the assay and composite lines are well represented, but more subdued in the resource model due to smoothing. The effect of capping the assays is readily visible in the plots, and the search restrictions on the mild outliers appear to have normalized the grade. Grade profiles for gold are presented in Figure 14-6 and Figure 14-7. The profile for the Z chart was omitted.



Source: AGP (2020)

Figure 14-6: X-Axis Grade Profile



Source: AGP (2020)

Figure 14-7: Y Axis Grade Profile

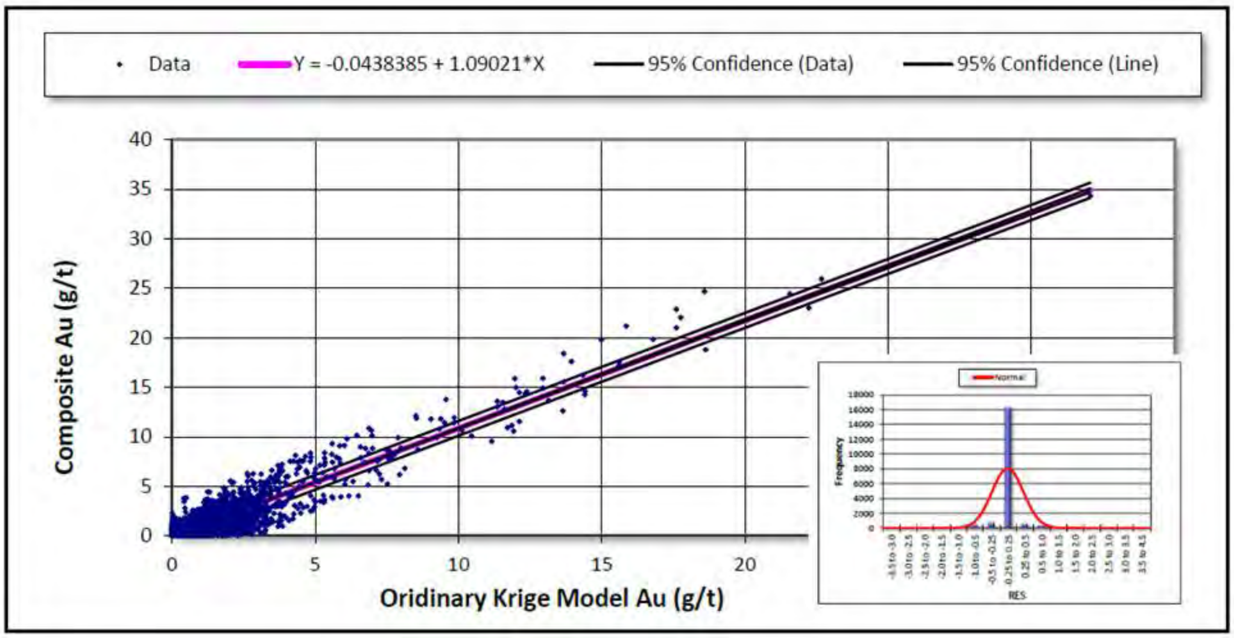
14.12.4 Naïve Cross-Validation Test

A comparison of the average grade of the 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 scatter plot gives a statistical valuation of the estimates. This methodology is distinct from “jackknifing,” which replaces a composite with a pseudo-block at the same location, and evaluates and compares the estimated grade of the pseudo-block against that of the composite grade.

With the naïve cross validation test, it is anticipated the estimated block grades should be similar (while not exactly the same value) to the composited grades within the block. This is especially true with deposits bearing a higher nugget component.

A high correlation coefficient (R^2) indicates satisfactory interpolation process results, while a medium to low correlation coefficient indicates larger differences in the estimates, or a low data density, which would suggest a further review of the interpolation process. Results from the pairing of the composited and estimated grades within blocks pierced by a drill hole are presented in Figure 14-8. Following the removal of 126 outliers (out of 19,137 pairs), the R^2 value is considered high for a gold deposit, at 0.89 R^2 (0.79 R^2 before outlier’s removal).

The regression residuals are the differences, on a case-by-case basis, between the actual Y values and the values calculated by the best-fit equation. These can be evaluated for normality and randomness. The inset image in Figure 14-8 shows the residual distribution. The chart shows a normal distribution with a very small negative bias.



Source: AGP (2020)

Figure 14-8: Naïve Cross Validation Test Results

14.13 MINERAL RESOURCE TABULATION

Effective December 30, 2020, the QP completed an update of the May 16, 2017 resource estimate for the Ana Paula Project located near the municipalities of Cuétzala del Progreso, and Apaxtla del Castregon, Guerrero State, Mexico. The mineral resource presented herein is in conformance with the CIM Mineral Resource definitions referred to in the NI 43-101 Standards of Disclosure for Mineral Projects.

The Ana Paula model was interpolated using 290 core holes completed by Goldcorp Corporation in 2005, Newstrike Capital from 2010 through 2015, and Alio Gold Corp. since 2015. The database totaled 123,499 m of core and 89,816 assays for the holes used in the resource estimate. The estimate takes into account all data that was available prior to May 31, 2018.

The estimate was completed based on the concept of a medium scale open pit, with a possible resource for an underground operation for the material remaining below the pit bottom.

The resource estimate consists of a combination of Measured, Indicated, and Inferred resources. Based on current exploration drilling data, the bulk of the mineralization is clustered in and around the CBX lithological unit. This lithological unit consists of a core of multi-lithic breccia in a steeply south plunging column surrounded by an alteration HALO bearing high grade mineralization which is characterized by veins, fracture zones, and massive sulphide contact replacements. Grade tends to be highest from the center of the complex breccia and extending from 100 m to 150 m into the sediments, intrusive, and hornfels lithology. The vertical extent of the Complex Breccia has been modelled to a depth of 950 m below surface and it is currently limited by drilling.

From the geometry described, the deposit is amenable to open pit extraction followed by a potential underground operation, likely using a bulk mining method such as long-hole or modified Avoca mining method, with or without backfill.

14.13.1 Marginal Cut-off Grade for Mineral Resources

Under CIM definitions, Mineral Resources should have a reasonable prospect of eventual economic extraction. A gold price of US$1,400 /ounce and a silver price of US$20 /ounce was used for the cut-off determination. For open pit resources, a cut-off of 0.6 g/t gold was used. Resources below the open pit shell used a cut-off of 1.6 g/t gold to define possible underground resources. The economic calculation to support this estimate is provided in Table 14-19.

Table 14-19: Breakeven Cut-off Grade for Resource

Ana Paula Project	Unit	Gold	Silver
World Price	US$/ounce	$1,400	$20.00
Payables	%	99%	99%
Refining, transportation	US/ounce	$20.00	$0.25
Royalty	%	2.5%	2.5%
Net Price	US$/ounce	$1,331.85	$19.06
	Unit	**Open Pit**	**Underground**
Mining	US$/t moved	$2.25	$36.00
Milling	US$/t mill feed	$19.00	$19.00
G&A	$/t mill feed	$2.49	$2.49
Process Recovery			
Gold	%	88%	88%
Silver	%	30%	30%
Wall Slopes (overall)			
All Sector	degrees	49.5	-
Dilution considered for cutoff	%	0%	5%
Breakeven Cut-off	g/t Au	0.60	1.65

Source: AGP (2020)

14.13.2 Mineral Resource Amenable to Open Pit Extraction

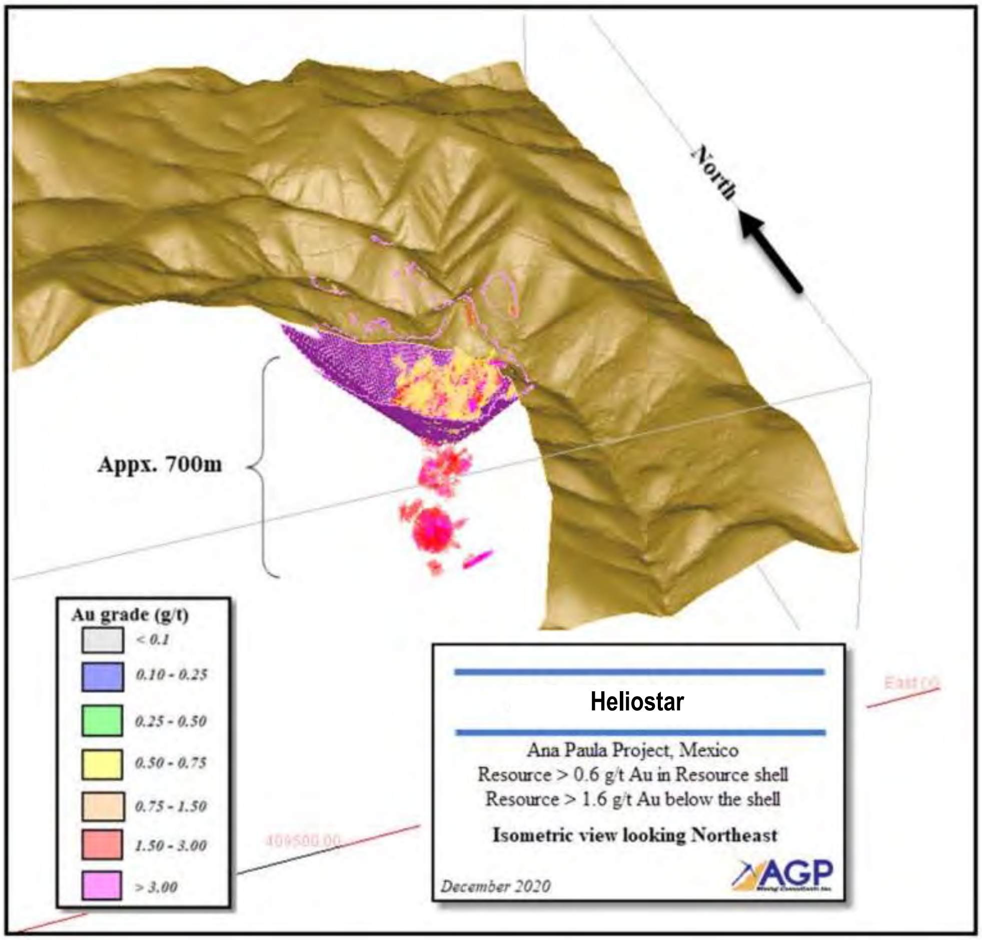
To further assess reasonable prospects of eventual economic extraction, a Lerchs-Grossman optimized shell was generated to constrain the potential open pit material. Parameters used to generate this shell included:

- Average of 49.5° overall slopes for the pit shell
- US$2.25/t mining, US$19/t milling, US$2.49/t G&A operating costs
- 88% gold recovery, 30% silver recovery
- Gold price of $1,400/ounce and $20/ounce silver price
- Above criteria was applied to Measured, Indicated, and Inferred materials

14.13.3 Mineral Resource Amenable to Underground Extraction

As mentioned above, and from the geometry described the material amenable to underground extraction will likely be using a bulk mining method such as long-hole or modified Avoca mining method, with or without backfill. In order to assess the reasonable prospects of eventual economic extraction below the resource constraining shell, blocks grading above 1.6 g/t Au break-even cut-off were selected based on the economic parameters shown in Table 14-19. The break-even cut-off stated is only applicable to the material in the vicinity of the mineralized HALO due to increase in development costs reaching blocks further away, or smaller groupings that were not expected to be able to pay for their development. The remaining blocks were visually inspected to eliminate single isolated blocks, as much as possible (Figure 14-9).

Lastly, the QP would like to caution the reader that no mining plan exists for the material amenable to underground extraction and therefore stope size, level spacing and other underground mining criteria have not yet been established.



Source: AGP (2020)

Figure 14-9: Resource Blocks

14.13.4 Mineral Resources

Within the resource constraining shell, at the greater than 0.6 g/t Au cut-off selected, the updated model returns a total of 9,095,000 Measured tonnes grading at 2.39 g/t Au and 5.6 g/t Ag, containing 698,000 ounces of gold and 1,629,000 ounces of silver. Indicated tonnes amounted to 9,810,000 tonnes grading at 1.79 g/t Au and 5.3 g/t Ag, containing 563,000 ounces of gold and 1,667,000 ounces of silver. The total Measured and Indicated resources within the constraining shell amounted to 18,905,000 tonnes grading at 2.07 g/t Au and 5.4 g/t silver, containing 1,261,000 ounces of gold and 3,306,000 silver ounces.

Below the constraining shell and reported at a greater than 1.6 g/t Au, the updated model returns 85,000 tonnes of Measured resources grading at 2.15 g/t Au and 2.8 g/t Ag, containing 5,800 ounces of gold and 8,000 ounces of silver. Indicated resources amounted to 2,212,000 tonnes grading 2.84 g/t Au and 4.0 g/t Ag, containing 202,000 ounces of gold and 286,000 ounces of silver. The total Measured and Indicated resources below the constraining shell amounted to 2,297,000 tonnes grading at 2.81 g/t Au and 4.0 g/t Ag, containing 207,800 ounces of gold and 294,000 ounces of silver.

Inferred resources within the resource constraining shell and reported at greater than 0.6 g/t Au, amounted to 63,000 tonnes grading at 0.86 g/t Au and 10.5 g/t Ag, containing 2,000 ounces of gold and 21,000 ounces of silver.

Below the constraining shell and reported at a greater than 1.6 g/t Au cut-off, the updated model returned 322,000 tonnes of Inferred resources grading at 2.09 g/t Au and 4.2 g/t Ag, containing 21,700 ounces of gold and 43,000 ounces of silver.

14.13.5 Ana Paula Total Resources

The Mineral Resources for the Ana Paula Project are: Measured resources of 9.1 Mt grading at 2.38 g/t Au and 5.5 g/t Ag; Indicated resources of 12.0 Mt grading at 1.98 g/t Au and 5.0 g/t Ag; and, Inferred resources of 0.4 Mt grading at 0.89 g/t Au and 5.2 g/t Ag. The total Measured and Indicated resources are: 21.2 Mt grading at 2.16 g/t Au and 5.3 g/t Ag. Table 14-20 presents the Mineral Resource Statement for the Ana Paula Project

Table 14-20: Ana Paula Resource Statement Effective December 30, 2020

Area	Category	Cut-off (Au g/t)	Tonnes	Au (g/t)	Gold (ounces)	Ag (g/t)	Silver (ounces)
Resource Amenable to Open Pit Extraction	Measured	0.6	9,095,000	2.39	698,000	5.6	1,629,000
	Indicated		9,810,000	1.79	563,000	5.3	1,677,000
	Measured & Indicated		**18,905,000**	**2.07**	**1,261,000**	**5.4**	**3,306,000**
	Inferred*		63,000	0.86	2,000	10.5	21,000
Resource Amenable to Underground Extraction	Measured	1.6	85,000	2.15	5,800	2.8	8,000
	Indicated		2,212,000	2.84	202,000	4.0	286,000
	Measured & Indicated		**2,297,000**	**2.81**	**207,800**	**4.0**	**294,000**
	Inferred*		322,000	2.09	21,700	4.2	43,000
Total Resource	Measured	OP 0.6 and UG 1.6	9,180,000	2.38	703,800	5.5	1,637,000
	Indicated		12,022,000	1.98	765,000	5.1	1,963,000
	Measured & Indicated		**21,202,000**	**2.16**	**1,468,800**	**5.3**	**3,600,000**
	Inferred*		385,000	1.89	23,700	5.2	64,000

Source: AGP (2020)

The QP is required to inform the public that the quantity and grade of Inferred resources reported above are conceptual in nature and are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. For these reasons, an Inferred Mineral Resource has a lower level of confidence than an Indicated Mineral Resources and it is reasonably expected that the majority of Inferred Mineral Resource could be upgraded to Indicated Mineral Resources with continued exploration. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Rounding of tonnes as required by reporting guidelines may result in apparent differences between tonnes, grade, and contained metal content.

14.13.6 Model Sensitivity

Table 14-21 shows the sensitivity of the model to changes in cut-off within the resource constraining shell for Mineral Resources amenable to open pit extraction. Figure 14-10 presents the grade tonnage curves for the Measured and

Indicated Mineral Resources within the resource constraining shell. The base case cut-off for the open pit resources is 0.6 g/t Au is highlighted in the table.

Table 14-21: Model Sensitivity to Cut-off within the Resource Constraining Shell

Area	Category	Cut-off (Au g/t)	Tonnes (million)	Au (g/t)	Gold (oz x 1000)	Ag (g/t)	Silver (oz x 1000)
Amenable to Open Pit extraction	Measured	> 1.0	5.9	3.27	617	6.0	1,133
		> 0.9	6.4	3.07	635	5.9	1,222
		> 0.8	7.2	2.84	655	5.8	1,341
		> 0.7	8.1	2.60	677	5.7	1,479
		> 0.6	9.1	2.39	698	5.6	1,629
		> 0.5	10.3	2.17	719	5.4	1,800
	Indicated	> 1.0	6.3	2.35	474	5.6	1,129
		> 0.9	7.0	2.21	495	5.6	1,247
		> 0.8	7.8	2.07	518	5.5	1,382
		> 0.7	8.7	1.93	540	5.4	1,515
		> 0.6	9.8	1.79	563	5.3	1,677
		> 0.5	11.3	1.62	589	5.2	1,906
	Measured + Indicated	> 1.0	12.1	2.80	1,092	5.8	2,262
		> 0.9	13.4	2.63	1,130	5.7	2,468
		> 0.8	15.0	2.44	1,173	5.7	2,723
		> 0.7	16.8	2.25	1,217	5.5	2,993
		> 0.6	18.9	2.07	1,261	5.4	3,306
		> 0.5	21.6	1.89	1,308	5.3	3,706
	Inferred	> 1.0	0.0	1.11	-	14.1	5
		> 0.9	0.0	1.06	1	12.9	6
		> 0.8	0.0	0.93	1	11.7	16
		> 0.7	0.1	0.88	2	10.9	20
		> 0.6	0.1	0.86	2	10.5	21
		> 0.5	0.1	0.83	2	10.2	22

Source: AGP (2020)

	> 0.3	> 0.4	> 0.5	> 0.6	> 0.7	> 0.8	> 0.9	> 1.0
tonnes (,000t)	27,770	24,701	21,586	18,905	16,799	14,976	13,388	12,133
Grade (g/t Au)	1.55	1.70	1.89	2.07	2.25	2.44	2.63	2.80

Source: AGP (2023)

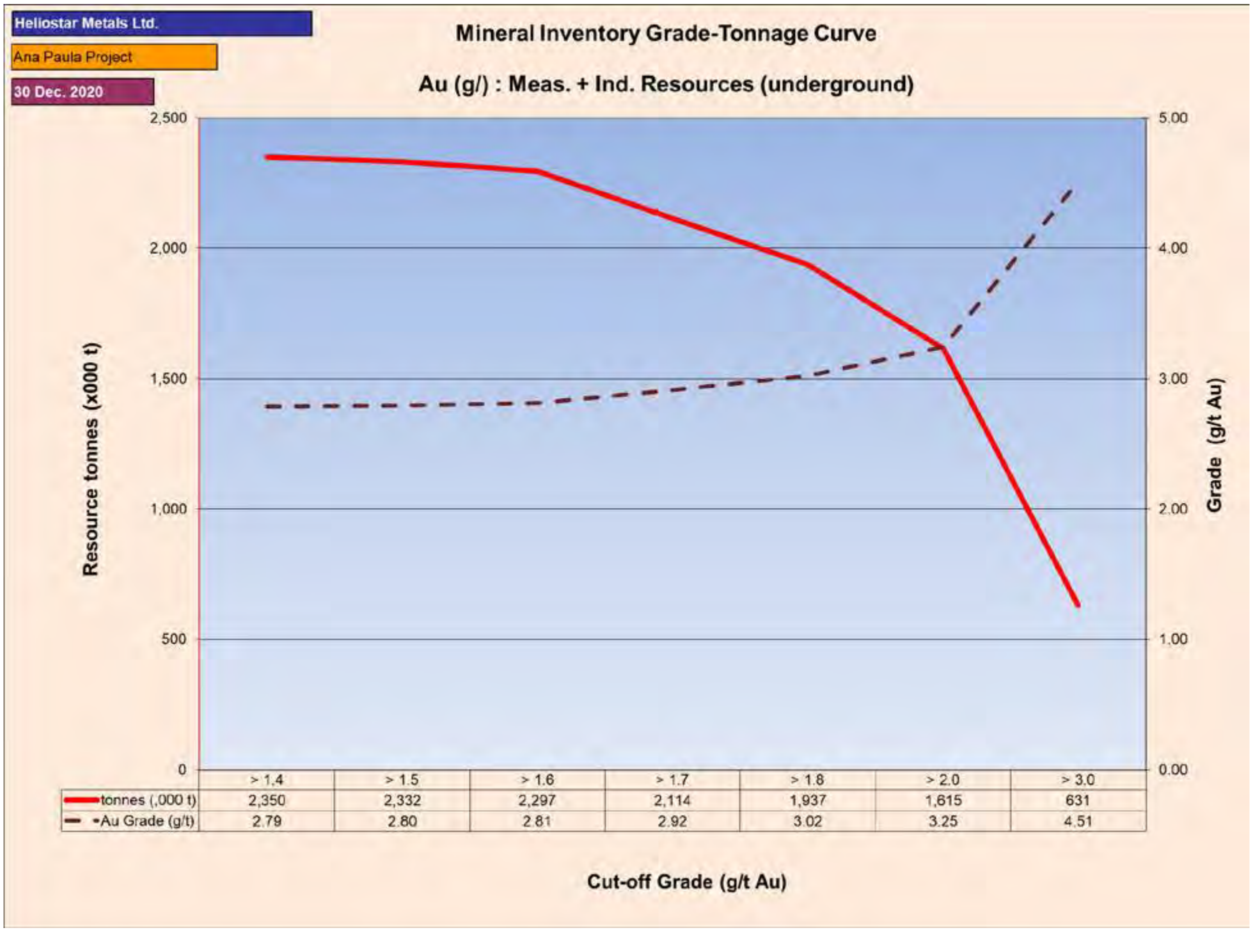
Figure 14-10: Grade-Tonnage Curves for the Measured and Indicated Mineral Resources within the Resource Constraining Shell

Table 14-22 shows the sensitivity of the model to changes in cut-off for the material amendable to underground extraction. Figure 14-11 presents the grade tonnage curves for the Measured and Indicated Mineral Resources amenable to underground extraction. The base case cut-off for the underground resources is 1.6 g/t Au is highlighted in the table.

Table 14-22: Model Sensitivity to Cut-off Below the Resource Constraining Shell

Area	Category	Cut-off (Au g/t)	Tonnes (million)	Au (g/t)	Gold (oz x 1000)	Ag (g/t)	Silver (oz x 1000)
Amenable to Underground extraction	Measured	>3.0	0.01	3.38	1	2.8	1
		>2.0	0.04	2.49	3	2.8	4
		>1.8	0.06	2.30	5	2.8	6
		>1.7	0.07	2.24	5	2.8	6
		>1.6	0.09	2.15	6	2.8	8
		>1.5	0.09	2.14	6	2.8	8
	Indicated	>3.0	0.62	4.52	91	5.4	108
		>2.0	1.57	3.27	165	4.5	226
		>1.8	1.87	3.05	183	4.2	256
		>1.7	2.04	2.94	193	4.1	271
		>1.6	2.21	2.84	202	4.0	286
		>1.5	2.25	2.82	204	4.0	289
	Measured + Indicated	>3.0	0.63	4.51	92	5.4	109
		>2.0	1.62	3.25	169	4.4	230
		>1.8	1.94	3.02	188	4.2	262
		>1.7	2.11	2.92	198	4.1	278
		>1.6	2.30	2.81	208	4.0	294
		>1.5	2.33	2.80	210	4.0	296
	Inferred	>3.0	0.02	4.40	3	6.1	4
		>2.0	0.11	2.70	10	4.9	18
		>1.8	0.19	2.37	14	4.5	27
		>1.7	0.25	2.22	18	4.4	35
		>1.6	0.32	2.09	22	4.2	43
		>1.5	0.33	2.08	22	4.1	44

Source: AGP (2020)



	> 1.4	> 1.5	> 1.6	> 1.7	> 1.8	> 2.0	> 3.0
tonnes (,000 t)	2,350	2,332	2,297	2,114	1,937	1,615	631
Au Grade (g/t)	2.79	2.80	2.81	2.92	3.02	3.25	4.51

Source: AGP (2023)

Figure 14-11: Grade-Tonnage Curves for the Measured and Indicated Mineral Resources Amenable to Underground Extraction

14.14 COMPARISON TO PREVIOUS ESTIMATE

Comparing this new resource estimate against the prior resource model effective May 16th, 2017, reveals an increase of 1% in the Measured and Indicated tonnes. The resource gold grade is virtually identical (2.17 g/t Au versus 2.16 g/t Au), and consequently the resource yields a very small increase of 0.5% in gold ounces.

The change in the Inferred resource amounted to 55.7% less tonnes. Grade is slightly higher from 1.84 g/t Au to 1.89 g/t Au. Total gold ounces decreased by 53.9% (Table 14-23).

Table 14-23: Resource Statement compared with Previous Estimate

Cut-off	*December 30th, 2020 > 0.6 g/t Au OP and > 1.6 g/t Au UG*			*May 16th, 2017 > 0.6 g/t Au OP and > 1.65 g/t Au UG*					
Classification	**Tonnage (T)**	**Au (g/t)**	**Gold (Ounces)**	**Tonnage (T)**	**Au (g/t)**	**Gold (Ounces)**	**Tonnage % Diff.**	**Grade Diff (g/t)**	**Ounces % Diff**
Measured	9,180,000	2.38	703,800	7,582,000	2.43	592,800	21.1%	-0.05	18.7%
Indicated	12,022,000	1.98	765,000	13,416,000	2.01	869,000	-10.4%	-0.03	-12.0%
Mea. + Ind.	21,202,000	2.16	1,468,800	20,999,000	2.17	1,461,700	1.0%	-0.01	0.5%
Inferred	385,000	1.89	23,700	870,000	1.84	51,400	-55.7%	0.05	-53.9%

Source: AGP (2020)

The major contributor to the changes in the resources are mostly related to the additional holes at the base of the May 2017 resource constraining shell and a revised classification model which shifted some tonnage between categories.

15 MINERAL RESERVE ESTIMATES

15.1 SUMMARY

The reserves for Ana Paula are based on the conversion of the Measured and Indicated resources within the current technical report mine plan. Measured resources are converted directly to Proven Reserves and Indicated resources to Probable Reserves. The total reserves for Ana Paula are shown in Table 15-1.

Table 15-1: Proven and Probable Reserves – Ana Paula

Category	Tonnes (kt)	Gold Grade (g/t)	Gold (ounces)	Silver Grade (g/t)	Silver (ounces)
Proven	7,126	2.75	630,000	5.77	1,322,000
Probable	6,996	2.00	451,000	5.45	1,226,000
Total	**14,122**	**2.38**	**1,081,000**	**5.61**	**2,547,000**

Note: This mineral reserve estimate is effective as of February 1, 2023 and is based on the mineral resource estimate dated December 30, 2020. The mineral reserve calculation was completed under the supervision of Gordon Zurowski, P.Eng. of AGP Mining Consultants Inc., who is a Qualified Person as defined under NI 43-101. Mineral reserves are stated within the final design pit based on a US$976/ounce gold price pit shell with a US$1,200/ounce gold price for revenue. The cut-off grade was 0.67 g/t Au for all pit areas. The mining cost averaged $3.08/tonne mined, processing averages US$19.68/tonne milled and G&A was US$2.44/tonne milled. The process recovery for gold averaged 88% and the silver recovery was 30%. The exchange rate assumption applied was Mex$20.00 equal to US$1.00.

The reserves are based solely on the Ana Paula open pit. The underground resources have not been converted and remain resources only for this technical report.

The QP has not identified any known legal, political, environmental, or other risks that would materially affect the potential development of the Mineral Reserves. The risk of not being able to secure the necessary permits from the government for development and operation of the Project exist, but the QP is not aware of any issues that would prevent those permits from being withheld per the normal permitting process.

15.2 MINING METHODS AND MINING COSTS

The Ana Paula Project is amenable to extraction by open pit methods. Preliminary costs were developed based on expected contractor mining.

The potential for underground development beneath the open pit has not been examined as part of this technical report. Areas of higher grade gold resources are present beneath the current design pit and are being considered for potential inclusion in future evaluations. Heliostar is advancing a plan to develop an exploration drift to further define the nature of the potential underground resource and examine possible opportunities to exploit these resources via underground methods.

Only Measured and Indicated Resources were used for the study and all Inferred resources were considered to be waste.

This section discusses the development and parameters employed to declare reserves for the current PFS pit design.

15.2.1 Geotechnical Considerations

Knight Piésold completed slope stability analysis for the Ana Paula pit to develop prefeasibility level parameters for the pit design. The various pit slope design parameters, including geotechnical considerations, are discussed in detail in Section 16 of this technical report.

Various design sectors were determined for the Ana Paula pit. Slope stability analyses were undertaken on each sector to determine achievable slope parameters. For all sectors, these parameters included the use of an 80- degree bench face angle, 8.1 meter berm and berms spaced every 18 meters vertically. This yielded an inter-ramp angle of 58 degrees. AGP reduced the inter-ramp angle in Sector A by two degrees to provide a slightly larger berm in case of toppling. No other geotechnical berms were recommended or included in the design.

For the economic pit shell development, the inclusion of ramps was considered to provide overall slopes of between 49 and 51 degrees.

15.2.2 Economic Pit Shell Development

The final pit design was based on pit shells developed using the Lerch-Grossman procedure in MineSight. The parameters for the shells are shown in Table 15-2.

Table 15-2: Pit Optimization Parameters

Parameter	Unit	Gold	Silver
Metal Prices	US$/oz	$1,200.00	$16.00
Payables	%	99%	99%
Transportation, Refining	US$/oz	$20.00	$0.25
Royalty	%	2.5%	2.5%
Net Value for Pit Shell	US$/oz	$1,138.80	$15.59
	US$/gram	$36.61	$0.49
Metallurgical Recovery	%	88%	30%
Processing Cost	US$/t	$19.00	$19.00
G&A Costs	US$/t	$2.49	$2.49
Mining Cost	US$/t mined	$2.38	$2.38
Pit Slopes		Inter-ramp	Overall
Sector A	Degrees	56	50
Sector B	Degrees	58	49.4
Sector C	Degrees	58	48.7
Sector D	Degrees	58	49.3
Sector E	Degrees	58	49.9
Sector F	Degrees	58	51.3

The metallurgical recoveries were updated after the pit design by the technical team. The gold recovery was reduced to 85% to be somewhat conservative while the silver recovery was increased to 55%. An additional $1,200 gold pit shell was run for comparison and it was noted that the reduced gold recovery resulted in 0.7% drop in feed tonnage and a 0.3% drop in contained gold. The contained silver increased by 1%. This was deemed to be non-material and the final pit design was not modified from what is shown in this technical report.

A series of nested shells were generated using a revenue factor(rf). These were varied between a gold price of US$252 (rf=0.21) and US$1200 (rf=1.0) to examine the deposit sensitivity to gold prices and outline the higher value areas. Pit shells were generated at 0.02 rf increments or roughly US$25 increments. This information was graphed, and the various phases and final shell determined based on a net revenue curve.

The final pit is based on the US$976/oz gold price shell with phasing at the US$277/oz gold shell and US$402/oz gold shell.

15.2.3 Cut-off Grade

For determining the tonnes and grade in the pit, the marginal cut-off grade was used. The marginal cut-off grade, or milling cut-off, is defined as the minimum grade that would make a profit by processing the material in the mill. This material is already planned to be mined as part of the economic calculations; therefore, the mining cost is not applicable.

With the cost parameters considered for the Project, this equated to a gold only value of 0.67 g/t. This value was also used to determine mill feed or waste for the dilution calculation.

15.2.4 Dilution

The geologic model was a whole block, fully diluted grade model. This means that the grade from the wireframes was diluted over the full volume of the block to arrive at a diluted block grade. AGP also believes that contact dilution would play a role in the material sent to the mill. To determine the amount of dilution and the grade of the dilution the size of the block in the model was examined. The block model is 5 m along strike (X axis), 5 m thick (Y axis) and 6 m high (Z axis).

The percentage of dilution is calculated for each contact side using an assumed 0.5 m contact dilution distance. If one side of a mill feed block is touching waste, then it is estimated that dilution of 9.1% would result. If two sides are contacting, it would rise to 16.7%. Three sides would be 23.1%, and four sides 28.6%. Four sides represent an isolated block of mill feed.

The number of diluting sides was calculated with a MineSight routine and the dilution percentage determined. Comparing the in situ to the diluted value for the design pit showed a mill feed tonnage dilution of 4.5%, a gold grade dilution of 3.92% and a silver grade dilution of 2.0%. The grade dilutions are lower as a result of the waste blocks containing some mineralization. Tonnes and grade for the pit designs and reserves are reported with the diluted tonnes and grade.

15.2.5 Pit Design

The detailed pit design utilized the pit shells developed earlier to provide guidance on the phasing and final pit. Wall slopes for the inter-ramp were per the Knight Piésold recommendations.

Equipment sizing for ramps and working benches is based on the use of 63 t rigid frame trucks. The ramp width is sized for the smaller capacity 56 t rigid frame units, as they are slightly wider than the 63 t rigid frame versions. The operating width used for the truck is 5.7 m. This means that single lane access is 17.8 m (2x operating width plus berm and ditch) and double lane widths are 23.5 m (3x operating width plus berm and ditch). Ramp gradients are 10% in the pit for uphill gradients and 8% downhill on the dump access roads. Working benches were designed for 35 to 40 m minimum on pushbacks.

Ana Paula is designed with three phases. The first phase is a starter phase designed to provide early higher-grade material for the plant and minimize strip ratio. The second phase expands on the first targeting the larger portion of the ore body. The final phase requires a significant push back from the upper elevations due to local topography.

15.2.6 Mine Reserves Statement

The reserves for Ana Paula are based on the conversion of the Measured and Indicated resources within the current technical report mine plan. Measured resources are converted directly to Proven Reserves and Indicated resources to Probable Reserves. These were prepared under the supervision of Gordon Zurowski, P.Eng. of AGP Mining Consultants Inc. who is a qualified person as defined under NI43-101. The reserves are based solely on the Ana Paula open pit. The underground resources have not been converted and remain resources only for this technical report.

This estimate is as of February 1, 2023. The total reserves for Ana Paula are shown in Table 15-3.

Table 15-3: Ana Paula Mine Reserves

Category	Tonnes (kt)	Gold Grade (g/t)	Gold (ounces)	Silver Grade (g/t)	Silver (ounces)
Proven	7,126	2.75	630,000	5.77	1,322,000
Probable	6,996	2.00	451,000	5.45	1,226,000
Total	**14,122**	**2.38**	**1,081,000**	**5.61**	**2,547,000**

Note: Mineral reserves are included within mineral resources.

16 MINING METHODS

16.1 INTRODUCTION

Mine design and planning for the Ana Paula Project is based on the AGP resource model, as detailed in Section 14 of this technical report. Mine planning and optimization results are based on measured and indicated resources for gold and silver.

Open pit mining was selected as the method to examine the development of the Ana Paula Project at this time. This is based on the size of the resource, tenor of the grade, grade distribution and topography.

The potential for underground development beneath the open pit has not been examined as part of this technical report. Areas of higher grade gold resources are present beneath the current design pit and are being considered for potential inclusion in future evaluations.

This section discusses the development and parameters employed to develop the PFS pit design.

16.2 OVERVIEW

The deposit will be a conventional, open pit, truck-and-shovel operation. A mill feed of approximately 5,000 t/d is planned over an approximate 8-year mine life. There will be pre-strip material in Year -1, with a full production ramp-up in Year 1.

The mine planning and cut-off grade reporting was completed using the MineSight software. Using the Lerchs-Grossman (LG) algorithm within the software, the optimization performs a series of nested shells by varying revenue factors. The ultimate pit and phases were then selected and used to develop the life of mine plan (LOM).

The waste rock, acid base accounting testing was not yet available at the time of this technical report; the next level of study will include management of waste as it is categorized. Initial indications are that the material will not be acid generating.

Table 16-1 shows the key results from the LOM plan. Waste material mined and associated strip ratio includes pre-stripping activities in Year -2 and Year -1.

Table 16-1: LOM Plan Key Results

Description	Units	Value
Ore Material Mined	Mtonnes	14.12
Average Gold Grade	g/t	2.38
Average Silver Grade	g/t	5.61
Waste Material Mined	Mtonnes	42.97
Strip Ratio	w:o	3.04
Milling Rate	t/d	5,000
Mine Life	years	8

16.3 GEOTECHNICAL

16.3.1 Pit Slope Evaluation

Knight Piésold and Co. (Knight Piésold) conducted a pit slope stability evaluation for the proposed Ana Paula Pit. Knight Piésold completed the work related to this study in 2017. This section of the technical report provides a summary of the geotechnical evaluation and pit slope recommendations.

The primary objective of this evaluation is to provide Heliostar with optimum pit slope angle recommendations to be used in development of the proposed Ana Paula Pit. Optimum pit slope angles are those that allow for maximum resource extraction, minimum waste rock handling, global pit slope stability and an acceptable level of pit slope maintenance.

The following tasks were completed by Knight Piésold:

- Reviewed pertinent information, including previous reports.
- Developed and conducted a geotechnical investigation program including geotechnical core logging of six geotechnical coreholes, discontinuity orientation (oriented core) and core sampling to support Rock Mass Rating (Bieniawski 1989) calculations.
- Installed vibrating wire piezometers (VWP) to collect groundwater information.
- Developed and managed a rock mechanics laboratory testing program.
- Conducted probability based pit slope stability analyses to provide overall global, inter-ramp, and bench scale recommendations.
- Developed pit slope geometry recommendations for the proposed Ana Paula Pit.

16.3.1.1 Geology

A geologic block model was provided to Knight Piésold by Heliostar. This model is comprised of four lithologies including Granodiorite, Limestone-Shale, and minor occurrences of Hornblende and Breccia. The weathering states of all lithologies are primarily fresh/unaltered. The Granodiorite is typically massive. The Limestone-Shale has a primary foliation but in many occurrences, this unit appears to have been re-worked and small-scale chaotic folding is present with numerous calcite veins. The Hornblende occurrence is minor and often inter-laminated with the Limestone-Shale unit. Breccia occurrences are also minor. These lithologies were used as the Engineering Lithologies delineated within the geotechnical model discussed in Section 16.3.1.2.

Geologic structure data were collected using the Reflex ACT III core orienting tool. Core orientation data were analyzed using the CODES commercially available software. Geologic structure is dominated by a pervasive foliation herein termed Set 1 which has a mean dip direction of 258.9 degrees and a mean dip of 58.7 degrees. Structure Set 2 is a low-angle set with a mean dip direction of 47.7 degrees and a mean dip of 21.4 degrees. Structure Set 3 has a mean dip direction of 164.6 degrees and a mean dip of 68.1 degrees.

16.3.1.2 Geotechnical Model

A geotechnical model was developed to facilitate pit slope stability analyses. The pit was divided into six primary sectors (Sectors A through F) based on overall slope height, dip direction of the slope face, and the orientation of Structure Set 1 (prominent foliation). Dip direction of the slope face was consistent across each design sector, except in the case of Sectors D and F, where the design sectors were further subdivided to capture changes in the slope face dip directions as they relate to orientation of the major geologic structures. Design Sector D was subdivided into Subsectors D1, D2 and D3 because pit slope dip directions varied across this design sector and Subsector D2 is oriented sub-parallel to Structure Set 1. Minor changes to the pit shape will allow for Sector D2 to be designed with the same recommendations as Sectors D1 and D3. Sector F also contains changes in pit slope dip direction and was divided into Subsectors F1 and F2 so that trials for backbreak analysis could be conducted. However, no viable plane shear or wedge failures were revealed for Sector F, so the recommendations across subsectors F1 and F2 are identical. Figure 16-1 shows the traces of the geotechnical coreholes and their orientation information. The design sectors are shown on Figure 16-2.

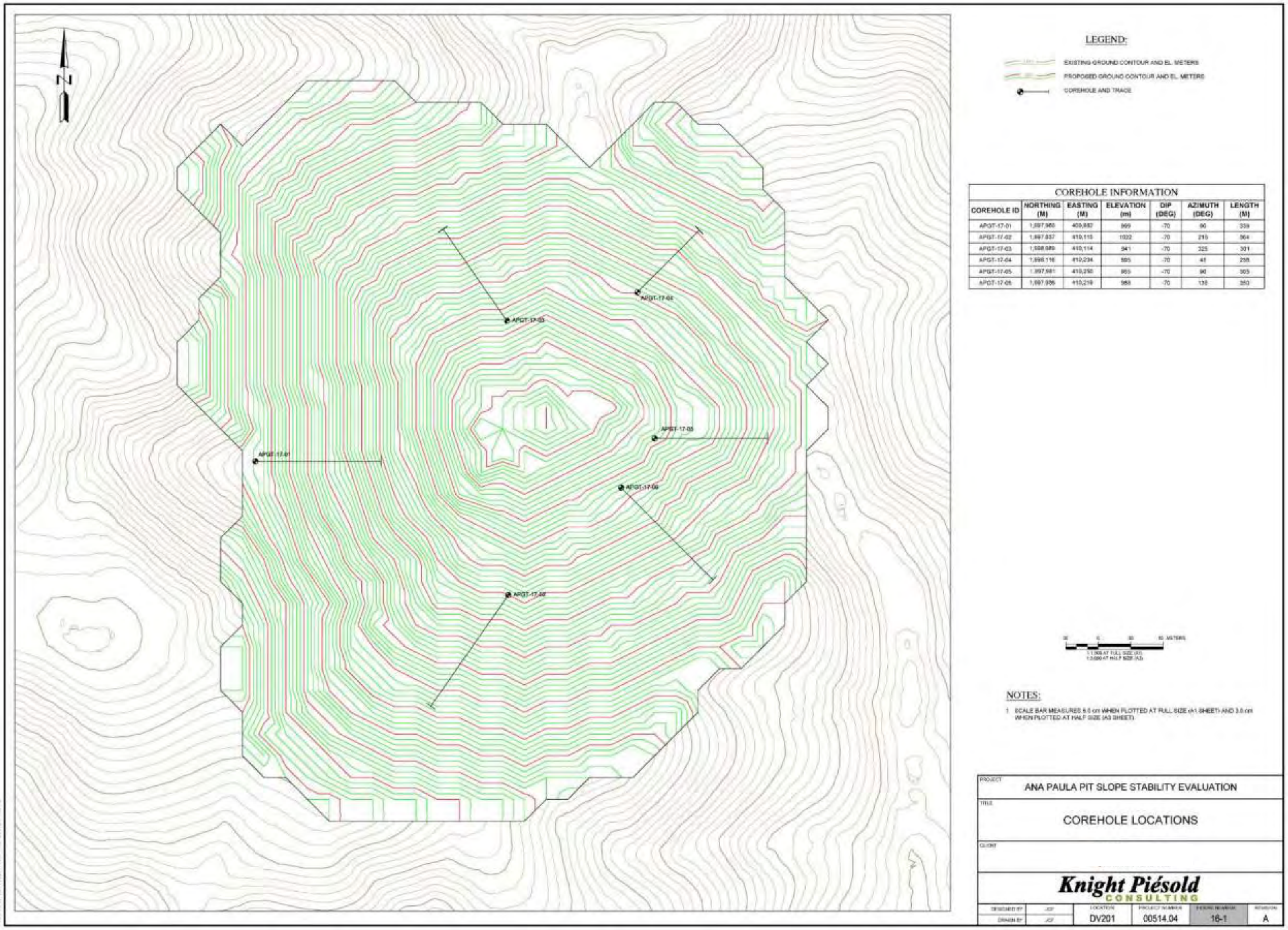


Figure 16-1: Core Locations

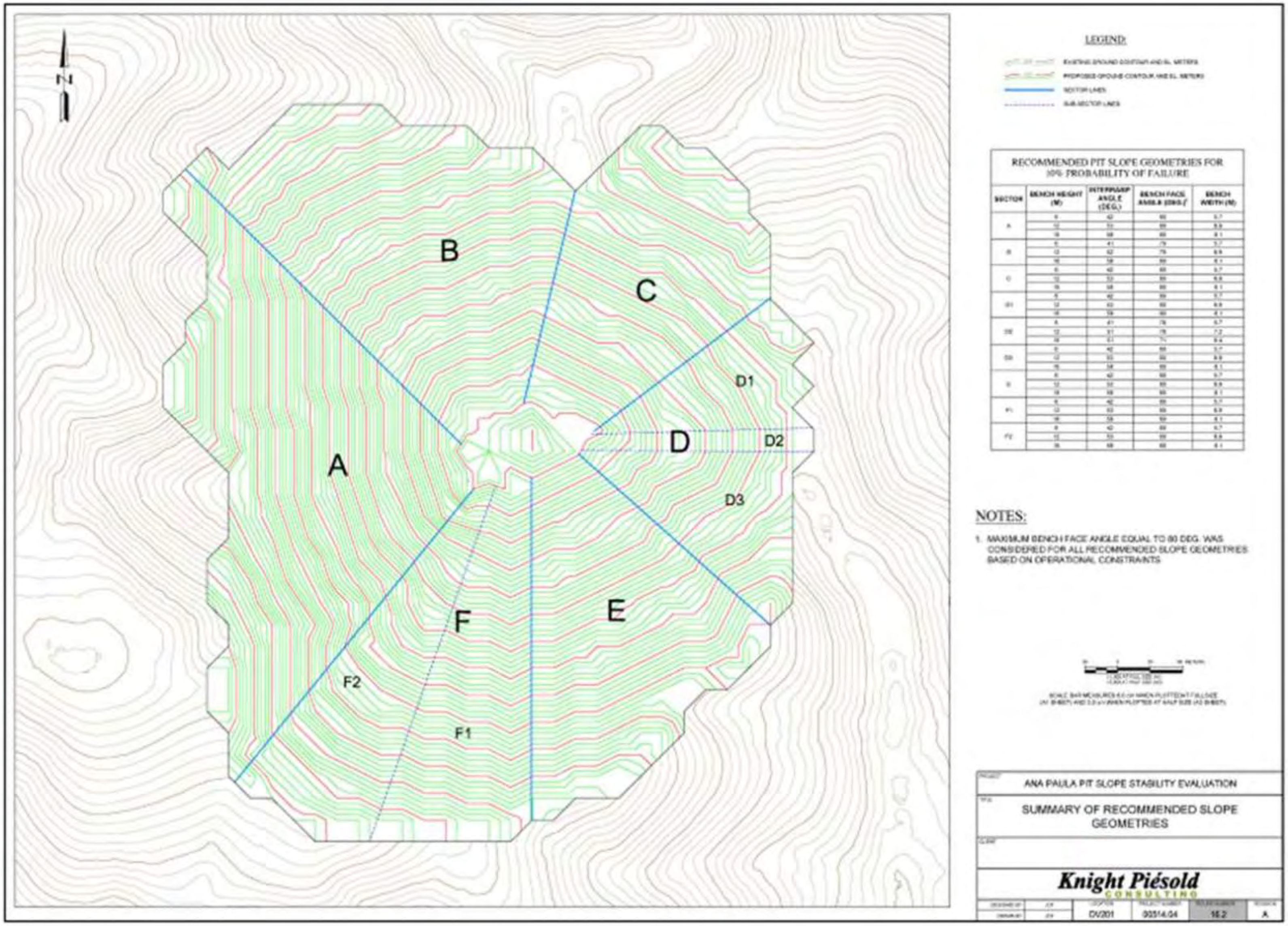


Figure 16-2: Design Sectors

16.3.1.3 Laboratory Testing

Laboratory unconfined compressive strength (UCS) testing, point load testing (PLT), and small scale direct shear (SSDS) testing were conducted. The laboratory UCS data were used in conjunction with the point load data to develop a large set of UCS data. The direct shear test data were used for bench scale (*backbreak*) analyses. Table 16-2 presents the results of the UCS testing. Table 16-3 presents the results of the SSDS testing.

Table 16-2: UCS Results Summary

Corehole ID	Sample Number	Interval		Rock Type	Density (kg/m^3)	UCS (MPa)
		From (m)	To (m)			
APGT-17-01	APGT-17-01-05	21.75	22.00	Granodiorite	2,657.8	132.7
APGT-17-01	APGT-17-01-10	44.90	45.05	Granodiorite	2,645.7	169.0
APGT-17-01	APGT-17-01-11	48.30	48.50	Granodiorite	2,590.8	115.6
APGT-17-01	APGT-17-01-18	81.85	82.05	Granodiorite	2,481.9	37.7
APGT-17-01	APGT-17-01-20	94.89	95.15	Granodiorite	2,417.1	25.6
APGT-17-01	APGT-17-01-32	164.02	164.30	Granodiorite	2,606.6	76.7
APGT-17-01	APGT-17-01-40	192.40	192.60	Granodiorite	2,439.2	54.0
APGT-17-01	APGT-17-01-47	213.90	214.12	Limestone-Shale	2,665.4	2.7(1)
APGT-17-01	APGT-17-01-50	222.75	223.00	Limestone-Shale	2,663.0	43.3
APGT-17-01	APGT-17-01-53	232.10	232.33	Limestone-Shale	2,671.3	125.4
APGT-17-01	APGT-17-01-62	262.30	262.56	Granodiorite	2,599.8	140.0
APGT-17-01	APGT-17-01-67	277.55	277.84	Limestone-Shale	2,717.9	54.0
APGT-17-01	APGT-17-01-74	298.88	299.06	Granodiorite	2,666.1	102.2
APGT-17-01	APGT-17-01-80	320.42	320.65	Granodiorite	2,659.3	181.1
APGT-17-01	APGT-17-01-85	338.46	338.69	Granodiorite	2,655.0	30.0(1)
APGT-17-02	APGT-17-02-27	96.60	96.85	Granodiorite	2,484.8	29.8
APGT-17-02	APGT-17-02-37	130.33	130.55	Breccia	2,684.3	50.8
APGT-17-02	APGT-17-02-41	143.66	143.83	Granodiorite	2,567.6	15.9
APGT-17-02	APGT-17-02-53	179.10	179.34	Granodiorite	2,545.0	92.7
APGT-17-02	APGT-17-02-66	226.49	226.67	Breccia	2,674.4	70.3
APGT-17-02	APGT-17-02-78	268.55	268.75	Limestone-Shale	2,670.2	111.5
APGT-17-02	APGT-17-02-87	296.75	296.96	Granodiorite	2,606.6	79.1
APGT-17-02	APGT-17-02-107	358.07	358.37	Granodiorite	2,479.0	36.0
APGT-17-03	APGT-17-03-09	30.12	30.33	Breccia	2,540.4	159.4
APGT-17-03	APGT-17-03-20	71.73	71.96	Granodiorite	2,648.1	259.0
APGT-17-03	APGT-17-03-29	100.85	101.10	Granodiorite	2,616.3	229.8
APGT-17-03	APGT-17-03-39	132.60	132.85	Granodiorite	2,624.3	233.3
APGT-17-03	APGT-17-03-43	144.60	144.82	Granodiorite	2,619.4	148.9
APGT-17-03	APGT-17-03-48	158.76	158.97	Granodiorite	2,623.1	160.4
APGT-17-03	APGT-17-03-59	195.60	195.77	Granodiorite	2,618.7	106.1

Table 16-3: SSDS Results Summary

Laboratory	Corehole ID	Sample Number	Interval		Test Type	Normal Stress (kPa)	Shear Stress (kPa)	Friction Angle (degrees)
			From (m)	To (m)				
University of Arizona	APGT-17-01	17-01-36	177.14	177.31	Saw Cut	150.1	125.6	39.9
University of Arizona	APGT-17-01	17-01-36	177.14	177.31	Saw Cut	310.1	202.7	33.2
University of Arizona	APGT-17-01	17-01-36	177.14	177.31	Saw Cut	755.4	460.9	31.4
University of Arizona	APGT-17-04	17-04-72	234.85	235.30	Natural Joint	146.4	86.7	30.6
University of Arizona	APGT-17-04	17-04-72	234.85	235.30	Natural Joint	303.8	152.2	26.6
University of Arizona	APGT-17-04	17-04-72	234.85	235.30	Natural Joint	762.4	351.5	24.7
University of Arizona	APGT-17-01	17-01-75	304.25	304.45	Natural Joint	150.8	107.9	35.6
University of Arizona	APGT-17-01	17-01-75	304.25	304.45	Natural Joint	302.2	196.3	33.0
University of Arizona	APGT-17-01	17-01-75	304.25	304.45	Natural Joint	756.2	457.3	31.2
University of Arizona	APGT-17-06	17-06-79(1)	252.92	253.20	Natural Joint	154.2	82.7	28.2
University of Arizona	APGT-17-06	17-06-79(1)	252.92	253.20	Natural Joint	309.7	165.8	28.2
University of Arizona	APGT-17-06	17-06-79(1)	252.92	253.20	Natural Joint	771.1	377.4	26.1
University of Arizona	APGT-17-03	17-03-93(1)	67.32	67.56	Natural Joint	2010.8	1149.7	29.8
University of Arizona	APGT-17-03	17-03-93(1)	67.32	67.56	Natural Joint	748.5	528.3	35.2
University of Arizona	APGT-17-03	17-03-93(1)	67.32	67.56	Natural Joint	300.0	264.7	41.4
University of Arizona	APGT-17-03	17-03-93(1)	67.32	67.56	Natural Joint	155.3	130.8	40.1
University of Arizona	APGT-17-03	17-03-94(1)	202.15	202.40	Natural Joint	148.8	113.3	37.3
University of Arizona	APGT-17-03	17-03-94(1)	202.15	202.40	Natural Joint	299.2	226.2	37.1
University of Arizona	APGT-17-03	17-03-94(1)	202.15	202.40	Natural Joint	739.2	532.3	35.8
University of Arizona	APGT-17-06	17-06-99(1)	314.10	314.34	Natural Joint	155.1	74.8	25.7
University of Arizona	APGT-17-06	17-06-99(1)	314.10	314.34	Natural Joint	307.3	160.7	27.6
University of Arizona	APGT-17-06	17-06-99(1)	314.10	314.34	Natural Joint	763.6	369.5	25.8
University of Arizona	APGT-17-02	17-02-111(1)	304.20	304.40	Natural Joint	145.5	123.7	40.4
University of Arizona	APGT-17-02	17-02-111(1)	304.20	304.40	Natural Joint	288.3	270.4	43.2
University of Arizona	APGT-17-02	17-02-111(1)	304.20	304.40	Natural Joint	726.4	522.4	35.7
University of Arizona	APGT-17-02	17-02-112(1)	348.98	349.33	Natural Joint	152.0	122.8	38.9
University of Arizona	APGT-17-02	17-02-112(1)	348.98	349.33	Natural Joint	304.6	238.1	38.0
University of Arizona	APGT-17-02	17-02-112(1)	348.98	349.33	Natural Joint	749.9	548.2	36.2
KP	APGT-17-01	17-01-38	184.48	184.83	Remolded	192.0	98.2	27.1
KP	APGT-17-01	17-01-38	184.48	184.83	Remolded	383.1	185.4	25.8
KP	APGT-17-01	17-01-38	184.48	184.83	Remolded	766.3	275.9	19.8

(1) Data received after completion of analysis.

16.3.1.4 Groundwater

At the time of the pit slope analyses, the VWPs had not yet equilibrated, and some were yet to be installed. Knight Piésold used a conservative initial groundwater level based on information from reverse circulation (RC) drilling. Steady state phreatic surfaces were developed using the Slide 6.0 (Rocscience 2011) software.

16.3.1.5 Hoek-Brown Failure Criterion

A shear strength vs. normal stress relationship for the rock mass was developed for each engineering lithology described, using the Generalized Hoek-Brown failure criteria (Marinos and Hoek 2002). The shear strength vs. normal stress relationship describes the ultimate shear strength available at a given point within the slope as a function of the normal stress acting upon that point. This relationship is defined using Primary and Secondary Hoek-Brown parameters. The Primary and Secondary Hoek-Brown parameters were incorporated into the geotechnical model used for limit equilibrium stability analyses.

Primary Hoek-Brown Parameters

Primary input parameters for the jointed rock mass criterion include Geological Strength Index (GSI), a material constant (m_i) and a disturbance factor (D) as defined by Marinos and Hoek (2002). For the analyses, a probability density function was selected to represent a statistical distribution of each of these primary input parameters for each of the engineering lithologies. The *Crystal Ball* (Oracle 2008) software was used to conduct a large number of Monte Carlo simulations (typically 10,000) that randomly sampled each of the three probability density functions (GSI, m_i, and D) during each simulation. The Primary Hoek-Brown parameters are presented by engineering lithology in Table 16-4.

Table 16-4: Primary Hoek-Brown Parameters

Material	Parameter	Distribution	Mean/Most Likely	Std Dev.	Min	Max
Granodiorite	GSI	Beta	75.5	12.8	25.03	89.79
	Hoek-Brown m_i parameter	Triangular	29	1.22	26	32.0
	Hoek-Brown D parameter	Triangular	0.9	0.06	0.7	1.0
Limestone-Shale	GSI	Beta	71.6	12.1	20.5	88.7
	Hoek-Brown m_i parameter	Triangular	8	0.82	6	10.0
	Hoek-Brown D parameter	Triangular	0.9	0.06	0.7	1.0
Hornblende	GSI	Min Extreme	79.9	10.5	37.81	88.2
	Hoek-Brown m_i parameter	Triangular	19	1.63	15	23.0
	Hoek-Brown D parameter	Triangular	0.9	0.06	0.7	1.0
Breccia	GSI	Beta	62.9	12.0	38.23	86.94
	Hoek-Brown m_i parameter	Triangular	19	2.04	14	24.0
	Hoek-Brown D parameter	Triangular	0.9	0.06	0.7	1.0

<u>Secondary Hoek-Brown Parameters</u>

For each set of Primary Hoek-Brown parameters sampled (typically 10,000) representative equations were solved resulting in a large number (typically 10,000) of Secondary Hoek-Brown parameters. These sets of Secondary Hoek-Brown parameters were used to fit a probability density function to represent each of the three parameters (m_b, s and a). Probability density functions representing the mean and variation in m_b, s, a, and UCS for each engineering lithology were defined using a mathematical, "best-fit" technique conducted using the *Crystal Ball* software. The distribution types and parameters defining the shape of the probability density functions (i.e., mean and standard deviation) selected for the analyses are presented in Table 16-5.

Table 16-5: Secondary Hoek-Brown Parameters

Material	Parameter	Distribution	Mean	Std Dev.	Min	Max
Granodiorite	Hoek-Brown a parameter	Lognormal	0.502	0.012	0.500	0.531
	Hoek-Brown m_b parameter	Beta	7.919	4.322	0.204	16.688
	Hoek-Brown s parameter	Gamma	0.061	0.078	0.000	0.204
	UCS (kPa)	Beta	137.670	71.370	3.970	314.270
	Unit Weight (kN/m^3)	Beta	25.503	0.502	23.704	26.145
Limestone-Shale	Hoek-Brown a parameter	Lognormal	0.502	0.003	0.500	0.542
	Hoek-Brown m_b parameter	Beta	1.645	0.930	0.041	4.458
	Hoek-Brown s parameter	Gamma	0.031	0.039	0.000	0.170
	UCS (kPa)	Beta	71.000	39.690	2.860	203.000
	Unit Weight (kN/m^3)	Beta	26.442	0.389	26.018	27.724
Hornblende	Hoek-Brown a parameter	Lognormal	0.501	0.001	0.500	0.510
	Hoek-Brown m_b parameter	Beta	4.625	2.094	0.330	11.305
	Hoek-Brown s parameter	Gamma	0.041	0.041	0.000	0.174
	UCS (kPa)	Beta	83.130	38.890	26.000	162.020
	Unit Weight (kN/m^3)	Beta	83.130	37.650	25.557	29.294
Breccia	Hoek-Brown a parameter	Lognormal	0.503	0.003	0.500	0.513
	Hoek-Brown m_b parameter	Lognormal	2.330	1.682	0.255	9.947
	Hoek-Brown s parameter	Lognormal	0.016	0.086	0.000	0.139
	UCS (kPa)	Beta	74.860	50.120	4.220	188.320
	Unit Weight (kN/m^3)	Normal	25.979	0.612	24.959	26.322

16.3.2 Slope Stability Evaluation

Three separate analyses are required for the stability evaluation of each design sector of the open pit including:

- Inter-ramp Analyses
- Bench Face Analyses
- Rockfall Catchment Analyses

The inter-ramp analyzes provide optimized inter-ramp angles (IRA), which 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 infrastructures. The inter-ramp angle can also be defined as the slope angle from bench crest to bench crest. The overall slope angle is defined as the slope angle measured from the crest of the pit to the bottom of the pit, including haul roads, step-outs or other infrastructure.

The bench face analyses provide optimized bench face angles (BFA) and includes backbreak analyses and bench scale limit equilibrium analyses. The rockfall catchment analyses provide the minimum acceptable bench width (BW) for the catchment of rockfall. Figure 16-3 presents an explanation of the IRA, BFA and BW terminology.

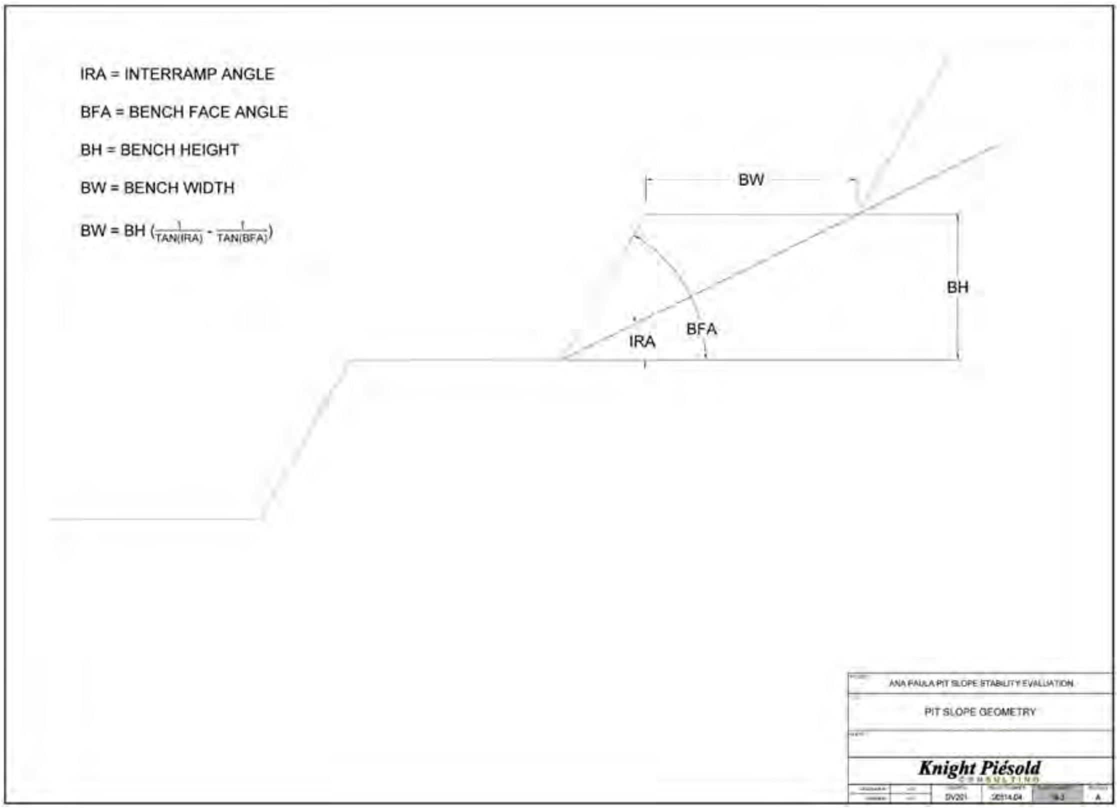


Figure 16-3: Pit Slope Geometry

The inter-ramp and bench scale analyses require the use of two probability based methods. These include the limit equilibrium method and the backbreak method. Both methods are used at the pit slope and bench level for the inter-ramp and bench scale analyses. The Limit Equilibrium method is conducted using the commercially available slope stability evaluation software Slide 6.0 (Rocscience 2013). The backbreak method evaluates the sliding potential of the rock masses along discontinuities such as joints, faults, or joints, at the bench scale using the *Backbreak* software. The recommended slope angles, IRA and BFA, will be the most critical angles defined by the three methods of analysis.

16.3.2.1 Methods of Analysis

<u>Probabilistic Limit Equilibrium Method</u>

Slope stability software *Slide* 6.0 (Rocscience 2011) was used to conduct probabilistic limit equilibrium analyses for the IRA and BFA. *Slide* is a two-dimensional probabilistic (and deterministic) slope stability analysis program that analyzes the stability of a slope by various methods of slices. Spencer's method (of slices) was selected for the limit equilibrium analyses conducted for this evaluation. Spencer's (method of analysis) is considered a rigorous solution to slope stability calculations due to its balancing of both force and moment equilibrium.

Slide allows 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. This method, known as pseudostatic analysis, simulated seismic forces in terms of horizontal acceleration expressed as a coefficient (or percent) of gravity (g). At the Ana Paula Project site, the design earthquake based on a return period of 475 years gives a Peak Ground Acceleration (PGA) of 0.5 g (USGS per GeoPentec 2017). For slopes that can tolerate up to 1 m of earthquake-induced deformation, such as pit slopes, it is common practice to reduce the PGA by a factor of 0.33 to 0.50 according to research conducted by the U.S. Army Corps of Engineers (Hynes-Griffen and Franklin 1984). In recognition of this guidance, Knight Piésold used a horizontal acceleration coefficient which is 50 percent less than the PGA for the area. Pseudostatic analyses for the Ana Paula Pit incorporated a horizontal acceleration coefficient of 0.25g which is reasonably conservative and technically appropriate.

Parameters describing the statistical distributions of each of the rock mass parameters (UCS, m_b, s, and a) for each engineering lithology were directly input into the slope stability modeling software *Slide* along the most critical cross section for each design sector. These parameters define the shape of the statistical distributions and are dependent upon the type of distribution that yielded the best fit. For each of the 10,000 simulations, *Slide* uses the Monte Carlo technique to randomly sample a set of primary and secondary Hoek-Brown parameters for each material type, based on the probability density functions, yielding a normal stress/shear strength envelope for each set of parameters for each engineering lithology. For each of the strength envelopes generated, a search for a critical circular failure surface was conducted by *Slide* to evaluate the ratio of available resisting forces to driving forces (i.e., factor of safety) for each valid trial surface. The critical trial surface (surface with the lowest factor of safety) was established for each set of randomly generated strength parameters. These factors of safety were recorded and as a result of the simulation, the mean factor of safety and the probability of failure of the slope were estimated. The probability of failure of a slope is defined as the number of critical surfaces yielding a safety factor of less than 1.0 divided by the total number of samples that resulted in a valid critical surface. Invalid trial surfaces generally include those that do not intersect the external boundary within the defined slope limits.

Probabilistic *Backbreak* Method

Failure mechanisms controlled by geologic structures are generally simplified into plane shear failure and wedge failure geometries. In either case, geologic structure controlled failure is only possible if the spatial occurrence of discontinuities results in a potential failure mass, and if the mass is unconstrained at the slope face. Once it had been established that a viable potential failure mass exists, as was the case for Design Sectors B, C, and D2, the likelihood of geologic structure controlled failure was assessed. This was achieved within the *Backbreak* program by evaluating if the maximum shearing resistance which can develop along the potential failure surface or surfaces is greater than the driving forces tending to destabilize the rock mass. The likelihood that shearing resistance could be exceeded was calculated by a Monte Carlo sampling of the distributions of friction angle, fracture spacing, fracture length, dip and dip direction for each of the plane shear and wedge geometries sampled.

Backbreak is a probabilistic slope stability routine used to optimize IRA and BFA with respect to structurally controlled failure mechanisms. *Backbreak* evaluates the likelihood that planar and/or wedge discontinuities will daylight into the pit, coupled with the probability that the shear strength of daylighted discontinuities will be exceeded. The slope stability analysis was conducted with the *Backbreak* routine using the Monte Carlo sampling simulation applications of *Crystal Ball*. Inputs into the *Backbreak* program include the probability density functions of the friction angle, dip and dip direction of the geologic structures, discontinuity spacing (the inverse of fracture frequency), discontinuity length, as well as pit slope orientation. Statistical distributions describing these probabilistic parameters were developed from corehole data (with the exception of fracture length) using the *Crystal Ball* software for each geologic structure and design sector. Fracture length was characterized by analyzing exponential distributions with mean structure lengths of 5 m, 10 m, 25 m, and 50 m.

Using Monte Carlo sampling from the probability density functions of each probabilistic backbreak parameter, 10,000 trial bench geometries were mathematically simulated for each of the six sectors analyzed. The distribution of the most likely plane shear bench face angle from each simulation was then calculated for each design sector. Similarly, bench face simulations were conducted for potential wedge failure geometries.

Composited plane shear and wedge failure backbreak distributions were calculated for 6 m, 12 m, and 18 m bench heights by assuming representative probabilities of 20 percent, 50 percent, 25 percent, and 5 percent, for 5 m, 10 m, 25 m, and 50 m mean lengths, respectively. These composited results were used to produce distributions of effective bench face angles for plane shear and wedge failure modes for each design sector with viable failure orientations. These include Design Sectors B, C, and D2.

Slope Stability Analyses

Slope stability analyses conducted for the Ana Paula Pit Slope Evaluation are comprised of three distinct analyses, the inter-ramp analysis, the bench face analysis, and the rockfall catchment analysis as previously discussed. The inter-ramp and bench face analyses were conducted for each sector using both the limit equilibrium method and the backbreak method. For each design sector the controlling method corresponds to the method that yielded the lowest slope angle. Recommendations developed by Knight Piésold based on the results of the slope stability analyses are presented in Section 16.3.2.

The results of the slope stability analyses are presented as a probability or likelihood of instability rather than a single, deterministic factor of safety. Based on Knight Piésold's experience, slope angles that yield a probability of failure of about 30 percent for slopes with low consequence of failure and about 10 percent for slopes with high failure consequences are suitable for an open pit mining application. Slopes that have a high consequence of instability are those that are critical to mine operations such as slopes containing major haul roads, access points, or infrastructure. Knight Piésold has provided 10% probability of failure recommendations for each design sector so that the slope recommendations will be applicable to sectors with haul roads and infrastructure.

Inter-ramp Analyses

Inter-ramp analyses were conducted using both the limit equilibrium and the backbreak methods. The limit equilibrium method was used for the Ana Paula Pit slopes to evaluate the entire pit slope height in terms of mean factors of safety and probabilities of failure. These analyses were completed for all design sectors of the proposed Ana Paula Pit. The backbreak method was used for each design sector that contained a viable failure mass using the two geologic structure sets identified to evaluate the entire pit slope height in terms of mean factors of safety and probabilities of failure. Plane shear evaluation was conducted for Design Sectors B and D2. Wedge failure evaluation was conducted for Design Sector C. Contrary to the results of the limit equilibrium method used for inter-ramp analyses, the results of the backbreak method depends on the bench height.

Bench Face Analyses

Bench face analyses were conducted using both the limit equilibrium method and the backbreak method. These analyses were conducted to evaluate the expected performance of bench faces, which are by design steeper than inter-ramp slopes. The limit equilibrium method was used to evaluate the stability of 6 m, 12 m, and 18 m bench heights in terms of mean factors of safety and probabilities of failure. These analyses were completed for all design sectors of the proposed Ana Paula Pit. The backbreak method was used for each design sector that contained a viable failure geometry using the three geologic structure sets identified for this evaluation. Plane shear backbreak analyses were conducted for Design Sectors B and D2. Wedge failure evaluation was conducted for Design Sector C.

Rockfall Catchment Analyses

Once inter-ramp and bench face analyses were completed, Knight Piésold used two analytical methods to evaluate rockfall catchment potential for the design bench width. These analytical methods are the Modified Ritchie method (Call and Savely 1990) and MROKS. The MROKS method was developed by Paul Visca. The MROKS method is a mathematical combination of the Modified Ritchie (Call and Savely 1990) method and the Oregon Department of Transportation (Pierson et. al. for ODOT& FHA 2001) criteria. Knight Piésold used the Modified Ritchie method for the Ana Paula Pit bench width evaluation because the results were slightly less conservative compared to the results of MROKS, and the 6 m benches were under the minimum valid height criteria of MROKS. Rockfall catchment analysis indicated a minimum 8.1 m bench width for the recommended 18 m bench heights.

16.4 GEOLOGIC MODEL IMPORTATION

AGP developed the resource models using Gemcom software. This was converted to MineSight for use in the mine planning. The resources dated December 30, 2020 form the basis for the work completed in this technical report and are shown in Table 16-6 below. Further detail on the resource development is discussed in Section 14 of this technical report.

Table 16-6: Ana Paula Resource Statement – Effective December 30, 2020

Area	Category	Cut-off (Au g/t)	Tonnes	Au (g/t)	Gold (ounces)	Ag (g/t)	Silver (ounces)
Resource Amenable to Open Pit Extraction	Measured	0.6	9,095,000	2.39	698,000	5.6	1,629,000
	Indicated		9,810,000	1.79	563,000	5.3	1,677,000
	Measured & Indicated		**18,905,000**	**2.07**	**1,261,000**	**5.4**	**3,306,000**
	Inferred*		63,000	0.86	2,000	10.5	21,000
Resource Amenable to Underground Extraction	Measured	1.60	85,000	2.15	5,800	2.8	8,000
	Indicated		2,212,000	2.84	202,000	4.0	286,000
	Measured & Indicated		**2,297,000**	**2.81**	**207,800**	**4.0**	**294,000**
	Inferred*		322,000	2.09	21,700	4.2	43,000
Total Resource	Measured	OP 0.6 and UG 1.60	9,180,000	2.38	703,800	5.5	1,637,000
	Indicated		12,022,000	1.98	765,000	5.1	1,963,000
	Measured & Indicated		**21,202,000**	**2.16**	**1,468,800**	**5.3**	**3,600,000**
	Inferred*		385,000	1.89	23,700	5.2	64,000

Notes: Open Pit Mineral Resource is inclusive of Mineral Reserves and has an effective date of December 30, 2020. The Mineral Resource is stated at $1,400/oz gold using a gold cut-off of 0.60 g/t gold for Open Pit and 1.60 for Underground. The quantity and grade of Inferred resource reported above are conceptual in nature and are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. For these reasons, an Inferred Mineral Resource has a lower level of confidence than an Indicated Mineral Resource and it is reasonably expected that the majority of Inferred Mineral Resource could be upgraded to Indicated Mineral Resource with continued exploration. Mineral Resource that is not Mineral Reserves does not have demonstrated economic viability. Rounding of tonnes as required by reporting guidelines may result in apparent differences between tonnes, grade, and contained metal content. The Mineral Resource Estimate was compiled using three pass ordinary kriging. Grade capping was applied differently by domain, ranging from 25 g/t to 55 g/t gold inside the breccia structure and HALO and between 7 and 10 g/t gold outside the mineralized HALO. Assay intervals were composited on 3-meter intervals to build a resource model based on 5m x 5m x 6m blocks. A search restriction was also applied to limit the influence of high-grade intercepts. Classification of the resource into Measured, Indicated and Inferred was determined based on pass number, distance to the closest composite and Kriging efficiency.

The 2020 Mineral Resource model is a whole block model. The block model contains the topography, rock type, density, gold and silver grades and classification. The mining model created by AGP in MineSight uses the same model dimensions as the original resource model with added items used for mine planning purposes. MineSight was used for the mining portion of the Project to take advantage of the included Lerchs-Grossman routine for economic pit shell development. The boundaries for the models are the same as the geology resource model.

The grade in each block is a fully diluted grade. This means that the block has one gold grade for the entire tonnage of the block. No ore percentages are considered in the block model provided. All the block model items remain the same as in the geologic model.

Only Measured and Indicated Resources were used for the Study. All Inferred Resources were considered as waste.

16.5 OPEN PIT MINING

16.5.1 Economic Pit Shell Development

To determine the potential size of the open pit, various input parameters were required including estimates of the expected mining, processing, and G&A costs. As well, metallurgical recoveries, pit slopes and reasonable long term metal price assumptions. The parameters defined and outlined in Table 16-7 were estimated using the current available information. No capital costs were considered at the time of this technical report for the pit shells. Optimizations were run using measured and indicated mineral resources only.

Table 16-7: Pit Optimization Parameters

Parameter	Unit	Gold	Silver
Metal Prices	US$/oz	$1,200.00	$16.00
Payables	%	99%	99%
Transportation, Refining	US$/oz	$20.00	$0.25
Royalty	%	2.5%	2.5%
Net Value for Pit Shell	US$/oz	$1,138.80	$15.59
	US$/gram	$36.61	$0.49
Metallurgical Recovery	%	88%	30%
Processing Cost	US$/t	$19.00	$19.00
G&A Costs	US$/t	$2.49	$2.49
Mining Cost	US$/t mined	$2.38	$2.38
Pit Slopes		**Inter-ramp**	**Overall**
Sector A	Degrees	56	50
Sector B	Degrees	58	49.4
Sector C	Degrees	58	48.7
Sector D	Degrees	58	49.3
Sector E	Degrees	58	49.9
Sector F	Degrees	58	51.3

The metallurgical recoveries were updated after the pit design by the technical team. The gold recovery was reduced to 85% to be somewhat conservative while the silver recovery was increased to 55%. The $1,200 pit shell was run for comparison and it was noted that the reduced gold recovery resulted in 0.7% drop in ore tonnage and a 0.3% drop in contained gold. The contained silver increased by 1%. This was deemed to be not material, and the final pit design was not modified from what is shown in this technical report.

The royalty was based on a 2% NSR royalty to Triple Flag and a 0.5% NSR royalty charged by the Mexican government to mining operators.

The process and G&A costs were provided by Heliostar for use in the study based on work by the other members of the technical team.

The mining costs were based on a blended rate of contract mining costs received for this technical report based on a previous internal design. The costs considered the current dump configuration complete with access road development.

The overall angles by wall slope sector used the provided inter-ramp angles with consideration for haulroads. All the sectors included a minimum of 2 full width ramps of 23.5 m double lane width. Five of the six sectors also included the width of 1 single lane ramp width of 17.8 meters.

Series of nested shells were generated using a revenue factor(rf). These were varied between a gold price of US$252 (rf=0.21) and US$1,200 (rf=1.0) to examine the deposit sensitivity to gold prices and outline the higher value areas. Pit shells were generated at 0.02 rf increments or roughly US$25 increments.

The waste, mill feed and net revenue were plotted to determine reasonable pit shapes and potential phasing. This graph is shown in Figure 16-4.

The graph illustrates the various break points in the pit shells. The first point picked and shown as Ph1, this represents the US$277/oz gold shell (Pit 12). It provides 4.1 million tonnes of mill feed, or approximately three years of mining with a strip ratio of 1.48:1 (W:O). The net profit at that point is US$263 million.

The second point selected is for Phase 2 and uses a US$402/oz gold shell price (Pit 17). This provided a cumulative mill feed tonnage of 9.7 million tonnes at total strip ratio to that point 2.21:1 (W:O). Cumulative net profit to that point is US$571 million.

The final phase uses the US$976/oz gold shell price (Pit 40). Total cumulative mill feed is 15.0 million tonnes with an overall strip ratio of 2.82:1 (W:O). Cumulative net profit is US$691 million. Beyond this point, an additional US$4.2 million in net profit is possible but only increases the mill feed by 1.2 million tonnes.

As shown, the majority of the pit value (82%) is obtained within the first two phases. Due to increasing strip ratios, beyond the final phase, limited value is generated.

These three shells were used for detailed pit design development.

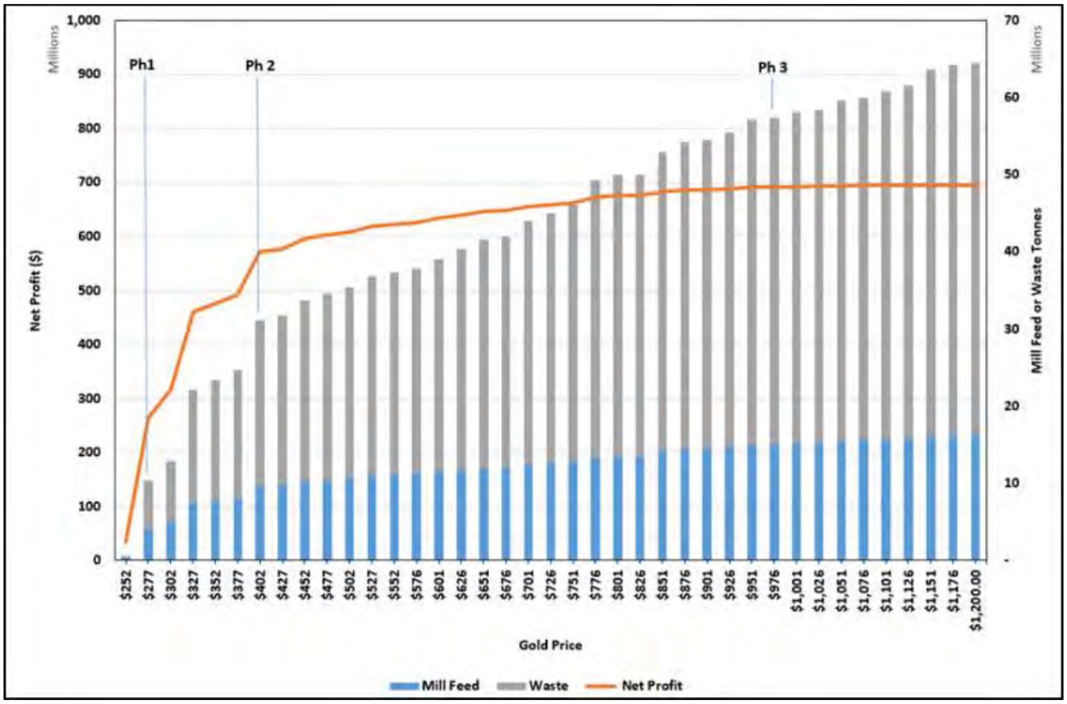


Figure 16-4: Economic Pit Shells

16.5.2 Dilution Calculation

The geologic model was a whole block, fully diluted grade model. This means that the grade from the wireframes was diluted over the full volume of the block to arrive at a diluted block grade. AGP also believes that contact dilution would play a role in the material sent to the mill. To determine the amount of dilution and the grade of the dilution the size of the block in the model was examined. The block model is 5 m along strike (X axis), 5 m thick (Y axis) and 6 m high (Z axis).

The pit optimization process calculates two block model values: value per block (VLB) and value per tonne (VLT).

VLB is used in the Lerch-Grossman pit optimization routine to determine the economic shell that corresponds to the given pit optimization parameters or is comparable to what is referred to as the mining cut-off. This is the value contained within each block and includes the mining cost as part of the overall calculation.

The VLT calculation does not include the mining cost and represents the “milling cut-off”, where the material is within the mining cut-off pit shell and needs to be moved but will still turn a profit to the mill if this value is above zero. AGP uses the VLT calculation to determine the ore cut-off for the mill. If the VLT is greater than US$0.01/t, then it is sent to the mill ultimately. The exact item used in the calculations was titled VLT1, which resulted from the final pit optimization run using the US$1,200 gold price. This VLT1 value is equivalent to the milling cut-off and that value is stored within each block. This cut-off was also used to define ore and waste blocks for the dilution calculation. If VLT1 is greater than US$0.01/t, then the block was deemed ore as it would make a profit. The VLT was only calculated on blocks with classification of Measured or Indicated. Inferred material was considered as waste and no value assigned other than a negative waste movement cost.

The percentage of dilution is calculated for each contact side using an assumed 0.5 m contact dilution distance. If one side of the block is touching waste, then it is estimated that dilution of 9.1% would result. If two sides are contacting, it would rise to 16.7%. Three sides would be 23.1%, and four sides 28.6%. Four sides represent an isolated block of ore.

Because the geologic model was a whole block already, the percentage of dilution could be estimated and then included in a block ore percentage item. The mining model was modified to include an ore percent item, and any blocks with a VLT greater than US$0.01/t were assigned an ore percent of 100% or it was deemed entirely ore.

MineSight has a routine that enables the user to query surrounding blocks against a set of conditions. For the dilution percentage calculation, the procedure was run to determine how many ore blocks contacted a waste block, which determined the dilution percentage to apply. This was stored in the waste block and the waste block grade used as the diluting value. If a waste block was surrounded by other waste blocks, the dilution percentage was zero.

In this manner, the contact blocks could be included in the tonnage and grade calculation of ore tonnes. The ore tonnage was then run with the block model Ore% item (Dore%) to report out the proper tonnes and grade.

Comparing the in situ to the diluted value for the design pit optimization shell showed a mill feed tonnage dilution of 4.5%, a gold grade dilution of 3.9% and a silver grade dilution of 2.0%. The grade dilutions are lower as a result of the waste blocks containing some mineralization. Tonnes and grade for the pit designs and reserves are reported with the diluted tonnes and grade.

16.5.3 Pit Design and Phase Development

Pit phase designs were developed for Ana Paula using the three pit optimization shells selected earlier (Pits 12, 17, 40). Geotechnical parameters described earlier in Section 16 were used in the detailed design.

In sector D, Knight Piésold highlighted a concern with a particular joint set. This required a square corner in this area rather than a rounded corner to prevent this joint set from daylighting. This was incorporated into the design as well. All sectors used an 80-degree bench face angle and an 8.1-meter berm spaced every 18 meters to provide an inter-ramp angle of 58 degrees. No other geotechnical berms were recommended or included in the design.

Equipment sizing for ramps and working benches is based on the use of 63 t rigid frame trucks. The sizing of the ramp is actually sized for the smaller capacity 56 t rigid frame units, as they are slightly wider than the 63 t rigid frame versions. The operating width used for the truck is 5.7 m. This means that single lane access is 17.8 m (2x operating width plus berm and ditch) and double lane widths are 23.5 m (3x operating width plus berm and ditch). Ramp gradients are 10% in the pit for uphill gradients and 8% downhill on the dump access roads. Working benches were designed for 35 to 40 m minimum on pushbacks.

Ana Paula is designed with three phases. The first phase is a starter phase designed to provide early higher-grade material for the plant and minimize strip ratio. The second phase expands on the first targeting the larger portion of the ore body. The final phase requires a significant push back from the upper elevations due to local topography. The final design phase tonnages and grades are shown in Table 16-8.

Table 16-8: Final Design – Phase Tonnages and Diluted Grades

Phase	Mill Feed (Mt)	Au (g/t)	Ag (g/t)	Waste (Mt)	Total Material (Mt)	Strip Ratio (W:O)
1	4.41	2.33	7.34	7.70	12.11	1.75
2	3.30	2.87	5.96	8.47	11.76	2.57
3	6.41	2.16	4.25	26.80	33.22	4.18
Total	**14.12**	**2.38**	**5.61**	**42.97**	**57.10**	**3.04**

The cut-off used was the VLT1 value stored in the block model. This varies due to the block location and contained grades but is approximately equal to a gold only cut-off of 0.67 g/t.

Mine access roads from the plant are critical to the design. One road extends to the north and climbs to the top of the Project for access to Phases 2 and 3. This road also acts as a diversion for surface runoff and minimizes contact with mining activity. The water is discharged near the primary crusher.

The second major road goes from the primary crusher downwards to the valley bottom and provides the long-term ore haulroad. From the valley bottom, the road winds up the topography to the top of Phase 1. This provides access for the mining of that phase plus longer-term access for the phases to the waste storage area to the south in the valley.

Phase 1 reaches a depth of 830 masl. It establishes the longer term access road along the northeast side and prepares the northern side of the pit for Phase 2 and 3 access roads.

Phase 2 expands the pit to the west and deepens the pit to the depth of 788 masl. The ore haulage switches to the north side of the pit. This access will be used by Phase 3 later in the mine life. The square corner on the east side is maintained to ensure issues with a particular joint set will not arise.

Phase 3 advances even further to the west to start the pit. Final pit depth is 728 masl.

The phase designs are shown in detail in Figure 16-5 to Figure 16-7.

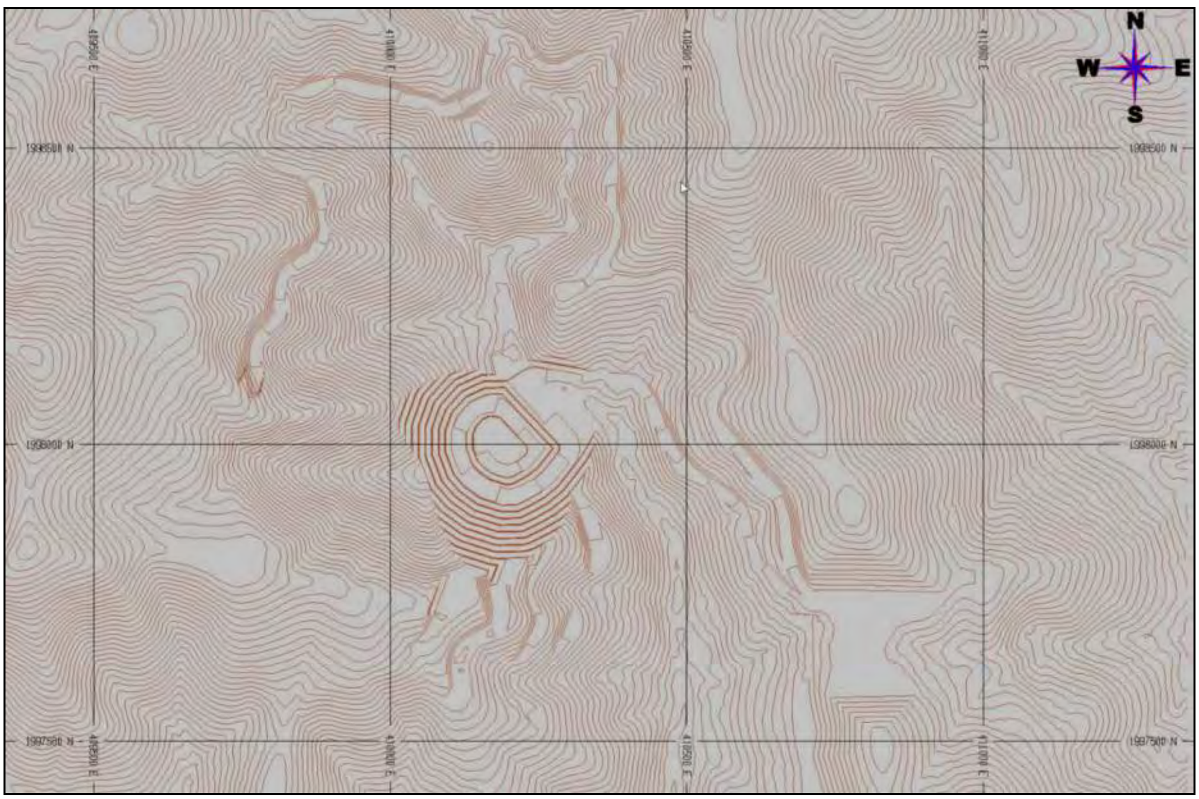


Figure 16-5: Phase 1 Design

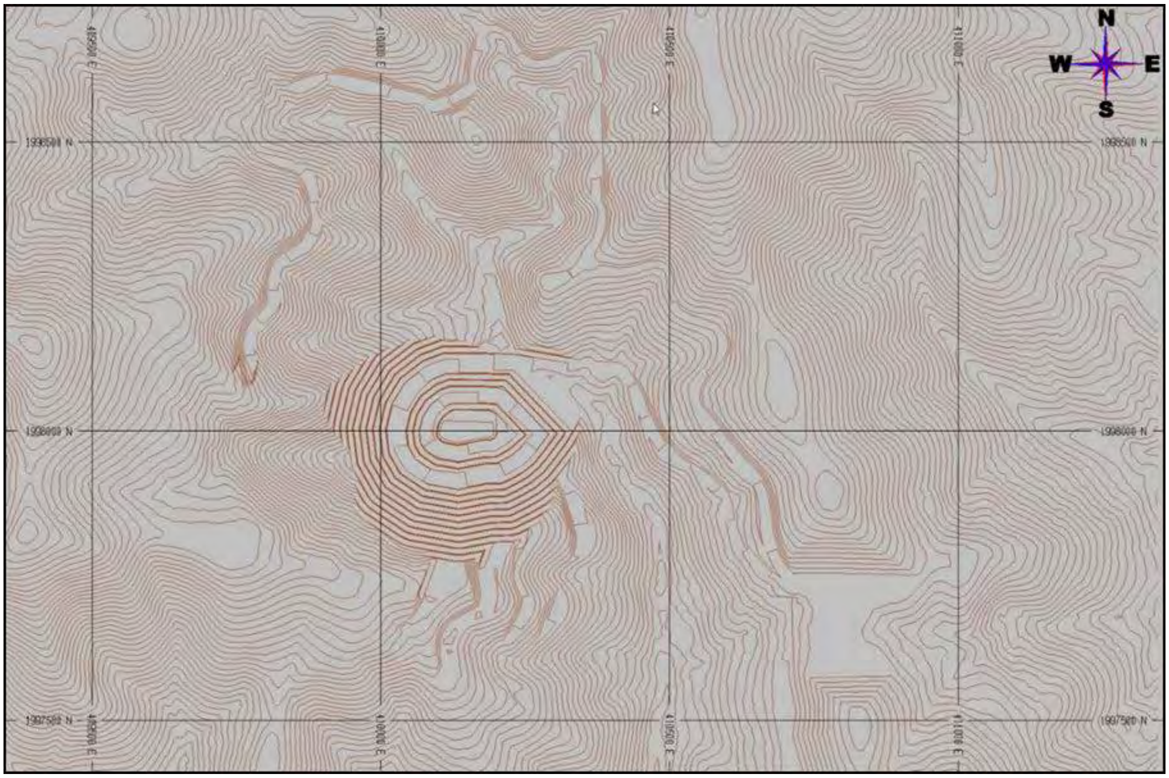


Figure 16-6: Phase 2 Design

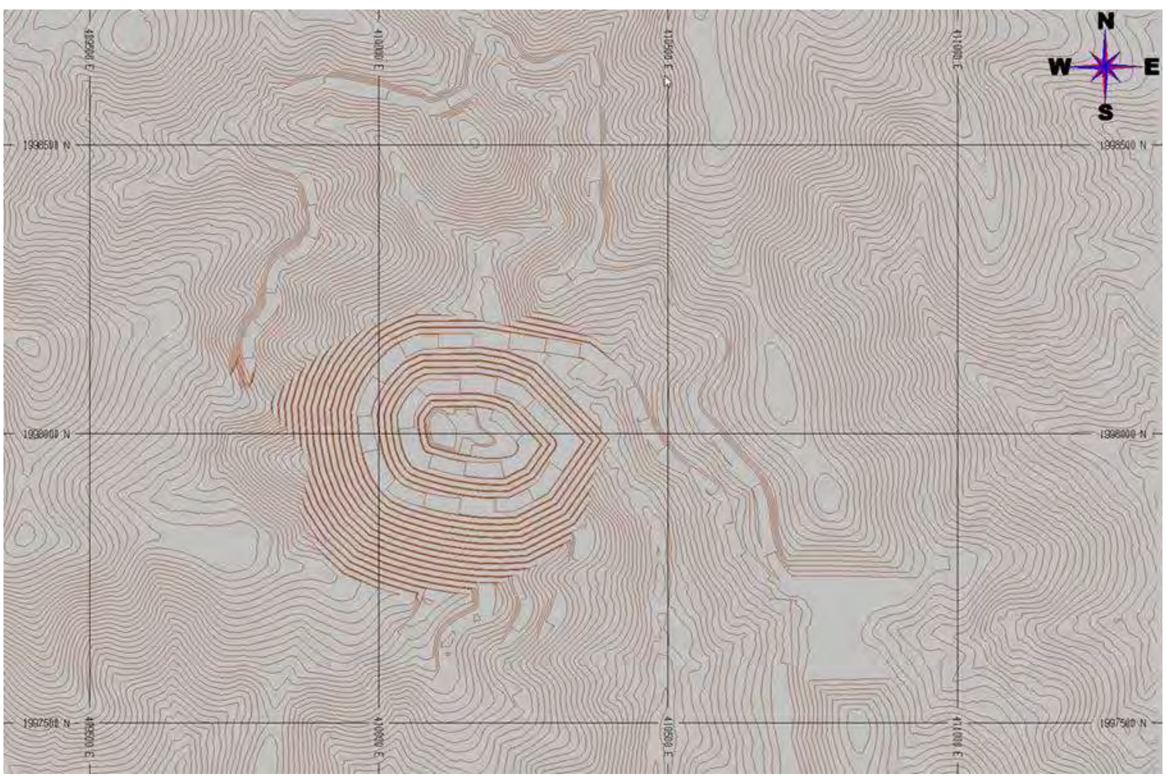


Figure 16-7: Phase 3 Design

16.5.4 Mine Production Schedule

The mining production schedule was developed based on a maximum mill capacity of approximately 5000 t/d. The Ana Paula Project life is 10 years, including two years of pre-stripping followed by 8-years of operations. The throughput rate is assumed to have a three-month ramp in Year 1 then full capacity afterwards. Table 16-9 outlines the pre-strip and mine production schedule by year.

Table 16-9: Pre-strip and Mine Production Schedule by Year

Year	Mill Feed (Mt)	Au (g/t)	Ag (g/t)	Waste (Mt)	Mine to Mill (Mt)	Mine to Stock (Mt)	Stock To Mill (Mt)	Total Material (Mt)	Strip Ratio (W:O)
Prestrip (Waste is Capitalized)									
-2	-	-	-	2.13	-	0.16	-	2.29	-
-1	-	-	-	4.83	-	0.34	-	5.17	-
Total				6.96		0.50		7.46	
Mine Operations									
1	1.70	2.15	7.98	7.12	1.22	0.56	0.47	9.37	3.99
2	1.80	1.96	6.19	7.06	1.80	0.15	-	9.00	3.62
3	1.80	2.60	7.28	7.24	1.66	0.07	0.14	9.12	4.19
4	1.80	2.20	5.26	7.26	1.77	-	0.03	9.06	4.09
5	1.80	3.15	5.50	4.53	1.80	0.09	-	6.42	2.39
6	1.80	2.05	3.47	2.14	1.80	0.12	-	4.07	1.11
7	1.80	3.17	3.88	0.53	1.80	0.05	-	2.37	0.29
8	1.63	1.68	5.41	0.13	0.72	-	0.90	1.76	0.18
Total	**14.12**	**2.38**	**5.61**	**36.01**	**12.58**	**1.03**	**1.54**	**49.63**	**2.55**
Overall Totals (Prestrip and Operations)									
Total	**14.12**	**2.38**	**5.61**	**42.97**	**12.25**	**1.54**	**1.54**	**57.10**	**3.04**

During the mine scheduling exercise, the goal was to mine the highest-grade material first, while deferring the pre-stripping requirements until later. This would allow for early payback and to help improve the economics of this deposit. Only 6.96 Mt of waste will be required to be moved during pre-striping.

Approximately 1.54 million tonnes of rehandled material will be required during the mine life from stockpiles. This will be required to manage the mill throughput and to ensure the plant capacity is achieved in the final years as the pit becomes smaller. The first stockpile will be located on top of a waste area below the primary crusher and the second on a pad near the primary crusher. The material on the lower stockpile will be rehandled in Year 1 to make room for additional waste storage.

Mining in Year -2 is primarily the development of the stockpile pad by the primary crusher, establishment of the various roads and development of the lower waste dump at the 880 level. Phase 1 is initiated and a small amount of Phase 2 is started.

Year -1 brings further development of Phase 1 and Phase 2, extension of the 880 level of the waste dump in the valley and development of the upper west dump at the 955 level. A small stockpile is placed on the 880 level for temporary storage of ore prior to plant commissioning.

Year 1 has Phase 3 under development, plus continued development of Phases 1 and 2. An access road is prepared with waste material to allow the tailings dam to be built with mine waste in the future. The upper 1050 dump platform is expanded, the lower 955 dump platform is expanded, and the valley dump is also extended.

Year 2, Phases 1 and 2 are developed together at the same level and Phase 3 is further advanced. A new dump platform is established at the 970 level placing material over the 890 level. The 890 level is the previous 880 level with a 10 meter lift applied.

Year 3 Phase 1 is advanced slightly over Phase 2 to provide additional high grade feed material. A new platform, 940 is created over the 890 level in addition to a dump access road. The road shortens the ore haul for Phase 3 material to the plant.

Year 4, Phase 1 is complete, Phase 2 is advancing deeper and providing the bulk of the mill feed. Phase 3 has linked access ramps with Phase 2 and is widening the pit. Waste haul from the pit uses the same access to the plant as the ore haul but then ties into the waste bridge to expand the dump platform 950.

In Year 5, waste material from the pit is hauled up to the 970 level to avoid encroaching on the mill site and further expansion of the 950 level alongside the plant. Phase 2 is almost complete, and Phase 3 is the primary mill feed source.

Years 6, 7 and 8 are Phase 3 only with waste going onto the 950 level and adding additional lifts. The toe of the dump alongside the plant maintains a channel to avoid rock impacting the plant site.

16.5.5 End of Period Plans

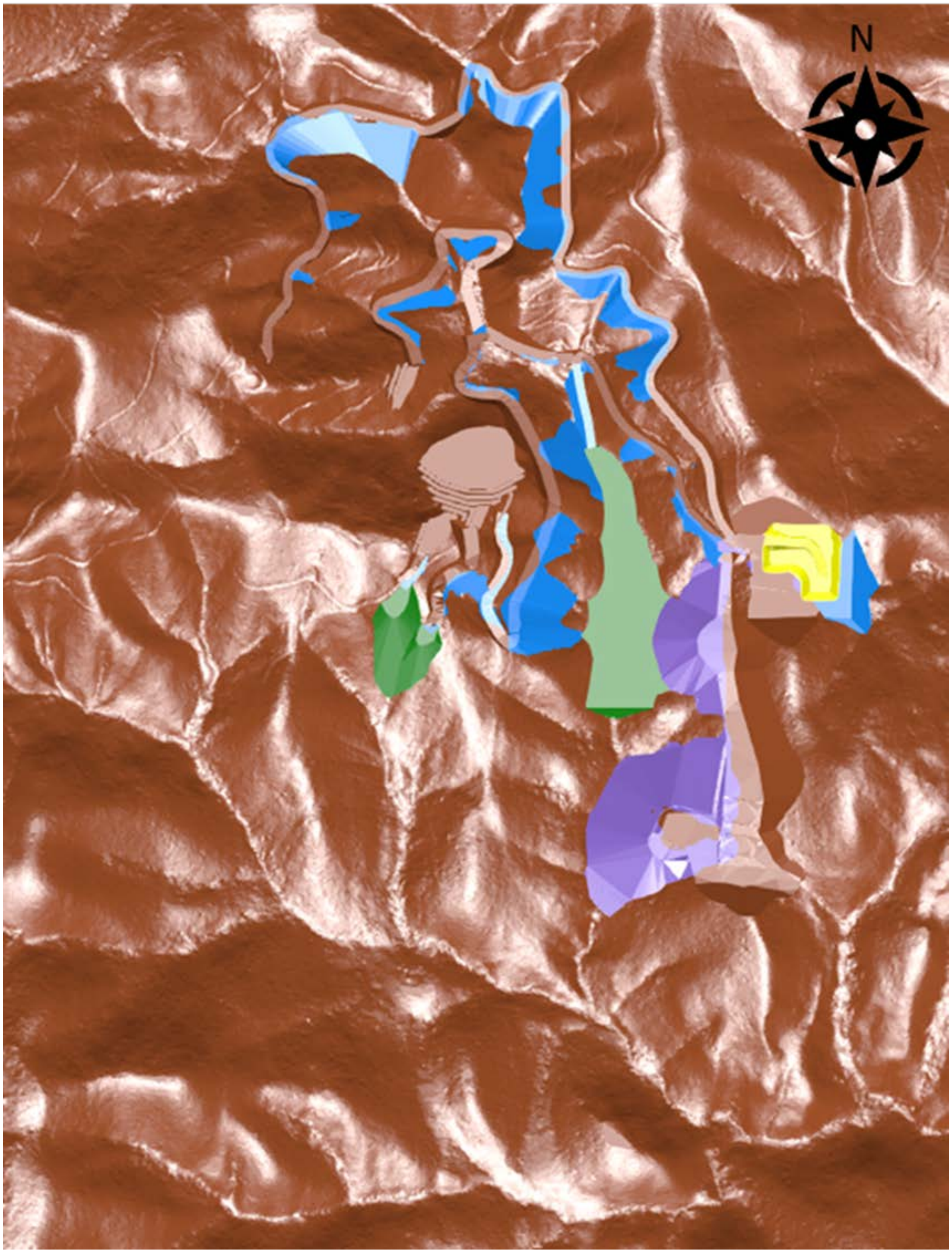


Figure 16-8: End of Year -2

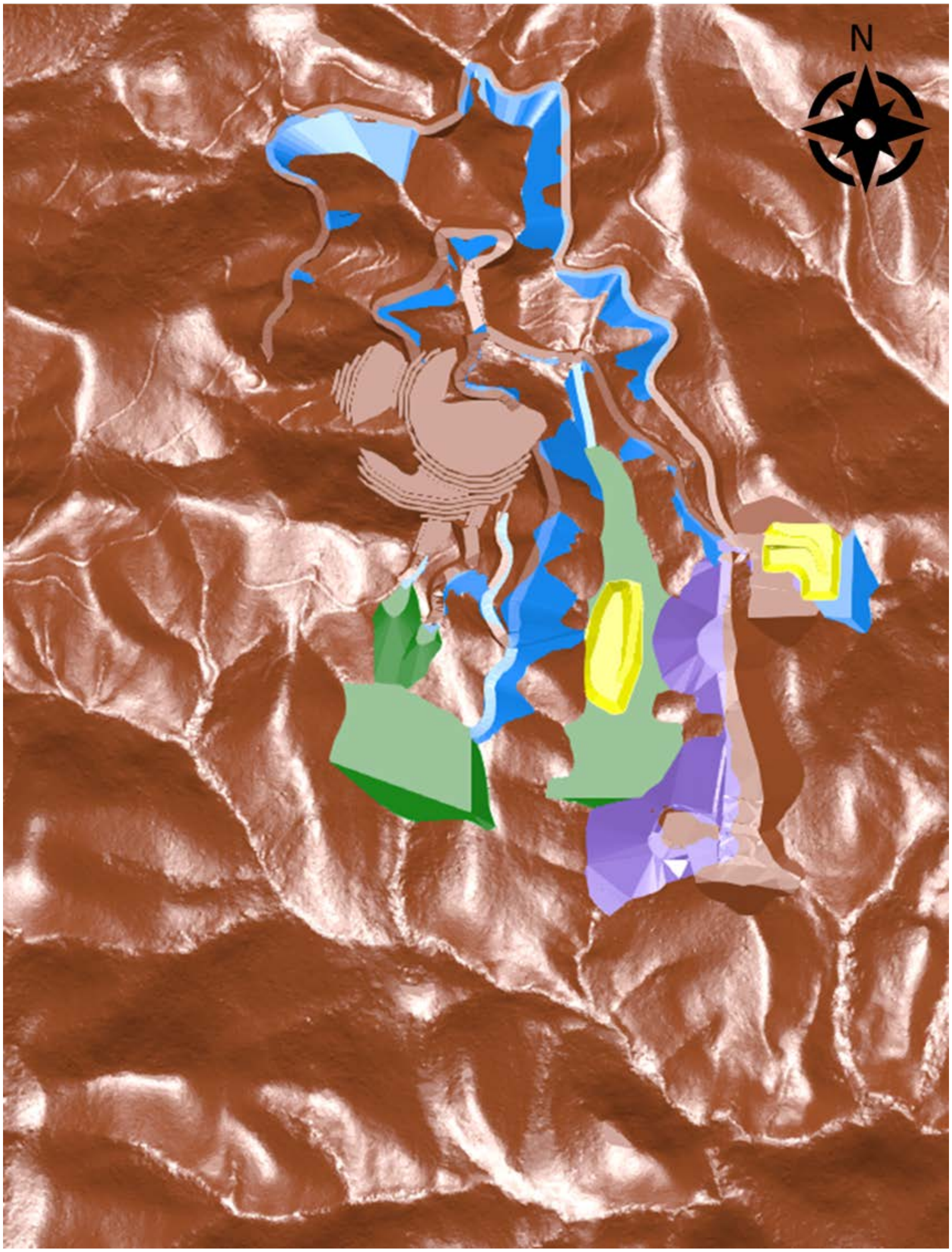


Figure 16-9: End of Year -1

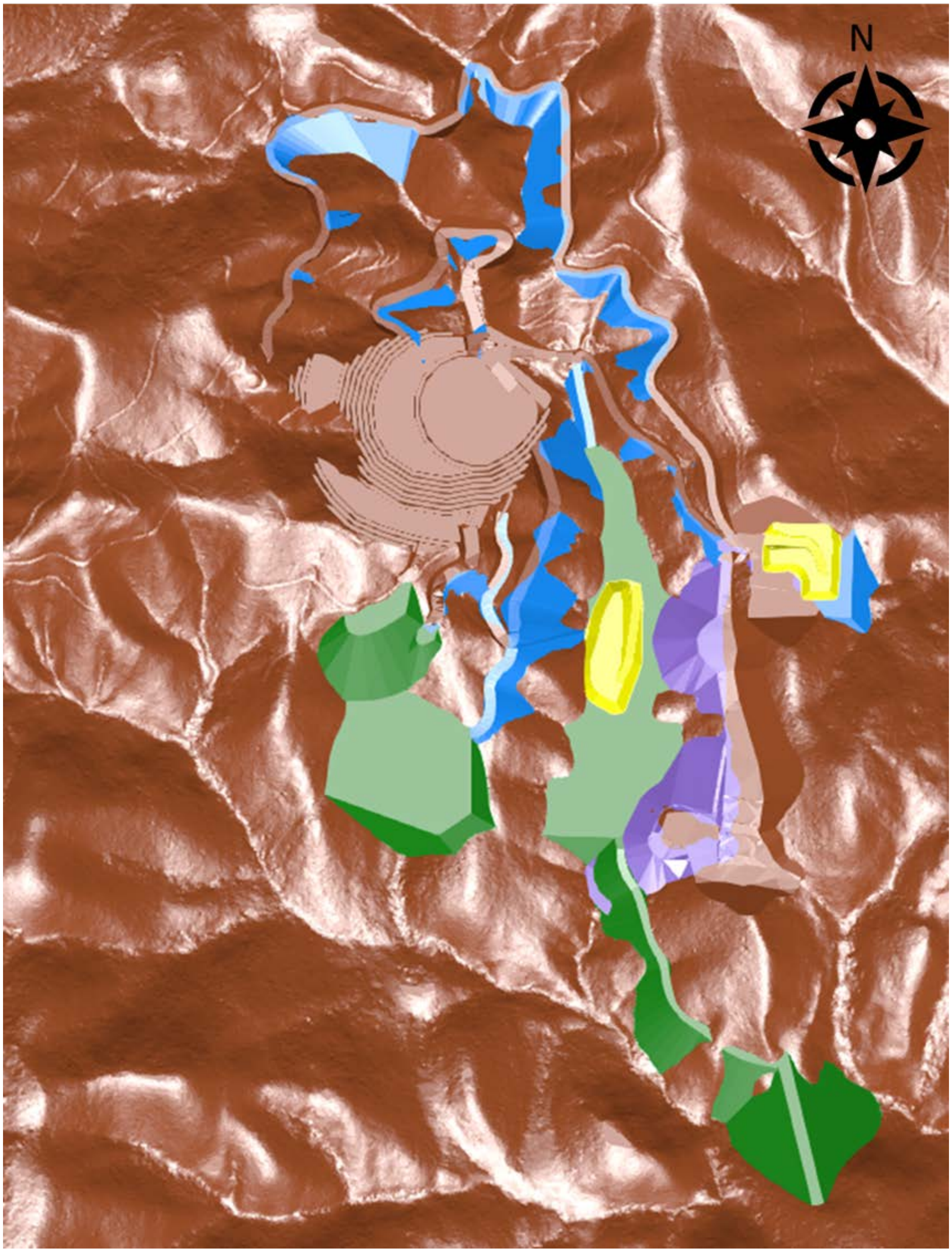


Figure 16-10: Year 1

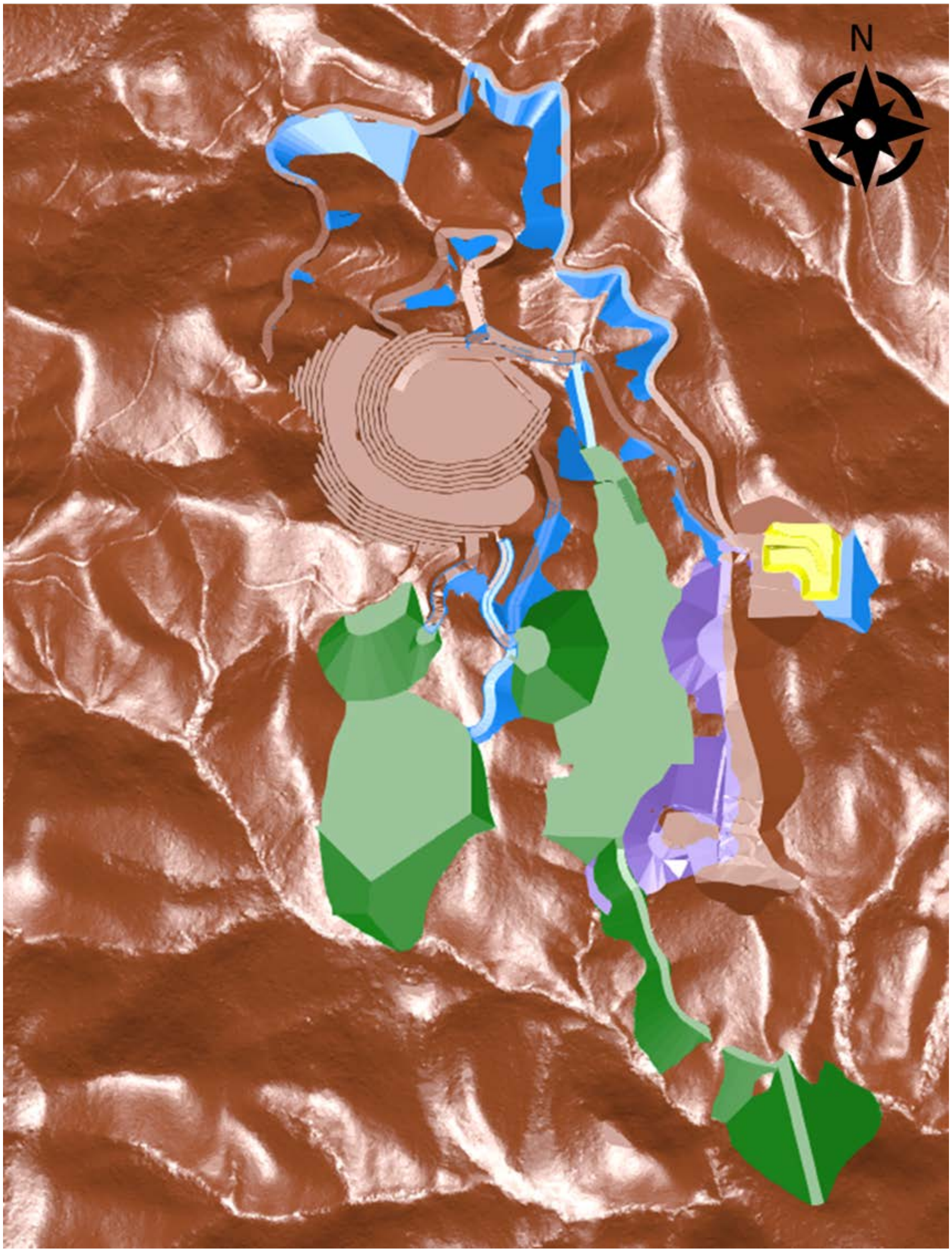


Figure 16-11: Year 2

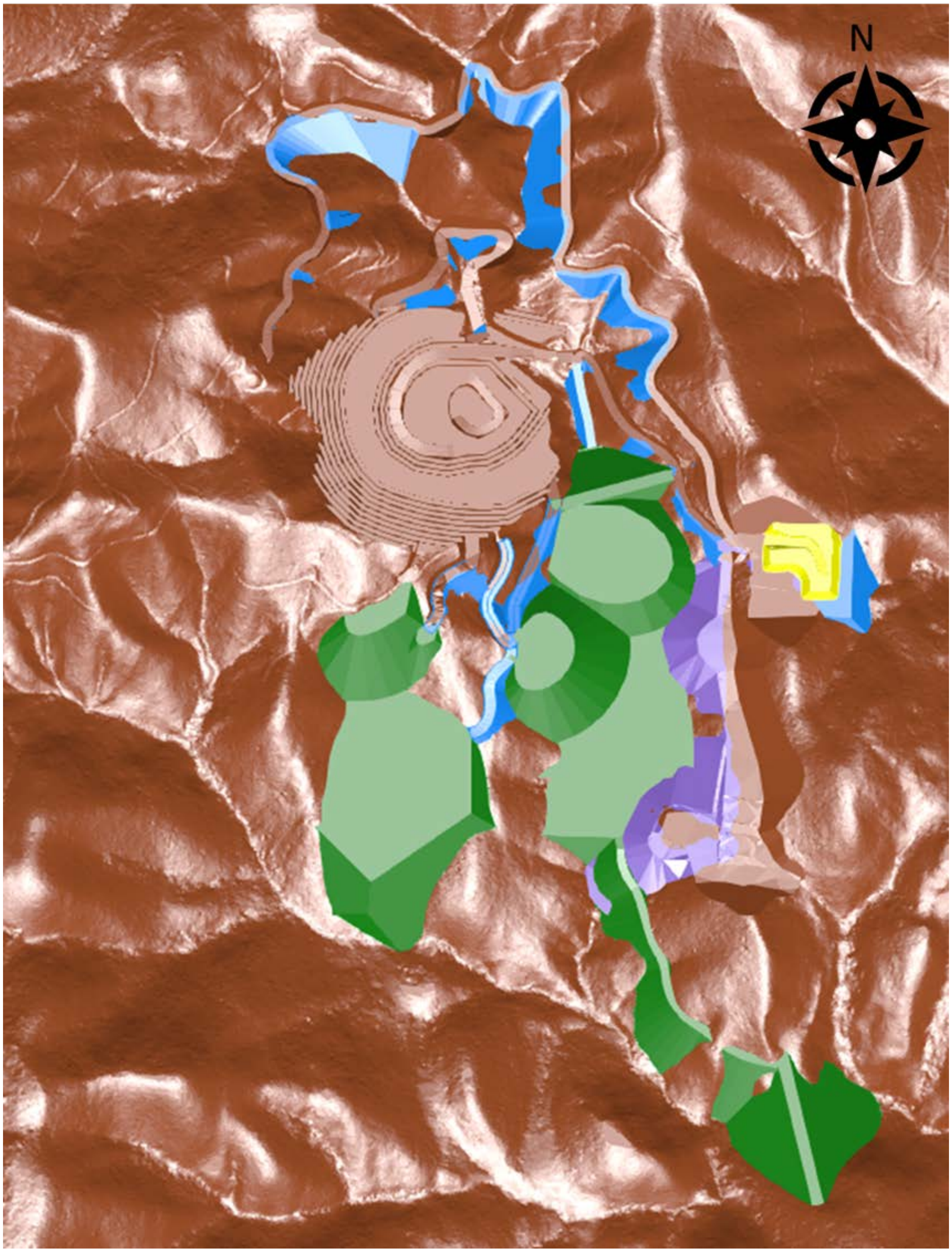


Figure 16-12: Year 3

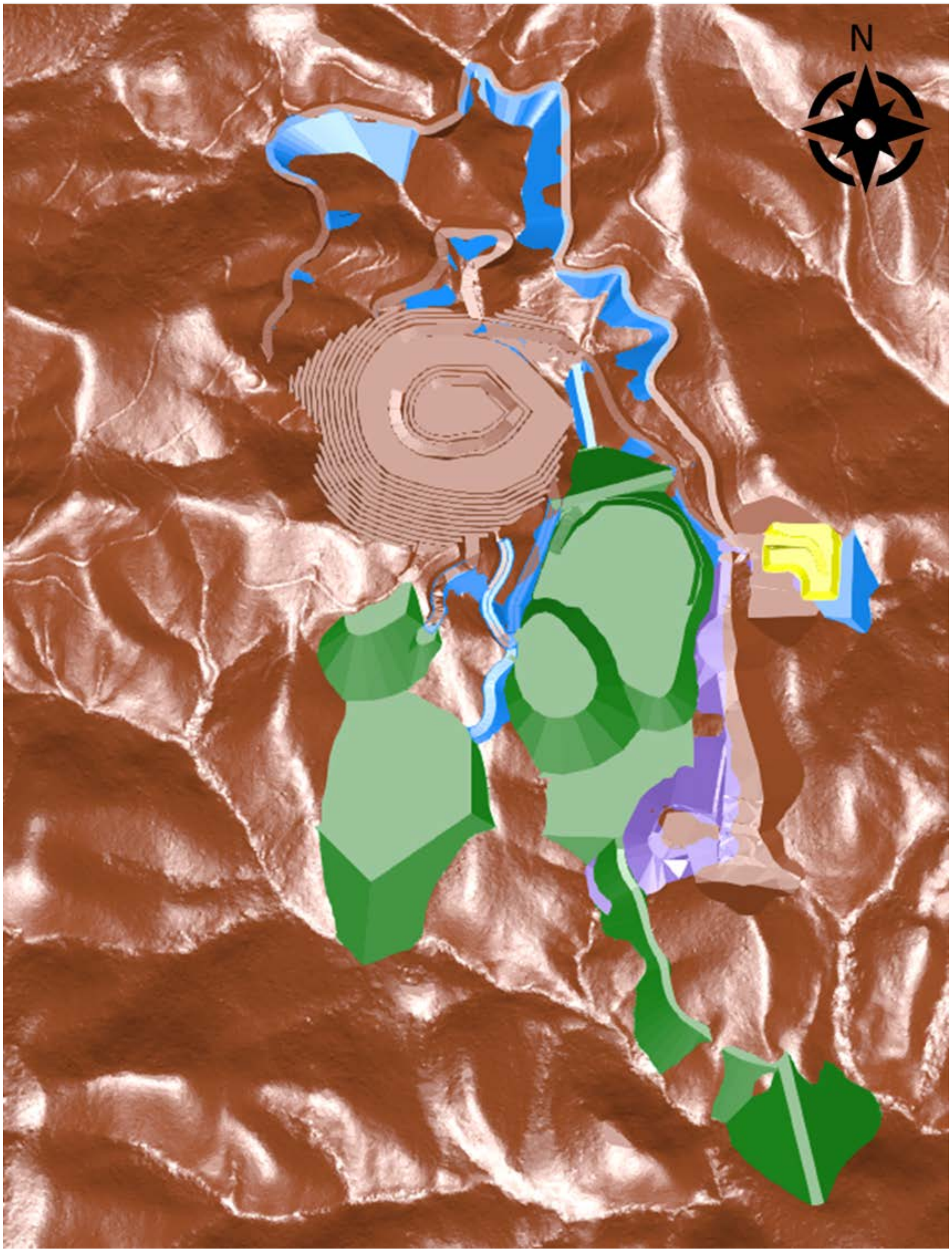


Figure 16-13: Year 4

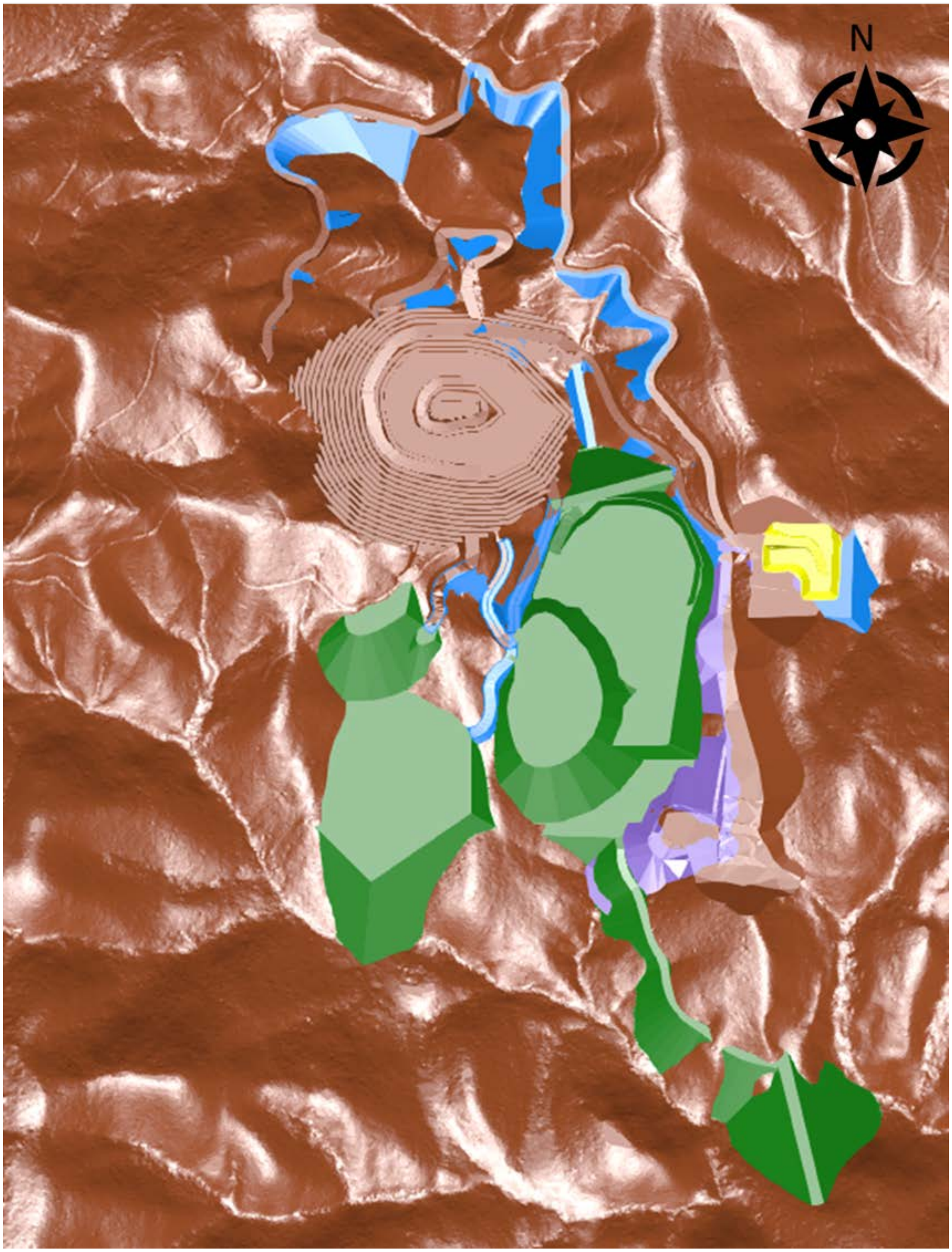


Figure 16-14: Year 5

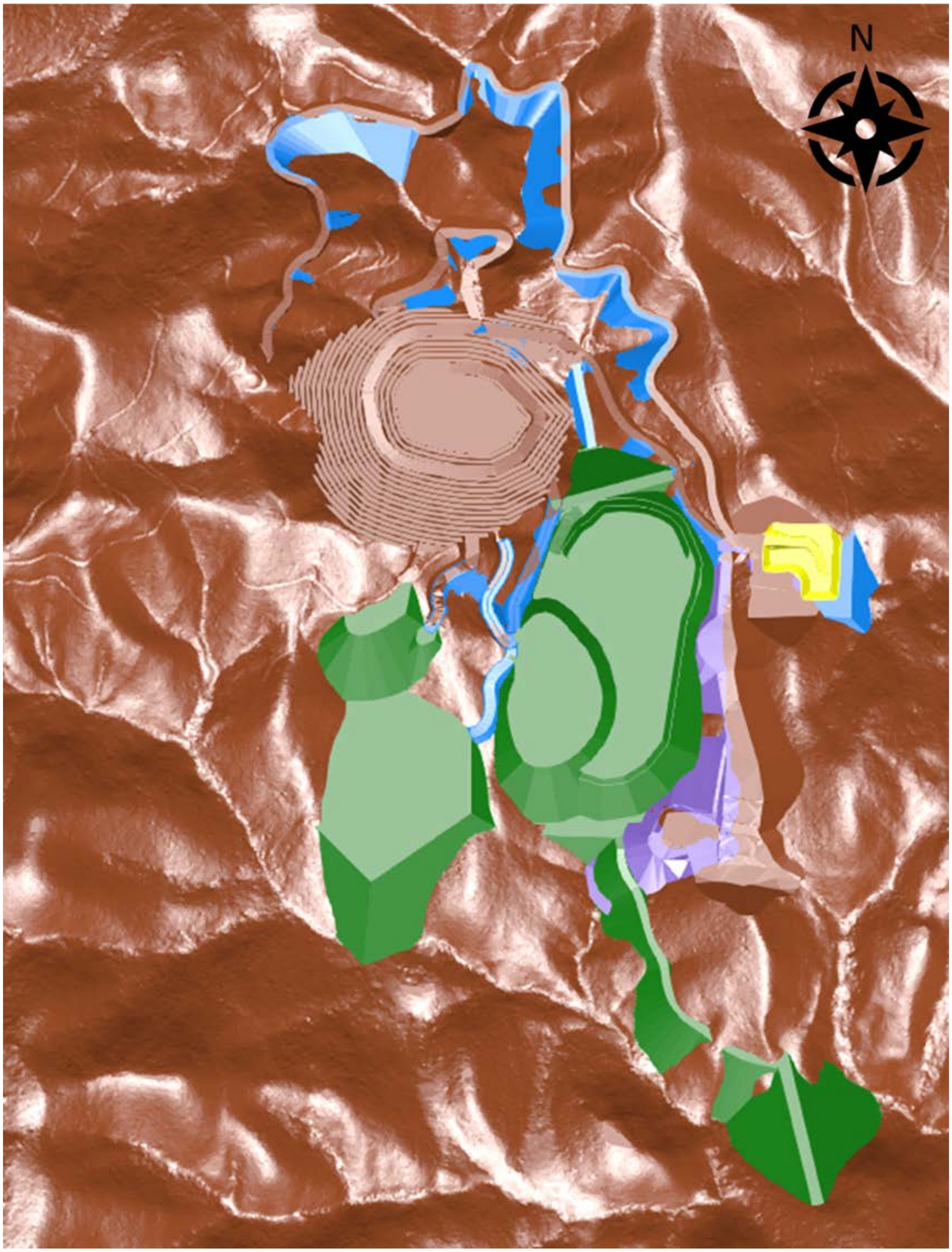


Figure 16-15: Year 6

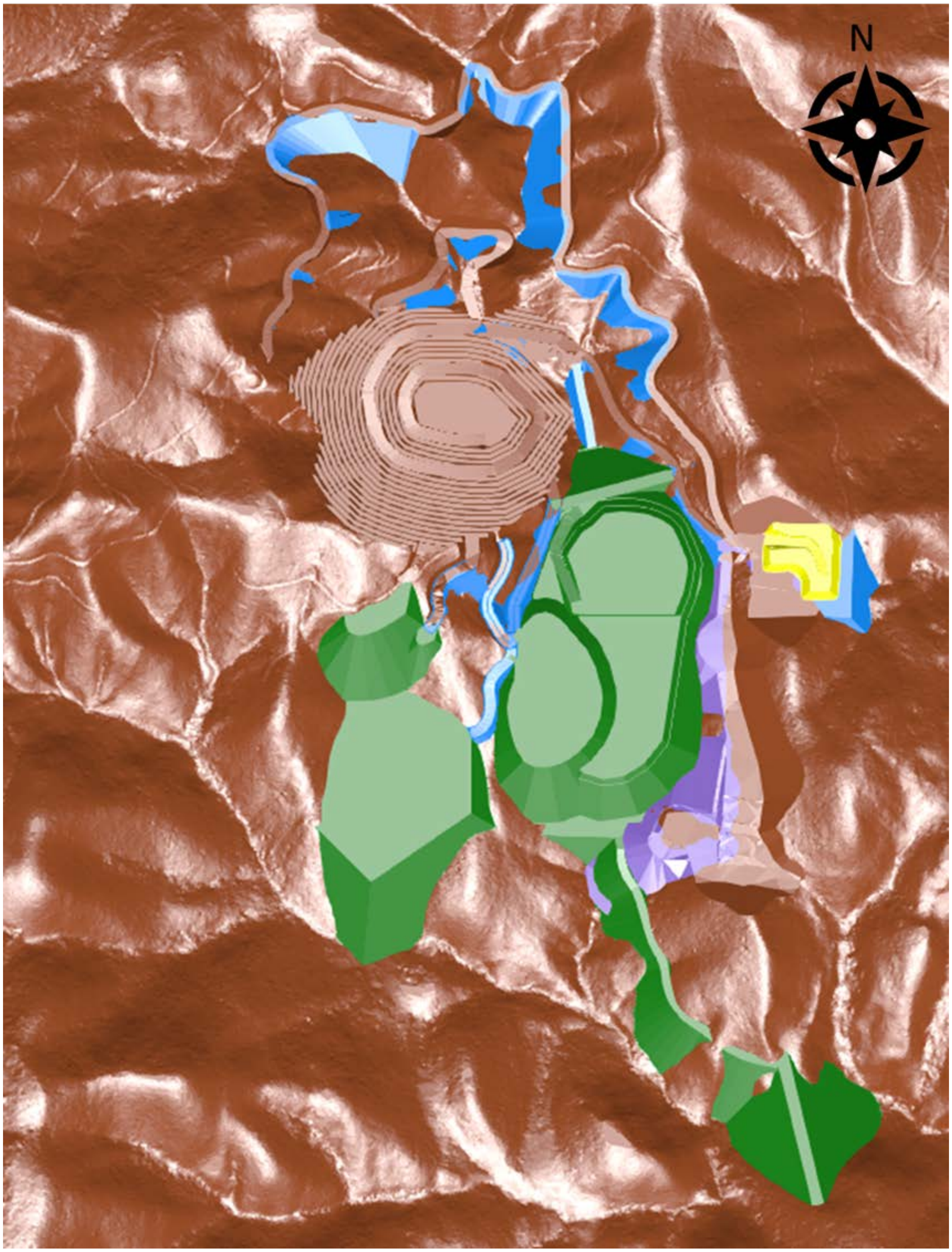


Figure 16-16: Year 7

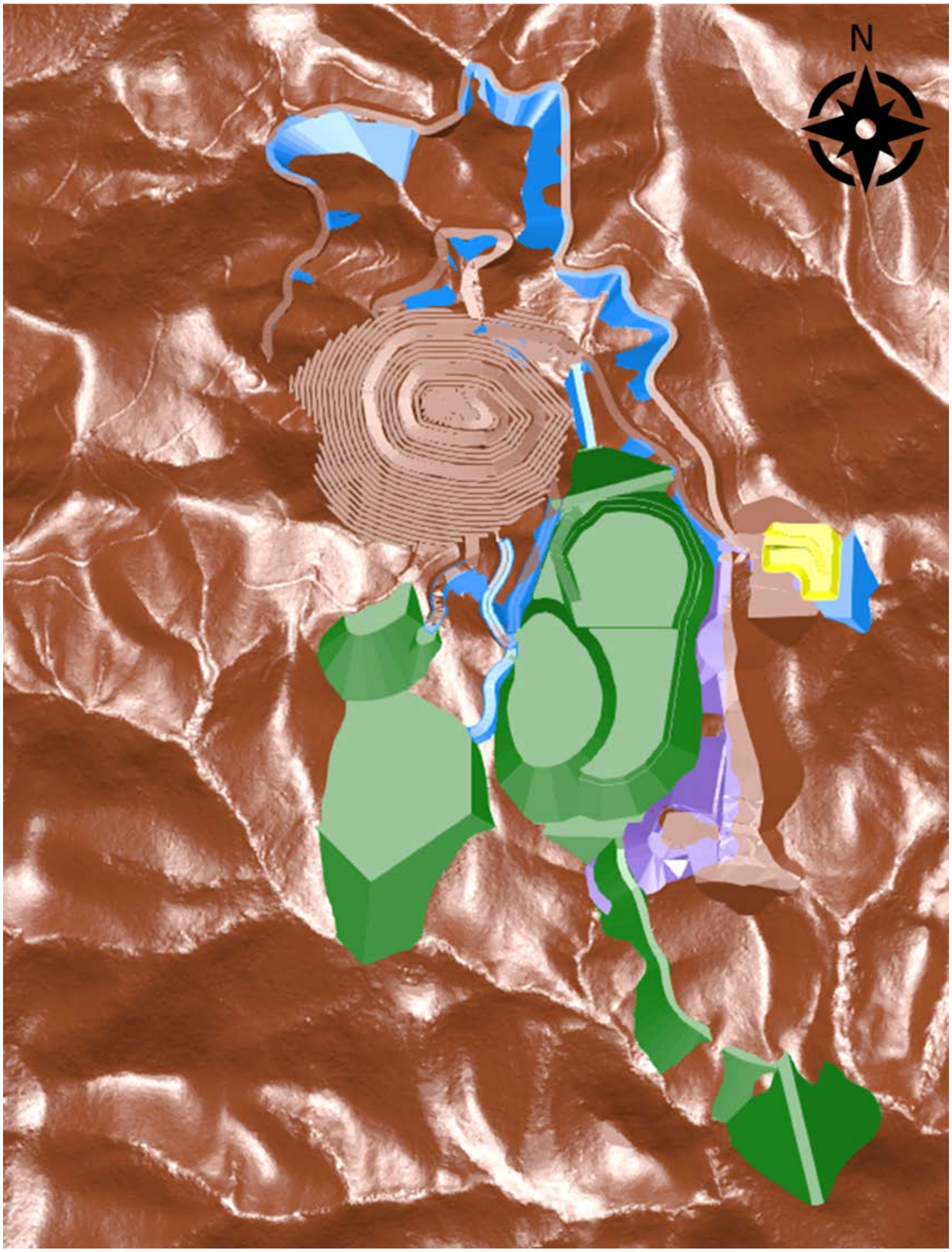


Figure 16-17: Year 8

16.6 ORE CONTROL

Grade control is an item that was considered from the beginning of the mine planning sequence. Blasthole sampling may be possible as a method of ore definition but a gold deportment study needs to be completed to confirm whether blasthole samples will be representative for the Ana Paula ore body. This may be considered in the Feasibility Study.

Other operations around the world are using a reverse circulation program in advance of mining on tight inclined drill hole spacing, to accurately define the ore/waste contacts. This is typically done when the mineralized zone is more dispersed or inclined towards the horizontal as it is at Ana Paula. This information is then built into the short range models and used to guide the loading equipment. This practice is widespread in Australia with great success and in Canada and Brazil.

The method involves using a dedicated grade control drill rig and crew in the pit to drill a series of shallow vertical holes drilled in a pattern similar to the blast hole pattern. The pattern for drilling will be a 5 m spacing and a 4 m burden with samples taken every 1 m in presumed mineralized zones as outlined by both previous ore control drilling and the exploration drilling. Holes will be included 70 degrees to intersect the ore zone at right angles. The volume of the sample to be assayed and sample intervals will be determined in a grade deportation study.

The amount of reverse circulation drilling peaks in Year 2 at 44,900 m then levels off averaging 38,000 m/a from Year 3 until Year 8. This is only for the reverse circulation drilling rig.

The reverse circulation drills will operate for 16 h/d to minimize disturbance and be in advance of mine operations with the information. A three-man crew per drill is required; one driller and two drill helpers. In addition, geologists will provide guidance throughout the day and be on call if unknown issues arise.

The drill penetration rate is estimated at 25 m/h with setups, sampling, etc. Overall, the cost for the drill without labor will be US$165/h or about US$6.61/m drilled. From an overall mine operating cost perspective, the reverse circulation drill sampling program costs US$0.10/t mined. The cost of not sampling and mistaking waste for ore or ore for waste easily is repaid in proper ore: waste definition.

The data from the grade control drilling is then interpreted by the geologist and the ore is then remodeled. The production drilling and blasting will then be designed to mine the ore material separately from the waste.

16.7 MINE ROCK MANAGEMENT

Over the life of mine, the open pit will produce approximately 43.0 Mt of waste rock. Testwork is underway to verify that the mine rock can be categorized as non-acid generating (NAG) but for this technical report it has been assumed to be NAG.

Two main waste storage facilities and two minor facilities are developed as part of the overall mine plan:

1) West Facility – 11.2 Mt capacity
2) Valley Facility – 29.1 Mt capacity
3) Tailings Road – 0.6 Mt capacity
4) Tailings Dam – 3.1 Mt capacity

Excess capacity exists in the Valley and West facilities. These have been designed at 35 degree slopes to be reclaimed at the end of the mine life.

Drainage from the waste storage facilities is all located in the tailings basin drainage. This will act as the settling area for the waste storage facilities.

16.8 CONTRACT MINING

All mine and support mine equipment will be provided by contractors. The equipment description in this section provides general information of the size and/or capacity of the selected equipment.

This operation will be a conventional, open pit, truck-and-loader operation. The Contractor will be using 56 t rigid mining trucks loaded by 6.4 m^3 wheel loaders.

A track-mounted DTH drill is proposed for blasthole drilling, capable of drilling 110-203 mm diameter holes. Due to the size of the operation, all equipment on site will be diesel powered.

The mine will operate 24 hours per day, 365 days per year.

16.8.1 Contractor Mine Equipment Requirements

Major mine equipment provided by contractors has been estimated based on the equipment parameters above. They are listed in Table 16-10 below.

Table 16-10: Major Mine Equipment Requirements

Equipment Type	Model	Number
Drill rig	Atlas Copco FlexiROC T40	2
Wheel Loader 6.4 m^3	Caterpillar 988H	1
Excavator 6.0 m^3	Caterpillar 390DL	3
Truck 54 t	Caterpillar 773F	10
Dozer	CAT D8T	2
Grader	CAT 16H	2
Water truck	Scania / Volvo	1
Fuel / Lube truck	Scania / Volvo	1
Excavator	Komatsu PC450	1

Contract support mine equipment will consist of:

- 6 t Crane Truck
- Telehandler
- Man lift
- Lighting plants
- 4x4 Pickup Trucks
- Bus
- Welder

16.9 CONTRACTOR EXPLOSIVES

Heliostar will hold the explosives license and be responsible for the storage of explosives and bulk products on site. Loading of explosives will be contracted out to a specialist explosives supplier. Bulk explosives will be used for blasting and will be mixed on site with an explosives mixing truck.

Blast designs are based on 6 m benches, using a powder factor of 0.29 kg/t. Over the life of mine, the Project will use approximately 19.9 Mkg of bulk emulsion with an average use of 2.05 Mkg/yr during years 1 through 8.

The Project will use conventional blasting products: bulk emulsion, nonels, detonating cords, delays and boosters.

Owner mine operations personnel will be responsible for the blasting pattern design and the contractor personnel for loading holes and tie-ins.

Pre-shear holes will be drilled on triple benches (18 m length holes) at a spacing of 1.4 m. The total length of the wall for pre-shear drilling is 18,460 m.

16.10 MINE PERSONNEL – OWNER AND CONTRACTOR

The management staff, technical personnel will only operate on a single 12-hour day shift, on 4 days in, 3 days out, as where contractor mine crews will operate on two 12-hour shifts per day, 365 days per year. This will require four mining and maintenance crews. Crews will work a standard rotation of two weeks on, two weeks off. Personnel requirements are estimated based on the peak number of equipment units operating. Peak mine personnel requirements are estimated and summarized in Table 16-11 to Table 16-13.

Table 16-11: Mine Supervision Personnel Summary – Owner

Position	Quantity	Hourly/Salary
Mine Operations Superintendent	1	Salary
Senior Engineer	1	Salary
Open Pit Planning Engineer	2	Salary
Surveyor/Mining Technician	1	Salary
Clerk/Secretary	1	Salary
Senior Geologist	1	Salary
Grade Control Geologist	2	Salary
Sampling Technician	2	Salary
General Mine Laborer	2	Hourly
Total	**13**	

Table 16-12: Mine and Maintenance Operations Personnel Summary – Contractors

Position	Quantity
Project Manager	1
Mine Supervisor	3
Safety Supervisor	3
Project Controller	1
Surveyor	2
Project Assistant	1
Maintenance Superintendent	1
Maintenance Supervisor	1
Administrator / HR	1
Admin Assistant	1
Logistic Assistant	1
Dispatcher	2
Cleaner	1
Driver (support equipment)	3
Mechanic	3
Electrician	2
Welder	2
Tire worker	2
Mechanic helper	3
Drill rig operator	3

Position	Quantity
Drill rig helper	3
Loader operator	6
Truck operator	22
Dozer operator	6
Grader operator	3
Water truck operator	3
Diesel / lube truck operator	3
Excavator operator	3
Project Manager	1
Mine Supervisor	3
Safety Supervisor	3
Project Controller	1
Total	**86**

Table 16-13: Total Mine Personnel Summary

Team	Personnel
Supervision - Owners	13
Operations and Maintenance Contractors	86
Total Mine Personnel	**99**

16.11 COMMENTS ON SECTION 16

- The open pit design is comprised of three phases for Ana Paula.
- Mill feed totals 14.1 Mt grading 2.38 g/t Au diluted and 5.61 g/t Ag diluted.
- Waste tonnage over the mine life will total 43.0 Mt for a strip ratio of 3.04:1 LOM.
- Contact dilution of the ore body resulted in a 4.5% increase in ore tonnage and 3.9% drop in gold feed grade and 2.0% drop in the silver feed grade. This is based on 0.5 m of block contact dilution.
- The open pit mine life is expected to be 10 years; 2 years of pre-production stripping and 8 years of mine production.
- Mine production will be preceded by two years of pre-production stripping, completed by contractor. This will be used to establish roads, an ore stockpile and initiate mining in Phases 1 and 2.
- Waste rock facilities are the south of the pit up on the slope (West WRF) and down in the valley (Valley WRF).
- No ARD potential appears to exist but testing is underway to confirm this. This will be completed either in the feasibility study or in basic engineering prior to plant start-up.
- Underground potential beneath the open pit offers opportunity for sending higher grade feed to the mill. It may also provide the opportunity avoid stripping the higher strip ratio Phase 3.
- Contract mining is used in the cost estimate for the open pit mine.

16.12 RECOMMENDATIONS FOR PIT SLOPE GEOMETRIES

Recommendations for the Ana Paula Pit slope geometries are presented in Table 16-14 and are discussed in this section. Pit slope angle recommendations consist of inter-ramp angles, bench face angles and bench widths. The method of analysis that results in the highest probability of failure and (typically) the lowest Factor of Safety is generally selected as the basis for recommendations because those results represent the most critical and hence most conservative results. As previously mentioned, Knight Piésold uses three methods of analysis to develop pit slope angle recommendations.

Table 16-14: Recommended Pit Slope Geometries for 10% Probability of Failure

Design Sector	Bench Height (m)	Inter-ramp Angle (deg)	Bench Face Angle (deg)	Bench Width (m)
A	18	58	80	8.1
B	18	58	80	8.1
C	18	58	80	8.1
D1	18	58	80	8.1
D2	18	51	71	8.4
D3	18	58	80	8.1
E	18	58	80	8.1
F1	18	58	80	8.1
F2	18	58	80	8.1

The limit equilibrium method is used to evaluate inter-ramp and bench face slope stability based on rock mass parameters. Bench scale recommendations are also analyzed for backbreak using the *Backbreak* routine, which is an analysis of the influence of geologic structures on bench face angle. Bench width is analyzed to evaluate for adequate rockfall containment. The results of the most critical method are used to adjust the other recommendations, along with operational considerations. Operational considerations include equipment limitations as well as experience with other mines. The pit slope recommendations are relatively steep compared to many gold deposits. This is because of the fresh/unaltered character of the lithologies.

The recommendations presented in this technical report are based upon Knight Piésold's current understanding of the conditions that will influence pit slope performance at the proposed Ana Paula Pit. These conditions should be assessed during pit development. Any significant deviations from the geotechnical model used to develop the recommendations presented in this technical report should prompt re-evaluation of these recommendations.

A program of geotechnical data collection should be undertaken during pit development to verify consistency with the geotechnical model. At a minimum, this program should include the following:

1. Geotechnical mapping to document geologic structure and rock mass strength conditions
2. Survey monitoring and inspection of the slopes for indications of displacement
3. Documentation of any slope failures
4. Documentation of groundwater inflows
5. Periodic inspection of the pit slopes during development by a geotechnical engineer experienced in pit slope design

With the exception of Item No. 5, these activities can be largely undertaken by mine staff as part of the ongoing mine engineering program.

These pit slope recommendations are also made with the assumption that controlled blasting techniques will be practiced. Controlled blasting techniques should be designed with pit slope damage as an important factor, along with fragmentation and casting.

Knight Piésold also recommends that the shape of the pit be altered in Design Sector D such that a pit face with a dip direction of 270 degrees (± 15 degrees) is avoided. This will reduce the potential for plane shear backbreak in Sector D.

Knight Piésold also recommends that Heliostar consider conducting a numerical simulation of moment-driven slope failure for Sector A (west slopes). This is because the combination of the pervasive high angle foliation (Set 1) which dips into the pit walls at the west side of the pit, and the low angle Set 2 which dips out of the west pit wall provides a geometry that has the kinematic potential for moment driven failure. Moment driven failure is similar to toppling, except that topping refers to a smaller scale specific failure mode whereas moment driven failure involves large scale blocks and different failure criteria.

17 RECOVERY METHODS

17.1 PROCESS DESCRIPTION

Metallurgical tests and mineralogical analyses have been performed on composites of the Ana Paula ore. The results show an average-hardness ore with a portion of gold content being refractory due to encapsulation in iron sulphides. The rest of the gold can be liberated with normal grinding and recovered by gravity concentration or direct cyanidation.

A process flowsheet has been developed that is suitable for the mineralogy of the Ana Paula ore and its response to metallurgical treatment. Run-of-mine ore is crushed and ground to 80 percent finer than 160 microns, processed by froth flotation to recover sulphides and free gold, atmospheric oxidation of the sulphide concentrate, and cyanide leaching of the oxidized slurry.

Figure 17-1 is a simplified schematic of the overall process for the Ana Paula plant. This provides the basis for the process description that follows.

17.2 PROCESS DESIGN CRITERIA

Heliostar tasked M3 to design a process plant for the Ana Paula Project with a nameplate capacity of 5,000 t/d. The current mine plan developed for the Project is based on a 365-day calendar year, totalling 1,825,000 tonnes of ore per year.

For the design, M3 uses an overall mill availability of 92%, except for the primary crusher, for which the availability is 75% and pebble crusher, which has an availability of 85%. These design availabilities are common for current and recent projects at M3 and in-line with general vendor specifications. For simplicity, M3 defines “availability” as the estimated actual run time of equipment. Nomenclature and tracking parameters may vary from operation to operation.

The mass balance was developed for the Ana Paula process using MetSim software. The process simulation assumed overall grades and recoveries for gold, and silver as shown in Table 17-1. The MetSim balance forms the basis for equipment sizing, including pipes and pumps, as well as sumps or pump boxes, and defines the parameters used in the process design criteria.

Table 17-1: Head Grades and Recoveries Used for Mass Balance Simulation

Metal	Head Grade	Flotation Recovery, %
Au	2.24 g/t	95
Ag	6.89 g/t	89
Flotation Mass Pull		20

Table 17-2 is a summary of the main components of the process design criteria used for the study. A detailed process design criteria document has been prepared and is listed as one of the references in Section 27.

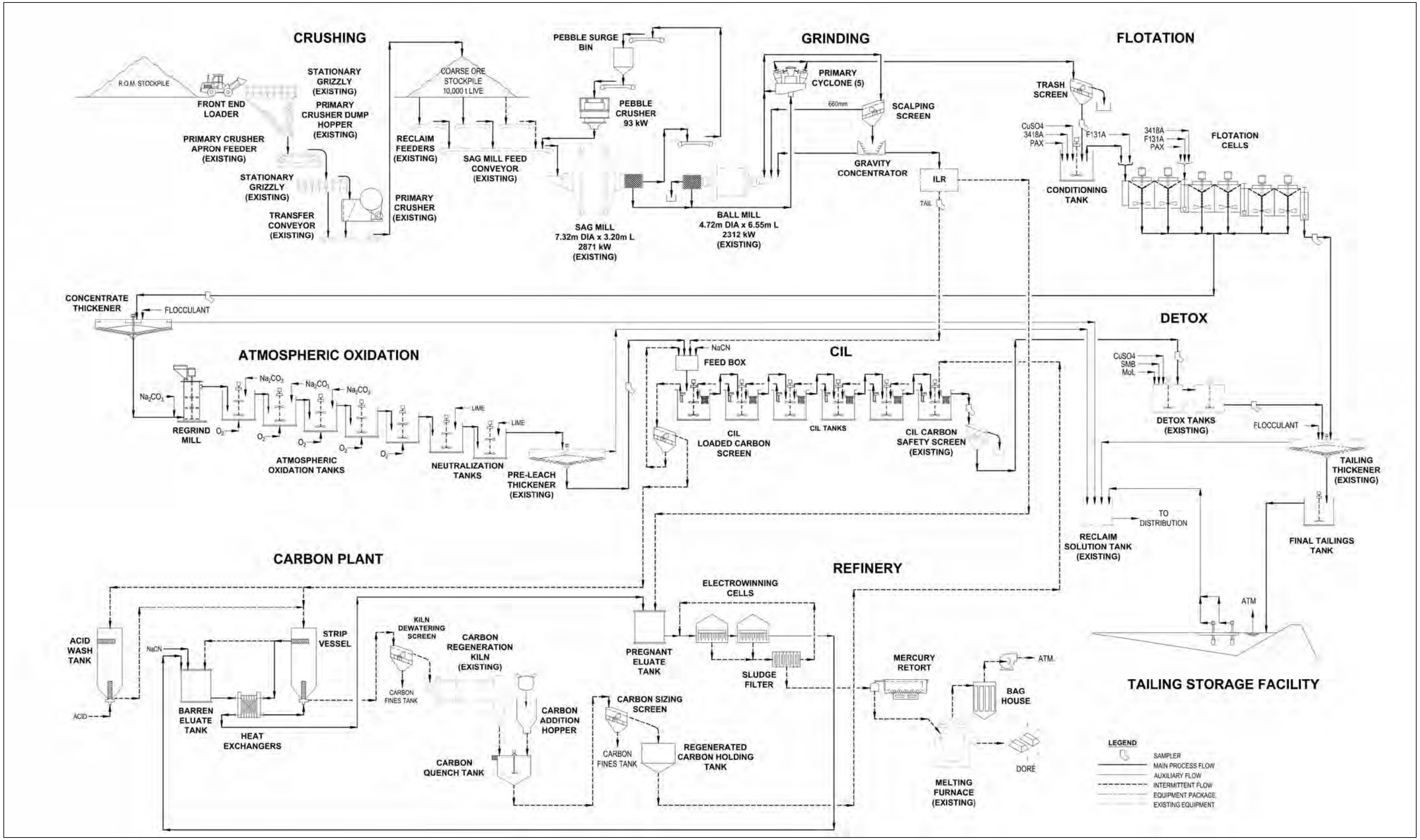


Figure 17-1: General Process Flowsheet

Table 17-2: Process Design Criteria Highlights

Description	Design
Capacity	
Tonnes per day, nominal	5,000
Tonnes per year	1,825,000
Availability/Use of Availability	
General	92%
Primary Crushing	75%
Pebble Crushing	85%
Primary Crushing	
Feed F80, mm	500
Product P_{80}, mm	126
Crushing Work Index, kWh/t (assumed)	13
SAG Mill Grinding	
Feed F80, mm	126
SAG Mill JKSimMet Parameters, Median	
A	54.58
b	0.806
t_a	0.424
Ore SG	2.7
Ball Mill Grinding	
Feed T80, microns	1,893
Feed F80, microns	2,908
Product P_{80}, microns	160
Ball Mill Work Index, kWh/t, Average	18.3
Bond Abrasion Index, g, Average	0.1782
Flotation	
Laboratory Flotation Time, min	16
Air Hold-up factor	1.15
Scale-up factor	2
Plant Flotation Time, min	37
Design Mass Pull	20%
Atmospheric Alkaline Oxidation	
Pulp Density, % Solids	25 – 35
Temperature, minimum, ^{o}C (^{o}F)	75 (167)
Oxidation Time, h	24
Sulphide-Sulphur Oxidation, %	~100
Soda Ash Consumption, kg/t conc	120
Cyanidation	
Leach Time, h	48
% Solids	40

17.3 COMMINUTION PLANT DESIGN

Primary crushing and pebble crushing was designed using Metso's Bruno simulator. SAG milling was simulated using JKSimMet and the ball mill capacity was calculated using standard Bond equations, with and without taking credit for SAG mill slimes that bypass the ball mill. As shown in Section 13, grindability parameters were measured for only four composites, each representing an ore type. With the limited number of data, the average or median hardness and the 80th percentile hardness were very close to each other. In addition, the A and b JK parameters were measured using the JK Rotary Breakage Tests (JKRBT) and have not been calibrated with full drop-weight tests.

17.3.1 Primary Crushing Simulations

The primary crusher included in the original El Sauzal purchase is a 42" x 48" Kolberg-Pioneer jaw crusher with a 186 kW (250 hp) drive. The performance of this crusher was simulated by Metso's Bruno Process Simulation software using a Metso C125 jaw crusher as a model. The run-of-mine (ROM) ore fragmentation used in the simulation was assumed to be similar to Metso's standard 800-mm coarse size distribution, which has a P_{80} of approximately 500 mm. The actual mine fragmentation may be different from this, depending on the rock type and blasting design.

If the 42x48 jaw crusher is similar to a C125, it is expected to be adequate to crush the ore in preparation for the SAG mill. With a closed side setting of 125 mm, the crusher is estimated to produce crushed ore that is 80% finer than 126 mm and practical top size of 190 mm (Bruno's "max stone"). The particle size distribution of this crushed product was entered into JKSimMet as the fresh feed to the SAG mill. The full particle size distribution is included in the particle size distribution plots for the SAG mill in the next subsection.

17.3.2 Grinding Simulations

Grinding at Ana Paula will be accomplished with a SAG mill that is 7.3 m in diameter and 3.2 m in length flange-to-flange (24' x 10.5' F/F), and a ball mill that is 4.72 m in diameter and 6.55 m in length (15.5' x 21.5'). Both mills were obtained with 2,313 kW (3,100 hp) drives. Several JKSimMet simulations using average or median hardness indicates that these mills will be able to process 5,000 t/d (92% availability) if the SAG mill drive is increased to 2,872 kW (3,850 hp).

JKSimMet simulations for the SAG mill was performed using the following parameters:

- Bruno-predicted feed particle-size distribution
- Median hardness: A=54.58, b=0.806, ta =0.424
- 74.2 % critical speed
- 12 % ball charge (133 mm steel balls)
- 38 mm grates
- 11 mm opening SAG screen
- Pebble crushing at a closed side setting of 13 mm

Figure 17-2 illustrates the results of the JKSimMet simulations, which shows that the target capacity of 5,000 t/d can be achieved at median hardness. The power draw is calculated to be 2,274 kW (3,048 hp), including JKSimMet voids correction and 6.5% drive losses from a single pinion drive. This power draw essentially maxes out the rating of the old drive that came with the SAG mill. With a larger drive, the mill will have enough power to perform the average duty as well as respond to fluctuations in ore fragmentation and hardness. It will also have a sufficient power range to control the mill.

Figure 17-3 is a plot of the particle size distribution of the process streams in the SAG mill circuit.

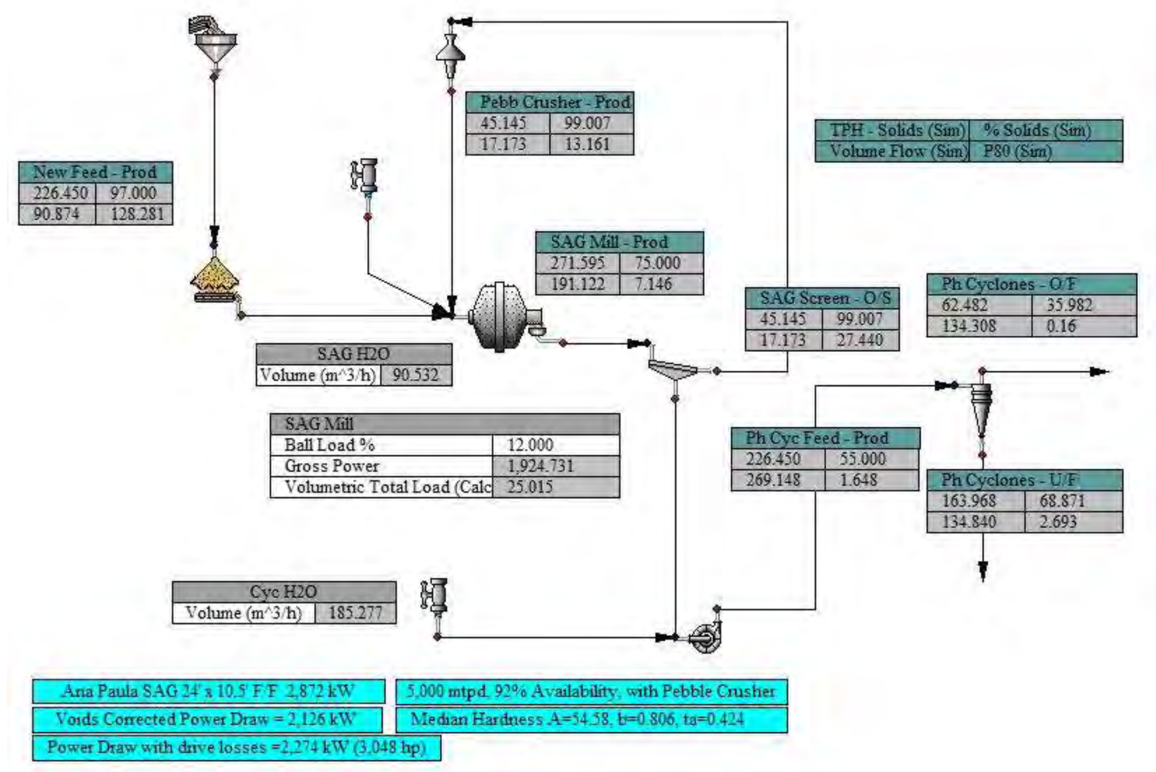


Figure 17-2: JKSimMet Simulation Flowsheet for the SAG Mill

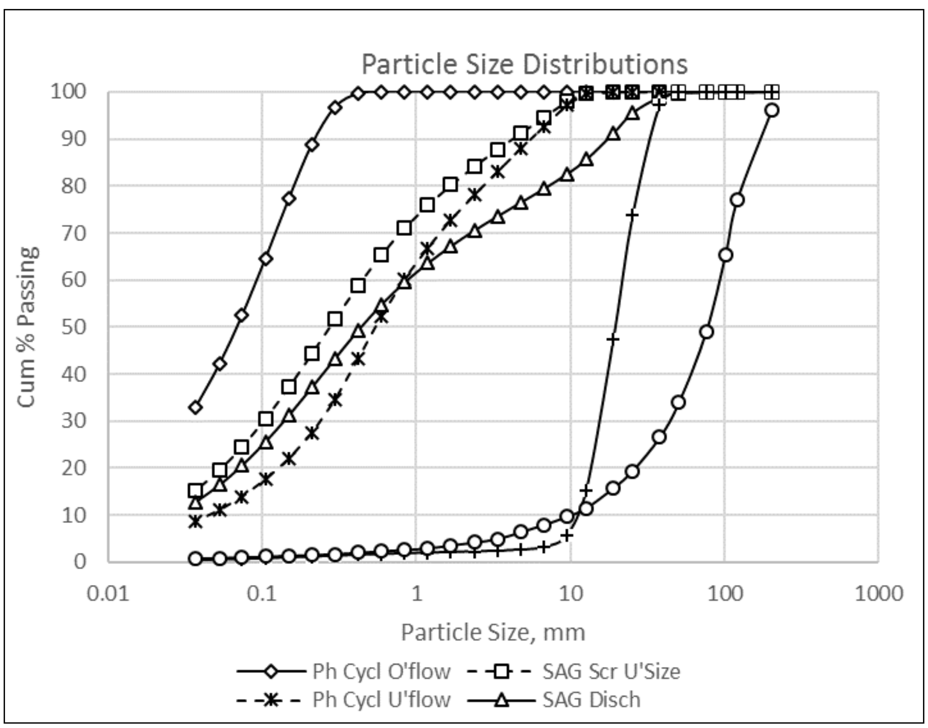


Figure 17-3: Particle Size Distribution of SAG Mill Streams

17.4 PRIMARY CRUSHING AND COARSE ORE STOCKPILE

ROM ore will be transported by 60-tonne haul trucks from the mine to the primary crusher and dumped into the primary crusher dump hopper with an approximate 120-tonne live capacity (2 truckloads) through a stationary grizzly (opening: 800 mm). An apron feeder moves the ore from the hopper to another stationary grizzly (opening: 100 mm). The oversize reports to the primary crusher while the undersize reports directly to the transfer conveyor, bypassing the primary crusher. The primary crusher is a 42" x 48" Kolberg-Pioneer jaw crusher, with a closed-side setting of 150 mm, powered by a 187 kW (250 hp) motor.

The crushed ore is discharged to the transfer conveyor, which is also the stacking conveyor feeding the coarse-ore stockpile. A self-cleaning magnet followed by a metal detector are provided to remove any tramp steel before stockpiling.

The coarse ore stockpile has a live capacity of 10,000 tonnes and a total capacity of 50,650 tonnes. The live capacity is equivalent to 2 days of SAG mill feed at the nominal capacity.

The crushed ore is reclaimed via a reclaim tunnel beneath the stockpile, with three reclaim feeders (two operating and one standby) onto the SAG mill feed conveyor. Each reclaim feeder is 1,067 mm wide and 6.5 m long, powered by an 11 kW (15 hp) drive on variable frequency drives. The feeders are also part of the El Sauzal equipment purchase. The crushed ore is reclaimed from the stockpile at a design rate of 226.4 t/h.

Dust suppression is accomplished by water sprays at the crusher dump hopper, jaw crusher, and at the discharge points of the feeders. A belt scale is included on the SAG mill feed conveyor after the feeders and before the point of addition of SAG mill balls.

17.5 GRINDING AND PEBBLE CRUSHING

The grinding circuit for the Ana Paula Project consists of a conventional SAG-mill, ball-mill, pebble-crushing system, commonly referred to by the acronym SABC. The grinding line comprises one SAG mill, a pebble wash screen, one ball mill, one cyclone cluster, and a pebble crusher. The SAG mill is in a closed circuit with the screen and pebble crusher. The ball mill is in a closed circuit with the hydrocyclone cluster.

The SAG feed conveyor will feed ore to the SAG mill, 7.32 m diameter by 2.74 m effective grinding length (24 ft x 9 ft EGL), powered by a new 2,872 kW (3,850 hp) drives on VFD. The SAG mill product will discharge to a pebble wash screen.

The pebbles separated by the SAG mill discharge screen are conveyed to the pebble crusher feed bin and crushed with a Metso HP100 cone crusher, or equivalent, set at a closed-side setting of 13 mm. The crushed pebbles are returned to the SAG mill via the SAG mill feed conveyor.

The undersize of the SAG mill discharge screen drops into the cyclone feed pump box. This will constitute fresh feed to the ball mill and will mix with the ball mill discharge and dilution water. The mixed slurry will then be pumped to a cluster of five 26-inch hydrocyclones (4 operating, 1 standby). Pumping will be by a 260 kW (350 hp) Warman pump. A second pump is installed as standby. Both motors are controlled by medium-voltage variable frequency drives.

The cyclone cluster underflow will flow by gravity to the ball mill, 4.72 m diameter by 6.55 m length by FFE Minerals. The ball mill is driven by a fixed-speed 2,313 kW (3,100 hp) motor by TECO-Westinghouse. The cyclone overflow will constitute the product of the grinding circuit and will be fed to the flotation circuit. The target size for distribution is 80 percent finer than 160 microns.

17.6 GRAVITY CONCENTRATION

A split from the hydrocyclone overflow is processed for gold recovery by gravity concentration and intensive cyanidation. Gravity concentration is achieved using a centrifugal concentrator. The gravity concentrate is then leached with cyanide in the presence of an oxidizer using an intensive leach package. The pregnant solution produced is sent to the same electrowinning circuit serving the oxidized concentrate leach circuit.

17.7 GRAVITY GOLD RECOVERY

Based on testwork (Section 13), approximately 40% of the gold is gravity recoverable. In the current design, 36% of the circulating load gets treated in the gravity concentration and intensive cyanidation section of the plant. This corresponds to approximately 20% of the gold being recovered by the gravity circuit.

The gravity concentrator will be a centrifugal gravity concentrator, a Knelson KC-QS40 or equivalent unit, that will be fed from the undersize of a vibrating screen – a 1.8 m x 4.8 m screening module. The gravity machine spins the slurry at a high velocity, collecting heavy particles on the inside ribs. The machine is operated in batch mode, on a set cycle to concentrate and then flush heavy materials to a downstream leach system. Tailing from the gravity operation are discharged to the ball mill feed chute with the cyclone underflow.

The gravity concentrate is fed to an intensive cyanidation package, a Consep Acacia CS200 or equivalent, through a reactor feed tank. The pregnant solution is pumped to the electrowinning cells that mainly process pregnant solution from the carbon-in-leach (CIL) process included in this plant. Tailing from the intensive cyanidation reactor are pumped to the CIL process.

17.8 FLOTATION

Sulphides in the ore will be floated at the ore's natural pH using potassium amyl-xanthate (PAX) as collector, AERO 3418A as promoter, copper sulfate as activator, and F131A as frother.

The average laboratory rougher flotation time determined during several bench-scale tests is 16 minutes. With a scale-up factor of 2 and 15% aeration at 30% solids, this will require 36.8 minutes of plant residence time and a total volume of 377 m^3. This calls for 6 units of 70 m^3 flotation cells.

Flotation of sulphides will be accomplished in a single rougher flotation stage. Cyclone overflow is first sent to a 41.2 m^3 conditioning tank, then to a bank of six 70 m^3 tank flotation cells. Each flotation cell mechanism is driven by a 93 kW (125 hp) motor through a gear reducer. Flotation air is supplied by a 70-kW (94-hp) blower, which can deliver 95 Nm^3/min of air.

Flotation concentrates will advance to the concentrate thickener and then to the regrind mill.

The flotation tailing slurry is pumped to a flotation tailing thickener (28 m diameter high-rate thickener) to be thickened to 55% solids, in preparation for pumping to the tailing storage facility.

17.9 CONCENTRATE THICKENING AND REGRIND

Concentrate from the rougher flotation circuit is dewatered in the 10.5 m diameter high-rate thickener to a pulp density of 55% solids. Flocculant is added to the thickener feed to aid in settling. The withdrawal rate of settled solids is controlled by one of two underflow pump to maintain either thickener underflow density or thickener solids loading. Each pump is driven by a 30 kW (40 hp) motor on variable frequency controller to deliver slurry at a nominal maximum rate of 65 m^3/h. Underflow from the concentrate thickener is pumped using variable speed horizontal centrifugal slurry pumps to the regrind mill feed box.

Concentrate thickener overflow, is pumped to the reclaim solution tank using two fixed speed horizontal centrifugal pumps, one operating and one standby, each driven by a 30 kW (40 hp) motor with a nominal capacity of 100 m^3/h.

The high-rate concentrate thickener is mounted on steel legs on foundations. A concrete containment area with slab on grade and cast-in-place walls will contain rain runoff and process spills. The floor is sloped to sumps that will pump the contained liquids and solids back to the process.

From the regrind mill feed box, the thickened concentrate is pumped to the regrind mill with two the variable speed feed pumps, one operating and one standby. Each pump is driven by a 45 kW (60 hp) motor to deliver a nominal maximum flowrate of 81 m^3/h.

The concentrate regrind mill is a 900-kW tower mill with ceramic grinding media. It will operate in open circuit while being monitored by an online particle size analyzer. The target grind of 80% finer than 25 microns is attained by controlling mill speed with a variable frequency drive.

The regrind mill discharge is pumped using two horizontal centrifugal pumps, one operating and one standby, from the regrind mill discharge box to the atmospheric oxidation feed box. The pumps are fixed speed, with 30 kW (40 hp) drives.

17.10 ATMOSPHERIC OXIDATION

Atmospheric oxidation (AOX) of the sulphide concentrate is conducted in five agitated tanks. Each tank is 9 meters in diameter and 10 meters high (operating volume of 608 m^3), made of 2205 duplex stainless steel. Slurry is fed to each tank through a downcomer and overflows to the next tank or a pump box at the end of the series. Each agitator is powered by a 56-kW (75-hp) motor through a gear reducer. Oxygen is injected into each tank through fine-bubble spargers.

The reaction kinetics was found to be optimized in the laboratory at around 75 ^oC. The reaction is exothermic so the process is expected to be autothermic if the feed concentrate grade is kept at 10% sulphide sulphur or higher.

17.11 CARBON-IN-LEACH (CYANIDATION)

The oxidized slurry flows to two neutralization tanks (6-m diameter, 7-m high, 185-m^3 operating capacity) where lime is added to increase the pH to 10 to 10.5. The neutralized slurry is then pumped to a pre-leach thickener (13.7-m diameter) to increase the pulp density to 40 to 45% solids. Once thickened, slurry is pumped to the carbon-in-leach feed tank where it combines dilution water, sodium cyanide reagent feed, and other process streams, into the first CIL tank.

Cyanide leaching is achieved in six CIL tanks (9.8-m diameter, 9.8-m high, 696-m^3 operating capacity) each equipped with 30-kW (40-hp) agitators with two narrow-blade hydrofoil impellers. The tanks are built with epoxy-coated mild steel. Air is delivered by a pipe under an inverted cone located directly below the agitator.

Based on leaching test results, a residence time of 48 hours is sufficient to achieve the target recovery for both gold and silver. After leaching, loaded activated carbon is sent to the carbon plant for stripping and electrowinning.

17.12 CARBON HANDLING PLANT – CARBON ELUTION AND METAL RECOVERY BY ELECTROWINNING

Once the loaded carbon is screened from the leached slurry, it is transported to the carbon handling plant. Loaded carbon is first acid washed with a dilute solution of hydrochloric acid to remove scale from the carbon, rinsed, and then pumped to the carbon stripping vessel. The carbon strip vessel is a pressure vessel, with a capacity to strip 5 tonnes of carbon per batch. The stripping process follows the pressure Zadra procedure developed by the US Bureau of Mines.

It involves contacting a hot solution of cyanide and caustic (0.15 % cyanide, 1.25 % caustic) at a rate of 2 bed volumes per hour. The solution is introduced at the bottom of the carbon bed and overflows at the top of the vessel through one of more cylindrical Johnson screens. The solution is preheated to 135°C by heat exchangers. Because of the elevated temperature, the strip vessel is kept at about 550 kPa to prevent boiling.

During stripping, gold and silver desorbs from the activated carbon into the strip solution. This loaded strip solution is then sent to electrowinning cells through a heat exchanger. In the electrowinning cells, gold and silver are deposited by electrolysis to a stainless-steel cathode. The anode is typically a stainless-steel wire mesh or punched plate.

When enough is deposited on the cathodes, gold and silver are pressure washed off the cathodes and collected as sludge at the bottom of the electrowinning cells. The sludge is discharged to a tank and filtered through a plate-and-frame filter press.

The filtered residue is finally dried in retorts to remove and collect any mercury and smelted in a tilting furnace. Metallic gold and silver melt is then poured into bar molds to produce the final product of the operations – doré bars.

17.13 CYANIDE DESTRUCTION

Residual weak-acid dissociable (WAD) cyanide in the leach tailing is destroyed (detoxified) by oxidation using oxygen (from air) and sodium metabisulfite. Milk-of-lime is added to maintain a slurry pH in the range of 8.0 to 8.5. The reaction is catalyzed by copper (5 ppm), which will need to be supplied if the ore does not contain enough cyanide-soluble copper.

Cyanide is oxidized first to cyanate, which eventually decomposes to carbon dioxide, ammonia, and nitrogen gas. The more stable iron cyanides are precipitated from solution as insoluble ferrocyanide compounds. The cyanide levels in solution are thereby reduced to an environmentally acceptable level (<50 ppm WAD cyanide, per the Cyanide Code). The detoxified slurry is sampled prior to thickening to ensure that the WAD cyanide content meets the target discharge level.

The detoxification reactors are two agitated tanks, operated in series. The two tanks will have a total volume of 315 cubic meters and will provide a total residence time of approximately 3 hours.

Slurry discharged from the detoxification circuit will overflow into a discharge box, from where it is pumped to the tailing thickener (28 m diameter thickener) by two 56 kW (75 hp) horizontal centrifugal pumps, one operating and one standby.

A concrete containment slab on grade and containment walls will contain rain runoff and process spills. A sump pump will transfer the solution and solids back to the process.

17.14 WATER BALANCE AND SOLUTION MANAGEMENT

A water balance was developed for the Ana Paula Project as part of the mass balance model using MetSim modeling software. The water and solution management scheme is illustrated in Figure 17-4 below.

The estimated raw water requirement of the Ana Paula Project is 83.8 m^3/h, of which 66.5 m^3/h is for mill operations, 5 m^3/h for potable water use and the equivalent flowrate of 10 m^3/h for mine dust control. Raw water supply will comprise 31 m^3/h from the well field, 52.8 m^3/h from the rainfall diversion channel runoff, and 8.6 m^3/h contained in the ore as moisture.

Well water use in the mill includes 11.6 m^3/h for gland seal, 1.4 m^3/h process water makeup, and 2.1 m^3/h for crushing plant dust control. Fire protection water is also derived from well water. All the runoff water is used as mill makeup water. It is introduced to the mill through the tailing storage facility and stored in the reclaim water tank with the tailing thickener overflow.

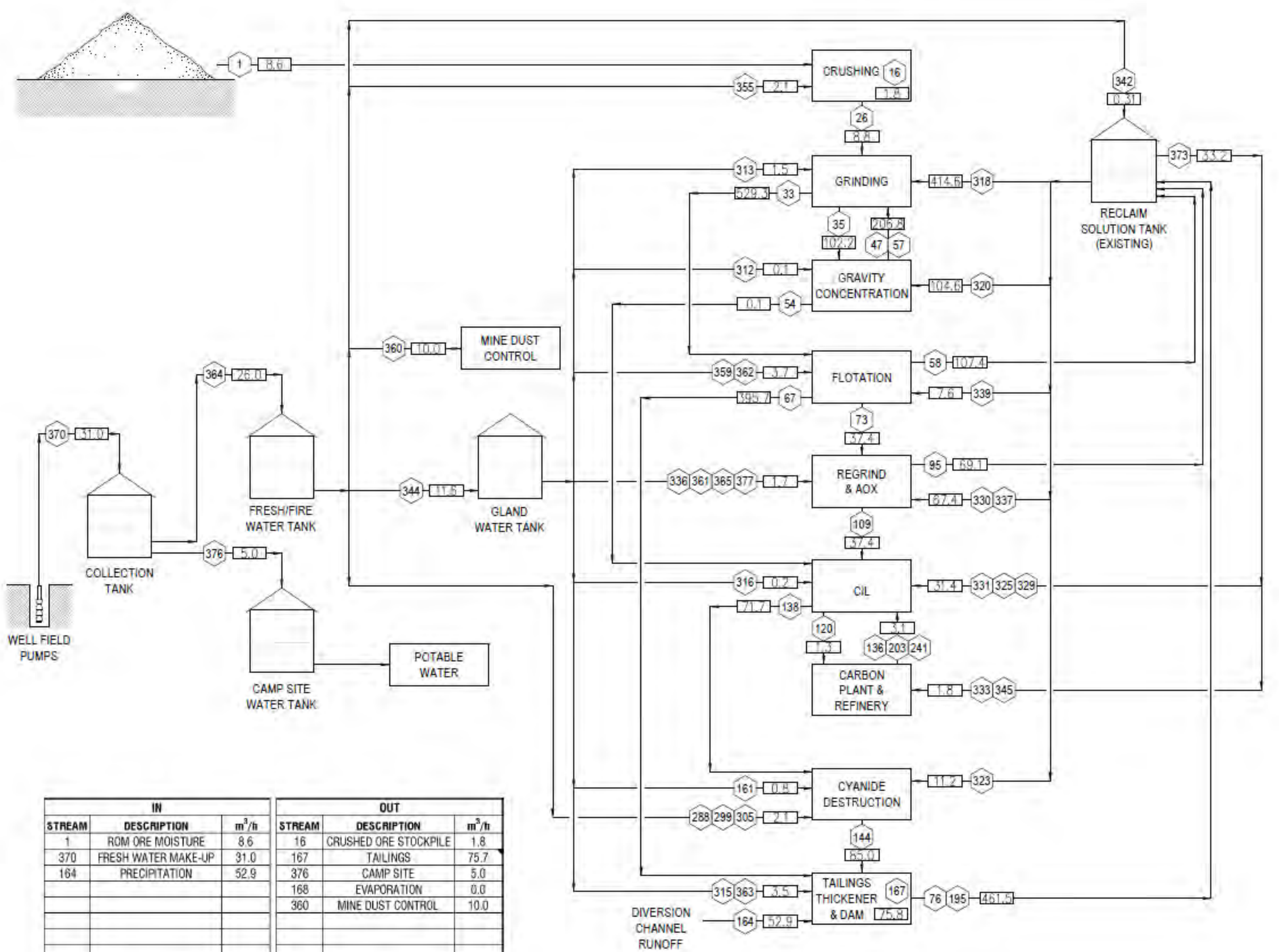
Mill operations use a total of 704.4 m^3/h of water, of which 90.6% (638 m^3/h) is water recycled from the TSF, the tailing thickener, the preleach thickener overflow, and the concentrate thickener overflow. Table 17-3 below is a list of water sources for the mill operations.

Table 17-3: Summary of Water Sources for the Mill

Water Source	Flow (m^3/h)	% of Requirement
Recycle Water Sources		
Tailing Storage Facility (Reclaim Portion)	166.6	23.7%
Concentrate Thickener Overflow	107.4	15.2%
Preleach Thickener Overflow	69.1	9.8%
Tailing Storage Facility (Recycle Portion)	294.8	41.9%
Total Recycle Water	638.0	90.6%
Raw Water Sources		
Tailing Thickener (Runoff Water Portion)	52.9	7.5%
Well Water (Gland Seal)	11.6	1.6%
Well Water (Crushing Plant Dust Control)	2.1	0.3%
Total Raw Water	66.5	9.4%
Total	**704.4**	

Water from well field is pumped to the fresh/fire water tank (534 m^3 capacity) and to the camp site water tank (78 m^3 capacity). Both tanks will include fire water reserves in the event of an emergency. Fresh water system is designed to prevent contamination with cyanide-containing solutions.

The reclaim solution tank (800 m^3 capacity) functions as the process water tank. It is supplied with tailing pond reclaim solution, concentrate thickener overflow, pre-leach thickener overflow, tailing thickener overflow, and raw water. Process water is pumped by two horizontal centrifugal process water pumps, one operating and one standby, each powered by 150 kW motors. Process water is supplied to the grinding circuit, flotation circuit, concentrate oxidation circuit, process water tank as make-up, refinery scrubber, and to the flocculant systems.



IN			OUT		
STREAM	DESCRIPTION	m^3/h	STREAM	DESCRIPTION	m^3/h
1	ROM ORE MOISTURE	8.6	16	CRUSHED ORE STOCKPILE	1.8
370	FRESH WATER MAKE-UP	31.0	167	TAILINGS	75.7
164	PRECIPITATION	52.9	376	CAMP SITE	5.0
			168	EVAPORATION	0.0
			360	MINE DUST CONTROL	10.0
	TOTAL:	92.5		TOTAL:	92.5

Figure 17-4: Mill Water Balance Model

17.15 TAILING SLURRY TRANSPORT

Thickened tailing is discharged to a final tailing tank, from which the slurry is pumped using two fixed speed horizontal centrifugal pumps, one operating and one standby, (56 kW, 274 m^3/h), to the tailing storage facility (TSF). The tailing pipeline is a DN250/PN16 PE100 HDPE pipe, which is 2,700 m long, 250 mm bore, and will distribute tailing to Zone A spigots as well as to the dump spigot. This pipe connects to a 600 m long, 150 mm bore DN150/PN10 PE100 HDPE distribution header that will deposit tailing through Zones B and C spigots.

Solution from the pond reservoir is reclaimed by two 75 kW barge-mounted turbine pumps, one operating, and one standby. The reclaim solution is pumped to the reclaim solution tank (800 m^3 capacity) through a 700-m long DN225/PN20 PE100 HDPE pipe.

A concrete containment slab on grade and containment walls will contain rain runoff and process spills.

17.15.1 Sodium Carbonate Handling

Sodium carbonate is delivered to the site by trucks and off loaded to two 1700-tonne silo system. The aim is to provide enough storage capacity to supply 28 days of operation. This would provide sufficient buffer capacity for the supply and transport of sodium carbonate from the supplier to the mine site.

Sodium carbonate is added as a solution to the regrind ball mill and to the oxidation tanks, sodium carbonate is diluted in an automatic dilution system located bellow the silos.

17.16 MILL POWER CONSUMPTION

The average annual power consumption in the process plant is tabulated in Table 17-4. The estimated life of mine consumption totals 495.5 million kWh, which translates to about 35.1 kWh/tonne of ore processed.

Table 17-4: Summary of Average Annual Mill Power Consumption (excluding first and last years of operation)

Area No	Mill Area	Annual kWh
100	Primary Crusher	1,754,329
200	Grinding	36,605,379
210	Gravity Concentration	854,048
250	Pebble Crushing	897,786
300	Rougher Flotation	4,498,940
350	Regrind	6,531,320
400	Concentrate Oxidation	3,233,232
500	CIL	1,327,896
600	Tailing Disposal	2,455,290
700	Carbon Handling & Refinery	1,483,199
800	Reagents	750,539
900	Raw Water And Plant Services	2,763,170
	Total	**63,155,129**

17.17 PROCESS CONTROL SYSTEM

A central control room (CCR) is provided in the concentrator grinding facility core, which is the main operating control center for the complex. From the CCR control consoles, primary crushing, material handling systems, grinding and flotation, reagents, tailing, and utility systems is monitored and/or controlled.

A computer room located adjacent to the CCR will contain engineering workstations, a supervisory computer, historical trend system, management information systems (MIS) server, programming terminal, network and communications equipment, and documentation printers. This is primarily used for Distributed Control System (DCS) development and support activities by plant and control systems engineers.

Although the facilities will normally be controlled from the CCR, local video display terminals are selectively provided on the plant floor for occasional monitoring and control of certain process areas. Any local control panels that are supplied by equipment vendors are interfaced with the DCS for remote monitoring and/or control from the related control room.

The DCS will use an Industrial Data Center (IDC), Programmable Logic Controllers (PLC) and Thin Clients or personal computers connected together with a fiber optic network using the Ethernet protocol, a remote input-output (RIO) cabinet with an adequate number of I/O ports on field and a PLC cabinet is in each electrical room. The interaction with these PLCs is through of virtual servers on IDC, using Thin Clients or personal computers running a Virtual Machine with the appropriate Human Machine Interface (HMI) programs. Interactive screens on the monitors will allow process control.

The basic system will incorporate an IDC in server room, PLCs in each electrical room, and two personal computers in the main control room in the grinding area. The remote systems such as well field are controlled from the main control room using a fiber optic or radio communication system.

A supervisory expert system will not be incorporated at this time.

17.18 MOBILE EQUIPMENT

Table 17-5 lists the mobile equipment that is provided in the Project capital cost estimate. The cost for this equipment is included in Owner's Costs. In addition, mobile equipment was included as part of the El Sauzal plant purchase.

Table 17-5: Mobile Equipment List

Description	Qty	Duty
Fire Truck	1	Emergency
Ambulance	1	Emergency
Water Truck	1	General Maintenance
Maintenance Service Truck	3	General Maintenance
20t telescopic crane	1	General Maintenance
150t all-terrain crane	1	General Maintenance
Manlift	1	General Maintenance
Telehandler	1	General Maintenance
Mini Loader	3	General Maintenance
Fork Lifts	2	Warehouse & General

17.19 PRODUCTION ESTIMATE

Production by project year is tabulated in Table 17-6 showing recovered gold and silver.

Table 17-6: Ana Paula Projected Metal Production

Production Year	Au, kOz	Ag, kOz
1	96.8	207.5
2	96.5	180.4
3	127.4	218.3
4	104.7	161.1
5	152.9	174.9
6	89.6	105.7
7	146.0	115.6
8	54.1	76.2
Grand Total	**868.0**	**1,239.7**

18 PROJECT INFRASTRUCTURE

18.1 SITE ACCESS

The Ana Paula Project is located in the state of Guerrero, Mexico, approximately 170 km southwest of Mexico City, roughly equidistant between Mexico City and Acapulco. The Project is accessible from Highway 51 along a stretch of gravel roads that will require some improvement to enable access for the larger trucks carrying heavy mine equipment and supply loads for the mine site. The mine site lies approximately 30 km south of Highway 51, and this section of gravel road can be relatively easily upgraded to service the Project. Iguala is the nearest major city and is serviced by direct airline flights from several major Mexican cities.

The current mine access road is off of the main road between Cuétzala del Progreso and Nuevo Balsas. The access road is approximately 4.5 km from the main road to the plant site. The road from Cuétzala to the mine site will need to be improved to provide access for the larger loads required to construct the Project.

The mine and process facilities are planned to lie between the open pit and the tailing storage facility and at a higher elevation. A crusher station and conveyor will be placed adjacent to the lower saddle point closer to the pit ramp and will deliver the crushed rock to the mill, where further processing will be accomplished.

18.2 TAILING STORAGE FACILITY

Tailing will be transported and deposited via conventional sub-aerial deposition methods, in a valley-type tailing storage facility (TSF), located immediately downstream of the waste management facilities and plant area. The TSF will be contained behind an embankment that will be constructed across a narrow outlet of the valley to reduce construction quantities and costs. Figure 18-1 shows the site plan for the TSF and WRF.

The TSF was sized to contain tailing and storm water runoff. Specifically, the TSF was sized to provide storage capacity for approximately 10.3 million m^3 of tailing (15.5 million tonnes) and the 0.1 percent chance of exceedance water volume. The maximum height of the dam will be approximately 100 m, and the dam will be constructed in four stages over the life of the mine, as presently envisioned. The starter dam (Stage 1) crest will reach elevation 841 (meters above sea level) and the next three stages will reach crest elevations of 849, 855, and 862.

The dam will be a zoned earthfill/rockfill structure, with the upstream face lined with 80-mil HDPE geomembrane. The dam will be constructed using conventional downstream methods, and the zone behind the upstream 80-mil HDPE geomembrane liner will consist of, from upstream to downstream: (1) Core zone, (2) Filter/drain zone, (3) Transition zone, and (4) Rockfill Zone. Both upstream and downstream slopes will be 2H:1V; however, based on rock quality materials slopes may be optimized to reduce construction costs. Figure 18-2 shows sections and details of the tailing dam.

Knight Piésold completed the work for the tailings storage facility in 2017.

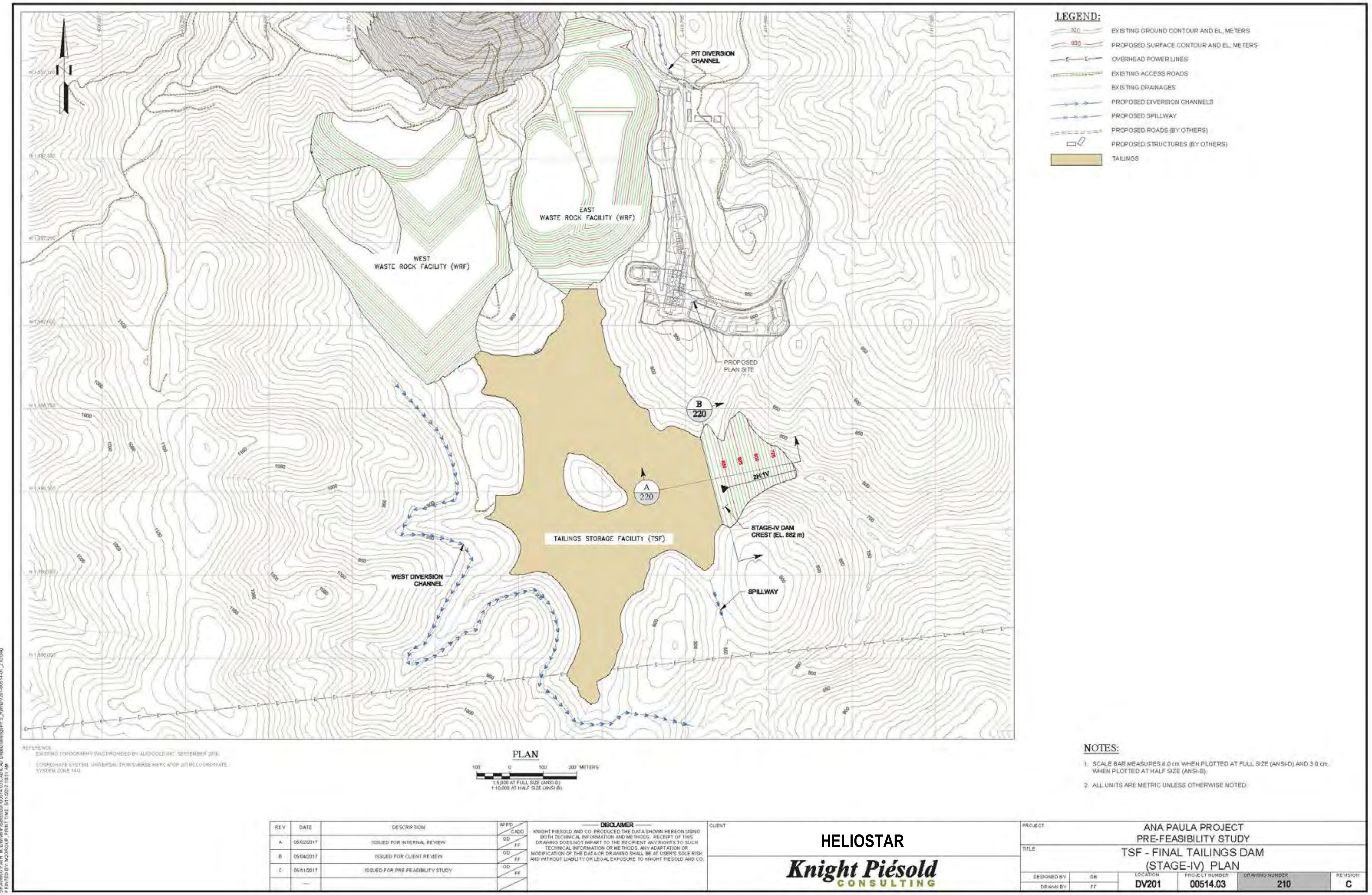


Figure 18-1: Site Plan View of TSF and WRF

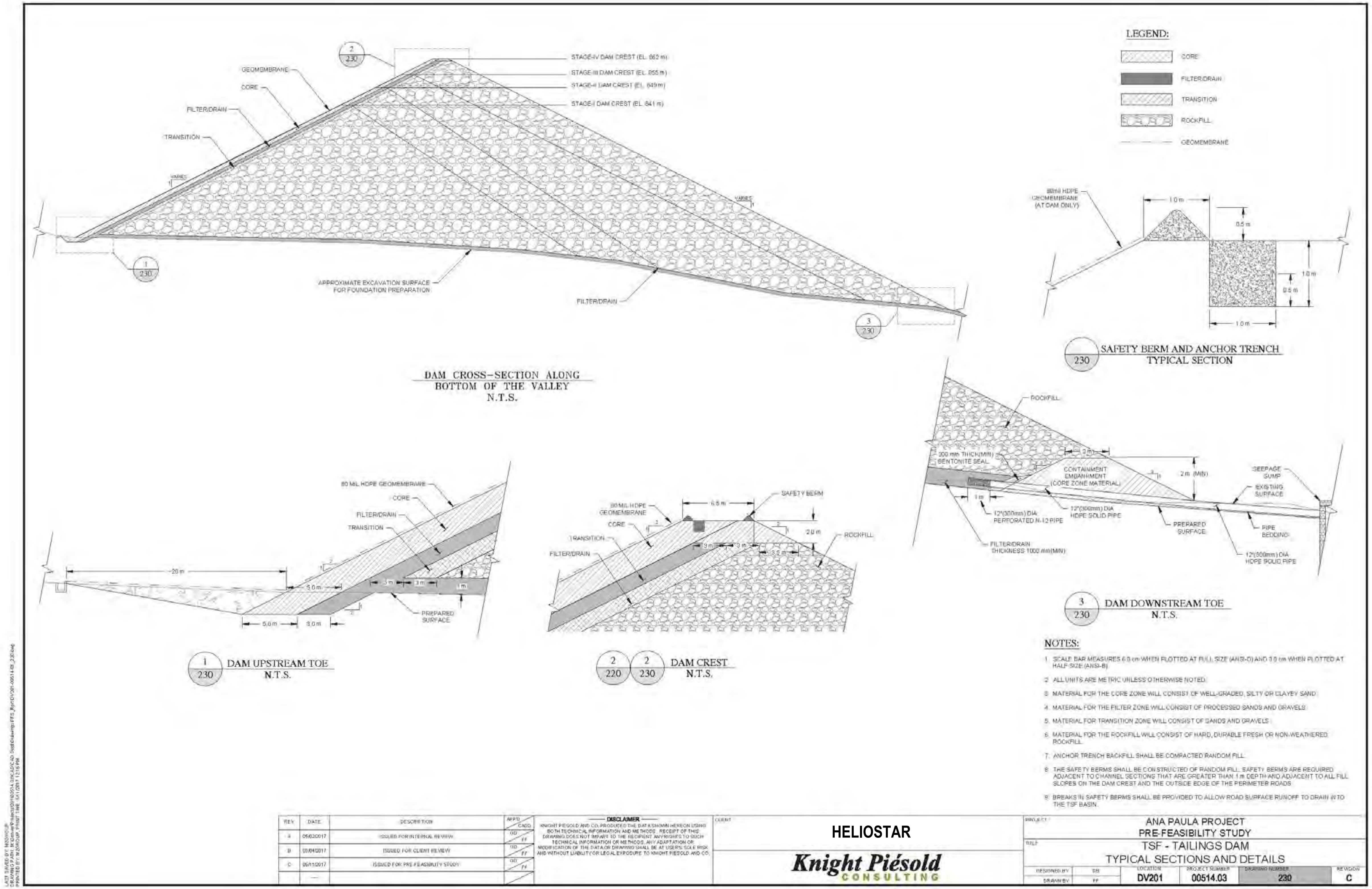


Figure 18-2: TSF Sections and Details

Geochemical characterization was completed for the mine materials, including ore samples, waste rock, and flotation tailing, to determine if the materials would require special waste management practices to prevent environmental impacts. It should be noted that two types of tailing will be generated; about 80% will be flotation tailing and about 20% will be leached tailing. Laboratory testing results for flotation tailing samples show relatively low contents of sulphide and considerable excess neutralization potential (NP). Seepage from the flotation tailings may contain metals at levels of concern. The potential impacts of this will be further assessed during the Feasibility Engineering stage. Characteristics of leached concentrate tailings have not been confirmed yet; once samples are available, testing of this material should be completed prior to finalizing management needs of these materials.

Design of the TSF dam was conducted using the dam safety guidelines developed by the Canadian Dam Association (CDA) for "mining dams". Based on CDA guidelines, the TSF dam was classified as a "high hazard dam", which is a common designation for dams of similar characteristics. Based on this, all design work for the TSF completed to date, including geotechnical analysis and water management, was designed accordingly.

A probabilistic water balance model was developed to perform life-of-mine simulations, including estimations of water transfers and storages. Storage facilities' volume capacity requirements were estimated using deterministic and probabilistic methods. The method that produces the largest storage volume (deterministic or probabilistic) was selected for the design. The dam crest elevation was set based on the 0.1 percent chance of exceedance wet condition, which is a more conservative volume, and could range from 4.3 Mm^3 to 6.8 Mm^3 over the operational life. An emergency spillway has been considered for the last year of operation which would be used as part of the closure plan for the facility.

Two diversion channels upstream of the TSF were included in the design and water balance model (Pit Channel and West Channel). The Pit Channel has been designed to collect natural ground runoff from the contributing area upgradient of the open pit and TSF. The West Channel has been designed to collect natural ground runoff from the contributing area upgradient, and west of the TSF.

According to the Mexican norm, NOM-141 SEMARNAT-2003, the Ana Paula site is classified as in a seismic region. In response, a Probabilistic Seismic Hazard Analysis (PSHA) was conducted for the site and the results were used to calculate the peak ground accelerations at the following return periods: 475-yr; 975-yr; 2,475-yr; 5,000-yr; and 10,000-yr. A Deterministic Seismic Hazard Analysis (DSHA) was also completed for the significant seismic sources near the site. The DSHA produced response spectra for 50th percentile (median) and 84th percentile ground motions estimated for the Maximum Credible Earthquake (MCE) that can be expected to occur at the site, based on currently-available information. The maximum design earthquake (MDE) for the TSF was preliminarily selected based on the site conditions and CDA dam safety guidelines, as having a Peak Horizontal Ground Acceleration (PHGA) of 0.7 g corresponding to a 2,475-yr return period event (g is the acceleration of gravity).

Geotechnical analyses for the TSF included limit-equilibrium stability analyses and deformation analyses for the dam. The analyses were carried out to confirm that the minimum acceptable Factor of Safety (FoS) would be achieved. Simplified seismic-induced deformation analyses were also performed. Based on the geotechnical analyses results, the TSF meets commonly accepted minimum factors of safety and estimated seismic-induced deformations are considered to be acceptable.

For the tailing delivery system, preliminary hydraulic evaluations indicate that a 10-inch diameter HDPE pipe will be required for the main pipeline. Tailing deposition will take place in three zones through a spigot system to meet requirements of overall deposition plans. A single point discharge is included at the north end of the facility to discharge tailing when the downstream tailing pipeline around the facility is out of commission and/or being raised to the next level. The tailing supernatant pond will be located in the northwest side of the TSF remote from the dam, from where the reclaimed water will be pumped back to the plant. The pumps (one duty and one standby) will be housed on a single barge or two connected barges.

Material take offs were completed for the 4 proposed stages of the TSF. Initial and sustaining capital expenditures were estimated based on unit prices provided by M3. Indirect costs for contingency and engineering were not included, but added to the total direct costs by M3.

18.3 WASTE ROCK FACILITIES

Two waste rock facilities (WRFs) have been located downgradient and south of the pit area. The two WRFs will have sufficient capacity to store 53 million tonnes of waste rock at an estimated density of 1.8 t/m^3. Configurations for the WRFs (East and West WRFs) were developed by AGP Mining Consultants Inc. based on the mine plan for the Project. The East facility will have the downstream toe at 840 meters above sea level (masl) and will reach a final elevation of 980 masl. The West facility will have the downstream toe at 848 masl and will reach a final elevation of 1,050 masl. Construction cost estimates for the WRFs were prepared which were limited to foundation preparation. Figure 18-3 shows the WRF sections.

The waste rock material in both facilities will be placed to form slopes of approximately 1.4H:1V. The foundation for the waste rock facilities will be prepared by removing vegetation and topsoil from the area. Slope stability and deformation analyses were completed for the WRFs; based on the results of these analyses, the waste rock facilities meet commonly accepted minimum factors of safety. The estimated seismic-induced deformations for both facilities are acceptable.

Waste rock materials are mostly classified as granodiorite and sediment comprising hard compacted particles. Geochemical analysis results for the waste rock samples tested indicate that it will contain an excess of neutralization potential (NP) over acid potential (AP), with capacity to neutralize potential production of acid solutions. Seepage from the waste rock may contain mobilized metals at levels of concern. This will be further assessed during the Feasibility Level Engineering stage.

Knight Piésold completed the work for the waste rock facilities in 2017.

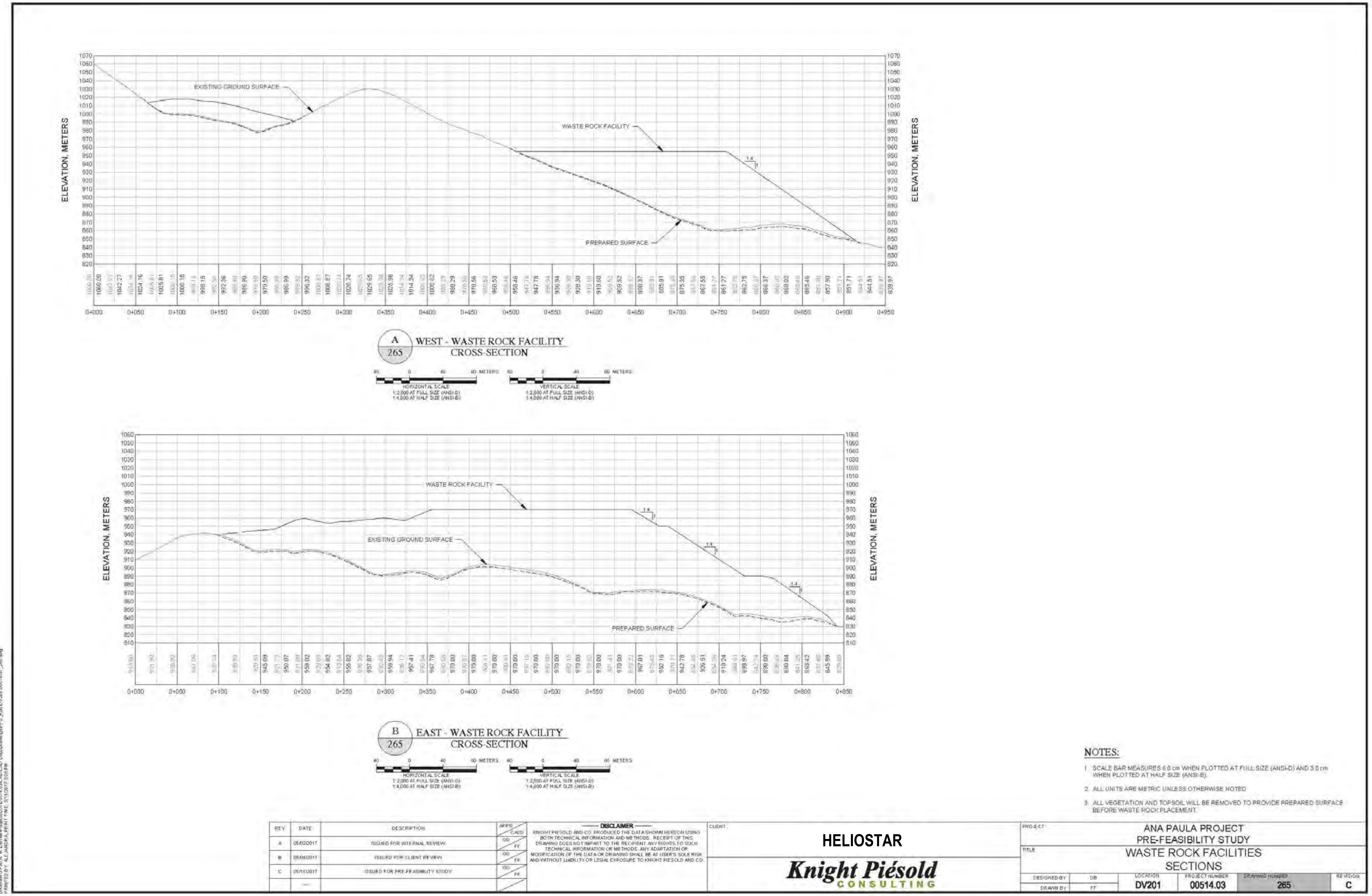


Figure 18-3: Waste Rock Facilities Sections

18.4 PROCESS PLANT

The process plant is located east of the waste rock management (WRM) facilities and southeast of the mine pit (Figure 18-4 and Figure 18-6). Process facilities include the laydown area, initial crushed ore stockpile, primary crusher, mine support buildings, mill area, gravity concentrator, reagents area, flotation, regrind, concentrate thickener, atmospheric oxidation (AOX) leach tanks, carbon-in-leach (CIL) tanks, carbon plant, refinery, cyanide treatment, tailing thickener, oxygen plant, generator area, and electrical substation, as shown in Figure 18-5, Figure 18-7, and Figure 18-8. Adequate warehouse and office space have been accounted for along with sewage treatment and potable water treatment facilities.

18.5 MINE SUPPORT AND ANCILLARY BUILDINGS

Support and ancillary buildings for the site include a covered, partially enclosed equipment maintenance shop, administration office building, fuel storage/dispensing system, truck scale, warehouse, security gate and guard house. The warehouse, permanent laydown area, laboratory, and administration offices are in the southeast corner of the plant area (Figure 18-5). Some additional facilities may be brought in by the contract miner.

Mine support buildings including a warehouse, truck shop, and two mine shops are located in the northern end of the plant area, just east of the primary crusher. The mine service area is located to be near the pit and is next to the stockpile area east of the crusher (Figure 18-5).

The mine scenario evaluated in this technical report includes the construction of an on-site camp capable of housing up to approximately 790 people, located along the mine access road (Figure 18-4). The site camp area is intended to be developed initially for the construction camp and evolve into the permanent operations camp.

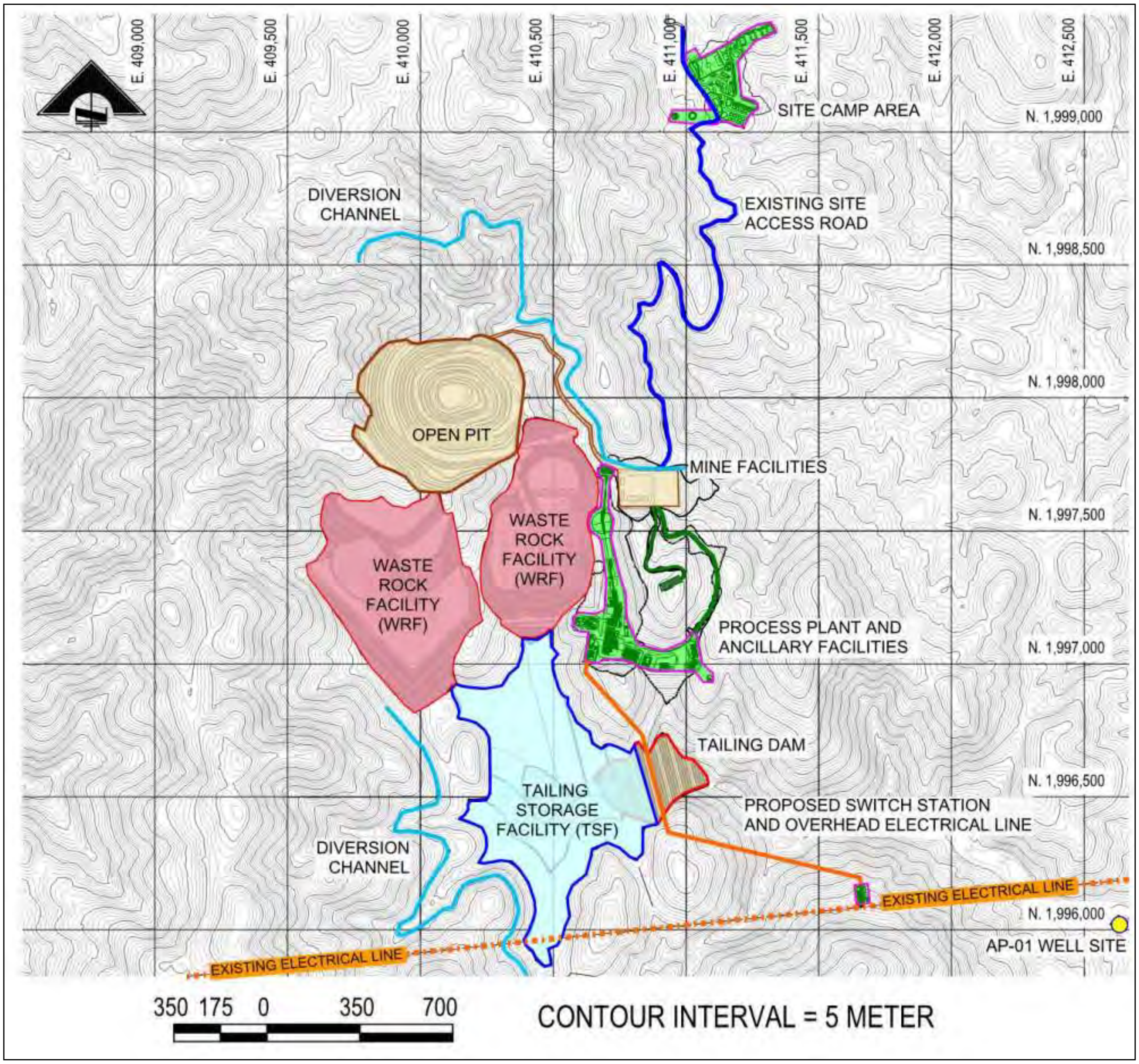


Figure 18-4: Site Layout

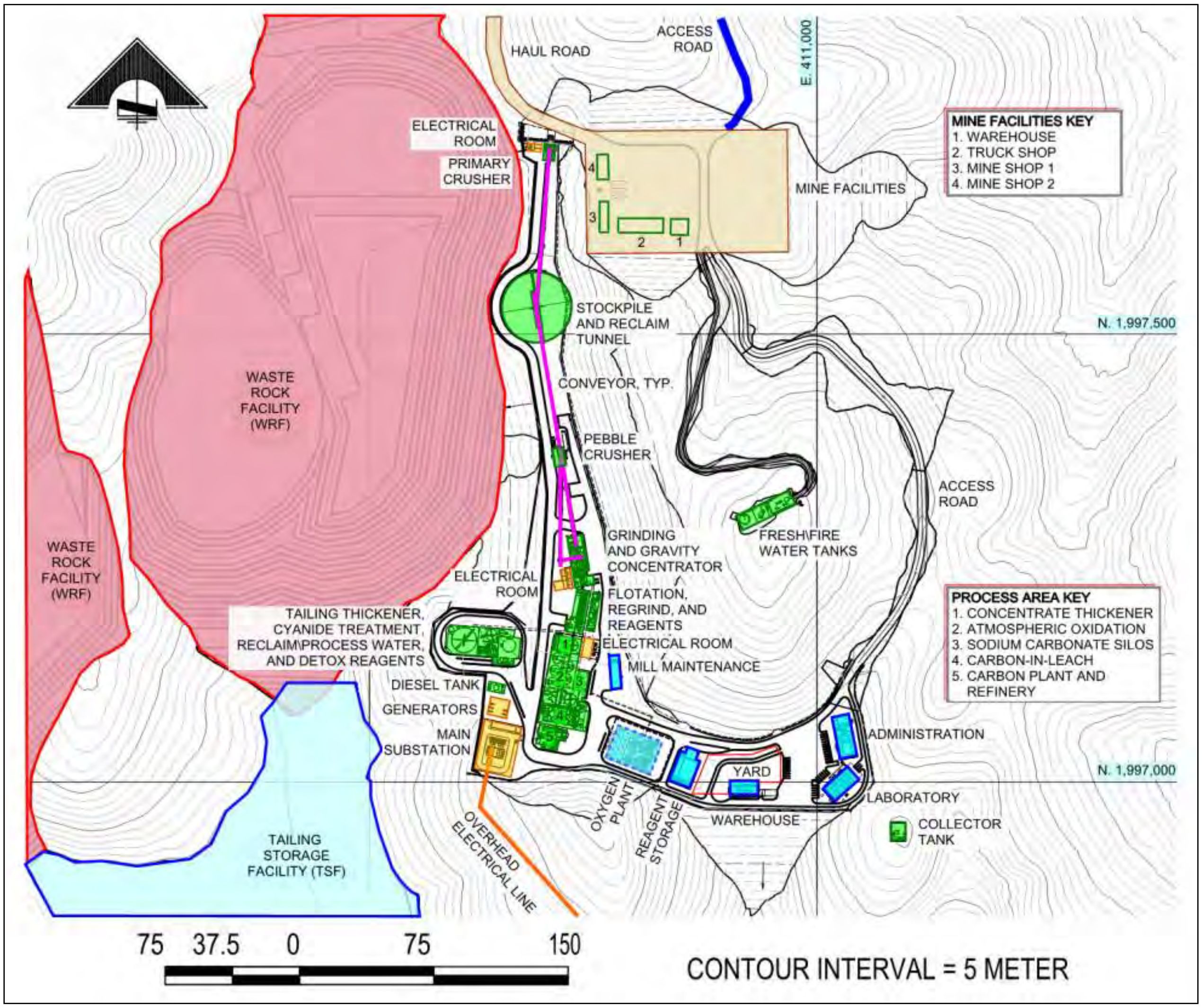


Figure 18-5: Plant Layout

18.6 POWER SUPPLY AND DISTRIBUTION

Line power is available within 2.5 km of the proposed plant site and is supplied via a 115 kV line running generally east-west adjacent to the site property (Figure 18-4). A 1.5 km power line will be constructed with appropriate tie-ins and switching to deliver power at 115 kV to a substation that will be constructed in close proximity to the plant site. The substation will drop the supply voltage to 4,160 V for general distribution around the site and for distribution to the large motor loads such as the crusher facilities. Design power load has been estimated at approximately 15 megawatts (MW).

18.7 WELL FIELD

The power supply for the operation of the well system will be carried out by an existing 34.5 kV overhead line that runs parallel to the Tomixtlacuan road.

18.8 WATER SYSTEMS

Details of the water requirements and management are discussed in Section 17. An average of 83.9 m^3/h of raw water will be required, which will comprise 31.0 m^3/h from the well field and 52.9 m^3/h from the rainfall diversion channel runoff.

Well water will be used for camp site potable water (5.0 m^3/h), mine dust suppression (10 m^3/h), gland seal water (11.6 m^3/h), and crushing dust suppression (1.8 m^3/h). Fire protection water is stored is also derived from well water.

All the runoff water is used as mill makeup water. It is introduced to the mill through the tailing thickener and reaches the reclaim water tank with the tailing thickener overflow.

18.8.1 Fresh and Fire Water

The fresh water supplied to the plant site will come from a well field located approximately 2.5 km from the current proposed plant site. Water will be extracted from two wells by two 37.3 kW (50-hp) pumps through an overland pipe to a collector water tank located at the southeast area of the plant. The collector water tank area will house a grid-based power transformer and diesel generator to supply power to distribution pumps. The collector tank will allow for fluctuations in the well pump system. The collector pumps will pump the water to a centralized fresh and fire water tank, raw water, and potable water tanks. The potable water tank will have an additional line to feed the site camp area head tank.

The Fresh/Fire Water Tank will have grid-based power and a backup diesel generator to supply power to electric distribution pumps. The fresh and fire water are stored in the same tank with fresh water being drawn from the upper portion of the tank and fire water drawn from the bottom portion of tank with a sufficient reserved volume dedicated to fire suppression needs. The fire suppression water pump system will also have a diesel fire pump backup system to provide adequate flow and pressure plant fire hydrants in the event of a fire during a power outage.

Potable water will be produced with use of local chlorination system at the plant site. The potable water supplied to the camp area will have designated water treatment systems for living quarters and food preparation areas. Drinking water is presumed to be imported bottled water.

18.8.2 Reclaim Water

Most of the water used in the process plant will be recycled from the overflows of the concentrate thickener (15.2%), preleach thickener (9.8%), tailing thickener (41.9%) and reclaimed from the TSF (23.7%). Water from the TSF is pumped to the Reclaim Solution Tank. Make-up water will be added, as needed from the Fresh/Fire Water Tank. Reclaimed water includes water from the tailing slurry and stormwater runoff that is captured in the TSF.

Water which comes into contact with the plant site shall be considered contact water. This water is expected to report to a series of channels, sumps, and drains to a small event pond located south of the processing facility. This pond will be designed to handle the required volume of all plant area watersheds. Contact water will be pumped out of the event pond after the fines settle to either the TSF or Process Solution Tank.

18.9 SEWAGE TREATMENT

The sewage discharge at the process plant and ancillary facilities is anticipated to report to a centralized wastewater treatment plant (WWTP) just south of the process facilities. The WWTP is anticipated to have the effluent discharge to the TSF.

The sewage discharge at the construction and permanent camp facilities is anticipated to report to a centralized wastewater treatment plant (WWTP) just north of the campus. A smaller specialized treatment system will be installed at the food preparation facilities to mitigate oils and food solids entering the WWTP.

The WWTP will be designed to meet the demand of the final man-counts and conform to local governing agencies.

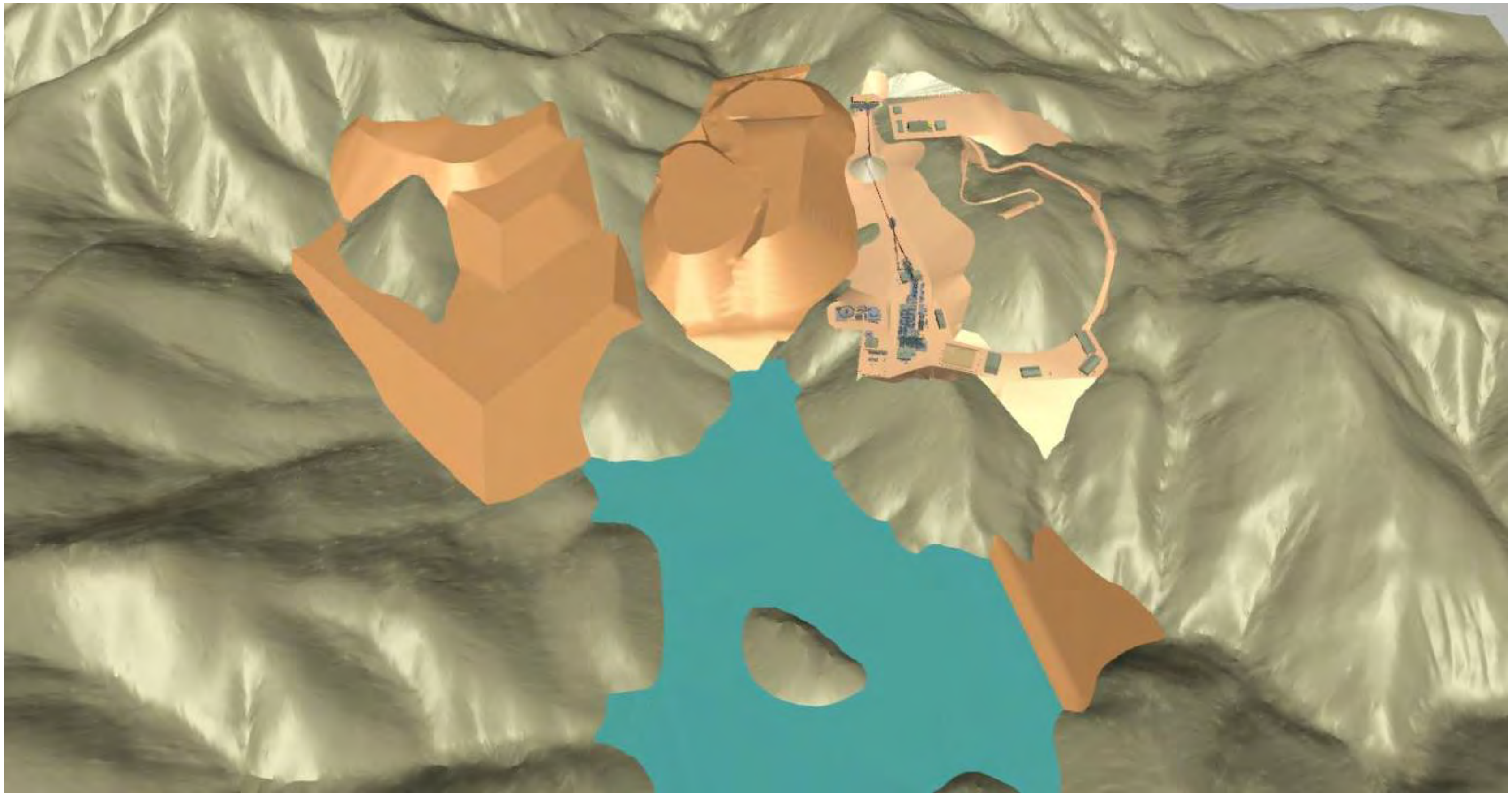


Figure 18-6: Process Plant (Birds Eye Looking North)

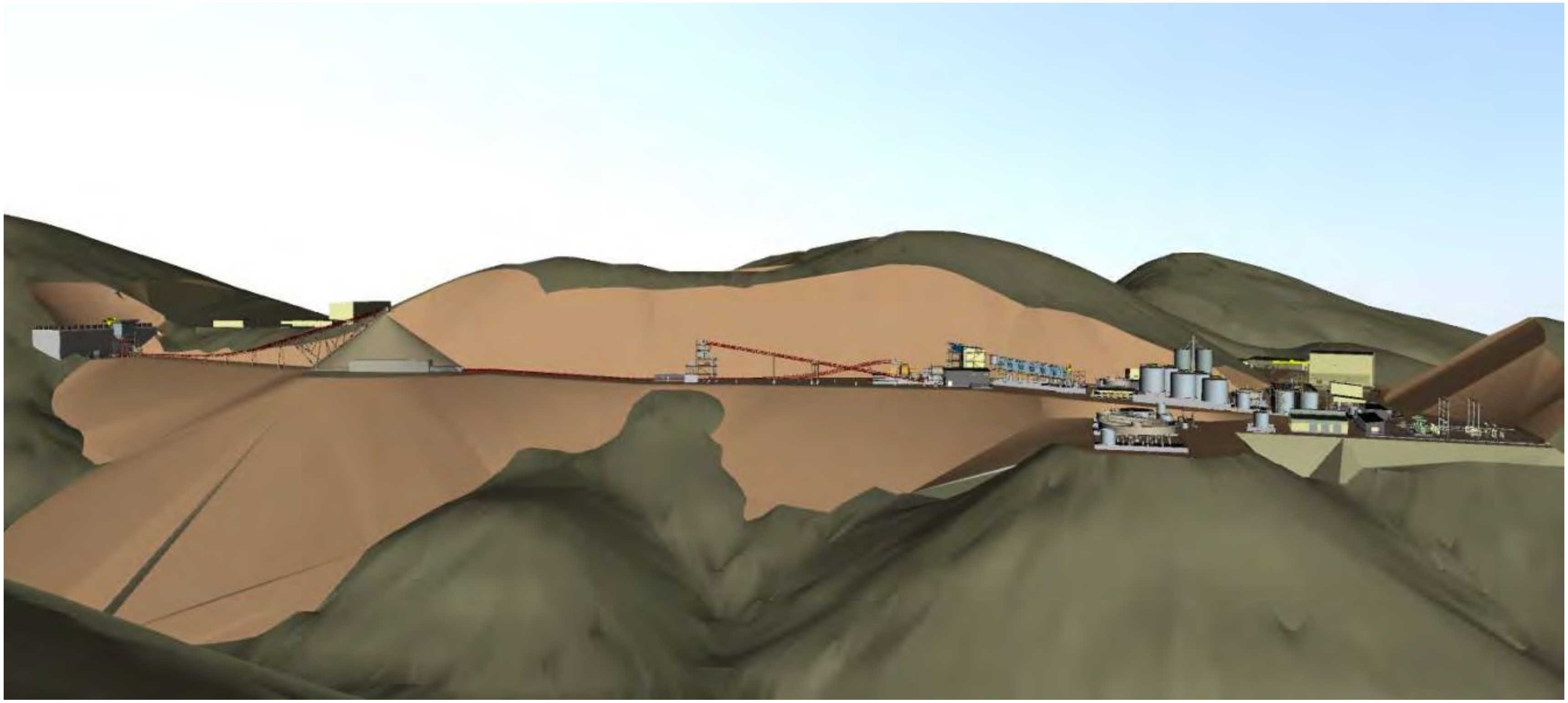


Figure 18-7: Process Plant (View Looking East)

Figure 18-8: Process Plant (View looking Northeast)

19 MARKET STUDIES AND CONTRACTS

19.1 MARKET STUDIES

At this time, no market studies have been completed, as the gold to be produced at Ana Paula can be readily sold in the open market. Gold refining and transport charges were assumed to be $4.00/oz gold equivalent.

19.2 CONTRACTS

No contractual arrangements for concentrate trucking, port usage, shipping, smelting or refining exist at this time. Furthermore, no contractual arrangements have been made for the sale of gold doré at this time.

19.3 ROYALTIES

The Project economic evaluation utilized the following royalties:

- 2.0 percent NSR Royalty to Triple Flag Precious Metals Corp
- 0.5 percent NSR Royalty for Mexican Precious Metals Tax

19.4 METAL PRICES

The base and precious metal markets benefit from terminal markets around the world (London, New York, Tokyo, Hong Kong) and fluctuate on an almost continuous basis. Historical metal prices for gold and silver are shown in Table 19-1 and demonstrate the change in metal price from 2000 to 2022.

Table 19-1: Metal Prices

Year	Gold Price			Silver Price		
	High (US$)	Low (US$)	Cumulative Average	High (US$)	Low (US$)	Cumulative Average
2000	312.70	263.80	279.11	5.45	4.57	4.95
2001	278.85	255.95	271.04	4.82	4.07	4.37
2002	349.30	277.75	309.73	4.85	4.20	4.60
2003	416.25	319.90	363.38	5.96	4.37	4.88
2004	454.20	375.00	409.72	7.83	5.49	6.67
2005	536.50	411.10	444.74	9.23	6.39	7.32
2006	725.00	524.75	603.46	14.94	8.83	11.55
2007	841.10	608.30	695.39	15.82	11.67	13.38
2008	1,011.25	712.50	871.96	20.92	8.88	14.99
2009	1,212.50	810.00	972.35	10.51	19.18	14.67
2010	1,421.00	1,058.00	1,224.53	15.14	28.55	20.19
2011	1,895.00	1,319.00	1,571.52	26.68	48.70	35.12
2012	1,791.75	1,540.00	1,668.98	37.23	26.67	31.15
2013	1,693.75	1,192.00	1,411.23	31.11	18.61	23.79
2014	1,385.00	1,142.00	1,266.40	22.05	15.28	19.08
2015	1,295.75	1,049.40	1,160.06	18.23	13.71	15.68
2016	1,366.25	1,077.00	1,250.74	20.71	13.58	17.14
2017	1,346.25	1,151.00	1257.12	18.56	15.22	17.04
2018	1360.30	1178.75	1,269.49	17.61	13.98	15.71
2019	1,549.59	1,270.36	1,392.60	19.49	14.40	16.22
2020	2056.79	1484.64	1,769.64	28.69	12.17	20.69
2021	1943.20	1683.95	1,798.61	29.59	21.53	25.04
2022	2039.05	1628.75	1,800.09	26.18	17.77	21.71

Base Case pricing is based on a gold price of $1,600/oz gold and $20/oz silver. For mine planning, $1,200/oz gold and $16.00/oz silver was used.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Mining in Mexico is subject to a well-developed system of environmental regulation that applies from the period of mine exploration to mine development, operation and ultimately through mine closure.

In April 2017, the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) approved the “Manifestación de Impacto Ambiental” (MIA), Environmental Impact Statement, submitted by Minera Aurea.

There are presently no known environmental issues that could materially impact Minera Aurea’s ability to extract the mineral resources and process material.

The only known environmental liabilities are associated with the exploration site activities and access roads. Remediation of surface disturbances and removal of residues is required as part of the exploration environmental permits. Exploration activities are ongoing, and closure will be incorporated into the mine closure plan.

20.1 ENVIRONMENTAL STUDIES

An environmental baseline study has been completed for the Ana Paula Project by MC Terra Emprendimientos Sustentables (Terra, 2016).

The Project site is located in a mining district in the Sierra Madre del Sur Mountain range in southern Mexico. Vegetation of the area is primarily tropical deciduous forest. The Project area is not within a known environmental protection area.

Minera Aurea has installed a site-specific weather station at the coordinates W 0411703 N 2004037. Local data for precipitation and temperature have been collected since 2000. Wind speed and direction have been collected since 2012. The area is subject to summer storms and hurricanes.

20.1.1 Climate

Guerrero has a warm climate characterized by hot and humid summers and warm winters. Clear, warm days and cool nights are common during winter months. Average daily high and low temperatures are summarized in Figure 20-1.

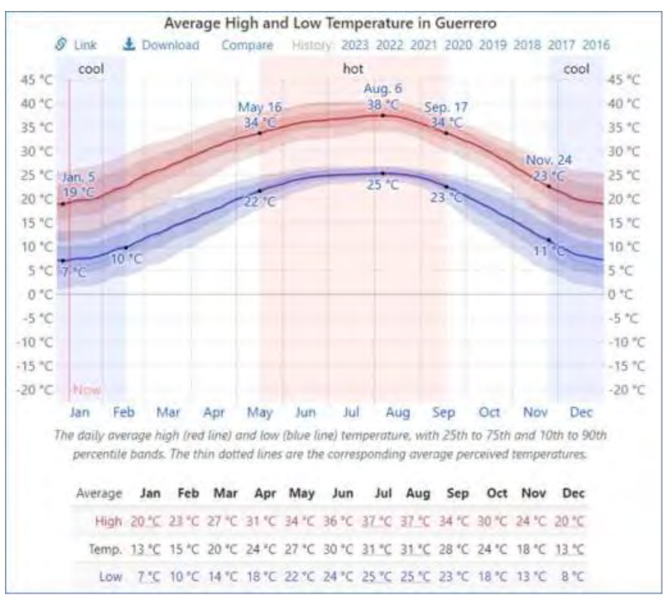


Figure 20-1: Average High and Low Temperatures in Guerrero

The historical information values of the climatological station 12177 Cuétzala del Progreso were used to determine the climatic characteristics of the Project area because its area of influence covers the entire basin of interest. This station has records of daily precipitation data from 1980 to 2013 and statistical temperature data for the same period.

The National Weather Service reports the average normal values of the climatological data recorded in the station (Table 20-1).

Table 20-1: Climate Data Summary

Item	Cuétzala del Progreso Station	
Average Annual Temperature in °C	23	
Absolute Maximum Temperature in °C	42	April 13, 2000
Extreme Minimum Temperature in °C	4	May 15, 1984
Maximum Average Monthly Temperature during Period, in °C	30.7	May
Minimum Average Monthly Temperature during Period, in °C	16.1	December
Maximum Monthly Temperature during Period, in °C	37.4	May 2000
Minimum Monthly Temperature during Period, in °C	6.1	July 2000
Average Annual Precipitation in mm.	874.3	
Maximum Monthly Precipitation in mm.	816	September 2004
Maximum Precipitation in 24 hours in mm.	147.9	July 18, 1995
Highest Rainfall Month	228.9	August
Lowest Rainfall Month	0.6	March
Days with Average Annual Rainfall	78	
Month with more days with rainfall	18.7	August
Month with fewer days with rainfall	0.1	March
Wettest Year, in mm.	3,058.7	1992
Driest Year, in mm.	102.9	1998
Average Annual Evaporation in mm.	No data	
Year with Maximum Evaporation in mm.	No data	
Year with Minimum Evaporation in mm.	No data	

Source: National Weather Service [Servicio Meteorológico Nacional]

The average annual temperature is 23°C; an absolute maximum temperature of 42°C was recorded on April 13, 2000; the extreme minimum temperature with a value of 4°C was recorded on May 15, 1984; the maximum monthly average temperature occurs in May with a value of 30.7°C; the minimum monthly average temperature is recorded in the month of December with a value of 16.1°C; the maximum average monthly temperature was recorded in May 2000 with 37.4°C; and the minimum average monthly temperature was recorded in July 2000 with a value of 6.1°C (atypical data).

On average, there are 78 days with rainfall per year; the average annual precipitation is 874.3 mm. The highest amount of precipitation was recorded in 1992 with 3.058.7 mm. The maximum monthly rainfall recorded is 816 mm in September 2004; the maximum rainfall recorded in 24 hours was 147.9 mm on July 18, 1995. The month with the highest rainfall was August with 228.9 mm and the driest month was March with only 0.6 mm on average from 1980 to 2013.

The calculation of the maximum and maximum design precipitation that could occur in 24 hours for different return periods was carried out, using the Gumbel method (Table 20-2).

Table 20-2: 24-hour Precipitation Maximum and Design Maximum by Return Period

Return Period	Imax (mm)	Design Imax
50	160.41	195.18
100	181.55	216.32
500	230.64	265.41
1,000	251.78	286.55

20.1.2 Groundwater

The Ana Paula Mining Project is located within the Tlacotepec aquifer. In general, this aquifer exhibits geological, geophysical and hydrogeological characteristics of a heterogeneous and anisotropic unconfined aquifer. The upper portion is composed of alluvial and fluvial sediments of various grain sizes, including sandstones, polymictic conglomerates, and tuffs, which are several hundred meters thick towards the center of the valleys. The lower portion is hosted by a sequence of marine sedimentary rocks, primarily limestone from the Morelos formation and sandstone from the Mezcala formation, with intrusive and metamorphic igneous rocks also present. The lower portion of the aquifer is dominated by secondary permeability due to fracturing and dissolution of calcareous rocks. Calcareous aquifer units can be confined or semi-confined if they are overlain by less permeable strata, such as shale or siltstone.

In some areas of the mining project, signs of artesian conditions have been found. The aquifer in the Project area can be classified as confined or semi-confined based on geological characteristics and the artesian conditions.

20.1.3 Water Quality

Geochemical characterization of waste rock has resulted in the following conclusions to date.

- Waste rock is unlikely to produce acid, but there is sufficient excess neutralizing capacity to neutralize any acid produced.
- Seepage from the waste rock may contain mobilized metals in concentrations that could pose environmental concern.
- This will be further assessed during the Feasibility Level Engineering stage for the waste rock facility.

Geochemical characterization of flotation tailing has resulted in the following conclusions to date.

- The flotation tailing are non-acid generating and have a net neutralizing potential (NNP).
- Seepage from the flotation and the detoxed leachate concentration tailings may contain metals at levels of concern.
- This will be further assessed during the Feasibility Level Engineering stage.

20.1.4 Water Quantity

Process water will be supplied primarily from the rainwater collected in the tailing facility with a make-up water supply provided by a well field located approximately 2.5 km from the plant site. Potable water for the mining operation is planned to come from the local well field.

A hydrologic study is required to characterize the local groundwater conditions. A permit to take water is required from the Comisión Nacional del Agua (CONAGUA).

20.2 PERMITTING

Guidance for the federal environmental requirements, including conservation of soils, water quality, flora and fauna, noise emissions, air quality, and hazardous waste management, derives primarily from the Ley General del Equilibrio Ecológico y la Protección al Ambiente (“LGEEPA”), the Ley General para la Prevención y Gestión Integral de los Residuos and the Ley de Aguas Nacionales (“LAN”). Article 28 of the LGEEPA specifies that SEMARNAT must issue prior approval to parties intending to develop a mine and mineral processing plant. On June 7, 2013, the Federal Law of Environmental Liability (Ley Federal de Responsabilidad Ambiental) was enacted. Per this law, any person or entity that by its action or omission, directly or indirectly, causes damage to the environment will be liable and obliged to repair the damage, or to pay compensation in the event that the repair is not possible. This liability is in addition to penalties imposed under any other judicial, administrative, or criminal proceeding.

Environmental permitting in the mining industry in Mexico is mainly administered by SEMARNAT, the federal regulatory agency that establishes the minimum standards for environmental compliance. SEMARNAT has set regulatory standards for air emissions, discharges, biodiversity, noise, mining wastes, tailing, hazardous wastes, and soils. The regulatory standards apply to construction and operation activities.

There are three main SEMARNAT permits required prior to construction and development of a mining project. An Environmental Impact Statement (MIA) must be filed with SEMARNAT for its evaluation. Approval by SEMARNAT is granted through the issuance of an Environmental Impact Authorization. The Ley General de Desarrollo Forestal Sustentable indicates that authorization for land use changes to industrial purposes must be obtained from SEMARNAT. An application for change in land use or Cambio de Uso de Suelo Forestal, must be accompanied by a technical study that supports the environmental permit application (Estudio Técnico Justificativo or “ETJ”). In cases requiring a change in forestry land use, a Land Use Environmental Impact Assessment (Cambio de Uso de Suelo Forestal e Impacto Ambiental) is also required. Mining projects also need to include a risk analysis for the use of regulated substances (Análisis de Riesgo) and an accident prevention program, which are reviewed and authorized by an interministerial governmental body.

Following the receipt of the Change of Land Use Authorization, there are several permits that need to be acquired from various federal agencies. The Land Use Authorization is required by the CONAGUA, an agency within SEMARNAT, to issue water extraction and discharge concessions, and specifies certain requirements to be met by applicants. Mexico recognizes water as a national resource and regulates the use of water through the CONAGUA. The aquifer targeted for supply of the groundwater needed for the Ana Paula Project site will require a new water concession application to be made with the CONAGUA. A water concession will need to be granted by CONAGUA based on a permit application. The permit application will need to be supported by a technical study demonstrating that water availability and sufficient quantity exist in the area. A water discharge and usage must be granted by the CONAGUA.

Other key permits include approval from the National Water Commission for construction of the tailing dam in creek basins that are considered to be federal zones. An archaeological release letter is required from the National Institute of Anthropology and History (“INAH”). An explosives permit is required from the Ministry of Defense (“SEDENA”) before construction begins. A project-specific environmental license (Licencia Ambiental Única or “LAU”,) is issued by SEMARNAT when the agency has approved the project operations, which delineates the operational conditions and requirements to be met.

Local permits include a construction permit from the local municipality. Other local permits regarding non-hazardous waste handling and municipal safety and operating authorizations may also be required. The permitting process requires that the mining company has acquired the necessary surface titles, rights, and agreements for the land to be used for the Project.

Hazardous wastes from the mining industry are highly regulated and specific handling requirements must be met once they are generated, such as hazardous waste generator documentation, logbooks, and handling manifests. Hazardous waste storage areas must comply with federal requirements.

Minera Aurea submitted an MIA for the Ana Paula Project in December 2016 with approval granted in April 2017.

The key permits and the stages at which they are required are summarized in Table 20-3.

Table 20-3: Key Remaining Permits Required

Permit	Mining Stage	Agency	Comments
Land Use Change - ETJ & Land Use MIA	Construction/Operation	SEMARNAT	Received MIA Regional 2017 – 2031 Received CUS ETJ October 2017-October 2022
Risk Analysis	Construction/Operation	SEMARNAT	Received
Construction Permit	Construction	Municipality	Not applicable
Explosive & Storage Permits	Construction/Operation	SEDENA	Outstanding
Archaeological Release	Construction	INAH	Received for the mill area and restricted in some areas
Water Use Concession	Construction/Operation	CNA	Outstanding
Water Discharge Permit	Operation	CNA	Water discharge for campsite only
Project-specific License (LAU)	Operation	SEMARNAT	Required upon commencing operation
Accident Prevention Plan	Operation	SEMARNAT	Only applicable upon commencing and if cyanide is used

20.3 SOCIAL AND COMMUNITY IMPACT

The first phase of the socio-economic baseline study was completed in the area of influence defined by the municipality of Cuétzala del Progreso (Minera Aurea, 2017). Metrics measured by field survey included current economic situation, way of life, and family and social environment. The statistical analysis of the survey data has been completed.

The estimated population of the area of influence is about 5,890 inhabitants. The surrounding land supports subsistence-level agriculture, including production of corn, beans, cattle, and mangoes. It is a rural area with small towns that has a high level of social programs for the underprivileged. The largest town in the area is Cuétzala del Progreso with a population of around 2,500 located 7.5 km from the mine site. The populations of the towns located in the Project area are provided in Table 20-4. There are no communities under direct physical impact from the future mine operations.

Various social processes, such as those related to land acquisition and hiring local labor, have not created conflict or opposition from local stakeholders.

Table 20-4: Towns and Populations in the Ana Paula Project Area

Municipality	Town	Total Population
Cuétzala del Progreso	Ahuaxotitla	530
Cuétzala del Progreso	Cuaxilotla	540
Cuétzala del Progreso	San Francisco de la Lagunita	266
Cuétzala del Progreso	Tomixtlahuacan	288
Cuétzala del Progreso	San Luis	101
Cuétzala del Progreso	Cuétzala del Progreso	2,319
Cuétzala del Progreso	Tianquizolco	877
Cuétzala del Progreso	Apetlanca	969
	Total	**5,890**

Data from INEGI, National Institute of Statistics & Geography Mexico

Local workers for the prefeasibility stage activities are sourced primarily from Cuétzala del Progreso. Minera Aurea employs 38 workers from the local communities. There is a locally accepted process for labor hiring opportunities in the Project. It is anticipated that about 35 percent of the area's population is actively working and could be employed in the proposed mining operations as general labor, domestic help, technicians, and office employees.

Minera Aurea has direct ownership and land access agreements in terms of 10- and 30-year leases for 100% of the land required for the Project. Depending on the land, package agreements are negotiated with individual landowners or with community groups.

Minera Aurea interacts directly with the municipal president of Cuétzala del Progreso for local permitting and to provide support to the community.

Minera Aurea maintains a small community relations team on site. Activities carried out as part of the community relations have included economic support and material support to the unions; Christmas holiday parties for the workers; participation and representation in annual sporting events in Cuétzala del Progreso; and support to schools in terms of machinery, materials, sports uniforms, prizes, and donation of medical supplies. Minera Aurea has commenced work on the establishment of a stakeholder engagement system which will be initiated during the feasibility stage of the Project. Minera Aurea's internal policy for social responsibility and community relations is based on respect, equality, and transparent communication with stakeholders.

20.4 CLOSURE AND RECLAMATION

Knight Piésold (2017b) have developed a conceptual closure plan for the TSF and WRFs. The conceptual closure plan components for the TSF and WRFs are presented in Figure 20-2. In general, the closure components include:

- Installation of a closure cover for the tailing surface and growth media soil layer (topsoil) for the dam downstream slope and waste rock slopes. The cover system for the tailing surface shall be durable and chemically stable and reduce wind erosion and animals burrowing into the tailing material.
- Placement of a growth media soil layer to facilitate revegetation for the designated disturbed areas.
- Partial grading on the TSF basin to promote positive drainage for runoff toward the spillway.
- Retention of a pond in the north side of the TSF basin that will capture runoff from the up-gradient catchment areas, including the reclaimed tailing surface and WRFs' slopes.
- Construction of a spillway for the final year of operation used for closure to release water during flood periods.
- Infiltration of rainfall on the WRFs will be allowed.

- Protection of site access and perimeter protection is part of the site-wide closure.
- Closure of access roads to the facilities using berms.
- Retention of the seepage sump as part of the post-closure monitoring program.

M3 developed a conceptual closure plan for the plant site and ancillary works. In general, the closure components include:

- Decommissioning
  - Internal closure planning would begin in the 1- to 3-year period prior to closure, as well as closure-related engineering and characterization studies and permitting activities.
  - The decommissioning process would initiate at the early stages of closure and would include the decommissioning of all cyanide materials and equipment.
  - Equipment associated with the mill site and other facilities will be removed from the site to be used in other projects, recycled, or disposed of in an approved landfill. Appropriate methods would be put in place for decommissioning procedures for hazardous materials and equipment.
  - Lubricants, oils and other industrial materials will be disposed of in accordance with applicable regulations.
- Demolition
  - Unless required for another use, building foundations will be demolished, covered, or removed from the site as per Mexican regulatory requirements applicable at the time of closure. If the foundations are required to remain for another use, management of them will be part of closure activities.
  - Power lines feeding electricity to the process plant will be decommissioned and removed.
- Rehabilitation
  - Breaking/perforating and backfilling foundations and sumps, recontouring for positive drainage, covering disturbed areas with growth media, re-establishing natural drainages, and revegetating with native species will be conducted.
  - The process site will be graded to promote surface water drainage. This includes earthworks for waste storage facilities, and plant area, as needed, to shed stormwater and to re-establish natural drainages.
  - Reclamation and re-vegetation of disturbed land will follow.
- Post-closure environmental monitoring and maintenance will follow.
- The areas of the open pits, tailing, and former plant site will be restricted from public access.
- The site closure and reclamation activities are estimated to take approximately three years, assuming some concurrent reclamation.

Knight Piésold and M3 estimated a closure cost of $10.0 M.

It is assumed that reclamation will be concurrent with mining activities to the extent practical. Closure and reclamation planning will be incorporated into the ultimate mine and tailing designs and implemented during operation to minimize end-of-mine closure liabilities. See Figure 20-2.

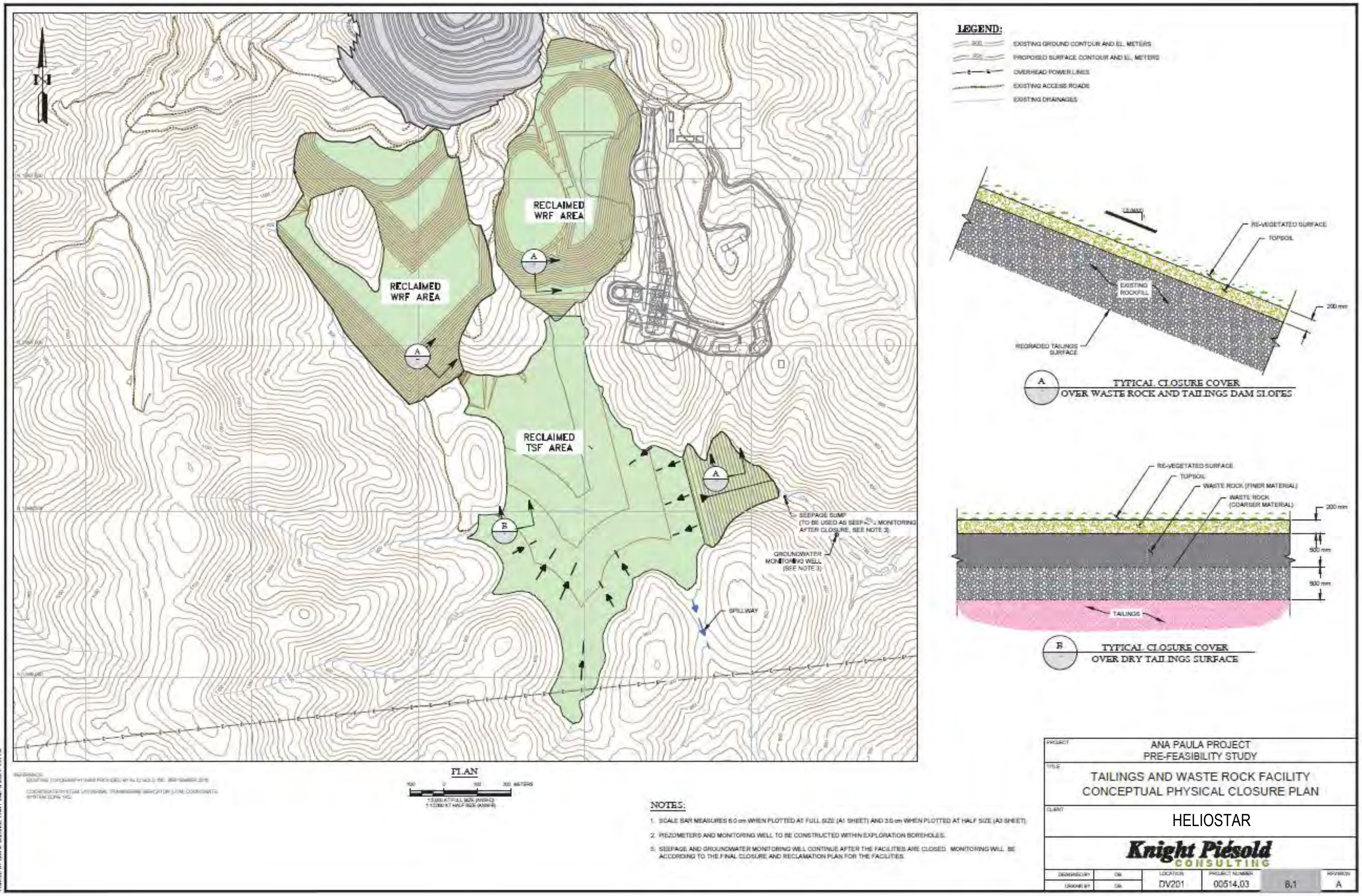


Figure 20-2: Tailing and Waste Rock Facility Conceptual Physical Closure Plan

21 CAPITAL AND OPERATING COSTS

21.1 CAPITAL COST

The capital cost estimate (CAPEX) is based on a combination of first-principles build-up, experience, reference projects, budgetary quotes and factors as appropriate with a Prefeasibility Study.

The CAPEX estimate includes the costs required to develop, sustain, and close the operation for the planned 8-year mine life. The construction schedule is based on an approximate 1.75-year build period. The intended accuracy of this estimate is ±10% to +30%. The initial CAPEX estimate summary is shown in Table 21-1.

Table 21-1: Capital Costs

Area	Initial Capital (US$M)
Mine Capital	
Pre-Strip and Mine Establishment	24.2
Mining Equipment	0.5
Miscellaneous Mine Capital*	5.3
First-Year Capital Expense	3.5
Total Mine Capital	**33.5**
Process Plant Capital	
Process Plant, General, Site Utilities	98.3
Tailings/Waste Facilities	13.6
Permanent Camp	4.2
Mobilization, Bussing and Construction Camp	6.0
EPCM	17.1
Owner's Costs**	37.8
Commissioning Cost	1.9
Contingency***	21.2
Total Process Plant Capital	**200.0**
Total Capital	**233.6**

* Miscellaneous mine capital includes engineering office equipment, dewatering systems, RC rental and mine roads
** Used equipment refurbishment and transport to site, misc. other owner's costs
*** Contingency calculated as 15% of Directs + Indirects + EPCM

21.1.1 Mine Capital Cost

The mining for the Prefeasibility Study is based on engaging a local contractor to perform the mining and maintenance operations at Ana Paula. This minimizes Heliostar's mining equipment capital requirements. Contractors have the ability to quickly mobilize.

The mine capital costs are summarized in Table 21-2. All costs are expressed in Q1 2023 US dollars. The Mexican Peso to United States Dollar exchange rate was assumed to be 20.00 Mex$ to US$1.00 for this estimate.

Table 21-2: Capital Cost Summary – Mining

Capital Category	Preproduction Capital Year -2, -1 US$M	Sustaining Capital US$M	Total Capital US$M
Pre-Production Stripping	24.2	-	24.2
Mining Equipment	0.5	1.0	1.5
Miscellaneous Mine Capital	5.3	4.2	9.5
Total	**30.0**	**5.2**	**35.3**

Initial capital requirements (pre-production) are estimated to be US$30.0 million and include pre-production mining which is capitalized. The pre-production activities for the contractor include drilling, blasting, mining of ore and waste, road construction, stockpile creation and other mine services. Heliostar will be responsible for ore control and dewatering and therefore will require an ore control RC drill and a dewatering pump service truck. The RC drill is rented initially then purchased in the production period.

Table 21-3 shows the open pit capital unit costs by equipment.

Table 21-3: Mining Capital by Period

Equipment	Total US$	Initial Capital Years -2, -1 US$	Sustaining US$
Mining Equipment			
Ore Control Drill	647,000	-	647,000
Pump Truck	300,000	300,000	-
Pickup Trucks	600,000	200,000	400,000
Subtotal	**1,547,000**	**500,000**	**1,047,000**
Miscellaneous Mine Capital			
Engineering Office Equipment	750,000	750,000	-
Dewatering System – pumps/piping	170,000	85,000	85,000
RC Drill Rental	200,000	200,000	-
Pit Access Roads	8,373,600	4,273,700	4,099,900
Subtotal	**9,493,600**	**5,308,700**	**4,184,900**
Contractor (Year -2 and -1 Stripping)	24,236,000	24,236,000	-
Total Mine Capital	**35,276,600**	**30,044,700**	**5,231,900**

21.1.1.1 Miscellaneous Mine Capital

The miscellaneous mine capital includes various separate line items in the costing:

- Engineering Office Equipment
- Pit Access Road Construction and Upgrading
- Contractor Pre-stripping
- Dewatering Pumps and Piping

The engineering office equipment includes such items as desktop computers, plotter, digitizer, licenses for mining and geology software and survey equipment with associated peripherals. This cost is estimated at US$750,000 with the majority of the cost being the mining software.

Proper road construction is considered imperative to maintaining efficient mining. This was quoted by the contractor for both single and double lane widths. Proper road construction includes compaction, and crushed rock. An estimate of US$791,000/km is used for 23.5 m wide roads and US$890,000/km for 17.8 m wide roads based on actual design locations. The single lane roads are in difficult terrain and are used primarily for access to the upper benches of each phase.

Dewatering is a key component of stable wall slopes. This will be accomplished with pumps and piping to remove the water from the pit. The dewatering system is a set of pumps for in the pit with piping to bring this to the surface storage ponds. US$170,000 is allocated for this with the cost split evenly between Year -2 and Year 1.

The fleet of equipment proposed by the Contractor is shown in Table 21-4.

Table 21-4: Contractor Mining Equipment by Period

Equipment	Capacity	Units in Preproduction Year -2, -1	Units Year 1 to 9
Drill Rig	Atlas Copco FlexiROC T40	2	2
Wheel Loader 6.4 m^3	Caterpillar 988H	1	1
Excavator 6.0 m^3	Caterpillar 390DL	3	3
Truck 54 t	Caterpillar 773F	10	10
Dozer	CAT D8T	2	2
Grader	CAT 16H	2	2
Water Truck	Scania / Volvo	1	1
Fuel / Lube Truck	Scania / Volvo	1	1
Excavator	Komatsu PC450	1	1

Budgetary quotations from two local contractors were used to determine a contract mining cost of US$3.08/t moved during the mine operating period which includes ore control and Heliostar overheads.

21.1.1.2 Pre-Production Stripping

The mine is scheduled to initiate mining in Year -2. The material moved will be used to develop the mine roads and provide ore for the stockpile. A total of 7.5 Mt of ore and waste will be mined by a contractor during Years -2 and -1.

This is expected to cost US$22.2 million or US$2.97/t material moved for the contractor and an additional US$2.1 million for the Heliostar functions for a total cost of US$3.25/t moved in Years -2 and -1. This includes all costs associated with Heliostar management, dewatering, engineering and geology department of labor and ore control.

These construction activities have typically less productive hauls due to narrower working conditions, and longer hauls than normally scheduled for the waste material. The narrow roads mean that the trucks will have to turn around on narrow road widths requiring back and forth movement to negotiate the turns. This plus extended reversing of the loaded trucks to the dumping point results in longer truck cycle times and has been factored into the haulage times.

21.1.2 Process Plant and General & Site Utilities Capital Cost

Process capital costs were based on the flowsheet developed by testwork. Major equipment items were based on budgetary quotations or recent database. All capital costs are expressed in US dollars (Table 21-5). Allowance for piping and electrical were utilized to build up the direct cost estimate.

All major equipment items, including mills, crushers, tanks, thickeners were calculated based on parameters from testwork results or calculated based on estimated parameters from similar projects. Existing equipment purchased from El Sauzal was used when possible. General and site utilities include power line, substation blowers, oxygen plant support facilities, mass excavation, etc. The complete details are included in the detailed CAPEX produced by M3.

Table 21-5: Process Plant and General & Site Utilities Direct Capital Costs

Area	Description	Total (US$)
	PROCESS PLANT	
100	Primary Crushing	3,394,824
200	Grinding	8,230,073
210	Gravity Concentration	2,461,147
250	Pebble Crushing	3,373,754
300	Flotation	4,609,694
350	Regrind	8,732,147
400	Atmospheric Oxidation	9,144,025
500	CIL	5,902,956
600	Detox Reagents (M3 Costs)	4,970,581
610	Tailings (Knight Piésold Costs)	13,640,756
700	ADR & Refinery	8,248,999
800	Reagents	8,510,589
900	Ancillaries	2,061,714
	Subtotal PROCESS PLANT DIRECTS	**83,281,259**
	GENERAL & SITE UTILITIES	
000	Master General	15,565,268
010	Switching Substation	2,499,699
905	Guardhouse	235,012
910	Laboratory	526,656
920	Warehouse	880,188
925	Permanent Camp (allowance – unit cost per client quote)	4,222,200
930	Reagent Storage	294,749
940	Mill Maintenance	762,833
950	Administration Offices	460,953
960	Mine Maintenance	687,639
970	Truck Scale	285,925
	Subtotal GENERAL & SITE UTILITIES DIRECTS	**26,421,122**
	Freight	6,479,220
	Subtotal PROCESS PLANT, GENERAL & SITE UTILITIES DIRECTS	**116,181,600**

21.1.3 Tailing Storage Facility (TSF) and Waste Rock Facility (WRF) Capital

Tailing storage facility consists of 4 stages plus closure and reclamation. Material take-offs were done by Knight Piésold and include mobilization and demobilization, TSF dam construction, TSF basin, tailing distribution system, perimeter roads, diversion channels and spillway, crushing and screening of material, instrumentation and closure and reclamation. M3 prepared the cost estimate based on these material takeoffs using M3's historical unit costs. Summary of TSF capital and sustaining capital is shown in Table 21-6.

Table 21-6: Tailing Storage & Waste Rock Facilities Capital and Sustaining Capital

Activity Description	Stage-I (Year-0)	Stage-II (Year-2)	Stage-III (Year-4)	Stage-IV (Year-6)	Closure/ Reclamation	Totals
TSF	**(US$)**	**(US$)**	**(US$)**	**(US$)**	**(US$)**	**(US$)**
Mobilization & Demobilization	1,153,321	365,295	438,176	587,788	711,540	3,256,120
TSF Dam	10,237,598	2,038,944	4,050,384	4,275,378	11,881	20,614,186
TSF Basin	560,940	83,434	73,415	94,856	0	812,644
Tailing Distribution System	849,495	414,171	462,855	721,492	0	2,448,013
Water Reclaim System	387,028	0	0	0	0	387,028
Perimeter Roads, Diversion Channels, & Spillway	574,292	1,286,780	0	1,066,305	0	2,927,376
Crushing & Screening	148,361	21,465	17,769	24,917	0	212,511
Instrumentation	25,984	9,315	18,630	18,630	0	72,559
Closure and Reclamation	0	0	0	0	6,390,234	6,390,234
WRF						
Mobilization & Demobilization	26,800	0	0	0	198,143	224,943
WRF Foundation Preparation	1,107,230	0	0	0	0	1,107,230
Closure and Reclamation	0	0	0	0	2,443,172	2,443,172
QA/QC & Surveying	452,132	126,235	151,420	203,122	292,648	1,225,557
Total Costs (US$)	**15,523,180**	**4,345,637**	**5,212,649**	**6,992,488**	**10,047,618**	**42,121,572**

21.2 OPERATING COSTS

The operating cost estimates are based on a combination of first-principles build-up, reference projects, budgetary quotes and escalation factors as appropriate for a preliminary study.

These costs include direct mining and re-handle by a contractor, and processing and disposal of the mineralized feed to the plant including doré produced on-site and transportation and refining charges, Table 21-7.

Table 21-7: Operating Costs Summary

Operating Cost	$/t ore processed	LOM $M
Mining	11.18	157.8
Processing	21.02	296.8
G&A	2.44	34.4
Refining Charge	0.26	3.7
Total	**34.90**	**492.7**

‡Mining Cost is based on $3.08/t material mined

21.2.1 Mining Operating Costs

Mine operating costs are estimated from base principles by the contractors. The exchange rate for the Mexican Peso to US Dollar is set at 20.00 Mex$:1 US$.

Diesel fuel costs are estimated from quotations from the contractors to complete the various work activities with their fleets. A value of US$1.10/L of diesel is used in the operating cost calculations net of taxes.

Labor costs for the various job classifications were obtained from Heliostar and compared to other labor costs in the AGP database and reviewing other operations. These rates were used and included the appropriate burden for each category to cover items such as health care, vacation and federal holidays. The mine labor is based on a 12-hour shift schedule.

The mine staff labor is to provide a supervisory and support role to the contractor. After initial recruitment in the pre-production period (Year -2), the level remains constant at 11 staff and 2 hourly, but reduces slightly after Year 6 during the later years of mining. The Staff positions include a Mine Operations Superintendent, Engineering and Geology, while the hourly employees will be responsible for dewatering operations. The staff workforce for Year -2, is shown in Table 21-8. This includes the loaded annual salary for each position.

Table 21-8: Heliostar Staff and Hourly Requirements (Year-2) with Annual Salaries

Heliostar Staff Position	Employees	Annual Salary US$/y
Mine Operations		
Mine Operations Superintendent	1	136,600
Mine Engineering		
Senior Engineer	1	48,800
Open Pit Planning Engineer	1	42,300
Surveyor/Mining Technician	2	26,900
Clerk/Secretary	1	18,100
Geology		
Senior Geologist	1	48,800
Grade Control Geologist/Modeler	2	26,900
Sampling/Geology Technician	2	21,800
Mine General		
General Mine Laborer	2	17,100
Total Staff and Hourly	**13**	

The proposed contractor workforce is shown in Table 21-9 and is the same for the pre-production and mining (Years 1 - 9). Table 21-9 shows the requirements for day shift, night shift and the shift on leave; however, the average number of personnel required per day is only 60.

Table 21-9: Proposed Contractor Personnel Requirements

Contractor Position	Employees
Project Manager	1
Mine Supervisor	3
Safety Supervisor	3
Project Controller	1
Surveyor	2
Project Assistant	1
Maintenance Superintendent	1
Maintenance Supervisor	1
Administrator / HR	1
Admin Assistant	1
Logistic Assistant	1
Dispatcher	2
Cleaner	1
Driver (support equipment)	3
Mechanic	3
Electrician	2
Welder	2
Tire worker	2
Mechanic helper	3
Drill rig operator	3
Drill rig helper	3

Contractor Position	Employees
Loader operator	6
Truck operator	22
Dozer operator	6
Grader operator	3
Water truck operator	3
Diesel / lube truck operator	3
Excavator operator	3
Total	**86**

Haulage profiles were determined for each pit phase for the primary crusher or the waste rock management facility destinations. These profiles were provided to the contractor for use in their estimation of haulage costs.

To avoid confusion and potential conflicts, the contractor's bids were based on bank cubic meters (BCM's) rather than by tonnage. Payment will also be based on BCM.

21.2.1.1 Grade Control

Grade control is an item that was considered from the beginning of the mine planning sequence. Blast hole sampling may be employed in the future depending on the results of a future gold deportment study but for this estimate are not considered. A reverse circulation program in advance of mining using tight inclined drill hole spacing to accurately define the ore/waste contacts has been included in the cost estimate. This ore-waste boundary information is then built into the short range models and then marked in the field to guide the loading equipment. This practice is widespread and has had great success in Australia, Canada and Brazil.

The method involves using a dedicated grade control drill rig and crew in the pit to drill a series of shallow inclined holes at approximately 70 degrees. The pattern for drilling will be a 5 m spacing and a 4 m burden with samples taken every 1 m in presumed mineralized zones as outlined by both previous ore control drilling and the exploration drilling. The samples spacing is to be verified with a gold deportation study to be completed in the future.

The amount of reverse circulation drilling peaks in Year 2 at 44,900 m then drops off after that averaging 38,000 m/a from Year 2 until Year 8. This is only for the reverse circulation drilling rig.

The reverse circulation drills will operate for 16 h/d to minimize disturbance and be in advance of mine operations with the information. A three-person crew per drill is required; one driller and two drill helpers. In addition, geologists will provide guidance throughout the day and be on call if unknown issues arise.

The drill penetration rate is estimated at 25 m/h with set-ups, sampling, etc. Overall, the cost for the drill without labor will be US$165/h or about US$6.61/m drilled. From an overall mine operating cost perspective, the reverse circulation drill sampling program costs $0.10/t mined.

The data from the grade control drilling is then interpreted by the geologist and the ore is contacts / zone are remodelled. Where possible, the production drilling and blasting is then sequenced to excavate the ore material separate from the waste.

21.2.1.2 Dewatering

Pit dewatering will be an important function at the Ana Paula Mine. Groundwater is not present, but precipitation averages 835 mm per year. Rainfall occurs from June through October during a monsoonal tropical wet season that includes the influence of hurricanes from both the Atlantic and Pacific oceans. Winters are dry with occasional light rains in February.

The dewatering cost estimate is broken into two components:

- In-pit.
- Ex-pit.

In-pit includes the pumps, sumps, pipelines responsible for moving water from the pit to the pit rim and beyond plus any additional items. Two general mine laborer positions and a pump service truck have been included to perform dewatering activities.

Ex-pit pumps will pick-up the water from the storage ponds and push it to the various discharge points around the mine property.

The capital cost estimate for the dewatering system is US$85,000 in Year -2 and another US$85,000 in Year 1. This includes the cost of pumps and piping.

21.2.1.3 Contract Services

Two local contractors have provided budgetary quotations for contract mining services at Ana Paula. The main responsibilities of the contractor and client are summarized as follows:

Contractor

- Drilling ore and waste.
- Loading and hauling ore and waste, including stockpile rehandle.
- Provide and maintain all equipment required to fulfill the contract.
- Provide a camp for contractor personnel, to be located on the mining property. Contractor to provide their own meals.
- Building and maintaining haul and access roads.
- Crushing material for road base.
- Manage all waste according to regulations and best practice.
- Provide site security.

Client (Heliostar)

- Provide a workshop.
- Provide diesel, power, and water.
- Hold the explosives licence, supply explosives, supply magazines, load explosives and conduct the blasting. A third party will be contracted to supply these services.
- Ore control and well drilling.
- Pit dewatering activities.
- Geotechnical monitoring.

Based on various quotations received from contractors during the preparation of the technical report, a contract mining cost of US$2.97/t moved is applied to all tonnes in preproduction (Years -2 and -1) and US$2.97/t moved for the production (Years 1 to 8) periods.

The contract mining costs in Years -2 and -1 were capitalized. Costs associated with the ore control and dewatering are to Heliostar's account and also capitalized in Years -2 and -1.

21.2.1.4 Total Mine Operating Costs

The total life of mine operating costs per tonne material mined and per tonne of ore processed are shown below in Table 21-10 and Table 21-11. Drilling, blasting, loading and hauling costs are included in the Contract Services rate.

Table 21-10: Open Pit Mine Operating Costs ($/t Total Material)

Open Pit Operating Category	Unit	Year 1	Year 3	Year 5	Year 1 - 8 Average Cost
General Mine and Engineering	US$/t	0.07	0.07	0.10	0.08
Drilling	US$/t	-	-	-	-
Blasting	US$/t	-	-	-	-
Loading	US$/t	-	-	-	-
Hauling	US$/t	-	-	-	-
Support	US$/t	0.02	0.02	0.03	0.02
Grade Control	US$/t	0.08	0.07	0.11	0.09
Dewatering	US$/t	-	-	-	-
Contract Services	US$/t	2.97	2.97	2.97	2.97
Total	**US$/t**	**3.13**	**3.13**	**3.20**	**3.16**

Table 21-11: Open Pit Mine Operating Costs (US$/t Ore)

Open Pit Operating Category	Unit	Year 1	Year 3	Year 5	Year 1 - 8 Average Cost
General Mine and Engineering	US$/t	0.38	0.36	0.36	0.30
Drilling	US$/t	-	-	-	-
Blasting	US$/t	-	-	-	-
Loading	US$/t	-	-	-	-
Hauling	US$/t	-	-	-	-
Support	US$/t	0.12	0.11	0.11	0.10
Grade Control	US$/t	0.40	0.37	0.39	0.37
Dewatering	US$/t	-	-	-	-
Contract Services	US$/t	15.58	14.80	10.58	10.43
Total	**US$/t**	**16.45**	**15.60**	**11.41**	**11.20**

21.2.2 Process Operating Costs

Operating costs were based on the design criteria calculated from testwork, labor rates (2 shifts at 12 hours/day) from previous projects, quotations and estimates for chemicals and grid power. The total annual cost (year 3) for operating the process plant is $38,365,109 when operating at full load or $21.31/tonne processed.

Table 21-12: Labor Costs

Operations	Staff	Annual Cost (US$000)
Mill Superintendent	1	120
Metallurgist	1	90
Plant Technician	2	41
Shift Foreman	4	207
Mill Clerk	1	21
Control Room Operators	4	124
Loader Operators	4	95
Crushing Operators	4	95
Grinding Operators	4	95
Flotation Operators	4	95
Conc Oxidation/CIL Operators	4	95
ADR Operator	4	95
Gold Room Operator	2	58
Tailing Operator	4	95
Lab Manager	1	94
Lab Metallurgical Technician	2	41
Assay Technicians - Senior	2	41
Assay Technicians - Junior	4	66
Sample Prep Labors	4	66
Total	**56**	**1,637**
Maintenance		
Mill Maintenance Superintendent	1	120
Mill Maintenance Foremen	2	104
Planner/Schedular/Reliability	1	50
Mechanics	8	207
Electrician	4	108
Instrument Technicians	4	124
Crane / Equipment Operators	2	48
Helpers- Elec/Mechanical	8	132
Maintenance Total	30	892
Total	**86**	**2,529**

Reagent costs are based on M3 benchmark prices or escalated vendor quotations from the previous study. Sodium hydroxide and hydrochloric acid unit costs are estimated using M3 benchmark prices. Consumption rates are calculated from testwork or estimated based on common factors. Soda ash consumption rate is taken directly from testwork. The soda ash reagent cost is from a vendor budgetary quotation. All reagent costs are subject to change based on market conditions.

Table 21-13: Reagents Costs at Full Plant Capacity

Reagents	kg/t ore	$/kg	US$/t ore (Yr 3)	Yearly Cost-Yr 3 (US$)
Flotation				
Frother	0.03	3.95	0.12	213,300
3418A	0.043	14.57	0.63	1,127,718
Copper Sulfate	0.100	2.50	0.25	450,000
PAX	0.079	3.95	0.31	561,690
Atmospheric Oxidation/CIL				
Cyanide	0.240	2.47	0.59	1,067,040
Flocculant	0.040	4.50	0.16	283,500
Carbon	0.040	1.70	0.07	122,400

Reagents	kg/t ore	$/kg	US$/t ore (Yr 3)	Yearly Cost-Yr 3 (US$)
Antiscalant	0.015	4.28	0.06	115,560
HCl	0.010	0.88	0.01	15,873
NaOH	0.012	1.43	0.02	30,953
Lime	5.10	0.17	0.84	1,514,701
Soda Ash	24.00	0.39	9.45	17,005,686
Oxygen	31.14	0.06	1.72	3,099,813
Detox				
Lime	0.0	0.17	0.0022	3,920
Cyanide	0.140	2.47	0.0	0
SMBS	0.016	0.95	0.0030	5,472
Copper Sulfate	0.0	2.50	0.0	0
Total			**14.23**	**25,617,628**

Infrastructure to support the process plant includes access to grid power. The total power consumption for the Ana Paula Plant is estimated based on an equipment list developed from the flowsheet with equipment sizing based on a calculated mass balance. Major equipment sizing calculations were performed to provide power associated with crushers, mills, agitators, and pumps. Miscellaneous lighting and small power is included in estimate at 2% of annual kWh consumed.

Table 21-14: Power Usage and Cost ($0.080/kWh)

Process Area	kWh/t	$/t (Yr 3)	Yearly Cost-Yr 3 ($US)
Primary Crusher	0.97	0.078	140,346
Grinding	20.34	1.627	2,928,432
Gravity Concentration	0.47	0.038	68,324
Pebble Crushing	0.50	0.040	71,823
Rougher Flotation	2.50	0.200	359,915
Regrind	3.63	0.290	522,506
Concentrate Oxidation	1.80	0.144	258,659
CIL	0.74	0.059	106,232
Tailing Disposal	1.36	0.109	196,423
ADR and Refinery	0.82	0.066	118,656
Reagents	0.42	0.033	60,043
Raw Water and Plant Services	1.54	0.123	221,054
Total	**35.09**	**2.81**	**5,052,412**

Steel consumption is based on estimates for liner replacements and ball consumption of similar sized plants with high rock hardness.

Table 21-15: Mill and Crusher Liners and Grind Media Costs

Liners	US$/t ore (Yr 3)	Yearly Cost-Yr 3 (US$000)
Crusher	0.078	140
SAG Mill	0.264	476
Ball Mill	0.065	118
Pebble Crusher	0.009	17
Regrind Mill	0.026	47
Grinding Media		
SAG Mill	0.515	928
Ball Mill	0.328	590
Regrind Mill	0.184	331
TOTAL	**1.47**	**2,646**

Maintenance parts, service and labor cost was estimated as an allowance of 5% of Plant equipment cost per year. A fixed yearly cost was estimated for supplies. Summary of maintenance cost is shown in Table 21-16.

Table 21-16: Supplies & Maintenance Costs

Area	US$/t ore (Yr 3)	Yearly Cost-Yr 3 (US$000)
Crushing	0.05	82
Grinding	0.32	574
Flotation	0.36	644
Atmospheric Oxidation & CIL	0.30	536
Tailing	0.09	164
ADR & Refinery	0.21	376
Ancillaries	0.58	1,037
Total Maintenance	**1.90**	**3,413**

21.2.3 General and Administration Operating Costs

G&A labor is comprised of 39 administrative staff for the following functions:

- Management
- Accounting
- Human Resources
- Safety
- Medical
- Community Relations
- Environment
- Purchasing
- Training

Costs for G&A are summarized in Table 21-17.

Table 21-17: Costs for G&A

Cost Area	US$/t ore	US$000/y
Labor & Fringes	0.97	1,745,000
Property & Business Interruption Insurance	0.28	500,000
Administrative	0.11	200,000
Accounting	0.08	150,000
Human Resources	0.08	150,000
Community Relations	0.11	200,000
Safety and Environmental	0.08	150,000
Purchasing	0.08	150,000
Travel Expenses	0.06	100,000
Vehicles	0.08	150,000
Camp Operation Cost	0.61	1,095,000
Total	**2.55**	**4,590,000**

22 ECONOMIC ANALYSIS

An engineering economic model was developed to estimate annual cash flows and sensitivities of the Project using a discounted cash flow (DCF) methodology. Pre-tax estimates of project values were prepared for comparative purposes, while after-tax estimates were developed and are likely to approximate the true investment value. It must be noted, however, that tax estimates involve many complex variables that can only be accurately calculated during operations and, as such, the after-tax results are only approximations.

Sensitivity analyses were performed for variations in metal prices, operating costs, capital costs, and discount rates to determine their relative importance as project value drivers.

This technical report contains forward-looking information regarding projected mine production rates, construction schedules and forecasts of resulting cash flows as part of this technical report. The mill head grades are based on sufficient sampling that is reasonably expected to be representative of the realized grades from actual mining operations. Factors such as the ability to obtain permits to construct and operate a mine, or to obtain major equipment or skilled labor on a timely basis, to achieve the assumed mine production rates at the assumed grades, may cause actual results to differ materially from those presented in this economic analysis.

The estimates of capital and operating costs have been developed specifically for this project and are summarized in Section 21 of this technical report (presented in Q1-2023 US dollars). The economic analysis has been run with no inflation (constant dollar basis).

22.1 ASSUMPTIONS

One metal price scenario was utilized to prepare the economic analysis. However, a sensitivity analysis on the metal prices was completed and outlined in Section 22.8.

All costs, metal prices and economic results are reported in US dollars unless stated otherwise. LOM plan tonnage and grade estimates are demonstrated in Table 22-1. Mexican Peso exposure is estimated at 15%, the MXN:USD rate used is 18.62:1.

Table 22-1: LOM Plan Summary

Mine Life	Years	8
Total Reserve	M tonnes	14.1
Total Waste	M tonnes	43.0
Total Capitalized Waste	M tonnes	7.0
Total Mined	**M tonnes**	**57.1**
Strip Ratio (Operations)	w:o	3.04
Mining Rate (Maximum)	t/d	24,658
Plant Throughput (Maximum)	t/d	4,932
Average Head Grades		
Au	g/t	2.38
Ag	g/t	5.61
Metal Produced		
Au	LOM k oz	919
	k oz/yr	115
Ag	LOM k oz	1,402
	k oz/yr	175

Economic factors include the following:

- Discount rate of five percent (sensitivities using other discount rates have been calculated for each scenario).
- Reclamation & Closure cost of $10.0 million was considered.
- Nominal 2023 US dollars.
- Revenues, costs, taxes are calculated for each period in which they occur rather than actual outgoing/incoming payment.
- Results are presented on 100 percent ownership.
- No management fees or financing costs (equity fund-raising was assumed).
- Exclusion of all pre-development and sunk costs up to the start of detailed engineering (i.e. exploration and resource definition costs, engineering fieldwork and studies costs, environmental baseline studies costs, etc.).

Table 22-2 outlines the metal price assumptions used in economic analysis. This pricing used in the parameters established for mine planning were $1,600/oz gold and $20.00/oz silver.

The reader is cautioned that the gold prices used in this technical report are only estimates based on recent historical performance and there is absolutely no guarantee that they will be realized if the Project is taken into production. The metal prices are based on many complex factors and there are no reliable long-term predictive tools.

Table 22-2: Metal Prices used in the Economic Analysis Scenarios

Parameter	Unit	Base Case
Gold Price	US$/oz	1,600
Silver Price	US$/oz	20.00

22.2 REVENUES & NSR PARAMETERS

Mine revenue is derived from the sale of doré into the international marketplace. No contractual arrangements for refining exist at this time. Details regarding the terms used for the economic analysis can be found in the Market Studies Section 19 of this technical report. Table 22-3 indicates the NSR parameters that were used in the economic analysis. Figure 22-1 and Figure 22-2 show breakdowns of the amount of payable gold and silver that would be produced during the mine life – a total of 919 koz of gold and 1,402 koz of silver is produced during the mine life. Figure 22-3 shows that less than 2% of the revenue would come from silver.

Table 22-3: NSR Parameters Used in Economic Analysis

Inputs & Assumptions		
Operating Days	days per year	365
Recoveries		
Au Recovery		85.0%
Ag Recovery		55.0%
NSR Parameters		
Au Payable		100.0%
Ag Payable		100.0%
Treatment & Refining Charge	US$/oz	$4.00
NSR Royalty		2.0%

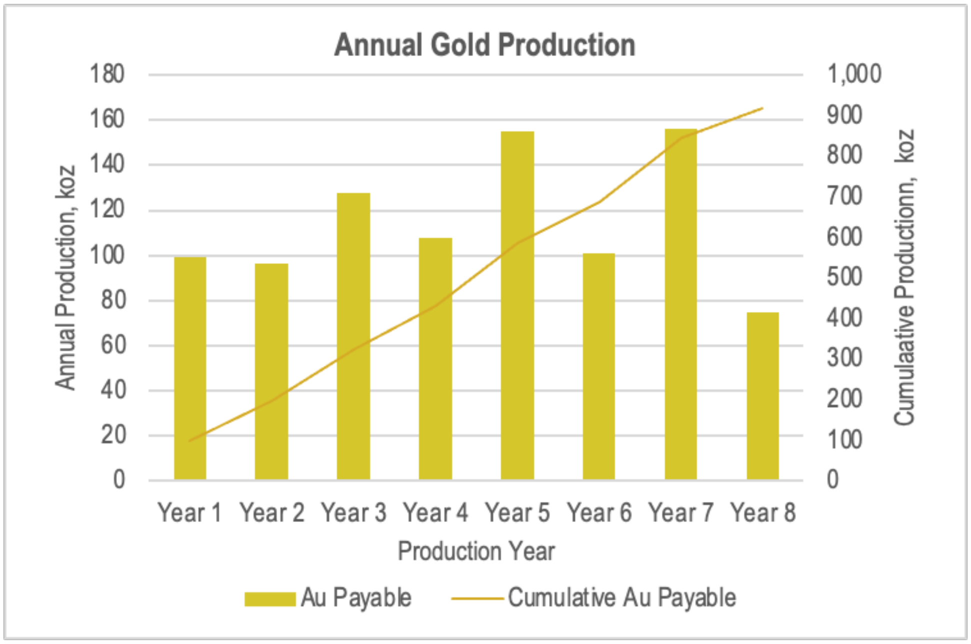


Figure 22-1: Payable Gold Doré Production by Year

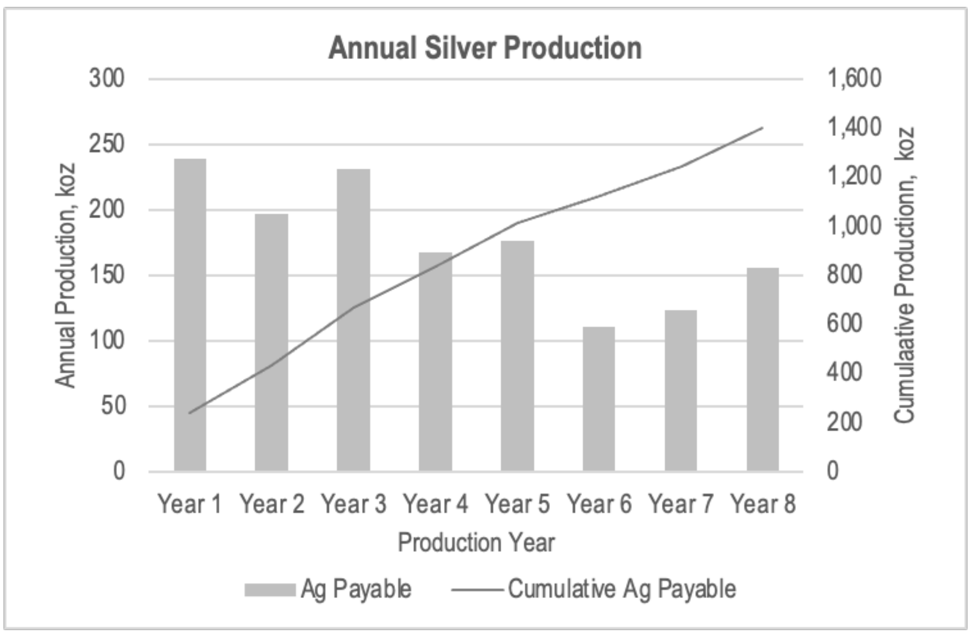


Figure 22-2: Payable Silver Doré Production by Year

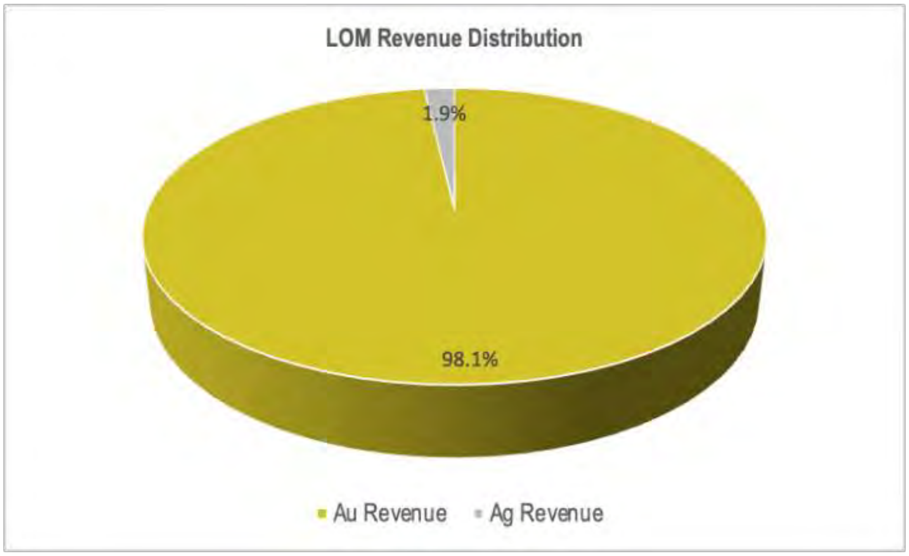


Figure 22-3: LOM Project Net Revenue Breakdown

22.3 SUMMARY OF CAPITAL COST ESTIMATE

The initial capital costs amount to $233.6. This includes costs for pre-stripping, site development, processing plant, on-site infrastructure, tailing management facility, etc. A contingency is included in the initial capital costs which is 15% of the sum of Directs (Process Plant, General & Site Utilities, Tailing Storage & Waste Rock Facilities, Camps), Indirects and EPCM. A breakdown of the initial capital costs is shown in Table 22-4.

Sustaining and closure capital cost estimates amount to $24.0M and were assumed to occur from Year 1 to Year 8. A breakdown of the sustaining and capital costs is also shown in Table 22-4.

An allowance for working capital is incorporated into the financial model assuming a 15-day receipt delay of revenue and 30-day payment delay of payables. All working capital is recaptured by the end of the Project.

Details on the capital costs can be found in Section 21 of this technical report. For the cash flow analysis, mining capital cost expense in Year 1 was treated as initial capital, to be consistent with the process plant estimate.

Table 22-4: Summary of LOM Capital Costs

Capital costs	Initial Capital ($M)	Sustaining Capital ($M)
Process Plant, General & Site Utilities	98.3	
Mobilization, bussing and construction camp	6.0	
Tailing Storage & Waste Rock Facilities	13.6	16.6
Permanent Camp	4.2	
EPCM	17.1	
Commissioning Costs	1.9	
Owner's Costs	37.8	5.6
Contingency	21.2	
Pre-Strip and Mine Establishment	24.2	
Mining Equipment	1.1	0.4
Miscellaneous Mine Capital	8.2	1.4
Total Capital	**233.6**	**24.0**

22.4 SUMMARY OF OPERATING COST ESTIMATES

Total LOM operating costs amount to $489.0M. The total LOM operating costs translate to an average cost of $34.64/tonne processed. A breakdown of these costs is outlined in Table 22-5 and Figure 22-4. Additionally, Section 22.5 provides further details of the royalties, treatment and refining charges included in operating costs.

Table 22-5: Summary of Operating Costs*

Operating Cost	$/t processed	LOM $M	$M/yr
Mining**	11.18	157.8	19.7
Processing	21.02	296.8	37.1
G&A	2.44	34.4	4.3
Total	**34.64**	**489.0**	**61.1**

*Excludes Refining Charge. **Mining cost is based on $3.08/t material mined.

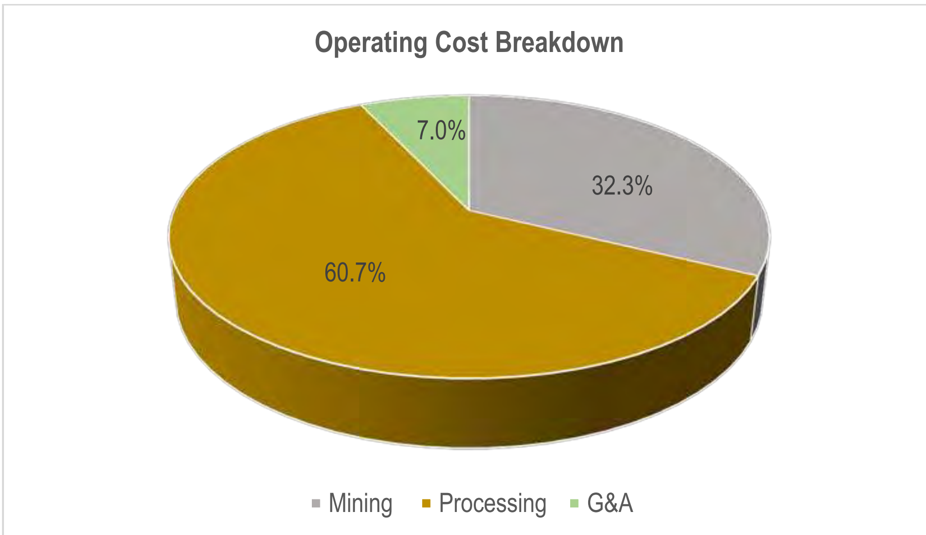


Figure 22-4: Breakdown of Operating Costs

22.5 ROYALTIES, TREATMENT & REFINING CHARGES

The economic analysis for the Project accounts for the following royalties:

- 2.0 percent NSR royalty for Triple Flag Precious Metals Corp.
- 0.5 percent NSR royalty fee for Mexican precious metals companies.
- Treatment and refining charges estimated at $4/ounce of gold sold.

Total NSR royalties, treatment and refining charges for the LOM amount to $33.6M.

22.6 TAXES

The Project has been evaluated on an after-tax basis in order to provide a more indicative, but still approximate, value of the potential project economics. The tax model contains the following assumptions:

- 30 percent federal income tax rate

- 7.5 percent EBITDA royalty (Special Mining Duty) tax
- Straight-line depreciation of capital assets utilizing a 10-year useful life.
- Total taxes for the Project amount to $263.3M.

22.7 ECONOMIC RESULTS

The Project is economically viable with an after-tax internal rate of return (IRR) of 30.5 percent and a net present value using a five percent discount rate (NPV5%) of $278.6M using the base-case metal prices. Table 22-6 summarizes the economic results of each scenario evaluated.

Figure 22-5 shows the projected cash flows for the base case.

Table 22-6: Summary of Results for Base Case Scenario – Au $1,600/oz; Ag $20/oz

Summary of Results	Unit	Value
Pre - Tax Cash Flow	$M	700.5
Taxes	$M	263.3
After - Tax Cash Flow	$M	437.1
Economic Results		
Pre - Tax NPV5%	**$M**	**463.9**
Pre - Tax IRR	**%**	**40.9%**
Pre - Tax Payback	**Years**	**2.5**
After - Tax NPV5%	**$M**	**278.6**
After - Tax IRR	**%**	**30.5%**
After - Tax Payback	**Years**	**3.0**

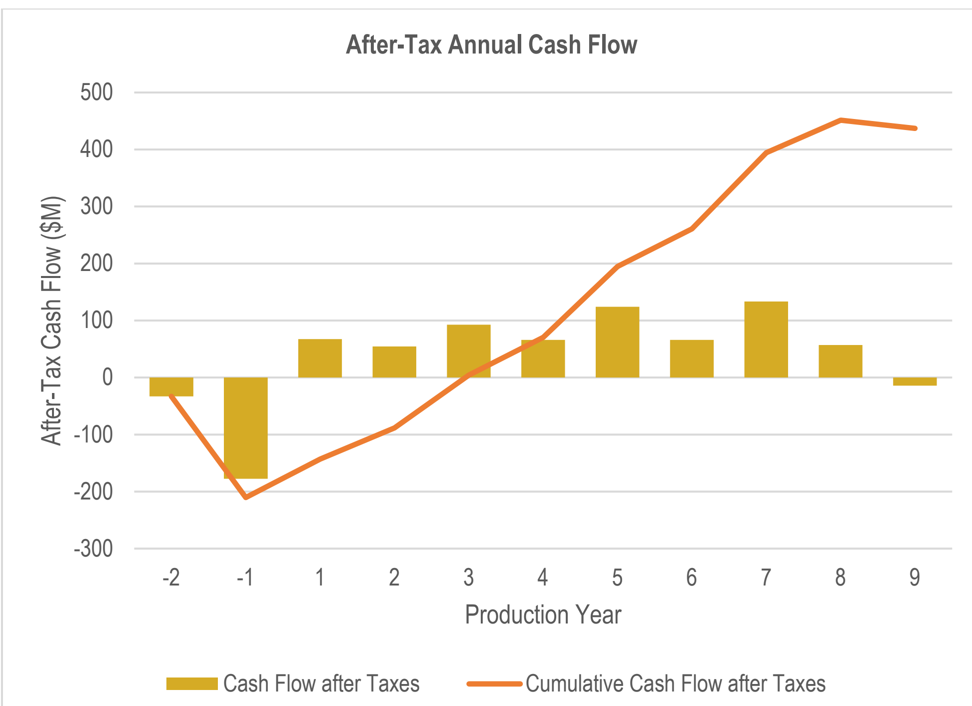


Figure 22-5: Annual After-Tax Cash Flows for Base Case Scenario

The all-in sustaining cost (AISC) is calculated to be $572.52 per troy ounce of payable gold. Details of the calculations are shown in Table 22-7 below.

Table 22-7: All-In Sustaining Costs

All-in Sustaining Costs	($000)
Mining	157,824
Process Plant	296,797
G&A	34,425
Cash Costs before By-Product Credits	489,047
By-Product Credit	-28,032
NSR Royalty	29,964
0.5% NSR Royalty as Mexican Precious Metals Tax	7,491
Refining Charge	3,675
Total Cash Costs	502,145
Sustaining Capital	23,920
All-in Sustaining Costs	526,065
$/Payable Au	572.52

22.8 SENSITIVITIES

A sensitivity analysis was performed on the Base Case metal pricing scenarios to determine which factors most affected the Project economics. The analysis revealed that the Project is most sensitive to metal prices, followed by capital and operating costs. The Project showed the least sensitivity to capital costs. Table 22-8 along with Figure 22-6 outline the results of the sensitivity tests performed on after-tax NPV at a discount rate of 5% for the base case evaluated.

Table 22-8: Sensitivity Results for Base Case Scenario

After-Tax $NPV_{5\%}$ ($M)			
Variable	**-15%**	**100%**	**+15**
Metal Prices	175	279	382
Operating Costs	314	279	243
Capital Costs	304	279	253

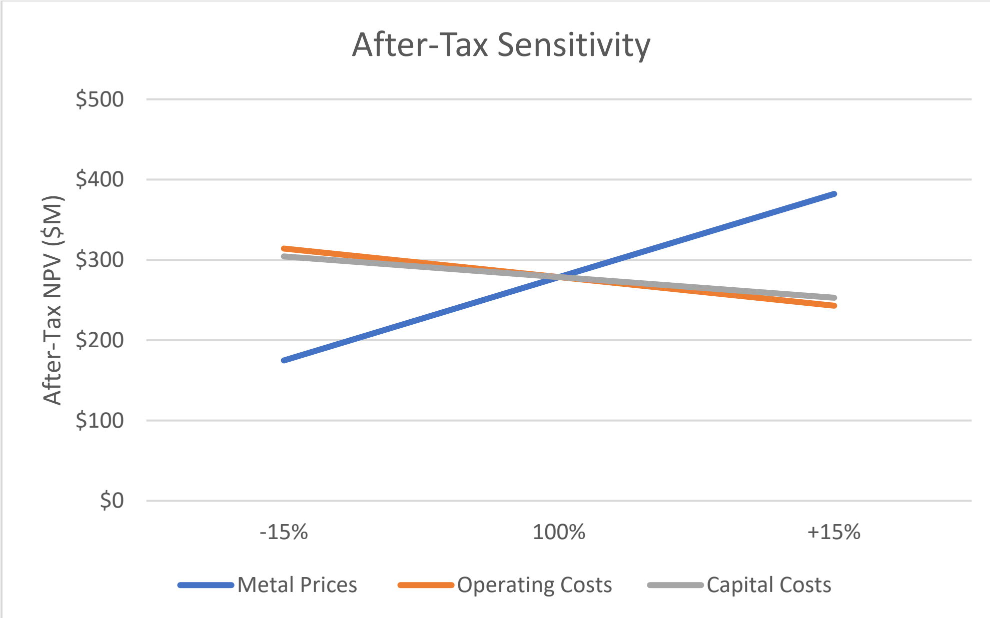


Figure 22-6: Sensitivity Results for Base Case Scenario

In addition, various scenarios were evaluated showing the Project's sensitivity to gold and silver price. Table 22-9 shows the economic results of the Project using various gold and silver prices.

Table 22-9: Project Sensitivity to Metal Prices

Gold Price (US$/oz)	1,280	1,360	1,600	1,840	1,920
Silver Price (US$/oz)	16	17	20	23	24
Pre-Tax $NPV_{5\%}$ ($M)	250.8	304.1	463.9	623.7	677.0
After-Tax $NPV_{5\%}$ ($M)	140.1	174.8	278.6	382.2	416.7
Pre-Tax IRR (%)	26.2	30.0	40.9	51.1	54.3
After-Tax IRR (%)	18.8	21.9	30.5	38.4	40.9
Pre-Tax Payback (Years)	3.6	3.2	2.5	2.1	2.0
After-Tax Payback (Years)	4.2	3.9	3.0	2.5	2.4

Table 22-10 below shows a more detailed excerpt of the financial model.

Table 22-10: Financial Model

	Units	Inputs	Totals	Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
OPERATIONS														
MINING														
Waste Mined	M tonnes		**42,974,128**	2,134,792	4,826,977	7,119,682	7,055,597	7,244,161	7,260,064	4,526,889	2,144,845	527,487	133,634	
Ore Mined	M tonnes		**14,122,151**	159,004	343,498	1,782,603	1,946,815	1,730,706	1,774,644	1,890,201	1,923,790	1,846,706	724,185	
Total Mined	M tonnes		**57,096,279**	2,293,797	5,170,475	8,902,285	9,002,412	8,974,866	9,034,707	6,417,090	4,068,635	2,374,193	857,819	
Rehandled	M tonnes							69,295	25,356				902,971	
Strip ratio	w:o		**3.04**	13.43	14.05	3.99	3.62	4.19	4.09	2.39	1.11	0.29	0.18	
Avg Tonnes per day mined	t/d					24,390	24,664	24,589	24,753	17,581	11,147	6,505	2,350	
PROCESSING														
Ore to Mill			**14,122,154**	-		1,694,999	1,799,999	1,800,001	1,800,000	1,800,000	1,800,000	1,800,000	1,627,156	
Avg Ore Processed per day						4,644	4,932	4,932	4,932	4,932	4,932	4,932	4,458	
Gold Ore Grade	g/t Au		**2.38**			2.15	1.96	2.60	2.20	3.15	2.05	3.17	1.68	
Contained Gold	oz		**1,081,139**			117,007	113,526	150,491	127,049	182,371	118,924	183,633	88,138	
Leach Recovery of Gold	%	85%	**85%**			85%	85%	85%	85%	85%	85%	85%	85%	
Gold Recovered	**oz**		**918,855**			**99,444**	**96,485**	**127,902**	**107,979**	**154,997**	**101,073**	**156,069**	**74,908**	
Silver Ore Grade	g/t Ag		**5.61**	-	-	7.98	6.19	7.28	5.26	5.55	3.47	3.88	5.41	
Contained Silver	oz		**2,548,376**			434,880	358,453	421,211	304,479	321,081	200,734	224,525	283,013	
Leach Recovery of Silver	%	55%	**55%**			55%	55%	55%	55%	55%	55%	55%	55%	
Silver Recovered	**oz**		**1,401,607**			**239,184**	**197,149**	**231,666**	**167,464**	**176,594**	**110,404**	**123,489**	**155,657**	
Total Gold Equivalent Recovered	oz		**936,375**			**102,433**	**98,949**	**130,797**	**110,072**	**157,204**	**102,453**	**157,613**	**76,854**	
LOM AuEq remaining						*833,942*	*734,993*	*604,195*	*494,123*	*336,919*	*234,466*	*76,854*	--	
Gold Price	US$/oz	$1,600	**1,600**		1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	
Silver Price	US$/oz	$20.00	**20.00**		20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
CASH REVENUE AND EXPENDITURE														
Gross Revenue from Gold Sales	US$	$1,600	**1,470,168,401**		--	159,109,652	154,376,106	204,642,417	172,765,615	247,994,475	161,716,978	249,710,442	119,852,715	
Gross Revenue from Silver Sales	US$	$20.00	**28,032,137**			4,783,681	3,942,987	4,633,323	3,349,274	3,531,886	2,208,071	2,469,776	3,113,141	
Gross Revenue from Gold & Silver Sales	US$		**1,498,200,538**			**163,893,333**	**158,319,093**	**209,275,740**	**176,114,889**	**251,526,360**	**163,925,049**	**252,180,217**	**122,965,857**	
Mining	US$	$2.76/t mat	**157,824,234**			27,882,664	28,223,216	28,084,339	28,273,430	20,536,743	13,364,504	8,316,211	3,143,127	
Processing	US$	$21.02/t ore	**296,797,296**		--	35,163,369	38,017,775	38,365,109	37,691,072	38,362,021	37,214,165	37,926,279	34,057,504	
Treatment and Refining cost	US$/oz	$4.00/ oz	**3,675,421**			**397,774**	**385,940**	**511,606**	**431,914**	**619,986**	**404,292**	**624,276**	**299,632**	
Environmental Erosion Fee (0.5% NSR)	US$	0.50%	**7,491,003**			819,467	791,595	1,046,379	880,574	1,257,632	819,625	1,260,901	614,829	
Triple Flag Royalty (2% NSR)	US$	2.00%	**29,964,011**			3,277,867	3,166,382	4,185,515	3,522,298	5,030,527	3,278,501	5,043,604	2,459,317	
General and Admin. Cost	US$	--	**34,425,000**			4,590,000	4,590,000	4,590,000	4,590,000	4,590,000	4,590,000	4,590,000	2,295,000	
Reclamation costs	US$		**10,047,620**											10,047,620
Total Operating Cost	US$		**540,224,584**			72,131,140	75,174,908	76,782,947	75,389,289	70,396,910	59,671,089	57,761,272	42,869,410	10,047,620
Unit Operating Cost	$/t ore		**37.54**			**42.56**	**41.76**	**42.66**	**41.88**	**39.11**	**33.15**	**32.09**	**26.35**	**0.00**
Cash Operating Cost (Net silver credits)	$/oz		**546**			**677**	**738**	**564**	**667**	**431**	**569**	**354**	**531**	**0**
OPERATING MARGIN	US$		**957,975,954**			**91,762,193**	**83,144,185**	**132,492,793**	**100,725,600**	**181,129,451**	**104,253,960**	**194,418,945**	**80,096,447**	**(10,047,620)**
SMD Royalty 7.5% (EBITDA tax)	US$	7.50%	**(72,601,768)**	-	-	-	(6,882,164)	(6,235,814)	(9,936,959)	(7,554,420)	(13,584,709)	(7,819,047)	(14,581,421)	(6,007,234)
EBITDA	US$		**885,374,186**			**91,762,193**	**76,262,021**	**126,256,979**	**90,788,641**	**173,575,031**	**90,669,251**	**186,599,898**	**65,515,026**	**(16,054,853)**
Initial Capex - Construction	US$		**209,326,478**	25,111,002	161,057,875	23,157,600								
Initial Capex - Capitalized Strip	US$		**24,235,998**	7,835,062	16,400,936									

	Units	Inputs	Totals	Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Surface Rights Payments	US$		**5,600,000**			--	800,000	800,000	800,000	800,000	800,000	800,000	800,000	
Mine Sustaining Capex	US$		**1,769,710**				1,569,710	--	--	200,000	--	--	--	
Plant Sustaining Capex	US$		**--**											
Reclamation costs	US$													
Tailings Facility Sustaining Capex	US$		**16,550,772**			--	4,345,637	--	5,212,649	--	6,992,486	--	--	
Contingency			**--**											
TOTAL CAPITAL	US$		**257,482,957**	**32,946,064**	**177,458,811**	**23,157,600**	**6,715,347**	**800,000**	**6,012,649**	**1,000,000**	**7,792,486**	**800,000**	**800,000**	**--**
All in Sustaining Cost (Net silver credits)	$/oz		**573**			**677**	**808**	**570**	**723**	**438**	**646**	**359**	**541**	**0**
BEGINNING DDA BALANCE	US$		**--**		32,946,064	210,404,875	210,206,228	193,565,328	170,337,545	152,242,412	128,533,365	111,516,803	86,728,508	
Less: Depreciation	US$		**(257,482,957)**		--	(23,356,248)	(23,356,248)	(24,027,782)	(24,107,782)	(24,709,047)	(24,809,047)	(25,588,296)	(25,668,296)	(25,748,296)
Add: New capital	US$		**257,482,957**	32,946,064	177,458,811	23,157,600	6,715,347	800,000	6,012,649	1,000,000	7,792,486	800,000	800,000	
ENDING DEPRECIABLE BALANCE	US$		**--**	32,946,064	210,404,875	210,206,228	193,565,328	170,337,545	152,242,412	128,533,365	111,516,803	86,728,508	61,860,212	(25,748,296)
EBIT	US$		**700,492,997**	**--**	**--**	**68,405,945**	**59,787,937**	**108,465,011**	**76,617,818**	**156,420,403**	**79,444,913**	**168,830,650**	**54,428,151**	**(35,795,916)**
Income Tax Expense	US$	30.0%	**(190,741,888)**			--	(15,393,516)	(30,668,759)	(20,004,258)	(44,659,795)	(19,758,061)	(48,303,481)	(11,954,019)	
OPERATING CASHFLOW	US$		**437,149,341**		**--**	**68,405,945**	**37,512,257**	**71,560,438**	**46,676,601**	**104,206,188**	**46,102,143**	**112,708,122**	**27,892,711**	**(41,803,149)**
Add Back Depreciation	US$		**257,482,957**	--	--	23,356,248	23,356,248	24,027,782	24,107,782	24,709,047	24,809,047	25,588,296	25,668,296	25,748,296
Working Capital	US$		**--**			(1,143,523)	490,705	(2,066,647)	1,316,366	(3,664,389)	2,898,482	(3,965,242)	4,351,699	1,782,548
Less: - Initial Capital	US$		**(233,562,476)**	(32,946,064)	(177,458,811)	(23,157,600)	--	--	--	--	--	--	--	
- Sustaining Capital	US$		**(23,920,482)**	--	--	--	(6,715,347)	(800,000)	(6,012,649)	(1,000,000)	(7,792,486)	(800,000)	(800,000)	
Net Cash Flow (after-tax, undiscounted)	US$		**$437,149,341**	(32,946,064)	(177,458,811)	67,461,070	54,643,863	92,721,573	66,088,101	124,250,846	66,017,187	133,531,175	57,112,706	(14,272,306)
NPV - 5% Discount Rate, after-tax	US$	5.0%	**$278,637,910**	**(32,946,064)**	(210,404,875)	(142,943,805)	(88,299,942)	4,421,631	70,509,731	194,760,578	260,777,764	394,308,940	451,421,646	437,149,341
IRR	%		**30.5%**											
Payback	Years		**3.0**											
Cash Cost	**$ / Oz**		**546**			**677**	**738**	**564**	**667**	**431**	**569**	**354**	**531**	**0**
All in Sustaining Cost	**$ / Oz**		**573**			**677**	**808**	**570**	**723**	**438**	**646**	**359**	**541**	**0**

23 ADJACENT PROPERTIES

Figure 23-1 below provides a property location map including known mines, deposits and showings for the area surrounding the Heliostar Ana Paula Project, the Aurea Norte and Aurea Sur properties located in the Guerrero Gold Belt.

The information presented in this section is from publicly available information referenced below. No information is available to the authors to permit verification of this data. The information below is not necessarily indicative of the mineralization on the Ana Paula Project and surrounding concessions.

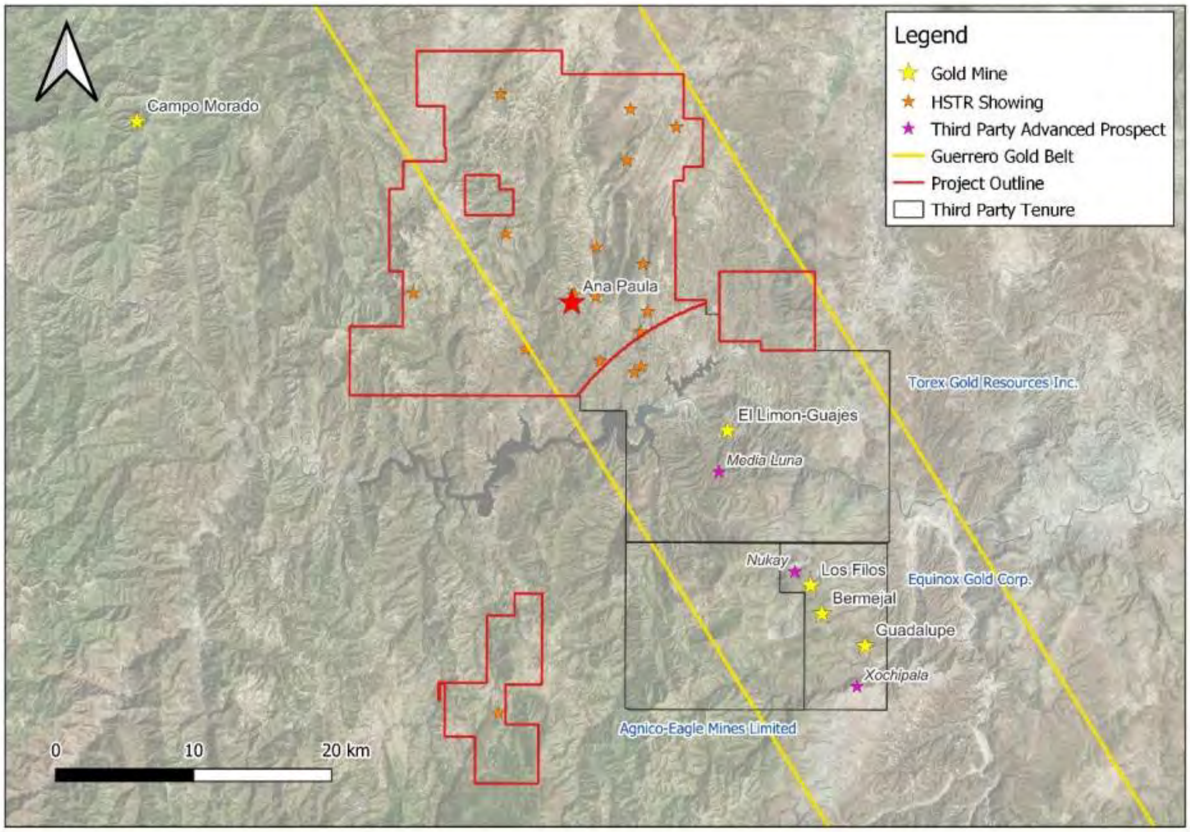


Figure 23-1: Adjacent Properties, Projects, and Mineral Deposits

The Los Filos mine is located on the trend of the Guerrero Gold Belt about 20 km southeasterly of Ana Paula (Numbers 14 through 16, Figure 23-1).

Los Filos was acquired by Goldcorp in 2005 through the purchase of Wheaton River Minerals Ltd, completed March 1st, 2005, and through the purchase of the Bermejal deposit from Minera El Bermejal, S. de R.L. de C.V. (Minera Bermejal), a joint venture of Industrias Peñoles S.A. de C.V. ("Peñoles") and Newmont Mining Corporation announced March 22, 2005. The two acquisitions became the Filos Project with a combined inferred resource of 4.92 million ounces that became the Filos Mine when Goldcorp Inc. ("Goldcorp"), put it into production three years later in 2008. In 2016, Goldcorp sold Los Filos to Leagold Mining Corporation ("Leagold"). Equinox Gold is the current owner of the property after it merged with Leagold in March 2020.

As of November 9, 2020, the mineral reserves and mineral resources for Los Filos are shown in Table 23-1.

Table 23-1: Los Filos Mine Reserves, Resources and Inferred

MINERAL RESERVES			
Class	Tonnes (kt)	Au (g/t)	Au (koz)
Proven & Probable	193,226	0.86	5,354
MINERAL RESOURCES			
Measured and Indicated	325,326	0.75	7,897
Inferred	135,935	0.74	3,237

Source: Equinox website. Effective date June 30, 2022.

The Los Filos mine is currently still operating. Table 23-2 shows the annual gold production from 2014 through 2022.

Table 23-2: Annual Gold Production at Los Filos

Production Year	Production, koz Au
2014	259
2015	273
2016	231
2017	191
2018	195
2019	375
2020	~45
2021	144
2022	155-170

The Morelos Project owned by Torex Gold Resources Inc. ("Torex") was acquired in 2009 as a 3.2 million ounce inferred gold resource within the Limón and Los Guajes deposits and located about eight kilometers southeast of Ana Paula, (Numbers 10 and 11, Figure 23-1). The Morelos Project shares the southeastern boundary with Heliostar's Aurea Norte Project, Figure 23-1. In 2012, Torex completed a bankable feasibility study for the El Limón Guajes open-pit mine and completed construction in 2015. First gold was poured in December 2015 and commercial production was declared in March 2016. Additionally, in 2022 Torex released a life of mine plan for the El Limón Guajes Mine Complex (ELG Mine Complex) and Feasibility Study for the Media Luna Project, a nearby underground deposit. The latest mineral resources and mineral reserves for Torex's projects were published in 2022 and are shown in Table 23-3 and Table 23-4.

Table 23-3: Morelos Property Mineral Resources

Mineral Resources	Tonnes (kt)	Grade			Contained Metal			Gold Equivalent	
		Au (g/t)	Ag (g/t)	Cu (%)	Au (koz)	Ag (koz)	Cu (Mlb)	AuEq (g/t)	AuEq (koz)
ELG Open Pits									
Measured	5,727	3.89	5.0	0.13	716	919	17	3.93	724
Indicated	11,027	2.37	4.7	0.12	842	1,660	28	2.41	856
Measured & Indicated	16,754	2.89	4.8	0.12	1,557	2,579	45	2.93	1,580
Inferred	812	1.80	3.5	0.08	47	90	1	1.83	48
ELG Underground									
Measured	584	7.24	10.0	0.52	136	187	7	7.37	138
Indicated	3,968	6.11	7.1	0.27	779	900	23	6.18	789
Measured & Indicated	4,551	6.25	7.4	0.30	915	1,088	30	6.34	927
Inferred	1,380	4.88	6.2	0.25	217	275	8	4.95	220
Media Luna Underground									
Measured									
Indicated	25,380	3.24	31.5	1.08	2,642	25,706	602	5.38	4,394
Measured & Indicated	25,380	3.24	31.5	1.08	2,642	25,706	602	5.38	4,394
Inferred	5,991	2.47	20.8	0.81	476	3,998	106	4.05	780
EPO Underground									
Measured									
Indicated									
Measured & Indicated									
Inferred	8,019	1.52	34.6	1.27	391	8,908	225	3.97	1,024
Total									
Measured	6,311	4.20	5.5	0.17	852	1,106	24	4.25	862
Indicated	40,375	3.28	21.8	0.73	4,263	28,266	653	4.65	6,039
Measured & Indicated	46,685	3.41	19.6	0.66	5,114	29,373	677	4.60	6,901
Inferred	16,202	2.17	25.5	0.95	1,131	13,271	340	3.98	2,071

Source: Morelos Property NI 43-101 Technical Report dated March 31, 2022.

Notes to accompany the Summary Mineral Resource Table:

1. CIM (2014) definitions were followed for Mineral Resources.
2. Mineral Resources are depleted above a mining surface or to the as-mined solids as of December 31, 2021.
3. Mineral Resources are reported using a gold price of US$1,550/oz, silver price of US$20/oz, and copper price of US$3.50/lb.
4. AuEq of total Mineral Resources is established from combined contributions of the various deposits.
5. Mineral Resources are inclusive of Mineral Reserves.
6. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
7. Numbers may not add due to rounding.
8. The estimate was prepared by Mr. John Makin, MAIG, a consultant with SLR Consulting (Canada) Ltd. Mr. Makin is independent of the Company and is a “Qualified Person” under NI 43-101.

Notes to accompany the ELG Mineral Resources:

9. The effective date of the estimate is December 31, 2021.
10. Average metallurgical recoveries are 89% for gold, 30% for silver and 10% for copper.
11. ELG AuEq = Au (g/t) + (Ag (g/t) * 0.0043) + (Cu (%) * 0.1740). AuEq calculations consider both metal prices and metallurgical recoveries.

Notes to accompany the ELG Open Pit Mineral Resources:

12. Mineral resources are reported above a cut-off grade of 0.9 g/t Au.
13. Mineral Resources are reported inside an optimized pit shell, underground Mineral Reserves at ELD within the El Limón shell have been excluded from the open pit Mineral Resources.

Notes to accompany ELG Underground Mineral Resources:

14. Mineral Resources are reported above a cut-off grade of 2.6 g/t Au.
15. The assumed mining method is underground cut and fill.
16. Mineral Resources from ELD that are contained within the El Limón pit optimization and that are not underground Mineral Reserves have been excluded from the underground Mineral Resources.

Notes to accompany Media Luna Mineral Resources:

17. The effective date of the estimate is October 31, 2021.
18. Mineral Resources are reported above a 2.0 g/t AuEq cut-off grade.
19. Metallurgical recoveries at Media Luna (excluding EPO) average 85% for gold, 79% for silver, and 91% for copper. Metallurgical recoveries at EPO average 85% for gold, 75% for silver, and 89% for copper.
20. Media Luna (excluding EPO) AuEq = Au (g/t) + (Ag (g/t) * 0.011889) + (Cu (%) * 1.648326). EPO AuEq = Au (g/t) + Ag (g/t) * (0.011385) + Cu % * (1.621237). AuEq calculations consider both metal prices and metallurgical recoveries.
21. The assumed mining method is from underground methods, using a combination of longhole stoping and, cut and fill.

Table 23-4: Morelos Property Mineral Reserves

Mineral Reserves		Grade			Contained Metal			Gold Equivalent	
		Au	Ag	Cu	Au	Ag	Cu	AuEq	AuEq
	Tonnes (kt)	(g/t)	(g/t)	(%)	(koz)	(koz)	(Mlb)	(g/t)	(koz)
ELG Open Pit									
Proven	4,900	3.95	4.6	0.14	623	719	15	4.00	630
Probable	5,471	2.35	4.5	0.12	414	784	15	2.39	421
Proven & Probable	10,371	3.11	4.5	0.13	1,037	1,503	30	3.15	1,051
ELG Underground									
Proven	110	7.23	10.5	0.59	25	37	1	7.38	26
Probable	2,566	5.68	5.7	0.22	469	474	13	5.74	474
Proven & Probable	2,675	5.74	5.9	0.24	494	511	14	5.81	500
Media Luna									
Proven	-	-	-	-	-	-	-	-	-
Probable	23,017	2.81	25.6	0.88	2,077	18,944	444	4.54	3,360
Proven & Probable	23,017	2.81	25.6	0.88	2,077	18,944	444	4.54	3,360
Surface Stockpiles									
Proven	4,808	1.35	3.1	0.07	209	484	7	1.38	213
Probable	-	-	-	-	-	-	-	-	-
Proven & Probable	4,808	1.35	3.1	0.07	209	484	7	1.38	213
Total									
Proven	9,817	2.72	3.9	0.11	858	1,240	23	2.75	869
Probable	31,054	2.96	20.2	0.69	2,959	20,202	472	4.26	4,254
Proven & Probable	40,871	2.90	16.3	0.55	3,817	21,442	495	3.90	5,123

Source: Morelos Property NI 43-101 Technical Report dated March 31, 2022.

<u>Notes to accompany the Mineral Reserves Estimate table:</u>

1. Mineral reserves were developed in accordance with CIM (2014) guidelines.
2. Rounding may result in apparent summation differences between tonnes, grade, and contained metal content Surface Stockpile Mineral Reserves are estimated using production and survey data and apply the ELG AuEq identified in Note 14.
3. AuEq of Total Reserves is established from combined contributions of the various deposits.
4. The qualified person for the Mineral Reserve estimate is Johannes (Gertjan) Bekkers, P. Eng., Director of Mine Technical Services.
5. The qualified person is not aware of mining, metallurgical, infrastructure, permitting, or other factors that materially affect the Mineral Reserve estimates

<u>Notes to accompany the ELG Open Pit Mineral Reserves:</u>

6. Mineral Reserves are founded on Measured and Indicated Mineral Resources, with an effective date of December 31, 2021, for ELG Open Pits (including El Limón, El Limón Sur and Guajes deposits).
7. El Limón and Guajes Open Pit Mineral Reserves are reported above a diluted cut-off grade of 1.1 g/t Au.
8. El Limón Guajes Low Grade Mineral Reserves are reported above a diluted cut-off grade of 1.0 g/t Au.
9. It is planned that ELG Low Grade Mineral Reserves within the designed pits will be stockpiled during pit operation and processed during pit closure.
10. Mineral Reserves within the designed pits include assumed estimates for dilution and ore losses.
11. Cut-off grades and designed pits are considered appropriate for a metal price of $1,400/oz Au and metal recovery of 89% Au.
12. Mineral Reserves are reported using a gold price of US$1,400/oz, silver price of US$17/oz, and copper price of US$3.25/lb.
13. Average metallurgical recoveries of 89% for gold and 30% for silver and 10% for copper.
14. ELG AuEq = Au (g/t) + Ag (g/t) * (0.0041) + Cu (%) * (0.1789), accounting for metal prices and metallurgical recoveries.

<u>Notes to accompany the ELG Underground Mineral Reserves:</u>

15. Mineral Reserves are founded on Measured and Indicated Mineral Resources, with an effective date of December 31, 2021, for ELG Underground (including Sub-Sill and ELD deposits).
16. Mineral Reserves were developed in accordance with CIM guidelines.
17. El Limón Underground Mineral Reserves are reported above an in-situ ore cut-off grade of 3.58 g/t Au and an in-situ incremental CoG of 1.04 g/t Au.
18. Cut-off grades and mining shapes are considered appropriate for a metal price of $1,400/oz Au and metal recovery of 89% Au.
19. Mineral Reserves within designed mine shapes assume mechanized cut and fill mining method and include estimates for dilution and mining losses.
20. Mineral Reserves are reported using a gold price of US$1,400/oz, silver price of US$17/oz, and copper price of US$3.25/lb.
21. Average metallurgical recoveries of 89% for gold and 30% for silver and 10% for copper.
22. ELG AuEq = Au (g/t) + Ag (g/t) * (0.0041) + Cu (%) * (0.1789), accounting for metal prices and metallurgical recoveries.

<u>Notes to accompany the Media Luna Underground Mineral Reserves:</u>

23. Mineral Reserves are based on Media Luna Indicated Mineral Resources with an effective date of October 31st, 2021.
24. Media Luna Mineral Reserves are reported above a diluted ore cut-off grade of 2.2 g/t AuEq.
25. Media Luna cut-off grades and mining shapes are considered appropriate for a metal price of $1,400/oz Au, $17/oz Ag and $3.25/lb Cu and metal recoveries of 85% Au, 79% Ag, and 91% Cu.
26. Mineral Reserves within designed mine shapes assume longhole stoping, supplemented with mechanized cut and fill mining method and includes estimates for dilution and mining losses as outlined in Section 16.4.4.4.5.
27. Media Luna gold equivalent (AuEq) = Au (g/t) + Ag (g/t) * (0.011188) + Cu (%) * (1.694580), accounting for metal prices and metallurgical recoveries.

24 OTHER RELEVANT DATA AND INFORMATION

Additional relevant information not presented elsewhere in the technical report includes details concerning the evaluation and refurbishment cost associated with purchased used equipment and a plan for project execution.

24.1 USED EQUIPMENT

Process equipment formerly used at the El Sauzal Mine in Chihuahua is owned by others and presently stored in Los Mochis, Sinaloa. The equipment has been inspected and evaluated for potential use for the Ana Paula Project by M3 and Heliostar. The equipment available for the Project includes the primary crushing and grinding circuits, tailing thickener, portions of the reagent systems, kiln system, tankage, and substation transformer.

Heliostar has obtained cost estimates for refurbishment of the primary crusher and reclaim system, conveyor systems, grinding mills, and substation transformer. A cost estimate has also been obtained for the transportation of this equipment to the refurbishment location and from there to the mine site. These cost estimates are summarized in Table 24-1.

Table 24-1: Refurbishment and Transportation Cost Estimates

Item	Estimated Cost (US$)
Primary Crushing system	500,000
Stockpile and Conveyor system	700,000
SAG and Ball Mill systems	1,500,000
Substation Transformer	100,000
Transportation (existing equipment in Los Mochis to be re-used at Ana Paula)	1,500,000
Used Equipment (Owner's cost)	5,000,000
Total	**9,300,000**

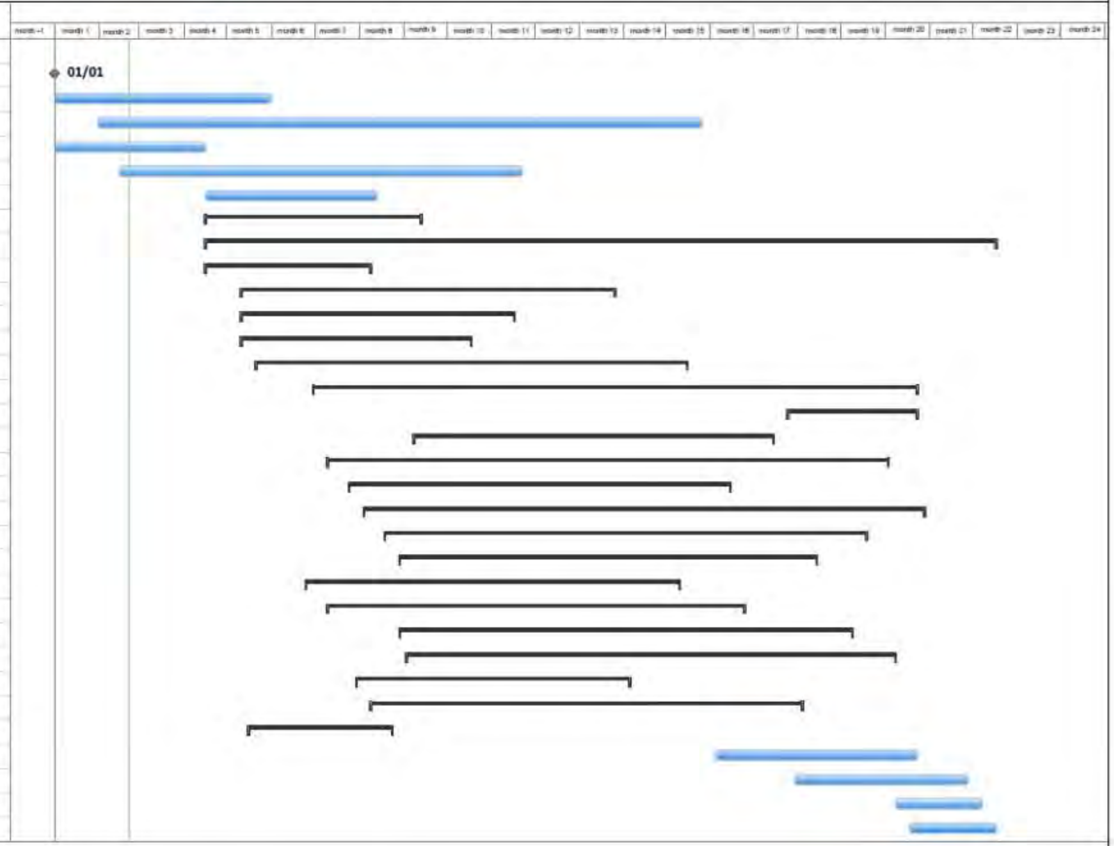
24.2 PROJECT SCHEDULE

A sequence of effort has been developed for this technical report with a prospective schedule by which the Project will likely proceed. The schedule includes Engineering, Contracts, Procurement, Construction, Remaining Site Work, Site Pre-Commissioning, and Site Commissioning activities and is presented as Figure 24-1.

M3-PN230002 - ANA PAULA PROJECT

Date: Feb 22th, 2023
Rev: P2

Id	Task Name	Duration
1	**M3-PN200276 ANA PAULA - PROJECT SCHEDULE**	1180 days
2	Project Start	0 days
3	Basic Engineering	150 days
4	Detailed Engineering	420 days
5	Contracting and mobilization	105 days
6	Procurement	280 days
7	Access road construction	119 days
8	915 Construction Camp	150 days
10	PLANT SITE	550 days
11	000 General Site	115 days
13	000 Main Substation	260 days
15	000 Power Line	190 days
18	010 Switching Substation	160 days
23	100 Primary Crusher / Stockpile	300 days
29	200 Grinding	420 days
35	210 Gravity Concentration	90 days
37	250 Pebble Crusher	250 days
39	300 Rougher Flotation	390 days
41	350 Concentrate Thickener / Regrind	265 days
43	400 Atmospheric Oxidation	390 days
45	500 Carbon - In - Leach (CIL)	335 days
47	600 Tailings Handling	290 days
49	610 Tailings Storage Facility	260 days
51	650 Fresh / Fire Water Systems	290 days
53	700 Carbon Plant - Refinery	315 days
55	800 Reagents	340 days
57	900 Utility Systems	190 days
59	910 Laboratory	300 days
61	950 Temporary Trailer Administration Offices	100 days
63	PRECOMMISSIONING	140 days
64	COMMISSIONING	120 days
65	START-UP	60 days
66	TURN OVER TO THE CLIENT	60 days



HELIOSTAR

Task — Milestone — Summary Task — Summary Progress — Progress
Division — Summary — Summary Division — Limit Date

Page 1

Figure 24-1: Project Execution Schedule Summary

24.3 PROJECT EXECUTION PLAN

A Project Execution Plan will be developed for Ana Paula as part of future study and engineering work. This plan will provide a high-level description of how the Project will be executed. This plan contains an overall description of what the main work focuses are, project organization, the estimated schedule, and where important aspects of the Project will be carried out. Key plans to be developed include, Health and Safety, Environment and Social Management, Engineering, Procurement, Construction and Construction Management, Contracting, Inspection, Expediting, Project Services, Quality Management and Commissioning.

25 INTERPRETATION AND CONCLUSIONS

It is the conclusion of the Qualified Persons preparing this technical report that the information contained within adequately supports the positive economic results obtained for the Ana Paula Project. The Project contains 14.1 million tonnes of gold-bearing sulphide mineralization that can be mined by open pit methods and recovered using common processing methods consisting of gravity, flotation, and cyanide leaching of flotation concentrates.

As demonstrated by the information contained in this technical report, the Project could be economically viable and should proceed to the next level of evaluation - a feasibility study.

25.1 PROJECT RISKS

As with any mining project, there are risks that could affect the economic viability of the Project. Many of these risks are based on lack of detailed knowledge and can be managed as more sampling, testing, design, and engineering are conducted at the next study stages. Table 25-1 identifies what are currently deemed to be the most significant internal project risks, potential impacts, and possible mitigation approaches.

The most significant potential risks associated with the Project are lower gold recoveries than those projected, unanticipated mining dilution, operating and capital cost escalation, permitting and environmental compliance, unforeseen schedule delays, changes in regulatory requirements, ability to raise financing and metal price. These risks are common to most mining projects, many of which can be mitigated with adequate engineering, planning and pro-active management.

External risks are, to a certain extent, beyond the control of the Project proponents and are much more difficult to anticipate and mitigate, although, in many instances, some risk reduction can be achieved. External risks are things such as the political situation in the Project region, metal prices, exchange rates and government legislation. These external risks are generally applicable to all mining projects. Negative variance to these items from the assumptions made in the economic model would reduce the profitability of the mine and the mineral resource and reserve estimates.

Table 25-1: Potential Risk Impacts and Mitigation

Risk	Explanation/Potential Impact	Possible Risk Mitigation
Water Supply	Further hydrogeological studies may be needed to determine if better-quality water exists to supply the mine.	Water may be obtained from the nearby Balsas reservoir if groundwater supplies are insufficient.
Mining Dilution	Dilution can impact project economics. Standard blasthole sampling may not be sufficient to minimize dilution.	A well planned and executed grade control plan is necessary immediately upon commencement of mining. RC drilling has been recommended for the PFS but requires a gold deportment study.
Resource Modelling	All mineral resource estimates carry some risk and are one of the most common issues with project success	Targeted infill drilling may be recommended in order to provide a greater level of confidence in the resource. Additionally, an area within the open pit (preferably within the HALO mineralization) should be selected for a testing of the proposed grade control drill pattern. The program will also be used to increase the confidence in the resource estimate and de-risk the Project.

Risk	Explanation/Potential Impact	Possible Risk Mitigation
Metallurgical Recoveries	Changes to metallurgical assumptions could lead to reduced metal recovery, increased processing costs, and/or changes to the processing circuit design. If LOM gold recovery is lower than assumed, the Project economics would be negatively impacted.	Additional sampling and testwork should be conducted as applicable, including testwork on variability samples. Alternative oxidation methods like the Albion Process or FLS's Rapid Oxidative Leach (ROL) process can be explored.
Arsenic Stability in Tailing	Long term stability of the resulting arsenic precipitates is not understood at this time. No TCLP or SPLP tests have been conducted on these products to date.	Conduct further tests to precipitate arsenic from solution into more stable forms. Future work must incorporate TCLP or SPLP analysis of final tailing to determine the stability of arsenic and its potential for mobilization.
CAPEX and OPEX	The ability to achieve the estimated CAPEX and OPEX costs are important elements of project success. If OPEX increases then the mining cut-off grade would increase and, all else being equal, the size of the optimized pit would reduce yielding fewer mineable tonnes.	Further cost estimation accuracy with the next level of study, as well as the active investigation of potential cost-reduction measures would assist in the support of reasonable cost estimates.
Permit Acquisition	The ability to secure all of the permits to build and operate the Project is of paramount importance. Failure to secure the necessary permits could stop or delay the Project.	The development of close relationships with the local communities and government and a project design that gives appropriate consideration to the environment and local people is required.
Geochemistry and Water Management	Potentially Acid-Generating (PAG) material is not currently defined in 3D geological block model. Acid-based accounting (ABA) testing needs to be completed to verify that PAG does not exist. If PAG material is present it will result in increased handling costs (containment cells for dump, etc.).	Further testwork should be conducted to determine how much, if any PAG material exists. Management plans should PAG exists, if implemented early can reduce the associated costs. Further hydrology work may also be needed to determine if water will accumulate in the open pit.
Development Schedule	The Project development could be delayed for a number of reasons and could impact project economics. A change in schedule would alter the Project economics.	If an aggressive schedule is to be followed, FS field work should begin as soon as possible.
Mine Geotech	The geotechnical nature of the open pit wall rock, including the nature and orientation of faults and secondary geological structures could impact pit slopes. Pit slopes could be increased or decreased and thus alter the pit designs, mineable tonnes, and strip ratio.	Improved geotechnical knowledge and modeling.
Ability to Attract Experienced Professionals	The ability to attract and retain competent, experienced professionals is a key success factor for the Project. High turnover or the lack of appropriate technical and management staff at the Project could result in difficulties meeting project goals.	The early search for professionals as well as competitive salaries and benefits identify, attract and retain critical people.

25.2 OPPORTUNITIES

There are also significant opportunities that could improve the economics, timing, and/or permitting potential of the Project. The major opportunities that have been identified at this time are summarized in Table 25-2, excluding those typical to all mining projects, such as changes in metal prices, exchange rates, and etcetera. Further information and assessments are needed before these opportunities should be included in the Project economics, however.

Table 25-2: Potential Opportunities

Opportunity	Explanation	Potential Benefit
Metallurgical Recovery Increases	Further testing may show that an increase in gravity concentration is possible. Investigation of other methods for recovery of gold from the gravity concentrate have potential to improve overall gold recovery.	Potential 4 to 5 percent increase in overall gold recovery.
Exploration Potential	Given the large project land holdings within the northwestern extension of the GGB, additional exploration has potential to increase resources.	Potential to increase the mineral resource, extending mine life.
Operating Cost Reduction	Further mine planning and process design work has potential to reduce operating costs as plans are further refined.	Reduce operating costs and increase revenue.
Pit Slope Steepening	Pit slope angles could potentially be improved which may increase slope angles (conversely it could also make them shallower).	An increase in overall pit slopes for all domains in all pits would reduce the strip ratio and increase the ounces mined.
Project Strategy and Optimization	Additional detailed planning and a series of strategic option reviews.	May add value to the Project.
Permit Acquisition	The ability to secure all of the permits to build and operate the Project quickly has potential to bring the Project on-line early.	Holding and owners costs would be reduced as a result.
Attracting an experienced and skilled construction work force.	Construction has potential to begin as other projects in the region are nearing completion.	A supply of experienced skilled workers looking for employment as this project begins has potential to reduce construction costs and shorten the construction period. Costs would be reduced accordingly.
Underground Mining	The deposit is open at depth suggesting there could be potential for underground mining in the future.	Underground mining would extend the mill life and could potentially improve overall projects economic.

25.3 GEOLOGY & RESOURCE MODEL

Ana Paula lies along the north-western extension of the Guerrero Gold Belt and straddles the proposed tectonic boundary between the Teloloapan and the Morelos Guerrero platform sub-terranes. The Teloloapan volcanic-volcaniclastic belt on the west of the property and to the east, the Morelos Guerrero platform, includes a thick carbonate sequence of bedded limestone and dolomite overlain by younger, thinly bedded flysch-like deposits. The Ana Paula geology project consists of a sedimentary-intrusive mixed domain, located in the eastern half of the exploration area, and an intrusive dominant domain located in the western half of the exploration area. The contact between these domains is interpreted to be a local fault. The Ana Paula deposit is hosted mostly in the sedimentary-intrusive domain. The sediments are locally metamorphosed to hornfels and skarn, occurring frequently as narrow contact replacement to the sediment intrusive contacts. In addition to the principal sediment and intrusive lithologies several different breccia units, important to gold mineralization, are developed in the local stratigraphy. The most important breccias at the Project are multi-lithic and hydrothermal types. The multi-lithic breccia consists of angular to rounded plagioclase-biotite porphyry, and angular fragments of hornfels, limestone, shale, and other very fine grained to aphanitic fragments. The hydrothermal breccia has a dense siliceous matrix with locally abundant sulphide minerals, mainly pyrite/marcasite and arsenopyrite. Hydrothermal brecciation can occur in all rock types but is dominantly observed in intrusive rocks and is locally observed to re-brecciate the multi-lithic breccia.

The Ana Paula exploration area is in the sediment-intrusive domain that includes limestone, hornfels and intrusive rocks along with two discrete structurally controlled breccia bodies of irregular dimensions. The most important breccia body is the high-grade breccia zone (complex breccia) which consists of a core of multi-lithic breccia, in a steeply south plunging column surrounded by a HALO of mineralization and alteration characterized by veins, fracture zones, and massive sulphide contact replacements. The high-grade breccia zone and surrounding HALO contain the bulk of the mineralization within the Ana Paula pit.

Based on the review of the QA/QC, data validation, and statistical analysis, the following conclusions were made:

- The methods and procedures to collect and compile geological, geotechnical, and assaying information for the Ana Paula Project were found to be suitable for the style of mineralization found on the property and meet accepted industry standards.
- The mineralization on the Ana Paula Project were sampled with surface sampling of outcrops and core drilling. Only the core drilling was used in the resource estimate.
- Samples were primarily prepared at ALS located in Guadalajara, Mexico and SGS Laboratory located in Durango, Mexico. A small number of samples were prepared at ACME Laboratory in Guadalajara, Mexico and Inspectorate Laboratory. All laboratories are internationally recognized and accredited to ISO 17025 and/or ISO 9001:2008 standards, or better.
- Samples were analyzed for gold by fire assay with an atomic absorption finish with samples assaying greater than 10 g/t gold, re-assayed by fire assay with a gravimetric. Samples were also analyzed with an aqua regia digestion, and a combination of inductively coupled plasma emission spectrometry (ICP-OES) and/or inductively coupled plasma mass spectrometry (ICP-MS) to provide a multi-element analysis.
- The quality control and quality assurance programs consist of insertion of blanks, standard reference material, quarter core duplicates, and reject/pulp checks at a second laboratory. Submission rates meet the industry accepted practice for each of the QA/QC type of samples. The QA/QC program was found to be well monitored by the exploration staff. The sampling procedures, analytical methods, and QA/QC procedures undertaken by Heliostar indicate reasonable accuracy of the sample data and no obvious cross contamination at the sample preparation level.
- Data verification was originally performed by IMC and later by AGP through site visits, collection of independent character samples, and a database audit. The drill database was found to be error free and suitable to be used for a resource estimate.
- Core handling, core storage, and chain of custody are consistent with industry standards.

Based on the above conclusions and effective December 30, 2020, the Ana Paula updated Mineral Resource Estimate (MRE) was developed in conformance with the CIM Mineral Resource definitions referred to in the NI 43-101 Standards of Disclosure for Mineral Projects. This mineral resource estimate is an update of the May 16, 2017, estimate of the Ana Paula Project located near the municipalities of Cuétzala del Progreso and Apaxtla del Castregon, Guerrero State, Mexico.

The estimate was completed based on the concept of a medium scale open pit, with a possible resource for an underground operation for the material remaining below the pit bottom.

The Ana Paula grade models were interpolated using 290 core holes completed by Goldcorp in 2005, Newstrike Capital from 2010 through 2015 and Alio Gold since 2015. The database totaled 123,499 m of core and contained 89,816 assays for the holes used in the resource estimate. The estimate takes into account all data that was available prior to May 31, 2018.

The 3D wireframes developed to control the grade interpolation of the resource model were based primarily on lithology with a probabilistic approach use for the high-grade mineralized HALO and the high-grade zones in the lithologies outside the HALO. The deposit has been modeled using an OK interpolation applied to 3 m gold and silver drill hole composite lengths which respected lithologic boundaries.

Densities were determined from a suite of 5,946 representative core samples using industry standard methods. The density was then interpolated in areas where the data was sufficiently dense to honor localized variations. For the remaining areas, the average density for each of the lithological domains was applied.

The block model matrix size of 5 m x 5 m x 6 m (width x length x height) was selected in consultation with the engineering team from AGP and was based on the size deemed suitable for a small to moderate open pit mining scenario with possible underground mining components below the pit.

The interpolation was carried out in multiple passes with increasing search ellipsoid dimensions. The classification was based primarily on the pass number and the average distance to the composites, followed by an adjustment based on diamond drilling density (core area), and the krige efficiency.

Under CIM definitions, Mineral Resources should have a reasonable prospect of eventual economic extraction. A gold price of $1,400/ounce and a silver price of $20/ounce was used for the cut-off determination. For open pit resources, a cut-off of 0.6 g/t gold was used.

To further assess reasonable prospects of eventual economic extraction, a Lerchs-Grossman optimized shell was generated to constrain the potential open pit material. Parameters used to generate this shell included:

- 49.5° overall slopes for the pit shell
- US$2.25/t mining, US$19/t milling, US$2.49/t G&A operating costs
- 88% gold recovery, and 30% silver recovery
- Gold price of $1,400/ounce and $20/ounce silver price
- Above criteria was applied to Measured, Indicated, and Inferred mineral resources

To further assess reasonable prospects of eventual economic extraction for the material below the resource constraining shell, a break-even cut-off of 1.6 g/t gold was selected based on the following parameters:

- US$36/t mining, US$19/t milling, US$2.49/t G&A operating costs
- 88% gold recovery, and 30% silver recovery
- Gold price of $1,400/ounce and $20/ounce silver price
- Dilution considered for cut-off determination 5%
- Above criteria was applied to Measured, Indicated, and Inferred mineral resources

Based on the geometry of the deposit, the material amenable to underground extraction will likely be using a bulk mining method such as long-hole or modified Avoca mining method. The break-even cut-off stated is only applicable to the material in the vicinity of the mineralized HALO due to increase in development cost reaching blocks further away and no mining plan exist for the material amenable to underground extraction and therefore stope size, level spacing and other underground mining criteria have not yet been established.

With an effective date of December 30, 2020, and based on the above criteria, a summary of the mineral resource is presented in Table 25-3, tabulated at a cut-off of 0.6 g/t gold within the resource constraining shell and 1.6 g/t gold below the shell.

Table 25-3: Ana Paula Resource Statement Effective December 30, 2020

Area	Category	Cut-off (Au g/t)	Tonnes	Au (g/t)	Gold (ounces)	Ag (g/t)	Silver (ounces)
Resource Amenable to Open Pit Extraction	Measured	0.6	9,095,000	2.39	698,000	5.6	1,629,000
	Indicated		9,810,000	1.79	563,000	5.3	1,677,000
	Measured & Indicated		**18,905,000**	**2.07**	**1,261,000**	**5.4**	**3,306,000**
	Inferred*		63,000	0.86	2,000	10.5	21,000
Resource Amenable to Underground Extraction	Measured	1.6	85,000	2.15	5,800	2.8	8,000
	Indicated		2,212,000	2.84	202,000	4.0	286,000
	Measured & Indicated		**2,297,000**	**2.81**	**207,800**	**4.0**	**294,000**
	Inferred*		322,000	2.09	21,700	4.2	43,000
Total Resource	Measured	OP 0.6 and UG 1.6	9,180,000	2.38	703,800	5.5	1,637,000
	Indicated		12,022,000	1.98	765,000	5.1	1,963,000
	Measured & Indicated		**21,202,000**	**2.16**	**1,468,800**	**5.3**	**3,600,000**
	Inferred*		385,000	1.89	23,700	5.2	64,000

*Note: The quantity and grade of reported Inferred resources in this estimation are conceptual in nature and are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. For these reasons, an Inferred Mineral Resources has a lower level of confidence than an Indicated Mineral Resources and it is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Rounding of tonnes as required by reporting guidelines may result in apparent differences between tonnes, grade, and contained metal content.

25.4 MINERAL RESERVES

The reserves for Ana Paula are based on the conversion of the Measured and Indicated resources within the current technical report mine plan. Measured resources are converted directly to Proven Reserves and Indicated resources to Probable Reserves. The total reserves for Ana Paula are shown in Table 25-4.

Table 25-4: Proven and Probable Reserves – Ana Paula

Category	Tonnes (kt)	Gold Grade (g/t)	Gold (ounces)	Silver Grade (g/t)	Silver (ounces)
Proven	7,126	2.75	630,000	5.77	1,322,000
Probable	6,996	2.00	451,000	5.45	1,226,000
Total	**14,122**	**2.38**	**1,081,000**	**5.61**	**2,547,000**

Note: This mineral reserve estimate is effective as of February 1, 2023 and is based on the mineral resource estimate dated December 30, 2020. The mineral reserve calculation was completed under the supervision of Gordon Zurowski, P.Eng. of AGP Mining Consultants Inc., who is a Qualified Person as defined under NI 43-101. Mineral reserves are stated within the final design pit based on a US$976/ounce gold price pit shell with a US$1,200/ounce gold price for revenue. The cut-off grade was 0.67 g/t Au for all pit areas. The mining cost averaged $3.08/tonne mined, processing averages US$19.68/tonne milled and G&A was US$2.44/tonne milled. The process recovery for gold averaged 88% and the silver recovery was 30%. The exchange rate assumption applied was Mex$20.00 equal to US$1.00.

The reserves are based solely on the Ana Paula open pit. The underground resources have not been converted and remain resources only for this technical report.

25.5 MINING METHODS

Mining studies have been completed using the resource estimate as of December 30, 2020, for Ana Paula and includes the following aspects:

- Pit optimization utilized the Lerch-Grossman algorithm to determine the ultimate pit limits. A metal price of $976/oz gold was used to define the ultimate pit for the Study.
- Final pit was designed with three phases to help advance ore to the mill and defer stripping. Bench and overall pit slope designs were based on recommendations by Knight Piésold.
- Mineral reserves have been determined from mineral resources by taking into account geologic, mining, processing, legal and environmental considerations and are therefore classified in accordance with the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves.
- Proven Mineral Reserves amount to 7.12 Mt at an average grade of 2.75 g/t Au and 5.77 g/t Ag. Probable Mineral Reserves amount to 7.00 Mt at an average grade of 2.00 g/t Au and 5.45 g/t Ag. Total estimated Mineral Reserves amounts to 14.12 Mt at an average grade of 2.38 g/t Au and 5.61 g/t Ag. Inferred Mineral Resources have not been converted to reserves and instead are treated as waste for mine planning purposes.
- The mine schedule moves 42.8 Mt of waste and 14.1 Mt of ore for a strip ratio of 3.04:1 over an 8 year mine life.
- Waste rock facilities (WRF) are located in the same valley as the tailing facility at two different locations. They accommodate all the waste material from the pit.
- Mining will be completed by contractor with size appropriate equipment in the form of 56 t haulage trucks matched to 6.4 m^3 front end loaders and 6.0 m^3 excavators. Support equipment such as dozers, graders and water trucks will assist in the mining operation.
- Contract mining has been employed for the entire mine production.
- Grade control will be provided by a separate fleet of reverse circulation drills working in advance of the active mine faces.
- Dewatering activities will be of smaller scale with seasonal pit dewatering after storm events. Water discharge from the pit will be to the tailing facility or consumed for dust control purposes.
- Estimates of both mine capital and operating costs are summarized in Section 21. Capital costs consider contractor mining from Year -2 onwards with supervision by Heliostar's technical team.

The potential for underground mining exists beneath the PFS design pit. This potential underground material has not been considered in the pre-feasibility study and are not included within the Mineral Reserves. Mineral Resources that are not included within Mineral Reserves do not have demonstrated economic viability.

25.6 MINERAL PROCESSING AND METALLURGY

- Arsenopyrite and pyrite were identified as the primary sulphide minerals in the deposit. Both minerals were identified as carriers of submicroscopic/solid solution gold.
- Ana Paula material may be considered moderately hard to hard with SMC results yielding Axb values of 34.8 and 33.3. Bond Ball Work Index test results showed work indices ranging from 15.1 kWh/t to 19.4 kWh/t.
- The material is mildly abrasive.
- Whole ore flotation yields gold recoveries ranging from 93% to 96% with an average mass recovery of 20%.

- The flotation response was insensitive to the primary grind size between 75µm and 160µm. A primary grind of 80% passing 160µm was selected.
- Ana Paula responded well to gravity concentration. At a 160µm grind size recovery to gravity concentrate is expected to be approximately 20%, based on treatment of 36% of the ball mill circulating load.
- Whole ore cyanidation resulted in recoveries ranging from 59% to 70% for GD, 62% to 68% for HGB, and 6% to 50% for LS.
- Preg-robbing carbon was identified in the LS composite, explaining the low initial recoveries. LS performance improved through the addition of activated carbon.
- Whole ore cyanidation of Ana Paula material was insensitive to primary grind size residence time, cyanide concentration, lead nitrate addition and preaeration. Gold recovery is limited by the refractory gold content of the material.
- Pressure oxidation of Ana Paula material yielded gold recoveries in excess of 95%.
- Atmospheric oxidation of Ana Paula material yielded overall gold recoveries of approximately 84-88% depending on regrind size and soda ash dosage.
- The atmospheric oxidation flowsheet was chosen based on a lower capital cost.
- Soda ash was chosen as the pH modifier during the atmospheric oxidation process as it yielded the best results.
- Soda ash consumption is a function of the sulphur content of the concentrate and the extent of oxidation desired.
- Regrinding the concentrate to 25µm resulted in the best oxidation conditions and highest gold recovery.
- Gold recovery is maximized after 48 hours of oxidation. Further residence time does not yield additional recovery.

25.7 ECONOMIC RESULTS

The results of the economic analysis are shown in Table 25-5.

Table 25-5: Results of the Economic Analysis

Summary of Results	Unit	Value
Mine Life	Years	8
Total Reserve	M tonnes	14.1
Total Waste	M tonnes	43.0
Total Capitalized Waste	M tonnes	7.0
Total Mined	**M tonnes**	**57.1**
Strip Ratio (Operations)	w:o	3.04
Mining Rate (Maximum)	t/d	24,658
Plant Throughput (Maximum)	t/d	4,932
Average Head Grades		
Au	g/t	2.38
Ag	g/t	5.61
Metal Produced		
Au	LOM k oz	919
	k oz/yr	115
Ag	LOM k oz	1,402

Summary of Results	Unit	Value
	k oz/yr	175
NSR (Net of Royalties)	$M	1,468
	$/t processed	104
Operating Costs	$M	492.7
	$/t processed	34.90
Cash Cost	$/ oz	546
Au All-In Sustaining Costs	$/Au oz	573
Capital Costs		
Initial Capital excluding Contingency	$M	212.4
Initial Capital Contingency	$M	21.2
Working Capital	$M	14.0
Total Initial Capital (excl. Working Capital)	$M	233.6
	$/t processed	16.57
Sustaining & Closure Capital	$M	24.0
Total Capital Costs Incl. Contingency	$M	257.5
	$/t processed	18.23
Pre-Tax Cash Flow	$M	700.5
Taxes	$M	263.32
After-Tax Cash Flow	$M	437.1
Economic Results		
Pre-Tax NPV5%	**$M**	**463.9**
Pre-Tax IRR	**%**	**40.9%**
Pre-Tax Payback	**Years**	**2.5**
After-Tax NPV5%	**$M**	**278.6**
After-Tax IRR	**%**	**30.5%**
After-Tax Payback	**Years**	**3.0**

Sensitivity analyses were performed on the Base Case economics shown in Table 25-6 to determine which factors most affected the project performance. The analysis revealed that the project is most sensitive to metal prices. Followed by operating costs and initial capital.

Table 25-6: Project Sensitivity to Metal Prices

Gold Price (US$/oz)	1,280	1,360	1,600	1,840	1,920
Silver Price (US$/oz)	16	17	20	23	24
Pre-Tax NPV$_{5\%}$ ($M)	250.8	304.1	463.9	623.7	677.0
After-Tax NPV$_{5\%}$ ($M)	140.1	174.8	278.6	382.2	416.7
Pre-Tax IRR (%)	26.2	30.0	40.9	51.1	54.3
After-Tax IRR (%)	18.8	21.9	30.5	38.4	40.9
Pre-Tax Payback (Years)	3.6	3.2	2.5	2.1	2.0
After-Tax Payback (Years)	4.2	3.9	3.0	2.5	2.4

26 RECOMMENDATIONS

The Ana Paula Project should advance through an initial rescoping to a feasibility study (FS) in alignment with Heliostar's desire to develop the resource.

The initial project rescoping will comprise a trade off study between open pit and underground mining and an optimization of the process flow sheet. In addition, a drill program will be undertaken to improve the resource and reserve definition in support of underground mining planning and provide additional metallurgical samples required for testing and process flow sheet optimization. The budget for the project rescoping is anticipated to be approximately C$4,000,000, including drilling. The goal of the scoping study is to determine the optimal means of exploiting the deposit with respect to the following metrics:

- Capital efficiency- determining what combination of mining and milling options provides the best return on capital on an NPV and IRR basis
- Initial capital expenditures- improving return for existing shareholders by reducing initial capital requirements and dilution
- Operational and technical risk- using conventional, well known, and benchmarkable methods of mining and milling- selecting options that demonstrate lesser sensitivities to inputs or that limit downside risk
- Development timelines- minimizing the build time to bring cash flows as far forward as possible
- Environmental impact and social acceptability- reduces potential objections to the mine and eases future community and permitting hurdles

The open pit versus underground mining trade off study will be based on the current resource and reserve model. Underground mining methods will be evaluated to determine the optimal underground method for extracting the central, high-grade panel of the Ana Paula Resource based on the criteria listed above. This high-grade panel is economically critical since it is believed to carry majority of the gold resource in the minority of the tonnes. This optimal method will then be compared to the open pit mining method, again based on the criteria above.

The mill circuit and process flow sheet optimization will re-evaluate processing methods on a fiscal and risk basis and in alignment with a potential high-grade underground operation. Alternative process flow sheets may present lower overall recoveries but better financial outcomes or reduced operational or financial risk profiles.

A 3,500m drill program will be conducted synchronously with the studies above. It will provide additional resolution for resource and geological modeling for the high-grade panel at the center of the Ana Paula resource.

Estimated costs for a FS-level study specific to the Project total $4.63M and itemized in Table 26-1. The planned activities for the feasibility study were selected by Heliostar and do not include all the recommendations proposed by the consultants. The scope and scale of the feasibility study may be materially impacted by the results of the rescoping study. Furthermore, Heliostar plans to start work on detail engineering design (EPCM Engineering) during the feasibility study to advance the Project schedule. While not part of the feasibility study, any detailed information derived may be used to improve the FS capital cost estimate.

Table 26-1: Feasibility Study Estimated Costs

Item	Cost ($000)	Description
Metallurgical Testwork	1,500	Metallurgical Core Sampling, Pilot Plant Testwork, Analysis, and Interpretation
Tailing Management and Waste Rock, Facilities and Water Supply	570	Geotechnical and Design Engineering for Tailings Management and Waste Rock Facilities. Hydrogeology and Geochemical
FS Engineering & Services	700	FS-Level Mine, Infrastructure and Process Designs
Other Studies	386	Mining, Geology & Peer Review
Local Infrastructure Engineering	350	Access Roads, Power Line corridor
EPCM Engineering	750	Infrastructure & Plant Design and Engineering
Subtotal	4,256	
Contingency (10%)	376	
Total	**4,632**	Excludes Owner's Costs

26.1 GEOLOGY

Heliostar plans to complete a 3,500m drill program in support of the planned rescoping study. The results of this program will provide additional resolution for modeling the resource and reserve in support of potential underground mining. The core will be used for metallurgical testing in support of optimizing the flow sheet. Geotechnical information will be obtained from the core in support of underground mine planning.

26.1.1 QA/QC Recommendation

- While the current QA/QC is of industry standard, the best program seen by the QP re-insert coarse and pulps rejects from earlier assays in the sample stream with a new tag number, in order to incorporate a blind coarse and pulp duplicate procedure to the QA/QC protocol. This additional protocol is deemed optional and should be considered on larger drill programs and for more advance projects. Cost per samples is US$35 for gold, silver and multi-elements. Therefore, the estimated cost per 1,000 samples, assuming only gold and silver is run, is estimated below US$1,500.

26.1.2 Resource Model Recommendation

- The block size while adequate for the area covered by the pre-feasibility pit is considered too small for the area to the North of the pit. The use of an 8m x 8m x 6m block model matrix should be investigated with the goal to improve the estimate in the North while minimizing the impact to the model in the pit area.
- It is recommended that the oxidation layer be studied and modeled separately during the construction of the feasibility model.
- For the feasibility study, AGP recommends investigating if a high grade probabilistic model could be used as a surrogate to the HALO in order to simplify the procedure. This may also result in a smoother grade distribution.
- The geological interpretation and resulting geological model covering the southwest portion of the deposit should be redone taking into account the surface mapping. There is potential mineralization occurring in this area and a preliminary resource model could be interpolated to assist the exploration effort.
- The underground resource requires significant additional drilling to confirm continuity and proper grade distribution at the precision level required for underground mine planning. Drilling this small target is difficult to accomplish due in part to topographical limitation and due to drill string accuracy. It is recommended to carry out an underground scoping study that would offer guidelines on stope size and level spacing which

would offer guidelines as to the drill pattern required to improve the resource estimate for the material below the pit shell.

Costs for the above recommendations pertaining to the resource model are included under "Other Studies" in Table 26-1.

26.1.3 Resource Model Risk Assessment

For a feasibility model, it is recommended that the resource model be evaluated for risks associated with the estimated quality (grade) and quantity (tonnage) of resources at a given cut-off. This risk is evaluated using advance geostatistical technique such as Hermite correction/change of support studies, confidence intervals via the use of conditional simulation and uniform conditioning. These studies will require the use of a geostatistician, and cost is estimated at $15,000 for approximately one week of work.

AGP also recommend drilling with an RC rig a test area covering the first few months of production on a tight pattern similar to what will be used for grade control. This drilling will allow the calibration of the resource model and de-risk the Project during start-up. The recommended area should be selected with the mine planning engineers.

Costs for the above recommendations pertaining to resource model risk assessment are under "Other Studies" in Table 26-1.

26.2 MINING METHODS

Significant work has been completed to date on the open pit designs and costing for the Ana Paula pit. This work demonstrates the potential for economic development of the Project. There are still some areas that require further definition prior to operation and can be addressed in the feasibility study. These include:

- ARD characterization:
  - Information regarding potential for ARD is still to be confirmed.
  - If this is an issue a proper mitigation strategy needs to be developed.
  - This may include encapsulation in WRF or submersion in the TSF.
- Underground potential:
  - Beneath the reserve pit lies additional high grade mineralization. This material represents an opportunity to mine underground which could add additional grade to the mill feed.
  - A study examining the costs and practicality should be completed internally and then drilling to confirm the design concept.
  - Further investigation is warranted to examine a potential opportunity with underground mining beneath the current reserve pit.
- WRF design and sequencing:
  - This needs to be examined in a bit more detail to assist in reducing hauls also minimizing future reclamation requirements.

26.2.1 Grade Control Procedures

The pre-feasibility study went into detail with specific methods of grade control, but this area represents a significant area of benefit to the overall mine operation in that it provides the following benefits:

- Dilution is controlled.
- The ore heterogeneity is understood and quantified to the extent possible.
- Additional study is required to evaluate exact equipment for use in the grade control program and methodologies to be employed in mine operations. There are specific experts in the field, and it would benefit the Project to consider them as part of the feasibility study and basic engineering.

26.2.2 Road Design

Access due to topography is a concern that requires an extensive road network. Proper road design and construction is critical reducing material movement costs. A detailed examination of the roads, their timing and construction can positively assist the Project economics.

The approximate cost for the access road engineering is included in the "Local Infrastructure Engineering" of $350,000.

26.3 TAILING STORAGE FACILITY, WASTE ROCK FACILITIES, AND WATER ENGINEERING

The following engineering studies are recommended as part of the feasibility study:

- TSF and WRF FS design engineering
- Tailing pipeline and water recirculation systems engineering
- Site wide water balance
- Geotechnical characterization
- TMF Hydrogeology model (to confirm hydrogeologic containment)
- FS level water management plan and design
- Geochemical characterization of leached tailing

The approximate cost for the feasibility stage is approximately $570,000.

26.4 METALLURGICAL TESTWORK RECOMMENDATIONS

The following testwork is recommended as part of the feasibility study:

- Additional grindability testing including the following:
  - JK Drop Weight tests on each major domain
  - Variability SMC Tests
  - Variability Bond Ball Work Index tests
- Variability flotation testing for each major domain
- Atmospheric oxidation-cyanidation testing of composites based on production years.
- As part of the oxidation-cyanidation testing, monitor concentration of copper that goes into solution to determine if enough copper is available for cyanide detoxification or if too much copper will accumulate in the water recycle loop.
- Pilot-scale testing of the atmospheric oxidation circuit

- Cyanide destruction testwork.
- Thickening and rheology testwork
- Arsenic precipitation testwork under different conditions. For example, the AOX process could be allowed to become very acidic, say to pH 2, before adding ferrous sulfate at 90 to 95°C in oxidizing conditions, to promote precipitation of scorodite. This would be followed by slurry cooling before final neutralization to keep the scorodite stable.
- Alternate oxidation testing, such as the Albion Process and Rapid Oxidative Leach (ROL) developed by FLS. Arsenic stabilization must be included in these tests.

The estimated cost for this testwork is expected to be approximately $1,500,000 assuming that pilot scale testing is required. The cost of drilling new metallurgical samples is excluded from this amount.

26.5 SOCIAL IMPACT STUDIES

The following work is recommended as part of the feasibility study:

- Complete Social Impact Studies.
- Develop a Community Stakeholder Engagement System.

The cost for these is included in Owner's cost as part of their continuing effort to develop close relationships with the local communities and government.

27 REFERENCES

ALS Metallurgy Kamloops, 2017, Ana Paula Comminution Test Program – KM 5227. April 20, 2017.

AuTec Innovative Extractive Solutions Ltd., 2016, Blue Coast Research – Rotary Breakage Test Lite. Document #: P2016-126. Revision #: 0. August 30, 2016.

Bagan, T., 2013, Personal communications.

Blue Coast Research, 2017, Ana Paula Prefeasibility Metallurgical Testwork Report. Prepared for Alio Gold Inc. 25 May 2017.

C.I.M, 2010, Canadian Institute of Mining, Metallurgy and Petroleum, as the CIM Definition Standards on Mineral Resources and Mineral Reserves as amended by the CIM Standing Committee on Reserve Definitions, adopted by CIM Council on November 27, 2010. Available at http://web.cim.org/standards.

Colombo, F., 2012, June 12, 2012, Report 120480, Ana Paula Project: An internal report for Newstrike Capital Inc., by Vancouver Petrographics Ltd., 92 p.

Centeno-García, E.; Guerrero-Suastegui, M; and Talavera-Mendoza, O, 2008, The Guerrero Composite Terrane of western Mexico: Collision and subsequent rifting in a supra-subduction zone. Geological Society of America Special Papers 2008; 436; 279-308.

Corbett G., 2009, Anatomy of porphyry-related Au-Cu-Ag-Mo Mineralised systems: Some exploration implications: For: Australian Institute of Geoscientists North Queensland Exploration Conference June 2009. www.corbettgeology.com.

Corbett, G.J., and Leach, T.M., 1998, 'Southwest Pacific rim gold-copper systems: Structure, alteration and mineralization', Short course manual May 1997 edition: Also published with edits as Economic Geology, Special Publication 6, 1998, 238 p.

Díaz Nieves, L., et.al. 2012, Legal opinion on mineral rights status dated November 6, 2012. from Diaz Bouchot and Raya of Mexico City to Davidson and Company LLP of Vancouver. Newstrike internal communication.

Estimate Municipalities Of Cuétzala Del Progreso and Apaxtla del Castregon Guerrero State, Mexico. NI 43-101 Technical Report for Newstrike Capital Inc., Effective Date February 26th, 2013 151p.

FLSmidth, 2017, Gravity Circuit Modeling Report, Timmins Gold-Blue Coast Research, Ana Paula. Prepared for Taj Sigh, Revision 2. May 26, 2017.

Gibson, C., 2010, Ana Paula geology, sampling, and core logging manual: Private report prepared for Newstrike Capital Inc. by ProDeMin, 22 p. Gibson, C., 2011, Personal communications.

Gibson, C., 2012, Ana Paula Geology – Aurea Report 05-2012, An internal report for Minera Aurea SA de CV, 6 p.

Gibson, C., 2012, Personal communications. Gibson, C. 2013, Personal communications. Gibson, C. 2014, Personal communications.

Goldcorp 2005a, Los Filos Project feasibility study. Press release dated May 17, 2005 available at http://sedar.com and from www.goldcorp.com.

Goldcorp 2005b, Goldcorp completes acquisition of Bermejal gold deposit in Mexico. Press release dated March 31, 2005 and available at http://sedar.com and from www.goldcorp.com.

Goldcorp, 2012, Management's discussion and analysis of financial condition and results of operations for the year ended December 31, 2012, Form 51-102F1. Available on www.Sedar.com and at: http://www.goldcorp.com with accompanying files Reserves.pdf and 2012 Resources.pdf.

Goldcorp, 2014, Goldcorp announces record quarterly and full-year gold production; Provides updated reserves and resources estimates. Press Release Dated February 13, 2014 Available on www.sedar.com and at www.goldcorp.com.

González-Partida, E., et. al., 2003, Paleocene Adakite Au–Fe Bearing Rocks, Mezcala, Mexico: Evidence From Geochemical Characteristics: Journal Of Geochemical Exploration, vol. 80 p. 25–40.

González-Partida, E., et. al., 2004, Fluidos Asociados Al Skarn Au(-Cu) De La Joya, Distrito De Mezcala, Guerrero, México: Implicaciones Regionales Para Depósitos Formados A Partir De Rocas Calcoalcalinas Vs. Adakíticas: Revista Mexicana de Ciencias Geológicas, V. 21, Núm. 3, p. 371-381.

Hacettepe University: Department of Mining Engineering Online Dictionary on Mining, Mineral and Related Terms, www.maden.hacettepe.edu.tr/dmmrt/index.html.

Hertel, M., Rust, J, 2013, Media Luna Gold–Copper Project Guerrero State, Mexico NI 43-101 Technical Report. Prepared for Torex Gold Resources Inc. by AMEC E&C Services, Inc Project Number: 167627. Effective Date: 13 September 2013. 176P.

JDS Energy & Mining Inc. 2016, Ana Paula Project Preliminary Economic Assessment, Municipalities of Cuétzala del Progreso and Apaxtla del Castregon, Guerrero State, Mexico. Effective Date February 2, 2016. Report Date: March 23, 2016. Prepared for Timmins Gold Corp.

JDS Energy & Mining Inc. 2014, Ana Paula Project Preliminary Economic Assessment, Municipalities of Cuétzala del Progreso and Apaxtla del Castregon, Guerrero State, Mexico. Effective Date August 8, 2014. Report Date: October 29, 2014. Prepared for Timmins Gold Corp.

Johnson, B, 2014, Internal memo for Newstrike Capital dated July 27, 2014, and various personal communications.

Kappes, Cassiday & Associates, 2012, Ana Paula Project BxA700 Composite Report of Metallurgical Test Work, August 2012, doc. file: KCA0120137_ANA02_02. 108p.

Kearvell, G., 2009, Aurea Norte Property, The Guerrero Gold Belt, Guerrero State, México, (the El Coyote, Cosmos, Don Richard, Coyopancho, Cuétzala, Morenita, Don Jesus, Estafania, and Estafania Fracc. I Mining Concessions). 2004-2008 Exploration Programs Compilation Report: Internal report for Newstrike Capital Inc., 115p.

Kearvell, G., 2010, Personal communications during and subsequent to the Ana Paula Project visit conducted March 22-23rd, 2010.

Kearvell, G., 2011, Personal communications during and subsequent to the Ana Paula Project visit conducted January 10-11, 2011.

Kearvell, G., 2012, Personal communications during and subsequent to the Ana Paula Project visit conducted March 27-29, 2012, and October 10-12, 2012, 2012.

Kearvell, G., 2013, Personal communications. Kearvell, G., 2014, Personal communications.

Knight Piésold Consulting, 2017a, Ana Paula Project Results of Geochemical Characterization Program. Prepared for Timmins Gold Corp. April 14, 2017.

Knight Piésold Consulting, 2017b, Alio Gold Inc., Ana Paula Project Pre-Feasibility Study, Tailings Storage Facility and Waste Rock Facility. Prepared for Alio Gold Inc. May 17, 2017.

Levresse, G; et al, 2004, Petrology, U/Pb Dating And (C-O) Stable Isotope Constraints On The Source And Evolution Of The Adakite-Related Mezcala Fe-Au Skarn District, Guerrero, Mexico. Mineralium Deposita (2004) 39: 301–312 DOI 10.1007/S00126-003-0403-Y. Springer-Verlag.

Lunceford, R. A., 2009, Geological Report and Summary of Field Examinations, Aurea Norte Property, Municipalities of Apaxtla, Cocula and, Cuétzala del Progreso Guerrero State Mexico, September 30, 2009: NI 43-101 Technical Report for Newstrike Capital Inc., 96 p.

Lunceford, R. A., 2010, Geological Report and Summary of Field Examinations, Ana Paula Project, Municipalities of Cuétzala del Progreso, Apaxtla del Castregon Guerrero State, México June 26, 2010: NI 43-101 Technical Report for Newstrike Capital Inc., 101 p.

M3 Engineering & Technology Corp., 2017, Ana Paula Project NI 43-101 Technical Report, Amended Preliminary Feasibility Report, Guerrero, Mexico, Revision 1, prepared for Alio Gold Inc. (Alio), Effective date May 16, 2017.

M3 Engineering & Technology Corp., 2022, Morelos Property, NI 43-101 Technical Report, ELG Mine Complex Life of Mine Plan and Media Luna Feasibility Study Guerrero State, Mexico, Revision 0, prepared for Torex Gold Resources, Inc., effective date March 16, 2020, issue date March 31, 2022.Mauler, A., Thompson, J. B., 2005, Petrographic Report Of 11 Samples; Mexico: Private Report For Goldcorp Inc., Petrascience Consultants, Inc., 44 P.

Mc. Terra Empredimientos Sustentables. Hidrolab Consultores, S.C., 2016, Minera Aurea S.A. de C.V. Cuétzala del Progreso, Guerrero. Estudio Línea Base del Proyecto Minero Ana Paula Cuétzala del Progreso, Guerrero. Prepared for Minera Aurea S.A. de C.V. January 2016.

Medina Cázares, H., 2010, Geología y Mineralización del Proyecto Ana Paula, Gro.: Goldcorp Internal Report, 46 p.

Minera Aurea S.A. de C.V., 2017, Estudio Socio-Económico, February 2017.

Neff, D.H., et al, 2012, Morelos Gold Project 43-101 Technical Report Feasibility Study Guerrero, Mexico, Effective Date: 4 September 2012, Issue Date October 1, 2012. Prepared for Torex Gold Resources Inc. by M3 Engineering & Technology Corporation. 377P.

Newstrike Capital Inc, 2010, "Newstrike Capital to acquire Goldcorp's 'Ana Paula' properties in Guerrero, Mexico" March 3, 2010. Available at http://sedar.com and from www.newstrikecapital.com.

Newstrike Capital Inc., 2011, Newstrike Drills 214 Meters of 3.0 G/T Gold at Ana Paula Project, Guerrero, Mexico: January 18, 2011 Available at http://sedar.com and from www.newstrikecapital.com.

Newstrike, 2012a, Management Discussion and Analysis (MD&A) - Six months ended January 31, 2012: Form 51-102F1, filed March 29, 2012, Newstrike Capital Inc., 28 p. Available at http://sedar.com and from www.newstrikecapital.com.

Newstrike, 2012b, Management Discussion and Analysis (MD&A) – Year ended July 31, 2012: Form 51-102F1, filed November 22, 2012, Newstrike Capital Inc., 41 p. Available at http://sedar.com and from www.newstrikecapital.com.

Newstrike, 2012c, Management Discussion and Analysis (MD&A) - Three months ended October 31, 2012: Form 51-102F1, filed December 19, 2012, Newstrike Capital Inc., 22 p. Available at http://sedar.com and from www.newstrikecapital.com.

Newstrike, 2013a, Newstrike Capital Inc. Announces Maiden Ni 43-101 Resource Estimate For The Ana Paula Project, Guerrero, Mexico. Press Release dated March 27, 2013 Available at http://sedar.com and from www.newstrikecapital.com.

NI-43-101, 2011, National Instrument 43-101 Standards of Disclosure for Mineral Projects, B.C. Reg. 86/2011, British Columbia Securities Commission. Deposited May 19, 2011 effective June 30, 2011, available from http://canlii.ca/t/l3nk and from http://www.bcsc.bc.ca.

Ortiz, J. M., 2005, Minas De San Luis, S.A. de C.V., Laboratorios de Servicios e Investigación Metalúrgica, Pruebas Metalúrgicas Por Cianuración y Flotación de Una Muestra del Proyecto Ana Paula: Internal Report for Goldcorp, 29 p.

Ross-Brown, D., Levy, M. 2012, Preliminary Geotechnical Assessment of Slope Angles for the Ultimate Pit of Ana Paula: A private report for Newstrike Capital Inc., 11 p.

SGS De México, S.A. de C.V., 2006, Pruebas Metalúrgicas para Determinar Las Máximas Extracciones De Oro Y Plata Por Cianuración Y Por Flotación, De Un Compuesto Proveniente Del Proyecto Ana Paula : Reporte preparada para Desarrollos Mineros San Luis S.A. de C.V., 21 p.

SJ, 2012, Internal reports and communications for Newstrike Capital by SJ Geophysics Ltd, Vancouver, Canada.

Teck Cominco, 2004, Teck Cominco and Wheaton River announce results of 2004 exploration program on Morelos Norte (El Limón) project, Mexico. Open pit inferred resource estimate at 3.2 million ounces gold. Press release dated November 08, 2004 available on www.sedar.com.

Thompson, T., 2008, Petrography Of The AP-Series And Outcrop Specimens, Ana Paula, Mexico: Economic Geology Consulting Internal Report Prepared For Goldcorp, Inc. May 15, 2008. 68p.

Valencia-Gomez, V.A., et al., 2001, Caracterización de las Intrusiones Graniticas Relacionadas Con Yacimientos de Oro del Limite Oeste de la Plataforma Morelos-Guerrero: Una Guía para la Exploración de Recursos Minerales en el Estado de Guerrero. Clave Proyecto 980506037. Sistema de Investigación Benito Juarez. SIBEJ, Informe Técnico Final, 151p.

Valencia, V.A and Ruiz, J, 2008, Resultados Analíticos De La Visita De Las Minas Los Filos, Bermejal Y Nukay, Mezcala, Guerrero Y El Proyecto Ana Paula En Cuétzala del Progreso, Guerrero. Departamento De Geociencias de la Universidad de Arizona, Informe Interno para Minera Luismin S.A. De C.V. Por El Dr. Victor A. Valencia May 2008, 66p.

Vollmer, F.W., 2012. Orient 2.1.2 Orientation Data Analysis Software. www.frederickvollmer.com.

Welhener, H. E., Lunceford, R.A., Winckers, A.H., Ana Paula Project Technical Report And Initial Resource.

Werre Keeman, F.J., Estrada Rosarte, G., et al., 1999, Monografía Geológico-Minera del Estado de Guerrero: Consejo de Recursos Minerales Publicación M-19e.SECOFI, 1º Ed., 262 p.

APPENDIX A – PRELIMINARY FEASIBILITY CONTRIBUTORS AND PROFESSIONAL QUALIFICATIONS

CERTIFICATE OF QUALIFIED PERSON

Daniel H. Neff

I, Daniel H. Neff, PE, do hereby certify that:

1. I am currently employed as Chairman of the Board of

   M3 Engineering & Technology Corporation
   2051 W. Sunset Road, Ste. 101
   Tucson, Arizona 85704
   U.S.A.

2. I am a graduate of the University of Arizona and received a Bachelor of Science degree in Civil Engineering in 1973 and a Master of Science degree in Civil Engineering in 1981.
3. I am a Registered Professional Engineer in the State of Arizona (No. 11804 and 13848).
4. I have practiced civil and structural engineering and project management for 49 years. I have worked for engineering consulting companies for 12 years and for M3 Engineering & Technology Corporation for 37 years.
5. 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.
6. I am responsible for Sections 1.1, 1.2, 1.11, 1.14, 1.16, 1.17, 2, 3, 4, 18, 19, 21.1, 21.1.2, 21.1.3, 21.2.2, 21.2.3, 23, 24, 25.1, 25.2, 25.7 and 27 of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico", (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited.
7. My prior involvement with the Ana Paula property consisted of preparing the Preliminary Feasibility Study Technical Report dated May 16, 2017 for Alio Gold Inc.
8. I visited the Ana Paula site on January 10-11, 2023.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report for which I am responsible contain all scientific and technical information required to be disclosed to make the report not misleading.
10. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
11. I have read National Instrument 43-101 and Form 43-101F1, and those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)
Daniel H. Neff, PE

CERTIFICATE OF QUALIFIED PERSON

Art S. Ibrado

I, Art S. Ibrado, PhD, PE, do hereby certify that:

1. I was employed as a project manager and metallurgist at M3 Engineering & Technology Corp., 2051 W Sunset Rd, Suite 101, Tucson, AZ 85704, USA, during the study. I am currently an independent metallurgical consultant with Fort Lowell Consulting PLLC, 4050 E Wading Duck Ct, Tucson, AZ 85712, USA.

2. I graduated with the following degrees:

   Bachelor of Science in Metallurgical Engineering, University of the Philippines, 1980
   Master of Science (Metallurgy), University of California, Berkeley, 1986
   Doctor of Philosophy (Metallurgy), University of California, Berkeley, 1993

3. I am a registered professional engineer in the State of Arizona (No. 58140).

4. I have worked as a metallurgist in the academic and research settings for fifteen years, including research on the mechanism of adsorption of gold cyanide on activated carbon (graduate research) and the oxidation of refractory gold ores (AJ Parker Centre for Hydrometallurgy, Perth, Australia). My industrial experience includes copper flotation for 7 years at Philex Mining (Philippines) and 1.5 years at the Phoenix Mine (Battle Mountain, NV); carbon-in-pulp (CIP) and carbon-in-leach (CIL) processes for gold recovery for 9 years at Philex Mining, Barrick Gold Strike and Newmont's Twin Creeks and Phoenix operations; pressure oxidation (POX) of refractory gold ores at Barrick Goldstrike and Newmont's Twin Creeks operations; carbon elution using the Zadra and modified AARL processes; and gold smelting. I was part of the owner's team for the design and engineering of the Mount Hope molybdenum project (Eureka, NV) for 1.5 years, before joining M3 Engineering as a metallurgical engineer from May 2009 to July 2021. At M3, I was project manager or lead process engineer for several studies involving the processing of Cu, Au, Pb, Zn minerals, was part of the commissioning team for the Peñasquito and Cananea process plants, and conducted HAZOPS workshops for the Toquepala expansion project. As an independent consultant, I have worked on the commissioning of the old Sutter Creek mine process plant, supported the restart of the adsorption, desorption and regeneration (ADR) plant at Çöpler Mine's heap leach operation, and provided metallurgical support for a few studies involving gold and copper processing plants.

5. 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, professional engineer registration, affiliation with a professional association (as defined in NI 43-101) and past relevant experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.

6. I am responsible for Sections 1.10, 12.5, and 17 of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico" (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited. I have not visited the Ana Paula property.

7. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report for which I am responsible contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

8. I am independent of Heliostar Metals Limited as independence is described in Section 1.5 of NI 43-101 and do not own any of their stocks or shares.

9. My prior involvement with the Ana Paula property consisted of preparing the Preliminary Feasibility Study Technical Report dated May 16, 2017 for Alio Gold Inc.

10. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)

Art S. Ibrado, PhD, PE

CERTIFICATE OF QUALIFIED PERSON

Richard K. Zimmerman

I, Richard K. Zimmerman, RG, SME-RM, do hereby certify that:

1. I am currently employed as a Registered Professional Geologist by

   M3 Engineering & Technology Corporation
   2051 W. Sunset Road, Ste. 101
   Tucson, Arizona 85704
   U.S.A.

2. I am a graduate of Carleton College and received a Bachelor of Arts degree in Geology in 1976. I am also a graduate of the University of Michigan and received a M.Sc. degree in Geology 1980.

3. I am a:

   - Registered Professional Geology in the State of Arizona (No. 24064)
   - Registered Member in good standing of the Society for Mining, Metallurgy and Exploration, Inc. (No. 3612900RM)

4. I have practiced geology, mineral exploration, environmental investigations, and project management for 41 years. I have worked for mining and exploration companies for 8 years, environmental and engineering consulting firms for 22 years, and for M3 Engineering & Technology Corporation for 12 years. My experience includes mine geology and exploration, ore reserve estimation, capital and operating cost estimation, mine process plant design, and managing feasibility studies for mining projects, contributing to over 20 technical reports.

5. I have read National Instrument 43-101 (NI 43-101) and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

6. I have read the definition of "qualified person" set out 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 am responsible for Sections 1.12, 20, and 26.5 of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico" (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited.

8. I have not visited the Ana Paula property.

9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information required to be disclosed to make the report not misleading.

10. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.

11. I have had previous involvement with the Ana Paula property working on the Preliminary Feasibility Study for the prior owner.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)
Richard K. Zimmerman, MSc, RG, SME-RM No. 3612900RM

CERTIFICATE OF QUALIFIED PERSON

Craig Gibson

I, Craig Gibson, PhD, CPG, do hereby certify that:

1. I am Technical Director of:

   Prospección y Desarrollo Minero del Norte SA de CV
   Paseo de las Margaritas 242
   Col. Bugambilias, Zapopan CP 45238
   Guadalajara, Jalisco, Mexico

2. I graduated with a BS degree in Geosciences in 1984 from the University of Arizona, and MS. and PhD degrees in Geology in 1986 and 1992 respectively, from the Mackay School of Mines, University of Nevada, Reno.

3. I am a Certified Professional Geologist #11096 with the American Institute of Professional Geologists of Westminster, Colorado since 2007.

4. I have accrued more than 30 years of experience in exploration, evaluation, discovery and research of mineral deposits in North and South America. Relevant experience includes investigation, evaluation, and exploration of multiple types of mineral systems throughout Mexico since 1993.

5. 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.

6. I am a contributing author for the preparation of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico" (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited; and am responsible for Sections 1.2, 4, 5, 6.2.4, 7.3, and 12.3. I have visited the project site many times over the last 12 years, with the latest visit on January 25-26, 2021.

7. I have prior involvement with the property that is the subject of the Technical Report. I was Field Operation Manager in charge of exploration for Newstrike Capital during its tenure at the project from 2010 to 2015 and was a contributing author for a prior technical report, Ana Paula Project, Preliminary Economic Assessment, Municipalities of Cuétzala del Progreso and Apaxtla del Castregon, Guerrero State, Mexico, Effective Date: February 2, 2016, Report Date: March 23, 2016.

8. As of the effective date of the Technical Report, 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.

9. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.

10. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)
Craig Gibson, PhD, CPG

CERTIFICATE OF QUALIFIED PERSON

Andrew Kelly

I, Andrew Kelly, P.Eng., do hereby certify that:

1. I am employed as President and Senior Metallurgist with:

   Blue Coast Research Ltd.
   2-1020 Herring Gull Way
   Parksville, BC V9P 1R2

2. I am a graduate of the University of New Brunswick and obtained a Bachelor of Science in Engineering (Chemical) degree in 2003.
3. I am a licensed Professional Engineer with the Association of Professional Engineers and Geoscientists of British Columbia (License No. 39900) and with the Association of Professional Engineers of Ontario (License No.100073664).
4. I have worked as metallurgist for a total of 19 years. My experience includes both plant operations and laboratory settings and covers base and precious metals.
5. 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.
6. I am a contributing author for the preparation of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update", (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited; and am responsible for Sections 1.5, 12.4, 13, 25.6, and 26.4.
7. I have not visited the property.
8. I have prior involvement with the property that is the subject of the Technical Report. I was involved in the preparation of the 2017 Prefeasibility Study titled "Ana Paula Project, NI 43-101 Technical Report, Amended Preliminary Feasibility Study", (the "Technical Report"), dated effective May 16, 2017, prepared for Alio Gold Inc.
9. As of the effective date of the Technical Report, 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.
10. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)
Andrew Kelly, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

Gordon Ross Zurowski

I, Gordon Ross Zurowski, P.Eng., do hereby certify that:

1. I am a Principal Mine Engineer of:

   AGP Mining Consultants Inc.
   132 Commerce Park Dr., Unit K, Suite 246
   Barrie, Ontario, Canada
   L4N 0Z7

2. I am a graduate of the University of Saskatchewan, B.Sc. in Geological Engineering, 1989.
3. I am member in good standing of the Association of Professional Engineers of Ontario, Registration #100077750.
4. I have practiced my profession in the mining industry continuously since graduation.
5. 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.
6. My relevant experience includes over 30 years in mineral resource and reserve estimations and feasibility studies in Canada, the United States, Central and South America, Europe, Asia, Africa, and Australia. As a result of my experience and qualifications, I am a Qualified Person as defined in NI 43-101.
7. I am a contributing author for the preparation of the technical report titled "Ana Paula Project, NI 43-101 Preliminary Feasibility Study Update", (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited; and am responsible for Sections 1.7, 1.8, 1.9, 15, 16.1, 16.2, 16.4 – 16.11, 21.1.1, 21.2.1, 25.4, and 26.2. I visited the project site on December 13th and 14th, 2016.
8. I was involved as a Qualified Person of the "Ana Project, NI 43-101 Amended Preliminary Feasibility Study", dated effective May 16, 2017.
9. As of the effective date of the Technical Report, 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.
10. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023 at Stouffville, Ontario, Canada.

(Signed and Sealed)
Gordon Ross Zurowski, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

Paul Daigle

I, Paul Daigle, P.Geo., do hereby certify that:

1. I am a Principal Resource Geologist with AGP Mining Consultants Inc. with a business address:

   #246-132K Commerce Park Dr., Barrie ON L4N 0Z7, Canada

2. I am a graduate of Concordia University, Montreal, Canada (B.Sc. Geology) in 1989
3. I am a member in good standing of the Professional Geoscientists of Ontario (No. 1592)
4. My profession in the mining industry continuously since graduation. My relevant experience includes over 30 years in the mining sector in the exploration and diamond drill programs, managing data, and estimating resources. I have been involved in numerous precious metal projects in similar precious metal deposits. My most recent experience includes the Dixie Gold Project, Miller Gold deposit and the Troilus Gold Copper Project, Canada.
5. 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.
6. I am responsible for the Sections 1.3, 1.4, 1.6, 6 (except 6.2.4), 7, 8, 9, 10, 11, 12.1, 12.2, 14, 25.3, and 26.1 of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico", (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited.
7. I have not had prior involvement with the property that is the subject of the Technical Report.
8. I visited the Ana Paula Site from January 10 to January 13, 2023, for three days.
9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the parts of the Technical Report for which I am responsible contain all scientific and technical information required to be disclosed to make the report not misleading.
10. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February, 2023.

(Signed and Sealed)
Paul Daigle, P.Geo.

CERTIFICATE OF QUALIFIED PERSON

Gilberto Dominguez

I, Gilberto Dominguez, PE, do hereby certify that:

1. I am Vice-President, Civil Executive Engineer of:

   Knight Piésold and Co.
   1999 Broadway, Suite 900
   Denver, CO 80202
   USA

2. I graduated in 1994 from Washington University in St. Louis with a Master of Science in Civil Engineering, in 1992 from the Pennsylvania State University also with a Master of Science in Civil Engineering, and from the Pontificia Universidad Católica del Perú, with a Bachelor of Science in Civil Engineering in 1989.

3. I am a Registered Professional Engineer in good standing in the state of Colorado (registration number 32075). I am also registered as a professional engineer in Peru as a Civil Engineer (registration number 63974).

4. I have worked as a Civil Engineer for a total of 30 years. My experience includes design of heap leach pads, waste and tailings management facilities, dams and reservoirs, geotechnical studies, construction management and quality assurance/control, environmental and permitting processes, and project management.

5. 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.

6. I am a contributing author for the preparation of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico", (the "Technical Report"), dated effective February 28, 2023, prepared for Heliostar Metals Limited; and I am responsible for Sections 18.2, 18.3, 21.1.3, and 26.3.

7. I have not visited the project site.

8. I was a contributing author and Qualified Person of the technical report titled "Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico", dated effective May 16, 2017, prepared for Alio Gold Inc.

9. As of the effective date of the Technical Report, 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.

10. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.

11. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)
Gilberto Dominguez, PE

CERTIFICATE OF QUALIFIED PERSON

James A. Cremeens

I, James A. Cremeens, PE, PG, do hereby certify that:

1. I am Chief Geotechnical Engineer – Senior Executive Manager of:

   Knight Piésold and Company
   1999 Broadway, Suite 900
   Denver, CO 80202

2. I graduated with a Bachelor of Science degree in Geology (University of Illinois - Urbana-Champaign - 1985) and Master of Science degree in Geology (Rock Mechanics specialization in combination with the Geotechnical Engineering department) from the University of Illinois - Urbana-Champaign (1990).
3. I am a Registered Professional Engineer in the State of Colorado (License No. 0040683). I am also a Registered Professional Engineer in the State of Nevada (License No. 022225). I am also a Registered Professional Geologist in the State of Wyoming (License No. PG-2957).
4. I have worked continuously in the field of geotechnical engineering with numerous domestic and international mining projects and mining operations since 1990. I have been involved in the evaluation of pit slope stability for large open pits at various levels: preliminary studies, preliminary economic assessments, pre-feasibility studies, feasibility studies, design level evaluations and technical due diligence reviews.
5. 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.
6. I am a contributing author for the preparation of the technical report titled “Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico”, (the “Technical Report”), dated effective February 28, 2023, prepared for Heliostar Metals Limited; and am responsible for Sections 16.3, 16.12, 25.5 and 26.2. I have visited the project site on September 27 and 28, 2016.
7. I was a contributing author and Qualified Person of the technical report titled “Ana Paula Project, NI 43-101 Technical Report, Preliminary Feasibility Study Update, Guerrero, Mexico”, dated effective May 16, 2017, prepared for Alio Gold Inc.
8. As of the effective date of the Technical Report, 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.
9. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
10. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Signed and dated this 28th day of February 2023.

(Signed and Sealed)
James A. Cremeens, PE, PG