Cerro Negro Operations
Santa Cruz Province, Argentina
NI 43-101 Technical Report

Effective Date:

31 December, 2015

Prepared for Goldcorp Inc. by:

Mr Andrew Tripp, P.E.

Dr Sally Goodman, P.Geo.

Dr Guillermo Pareja, P.Geo.

Mr Kevin Murray, P.Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Andrew Tripp, P.E., am employed as the Technical Services Manager, Cerro Negro, with Goldcorp Inc.'s subsidiary, Oroplata SA.

This certificate applies to the technical report titled "Cerro Negro Operations, Santa Cruz Province, Argentina, NI 43-101 Technical Report" that has an effective date of 31 December, 2015 (the "technical report").

I am a Registered Professional Engineer in the State of Colorado (#41799) and a Registered Member of the Society for Mining, Metallurgy, and Exploration (RM SME #4131306). I graduated from the Colorado School of Mines with a Bachelor of Science degree in Mining Engineering in 2003.

I have practiced my profession for 12 years. I have been directly involved in exploration, diamond drilling, mine planning, rock mechanics, ventilation, surveying, production geology, resource modeling, and surface and underground mine operations. I have performed and supervised Mineral Resource and Mineral Reserve estimates.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* ("NI 43–101").

I have worked at the Cerro Negro Operations since September 2014 in my site-based role as Technical Services Manager.

I am responsible for Sections 1.1, 1.2, 1.3, 1.4, 1.5, 1.9, 1.13, 1.14, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21; Section 2; Section 3; Section 4; Section 5; Sections 11.3, 11.4.2; Section 15; Section 16; Section 18; Section 19; Section 20; Section 21; Section 22; Section 24; Sections 25.1, 25.2, 25.7, 25.8, 25.10, 25.11, 25.12, 25.13, 25.14, 25.15; Sections 26.1, 26.3; and Section 27 of the technical report.

I am not independent of Goldcorp Inc. as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Cerro Negro Operations since 2014,

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 23 March, 2016

"Signed and sealed"

Andrew Tripp, P.E.

GOLDCORP

CERTIFICATE OF QUALIFIED PERSON

I, Dr Sally Goodman, P.Geo, am employed as the Director, Geology and Mineral Resources, with Goldcorp Inc.

This certificate applies to the technical report titled "Cerro Negro Operations, Santa Cruz Province, Argentina, NI 43-101 Technical Report" that has an effective date of 31 December, 2015 (the "technical report").

I am a Professional Geoscientist of the Association of Professional Geoscientists of Ontario, Registration Number 1197. I graduated with a Bachelor of Science degree in Geological Sciences from Leeds University (U.K.) in 1982, and have a Master of Science degree in Mineral Exploration (1983) and PhD in Geology (1986), both from the Royal School of Mines, Imperial College, London (U.K).

I have practiced my profession for 30 years, having been involved in geological mapping and geological research at Aberdeen University and St Andrews University (Scotland), and at McGill University (Montreal, Canada). As a consultant with SRK Consulting (Canada) Inc. and CAE Mining (Canada), I have worked on exploration, resource geology, geotechnical and due diligence studies on a wide range of commodities and deposit types, including epithermal gold deposits such as those described herein.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* ("NI 43–101").

I have regularly visited the Cerro Negro Operations, firstly as consultant with SRK Consulting (Canada) Inc., then as a Goldcorp employee, site visits being undertaken from 4–9 April 2011, 15–20 April 2013, 6–13 July 2014, 23–28 August 2014, and 27–31 October 2014. My most recent site visit is from 8–22 April 2015.

I am responsible for Sections 1.5, 1.6, 1.7, 1.8, 1.9, 1.19, 1.20; Sections 2.1, 2.2, 2.3, 2.4, 2.6; Section 3; Section 6; Section 7; Section 8; Section 9; Section 10; Section 11; Section 23; Sections 25.3, 25.4, 25.15; Sections 26.1, 26.2; and Section 27 of the technical report.

I am not independent of Goldcorp Inc. as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Cerro Negro Operations since 2011.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 23 March, 2016

"Signed and sealed"

Dr Sally Goodman, P.Geo.

GOLDCORP

CERTIFICATE OF QUALIFIED PERSON

I, Dr Guillermo Pareja, P.Geo, am employed as a Manager, Mineral Resources, with Goldcorp Inc.

This certificate applies to the technical report titled "Cerro Negro Operations, Santa Cruz Province, Argentina, NI 43-101 Technical Report" that has an effective date of 31 December, 2015 (the "technical report").

I am a Professional Geoscientist (P.Geo. #35049) registered with the Association of Professional Engineers and Geoscientists of BC (APEGBC), Canada. I am a graduate of Universidad Nacional de Ingenieria, Lima, Peru (B.Sc in Geology, 1989) and of the Leland Stanford Junior University, USA (Ph.D. in Geology, 1998).

I have practiced my profession since 1989, and have been involved in mineral exploration, data verification and QA/QC, mine site geology and operations, Mineral Resource estimation, and feasibility studies on numerous underground and open pit base metal and gold deposits all over the world, but particularly in the Americas. I have been directly involved in Mineral Resource estimation since 2002.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* ("NI 43–101").

I have regularly visited the Cerro Negro Operations, firstly in September, 2011, then for two weeks every month from June to November 2014. My most recent site visits were from 8–22 April 2015, and 30 August to 5 September 2015.

I am responsible for Sections 1.10, 1.12, 1.20; Section 2; Section 3; Section 12; Section 14; Sections 25.6, 25.15; and Section 27 of the technical report.

I am not independent of Goldcorp Inc. as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Cerro Negro Operations since 2011.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 23 March, 2016

"Signed and sealed"

Dr Guillermo Pareja, P.Geo.

GOLDCORP

CERTIFICATE OF QUALIFIED PERSON

I, Kevin Murray, P.Eng., am employed as a Manager, Operations Metallurgy, with Goldcorp Inc.

This certificate applies to the technical report titled "Cerro Negro Operations, Santa Cruz Province, Argentina, NI 43-101 Technical Report" that has an effective date of 31 December, 2015 (the "technical report").

I am a Professional Engineer registered with the Association of Professional Engineering and Geoscientists of British Columbia (APEGBC #32350). I graduated from the University of New Brunswick with a Bachelor of Science degree in Chemical Engineering in 1995.

I have practiced my profession for 18 years. I have been directly involved in mineral processing and metal extraction operations, research and technology development. I have operated and managed hydrometallurgical pilot plants including the design and analysis of testwork programs and results. I have been involved in full scale process design, commissioning and ramp-up.

As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43–101 *Standards of Disclosure for Mineral Projects* ("NI 43–101").

I visited the Cerro Negro Operations from 12 October to 7 November 2014, 12–20 February 2015, and most recently from 14–22 April 2015.

I am responsible for Sections 1.11, 1.15; Sections 2.1, 2.2, 2.3, 2.4, 2.6; Section 3; Section 13; Section 17; Sections 25.5, 25.9, 25.15; and Section 27 of the technical report.

I am not independent of Goldcorp Inc. as independence is described by Section 1.5 of NI 43–101.

I have been involved with the Cerro Negro Operations since the fall of 2014.

I have read NI 43–101 and the sections of the technical report for which I am responsible have been prepared in compliance with that Instrument.

As of the effective date of the technical report, to the best of my knowledge, information and belief, the sections of the technical report for which I am responsible contain all scientific and technical information that is required to be disclosed to make those sections of the technical report not misleading.

Dated: 23 March, 2016

"Signed and sealed"

Kevin Murray, P.Eng.

IMPORTANT NOTICE

This report was prepared as a National Instrument 43-101 Technical Report by Goldcorp Inc. The quality of information, conclusions, and estimates contained herein are based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. Except for the purposes legislated under Canadian provincial securities law, any other uses of this report by any third party is at that party's sole risk.

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1.0 SUMMARY

1.1 Introduction

Mr Andrew Tripp P.E., Dr Sally Goodman P.Geo., Dr Guillermo Pareja P.Geo., and Mr Kevin Murray P.Eng. (collectively the Qualified Persons or QPs) prepared this Technical Report (the Report) for Goldcorp Inc. (Goldcorp) on the wholly-owned Cerro Negro Gold Operations (the Cerro Negro Operations or the Project) located in the Santa Cruz Province of Argentina.

The Cerro Negro Operations host the Eureka, Mariana Norte, Mariana Central, San Marcos and Bajo Negro zones that are, or will be, exploited using underground mining methods, and the Vein Zone, to be mined via open pit methods. Currently, active mining is taking place at the Eureka and Mariana Central zones.

1.2 Location, Climate, and Access

The Project is located about 345 km by road southwest of the coastal city of Comodoro Rivadavia.

Vehicle access to the Project is from the coastal city of Comodoro Rivadavia, which is a 2.5 hour flight south of Buenos Aires. From Comodoro Rivadavia, road vehicle access to the Project takes approximately six hours. Road vehicle access is also possible from the west side of the Project from the town of Perito Moreno, about a 1.5 hour drive. The commercial airport at Balmaceda, Chile is about a five-hour drive to the west of the Project. Within the Project, a network of internal gravel roads services the various mines, plant and exploration sites.

The Cerro Negro Operations are located in the arid to semi-arid Patagonian Region of Argentina. Average annual temperature is 7.7℃ with a range between -1.8℃ and 21.4℃. The average annual rainfall is 172 mm and the annual potential evapotranspiration is estimated to be 606 mm, resulting in an overall negative water balance. Mining activities are conducted year-round. Exploration activities are occasionally curtailed for short periods if exceptionally heavy snowfall occurs.

1.3 Mineral Tenure and Surface Rights

Project mineral tenure consists of 10 mining leases (minas in Spanish) totalling 21,548 ha, and three exploration licences (cateos in Spanish), covering 5,338.8 ha. Tenure is held in the name of Oroplata SA (Oroplata), an indirectly wholly-owned subsidiary of Goldcorp. Tenure for minas is indefinite, providing that annual payments are made in February and July each year.

A thin, 20 m wide x 3 km long tenure coverage gap currently exists internal to the tenements and Goldcorp has initiated the process required to eliminate the gap.

The tenements lie on parts of five estancias (ranches), respectively Cerro Negro, El Retiro, La Unión, Marianas and Los Tordos. Goldcorp has access and occupation agreements in force with the owners of La Unión, Los Tordos, Cerro Negro, and El Retiro estancias; these agreements allow Goldcorp to have access to ground that it does not control and allow certain mining and exploration activities to be conducted.

Goldcorp owns significant lands in the Project area, totalling approximately 11,100 ha. These lands overlie the Bajo Negro and Vein Zone deposits and adjacent prospects.

1.4 Agreements and Royalties

Newcrest Mining Ltd. had a royalty interest of US$1 million; this royalty has been paid. A royalty of 3% is payable to the Province of Santa Cruz for the life of the mine. That royalty is based on the gross value of gold and silver produced each month minus processing costs, commercial costs, and allowed general and administrative (G&A) costs. In addition, there is a Provincial Sustainability Fund royalty of up to 1% net smelter return, a Municipality Sustainability Fund royalty of 1% of net earnings, and a Bank Transaction Fee of 0.6% on all transactions except for receipt of revenues derived from exported product.

1.5 Environment, Permitting and Socio-Economics

Goldcorp currently holds all required permits to support the current mining operations.

1.6 Geology and Mineralization

Deposits within the Cerro Negro Operations are low-sulphidation, epithermal gold–silver vein deposits. The known deposits and prospects within the Project are distributed along and east of a volcanic–subvolcanic complex flanked and overlain by a series of rhyolite domes. The eruptive products of the rhyolite domes form an ignimbrite apron, which post-dates the mineralization and forms extensive outcrops north and south of the volcanic–subvolcanic complex. These post-mineralization ignimbrites have preserved the epithermal systems, as well as lacustrine sediments, travertine, and sinter deposited at the Late Jurassic paleo-surface.

Vein mineralogy depends on the location of veins relative to the Eureka Volcanic-Subvolcanic Complex. Veins within the Complex (Eureka, San Marcos and the Marianas) contain higher silver and gold grades, and the Eureka veins contain abundant adularia and ginguro-style banding. Veins outside the dome and hosted by the Cerro Negro Ignimbrite (Bajo Negro and Vein Zone) contain lower silver grades, coarse pyrite rather than fine sulphides in ginguro bands, and a higher percentage of chalcedony and less adularia and carbonate in the gangue.

Vein textures typical of low-sulphidation epithermal systems include colloform and crustiform banding, cockade, and manganese/iron-oxide matrix breccias. At deeper

levels, alternating colloform bands of quartz and adularia are developed, and bonanza gold–silver grades may be associated with dark, fine-grained ginguro sulphide bands.

1.7 History and Exploration

Exploration has been performed by a number of companies, including Minera Newcrest Argentina SA (Newcrest), Pegasus Gold International Inc. (Pegasus), MIM Argentina Exploraciones (MIM), Oroplata, and Andean Resources Limited (Andean). Goldcorp acquired 100% of the Project in December 2010 after acquiring Andean.

Work completed includes geological mapping, surface rock sampling, reverse circulation (RC) and core drilling, metallurgical testwork, mineral resource and mineral reserve estimation, and engineering and design studies. Andean completed a preliminary assessment, a pre-feasibility study, and a feasibility study on the Project. Goldcorp completed an updated feasibility study in 2011 and began construction later the same year. First ore was milled in July 2014 and commercial production was achieved on 1 January, 2015.

In the opinion of the responsible QP, the exploration programs completed to date are appropriate for the known mineralization style.

1.8 Drilling

Drilling completed in the Cerro Negro Operations area to December 2015 comprises 307 RC drill holes (approximately 88,000 m) and 1,917 core holes (564,000 m, approximately). Drilling was undertaken by Pegasus, MIM, Oroplata, Andean and Goldcorp, with the majority of the drilling being by Andean and Goldcorp.

No information is available on the Pegasus logging protocols; however, logged geological information has been spot checked where possible and those data are used for geological modeling. For the MIM drilling, core was logged, photographed, and cut on site. During the Oroplata drill programs, chips were logged at the completion of each hole with results recorded in the field on handwritten log sheets and later transferred to a computer format. Prior to the use of geological logging software, core was logged initially on log sheets designed by Andean personnel. In about 2008, DH Logger (a Datamine product) was implemented and used for digital logging of core. Logging data were entered directly into DH Logger. In addition, geotechnical logging was performed. Core recovery and rock quality designation (RQD) data are routinely collected. All drill core from the Andean programs has been photographed. Goldcorp continues to utilize DH Logger and logs the same geological features as were logged by Andean.

Collar locations of holes drilled by prior operators were determined by a licensed surveyor using differential global positioning system (DGPS) instruments. Contracted surveyors have been used from time to time. From 2009 to 2010, the surveyor was an employee of Andean and reported collar locations to the nearest millimetre using a

differential GPS unit. Since 2011, surface collar locations and other surface features were determined by Goldcorp employees using DGPS. Various Trimble instruments were used. Underground surveys are performed using total station instruments. Some collars are manually measured from points set using total station instruments.

No downhole surveys are available for the Pegasus drilling. Surveys for the MIM and Oroplata drilling were provided in a database, but have no supporting documentation. Andean completed downhole surveys using an Eastman camera for holes drilled up to July 2007, a Reflex system tool for drill holes drilled between July 2007 and September 2008, and a gyroscopic system for holes drilled in 2009 and 2010. Goldcorp performs downhole surveys of exploration holes with a Reflex Gyro on 10 m intervals. Infill drilling from underground stations are surveyed using either a Reflex Gyro or a Reflex EZ-TRAC on 3 m intervals.

Overall, recovery for core samples averaged 93% with 80% of the intervals reporting >95% recovery. Recovery in the veins frequently suffers because of the intense fracturing in the core. Review of the data indicates that there is likely no significant grade/recovery relationship for recoveries ≥30%.

Pegasus and Oroplata RC drill holes were sampled every metre. During the MIM programs, sampling was carried out every 2 m. All RC holes drilled by Andean have been sampled every metre, with the exception of the first hole drilled at Vein Zone which was sampled every 2 m. Goldcorp generally does not perform RC drilling.

During the MIM programs, core was split in half using a diamond saw and was sampled over 1 m intervals unless a different interval was required because of the geology. During the Andean programs, core samples collected for analysis were typically 1 m in length, but ranged from 20 cm to 3 m. The Goldcorp Exploration sampling protocols call for samples to be between 0.5 and 2.0 m in length. Samples within the vein are typically 1.0 m or less and are often based on differing vein textures. Samples adjacent to the mineralized zones may be up to 2.0 m. Sampling protocols for Goldcorp underground infill samples are to collect samples between 0.3 m and 1.0 m in both un-mineralized and mineralized rock. Sample lengths noted in the database range from 0.15 m to 21.4 m. Samples in excess of 4.0 m have most often been collected from surface holes in overburden at the start of the hole where recoveries are low. Most wall rock samples have been collected over consistent 1.0 or 2.0 m intervals. Underground channel samples are collected over lengths from 0.3 m to 1.5 m and respect geological boundaries. The channels are 10 cm wide and 1.5 cm deep.

In the opinion of the responsible QP, the quantity and quality of the lithological, geotechnical, collar, and down-hole survey data collected during the Andean and Goldcorp exploration and infill drill programs are sufficient to support Mineral Resource and Mineral Reserve estimation.

1.9 Sample Analysis and Security

Several independent, primary assay laboratories have been used for routine analyses of surface drilling samples over the Project history, and include SGS Laboratories, Bondar Clegg Laboratories (now ALS Chemex), Alex Stewart Argentina, and Acme Laboratories (now Bureau Veritas). Laboratories are certified, and independent of Goldcorp.

In mid-2010, sample preparation was moved to the Project site using an onsite laboratory staffed by two Acme employees who were assisted by two Goldcorp employees. Onsite preparation ceased in 2013 and is once again carried out at Acme's Mendoza laboratory.

From June 2013 until December 2015, all of Goldcorp's underground diamond drill, mine production, and plant solid and solution samples were assayed for gold and silver at the Goldcorp-operated on-site laboratory located at Eureka Camp. The on-site laboratory obtained ISO 9001 certification in June 2013 and is not independent.

Beginning in January 2016, all underground diamond drill and mine production samples will be assayed at Alex Stewart Assayers Argentina SA (ASA) Perito Moreno facility. This laboratory is independent and is ISO 9001 and ISO 14001 certified.

Plant samples will continue to be analyzed on site.

The sample preparation method typically consists of drying, pulverizing and splitting to generate a 200 g pulp for assay. The pulverization standard has varied from 85% passing -200 mesh to 95% passing 150 mesh. The underground pulverization standard is 90% -140 mesh.

Assay procedures by Alex Stewart for the initial Andean drill programs included fire assay on a 50 g sample using an atomic absorption (AA) finish, and a 34 element inductively-coupled plasma (ICP) package. Samples assaying >10 g/t gold were re-assayed using a gravimetric finish.

From the last Andean drilling phase onwards through Goldcorp's programs to present, Acme has analyzed for gold by fire assay with an AA finish, for silver by aqua regia digestion with an AA finish, and aqua regia digestion ICP/mass spectrometry (MS) analysis for a multi element suite. Gold results of >10 g/t and silver results of >100 g/t are re-assayed using a fire assay with a gravimetric finish.

At the Eureka Camp on-site laboratory as well as the Alex Stewart laboratory in Perito Moreno, samples are analyzed using a 50 g fire assay to determine gold and silver values. For gold values lower than 10 g/t, analyses are completed using an AA finish. For gold values higher than 10 g/t, analyses are completed using gravimetric finish.

Quality assurance and quality control (QA/QC) measures for Andean and Goldcorp programs include the insertion of blanks, duplicates, and both site-specific and commercially available standards. There has been a strong program of check assaying at Cerro Negro with just over 5% of all samples from 2009 to 2013 originally assayed at Acme being submitted for re-assay to ALS Chemex.

The responsible QP is of the opinion that the quality of the analytical data are sufficiently reliable to support Mineral Resource and Mineral Reserve estimation and that sample preparation, analysis, and security are generally performed in accordance with exploration best practices and industry standards.

1.10 Data Verification

A number of data verification programs and audits have been performed over the Project history to verify that data collected were sufficiently reliable for the purposes of Mineral Resource and Mineral Reserve estimation. Data verification checks were performed as follows:

- MIM (2000): review of sampling and assay data on the Project; the data were considered suitable for Mineral Resource estimation purposes;
- Andean (2006): review of drill collar data, and resurvey of existing holes; small check assaying program; completion of two twin holes; the data were considered suitable for Mineral Resource estimation purposes;
- Andean (2007): check assay program; completion of one twin drill hole; the data were considered suitable for Mineral Resource estimation purposes;
- Micon International Limited (2008): review of existing data verification programs; re-survey of existing drill hole collars; review of geological and assay data generated by Pegasus, MIM and Oroplata; twinning of two RC holes; check assay program pulps of 293 samples assayed by Alex Stewart were re-assayed by Acme; the data were considered suitable for Mineral Resource estimation purposes;
- Mine Development Associates Inc. (2009 and 2010): data verification checks in support of Mineral Resource estimation; the data were considered suitable for Mineral Resource estimation purposes;
- Hamilton (2014): review of QA/QC data for all zones except Eureka; the data were considered suitable for Mineral Resource estimation purposes;

A reasonable level of verification has been completed, and no material issues would have been left unidentified from the programs undertaken. Data verification programs completed on the data collected from the Project adequately support the geological interpretations, and the quality of the analyses and the analytical database, and

therefore support the use of the data in Mineral Resource and Mineral Reserve estimation.

1.11 Metallurgical Testwork

Over the Project history, a number of metallurgical testwork campaigns were undertaken on drill core to advance the Project to feasibility level and establish process operating parameters. No additional metallurgical testwork has been performed on drill core since 2012. Since start-up of the process plant, the metallurgical testwork programs are focused on plant performance optimization.

Tests completed included mineralogy, gravity concentration, gravity separation and intensive cyanidation of gravity concentrate, carbon-in-pulp (CIP) leach, and bottle roll testing, evaluation of acid mine drainage potential, comminution testwork including SMC tests, abrasion index, bond, rod, and ball work indexes, settling, filtration and paste characterization testwork, and variability tests.

Tests completed included mineralogy, gravity concentration, gravity separation and intensive cyanidation of gravity concentrate, CIP leach, and bottle roll testing, evaluation of acid mine drainage potential, comminution testwork including SMC tests, abrasion index, bond rod and ball work indexes, settling, filtration and paste characterization testwork, and variability tests.

Metallurgical recoveries are based on the testwork completed, and on plant performance data. Recoveries range from 90–95% for gold, depending on the zone and deposit, and 70–83% for silver, again depending on the zone/deposit.

No deleterious elements are currently identified. There may be occasions when short-term blending is required for high clay content ores.

1.12 Mineral Resource Estimate

Mineral Resource estimates were performed by Goldcorp employees under the supervision of Mr Hector Aspajo, also a Goldcorp employee.

Three dimensional wireframe models are constructed of the vein systems, and, depending on deposit, three to four additional gold grade domains are also constructed. Drill logs and assay values are used for geological and grade domain modeling.

In some deposits, Vein Zone and Emilia for example, the high-grade domain is too discontinuous to be effectively modeled so no high-grade domain is estimated.

Goldcorp used mean densities for each domain to assign density to blocks in the block model.

Gold and silver grades may be capped following evaluation of the grade distributions using histograms and probability plots. Once the outlier assays were capped by domain, the assays were composited to 1 m downhole composites.

Estimation parameters were defined to honour understood geologic controls and sample distributions. Inverse distance weighting to the third power (ID3) estimation was chosen for the reported estimate for the Eureka, Mariana Central, Mariana Central SE/Emilia, Vein Zone, and Mariana Norte Este B deposits, but estimates were also interpolated using nearest-neighbour (NN) methods. Ordinary kriging (OK) estimation was chosen for the reported estimate for the Mariana Norte, San Marcos and Bajo Negro deposits, but estimates were also interpolated using NN. Each domain is estimated separately and contacts between domains form hard boundaries.

Blocks are estimated in a series of passes, separately for each domain and are flagged with the pass, which is used to classify the Mineral Resource. Search distances are designed so that each pass can be used to classify the Mineral Resource, i.e., Pass 1 estimates Measured Mineral Resources, Pass 2 estimates Indicated Mineral Resources, and Pass 3 estimates Inferred Mineral Resources. Mineralization in the Outside domain is not classified. Goldcorp classified the Mineral Resources by using a combination of distance to the nearest sample, number of samples, number of drill holes, and confidence in the samples used in a block estimate, and the confidence in geological interpretations.

Block models are validated by visual comparison of block grades to composite grades, comparison of global average ID3 or OK to NN grades, and swath plots.

Mineral Resources are estimated using a gold price of US$1,300/oz and a silver price of US$19/oz, and assume a long-term exchange rate of US$1 = Argentinean pesos ARS$16.85. The Eureka, Bajo Negro, Mariana Norte, Mariana Central, and San Marcos deposits will be mined by underground methods. Mineral Resources for underground deposits were estimated within optimized stope shapes calculated with Deswik Stope Optimizer using current and planned operating parameters. Mineral Resource reporting cutoff grade for “reasonable prospects for eventual economic extraction” was calculated at between 3.57 and 4.03 g/t gold equivalent (AuEq) depending on deposit. The cutoff was derived by using expected optimized, steady-state mining costs, and metallurgical recoveries for each deposit.

Exploitation at Vein Zone is likely to be by open-pit mining methods. Goldcorp considered that the Mineral Resource reporting cutoff grade would best represent material with reasonable prospects for economic extraction at 0.95 g/t AuEq. Mineralization considered to have reasonable prospects for eventual economic extraction includes that material that lies within the US$1,300/oz gold price optimized pit shell.

Gold equivalency was calculated based on Mineral Resource pricing as well as the estimated metallurgical recovery of each metal. The gold equivalent calculation is:

- AuEq = gold + (silver / ratio)

The silver:gold ratio used was in the range of 78.31 to 87.97 for the underground deposits, depending on the deposit. The open pit silver:gold ratio was 102.63.

Mineral Resources take into account geological, mining, processing and economic constraints, and have been confined within geological boundaries; they can therefore be classified in accordance with the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves (CIM 2014). The QP for the Mineral Resource estimate is Dr Guillermo Pareja, an employee of Goldcorp. Mineral Resources have an effective date of 31 December, 2015.

Mineral Resources (exclusive of Mineral Reserves) are summarized in Table 1-1.

Factors that may affect the estimates include metal prices and exchange rate assumptions; assumptions which are to constrain Mineral Resources, including mining, processing and general and administrative (G&A) costs, metal recoveries, geotechnical and hydrogeological assumptions; and assumptions that the operation will maintain the social licence to operate.

1.13 Mineral Reserve Estimate

Mineralization that had been classified as Measured or Indicated Mineral Resources was used to support estimation of Mineral Reserves. Two mining scenarios were considered: open pit mining for the Vein Zone, and underground mining for the other mineralized zones. Dilution and mining recovery factors were incorporated into the scenarios.

Mineral Reserves are estimated using a gold price of US$1,100/oz, a silver price of US$16.50/oz, and assume a long-term exchange rate of US$1= ARS$16.85. Cutoff grades used to report underground estimates range from 4.91–5.56 g/t AuEq; the actual value is used as an economic indicator only, and is dependent upon deposit location. Open pit Mineral Reserves are reported using a cutoff grade of 1.13 g/t AuEq.

Gold equivalency was calculated based on Mineral Reserve pricing as well as the estimated metallurgical recovery of each metal. The same equivalency equation as provided in Section 1.11 was used for Mineral Reserves, however, silver:gold ratio used was in the range of 76.31 and 85.71 for underground deposits, depending on the deposit. The silver:gold ratio for the planned open pit Mineral Reserves was 100.

Table 1-1: Mineral Resource Statement

Category	Tonnes (Mt)	Au Grade (g/t Au)	Ag Grade (g/t Ag)	Contained Gold (M oz)	Contained Silver (M oz)
Measured	1.35	4.99	51.62	0.22	2.24
Indicated	5.53	5.97	38.58	1.06	6.86
Total Measured and Indicated	***6.88***	***5.78***	***41.14***	***1.28***	***9.09***
Inferred	2.17	7.19	44.68	0.50	3.11

Notes to Accompany Mineral Resource Table:

1. The Qualified Person for the estimate is Dr Guillermo Pareja, P.Geo., a Goldcorp employee. Mineral Resources have an effective date of December 31, 2015.
2. Mineral Resources are reported exclusive of Mineral Reserves and do not include dilution;
3. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability;
4. Mineral Resources are reported at a gold price of US$1,300/oz,, a silver price of US$19/oz, and long term exchange rate of US$1= ARS$16.85;
5. Mineral Resources are defined within Lerchs–Grossmann pit shells or have been confined using appropriate underground mining constraints;
1. The cutoff grade for the Vein Zone open pit is 0.95 g/t gold equivalent (AuEq). The cutoff grade for the underground deposits ranges from 3.57 to 4.03 g/t AuEq. For equivalency purposes a silver:gold ratio of between 78.31 and 87.97 silver to one gold is used for the underground deposits, depending on the deposit; a silver:gold ratio of 102.63 is used for the Vein Zone open pit deposit. Operating costs used for cutoff grade derivation for the underground deposits range from US$128.00 to US$137.00 per tonne (range US$45–54/tonne; processing: US$33.00/tonne; G&A: US$50.00/tonne). Operating costs used for cutoff grade calculations for the Vein Zone comprise US$6/tonne mining cost, US$25/tonne processing cost, and US$31/ounce G&A costs;
6. The estimated gold metallurgical recovery rate is 95% for Eureka, Mariana Central, Mariana Central SE/Emilia deposits, and 90% for Mariana Norte, Mariana Norte Este Beta, San Marcos, Bajo Negro and Vein Zone deposits. Silver metallurgical recovery is estimated at 83% for Eureka, Mariana Central, and Mariana Central SE/Emilia deposits; 75% for San Marcos and Bajo Negro, 70% for Mariana Norte and Mariana Norte Este Beta deposits, and 60% for the Vein Zone deposit
7. Tonnages and ounces are rounded to the nearest 10,000 tonnes and 10,000 ounces respectively, grades are rounded to two decimal places;
8. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal content;
9. Tonnage and grade measurements are in metric units. Contained gold and silver ounces are reported as troy ounces.

Mineral Reserves have been classified using CIM (2014). The Qualified Person for the Mineral Reserve estimate is Mr Andrew Tripp, P.E., a Goldcorp employee. The Mineral Reserves have an effective date of 31 December, 2015, and are summarized in Table 1-2.

The major risk factors that can affect the Mineral Reserves estimates include: metal price and exchange rate assumptions, capital and operating cost assumptions, royalties and taxes, geotechnical stability and dilution assumptions, environmental and permitting status, and maintaining a social license to operate.

1.14 Mine Plan

With the exception of the Vein Zone, all deposits will be mined by underground mining methods.

Table 1-2: Mineral Reserve Statement

Category	Tonnes (Mt)	Au Grade (g/t Au)	Ag Grade (g/t Ag)	Contained Gold (M oz)	Contained Silver (M oz)
Proven	5.02	10.58	94.38	1.71	15.23
Probable	10.00	9.17	64.81	2.95	20.84
Total Proven + Probable	***15.02***	***9.64***	***74.69***	***4.66***	***36.07***

Notes to accompany Mineral Reserve table:

1. Mr Andrew Tripp, P.E., an employee of Goldcorp is the Qualified Person for the estimate. The estimate has an effective date of 31 December 2015.
2. The Mineral Reserves are classified as Proven and Probable Mineral Reserves, and are based on the 2014 CIM Definition Standards.
3. Mineral Reserve estimates are based on a gold price of $1,100 per ounce, a silver price of $16.50 per ounce, and a long-term exchange rate of US$1= ARS$16.85.
4. For underground estimates, a cutoff grade ranging from 4.91 to 5.56 grams per tonne gold equivalent (AuEq) is used as an economic indicator only, and is dependent upon deposit location. Operating costs used for cutoff grade derivation range from US$149.00 to US$160.00/tonne (underground mining: range US$49–60/tonne; processing: US$38.00/tonne; G&A: US$62.00/tonne). Operating costs used for cutoff grade calculations for the Vein Zone comprise US$6/tonne mining cost, US$25/tonne processing cost, and US$31/ounce G&A costs. The Vein Zone cutoff grade is 1.13 g/t AuEq.
5. The estimated gold metallurgical recovery rate is 95% for Eureka, Mariana Central, Mariana Central SE / Emilia deposits, and 90% for Mariana Norte, Mariana Norte Este Beta, San Marcos, Bajo Negro and Vein Zone deposits. Silver metallurgical recovery is estimated at 83% for Eureka, Mariana Central, and Mariana Central SE / Emilia deposits; 75% for San Marcos and Bajo Negro, 70% for Mariana Norte and Mariana Norte Este Beta deposits, and 60% for the Vein Zone deposit.
6. Underground mining dilution assumes a minimum mining width of 3.0 m and a minimum 1.0 to 1.25 metre overbreak on each stope sidewall depending upon zone, and dilution grade estimated from the block model. Open pit mining dilution is taken into account through the chosen block size which represents the expected SMU. The minimum mining width is 3 m in both open pit and underground.
7. Underground Mineral Reserves take into account a 98% mining recovery and open pit mining 100% recovery.
8. Tonnages and ounces are rounded to the nearest 10,000 tonnes and 10,000 ounces respectively, grades are rounded to two decimal places. Numbers may not sum due to rounding.

A combination of transverse and longitudinal long-hole sublevel stoping methods with cemented rock backfill are currently being used at the Eureka and Mariana Central mines. The determination of which method is used is made based on geometries and the rock quality. Generally, transverse stoping is used in wider ore zones and areas where high grades along the contact require parallel drilling. Longitudinal stoping is used whenever practical in narrower zones to reduce development requirements. In certain areas, a modified Avoca mining method is used, which constitutes a longitudinal long-hole method with a rolling backfill front following the mining of ore in a single direction along strike. These methods are planned to be used to mine the other underground deposits at the Cerro Negro Operations.

Ore extraction is carried out by load–haul–dump vehicles (LHDs) with capacities ranging from 4.0 m^3 to 5.4 m^3. These units muck the ore from the stopes and haul it to a temporary stockpile located in the haulage drift or directly to trucks. Then the ore is loaded into trucks with capacities between 33 t and 40 t to be hauled to the surface and dumped, depending on grade, into high-, medium-, low- or marginal-grade stockpiles. The ore is then transported to the plant in haul trucks with capacities of 35 t to 40 t.

The mine plan for the Vein Zone deposit considers a two-phase operation, in order to allow quicker access to ore and a smoother ore flow and stripping ratio over the life of the pit. Both phases will be mined concurrently with the underground mines. The Vein Zone will be mined using standard open pit mining methods using drilling, blasting, loading and hauling operations at a scale suitable for selective ore mining.

The first mine to begin stope production was the Eureka mine in 2013, followed by Mariana Central in 2015. The Mariana Norte mine is being developed and will begin production in 2017. Once fully ramped up, the three mines will have a combined throughput of at least 4,000 t/d which will fully utilize the current capacity of the process plant. The current life of mine plan contemplates the San Marcos and Bajo Negro deposits beginning production in 2022 when Eureka and the Marianas mines are depleted. Production from the Vein Zone pit is currently scheduled to be mined from 2022–2026.

Underground equipment includes haul trucks, load–haul-dump (LHD) vehicles, long-hole drills, face jumbos, and bolting jumbos. Additional support equipment including telehandlers, lube and fuel trucks, shotcrete spray trucks, shotcrete transmixers, blasting trucks, diamond drills, man carriers, and light vehicles is used.

For the open pit operation, the following equipment is envisaged: hammer drills, front-end loaders, track excavators, articulated trucks, and support units including track dozers, motor graders, and water trucks.

Additional mobile equipment consists of suburban utility vehicles (SUVs), dual-cabs, an ambulance, fire truck, forklifts, skid-steer loader, and cranes. This equipment is in place to support the underground and process plant operations, but additional equipment would be purchased for the open pit.

1.15 Process Description

The Cerro Negro processing plant uses conventional technology. The process plant and associated service facilities process run-of-mine ore delivered to the primary crusher. The process encompasses crushing and grinding of the run-of-mine ore, agitated leaching with cyanide, counter-current decantation, solution clarification, zinc precipitation and smelting to produce gold/silver bars that are shipped to a refinery for further processing. The counter-current decantation tailings are washed to recover cyanide prior to being pumped to the tailings storage facility. The plant commenced initial feed on July 5, 2014 and first gold was poured on July 25, 2014. The plant is expected to process 4,000 t/d once the mines have ramped-up to full production capacity. It is currently operating at 3,590 t/d.

1.16 Infrastructure

Haul and service roads link the Vein Zone plant to the Marianas complex and Eureka mine. The haul road from the Vein Zone pit to the plant is currently permitted but not constructed.

Existing and planned buildings and infrastructure include:

- Open pit;
- Underground mine;
- Water bores for water supply;
- Tailings storage facility;
- Main administration building with medical centre and training room;
- Security office;
- Security gatehouse;
- Laboratory;
- Metallurgical office/laboratory;
- Plant mess and training room;
- Plant workshop and warehouse;
- Reagent storage and sodium cyanide storage;
- Grinding building;
- Filtration building;
- Reagents building;
- Refinery;
- Mine change house and training centre;
- Mine workshops, maintenance facilities and warehouses;
- Fuel storage facilities;
- Sewage treatment works.

The operations have a projected maximum power demand of 25 MW.

1.17 Markets and Contracts

The doré produced by the Cerro Negro Operations is sold to Goldcorp's trading entity located in Switzerland. After the refining process, the trading entity´s in-house marketing experts sell bullion on the spot market. The terms contained within the sales contracts are typical of and consistent with standard industry practices, and are similar to supply contracts elsewhere in the world.

1.18 Capital and Operating Cost Estimates

All capital expended prior to 1 January 2016 was considered as initial project capital ("sunk" capital), either spent or committed to be spent, and so was not included in the economic evaluation. Exploration expenditures were not included in the financial analysis. Exploration drilling will be performed in the future to target mineralization that may lead to an increase in Mineral Resources. Because these future exploration drilling expenditures do not pertain to the current Mineral Reserves, they were not included in the financial model.

Capital costs are based on the latest mine construction data, budgetary figures and quotes provided by suppliers. Capital cost estimates include funding for infrastructure, mobile equipment, development and permitting, and miscellaneous costs. Infrastructure requirements were incorporated into the estimates as needed. Sustaining capital costs reflect current price trends.

The sustaining and expansionary capital cost estimates are included as Table 1-3.

Operating costs are based on the 2016 life-of-mine (LOM) budget which includes estimates from first principles for major items, and included allowances or estimates for minor costs.

The estimated average annual operating cost is US$154/t once the operations reach steady-state production. This consists of US$38/t for processing, US$55/t for mining, US$59/t for general and administrative costs, and $2/t for other costs.

Inflation of future capital and operating costs in local currency is expected to be offset by devaluation of the local currency with respect to the US$.

1.19 Financial Analysis

Goldcorp is using the provision for producing issuers, whereby producing issuers may exclude the information required under Item 22 for technical reports on properties currently in production.

Mineral Reserve declaration is supported by a positive cashflow.

Table 1-3: Capital Cost Summary

Area	Life-of-Mine (US$ million)
Sustaining	903.6
Expansionary	1.6
Grand Total	***905.2***

Note: Exploration is not included. Sustaining expenditures includes mine development.

1.20 Interpretation and Conclusions

Under the assumptions in this Report, the Cerro Negro Operations show a positive cash flow over the life-of-mine and support Mineral Reserves. The mine plan is achievable under the set of assumptions and parameters used.

1.21 Recommendations

The recommended work programs include continued exploration and sequenced mine development. These comprise two phases of work, and the elements of each phase can be conducted concurrently, with no program dependent on the results of another. All budget figures are in US$. The total cost of the exploration and development work programs in the first work phase is in the range of US$60–80 million annually for the next five years (2016–2021); planned capital development expenditure in the second work phase is for 2016 and is about US$50 million.

2.0 INTRODUCTION

2.1 Introduction

Mr Andrew Tripp P.E., Dr Sally Goodman P.Geo., Dr Guillermo Pareja P.Geo., and Mr Kevin Murray P.Eng. (collectively the Qualified Persons or QPs) prepared this Technical Report (the Report) for Goldcorp Inc. (Goldcorp) on the wholly-owned Cerro Negro Gold Operations (the Cerro Negro Operations or the Project) located in the Santa Cruz Province of Argentina. The general location of the Project is indicated in Figure 2-1.

The Cerro Negro Operations host the Eureka, Mariana Norte, Mariana Central, San Marcos and Bajo Negro zones that are, or will be, exploited using underground mining methods, and the Vein Zone, to be mined via open pit methods. Currently, active mining is taking place at the Eureka and Mariana Central zones.

2.2 Terms of Reference

This Report supports the disclosure of updated Mineral Resources and Mineral Reserves for the Project. Goldcorp will be using the Report in support of its 2015 Annual Information Form (AIF) filing.

The operating entity for the Project is Oroplata SA (Oroplata), an indirectly wholly-owned subsidiary of Goldcorp Inc. For the purposes of this Report, “Goldcorp” is used to refer interchangeably to the parent and subsidiary companies.

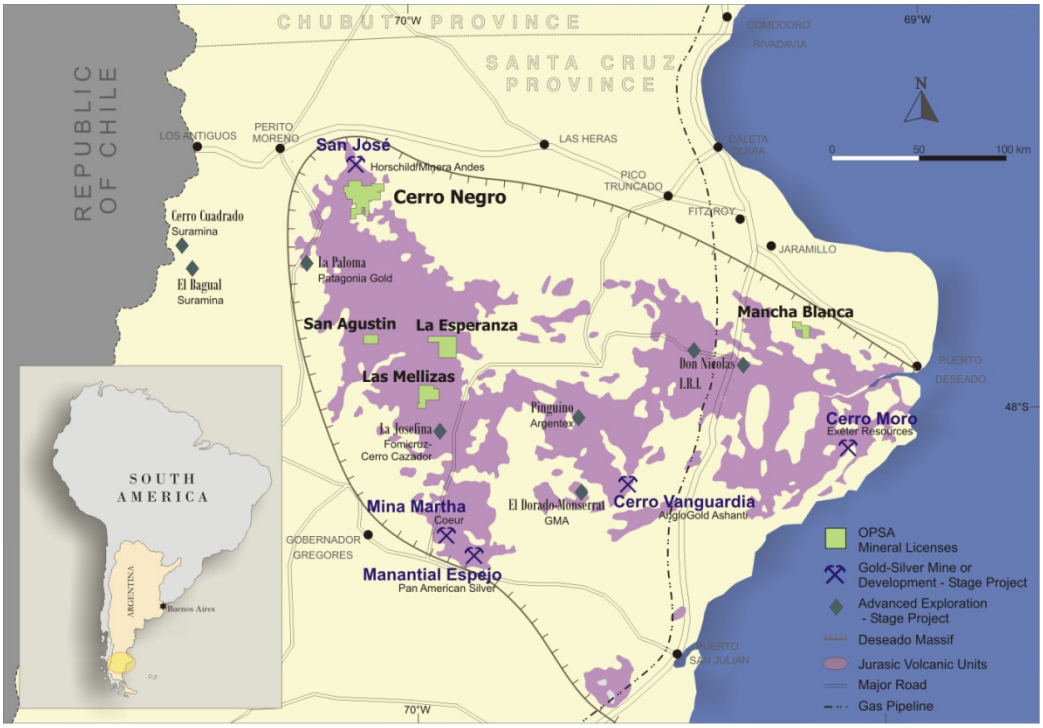
All measurement units used in this Report are metric unless otherwise noted, and currency is expressed in United States (US$), Canadian dollars (C$), or Argentine pesos (ARS$) as identified in the text.

2.3 Qualified Persons

This Report has been prepared by the following QPs, who are all employees of Goldcorp:

- Mr Andrew Tripp, P.E., Technical Services Manager Cerro Negro, Oroplata;
- Dr Sally Goodman, P.Geo, Director, Geology and Mineral Resources, Goldcorp;
- Dr Guillermo Pareja, P.Geo, Manager, Mineral Resources, Goldcorp;
- Mr Kevin Murray, P.Eng., Manager, Operations Metallurgy, Goldcorp.

Figure 2-1: Project Location Map



Note: Mines other than Cerro Negro that are shown on the map are operated by third parties. In the legend key, OPSA mineral licences outside Cerro Negro, although held indirectly by Goldcorp, are not considered to be part of the Cerro Negro Operations and are not included in this Report.

2.4 Site Visits and Scope of Personal Inspection

The following QP is an employee of Goldcorp, based at the Cerro Negro Operations, and works at the Project operations; this familiarity with the Project constitutes the personal inspection requirement.

- Mr Andrew Tripp has worked at the Cerro Negro Operations since September 2014. In his site based role as Technical Services Manager, he has overall responsibility for the engineering and geology activities at the Project site including mine planning, rock mechanics, ventilation, survey, production geology, underground diamond drilling, and resource modeling. Mr Tripp has visited the underground workings and inspected active mining faces, viewed site infrastructure including ventilation, dewatering and water treatment, power distribution, compressed air, waste dumps, and process and tailings infrastructure. He was directly responsible for mine modeling, mine planning and Mineral Resource and Mineral Reserve estimations. He has held discussions with site personnel on aspects of exploration, mine

operations, infrastructure, plant operations, metallurgy, financial planning and budgeting, environmental and permitting considerations and social considerations.

The following QPs are Goldcorp employees, based in the Goldcorp corporate offices, and the scope of personal inspection is detailed below:

- Dr Sally Goodman has visited the Cerro Negro Operations regularly, firstly as consultant with SRK Consulting (Canada) Inc., then as a Goldcorp employee, site visits being undertaken from 4–9 April 2011, 15–20 April 2013, 6–13 July 2014, 23–28 August 2014, 27–31 October 2014, and most recently from 8–22 April 2015. During these visits she has inspected drill core, visited sample cutting and logging areas; discussed geology and mineralization with the staff; reviewed geological interpretations with staff; and undertaken and supervised modeling efforts. She has visited both the Eureka and Mariana Central underground operations, and has visited vein outcrops in the vicinity of the mines;
- Dr Guillermo Pareja has visited the Cerro Negro Operations on numerous occasions, firstly in September, 2011, then for two weeks every month from June to November 2014. Dr Pareja's most recent site visits were from 8–22 April, 2015, and 30 August to 5 September, 2015. During the visits, Dr Pareja inspected drill core; visited logging areas; discussed geology and mineralization with the staff; reviewed geological interpretations with staff; and reviewed on-site data compilation;
- Mr Kevin Murray visited the Cerro Negro Operations from 12 October to 7 November 2014, 12–20 February, 2015, and again from 14–22 April, 2015. In his role as Manager, Operations Metallurgy, he has evaluated and initiated metallurgical testwork programs at both the site metallurgical laboratory as well as external laboratories, and has supported those responsible for the process-related activities at the Project site. Mr Murray has toured the process plant, observed and evaluated the day-to-day operation. Mr Murray has corrected and updated the process model to determine and demonstrate the value of a number of suggested process improvements, discussed aspects of the metallurgical testwork and plant operation with site-based process staff. Mr Murray continues to monitor the daily operations and discuss problems and improvement with site personnel as necessary.

2.5 Effective Dates

The Report has a number of effective dates as follows:

- The effective date of the Mineral Resource Estimate is 31 December, 2015;
- The effective date of the Mineral Reserve Estimate is 31 December, 2015.

The overall effective date of this Report is the effective date of the Mineral Reserves and is 31 December, 2015.

2.6 Information Sources and References

This Report is based in part on internal company reports, maps, published government reports, and public information, as listed in Section 27 of this Report. Specialist input from Goldcorp employees in other disciplines, including legal, process, geology, geotechnical, hydrological and financial, was sought to support the preparation of the Report. Information used to support this Report is also derived from previous technical reports on the property.

All figures were prepared by Goldcorp personnel for the Report unless otherwise noted.

2.7 Previous Technical Reports

Goldcorp has previously filed the following technical report on the Project:

- Belanger, M., and Bergeron, S., 2011: Cerro Negro Gold Project, Santa Cruz Province, Argentina NI 43-101 Technical Report: report prepared for Goldcorp Inc., effective date 31 December, 2010.

Andean Resources Ltd. (Andean) was acquired by Goldcorp during 2010. Prior to the acquisition, Andean filed the following Technical Reports on the Project:

- Brimage, D., Ristorcelli, S., Guzman, C., and Eldridge, T., 2010: Technical Report on the Cerro Negro Feasibility Study, Santa Cruz Province, Argentina: unpublished technical report prepared by Ausenco Solutions Canada Inc. for Andean Resources Ltd., effective date 20 July, 2010;
- Ristorcelli, S., Ronning, P., Shatwell, D., Brimage, D., 2010: Technical Report on the Bajo Negro Vein, Cerro Negro Gold-Silver Project, Santa Cruz Province, Argentina: unpublished technical report prepared by Mine Development Associates for Andean Resources Ltd., effective date 16 April, 2010;
- Ristorcelli, S., Ronning, P., Shatwell, D., Brimage, D., 2009: Technical Report on the Eureka Resource Estimate Update Cerro Negro Gold-Silver Project, Santa Cruz Province, Argentina: unpublished technical report prepared by Mine Development Associates for Andean Resources Ltd., effective date 22 June, 2009;
- Cooper, D., Lattanzi, C., Laudrum, D., Messenger, P., Prenn, N., Pressacco, R., and Rougier, M., 2008: Technical Report on the Pre-Feasibility Study, Cerro Negro Property Santa Cruz Province, Argentina: unpublished technical report prepared by Micon International for Andean Resources Ltd., effective date 1 December, 2008;
- Pressacco, R., 2008: Technical Report on the Updated Mineral Resource Estimate for the Eureka West Deposit, Cerro Negro Property Santa Cruz Province, Argentina: unpublished technical report prepared by Micon International for Andean Resources Ltd., effective date 30 May, 2008;

- Laudrum, D., 2007: Technical Report on the Cerro Negro Property, Santa Cruz Province, Argentina: unpublished technical report prepared by Micon International for Andean Resources Ltd., effective date 23 October, 2007;
- Pressacco, R., 2007: Technical Report on the Cerro Negro Property, Santa Cruz Province, Argentina: unpublished technical report prepared by Micon International for Andean Resources Ltd., effective date 31 March, 2007.

3.0 RELIANCE ON OTHER EXPERTS

This section is not relevant to the Report as information on areas outside the QPs' experience was sourced from Goldcorp experts as noted in Section 2.6.

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 Location

The Cerro Negro Operations are located about 345 km by road southwest of the coastal city of Comodoro Rivadavia and 75 km south of Perito Moreno.

Centroid co-ordinates, based on the location of the Bajo Negro deposit, are approximately 70°13' west longitude and 46°54'15" south latitude, or using Gauss Kruger co-ordinates, at 2,407,330 east, 4,804,860 north.

The Cerro Negro Operations currently contain six major mineralized zones, including Bajo Negro, the Eureka Vein, Mariana Central, Mariana Norte, San Marcos, and the Vein Zone.

4.2 Project Ownership

The Project is owned by Oroplata SA, which is indirectly owned by Goldcorp Trading GmbH (99.745%) and Goldcorp Inc. (0.255%). Goldcorp Trading GmbH is indirectly 100% owned by Goldcorp Inc.

4.3 Mineral Tenure

The Project mineral tenure is held in the name of Oroplata and consists of 10 mining leases (minas in Spanish) totalling 21,548 ha, and three exploration licence (cateos in Spanish), covering 5,338.8 ha. A thin 20 m-wide by 3,000 m-long tenure gap exists internal to the tenements. Such areas are provided for in the Argentine mining law and Goldcorp has initiated the process required to eliminate the gap. Tenure is summarized in Table 4-1 and shown in Figure 4-1. Tenure for minas is indefinite, providing that annual payments are made in February and July each year. Applications have been made to convert the cateos to minas.

Tenement boundaries are based on geographic co-ordinates based on the Gauss Kruger system and the Campo Inchauspe datum.

4.4 Surface Rights

The tenements lie on parts of five estancias (ranches), respectively Cerro Negro, El Retiro, La Unión, Marianas and Los Tordos. Goldcorp has current access and occupation agreements (easements) with the owners of La Unión, Los Tordos, Cerro Negro, and El Retiro; these agreements allow company access to ground that it does not control and allow certain mining and exploration activities to be conducted. The agreements contemplate payments that vary by agreement, and depending on the agreement, are paid on intervals that vary from monthly to annually.

Table 4-1: Mineral Tenure Summary Table

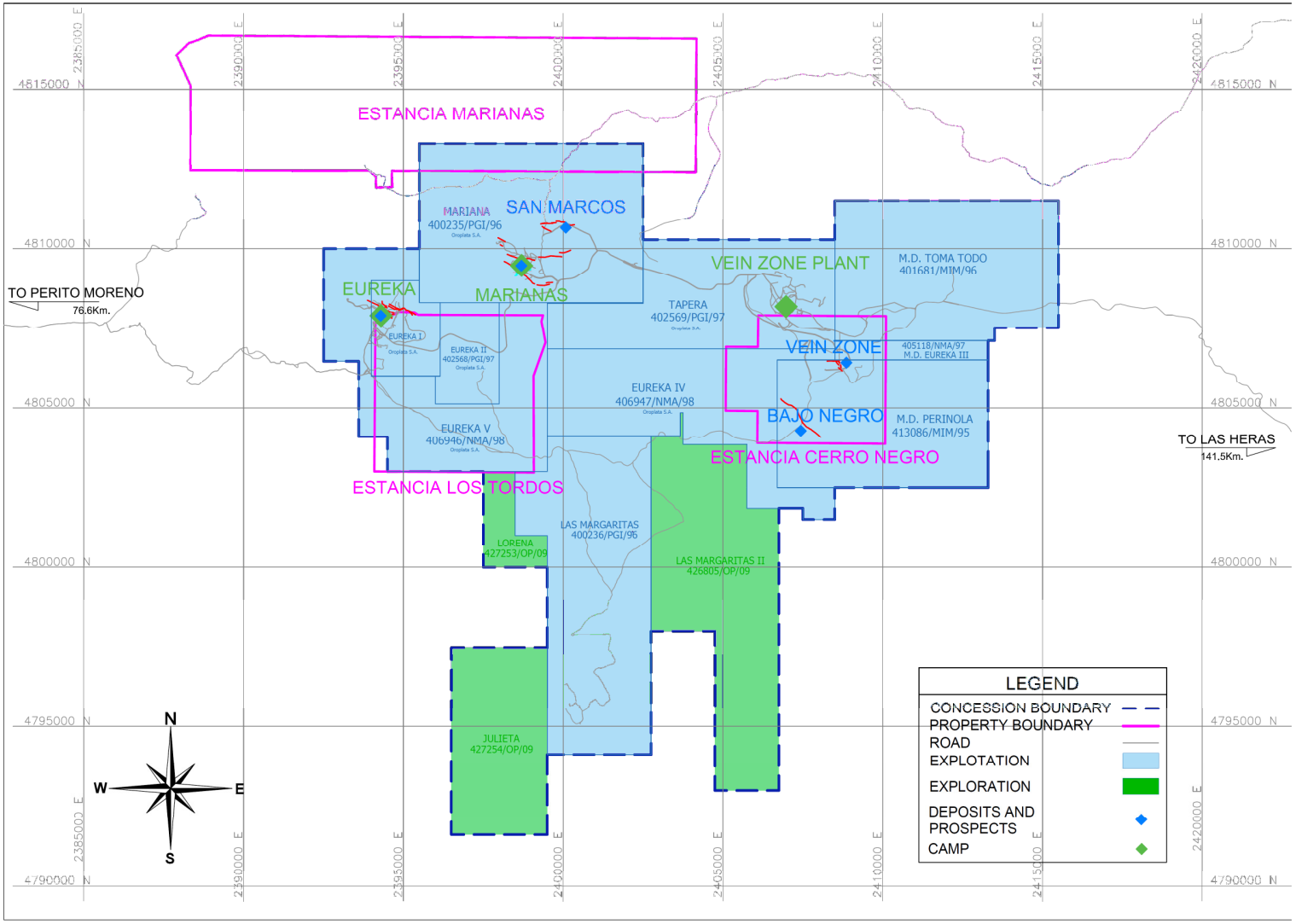
Name	Registration No.	Registration Date	Type	Area (ha)	Pertenencias*	Annual Fee (US$)*
MARIANA	400.235/P/96	14/08/98	Exploitation Permit	3,500	35	112,000
LAS MARGARITAS	400.236/P/96	14/08/98	Exploitation Permit	3,450	35	112,000
TOMA TODO	401.681/MIM/96	11/06/98	Exploitation Permit	3,000	30	96,000
EUREKA I	402.567/P/97	14/08/98	Exploitation Permit	600	6	19,200
EUREKA II	402.568/P/97	14/08/98	Exploitation Permit	600	6	19,200
TAPERA	402.569/N/97	12/08/98	Exploitation Permit	2,487	25	80,000
EUREKA III	405.118/N/97	14/08/98	Exploitation Permit	288	3	9,600
EUREKA V	406.946/N/98	26/11/98	Exploitation Permit	2,539	26	83,200
EUREKA IV	406.947/N/98	26/11/98	Exploitation Permit	2,444	25	80,000
PERINOLA	413.086/MIM/95	18/07/97	Exploitation Permit	2,640	27	86,400
Lorena	427.253/OP/09	26/10/11	**Manifestacion de Descrubrimiento	400	4	12,800
Julieta	427.254/OP/09	23/11/11	**Manifestacion de Descrubrimiento	1,766	18	57,600
Las Margaritas II	426.805/OP/09	26/10/11	**Manifestacion de Descrubrimiento	3,173	32	102,400

Notes:

* Fees for pertenencias are US$3,200/year/pertenencia

** Filing of a Manifestacion de Descrubrimiento is the first step for conversion of an exploration permit (cateo) to an Exploitation Permit.

Figure 4-1: Mineral Tenure Plan



Note: figure prepared by Goldcorp, 2016.

Goldcorp also owns significant lands in the mine area, including:

- Surface title to about 1,800 ha of the Cerro Negro estancia that overlies the Bajo Negro and Vein Zone deposits and adjacent prospects;
- Surface title to about 2,500 ha of surface rights for the Los Tordos estancia that overlies a portion of the Eureka deposit;
- Surface title to about 6,800 ha of surface rights of the Marianas estancia.

These properties were purchased prior to passage of the Tierras Rurales Ley 26.737, *Régimen de Protección al Dominio Nacional sobre la Propiedad, Posesión o Tenencia de las Tierras Rurales (Regime of Protection of National Domain on Property, Possession or Holding of the Rural Lands)* on 22 December 2011. These properties are grandfathered under the law allowing Goldcorp to hold more fee land than allowed by current law.

Surface title areas held by Goldcorp (via Oroplata SA) are indicated on Figure 4-1 in relation to the mineral tenure and shown in Figure 4-2 in relation to the deposits that host Mineral Reserves.

4.5 Water Rights

Goldcorp has acquired a number of water rights in the Project area. The permits are renewable annually, free of charge. The only requirement is that the application be properly filed. Water use is closely monitored, and a levy of approximately US$2/m^3 is assessed for industrial water (used in mine or plant), US$1/m^3 for dewatering (not re-used for industrial purposes), and US$0.50/m^3 is assessed for potable water. Levies are paid to the Provincial Government.

4.6 Royalties and Encumbrances

A required one-time royalty payment of US$1.0 million has been paid to Newcrest International Pty Ltd (50%) and its successor company, Pizzolon Pietro SA (50%).

A royalty of 3% is payable to the Province of Santa Cruz for the life of the mine. That royalty is based on the gross value of gold and silver produced each month minus processing costs, commercial costs, and allowed general and administrative (G&A) costs. In addition, Goldcorp is obligated to pay an additional voluntary contribution to the province based on gross monthly sales. The additional royalty is based on a sliding scale (Table 4-2) and the price of gold set by the London Bullion Market Association (LBMA).

Figure 4-2: Surface Rights in Relation to Deposits

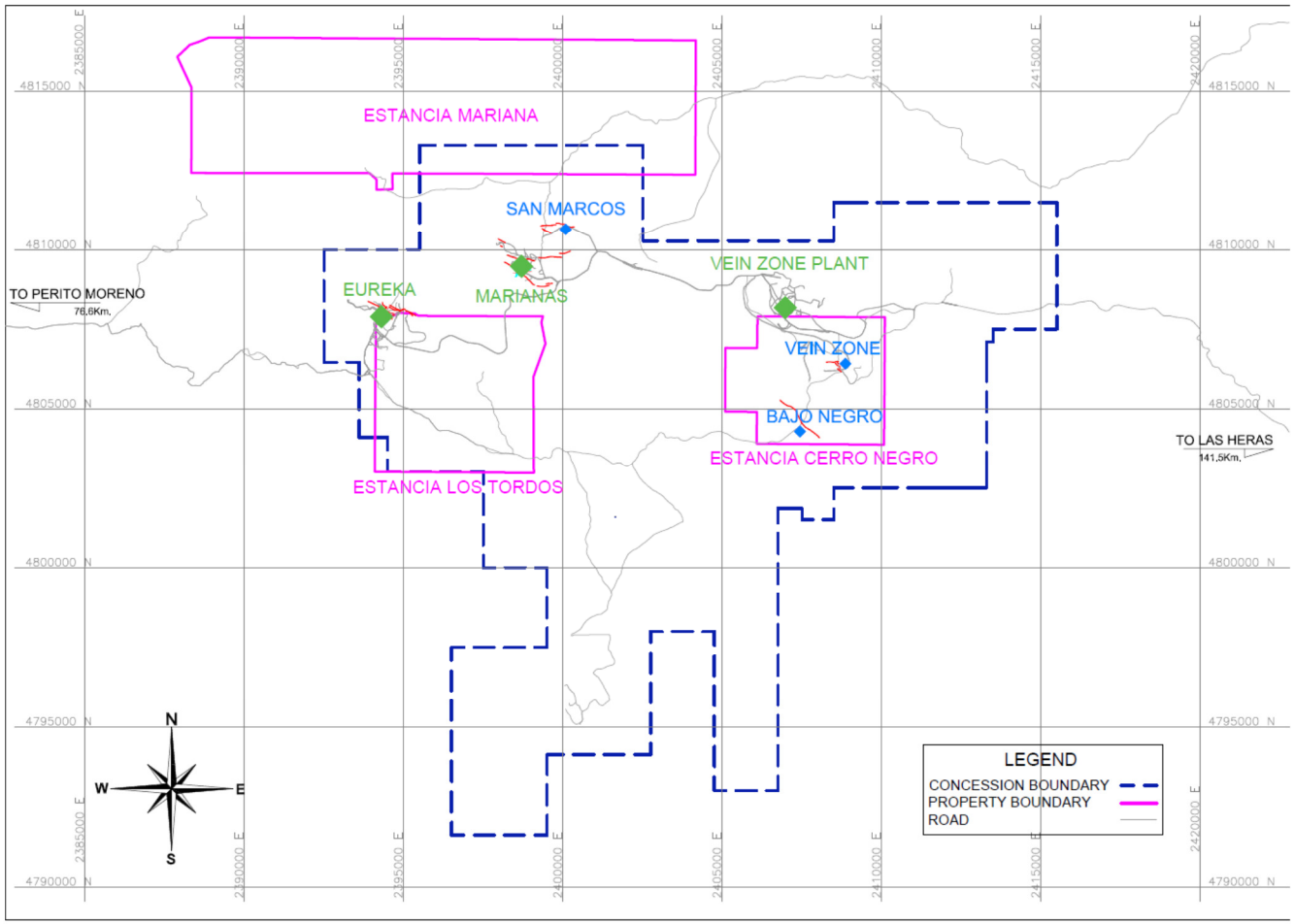


Figure prepared by Goldcorp, 2015. Blue dashed line = concession boundary; magenta lines = estancia with surface rights boundaries; red lines = deposits where Mineral Reserves have been estimated; green diamonds = areas of current operations.

Table 4-2: Voluntary Additional Royalty Rates

%	Gold Value (US$)/ oz	% Applied
100	>1,271.1	1
75	953.33–1,271.1	0.75
50	635.55–953.33	0.5
25	317.78–635.55	0.25

A voluntary royalty of 1% is payable to the municipality of Perito Moreno for the life of the mine. The royalty is based on net earnings under Argentinean GAAP, e.g. sales minus operating costs, royalties, depreciation and amortization, general and administrative costs, exploration costs, and other items like interest paid and other taxes.

In 2013, the province of Santa Cruz imposed a tax on Mineral Reserves equal to 1% of the value of Proven Reserves in the ground, payable annually based on the closing price of gold and silver fixed at December 31 each year by the LBMA and the company´s stated year-end Mineral Reserve Statement. This tax was revoked in December 2015, and the amount paid from 2013 to 2015 was not material to the Project.

An export duty equal to 5% of the gross value of precious metal exports was in place until December 2015. This duty has been reduced to zero as of the effective date of the Mineral Reserves and Mineral Resources, but was included in the cutoff grade calculation used for the estimates, due to the timing of the reduction of the duty.

A Bank Transaction Fee equal to 0.6% of all bank transactions in Argentina is applicable to all transactions except for receipt of revenues derived from exports.

4.7 Permits, Environment and Social Licence

The current status of the environment permitting and study status, community consultation and the social licence to operate is discussed in Section 20.

4.8 Comments on Section 4

The QP notes:

- Goldcorp holds 100% of the Project; mineral tenure is in the name of an indirectly wholly-owned Goldcorp subsidiary.
- Information provided by Goldcorp legal experts supports that the mining tenure held is valid and is sufficient to support declaration of Mineral Resources and Mineral Reserves.
- Goldcorp currently holds sufficient surface rights in the Project area to support the mining operations, including provisions for access and power lines.

- A required one-time royalty payment of US$1 million to Newcrest International Pty (50%) and its successor Pizzolon Pietro SA (50%) has been made.
- A 3% royalty is payable to the Province of Santa Cruz. In addition, there is a Provincial Sustainability Fund royalty of up to 1% net smelter return, a Municipality Sustainability Fund royalty of 1% of net earnings, and a Bank Transaction Fee of 0.6% on all transactions except for receipt of revenues derived from exported product.
- Goldcorp is not aware of any other significant environmental, social or permitting issues that would prevent continued exploitation of the Project deposits.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 Accessibility

The Cerro Negro Operations are located about 345 km by road southwest of the coastal city of Comodoro Rivadavia. It is about a six-hour drive from Comodoro Rivadavia to the mine site.

A 75 km road connects the property to Perito Moreno which allows personnel and smaller equipment access. That road is hard surfaced to the mine gate 40 km from Perito Moreno and graveled to the Eureka mine (35 km).

Comodoro Rivadavia is approximately a 2.5 hour flight south of Buenos Aires. Two scheduled charter flights per week connect Perito Moreno with Mendoza, Argentina. Access from the airport at Balmaceda, Chile, is via Perito Moreno and requires about five hours of driving time.

Within the Project area, a network of internal gravel roads services the various mines, plant and exploration sites.

5.2 Climate

The Cerro Negro Operations are located in the arid to semi-arid Patagonian region of Argentina. The site is affected by strong, persistent westerly winds, particularly in the warmer months (December to February) when the average wind speed is on the order of 43.5 km/h.

Average annual temperature is 7.7°C with a range between -1.8°C and 21.4°C. The average annual rainfall is 172 mm and the annual potential evapotranspiration is estimated to be 606 mm, resulting in an overall negative water balance. Average monthly precipitation only exceeds average potential evapotranspiration during the winter months (May to July).

Mining and processing activities are conducted year-round. Exploration activities are occasionally curtailed for short periods if exceptionally heavy snowfall occurs.

5.3 Local Resources and Infrastructure

The Cerro Negro Operations are situated within a relatively undeveloped region in the Province of Santa Cruz. The closest towns to the operations are Perito Moreno and Las Heras.

Additional information on infrastructure is included in Section 18.

5.4 Physiography

The Cerro Negro Operations are named after a 1,050 m high hill within the Project area. It lies on the central plateau of the Province of Santa Cruz on the Deseado Massif. Topography at Cerro Negro is generally gently rolling with a few deeply incised valleys. Elevations range between 300 m above sea level (masl) and 1,050 masl.

The Eureka area drains towards the northwest into the Pinturas River. The El Retiro basin drains in a northerly direction into the El Deseado River which drains to the east.

Low scrub bushes and grass that are typical of areas with a harsh climate and poor soils constitute the vegetation in the area. The Project area generally hosts a lower than average vegetation diversity and available biomass relative to values typical of southern Patagonia. Sub-shrubby vegetation covers most of the surface of the Eureka area, while shrubby vegetation covers most part of the surface area of the Vein Zone.

Soils in the El Retiro and Eureka areas are severely limited (climatic conditions, salinity, very high risk of water erosion and shallow depth), which make them generally unsuitable for cultivation and restrict their extensive grazing use.

The Project area is located in a zone classified as having reduced seismic activity.

5.5 Comments on Section 5

There is sufficient suitable land available within the Goldcorp mineral tenure for tailings disposal, mine waste disposal, and mining-related infrastructure such as the open pit, process plant, workshops and offices.

A review of the power and water sources, manpower availability, and transport options indicate that there are reasonable expectations that sufficient labour and infrastructure is available or under construction to support declaration of Mineral Resources, Mineral Reserves, and the proposed mine plan.

Mining activities are conducted on a year-round basis.

6.0 HISTORY

Gold mineralization was first recognized and a claim staked at Silica Cap by Roberto Schupback. The subsequent ownership, exploration and development history is summarized in Table 6-1.

The decline at Eureka was started in May 2010, at Mariana Central in March 2012, and at Mariana Norte in May 2012. The work at Mariana Norte was placed on standby in November, 2013 after a total of 1,224 m of development had been driven, due to a shift of strategy aimed at accelerating development of the higher-grade Mariana Central deposit.

A small surface mining operation at Eureka was started in the fourth quarter of 2013 as a supplement to underground ore production. Mining continued through early 2014, and the open cut is now used as a landfill.

The processing plant was commissioned in July 2014 and the mine entered commercial production on 1 January, 2015. Life of mine production as of 31 December, 2015 was 1.63 Mt processed at 13.72 g/t gold and 204.2 g/t silver. Approximately 659,000 ounces of gold and 8.3 million ounces of silver have been poured. Some of this production came before declaration of commercial production, and was accounted for as offsetting part of the initial capital cost.

Table 6-1: Exploration Summary Table

Year	Operator	Work Undertaken
1993	Minera Newcrest Argentina SA (Newcrest)	Reconnaissance exploration program over the Deseado Massif; identified mineralization at the Eureka, Mariana, El Retiro, and Las Margaritas and Vein Zone areas
1994	Newcrest	Preliminary mapping and sampling of Vein Zone and Silica Cap
1995	Newcrest	Geological mapping and sampling; identified significant mineralization on the western end of the Eureka vein zone and outlined several anomalous zones in the Mariana area
1996	Pegasus Gold International Inc. (Pegasus) and Newcrest Joint Venture	Joint venture into the Eureka–Mariana portion of the Newcrest tenure; undertook 13 reverse circulation (RC) drill holes; five holes were drilled at the San Marcos prospect, five on the Eureka prospect, and three at Mariana Sur. Pegasus also trenched the San Marcos prospect
1995–1996	MIM Argentina Exploraciones (MIM)	Rock-chip sampling of the Vein Zone and Silica Cap prospects; dipole-dipole induced polarization (IP) and ground magnetic geophysical surveys over Cerro Negro and in the vicinity of the Vein Zone; and property-wide geological mapping, rock and soil sampling, and trenching. A total of 17 RC drill holes (1,920 m) were completed in the Vein Zone, Herradura, and Silica Cap areas.
1997	Newcrest and MIM Joint Venture	Geological mapping at the Eureka, Las Margaritas, and Mariana Sur prospects; a soil geochemistry orientation study and mobile metal ion (MMI) soil geochemistry survey at Vein Zone and Las Marianas; PIMA analysis of clay alteration minerals in samples from 11 RC holes at Vein Zone; preliminary metallurgical studies; trenching; ground magnetics and dipole-dipole IP geophysical surveys; an airborne radiometric and aeromagnetic geophysical survey; and 13 core and 47 RC holes.
1999	MIM	Acquired 100% of property, completed Mineral Resource estimate
2000	Oroplata	Optioned property.
2000–2003	Oroplata	Evaluation and ground checking of Landsat and ASTER spectral anomalies; reconnaissance mapping and sampling at Mariana Sur, San Marcos, and Las Margaritas; completed 22 RC drill holes at Vein Zone and Eureka Main
2003	Andean Resources Limited (Andean)	Agreement with MIM to acquire a 51% interest; subsequently acquired 100% interest by acquiring Oroplata
2004–2010	Andean	Data validation, geological mapping, reconnaissance rock chip sampling, backhoe trenching, gradient-array resistivity, dipole-dipole resistivity, gradient-array chargeability, and ground magnetic surveys, petrographic and mineralogical descriptions, and 591 RC and core drill holes, totalling 140,599 m. Mineral Resource estimates were undertaken in 2005, 2006, 2007, 2008, 2009 and 2010. A pre-feasibility study was completed in 2008 on the Eureka and Vein Zones, and a feasibility study in 2010 on the Eureka, Vein, and Bajo Negro Zones.
2010–2015	Goldcorp	Goldcorp acquired Andean. Completes additional drilling, which identified significant mineralization at the San Marco and Marianas deposits. Goldcorp completed an updated feasibility study on the Project to incorporate this additional mineralization and constructed mines at Eureka, Mariana Central, and a processing plant at Vein Zone that processed the first ore in July 2014. Commercial production was achieved on 1 January, 2015.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Cerro Negro gold-silver veins are located near the northwestern margin of the Deseado Massif, a 60,000 km^2 rigid crustal block in southern Argentina bounded to the north by the Río Deseado, to the south by the Río Chico, to the east by the Atlantic coast, and to the west by the Andean Cordillera (Figure 7-1). The massif is in a back-arc position relative to the Andean subduction system and is flanked by the subsiding Golfo de San Jorge and Austral sedimentary basins to the north and south, respectively. The massif is regarded by some authors as a Late Proterozoic to Permian allochthonous terrane that collided with Gondwana in the early Permian, and by others as an autochthonous part of the Gondwana continent. The Deseado Massif hosts numerous low-sulphidation epithermal vein systems (Sillitoe and Hendenquist, 2003).

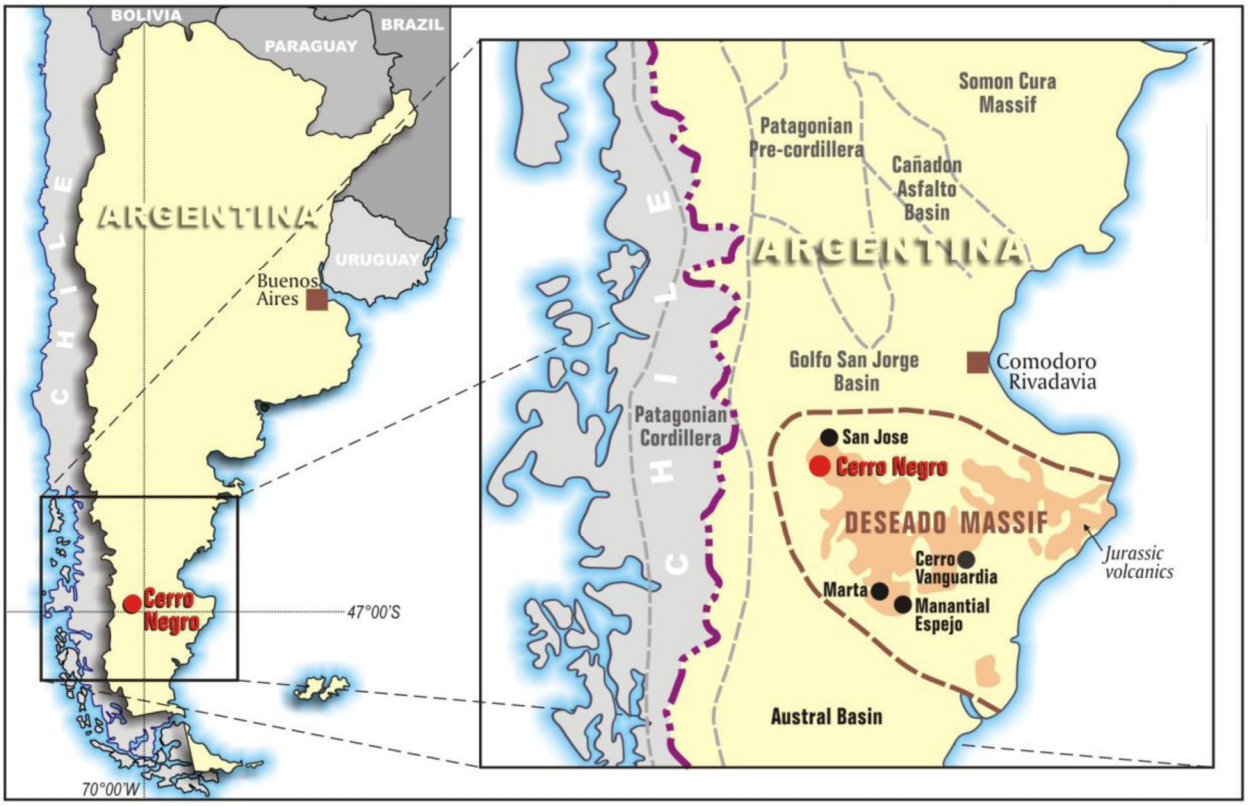
A late Triassic to late Cretaceous (230–65 Ma) extensional phase, linked to the opening of the South Atlantic Ocean, triggered extensive Mesozoic and Cenozoic magmatism throughout the massif. Magmatic activity commenced in the early Jurassic, with the intrusion of granitoids and eruption of coeval pyroclastic and epiclastic volcanic rocks. Andesitic to rhyolitic volcanism continued through the mid- to late Jurassic, culminating in the deposition of epiclastic sediments in the early Cretaceous. Mid- to late Jurassic volcanism in the Deseado Massif is conventionally divided into the andesitic Bajo Pobre Formation and the rhyolitic Bahía Laura Complex, the latter comprising the Chon Aike and La Matilde Formations.

Basaltic volcanism commenced in the Cretaceous and continued throughout the Cenozoic; volcaniclastic sediments were deposited and tuffs were erupted in the early Tertiary. These units are overlain by extensive Pleistocene fluvial gravel terraces.

7.2 Project Geology

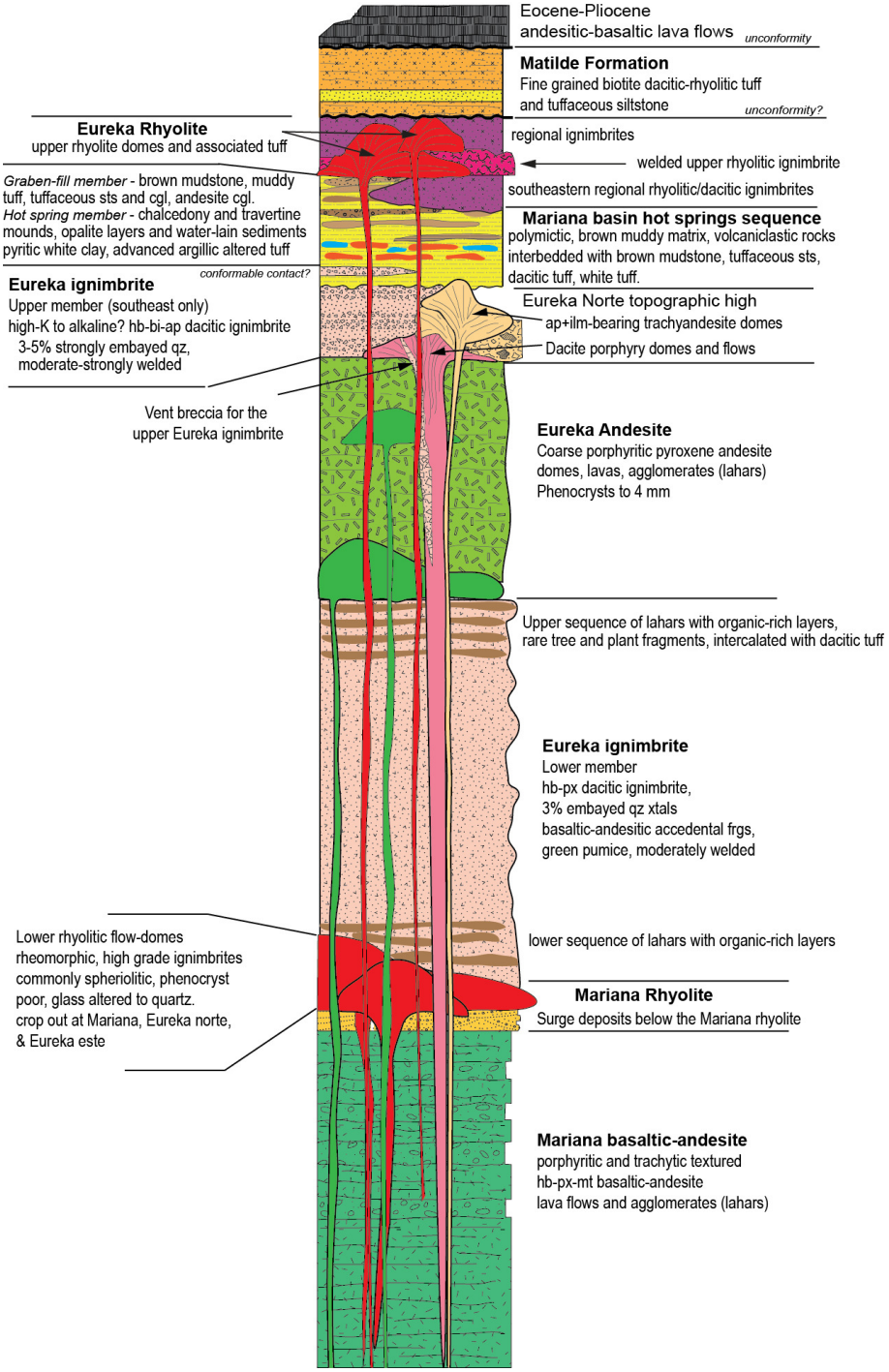
The known deposits and prospects at Cerro Negro are distributed within and east of a volcanic–subvolcanic complex flanked and overlain by a series of rhyolite domes. The eruptive products of the rhyolite domes form an ignimbrite apron, which post-dates the mineralization and forms extensive outcrops north and south of the volcanic–subvolcanic complex. These post-mineral ignimbrites have preserved the epithermal systems, as well as lacustrine sediments, travertine, and sinter deposited at the Late Jurassic paleo-surface. Older ignimbrites that lie east of the volcanic-subvolcanic complex host mineralization at Bajo Negro and Vein Zone. The stratigraphy of the Cerro Negro area is shown in Figure 7-2 and a generalized geological map is shown as Figure 7-3.

Figure 7-1: Regional Setting of the Deseado Massif



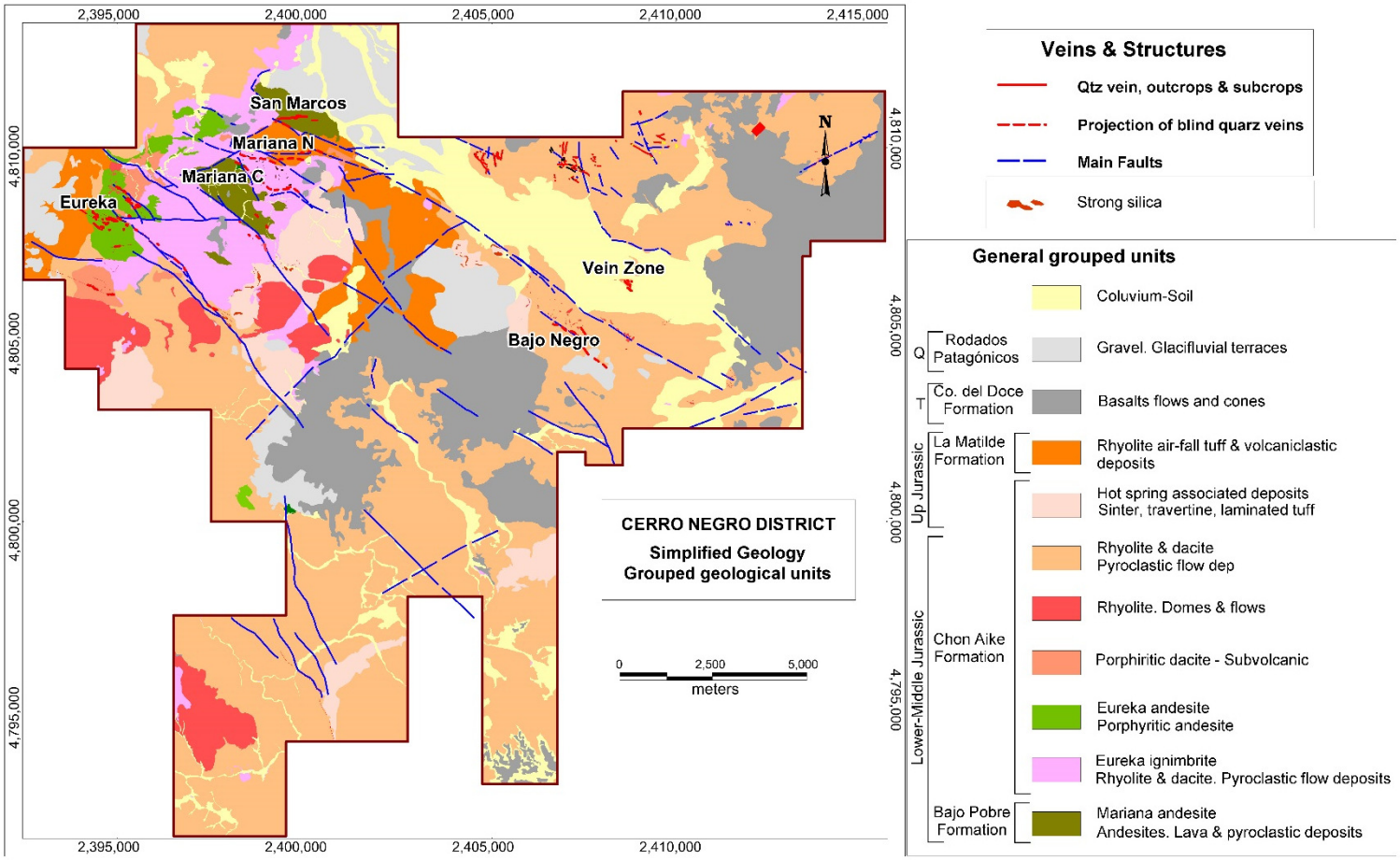
Note: Figure prepared by Goldcorp, 2015. Operating mines shown as black circles are held and operated by third parties.

Figure 7-2: Cerro Negro Stratigraphy



Note: Figure from Longo, 2013.

Figure 7-3: Simplified Project Geology Map



Note: Figure prepared by Goldcorp, 2016.

Structurally, the area shows a pattern of dominant northwest and subordinate east-west faults considered to form the margins of a series of pull-apart basins. Gold–silver veins are emplaced in both east–west- and northwest-trending faults.

Vein systems at Vein Zone, Eureka, Bajo Negro, Mariana Sur, and Mariana Central strike northwest to west–northwest, but Vein Zone and Eureka have subordinate east-trending segments. The San Marcos Mineral Resource is hosted by an east-trending vein that splays off a northwest-trending fault. The Mariana Norte vein trends approximately east–west.

Vein mineralogy depends on the location of veins relative to the Eureka Volcanic-Subvolcanic Complex. Veins in the Complex (Eureka, San Marcos and the Marianas) contain significant silver as well as gold. The Eureka veins contain abundant adularia and ginguro-style sulphides. Veins outside the dome hosted by the Cerro Negro Ignimbrite (Bajo Negro and Vein Zone) contain lower silver grades, coarse pyrite rather than ginguro sulphides, and lack macroscopic adularia or carbonate in the gangue.

7.3 Deposit Descriptions

7.3.1 Eureka

Outcrops of the Eureka vein system can be traced for 4.6 km between post-vein cover rocks to the northwest and hot-spring deposits to the southeast. Higher-grade mineralization has a known strike extent of about 1,500 m. The entire mineralized zone, including stockwork and vein material, can reach 100 m in width; however, economic widths are substantially less, locally as wide as 27.8 m, but averaging about 8.4 m.

The Eureka vein system strikes northwest to east–west and dips southwest to south. Host rocks are typically intrusive andesite in the hanging wall and a sequence of andesitic rocks and more felsic porphyries and ignimbrites in the footwall. It has three main segments:

- Southeast segment: A 3.7 km length of northwest-striking discontinuous vein outcrops, bounded by a gorge known as the Cañadon del Puma at the northwest end, and by outcrops of sinter and related geothermal discharge deposits to the southeast. The names “Eureka Southeast vein” and “Eureka Southeast Extension” are used to describe the vein in this segment;
- Central segment: A 450 m length in which the veins strike east–west, which includes the Eureka Main, 721, and other, as yet unnamed, veins. The segment is bounded to the east by the Cañadon del Puma and to the west by the easternmost outcrops of the Eureka West vein;
- Western segment: A 700 m length of continuous, northwest-striking vein system lies mostly below post-vein cover rocks. The segment extends from the known eastern

limit of the outcrop of this structure to the western limit of drilling. The vein consists of two predominant splits, known as the West vein (or 1.0 vein) and first footwall vein (or 1.1 vein). A hanging wall vein and another footwall vein northeast of the first footwall vein have been identified and modelled. The principal vein at Eureka includes the historically named West or 1.0 vein, the 721 vein, and the Main vein.

Eureka vein textures are typical of low-sulphidation epithermal systems and include colloform and crustiform banding, cockade, and manganese–iron-oxide matrix breccias. At deeper levels, especially in the principal vein, delicate alternating colloform bands of quartz and adularia are developed, and bonanza gold–silver grades are associated with dark, fine-grained ginguro sulphide bands.

Native gold is reported in the size range 10 to 40 µm, and locally 0.1 to 0.2 mm. Native silver and electrum are reported in the range 0.05 to 0.2 mm. Both native gold and native silver appear especially abundant in dark quartz veinlets or on their margins.

Oxidation and a possible post-mineral phase of hypogene oxidation or deep surficial oxidation have remobilized the silver.

Figure 7-4 shows the geological setting of the vein.

7.3.2 Mariana Norte and Mariana Central

The oldest unit in the Mariana area consists of fine-grained andesitic volcanic rocks, exposed to the south of the Mariana Central vein. This andesite is correlated with the lowermost unit of the Eureka Volcanic-Subvolcanic Complex and is host to all known mineralization at Mariana Sur, Mariana Central, and San Marcos. Figure 7-5 shows the geology surrounding the vein systems.

The andesite is overlain by a rubbly collapse breccia (BAFU) which, at Mariana Central and Mariana Norte, consists predominantly of andesite clasts and blocks, some of which may be tens of metres in size. BAFU contains vein quartz clasts near the base of BAFU where it overlies veins.

BAFU includes felsic ignimbrite, either deposited contemporaneously with the breccia or as part of the collapse breccia itself. Hydrothermal breccias that crop out on the collapse breccia show that hydrothermal activity was still active at the time the collapse breccia was formed but clasts of vein material indicate that the formation was largely post vein deposition. A rhyolite flow-dome of unknown age is exposed a few hundred metres west of the Mariana veins.

Mariana veins formed within dilation zones on major northwest-trending normal faults and/or splays, with predominantly dip-slip displacement. The major faults are likely reactivated older structures that extend into the pre-Jurassic basement.

Figure 7-4: Eureka Vein System

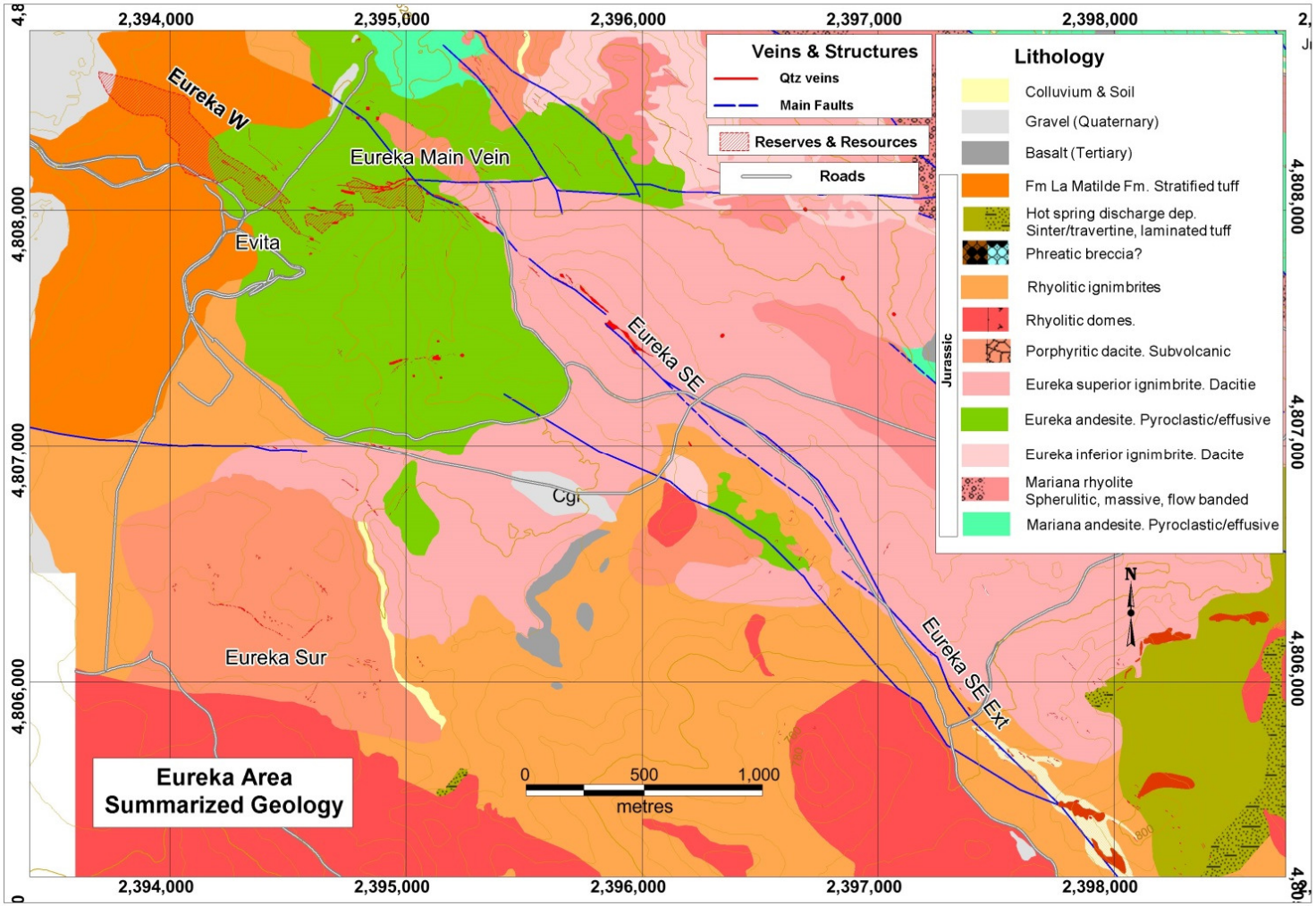


Figure prepared by Goldcorp, 2016.

Figure 7-5: Geological Map, Mariana Norte and Mariana Central

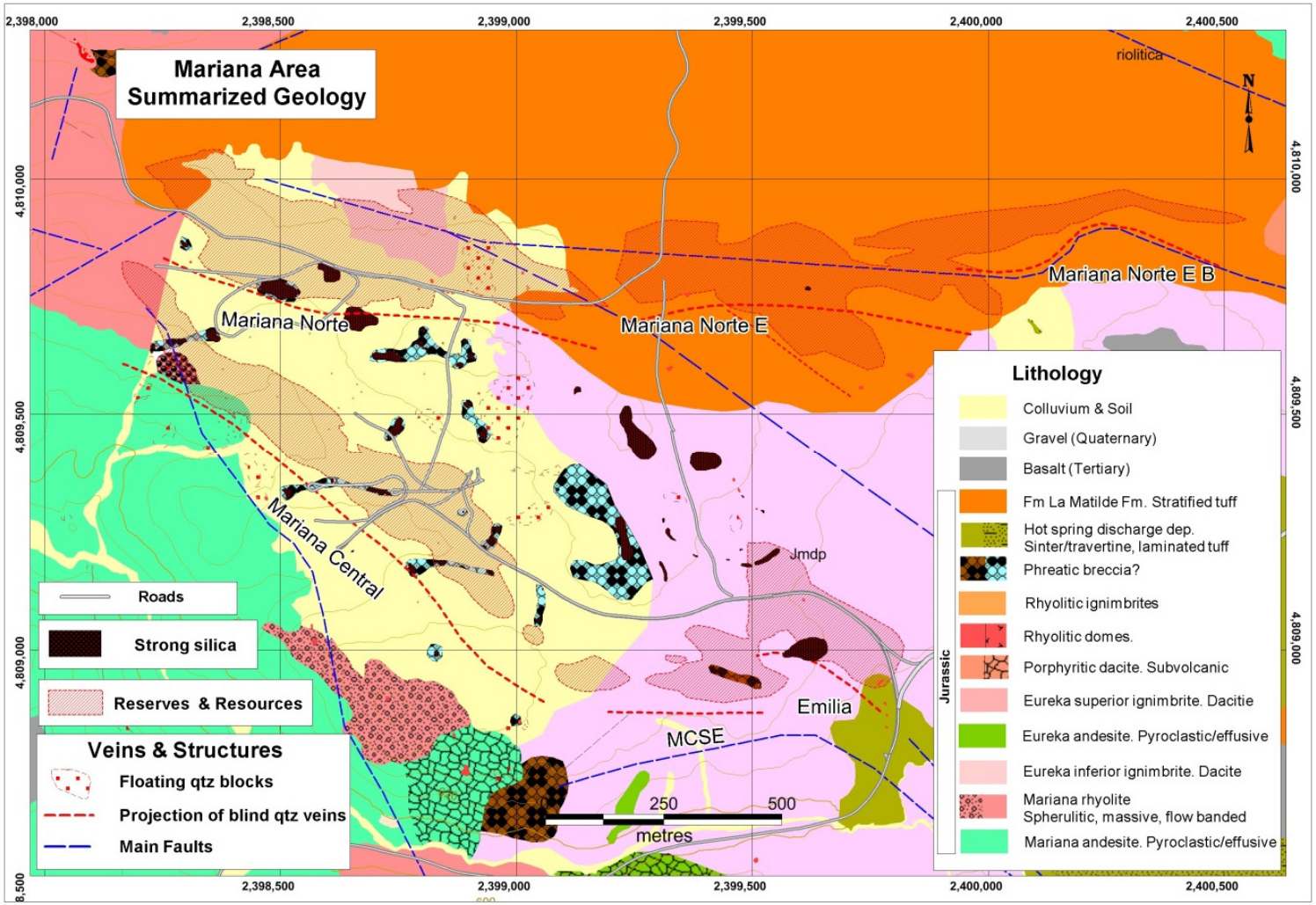


Figure prepared by Goldcorp, 2016Mariana Norte E = Mariana Norte Este; Mariana Norte EB = Mariana Norte Este Beta; MCSE = Mariana Central Southeast

Continued movement during and after mineralization has resulted in footwall collapse and deposition of the post-mineral breccias. Veins of Mariana Norte and Mariana Central are in a half-graben, with the stratigraphic succession dropped down stepwise to the north.

The two Mariana vein systems are about 250 m to 500 m apart, depending upon location, and strike 280º (Mariana Norte) and 305° (Mariana Central). Both veins have northerly dips, but the Norte vein dips at about 60º, while the Central vein has a steeper dip of approximately 65º.

Mariana Central comprises a main vein, a hanging wall split that separates from the main vein near the east end of the deposit and then rejoins the main vein 300 m farther to the west–northwest, and a separate, roughly parallel, secondary hanging wall vein that occurs about 100 m into the hanging wall of the main and hanging wall split veins. A third, roughly parallel, hanging wall vein occurs about 100 m from the main, interior to the hanging wall split vein. All of the defined veins have small, discontinuous sub-parallel veins. The main vein strikes west–northwest at about 305º and dips rather consistently at about 65º to the north.

Overall dimensions of the main vein are 800 m long by 300 m high by an average of over 7.1 m thick, reaching a maximum modeled thickness of 23.0 m. Southeasterly extensions, known as Mariana Southeast and Emilia, have recently extended the length of the known mineralization by more than 1 km. This is the highest-grade vein in the district.

Mariana Norte consists of a main vein, with an adjacent, discontinuous, high-grade sub-parallel footwall vein. A hanging wall split separates from the main vein near the east end of the deposit at an angle of about 20º. This hanging wall split dips very steeply northeast at over 80º. The main vein strikes west–northwest at about 280º and dips consistently at about 60º to the north.

Overall dimensions of the main vein are 700 m long by 400 m high, averaging 7.4 m wide; the widest part of the vein is approximately 26.9 m. Recently discovered mineralization at the east end of Mariana Norte extends the known length of the system by several hundred metres.

Mariana vein mineralization is unoxidized and contains abundant pyrite and other sulphides. Fine-grained black sulphides and sulphosalts are present especially at Mariana Central. Ginguro banding is also present but is not as abundant as at Eureka, and colloform-banded and apparent ginguro-textured quartz float is abundant on the surface.

The Mariana Central vein system has undergone a series of mineralizing events (Guido and Permuy, 2010) commencing with barren carbonate and culminating in extensive gold–silver deposition:

- Carbonate breccia;
- Colloform banded quartz with amethyst;
- Quartz adularia;
- Gray chalcedony with disseminated sulphides;
- Colloform-banded quartz–adularia associated with pyrite, chalcopyrite, galena, sphalerite and electrum;
- Green chalcedonic quartz with abundant sulphides and sulphosalts including bornite, idaite (Cu_3FeS_4), miargyrite ($AgSbS_2$), dyscrasite (Ag_3Sb), argentite, sphalerite, galena, native gold and silver, and electrum.

7.3.3 Bajo Negro

The Bajo Negro vein is hosted by a relatively uniform sequence of weakly to moderately welded dacitic ignimbrites assigned to the Cerro Negro Ignimbrite. To date, the Bajo Negro vein has been defined by drilling over a strike length of almost 1,200 m, with an average true width of 7.4 m, maximum width of 16.0 m and a known vertical extent of as much as 300 m.

The vein is essentially a single structure that strikes approximately 330º and dips at 65º to 75ºNE in its central half, but jogs to 310º and flattens slightly in its northwestern and southeastern extensions. Several smaller parallel veins occur on the western end of the structure. Some deeper drill intersections pass from ignimbrite in the hanging wall to lithic tuff or less-welded ignimbrite in the footwall, suggesting that the vein is emplaced along a normal fault.

The northwestern end of the vein is cut by a post-mineral breccia, whose northeastern contact dips to the southwest (Figure 7-6). The southwestern contact is steep and is inferred to be faulted. The post-mineralization breccia body displays multiple styles of brecciation with numerous clast types, including mineralized vein quartz, milled-matrix breccia, and clast-supported hydrothermal breccia. Most surface exposures of the breccia are silicified.

Intersections of vein quartz within the breccia in some drill holes were initially interpreted as large clasts. However, Corbett (2009) regards them as small veins, an interpretation which makes breccia emplacement a late syn-mineralization event. The ignimbrite–breccia contact is treated as a hard upper limit to mineralization in resource estimation, and no Mineral Resources are estimated within the ignimbrite–breccia.

Figure 7-6: Geological Map, Bajo Negro

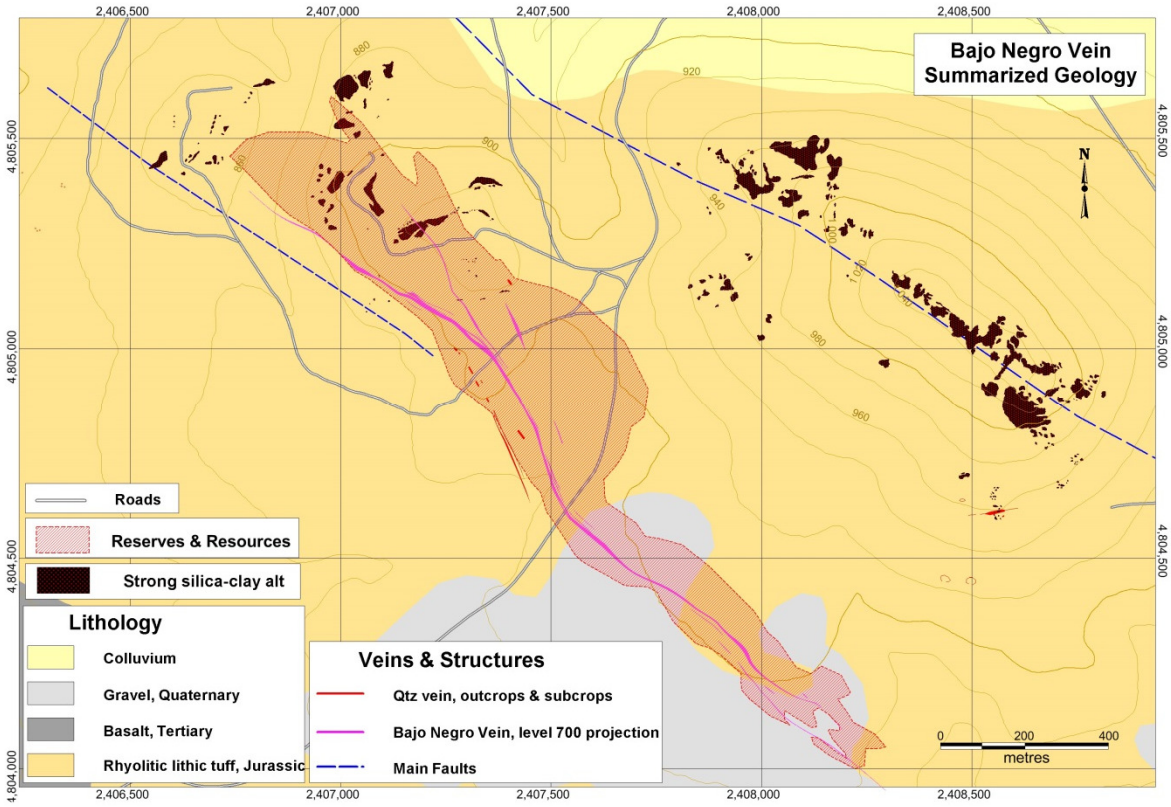


Figure prepared by Goldcorp, 2015.

Wall rocks at Bajo Negro are altered to a quartz–sericite–pyrite assemblage (Guido and Permuy, 2009), commonly with adularia both as veinlets and replacement. Pyrite is generally oxidized, and Corbett (2009) suggests that both supergene and hypogene kaolinite and hematite may be present.

The Bajo Negro vein is a single structure consisting of chalcedonic to crystalline quartz plus well-crystallized pyrite or (more commonly) iron oxide after pyrite. Native gold, some of it likely supergene, is commonly visible. Bladed quartz replacing carbonate is present in most drill intersections of the vein. The vein is deeply weathered and contains supergene (and probably hypogene) kaolinite and hematite throughout. Much of the vein is brecciated and cemented with jasperoid (silica plus iron oxide).

Small quantities of sphalerite, galena, and chalcopyrite, as well as pyrite, are associated with higher gold grades. Chalcopyrite is also present in lower-grade samples. Electrum is common, as is native gold, in samples with grades above about 10 g/t gold. Gold particles range in size from 5 to 50 µm; electrum is somewhat coarser grained and

mostly in the range 20 to 60 µm (in one case, 150 µm), while native silver reports across a wide size range from <5 to 150 µm.

Vein alteration minerals include kaolinite, illite, and smectite, and (less commonly) barite and alunite. Barite and alunite are locally common vein minerals. Adularia, largely replaced by quartz and clays, has only been observed in thin section.

7.3.4 Vein Zone

The Vein Zone deposit as presently defined is approximately 500 m long, occurs over a vertical extent of close to 400 m, and excluding the footwall vein, is as thick as 80 m. Mineralization, consisting of complex discrete veins and stockworks, is hosted by a relatively uniform sequence of welded rhyodacitic ignimbrites.

Both discrete veins and stockwork-like zones appear to have been emplaced in a complex north- to northeast-dipping fault zone that forms the boundary between strongly welded and moderately welded ignimbrites. The intersection of northwest- and east-trending veins may have been important in localizing mineralized shoots.

The Vein Zone consists of a west–northwest-trending arcuate system of quartz veins, sheeted veins, and breccia zones, in which the veins have easterly, northwesterly, or northerly strikes and steep to sub-vertical dips; the system dips to the north and northeast. The main deposit dips at about 60° northeast; the footwall structure dips about 80° northeast.

Oxidation of the Vein Zone deposit is thought to have been the result of two processes: hypogene alteration by a low-pH hydrothermal fluid and post-mineral oxidation due to near-surface weathering.

Figure 7-7 shows the detailed geology of the Vein Zone deposit.

Gold is associated with oxidized pyrite and manganese oxide along with hematite-goethite, minor sphalerite, kaolinite, illite, and adularia. Arsenic, manganese, and barium are locally anomalous. Platy quartz that is a pseudomorph of carbonate, colloform banding, and open or clay-filled vugs accompanies the gold. Mineralization occurs within an extensive envelope of kaolinitic alteration that changes sharply to illite alteration in the footwall.

7.3.5 San Marcos

A west–northwest-trending fault/breccia vein separates fine-grained andesite of the basal member of the Eureka Volcanic-Subvolcanic Complex to the north from rhyodacitic ignimbrite of the Complex, to the south. This fault coincides with a strong, property-scale magnetic lineament, which can be traced for at least 11 km. The fine-grained andesite is the host to all mineralization so far known at San Marcos.

A geological map for the San Marcos vein area is included as Figure 7-8.

Figure 7-7: Geological Map, Vein Zone

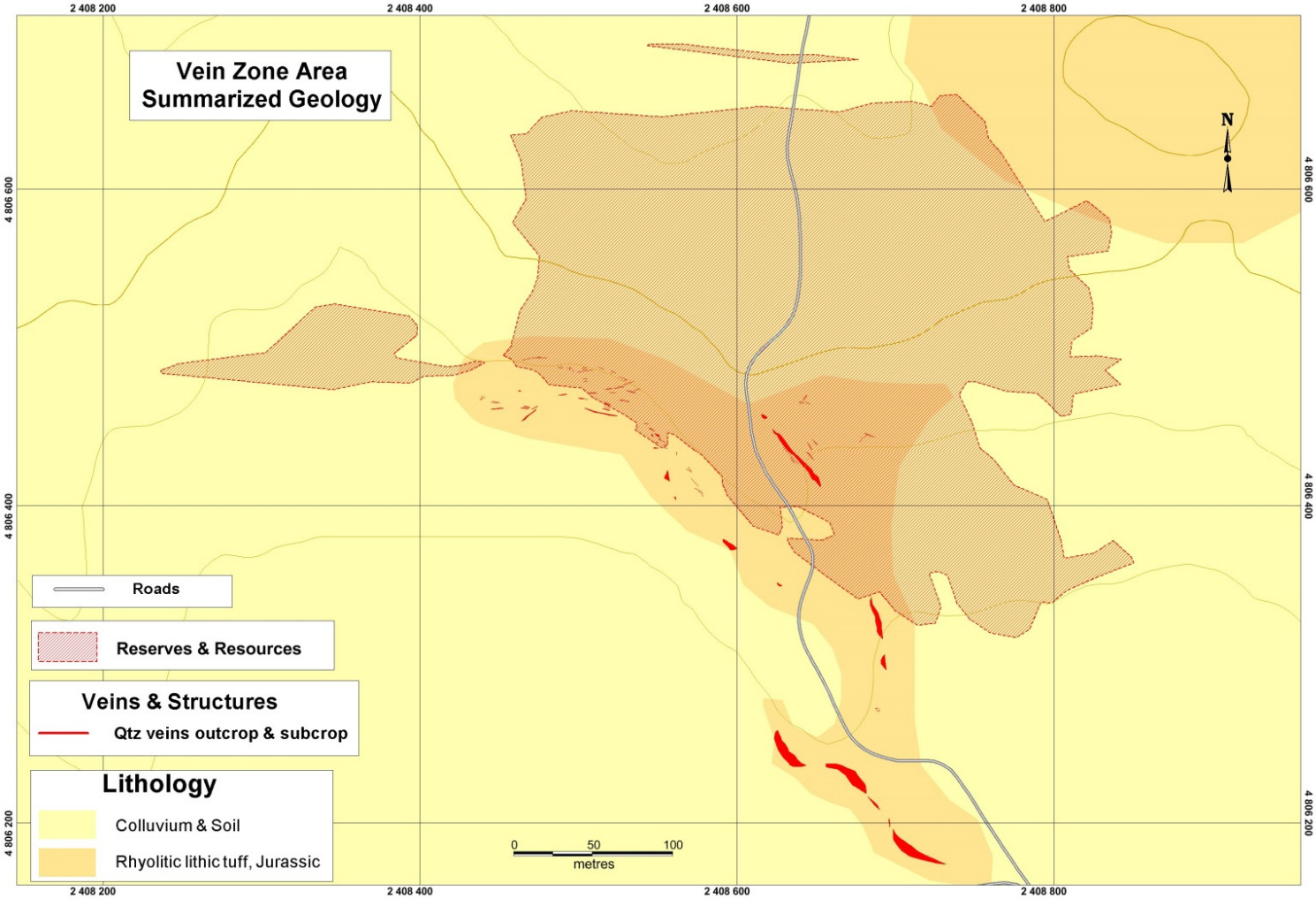


Figure prepared by Goldcorp, 2015.

Figure 7-8: Geological Map, San Marcos Vein

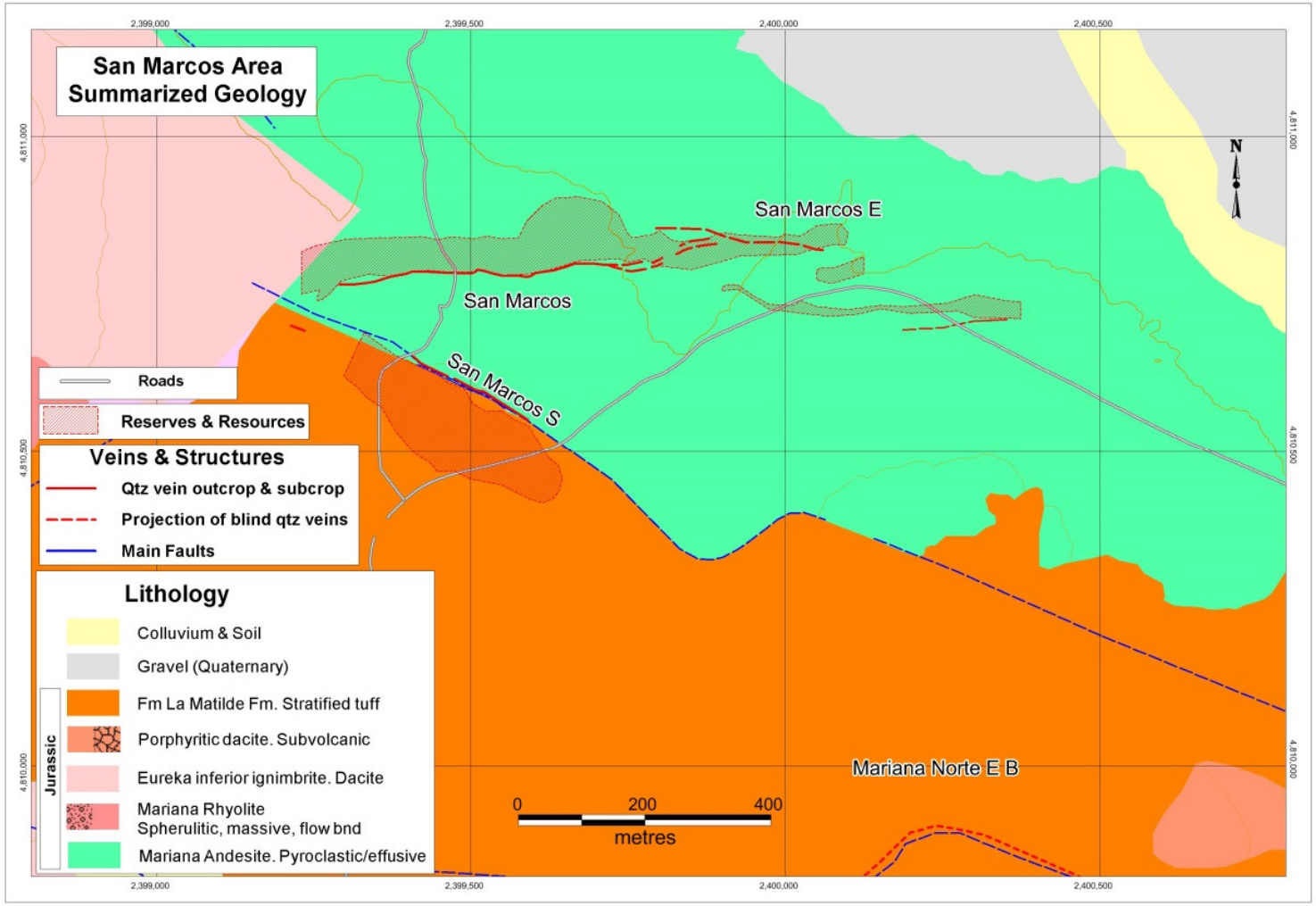


Figure prepared by Goldcorp, 2015.

The mineralized east-trending vein at San Marcos is a braided system dominated by two primary veins, along with two separate sub-parallel veins and a hanging wall split. The two primary veins—main hanging wall vein and main footwall vein—are more continuous and predictable than the subsidiary veins. A hanging wall vein split intersects the primary vein at an angle of about 40º dipping near vertically and then rolls over and dips south–southwest, opposite to the main vein. While this hanging wall split forms a relatively well-defined structure, it carries very little gold. Weakly-mineralized quartz-vein stockworks occur in the wall.

The main hanging wall and footwall veins strike east–west and are defined over a strike length of 750 m. These veins, and the subsidiary hanging wall and footwall veins, are typically vertical, though in places the dip is as low as 80º. The main hanging wall vein, which is on the north side, averages 6.5 m thick and has a maximum thickness of 20.4 m; the main footwall vein, which is on the south side, averages 4.7 m thick and has a maximum thickness of 9.8 m.

Mineralization consists of white quartz veins with abundant coarsely crystalline pyrite, vein breccias, and some black banding. No detailed studies of the San Marcos mineralization have been made to date.

7.4 Comments on Section 7

Knowledge of the deposit settings, lithologies, and structural and alteration controls on mineralization is sufficient to support Mineral Resource and Mineral Reserve estimation and to support mine planning.

The mineralization style and setting of the deposits is sufficiently well understood to support Mineral Resource and Mineral Reserve estimation.

8.0 DEPOSIT TYPES

The deposits within the Cerro Negro Operations are considered to be examples of low-sulphidation, epithermal gold–silver deposits. Global examples of such deposits include Comstock, Aurora (Nevada, USA), Bodie (California, USA), Creede (Colorado, USA), Republic (Washington, USA), El Bronce (Chile), Guanajuato (Mexico), Sado, Hishikari (Japan), Colqui (Peru), Baguio (Philippines) and Ladolam (Lihir, Papua New Guinea).

The type description for low-sulphidation epithermal deposits below is abstracted from Panteleyev (1996).

Low-sulphidation epithermal deposits are high-level hydrothermal systems, which vary in crustal depths from about 1 km to surficial hot spring settings. Host rocks are extremely variable, ranging from volcanic rocks to sediments. Calc-alkaline andesitic compositions predominate as volcanic rock hosts, but deposits can also occur in areas with bimodal volcanism and extensive subaerial ignimbrite deposits. A third, less common association is with alkalic intrusive rocks and shoshonitic volcanic rocks. Clastic and epiclastic sedimentary rocks in intra-volcanic basins and structural depressions are the primary non-volcanic host rocks.

Mineralization in the near surface environment takes place in hot spring systems, or the slightly deeper underlying hydrothermal conduits. At greater crustal depth, mineralization can occur above, or peripheral to, porphyry (and possibly skarn) mineralization. Normal faults, margins of grabens, coarse clastic caldera moat-fill units, radial and ring dyke fracture sets, and hydrothermal and tectonic breccias can act as mineralized-fluid channelling structures. Through-going, branching, bifurcating, anastomosing and intersecting fracture systems are commonly mineralized. Mineralization forms where dilatational openings and cymoid loops develop, typically where the strike or dip of veins change. Hanging wall fractures in mineralized structures are particularly favourable for high-grade mineralization.

Deposits are typically zoned vertically over about a 250 m to 350 m interval, from a base metal poor, gold–silver-rich top to a relatively silver-rich base metal zone and an underlying base metal-rich zone grading at depth into a sparse base metal, pyritic zone. From surface to depth, metal zones grade from gold–silver–arsenic–antimony–mercury-rich zones to gold–silver–lead–zinc–copper-rich zones, to basal silver–lead–zinc-rich zones.

Silicification is the most common alteration type with multiple generations of quartz and chalcedony, which are typically accompanied by adularia and calcite. Pervasive silicification in vein envelopes is flanked by sericite–illite–kaolinite assemblages. Kaolinite illite–montmorillonite ± smectite (intermediate argillic alteration) can form adjacent to veins; kaolinite–alunite (advanced argillic alteration) may form along the tops

of mineralized zones. Propylitic alteration dominates at depth and along the deposit margins.

Mineralization characteristically comprises pyrite, electrum, gold, silver, and argentite. Other minerals can include chalcopyrite, sphalerite, galena, tetrahedrite, and silver sulphosalt and/or selenide minerals. In alkalic host rocks, tellurides, roscoelite, and fluorite may be abundant, with lesser molybdenite as an accessory mineral.

8.1 Comment on Deposit Model

Features that classify the deposits as low-sulphidation epithermal-style deposits include:

- Banded crustiform, colloform, drusy, and cockade textures in quartz vein outcrops in the Eureka and Mariana areas;
- Banded quartz–adularia and dark, fine-grained quartz–sulphide bands (ginguro texture) in the Eureka and Mariana veins at depth;
- Abundant bladed carbonate-replacement textures in outcrop and drill core at Vein Zone and Bajo Negro, as well as drusy, colloform, and cockade textures;
- Presence of widespread, preserved, geothermal discharge deposits overlying the vein systems. Sinter-like deposits overlie the southeastern end of the Eureka vein; geyserite in lake beds, and travertine occur to the east of the Eureka vein; massive silica replacement of ignimbrite forms the summit of Cerro Negro, and a breccia overlying part of the Bajo Negro vein is silicified.

In the opinion of the QPs, a low-sulphidation epithermal deposit type is an appropriate model to guide exploration in the Project area.

9.0 EXPLORATION

Exploration has been undertaken by Goldcorp, its precursor companies (e.g. gold exploration by Andean), or by contractors (e.g. geophysical surveys). Exploration activities on the Project have included geological mapping, core drilling, RC drilling, trenching, soil and sediment sampling, ground geophysical surveys, mineralization characterization studies and metallurgical testing of samples. Petrographic studies and density measurements on the different lithologies have also been conducted.

A summary of the work programs completed to the Report effective date is provided in Section 6. More detail on the programs completed by Andean and Goldcorp is provided in Table 9-1.

9.1 Grids and Surveys

All surveying has been completed using the Gauss Krüger 84 coordinate system and the Campo Inchauspe 69 vertical datum. Since 2009, all surveying has been performed by company personnel using a variety of differential GPS (DGPS) instruments.

9.2 Petrology, Mineralogy, and Research Studies

A number of petrographic and mineralogical studies have been performed. In 2006, 2007, and 2009, petrography of various samples from the Cerro Negro Operations area were studied at La Plata University. Cornejo (2008, 2009) reports the results of petrographic studies on Cerro Negro Samples. Permuy (2014) completed a Ph.D. dissertation on sulphide mineralogy and petrogenesis of the Project deposits.

9.3 Exploration Potential

The veins for which Mineral Resources have been estimated to date are still deemed to have potential for expansion either along strike or down dip.

Regionally, the epithermal low-sulphidation gold–silver-bearing quartz veins occur in two belts. Significant potential exists to increase the known mineralization of the West Belt by continued drilling of the currently known gold–silver quartz veins. Exploration of known veins in the East Belt is also continuing.

Continued geological mapping and prospecting between the East and West belts in the central portion of the Project will focus on extending mineralized zones beneath relatively thin post-mineral cover dominated by alluvium and lacustrine sedimentary units. A number of prospects are known (Table 9-2) and have been variably explored. These prospects retain exploration potential.

Table 9-1: Exploration Summary Table

Activity	Work Undertaken
Geological mapping	Surface geological mapping from 2005–2008 was performed over areas of veining, ranging from 1:5,000 to 1:500 scale. Mapping was used to identify lithologies, areas of quartz veining, and visible sulphide mineralization. Mapping of the San Marcos area in 2009–2010 used Quickbird imagery and hand-held GPS. From 2011 to 2014, geological mapping continued at a scale of 1:5,000 over much of the area as part of a regional prospecting and sampling program.
Geochemical sampling	During reconnaissance exploration from 2006 to 2010, a total of 289 rock chip samples were taken from areas of quartz outcrop. Rock chip sampling resulted in the discovery of the Eureka West vein. Additional samples were collected between 2011–2014, including 62 float, 302 rock chip, and 173 stream sediment samples.
Geophysical surveys	Gradient-array resistivity, dipole-dipole resistivity, gradient-array chargeability, and ground magnetics surveys (700 line km) were performed in the period 2005–2008 by Akubra Exploraciones and Argali Geofísica. Those surveys covered Eureka–Mariana, Vein Zone, and Bajo Negro. In 2009, Argali Geofísica completed 1,419.3 line-km of ground magnetics and 788 line-km of gradient array resistivity over San Marcos, Eureka, and Mariana. Both surveys were run on north–south grid lines with 50 m data spacing. In 2011–2012, Quantech completed 168 line-km of gradient-array IP/resistivity for Goldcorp, linking together previous gradient-array work in the north–central portion of the concession block. Interpretations included: • The most conspicuous feature of the 2009 survey is a west–northwest-trending lineament that coincides with the southern breccia vein at San Marcos. The lineament can be traced for at least 3 km west–northwest and 8 km east–southeast of San Marcos and is clearly a major fault. There are a number of west- to west–northwest-trending resistivity anomalies in a west–northwest-trending zone of generally low resistivity whose southern limit is the magnetic lineament. • There is abundant unoxidized pyrite associated with the Mariana Norte and Mariana Central veins, and perhaps for this reason, there are strong gradient-array chargeability anomalies associated with the prospects
Pits and trenches	During 2005, 10 north-trending trenches totalling 745 m were excavated at Vein Zone, and one trench totalling 212 m was excavated at Bajo Negro. Additional trenching was undertaken in 2006–2007, including excavation and sampling of five backhoe trenches at the western end of the Eureka vein system to expose the Eureka West vein. Andean excavated six backhoe trenches at Bajo Negro in 2008. Two trenches were designed to investigate a resistivity feature east of the known vein, and the other four were used to explore the area to the northwest and southeast of the outcrops. Three backhoe trenches were excavated south of the silicified ridge at Mariana that contains most of the anomalous vein quartz float. The trenches exposed highly-brecciated andesite and some quartz fragments but no in-situ veins. Trenching was completed at the San Marcos vein outcrop in 2015. A total of 28 trenches covering 584 m were excavated, resulting in 564 samples. Results will be used to study the potential extraction of the San Marcos crown pillar.

Table 9-2: Prospects

Prospect	Work Completed to Date
Campamento Vein	Rock chip sampling; 6 core and 12 RC holes
Don Adolfo	4 lines pole-dipole resistivity 150 m apart; trenching; sampling; 4 RC holes and 8 core holes; geological mapping and prospecting, ground magnetics
El Retiro	Rock chip sampling
Eureka Norte	Rock chip sampling; 8 RC drill holes; geological mapping and prospecting, ground magnetics
Eureka Sur	Rock chip sampling; 11 RC and 3 core holes; geological mapping and prospecting, ground magnetics
La Herradura	Rock chip sampling; 7 RC and 4 core holes; IP gradient; geological mapping and prospecting, ground magnetics
Las Margaritas	Rock chip sampling; 9 core holes
Mara	Rock chip sampling; geological mapping and prospecting, ground magnetics
Pescado Rabioso	Trenching
Silica cap	Rock chip sampling; BLEG soil sampling; 6 RC holes
Sinter-geyserite	Rock chip sampling; geological mapping and prospecting, ground magnetics
La Tapera Lineament	Rock chip sampling of float material; 13 core holes; IP gradient; geological mapping and prospecting, ground magnetics
Cerro Negro	4 RC and 2 core holes; IP gradient; geological mapping and prospecting, ground magnetics
San Marcos Sur Extension	6 core holes; IP gradient; geological mapping and prospecting, ground magnetics
San Marcos E and extension	32 core holes; IP gradient; geological mapping and prospecting, ground magnetics
Eco 1 Vein	Rock chip sampling; 7 RC and one core hole; IP gradient; geological mapping and prospecting, ground magnetics
Damina	Rock chip sampling; 8 core holes; IP gradient; geological mapping and prospecting, ground magnetics
Mariana Sur	Rock chip sampling; 17 core holes; geological mapping and prospecting, ground magnetics

Note: RC = reverse circulation; IP = induced polarization; BLEG = bulk-leach extractable gold

9.4 Comments on Section 9

The strike extent of presently-known veins is likely to be extended with additional drilling in areas of subdued topography and under post-mineral cover. There are numerous occurrences of quartz veins and silicified rock with anomalous gold and silver values which remain to be fully evaluated in the Project area. Identification of additional veins is also anticipated in areas of surface silicification and beneath linear trends of silicified float boulders.

In the opinion of the QPs, the exploration programs completed to date are appropriate for the style of the deposits and prospects within the Project.

10.0 DRILLING

Drilling completed on the Project is summarized in Table 10-1. Figure 10-1 shows drill hole locations for the entire Project area. More detailed drill hole location maps for the deposits areas are included as Figure 10-2, Figure 10-3, Figure 10-4, Figure 10-5, and Figure 10-6.

Drill programs were completed by various contract drill crews and supervised by geological staff of the operator at the time. Where programs are referred to by company name, that company was the Project manager at the time of drilling, and was responsible for data collection.

10.1 Drill Methods

Andean conducted drilling in six campaign phases, from 2005 to 2010. From July 2009, Andean policy was to use RC drill rigs for exploration targets and for core pre-collars. When an exploration hole intersected a quartz vein intercept(s) and analysis confirmed a mineralized interval, the drill rig protocol was changed so that the follow-up target interval(s) was tested by coring methods. The follow-up drill holes could be either core only or a combination of RC as a pre-collar with a core “tail” to finish the drill hole.

Goldcorp drilling has been exclusively core drilling from surface and underground. Surface holes typically utilize H-size core (63.5 mm) and reduce to N-size core (47.6 mm) when required by ground conditions. Underground drilling also uses N-size core. Drilling procedures are consistent with those typically used for mineral exploration.

10.2 Geological Logging

No information is available on the Pegasus logging protocols; however, logged geological information has been spot checked where possible and those data are used for geological modeling.

For the MIM drilling, core was logged, photographed, and cut on site. During the Oroplata drill programs, chips were logged at the completion of each hole with results recorded in the field on handwritten log sheets and later transferred to a computer format.

Prior to the use of geological logging software, core was logged initially on log sheets designed by Andean personnel. In about 2008, DH Logger (a Datamine product) was implemented and used for digital logging of core. Logging data were entered directly into DH Logger. Logging data included alteration, breccias, clay types, colour and intensity, lithology, hardness, mineralization, oxidation, rock unit, vein type and texture. All drill core from the Andean programs has been photographed.

Table 10-1: Project Drill Summary Table

Year	Project Operator	Drill Holes			Metres		
		RC	Core	Total Drill Hole Number	RC	Core	Total Metres
1996–1997	Pegasus	13	0	13	1,511.00	0	1,511.00
1997	MIM	18	0	18	2,012.00	0	2,012.00
1998		5	7	12	686	1,082.30	1,768.30
1999		21	6	27	3,130.00	1,055.75	4,185.75
2000–2003		No Drilling					
2004		11	0	11	1,331.00	0	1,331.00
2005	Andean	10	16	26	1,192.50	3,034.10	4,226.60
2006		8	33	41	1,100.50	6,436.30	7,536.80
2007		34	71	105	8,091.00	18,048.90	26,139.90
2008		89	68	157	24,807.00	17,774.85	42,581.85
2009		84	165	249	39,504.85	19,899.00	59,403.85
2010		27	173	200	6,105.00	58,414.00	64,519.00
2011	Goldcorp	0	500	500	0	140,352.85	140,352.85
2012		0	420	420	0	145,728.70	145,725.70
2013		0	70	70	0	21,420.60	21,420.60
2014		0	82	82	0	20,124.10	20,124.10
2015		0	306	306	0	110,256.80	110,256.80
	Total	***320***	***1,917***	***2,237***	***89,470.85***	***563,628.25***	***653,096.10***

Figure 10-1: Project Drill Hole Location Plan

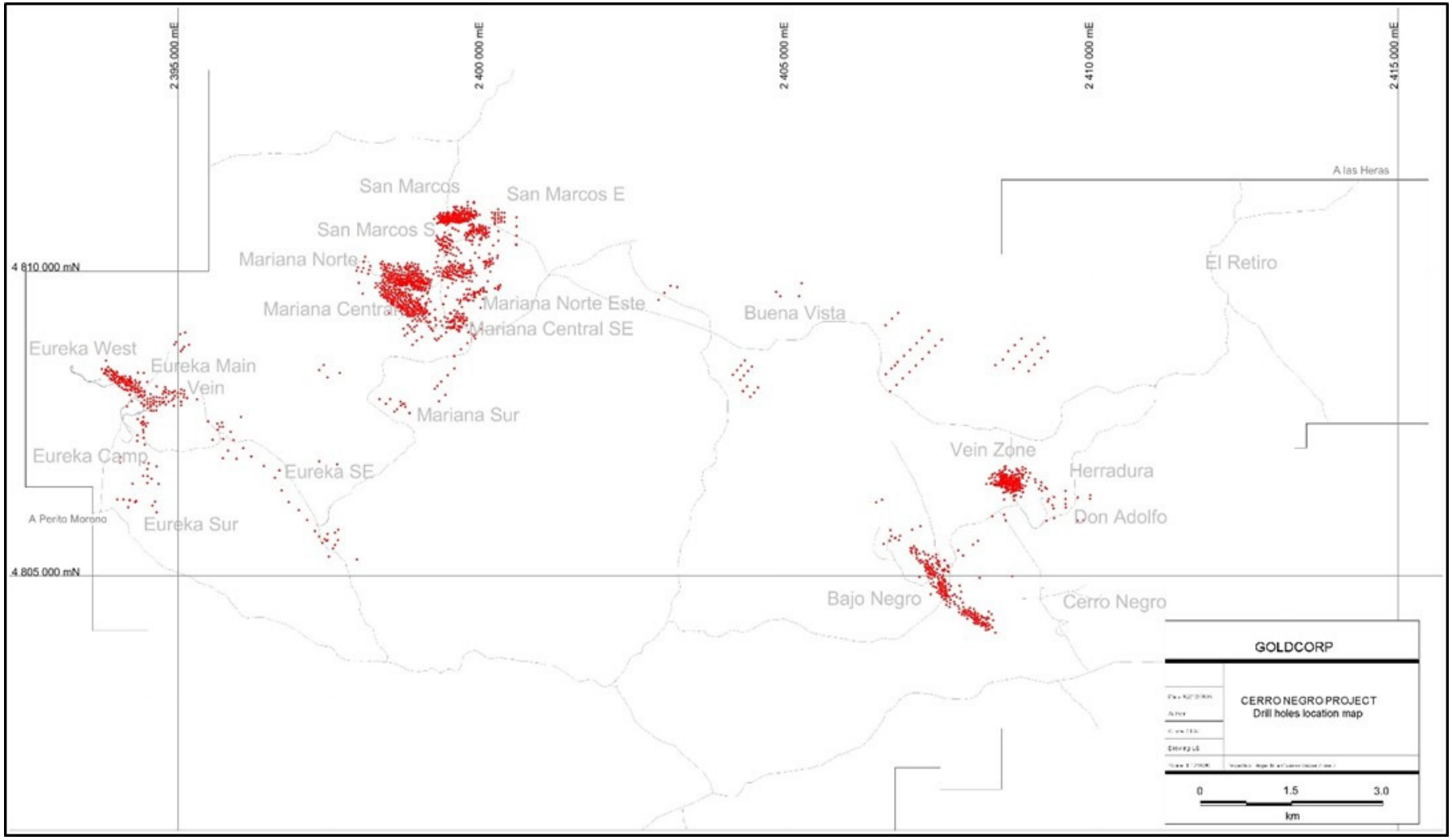


Figure prepared by Goldcorp, 2015.

Figure 10-2: Drill Hole Location Map, Eureka Area

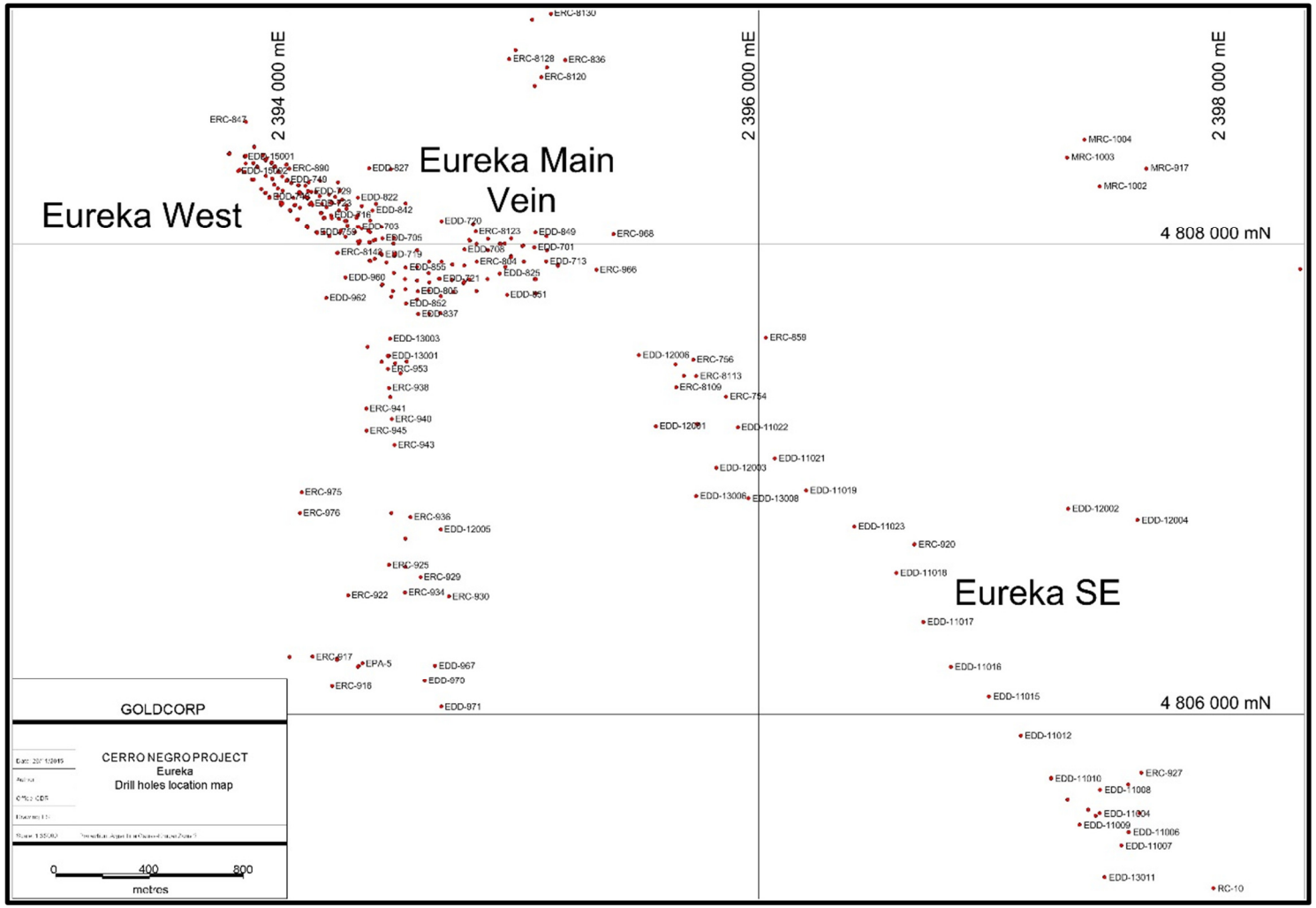


Figure prepared by Goldcorp, 2015.

Figure 10-3: Drill Hole Location Plan, Bajo Negro

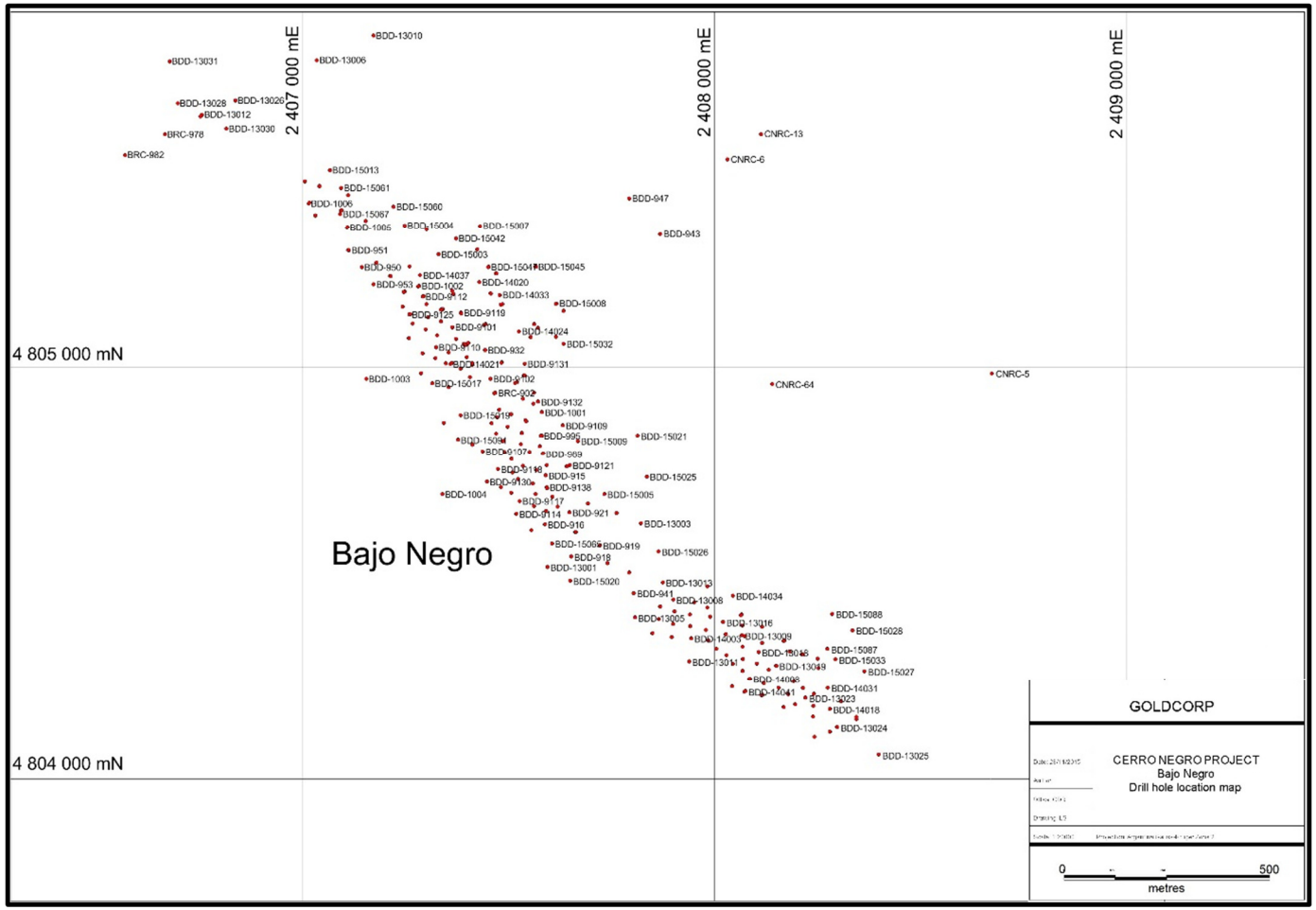


Figure prepared by Goldcorp, 2015.

Figure 10-4: Drill Hole Location Plan, Vein Zone

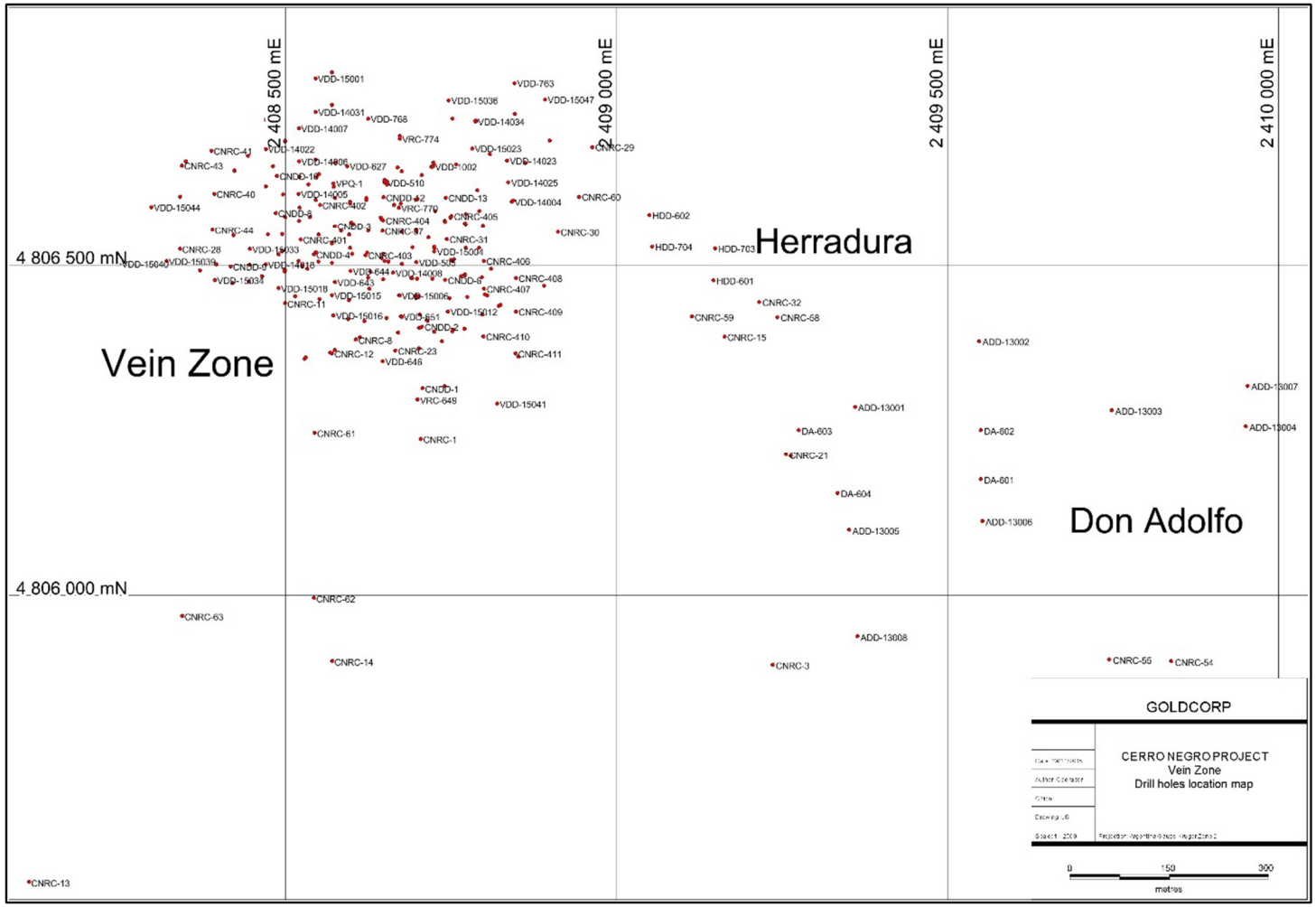


Figure prepared by Goldcorp, 2015.

Figure 10-5: Drill Hole Location Plan, San Marcos Area

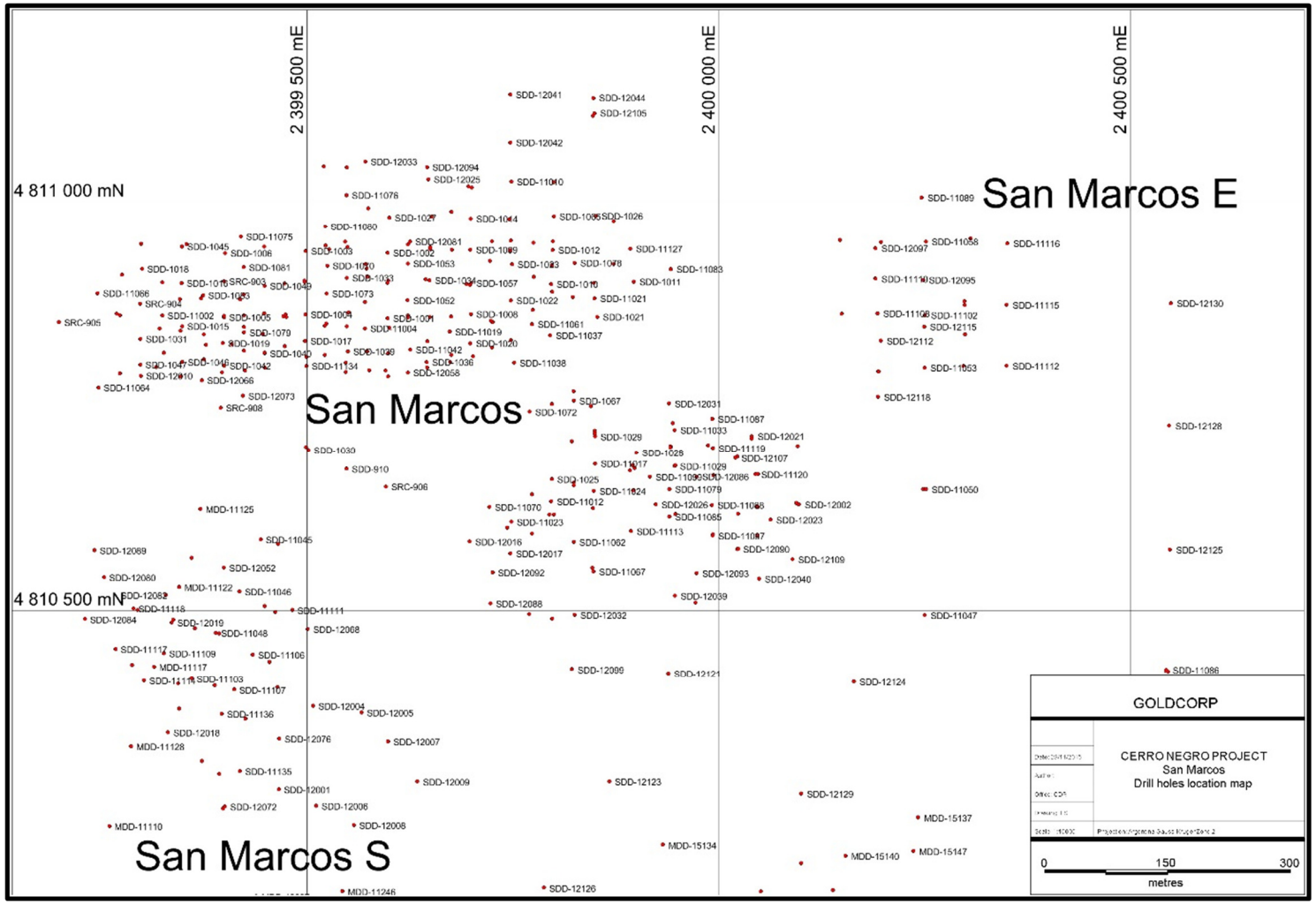


Figure prepared by Goldcorp, 2015.

Figure 10-6: Drill Hole Location Plan, Mariana Norte and Mariana Central

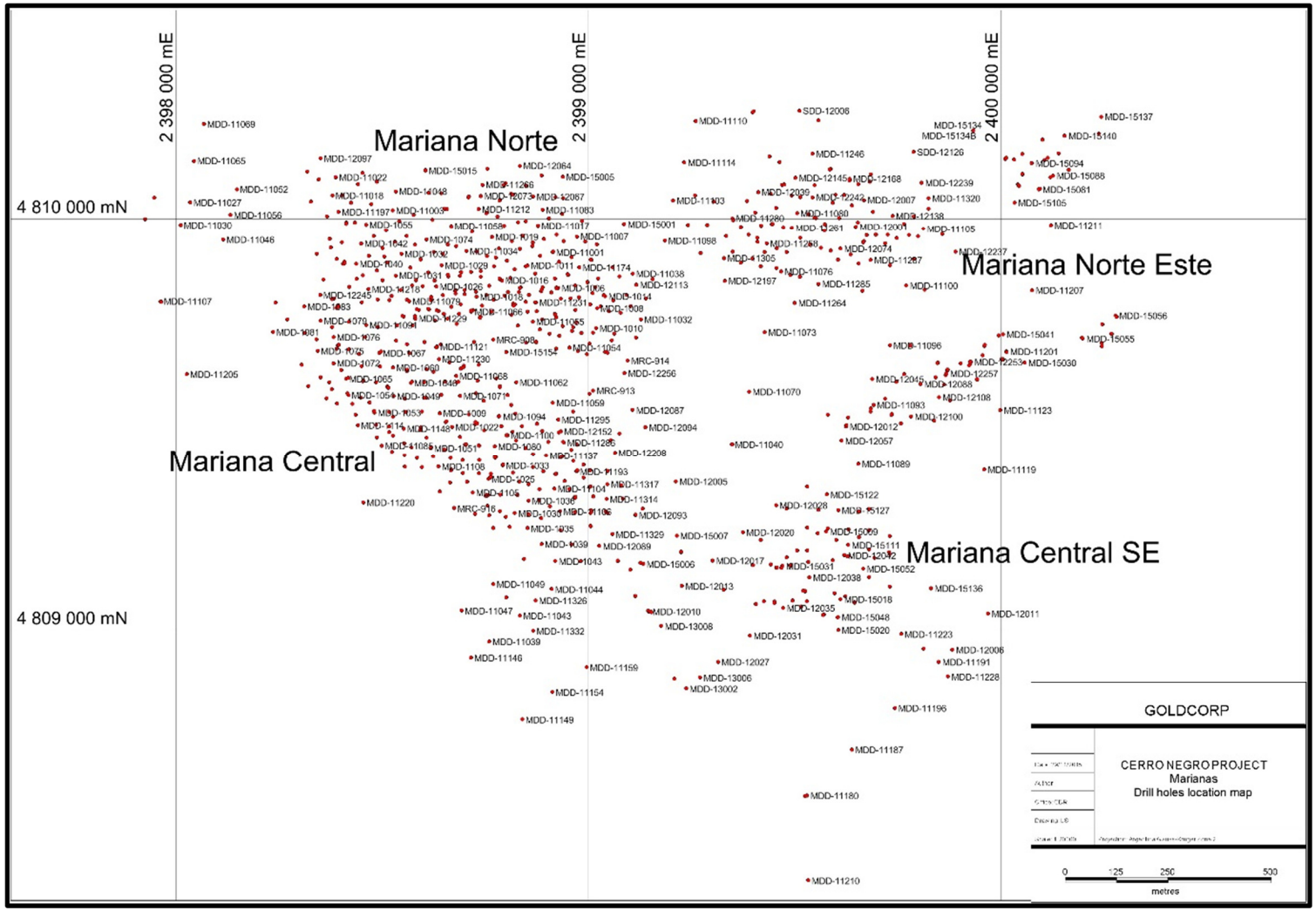


Figure prepared by Goldcorp, 2015.

Goldcorp continues to utilize DH Logger and logs the same geological features as were logged by Andean. DH Logger uses a "check-out" system where the log for a specific hole is "checked out" by the geologist logging the hole. Data are captured digitally using drop-down menus which minimizes data errors. When logging is completed for the drill hole, the log is "checked in" and data are directly added to the database. When logging is completed and properly signed off, the log is printed for a permanent paper record. Logged geological features are appropriate for this type of mineralization.

10.3 Geotechnical Logging

Core recovery and rock quality designation (RQD) data are routinely collected. Prior to 2007, Andean oriented core using a plasticine impression of the core stub at the bottom of the hole (Ristorcelli et al., 2010; Shatwell, 2007a). Beginning in 2007, Andean used the Reflex ACT tool (Shatwell, 2008) to orient core. Oriented core determinations were largely discontinued after 2007, except in selected holes used for geotechnical studies.

10.4 Underground Face Sampling

Goldcorp utilizes channel samples from underground faces as production control samples. These samples are collected using hammers and chisels and are typically about 10 cm x 1.5 cm in cross section. Samples are collected across the vein contact, but frequently do not cross the entire vein for various operational reasons. Logged lithologies of these samples are used for geological control in the exploration and short-term geological models and grades are used for Mineral Resource estimation.

10.5 Recovery

Overall, recovery for core samples averaged 93% with 80% of the intervals reporting >95% recovery. Recovery in the veins frequently suffers because of the intense fracturing in the core. Review of the data indicates that there is likely no significant grade/recovery relationship for recoveries ≥30%.

For the Pegasus RC drill programs, recoveries of 80% to 90% were recorded for dry samples. Wet samples were split by hydraulic splitter, and recoveries were not determined. For Andean RC drill programs, recoveries were estimated by comparing the weight of sample with the theoretical sample weight for the hole-size assuming a specific gravity (SG) of 2.35. Recovery is not recorded in the database, but was reportedly in the 80–90% range.

10.6 Collar Surveys

Collar locations of holes drilled by prior operators were determined by a licensed surveyor using differential GPS instruments. Contracted surveyors have been used

from time to time. From 2009 to 2010, the surveyor was an employee of Andean and reported collar locations to the nearest millimetre using a differential GPS unit.

Since 2011, surface collar locations and other surface features were determined by Goldcorp employees using DGPS. Various Trimble instruments were used. Underground surveys are performed using total station instruments. Some collars are manually measured from points set using total station instruments.

10.7 Downhole Surveys

There is no information on downhole surveys for the Pegasus drilling. Downhole survey data on core holes CNDD-1 to CNDD-13, drilled by MIM, were provided by Oroplata and were included in the database (Shatwell, 2006b). No additional information is available for the Oroplata drilling.

Andean completed downhole surveys using an Eastman camera for holes drilled up to July 2007, a Reflex system tool for drill holes drilled between July 2007 and September 2008, and a gyroscopic system for holes drilled in 2009 and 2010. In some earlier programs, downhole surveys were only taken at the midpoint and bottom of the holes, but as of 2008, downhole surveys were taken on increments of 10 m and 30 m.

Core holes drilled prior to VRC-905 were surveyed by Eastman camera or the Reflex system tool. Drillers conducted the surveys. The RC drill-holes were not down-hole surveyed during this time period. Drill holes from VRC-905 onward were surveyed with gyroscopic equipment by Comprobe Ltda. (Comprobe). Ristorcelli et al (2010, 2011) noted that the initial azimuth orientation of the down-hole instrument was determined using a tripod-mounted magnetic compass, which limits the accuracy of the survey azimuths to that of the magnetic compass.

Goldcorp performs downhole surveys of exploration holes with a Reflex Gyro on 10 m intervals. Infill drilling from underground stations are surveyed using either a Reflex Gyro or a Reflex EZ-TRAC on 3 m intervals.

10.8 Sample Length/True Thickness

Sample lengths do not represent true thickness of the veins because drill holes rarely intersect the veins perpendicular to the contacts. In general, the drilled thickness is greater than the vein true thickness.

10.9 Comments on Section 10

In the opinion of the QPs, the quantity and quality of the lithological, geotechnical, collar and downhole survey data collected in the exploration and infill drill programs are sufficient to support Mineral Resource and Mineral Reserve estimation as follows:

- Drilling from the Pegasus programs does not support Mineral Resource estimation;

- Collar surveys have been performed using industry-standard instrumentation;
- Downhole surveys performed after 2006 were performed using industry-standard instrumentation;
- Core logging meets industry standards for gold and silver exploration;
- Recovery data from core drill programs are acceptable;
- Drill intercept widths are typically greater than true widths;
- Drill orientations are generally appropriate for the mineralization style, and have been drilled at orientations that are optimal for the orientation of mineralization for the bulk of the deposit area.

11.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

11.1 Sampling Methods

11.1.1 RC Sampling

RC sampling completed prior to Goldcorp's Project ownership is summarized in Table 11-1.

Goldcorp does not typically complete RC holes; however if these are drilled, Goldcorp uses similar procedures to Andean.

11.1.2 Core Sampling

Core sampling procedures in place prior to Goldcorp's Project ownership are summarized in Table 11-2.

For Goldcorp surface drilling programs, sample intervals, including depths, are marked on the core boxes by the geologist, the sample number is written within the interval and a sample tag is placed within the interval. The location of quality assurance and quality control (QA/QC) material is also marked on the core boxes. The sampling protocols call for samples to be between 0.5 and 2.0 m in length. Samples within the vein are typically 1.0 m or less, and are often based on differing vein textures. Samples adjacent to the mineralized zones may be up to 2.0 m in length. Samples in excess of 4.0 m have been collected from surface holes in overburden at the start of the hole where recoveries are low.

11.1.3 Underground Core Drilling

Sampling protocols for Goldcorp underground infill samples are slightly different from those used for surface holes. Sample intervals, including depths are marked on the core boxes, and the sample number is written within the interval but no sample tag is placed in the box. Protocols are to collect samples between 0.3 m and 1.0 m in both un-mineralized and mineralized rock. The entire core, typically NQ size, is taken as a sample and placed in pre-marked plastic samples bags along with a sample tag. Standards and blanks are then inserted in the sample sequence.

Sample lengths noted in the database range from 0.15 m to 21.4 m. Most wall rock samples have been collected over consistent 1.0 m or 2.0 m intervals.

11.1.4 Underground Face Samples

Underground channel samples are collected over lengths from 0.3 m to 1.5 m and respect geological boundaries. The channels are 10 cm wide and 1.5 cm deep.

Table 11-1: RC Sampling Methods

Company	Sampling Methodology
Pegasus	Dry cuttings were quartered in the field to provide an assay sample of 7 kg to 9 kg. Samples were combined into 2–4 m composites, depending on lithology and mineralization.
MIM	Sampling was carried out every 2 m, with further splitting of each interval to collect a 5 kg sample
Oroplata	Drill holes at Eureka (in 2002) and Vein Zone (in 2004) were flushed and sampled at 1 m intervals, with the entire sample collected in large plastic bags at the base of the sampling cyclone. The samples were split through a large, two-deck steel riffle splitter, producing a 3 kg to 4 kg sample. Composite 2 m samples for geochemical analysis were obtained in 2002 by combining pairs of 1 m samples from adjacent intervals. There was no information on how wet samples were split during 2004
Andean	Sampled every metre, with the exception of the first hole drilled at Vein Zone which was sampled every 2 m. For drill holes VRC501-510, drilling crew delivered the full dry sample for each metre to Andean sampling personnel at the rig site. This sample was then riffle-split 7/8:1/8 using a Jones-type splitter at the drill site, and the 1/8 split was delivered to the sample preparation laboratory at El Retiro for further processing. The weight of the 1/8 assay split was recorded in the sample preparation laboratory after drying. Riffle splitting was not possible for wet holes, and samples from these holes were stored in permeable bags and left to settle. These samples were then batch-split using a wet cyclone with a splitter attached to the rig. For RC holes drilled after VRC-736, samples were split approximately 75:25 by a splitter attached to the cyclone on the rig, and this procedure was applied to both wet and dry samples. If samples were dry, both splits were weighed on site and the ¼ split was delivered to the sample preparation laboratory. If samples were wet, they were not weighed at the rig site but the ¼ split was oven-dried and weighed at the sample preparation laboratory. From 2009, for RC drill holes, samples were collected by the drilling crew from a cyclone attached to the rig. Dry samples were riffle split using a Jones-type splitter, and a ½ split was sent for sample preparation. Wet samples were first split using a wet cyclone attached to the rig; the split size was not recorded. Essentially all drilling below 50–100 m depth is wet. During 2009–2010, the primary samples were organized, and drill-rig duplicates and blanks were inserted into the sample stream in consecutive numbers so that the analytical laboratory was unaware of these samples. Andean also placed a “dummy” sample in the sample stream as a placeholder for the to-be-inserted pulp standards after sample preparation, including pulverizing, is completed. One of each blank, standard, and duplicate sample was inserted per approximately 71 samples.

Table 11-2: Core Sampling Methods

Company	Sampling Methodology
MIM	Core was split in half using a diamond saw and was sampled over 1 m intervals unless a different interval was required because of the geology
Andean	For the Andean drilling programs core was transferred to the core shack at the exploration camp where it was laid out and washed by a technician. The core recovery and RQD was measured between wood blocks, and was marked up in 1 m intervals taking core recovery into account. Sample lengths were laid out by geologists and adjusted to best represent geologic boundaries, although on the initial Andean drill programs prior to drill hole EDD-722, samples were taken on regular 1 m intervals regardless of geology. Otherwise core samples collected for analysis by Andean were typically 1 m in length but ranged from 0.2 m to 3.0 m. The geologist marked the core with a line so a consistent side was taken during sampling. Andean technicians cut the core using a diamond rock saw for samples of the vein and used a hydraulic splitter for the remainder of the hole, producing a samples of 1 kg to 3.5 kg.

Vein samples are cut with a diamond rock saw with the remaining samples being collected using a hydraulic splitter. The remaining half is returned to the core box and stored for future reference. Samples are placed in pre-marked plastic sample bags with a sample tag and are laid out in an orderly fashion. QA/QC materials are then inserted.

11.2 Density Determinations

Historically, bulk density determinations were collected using the water displacement method. During 2010, Andean adopted a dry volumetric measurement method that is currently used by Goldcorp to make periodic checks.

Density determinations have been performed by Alex Stewart Argentina Laboratories on behalf of Andean and by Goldcorp personnel. The practice is to collect two samples from host rock, one above and one below each vein, and to collect one sample from the vein.

In total, including all Andean samples, the current density sample database contains 3,681 measurements.

11.3 Analytical and Test Laboratories

Several primary assay laboratories have been used for routine analyses over the Project history.

SGS Laboratories (SGS) were used by Pegasus in 1996–1997. SGS is an independent analytical laboratory service provider; accreditations at the time of sample preparation and analysis are not known. Samples were prepared by SGS at their mobile laboratory in San Julián and assayed by SGS in Chile.

SGS is interpreted to have performed the sample preparation and analysis for the first two MIM RC drill campaigns and the first three core drill holes; information available notes that sample preparation was performed at San Julián. In 1998, following a check assay program to confirm analytical values received from SGS, MIM used ALS Chemex. For all subsequent RC and core drilling, sample preparation and analysis were performed by ALS Chemex in Chile, Mendoza, and Vancouver. ALS Chemex is an independent analytical laboratory group; certifications of the laboratories performing sample preparation and analysis are not known at the time of the work. Bondar Clegg Laboratories undertook check sampling during the MIM programs. Bondar Clegg is now owned by the ALS Chemex group. Laboratory accreditations at the time of the check assaying are not known.

Samples from the Oroplata programs were despatched for sample preparation to the ALS Chemex preparation facility in Esquel, Argentina and analysed at the Mendoza laboratory. Certifications for either facility are not known for the time the work was completed.

For the Andean Phase 1 to Phase 4 drilling programs, samples were prepared by Alex Stewart Argentina at a sample preparation facility at El Retiro within the Project. Prepared samples were then assayed by the Mendoza laboratory of Alex Stewart. Certifications for either facility are not known for the time the work was completed. The Mendoza laboratory appears to have held ISO9001:2000 certification from at least 2007. Check sampling was performed by Acme Laboratories (Acme) in Mendoza; the laboratory was independent of Andean, but analytical accreditations are not known for the timeframe in which the work was completed.

From September 2008, sample preparation was performed by Acme in Mendoza, and analysis by Acme in Santiago, Chile. From 2005, the Santiago laboratory has had ISO9001:2000 accreditation. From 2006, the Mendoza laboratory has had the same accreditation.

On June 29, 2010, sample preparation was again moved to the Project site to a laboratory staffed by two Acme employees, who worked with and supervised Andean and Goldcorp staff, but overseen by Acme. Standards were inserted on site following sample preparation and before the pulps were shipped to Chile for assaying. Onsite preparation of surface exploration samples ceased in 2013, and sample preparation returned to Acme´s facility in Mendoza.

Goldcorp has continued to use Acme (now Bureau Veritis) as the primary laboratory.

From June 2013 until December 2015, all of Goldcorp's underground diamond drill, mine production, and plant solid and solution samples have been assayed for gold and silver at the Goldcorp-operated on-site laboratory located at Eureka Camp. The on-site laboratory obtained ISO 9001:2008 certification in June 2013 and is not independent.

Beginning in January 2016, all underground diamond drill and mine production samples will be prepared and assayed at Alex Stewart Assayers Argentina SA (ASA) Perito Moreno facility. This laboratory is independent and is ISO 9001:2008 and ISO 14001:2004 certified.

Plant samples will continue to be analyzed on site.

All laboratories except the Goldcorp-operated on-site laboratory are independent of Goldcorp.

11.4 Sample Preparation and Analysis

11.4.1 Sample Preparation

No information is available on the sample preparations procedures used for the Pegasus or MIM drill programs.

Sample preparation information is only available for the Oroplata drill program at Eureka. For these drill holes, samples were crushed to greater than 80% passing a 10 mesh

screen, split to 250 g to 300 g, and pulverized to greater than 95% passing a 150 mesh screen.

Andean Phase 1 to Phase 4 RC and core drill hole samples were crushed to 80% passing -10 mesh, and grind-split to 85% passing -200 mesh. The Phase 5 samples were crushed to 70% passing -10 mesh, and pulverised to 95% passing -150 mesh.

Goldcorp core samples are prepared using the same crush and pulverize parameters as those noted for Andean.

Underground drilling and mine samples prepared at the on-site laboratory go through a three-step process. After drying in an oven samples undergo primary crushing to ¼ inch, then secondary crushing to 85% passing -10 mesh at which time a 300–400 g split is taken using a rotary splitter attached to the side of the crusher. The split is then pulverized to 90% passing -140 mesh. After every sample the equipment is cleaned with compressed air and every 10 samples a commercially prepared, barren quartz gravel is run through all three stages.

11.4.2 Analytical Procedures

Where information is available on analytical programs prior to Goldcorp's Project acquisition, this is summarized in Table 11-3. The analytical procedures requested by Goldcorp from Acme are the same as those documented for Andean.

At the Eureka Camp on-site laboratory as well as the Alex Stewart laboratory in Perito Moreno, samples are analyzed using a 50 g fire assay to determine gold and silver values. For gold values lower than 10 g/t, analyses are completed using an AA finish. For gold values higher than 10 g/t, analyses are completed using gravimetric finish.

11.5 Quality Assurance and Quality Control

11.5.1 Surface Drill Sample QA/QC

Where information is available on quality assurance and quality control (QA/QC) programs prior to Goldcorp's Project acquisition, this is summarized in Table 11-4.

Goldcorp's insertion rates continued to use the protocols established by Andean in 2008. QA/QC practices on surface drilling programs have included the insertion of blanks, duplicates, and both site-specific and commercially available standards. Regular insertion rates have not always been used. Instead, QA/QC materials have been placed preferentially within and around mineralized zone intersections, while samples intervals in the host rocks, even if relatively extensive, have relatively few QA/QC insertions. Overall insertion rates are about 4%, although the percentage would be considerably higher for mineralized intervals. More recently protocols have been employed where three out of 40 samples are QA/QC materials, an insertion rate of 6%.

Table 11-3: Sample Preparation Procedures

Company	Sample Preparation Methodology
MIM	For the January 1998 MIM drilling, gold was analyzed by a 50 gram charge fire assay with atomic absorption (AA) finish, and by inductively-coupled plasma (ICP) analysis following aqua regia digestion for base metal and indicator elements. Analysis at ALS Chemex for the MIM for RC and core drilling was by 50 g charge fire assay with an AA finish.
Oroplata	Samples were assayed for gold by fire assay on 50 g nominal sample weight and were also analyzed for 34 elements, including base metals, by aqua regia acid digestion/inductively coupled plasma-atomic emission spectroscopy (ICP-AES) analysis.
Andean	For the Phase 1 to Phase 4 Andean drill programs, gold was determined by fire assay on a 50 g sample using an AA finish. Samples assaying greater than 10 g/t were re-assayed using a gravimetric finish. In addition to gold, the Ag, Al, As, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, Sb, Sc, Se, Sn, Sr, Te, Ta, Ti, V, W, Y, Zn, and Zr abundances were determined by ICP. From Phase 5, gold is analyzed by fire assay and silver by aqua-regia digestion with AA finish and ICP analysis for a suite of multi-elements. Silver over-limits (>200 g/t Ag prior to Phase 5 and >100 g/t Ag for Phase 5) are analyzed by fire assay gravimetric finish. Over-limits for gold are 10 g/t Au at which point the finish on the re-assay is done with gravimetric methods. The ICP method provides analyses for multiple elements in addition to silver.

Table 11-4: QA/QC Procedures

Company	Sample Preparation Methodology
Pegasus	There is no information available for any quality assurance/quality control (QA/QC) programs for the Pegasus drilling. The Pegasus drill holes do not inform Mineral Resource estimation.
MIM	Drill programs had a blank and a duplicate sample inserted into the sample stream every 30 m, and a standard inserted every 50 m. Blanks consisted of about 5 kg of a local tuff known to contain insignificant mineralization and a total of 51 blanks were inserted. MIM used commercial and in-house standards for all of their drilling, with a total of 74 standards reported. Programs of cross-laboratory checks and screen fire assay checks were conducted.
Oroplata	Apparently conducted no QA/QC except for one duplicate sample per drill hole
Andean	One each of a blank, duplicate, and standard approximately every 20 samples for RC and core drilling and also in trench samples. Samples used for blanks are prepared from local basalt that is known to contain no significant mineralization. The samples are crushed in the Alex Stewart sample preparation laboratory. Duplicate samples are prepared from the 10-mesh crushed rejects prepared in the Alex Stewart sample preparation laboratory. Standards were provided by Geostats Pty Ltd. of Western Australia. Prior to October 2005, standards for gold were routinely inserted into the drill hole sample series by staff of the Alex Stewart sample preparation laboratory. Since then, Andean's geologists insert the standards into the sample stream so that the gold grade of the standard is not known by Alex Stewart laboratory personnel. Modifications were made to the QA/QC procedures in 2008. The use of commercial gold standards was discontinued, and an in-house standard suite that more closely reflected the high gold and silver grades found in the Eureka West vein was prepared. Early QA/QC programs had not included a silver standard; such standards were prepared and inserted in sample streams from 2009. From 2008 QA/QC practices on surface drilling programs included the insertion of blanks, duplicates, and both site-specific and commercially available standards.

A substantial number of check assays, 5% of all samples, have been performed on pulps from 2009 until present.

11.5.2 Underground Drill Sample QA/QC

The Ore Control group at Cerro Negro has well developed and well documented protocols for their QA/QC programs.

The assays from infill drilling are based on batches of 30 samples, each of which comprises 24 actual drill core samples and six QA/QC materials, which total 20% of all samples submittals. Included within the QA/QC materials are two standards, two blanks (one fine and one coarse) and two duplicates (one reject duplicate and pulp duplicate). This protocol allows the samples to be coordinated with the 30 samples fire assay batch size in the onsite laboratory.

11.5.3 Blanks

Surface Drill Samples

From 2008 onwards the blanks inserted with exploration drilling samples have consisted of RC cuttings or drill core believed to be devoid of mineralization. Blanks are assessed at six times detection limits for failure levels of 0.03 g/t gold and 6.0 g/t silver.

A number of anomalous results were returned suggesting that the blank material contains low-level, sporadic mineralization or that low-level contamination is occurring between samples at the assay laboratory. The levels encountered are not high enough to have a material effect on Mineral Resource estimation.

However, it is recommended that Goldcorp considers use of a better source of blank material, such as Tertiary basalts.

Underground Samples

Two different blanks are used on samples from underground drill holes. The coarse field blank used on samples from underground drill holes consists of Tertiary basalt which is collected from a location within the property boundaries. The fine blank is a commercially-prepared one that is obtained from material submitted to Alex Stewart International in Mendoza for analysis in early 2012. A certificate obtained from site staff shows the values of a dozen cuts, all of which returned results at or below detection for gold (0.01 g/t), and below detection for silver (2.0 g/t). Coarse blanks assessed at three times the detection limit; fine blanks are assessed at two times detection limits.

The detection limits in the on-site laboratory for gold and silver are 0.07 g/t and 3.0 g/t respectively. The laboratory uses failure thresholds of three times the detection limit for coarse blanks and two times the detection limit for fine blanks, giving failure levels of

0.21 g/t gold and 9.0 g/t silver for coarse blanks, and 0.14 g/t gold and 6.0 g/t silver for fine blanks.

Hamilton (2014a, 2014b) evaluated the blank performance from July 6, 2013 to February 24, 2014. On this basis there were two coarse blank failures and two fine blank failures for gold, and no failures for silver in either blank.

11.5.4 Duplicates

Surface Drill Samples

Data exist for both quarter core field duplicates and sample preparation duplicates created from rejects by Acme.

Quarter core field duplicates are submitted with regular surface drill samples. The differences in means between original and field duplicate samples for gold and silver are 0.2% and 2.1% respectively, indicating no bias. Scatter plots show considerable but even dispersion at all grade levels around a line with a slope of one, indicating that assay precision on an individual sample basis is poor, likely due to geological variability in mineralization.

Results for the reject duplicates which are prepared every 40 to 50 samples by Acme were not compiled.

Underground Samples

Both fine and coarse duplicates are selected by the logging geologist on a low grade or high grade basis. In the vein material where grades above 5.0 g/t gold are expected, a “high” duplicate is taken, and in wall rock or stockwork zones where grades are expected to be less than 5.0 g/t gold, a “low” duplicate is taken.

Duplicates are not submitted in the same analytical batch as the original. Rather the duplicate samples are retrieved from the laboratory as a pulp or reject, and are given a new number, often a sample number associated with a different zone on the property, and submitted to the laboratory in a different batch of samples. This way the laboratory knows that it is re-assaying a sample but has no idea what the original value was.

The results for the reject duplicates show no significant bias but precision is poor due to geologic variability typically associated with high-grade precious metals deposits. The pulp duplicates show good precision.

11.5.5 Standard Reference Materials

Surface Drill Samples

Three sets of standard reference materials have been used in the last Andean drilling program and the Goldcorp surface drilling programs.

In late 2008, five site specific gold–silver standards were prepared by Geoanalitica in Coquimbo, Chile, for Andean from diamond drill core. These were used for several years until they were exhausted in the 2011 to 2012 time period.

Seven different RockLabs (New Zealand) standards, five of which were gold-only standards and two were gold–silver standards, were used on a temporary basis until a second series of five site-specific gold–silver standards, also prepared by Geoanalitica from drill core, were available in the second half of 2012.

Both sets of Geoanalitica standards were well tailored to the differing grade ranges found in the Cerro Negro vein systems with, expected gold values ranging from 0.25–31.0 g/t and expected silver values ranging from 1.8–397.0 g/t. The second set of standards prepared by Geoanalitica are still in use.

Plots of all standards using ±3 standard deviation failure limits indicate no problems with assay accuracy.

Underground Samples

A set of nine site-specific standards, which were prepared in September 2012 by Alex Stewart in Mendoza from material collected from one of the upper levels of the Eureka vein workings, were used on used on underground drill samples from 2013 to September 2015. Expected gold values vary from 1.6–3.25 g/t and expected silver values from 17–38 g/t. There are few failures when the results are assessed at ±3 standard deviations indicating good assay accuracy.

In September of 2015 eight new standards, were put into use. Two sets of four standards were prepared at the on-site laboratory from material collected from the Eureka working and the Mariana workings to better reflect the full range of grades for gold and silver. Both sets were refereed at a total of five laboratories including the mine laboratory, and were validated using the Anova technique as well as undergoing heterogeneity and homogeneity testing.

The Eureka standards have values ranging from 11–23 g/t gold and from 170–470 g/t silver. The Mariana standards have values ranging from 2–54 g/t gold and from 23–400 g/t silver.

11.5.6 Check Assays

There has been a strong program of check assaying at Cerro Negro with just over 5% of all samples from 2009 to 2013 originally assayed at Acme being submitted for re-assay to ALS Chemex.

The results show very good assay accuracy between laboratories, with ALS Chemex showing low biases of 1.1% for gold and 4.7% for silver relative to the original results. The biases are largely due to stronger negative biases for ALS Chemex data at grades of >20 g/t gold and approximately >200 g/t silver.

11.5.7 Site Assessment and Follow Up

Surface Drill Samples

Goldcorp site personnel compile and chart QA/QC results in excel files that correspond to each year and contain separate worksheets for each standard, blank, duplicates and check assays.

Failures of standards and blanks are often followed up. When re-runs are carried out, the site personnel ask the primary laboratory for list of samples included in the fire assay run with the failing sample. All samples in the assay run, which may be of variable numbers, are re-run. If the re-run batch passes QA/QC, the new data replace the original assay data in the database.

Underground Samples

QA/QC data from underground drilling and mine samples is regularly assessed, and a spreadsheet is maintained listing the failures and the action taken. For failures whether or not re-assays are done or not depends on the values around the failures. If the surrounding samples have values then re-runs take place. If the surrounding samples are without values then the original results are put directly into the database.

11.6 Databases

Andean used a Microsoft Access database to maintain data.

With the transition to electronic capture of drill data early in Goldcorp's tenure a switch was made to CAE Mining's Fusion database software. This was initially maintained by the Exploration department but with the addition of underground operations to the project the database was centralized and several departments now contribute to it.

All co-ordinate, geological and sample data are captured directly onto computer units using a series of screens for each type of data. Data are then downloaded directly from DH Logger into the fusion database.

Data can be entered into the Fusion database by a number of site personnel from the different departments but editing or corrections can only be carried out by three database managers or administrators. Data for a particular drill hole can also apparently be exported for updates, such as additional sampling, and then reimported. Further, only two site personnel in ore control currently have the ability to enter assay data.

The Fusion database is backed up twice a month by exporting the data in all tables as *.csv* files to a dated directory on the server. A copy of all previous database exports is maintained.

11.7 Sample Security

All preparation and handling of samples at the Cerro Negro Project site is done by Goldcorp employees, and prior to that, by Andean employees. No information regarding sample security for programs prior to those of Andean is available.

During the Andean programs, samples were placed in steel-wire-reinforced plastic bins and held on-site until a sufficient number of samples have been collected for a shipment. Weekly, a private trucking company transported the samples directly to the Acme preparation laboratory in Mendoza, Argentina. The plastic bins were covered with an impermeable tarpaulin that was only removed upon arrival to the laboratory. After delivery the samples were within Acme's control and they were responsible for shipping them to the Santiago analytical facility.

Currently, Goldcorp places five samples in larger plastic bags or burlap sacks that are then securely closed. Shipments of samples are collected from site by an Acme truck whenever a batch of 500 or more samples is ready and transported to the sample preparation laboratory in Mendoza, Argentina. Acme is responsible for delivering the prepared pulps to the Santiago analytical laboratory.

11.8 Sample Storage

Andean retained a small washed split of each RC sample interval, which was stored in an RC chip tray. The coarse and fine rejects (pulps) from Acme are returned to the project on a regular basis and are stored in Project sample storage sheds. Half core is retained in core trays and stored on site.

Goldcorp has maintained similar sample storage methods. Most core has been stored in wooden core boxes stacked on pallets. Since 2011 covered storage space has not been available and the core is stored outdoors. Rejects and pulps have been returned to the Project. Rejects are stored outdoors and the pulps are stored in sheds.

11.9 Comments on Section 11

In the opinion of the QPs, the sampling methods are acceptable, meet industry-standard practice, and are adequate for Mineral Resource and Mineral Reserve estimation purposes, based on the following:

- Data are collected following industry standard sampling protocols;
- Sample collection and handling of core was undertaken in accordance with industry standard practices, with procedures to limit potential sample losses and sampling biases;
- Sample lengths in RC drilling and core are variable. Typically, core sample lengths in mineralized zones ranges from 0.3 m to 1.0 m and honor geology. Wall rock samples are collected over 1.0 m or 2.0 m lengths. Early Andean programs tended to have strict 1.0 m sample lengths, irrespective of lithology. Not all drill material may be sampled depending on location and alteration;
- Bulk density determination procedures are consistent with industry-standard procedures and there are sufficient acceptable bulk density determinations to support the bulk density values utilized in tonnage estimations;
- Sample preparation for samples that support Mineral Resource estimation has followed an essentially similar procedure since 2006. The preparation procedure is consistent with industry-standard methods for gold–silver deposits;
- Surface RC cuttings and drill core are and have been analysed by independent laboratories using industry-standard methods for gold, and silver analysis;
- Underground drill hole samples and mine samples were analysed by the on-site laboratory until December 2015. It is not independent;
- There is limited information available on the QA/QC employed for the early pre-Andean drill programs;
- Andean and Goldcorp drill programs have included the insertion of blank, duplicate and SRM samples. The QA/QC program results do not indicate any significant problems with the analytical programs, therefore the gold and silver analyses from the core drilling are suitable for inclusion in Mineral Resource estimation;
- Verification is performed on all digitally-collected data on upload to the main database, and includes checks on surveys, collar co-ordinates, lithology data, and assay data. The checks are appropriate, and consistent with industry standards;
- Sample security has relied upon the fact that the samples were always attended or locked in the on-site sample preparation facility, or in the possession of independent laboratories for transport to preparation and analytical facilities;

- Current sample storage procedures and storage areas are consistent with industry standards.

12.0 DATA VERIFICATION

A number of data verification programs and audits have been performed over the Project history, primarily in support of technical reports, but also to verify that data collected were sufficiently reliable for the purposes of Mineral Resource and Mineral Reserve estimation.

12.1 2000

Verification performed at the completion of the MIM work programs (Jennings 2000b) concluded that:

- Sampling practices were acceptable;
- Core assays were consistently lower than RC results;
- ALS analyses were acceptable;
- It was noted that insufficient QA/QC data existed for Bondar Clegg to evaluate the reliability of the laboratory data from Bondar Clegg.

The data were considered to be suitable for Mineral Resource estimation purposes at the time.

12.2 2006

All Oroplata and MIM drill holes that could be located and positively identified in the Main Zone area were resurveyed by a licensed surveyor. Discrepancies were noted with the collar locations of the MIM drilling, and three drill holes were subsequently excluded from the drill database. Reported collar locations for the Oroplata drill holes agreed well with the survey data.

Holes drilled by Pegasus, MIM and Oroplata at Eureka and Mariana were located in the field, and their positions were checked by hand-held GPS and in most cases by differential GPS. Hole collars were considered to be acceptably located.

A small check assaying program of 101 samples was conducted for Vein Zone samples in which jaw-crushed reject material from phases 1 and 2 originally assayed by Alex Stewart was checked by ALS Chemex. The mean of ALS' samples was 4.7% below that of Alex Stewart's primary assays (Hellman and Schofield, 2006), and the results were considered to be comparable with no biases between the laboratories.

Two twin holes were completed in 2006. One was misaligned, and therefore did not represent a true twin; the second returned comparable grades and drilled widths.

12.3 2007

Andean re-assayed 412 samples of RC rejects from holes drilled by MIM in 1997–1998 and found acceptable agreement with the original MIM assays, despite the samples having been stored in less than an ideal situation.

A total of 293 samples from Andean's Phase 3 program were re-assayed by Acme. Results indicated acceptable agreement between the original and reassay values.

Micon International Limited (Micon) selected 23 samples of pulps from drill hole VDD-628 and had shipped them to Acme for assay. Results indicated good agreement.

Andean drilled hole VDD-764 as a twin to Oroplata's RC hole CNRC-405 drilled in 2004. Zones of extensive stockworks were encountered in the Andean drill hole that had not been recorded in the Oroplata drilling. Additional twinning of the Oroplata drilling was recommended.

12.4 2008

In 2008, Micon:

- Reviewed previous data verification programs and conducted additional verification.
- Selected 17 samples of core from drill hole EDD-766 for check assaying. The check assays verified the presence of gold and silver in the selected samples.
- Checked 19 drill holes from the Project database for transcription errors.

Micon concluded that the data at the time were suitable for Mineral Resource estimation purposes.

12.5 2009

Mine Development Associates Inc (MDA; Ristorcelli et al., 2009) completed a program of data verification on the Project to support Mineral Resource estimation. Checks completed included collar location verification, down-hole surveys, reviews of the Project geology during resource model compilation, analytical and density data.

Based on those reviews, MDA concluded that:

- Collar locations were acceptable;
- Down-hole surveys were generally acceptable, but some data were recommended for rejection, mostly because of obvious magnetic interference with the survey instrument;
- The analytical database was acceptably free of errors;
- Density data were acceptable after a small number of data were corrected.

MDA also reviewed Andean's QA/QC data for standards, blanks, and preparation, field, and pulp duplicates, and found that:

- Accuracy of gold and silver assays was acceptable,
- No material contamination occurred during sample preparation and analysis
- Precision for gold and silver was acceptable

MDA reviewed the Eureka core recovery and RQD data by mineral domain (country rock, low-grade silicified/stockwork, vein or vein breccia, and high-grade vein material), and concluded that there was a relationship between grade and core recovery within the Main Zone, and that higher core recoveries were associated with lower grades.

To verify if the wet drilling had impacted sample quality at Eureka, MDA plotted core-sample grades to the nearest RC sample grades. Gold and silver grades were noted to be lower in RC samples inside the mineralized zone, and higher in RC samples outside the mineralized zone. To assess the impact of this on the resource model, MDA performed a Mineral Resource estimate without the RC samples. The grade of the Mineral Resource at a reporting cutoff of 3 g/t AuEq increased by 7% for gold and by 2% for silver.

Six each independent samples of core from Eureka and Bajo Negro were selected by MDA and submitted to ACME in Vancouver and ALS Chemex in Reno, respectively, for assay. The analytical results received demonstrated that the grades stated by Andean were similar to and supported by those samples taken by MDA.

12.6 2010

MDA completed a number of data checks in support of database validation during 2010 (Ristorcelli et al., 2010). Checks completed included collar location verification, down-hole surveys, reviews of the Project geology during resource model compilation, analytical and density data.

Based on those reviews, MDA concluded that:

- Collar locations were acceptable;
- Down-hole survey data were acceptable;
- Analytical data were acceptable to support Mineral Resource estimation;
- No procedural deficiencies were identified with collection of density data.

Core from mineralized zones, as well as the adjacent 10 m or more of stockwork and unmineralized wall rock, was visually inspected by MDA for independent sampling. Nineteen specific samples were chosen from multiple, broadly-spaced drill holes within each of the Mariana Central, Mariana Norte, and San Marcos deposits. Samples

delivered by MDA to the Acme preparation facility, where the standard Andean preparation protocols were followed. MDA noted that check assays sent to Acme compared well with the originals.

MDA also reviewed Andean's QA/QC data for standards, blanks, and preparation, field, and pulp duplicates, and found that analytical accuracy and precision were adequate to support Mineral Resource estimation. Evaluation of contamination was not possible because the material used, supposedly barren core and RC samples, contained sporadic mineralization. Check assays compared well with original assays.

MDA (Ristorcelli et al., 2010) concluded:

- MDA's audit of the San Marcos and Marianas databases showed that the data in Andean's database accurately represent the data collected in the field and laboratory. The very small numbers of issues noted have been dealt with by working with Andean to resolve discrepancies. The database is acceptable as the basis for the Mineral Resource estimate;
- MDA believes that the QA/QC data provide sufficient evidence that Andean's assay data are reliable enough to support the Mineral Resource estimate. There is some suggestion in the assays of blank material that there may be some contamination of samples that immediately follow high-grade gold samples through the laboratory process, although to very low levels on average. This issue is not sufficient to preclude the use of the assay data in the resource estimate, but is noted as something to be monitored and discussed with the laboratory.

12.7 2014

Hamilton (2014a) reported on an audit of the Project database performed in 2014. The data in the Cerro Negro database for the Bajo Negro, Mariana Central, Mariana Norte, San Marcos, Vein Zone vein systems and other exploration targets were found to be exceptionally free of errors.

Errors that were identified were not material, and were easily able to be investigated and corrected. The data are of very good quality, reliable and can be depended on for Mineral Resource estimation.

Hamilton (2014b) investigated QA/QC results from surface exploration and underground infill drilling programs and concluded:

- Results indicate that the analytical procedures employed by the analytical laboratories are generally reliable and repeatable;
- Accuracy and precision are acceptable;

- Analyses of standards and duplicates indicate that there are no significant biases to suggest over or under-reporting of assay values;
- The QA/QC protocols used by Goldcorp are in keeping with best industry practices and adequate to support Mineral Resource estimation and mine planning.

12.8 Comment on Section 12

Goldcorp has established internal controls and procedures on their mining operations and exploration programs, which are periodically reviewed for effectiveness. These are considered by the QP to be supportive of data verification.

The process of data verification for the Project has been performed by external consultancies and Goldcorp personnel. Goldcorp considers that a reasonable level of verification has been completed, and that no material issues would have been left unidentified from the programs undertaken.

The QP, who relies upon this work, has reviewed the appropriate reports, and is of the opinion that the data verification programs undertaken on the data collected from the Project adequately support the geological interpretations, the analytical and database quality, and therefore support the use of the data in Mineral Resource and Mineral Reserve estimation, and in mine planning:

- Inspection of all laboratories are undertaken on a regular basis to ensure that they are well maintained and that all procedures are being followed properly. Deficiencies or concerns are reported to the laboratory manager;
- QA/QC data are monitored closely and detailed reports are prepared on a monthly basis. Assay data needs to be approved before import in to the database;
- Drill data including collar co-ordinates, down hole surveys, lithology data, and assay data are typically verified prior to Mineral Resource and Mineral Reserve estimation by running program checks in both database and resource modelling software packages;
- External reviews of the database have been undertaken in support of acquisitions, support of feasibility-level studies, and in support of technical reports, producing independent assessments of the database quality. No significant problems with the database, sampling protocols, flowsheets, check analysis program, or data storage were noted.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Metallurgical Testwork

13.1.1 Testwork Programs

Over the Project history, a number of metallurgical testwork campaigns have been undertaken (Table 13-1).

No additional metallurgical testwork has been performed on drill core since 2012. Following plant start-up, the metallurgical testwork programs have been focused on plant performance optimization.

13.1.2 Mineralogy

Automated mineralogical analysis (AMA) was conducted on a sample of each Eureka domain composite to determine the form and mineralogical associations of the precious metals. Each sample was ground to a P80 of 106 µm and split into three fractions, +106, -106/+53 and -53 µm. Major minerals include quartz, micas/clays, feldspar, carbonates, iron sulphides, iron oxides and ilmenite. Gold is present primarily as elemental gold with an average of 6% silver. Silver is present as electrum, argentite and silver sulphosalts containing up to 21% silver. Trace sulphides are present in all samples, with pyrite as the predominant sulphide mineral. Sulphides of lead, copper, zinc and silver are also present in some of the samples examined.

A sample of gravity concentrate and gravity tailings from each Eureka Domain composite was also examined using AMA. The concentrates consisted primarily of quartz and accessory sulphide gangue, feldspars and silver-gold minerals. There is native silver present in the samples, especially in Lower Central composite. Electrum is present in moderate amounts in all samples. Gold telluride is abundant in the Upper Central concentrate, but otherwise occurs as traces. Native gold has minor presence and only in the West, and Lower Central Domain concentrates.

No mineralogical analyses were conducted on samples from any other deposit.

Table 13-1: Metallurgical Testwork Summary

Year	Laboratory	Comment
1998	Hydrometallurgical Research Laboratories	MIM subsidiary. Completed gravity concentration, carbon-in-pulp (CIP) leach, and bottle roll testing.
2006	AMMTEC Limited	Acid mine drainage potential testing performed in Perth, WA. It was concluded that the four 'ore' samples possessed no potential for acid mine drainage,
2007	AMMTEC Limited	Testing performed in Perth, WA.
2008	Process Research Associates Ltd	This program Included the following work: - Comminution testwork by Hazen Research Inc of Golden Colorado, and JKTech Pty Ltd of Queensland, Australia - Settling testwork by Outotec of Burlington, Ontario. - Settling, filtration and paste characterization testwork by Pocock Industrial of Salt lake City, Utah.
2010	AMMTEC	Amenability testwork to evaluate the response of ore composites to free milling process route. The test program was carried out in several stages: - Evaluation of comminution parameters on Eureka and Bajo Negro composites - Evaluation and optimization of extraction process parameters on Eureka, Bajo Negro composites - Confirmatory tests on Eureka, Bajo Negro and Vein Zone composites - Variability testwork using optimized parameters on Eureka, Bajo Negro
2010	SGS	Leaching and grinding metallurgical tests for Mariana Norte and Mariana Central. The program included: - Cyanide Leaching Test - Diagnostic Leach Test - Gravity separation and intensive cyanidation of gravity concentrate - SMC test, Abrasion Index, Bond Rod and Ball work index

Year	Laboratory	Comment
2011–2012	SGS	Testwork on the amenability of mineralized material from San Marcos, Mariana Central and Mariana Norte to typical processing methods. This work was not to the same level of detail as the prefeasibility testing performed on Eureka, Bajo Negro and Vein Zone. Results are at a preliminary assessment level of accuracy. Samples used for the preliminary testing are not considered to be representative of the entire deposit. The program comprised: - Chemical characterization of individual samples that were used in the composite; - Tests of the cyanide leach characteristics of the material; - Diagnostic tests to determine the mineral species associated with gold and silver; - Gravity separation in a Knelson concentrator, followed by intense leaching of the concentrate and conventional leaching of the concentrator tails; - Determination of the specific gravity of the concentrate; Abrasion tests and bond work index determinations.

13.1.3 Comminution

The 2010 feasibility study included a review of comminution circuit; specifically the secondary and tertiary crushing stages and the SAG–ball mill configuration proposed in the pre-feasibility study. As a result of this exercise the secondary and tertiary crushing equipment was purchased and not installed, and the SAG mill was eliminated.

The as-built circuit includes a primary jaw crusher that directly feeds a ball mill. This ball mill is configured to run with a higher than normal ball load: 27–30% using 5” (12.7 cm) and 3” (7.6 cm) diameter balls. The discharge trommel screen opening is 32 mm, typical of a SAG mill.

13.1.4 Leach Tests

Leach tests were conducted under selected conditions to determine the response of the ore to various parameters. These include grind size, pulp density, cyanide concentration, the addition of lead nitrate, pH, and the comparison of leaching whole ore or separate leaching of a gravity concentrate and the gravity tailings.

During 2011 metallurgical testwork focused on:

- Confirming metallurgical performance with new testwork on material from the Eureka and Bajo Negro veins

- Determining the extraction variability of metallurgical performance for Eureka, Mariana Central, Mariana Norte and San Marcos.

13.1.5 Extraction Variability

Variability composites from both Eureka and Bajo Negro were tested using the selected extraction conditions determined from the composite testwork. The Eureka domain variability composites were tested for zinc precipitation. No variability testwork was conducted on Vein Zone mineralization.

The variability testwork results confirmed the leaching conditions selected for the Eureka domain composites and Bajo Negro oxide and mixed composites. Solutions from the Eureka variability tests were used as feed to zinc precipitation tests.

Total gold recovery was independent of both gold and silver head grade. Gravity recovery was independent of both silver-to-gold ratio, and gold and silver head grade. Gravity recovery does not control the total gold and silver extraction after vat leaching.

Results for the variability program performed in 2011 on material from Eureka, Mariana Central, Mariana Norte, and San Marcos included:

- Bond ball mill index: averages that ranged from 14.9 at Mariana Norte to 18.8 at Eureka;
- Abrasion index: averages that ranged from 0.639 at Mariana Central to 0.842 at Mariana Norte;
- Gold cyanide leaching results (48 hours residency time): averages that ranged from 87.9% recovery at San Marcos to 96.2% at Mariana Central;
- Silver cyanide leaching results (48 hours residency time): averages that ranged from 58% at San Marcos to 64% at Mariana Central.

13.1.6 Zinc Cementation Testwork

Leach test pregnant solutions from both the gravity concentrate leach and the tailings leach for the Eureka variability composites were combined and used without dilution for zinc precipitation tests. All zinc precipitation was effective in recovering gold to 0.05 ppm or lower. Silver recovery was also good, with all barren solutions below 0.55 ppm.

13.1.7 Settling

Settling testwork was conducted by Outotec on domain samples from Eureka and Bajo Negro.

The four domain composites for Eureka were all subject to settling testwork by Outotec (2009). Overflow from each test, despite giving low levels of total suspended solids (TSS), was slow to filter. A series of sighter tests to improve the clarity of the overflow

by simulating a clarifier were completed. The resultant clear overflow filtered well through a micropore 0.45 µm filter paper, and produced no measurable TSS.

Leached whole ore slurry from Oxide and Mixed domain composites for Bajo Negro were subject to settling testwork in a dynamic thickening rig by Outotec (2010). No settling testwork was conducted on the Vein Zone composite.

13.1.8 Cyanide Detoxification

The Inco SO_2/air oxidation process was used to test amenability of primary cyanide detoxification for the plant tailings slurry. The results indicated that the leach tailings from all ore types are amenable to cyanide detoxification.

13.2 Recovery Estimates

Metallurgical recovery predictions are included in Table 13-2. These estimates take historical plant production data and recovery performance into account. Actual metallurgical recoveries have been in line or higher than those predicted by pre-production testwork for gold and silver.

13.3 Metallurgical Variability

To date, the metallurgical variability encountered in the plant has been consistent with the expected variability projected from testwork results.

13.4 Deleterious Elements

No deleterious elements are currently identified. Plant operators monitor clay inputs, as there may be operating days where the clay content of the ore fed in the blend of a particular batch can be higher than optimal.

Consideration may be given in the future to monitoring carbon contents of selected materials to determine if any preg-rob losses are occurring.

Table 13-2: Recovery Projections

Support	Zone	Gold Recovery (%)	Silver Recovery (%)
Mineral Reserves	Eureka	95	83
	Mariana Norte	90	70
	Mariana Norte Este Beta	90	70
	Mariana Central	95	83
	Mariana Central SE / Emilia	95	83
	Bajo Negro	90	75
	San Marcos	90	75
	Vein Zone	90	60

13.5 Comments on Section 13

In the opinion of the responsible QP, the following interpretations and conclusions are appropriate:

- Metallurgical testwork and associated analytical procedures were performed by recognized testing facilities, and the tests performed were appropriate to the mineralization type;
- Samples selected for testing were representative of the various types and styles of mineralization within the known zones at Cerro Negro. Samples were selected from a range of depths within the deposits. Sufficient samples were taken to ensure that tests were performed on sufficient sample mass;
- Testwork has established the most appropriate grind size for plant design;
- Assumed life-of-mine gold recovery assumptions are based on appropriate testwork, and, depending on the zone mined, should average between 90 and 95% over the life-of-mine;
- There are no currently known deleterious elements.

14.0 MINERAL RESOURCE ESTIMATES

14.1 Introduction

During the 2015 exploration campaign, two new deposit extensions were identified. The Mariana Central SE/Emilia veins form the southeastern extension of the Mariana Central deposit and the Mariana Norte Este Beta vein forms the eastern extension of the Mariana Norte deposit. While these vein extensions were modeled separately, they are considered part of the principal deposits referenced elsewhere in this Report.

The close-out dates of the databases used for Mineral Resource estimation are:

- Eureka: 11 November, 2015;
- Bajo Negro: 24 November, 2015;
- Vein Zone: 2 September, 2015;
- Mariana Central: 11 November, 2015;
- Mariana Central SE/Emilia: 11 November, 2015;
- San Marcos: 18 December, 2012;
- Mariana Norte: 28 August, 2014;
- Mariana Norte Este Beta: 11 November, 2015.

14.2 Geological Models

14.2.1 Pre-2013

For San Marcos, paper cross-sections were plotted with drill data (geological and analytical), topography, and mapped surface geology. Interpretations of lithology, structure, quartz veins, and mineral domains were done on these cross-sections on site with Goldcorp staff. Using the geology as a guide, together with the colour-coded assays representing natural distributions, mineral domains were developed that reflected different styles of mineralization. Mineral domains were then modeled from digitized domain interpretations. The modeled domains were then imported into MineSight, and the domains converted to wireframes.

14.2.2 Post 2013

The current procedure (used for all models except for San Marcos) is to model the vein system and either three or four grade domains. The domains are:

- Low-grade gold domain;

- Medium-grade gold domain;
- High-grade gold domain;
- Very high-grade gold domain (only in Mariana Central);
- A domain outside the low-grade domain.

These models are completed entirely within Leapfrog software, based on sectional interpretation. Based on the coded lithology and assay intervals, a wireframe vein model is constructed based on lithology. The vein model is then used as a guide for the grade models. A low-grade model is constructed from the coded assay intervals. Within the low-grade model, the medium-grade model is constructed using the outline of the low-grade model as a guide. The high-grade is modeled within the medium-grade model and controlled by the medium-grade outline. An “outside” domain is all of the volume outside the low-grade domain. When necessary, auxiliary lines are manually inserted and used to modify the Leapfrog model.

In some deposits, such as Vein Zone and Emilia, the high-grade domain is too discontinuous to be effectively modeled so no high-grade domain is estimated.

Each domain is estimated separately and contacts between domains form hard boundaries.

14.3 Exploratory Data Analysis

Histograms and probability plots were prepared for gold and silver for the three or four domains in each deposit. The probability plots were used to evaluate the necessity of grade capping. Boxplots for gold and silver by domain were prepared, as needed, for each deposit.

14.4 Density Assignment

Goldcorp used mean densities for each domain to assign density to blocks in the block model. Densities used in modelling are summarized in Table 14-1.

Table 14-1: Density Values used in Estimation

Deposit	Lithology	Density (g/cm^3)
Eureka	vein	2.35
	andesite	2.41
	BAFU	2.40
Bajo Negro	vein	2.46
	andesite	2.39
	post mineral breccia	2.30
Vein Zone	vein	2.48
	andesite	2.31
	Formation Santa Cruz	1.50
Mariana Central	vein	2.53
	andesite	2.55
	BAFU	2.40
Mariana Norte	vein	2.54
	andesite	2.57
	BAFU	2.40
Mariana Central SE/Emilia	vein	2.53
	andesite	2.55
	BAFU	2.40
Mariana NE	vein	2.54
	andesite	2.57
	BAFU	2.40
San Marcos	vein	2.52
	andesite	2.58

14.5 Grade Capping/Outlier Restrictions

Outlier assays were capped, based on interpretation of histograms and probability plots. Caps included the following ranges, based on domain:

- Eureka: 15–500 g/t gold; 270–4,500 g/t silver;
- Bajo Negro: 15–200 g/t gold; 70–2,000 g/t silver;
- Vein Zone: 5–30 g/t gold; 6–115 g/t silver;
- Mariana Central: 7.5–500 g/t gold; 150–4,000 g/t silver;

- Mariana Norte: 4–600 g/t gold; 20–1,000 g/t silver
- Mariana Central SE/Emilia: 3.5–170 g/t gold; 45–550 g/t silver
- Mariana Norte Este Beta: 1.8–60 g/t gold; 6–600 g/t silver;
- San Marcos: 35–90 g/t gold; no silver values were capped.

14.6 Composites

Once the outlier assays were capped by domain, the assays were composited to 1 m downhole composites.

14.7 Estimation/Interpolation Methods

The dimensions of block models vary by deposit:

- Eureka: 3 x 1 x 4 m;
- Bajo Negro: 4 x 2 x 4 m;
- Vein Zone: 3 x 3 x 3 m;
- Mariana Central: 4 x 1 x 4 m;
- Mariana Norte: 4 x 2 x 4 m
- Mariana Central SE/Emilia: 4 x 1 x 4 m
- Mariana Norte Este Beta: 4 x 1 x 4 m;
- San Marcos: 2 x 2 x 2 m.

The blocks are rotated in the general plane of the main vein of each deposit. These blocks are sub-blocked to a minimum of 50 x 50 x 50 cm, except for Vein Zone, where whole blocks were used for both Mineral Resource and Mineral Reserve estimates.

Estimation parameters were defined to honour understood geologic controls and sample distributions. Inverse distance weighting to the third power (ID3) estimation was selected for the reported estimate for the Eureka, Mariana Central, Mariana Central SE / Emilia, Vein Zone, and Mariana Norte Este Beta deposits, and a supporting nearest-neighbour (NN) estimate was completed as a comparison. Ordinary kriging (OK) estimation was used for the Mariana Norte, San Marcos and Bajo Negro deposits, and an NN check was also performed.

Estimation was done in three passes per domain except for the outside domain and San Marcos, which were estimated in two passes (Table 14-2). Blocks estimated in each pass are flagged with the pass and that flag is used to classify the Mineral Resource.

Table 14-2: Estimation Passes

Deposit	Pass Number	Search Radius (m) (x, y, z)	Number of Allowable Composites		
			Min	Max	Max per Drill Hole
Eureka	Pass 1	40 x 40 x 30	5	12	2
	Pass 2	80 x 80 x 60	4	10	2
	Pass 3	120 x 120 x 90	3	8	3
Bajo Negro	Pass 1	40 x 40 x 20	5	12	2
	Pass 2	80 x 80 x 40	4	8	2
	Pass 3	120 x 120 x 60	3	8	3
Vein Zone	Pass 1	40 x 35 x 25	7	18	3
	Pass 2	80 x 70 x 25	5	12	3
	Pass 3	120 x 105 x 35	3	8	3
Mariana Central	Pass 1	20 x 20 x 10	7	18	3
	Pass 2	40 x 40 x 20	5	12	3
	Pass 3	100 x 100 x 30	3	8	3
Mariana Norte	Pass 1	40 x40 x 30	5	12	2
	Pass 2	80 x 80 x 60	4	10	2
	Pass 3	120 x 120 x 90	3	8	3
Mariana Central SE/Emilia	Pass 1	20 x 20 x 10	7	18	3
	Pass 2	40 x 40 x 20	5	12	3
	Pass 3	100 x 100 x 30	3	8	3
Mariana Norte Este Beta	Pass 1	25 x 25 x 10	7	18	3
	Pass 2	50 x 50 x 15	5	12	3
	Pass 3	100 x 100 x 20	3	8	3
San Marcos	Pass 1	60 x 60 x 15	3	6	1
	Pass 2	120 x 120 x 30	2	4	1

14.8 Block Model Validation

Block models are validated by visual comparison of block grades to composite grades, comparison of global average ID3 or OK grades to NN grades, and swath plots.

Global averages, by domain, can be used to determine if there is any bias in the ID3 or OK grade estimate. In general, domains compared well. Swath plots were used to evaluate local bias. Typically, the plots showed very good correspondence of the ID3 or OK and NN models, except near the vein terminations where data are sparse.

14.9 Classification of Mineral Resources

Goldcorp classified the Cerro Negro Mineral Resources by a combination of distance to the nearest sample, number of samples, number of drill holes, and confidence in the samples used in a block estimate, and the confidence in geologic interpretations. Table 14-3 summarizes the classification scheme applied to each model.

14.10 Reasonable Prospects of Eventual Economic Extraction

Mineral Resources are estimated using a gold price of US$1,300/oz and a silver price of US$19/oz, and assume a long-term exchange rate of US$1 = ARS$16.85. The Eureka, Bajo Negro, Mariana Norte, Mariana Central, and San Marcos deposits and extensions will be mined by underground methods.

Resource reporting cutoffs for "reasonable prospects for eventual economic extraction" were calculated at between 3.57 and 4.03 g/t gold equivalent (AuEq) depending on the deposit. The cutoff was derived by using expected optimized, steady-state, mining costs and metallurgical recoveries for each deposit. Mineral Resources for underground deposits were calculated within optimized stope shapes calculated with the Deswik Stope Optimizer using current or planned operating parameters.

Exploitation at Vein Zone is likely to be by open-pit mining methods. Goldcorp considered that the Mineral Resource reporting cutoff would best represent material with reasonable prospects for economic extraction at 0.95 g/t AuEq. Mineralization considered to have reasonable prospects for eventual economic extraction includes that material which lies within the US$1,300/oz optimized pit shell.

The equation used to derive the cutoff grade is:

- Cutoff grade (gold) = [mining cost + process cost + general and administrative (G&A) costs] / [(payable recovery * ((gold price - refining and sales cost) / conversion factor)) * (1 + royalty)].

Gold equivalency was calculated based on Mineral Resource or Mineral Reserve pricing as well as the estimated metallurgical recovery of each metal. The equation used to derive the gold equivalency is:

- AuEq = gold grade + silver grade / [(gold price / gold recovery) / (silver price / silver recovery)]; which can be simplified to AuEq = gold + (silver / ratio).

The silver:gold ratio used was in the range of 78.31–87.97 for the underground deposits, depending on the deposit. The open pit silver:gold ratio was 102.63.

Table 14-3: Mineral Resource Confidence Classification Parameters

Deposit	Confidence Category	Criteria
Eureka and Mariana Central	Measured	Limited for polygon that involved blocks estimated in the first pass inside the domains and zones where the vein was recognized
	Indicated	Limited for polygon that involved blocks estimated in the second pass and zones where the vein was recognized
	Inferred	All blocks outside of both polygons but inside domains
Bajo Negro	Indicated	blocks within quartz vein were classified as Indicated if any of the three following conditions apply: there are three or more drill holes within 80 m from the block centroid and the closest drill hole is within 40 m of the block centroid there are two or more drill holes within 80 m from the block centroid and the closest drill hole is within 25 m of the block centroid there is more than one drill hole within 80 m from the block centroid and the closest drill hole is within 10 m of the block centroid
	Inferred	blocks were classified as Inferred if there is at least one drill hole within 120 m from the block centroid
Vein Zone	Measured	Number of hole great or equal 3 and average distance sample less than 25 m
	Indicated	Number of hole great or equal 2 and average distance sample less than 25 m
	Inferred	Number of hole great or equal 1 and average distance sample less than 50 m
Mariana Central SE/Emilia and Mariana Norte Este Beta	Indicated	Limited for polygon that involved blocks estimated in the first and second pass inside the domains
	Inferred	All blocks outside this polygon but inside the domains
San Marcos	Indicated	Number of hole great than 3 and average distance sample less than 35 m and distance average all composites less than 45 m
	Inferred	All outside

Worked examples of the equations in practice are presented below for the Eureka deposit (note metal prices and operating cost assumptions apply to Eureka Mineral Reserve estimation):

- Cutoff grade (4.94 g/t gold for Mineral Reserves) = [mining cost US$50/t + process cost US$38/t + G&A costs US$62/t] / [(payable recovery 95% * (gold price US$1,100/oz. - refining and sales cost US$7/oz) / conversion factor 31.1035 g/oz) * (1 + royalty 10% of sales)];

- AuEq = gold grade + silver grade / [(gold price US$1100/oz. / gold recovery 95%) / (silver price US$16.50/oz. / silver recovery 83%)]; which can be simplified to AuEq = gold grade + (silver grade / 76.31).

Note that equivalent royalty rate of 10% was used as an approximation for all royalties and production taxes in the cutoff grade calculations for both Mineral Resources and Mineral Reserves.

14.11 Mineral Resource Statement

Mineral Resources for the Project were classified under the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves by application of a cutoff grade that incorporated mining and recovery parameters, and constraint of the Mineral Resources to a pit shell based on commodity prices.

Mineral Resource estimates were performed by Goldcorp employees under the supervision of Mr Hector Aspajo, who is the Modeling Superintendent at the Cerro Negro Operations. The Mineral Resource estimates were reviewed and accepted by Dr Guillermo Pareja, P.Geo., a Goldcorp employee. Dr. Pareja is the Qualified Person responsible for the estimates.

Mineral Resources are reported considering long-term commodity prices of US$1,300 per ounce of gold and US$19 per ounce of silver. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Mineral Resources are tabulated in Table 14-4.

14.12 Comments on Section 14

The responsible QP is of the opinion that the Mineral Resources for the Cerro Negro Operations were estimated according to industry best practices and conform to CIM (2014) requirements.

Key areas of uncertainty that may materially impact the Mineral Resource estimate include:

- Commodity price and exchange rate assumptions;
- Metal recovery assumptions;
- Hydrogeological constraints;
- Rock mechanics (geotechnical) constraints;
- Geological interpretations.

To the extent known to the responsible QP, there are no known environmental, permitting, legal, title-related, taxation, socio-political or marketing issues that could materially affect the Mineral Resource estimate that are not documented in this Report.

Table 14-4: Mineral Resource Statement

Category	Tonnes (Mt)	Au Grade (g/t Au)	Ag Grade (g/t Ag)	Contained Gold (M oz)	Contained Silver (M oz)
Measured	1.35	4.99	51.62	0.22	2.24
Indicated	5.53	5.97	38.58	1.06	6.86
Total Measured and Indicated	***6.88***	***5.78***	***41.14***	***1.28***	***9.09***
Inferred	2.17	7.19	44.68	0.50	3.11

Notes to Accompany Mineral Resource Table:

1. The Qualified Person for the estimate is Dr Guillermo Pareja, P.Geo., a Goldcorp employee. Mineral Resources have an effective date of December 31, 2015.
2. Mineral Resources are reported exclusive of Mineral Reserves and do not include dilution;
3. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability;
4. Mineral Resources are reported at a gold price of US$1,300/oz,, a silver price of US$19/oz, and long term exchange rate of US$1= ARS$16.85;
5. Mineral Resources are defined within Lerchs–Grossmann pit shells or have been confined using appropriate underground mining constraints;
2. The cutoff grade for the Vein Zone open pit is 0.95 g/t gold equivalent (AuEq). The cutoff grade for the underground deposits ranges from 3.57 to 4.03 g/t AuEq. For equivalency purposes a silver:gold ratio of between 78.31 and 87.97 silver to one gold is used for the underground deposits, depending on the deposit; a silver:gold ratio of 102.63 is used for the Vein Zone open pit deposit. Operating costs used for cutoff grade derivation for the underground deposits range from US$128.00 to US$137.00 per tonne (range US$45–54/tonne; processing: US$33.00/tonne; G&A: US$50.00/tonne). Operating costs used for cutoff grade calculations for the Vein Zone comprise US$6/tonne mining cost, US$25/tonne processing cost, and US$31/ounce G&A costs;
6. The estimated gold metallurgical recovery rate is 95% for Eureka, Mariana Central, Mariana Central SE/Emilia deposits, and 90% for Mariana Norte, Mariana Norte Este Beta, San Marcos, Bajo Negro and Vein Zone deposits. Silver metallurgical recovery is estimated at 83% for Eureka, Mariana Central, and Mariana Central SE/Emilia deposits; 75% for San Marcos and Bajo Negro, 70% for Mariana Norte and Mariana Norte Este Beta deposits, and 60% for the Vein Zone deposit
7. Tonnages and ounces are rounded to the nearest 10,000 tonnes and 10,000 ounces respectively, grades are rounded to two decimal places;
8. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained metal content;
9. Tonnage and grade measurements are in metric units. Contained gold and silver ounces are reported as troy ounces.

15.0 MINERAL RESERVE ESTIMATES

15.1 Introduction

The Mineral Reserve estimate assumed the following mining methods would be employed:

- Underground transverse stoping methods with backfill;
- Underground longitudinal stoping with backfill;
- Open pit mining.

Underground mining is currently conducted at the Eureka and Mariana Central deposits and is planned for the Mariana Norte, San Marcos, and Bajo Negro deposits. Open pit mining is planned for the Vein Zone deposit.

15.2 Mineral Reserves Statement

Mineralization that had been classified as Measured or Indicated Mineral Resources was used to support estimation of Mineral Reserves. Mineral Reserve estimates were prepared by Mr Jesus Sanchez, the Planning Superintendent at the Cerro Negro Operations. The Mineral Reserve estimates were reviewed and accepted by Andrew Tripp, P.E. Mr Tripp is the Qualified Person responsible for the estimates.

Mineral Reserves for the Cerro Negro Operations are tabulated in Table 15-1. Mineral Reserves are estimated using a gold price of US$1,100/oz and a silver price of US$16.50/oz, and assume a long-term exchange rate of US$1= ARS$16.85. Cutoff grades used to report underground estimates range from 4.91–5.56 g/t AuEq; the cutoff grade is used as an economic indicator only, and is dependent upon deposit location. Open pit Mineral Reserves are reported using a cutoff grade of 1.13 g/t AuEq.

Gold equivalency was calculated based on Mineral Reserve pricing as well as the estimated metallurgical recovery of each metal. The gold equivalent calculation is:

AuEq = gold + (silver / ratio).

The silver:gold ratio used was in the range of 76.31 to 85.71 for the underground deposits, depending on the deposit. The silver:gold ratio used for the open pit deposit was 100.

Table 15-1: Mineral Reserve Estimate

Category	Tonnes (Mt)	Au Grade (g/t Au)	Ag Grade (g/t Ag)	Contained Gold (M oz)	Contained Silver (M oz)
Proven	5.02	10.58	94.38	1.71	15.23
Probable	10.00	9.17	64.81	2.95	20.84
Total Proven + Probable	***15.02***	***9.64***	***74.69***	***4.66***	***36.07***

Notes to accompany Mineral Reserve table:

1. Mr Andrew Tripp, P.E., an employee of Goldcorp is the Qualified Person for the estimate. The estimate has an effective date of 31 December 2015.
2. The Mineral Reserves are classified as Proven and Probable Mineral Reserves, and are based on the 2014 CIM Definition Standards.
3. Mineral Reserve estimates are based on a gold price of $1,100 per ounce, a silver price of $16.50 per ounce, and a long-term exchange rate of US$1= ARS$16.85.
4. For underground estimates, a cutoff grade ranging from 4.91 to 5.56 grams per tonne gold equivalent (AuEq) is used as an economic indicator only, and is dependent upon deposit location. Operating costs used for cutoff grade derivation range from US$149.00 to US$160.00/tonne (underground mining: range US$49–60/tonne; processing: US$38.00/tonne; G&A: US$62.00/tonne). Operating costs used for cutoff grade calculations for the Vein Zone comprise US$6/tonne mining cost, US$25/tonne processing cost, and US$31/ounce G&A costs. The Vein Zone cutoff grade is 1.13 g/t AuEq.
5. The estimated gold metallurgical recovery rate is 95% for Eureka, Mariana Central, Mariana Central SE / Emilia deposits, and 90% for Mariana Norte, Mariana Norte Este Beta, San Marcos, Bajo Negro and Vein Zone deposits. Silver metallurgical recovery is estimated at 83% for Eureka, Mariana Central, and Mariana Central SE / Emilia deposits; 75% for San Marcos and Bajo Negro, 70% for Mariana Norte and Mariana Norte Este Beta deposits, and 60% for the Vein Zone deposit.
6. Underground mining dilution assumes a minimum mining width of 3.0 m and a minimum 1.0 to 1.25 metre overbreak on each stope sidewall depending upon zone, and dilution grade estimated from the block model. Open pit mining dilution is taken into account through the chosen block size which represents the expected SMU. The minimum mining width is 3 m in both open pit and underground.
7. Underground Mineral Reserves take into account a 98% mining recovery and open pit mining 100% recovery.
8. Tonnages and ounces are rounded to the nearest 10,000 tonnes and 10,000 ounces respectively, grades are rounded to two decimal places. Numbers may not sum due to rounding.

15.3 Factors That May Affect the Mineral Reserve Estimate

The major risk factors that can affect the Mineral Reserves estimates are: metal price and exchange rate assumptions, capital and operating cost assumptions, royalties and taxes, geotechnical stability and dilution assumptions, hydrogeological constraints, geological interpretations, environmental and permitting status, and maintaining a social license to operate.

15.4 Estimation Procedure

Underground Mineral Reserves were calculated by interrogating the Mineral Resource block models using the Deswik Stope Optimizer and current and planned operating parameters, including planned dilution, minimum width and cutoff grades, to develop three dimensional optimal stope solids. A mine plan was developed to extract the stopes in a logical sequence. If a particular stope or group of stopes would generate marginal development costs greater than the value of the particular stope, the stope was excluded

from the mine plan and Mineral Reserves estimation. A mining recovery factor of 98% was applied to the stope tonnages.

15.5 Dilution

15.5.1 Open Pit

Open pit mining dilution is taken into account through the chosen block size which represents the expected selective mining unit (SMU). A geometric approach was developed to determine expected dilution when mining ore on 3 m benches, based on average and minimum ore zone width as well as expected loading bucket size. The resultant dilution factor was 28% (waste/ore). Using a whole block approach (without sub-blocking or applying ore percentages) results in a 38% dilution factor implicit in a 3 x 3 x 3 m block, and is deemed appropriate to account for geometric- and mining-induced dilution. Mineral Reserves are reported using whole block tonnages and grades within the pit design.

15.5.2 Underground

Two types of dilution were considered for the selected long hole with backfill mining method: internal dilution and operational dilution. Internal dilution corresponds to all of the material within the designed SMU that does not add value (material below cutoff), but will be mined and processed. Operational dilution because of over-break was considered by expanding the SMUs past both the hanging wall and footwall. This extra volume was considered as part of the stope shape for the mine schedule; hence, as part of the Mineral Reserves.

The minimum mining width for all deposits was 3.0 m, and the hanging wall and footwall overbreak dilution was estimated at 1.0–1.25 m per contact, depending on deposit.

15.6 Mining Widths

Mining widths are primarily a function of the geometry and geotechnical quality of the orebody and host rock, as well as the equipment selection. The selection of a long-hole stoping mining method (transversal and longitudinal) and the choice of mining equipment allows mining to reach a minimum width of 3.0 m. Other mining methods and equipment types could potentially allow for reduced minimum widths and will be considered in the future.

15.7 Conversion Factors from Mineral Resources to Mineral Reserves

Mineral Resources classified as either Indicated or Measured were considered during the conversion to Mineral Reserves.

The economic analysis used to define the Mineral Reserve combines the results from long-term and mid-term planning.

15.8 Production Reconciliation

Previous Mineral Resource block models have performed well when compared to actual process plant tonnes head grade. The difference in metal content has been less than 5% life of mine to date. Dilution assumptions have been updated in the most recent Mineral Reserve estimates to reflect actual dilution experienced to date.

15.9 Comments on Section 15

The responsible QP is of the opinion that the Mineral Reserves for the Cerro Negro Operations were estimated according to industry best practices and conform to CIM (2014) requirements.

To the extent known to the QP, there are no known environmental, permitting, legal, title-related, taxation, socio-political or marketing issues that could materially affect the Mineral Resource estimate that are not documented in this Report.

16.0 MINING METHODS

16.1 Overview

With the exception of the Vein Zone, all deposits will be mined by underground mining methods.

A combination of transverse and longitudinal long-hole sublevel stoping methods with cemented rock backfill are currently being used at the Eureka and Mariana Central mines. The determination of which method is used is made based on geometries and the rock quality. Generally, transverse stoping is used in wider ore zones and areas where high grades along the contact require parallel drilling. Longitudinal stoping is used whenever practical in narrower zones to reduce development requirements. In certain areas, a modified Avoca mining method is used, which constitutes a longitudinal long-hole method with a rolling backfill front following the mining of ore in a single direction along strike. These methods are planned to be used to mine the other underground deposits at Cerro Negro.

The Vein Zone will be mined using standard open pit mining methods using drilling, blasting, loading and hauling operations at a scale suitable for selective ore mining.

16.2 Geotechnical Considerations

16.2.1 Open Pit

The geotechnical recommendations given by Golder Associates (2010) were used to design the Vein Zone open pit mine. These recommendations are based in the development of a geotechnical model based on lithology, alteration, regional structures and existing discontinuities. The model was used to define and characterize the geotechnical sectors which, jointly with hydrogeological information, were used to recommend the slope design components and to assess the overall slope stability.

Four distinct geotechnical domains were defined to model the rock mass in which the Vein Zone pit will be located:

- Pleistocene volcanogenic siltstone (PVS);
- Footwall and hanging ignimbrites - high weathering (FH-HW);
- Footwall and hanging wall ignimbrites - low weathering (FH-LW);
- Vein Zone ignimbrite (VZI).

The characterization parameters for these sectors included density and porosity, fractures spacing, intact rock strength, RQD, rock mass rating (RMR) and estimated rock strength.

Recommended inter-ramp slope angles varied from 40–54º, and bench face angles ranged from 65–71º.

16.2.2 Underground

The initial stope dimensions were established by Golder Associates (2010) and verified using empirical stability graph assessment performed in the Eureka mine. The suggested stope dimensions ranged from:

- Vertical height: 26 m (planned dimension);
- Strike length: 17–22 m (panel width); 15 m (planned dimension);
- Stope maximum thickness: 17–22 m (supported sill roof); 13–16 m (unsupported side wall); planned dimensions vary with ore zone thickness.

Operational experience has been used to refine the stope size parameters at Eureka and Mariana Central. Geotechnical modeling is performed on each individual stope, taking into account the unique geometry and quality of wall rock and side wall rock or backfill to determine maximum strike length and support requirements. Strike lengths up to 40 m have been achieved especially in narrower zones. Fifteen metre cable bolts are installed in certain areas of the hanging wall with rings of 3–5 bolts on 2.5–3.0 m centres. Stope stability has been acceptable at both mines.

Future deposits are planned to be mined with similar stope dimensions due to their similar geotechnical characteristics.

In development, primary support consists of wire mesh and resin or grouted 2.4 m rebar rock bolts for good and regular quality rock. Shotcrete is added when the rock quality is poor or very poor. Some areas require longer bolts as secondary support. Friction bolts are being tested for use in short lived development.

16.3 Hydrogeological Considerations

The Eureka and Mariana Central deposits are characterized as non-recharging fracture- and fault-controlled aquifers. Infiltration within the Eureka mine is pumped out of the mine with a staged pumping system. The water is treated for sediment on the surface and most is re-used as service water in the mine. The excess amount is used for dust control on surface roads or pumped to the process plant.

The Mariana Central mine has a dewatering well in the centre of the deposit that draws down the water level within the entire strike length of the deposit at a similar rate. The well is used to keep the water level below the lowest level where ore development is taking place.

The Mariana Central mine also has a staged pumping system similar to Eureka for any perched water encountered after dewatering.

Water is re-used within the mine or pumped to the process plant.

16.4 Open Pit

The mine plan for the Vein Zone deposit considers a two-phase operation, in order to allow quicker access to ore and a smoother ore flow and stripping ratio over the life of the pit. Both phases will be mined concurrently with the underground mines.

The mining method will consist of standard drilling, blasting, loading and hauling operations. The pit design considers 6 m benches in waste and 3 m benches in ore for greater selectivity. Haulage ramps are designed at 20 m wide with a 10% gradient. The starter pit will be approximately 130 m deep with a diameter of approximately 270 m. The second phase will be the final pit with a depth of approximately 200 m, and a diameter of approximately 480 m. The lowest bench elevation will be located at 632 masl.

16.4.1 Consideration of Cutoff Grades

The breakeven cutoff grade for the Vein Zone pit Mineral Resources and Mineral Reserves was determined assuming that the mill fixed cost will be paid by the concurrent underground operation and, as a result, only the variable portion of the cost will be considered for the Vein Zone open pit. In the same manner, only the portion of the G&A costs corresponding to the open pit was considered. A breakeven cutoff grade for Mineral Reserves of 1.13 g/t AuEq was calculated, which corresponds to 1.11 g/t gold if applied to gold only.

16.5 Underground

The mining method selected for the underground orebodies in the Cerro Negro Operations is traverse or longitudinal sublevel long-hole stoping with cemented rock backfill, with a variation of the Avoca method used when the vein width is less than 6 m. The selected mining method suits the orebody geometry and rock quality while providing a high productivity and maximizing ore recovery. Once the stopes are depleted they will be backfilled using waste rock fill, cemented rock fill, or a combination of both.

In the traverse and longitudinal sublevel stoping mining methods, the vein is divided into stopes that are mined in an alternate sequence of primary and secondary stopes. Drilling is carried out primarily in a descending fashion and blasting is carried out using emulsion explosives. Cemented rock fill is used in the primary stopes and rock fill in the secondary stopes. The mining sequence occurs in ascending fashion.

In the modified Avoca mining method drilling and blasting is carried out in a descending fashion using emulsion explosives. The mining sequence occurs in ascending fashion by retreating from the central portion of the vein towards its ends. The stope is mined out and partially backfilled with a combination of rock fill and cemented rock fill from the

side opposite of the mining face. Mining continues to advance with drilling and mucking operations on one side, and backfill placement from the other.

Ore extraction is carried out by load–haul–dump vehicles (LHDs) with capacities ranging from 4.0 m^3 to 5.4 m^3. These units muck the ore from the stopes and haul it to a temporary stockpile located in the haulage drift or directly to trucks. Then the ore is loaded into trucks with capacities between 33 t and 40 t to be hauled to the surface and dumped, depending on grade, into high-, medium-, low- or marginal-grade stockpiles. The ore is then transported to the plant in haul trucks with capacities of 35 t to 40 t.

16.5.1 Eureka

The Eureka mine is accessed through a 15% gradient decline with a 4.5 m x 4.7 m section that connects from the surface, at a portal elevation of 630 m, down to elevation 190 m, which represents the lowest planned level of the mine.

The decline is currently developed to the 268 level. The decline is driven on the hanging wall of the vein at a minimum distance of 75 m from the vein to prevent any subsidence from subsequent over-excavation of stopes.

At every 26 m in vertical distance along the ramp, access drifts are developed to a haulage drift driven in waste rock, parallel to the vein. Crosscut drifts are developed from the haulage drift into the vein approximately every 30 m in the sublevel stoping method, and approximately every 75 m in the longitudinal or Avoca variation.

Backfill is prepared on surface by mixing waste rock with cement grout prepared in a colloidal mixer plant. The mixing is done with a front-end loader which loads underground haul trucks after they have brought ore to surface. The trucks deliver the backfill to the stope and either dump directly or dump into a rehandle bay, where it is picked up by a loader and dumped into the stope.

The ventilation circuit is made up of three raises of 2.4 m diameter located in the east side of the mine, two raises of 3.1 m diameter located in the west side of the mine and one central raise of 4 m diameter. Fresh air intake occurs through the decline and the east raises, which are connected to the haulage level. This allows the air to enter all production areas and to be exhausted trough the west raises, where one 400 hp fan is located. The decline intake is used to further develop the decline and the development of new production levels. The central raise is used as an exhaust, where one 400 hp fan is in operation, and another installed as backup. Total airflow is approximately 480,000 cfm.

Sumps are constructed on each level, and water is pumped up to surface in a staged manner. A water pond has been constructed near the Eureka portal to temporarily store water from the underground workings before it is re-used in the mine, used for surface dust suppression, or pumped to the process plant.

The portable mine refuge chambers consist of transportable, hermetically sealed, 20-person cabins, and are used in areas where escape raises have not yet been established. Secondary egress is achieved through escape raises which consist of a set of metal stairs installed in a purpose built raise that connects every level of the mine to the surface.

Compressed air is provided by a set of compressors located at the portal. The shotcrete plant is situated adjacent the portal, and has a 30 t/h capacity. The ore storage pad is approximately 300 m southwest of the portal.

16.5.2 Mariana Central

The Mariana Central vein is mined using the same methods applied at Eureka.

The main access to the mine consists of a 15% gradient decline and a 4.5 x 4.7 m section, using the same design parameters as for Eureka.

From this decline, the haulage levels are developed at 25 m intervals. The portal is located at an elevation of 621 masl and the planned bottom of the decline is at 206 masl. The decline is currently at an elevation of 356 masl. The decline is driven on the foot wall of the vein at a minimum distance of 75 m to prevent any subsidence from subsequent over-excavation of stopes.

The crosscuts into the vein are developed approximately every 30 m in the sublevel stoping method, and approximately every 75 m in the longitudinal or Avoca variation

Backfill is prepared on surface by mixing waste rock with dry cement, water, and concrete additives. The mixing is done with a front end loader which loads underground haul trucks after they have brought ore to surface. The trucks deliver the backfill to the stope and either dump directly or dump into a rehandle bay, where it is picked up by a loader and dumped into the stope.

The principal ventilation system at Mariana Central consists of air intake at the portal and three 2.4m raise-bored raises in the east sector of the mine. The main exhaust fans (400 hp each) are located at the bottom of two sets of raise-bored raises, one of 2 x 2.4 m in the centre of the deposit and one of 2 x 3.1 m in the western limit of the deposit. A set of 4 x 4 m long-hole (VCR) raises connect levels and transfer fresh and exhaust air. Total airflow is 430,000 cfm. Auxiliary fans with vent bag provide air to the development headings and stopes in production.

Sumps are constructed on each level, and water is pumped up to surface in a staged manner. A series of water ponds have been constructed near the Mariana Central portal to temporarily store water from the underground workings before it is re-used in the mine, used for surface dust suppression, or pumped to the process plant.

The portable mine refuge chambers consist of transportable, hermetically sealed, 20-person cabins, and are used in areas where escape raises have not yet been

established. Secondary egress is achieved through escape raises which consist of a set of metal stairs installed in a purpose built raise that connects every level of the mine to the surface.

Compressed air is provided by a set of compressors located at the portal. The shotcrete plant is situated adjacent the portal, and has a 30 t/h capacity. The ore storage pad is approximately 500 m northeast of the portal.

16.5.3 Backfill

The backfill materials used at in the mining operations are obtained from mine development waste and supplemented from surface sources. Waste is currently stockpiled on surface, but it is planned that all waste stockpiles will be returned underground as backfill before completion of the operations. Future backfill will be sourced from an on-site quarry and/or waste rock from the Vein Zone pit. A cemented aggregate fill (CAF) backfill plant is planned to be constructed at the Marianas complex to serve the Mariana Central and Mariana Norte mines.

16.6 Production Schedule

The first mine to begin stope production was the Eureka mine in 2013, followed by Mariana Central in 2015. The Mariana Norte mine is being developed and will begin production in 2017. Once fully ramped up, the three mines will have a combined throughput of at least 4,000 t/d which will fully utilize the current capacity of the process plant. The current life of mine plan contemplates the San Marcos and Bajo Negro deposits beginning production in 2022 when Eureka and the Marianas deposits are depleted.

Production from the Vein Zone pit is planned in two phases, in order to allow quicker access to ore and a smoother ore flow and stripping ratio over the life of the pit. The pit is currently scheduled to be mined from 2022–2026.

16.7 Blasting and Explosives

Blasting is performed at the end of each shift by a contractor. The contractor supplies explosives and manages inventories in company owned surface magazines. Development rounds and production drill holes are loaded with emulsion explosives. Nonelectric detonators are used in development rounds and electronic detonators are used in production stopes. ANFO and packaged explosives are used on occasion in certain circumstances.

16.8 Mining Equipment

The mining equipment currently on site is summarized in Table 16-1.

Table 16-1: Current Equipment List

Equipment	Type	Make	Comment	Number on Site
Haul Trucks	Sandvik	EJC 533	33t Ejector Bed	4
	Sandvik	TH540	40t Ejector Bed	7
	Sandvik	TH540	40t Standard Bed	6
LHDs	Sandvik	LH410		4
	Sandvik	LH514		6
Long-hole Drills	Sandvik	Cubex Orion 88		2
	Sandvik	DL311		2
	Sandvik	DL411		2
	Atlas Copco	Simba H1254		1
Face Jumbos	Sandvik	DD320	2 Boom	3
	Sandvik	DD321	2 Boom	4
Bolting Jumbos	Sandvik	DS311		7

Additional mining support equipment including telehandlers, lube and fuel trucks, shotcrete spray trucks, shotcrete transmixers, blasting trucks, diamond drills, man carriers, and light vehicles is used.

For the open pit operation, the following equipment is envisaged:

- Diesel powered top hammer drills capable of drilling 89 to 130mm blast holes for waste and ore;
- 5.5 m^3 class front-end loader (Cat 980) for waste;
- 37.5 t class track excavator (Cat 330) for ore;
- 40 t capacity articulated trucks (Cat 740);
- Support units including track dozers (Cat D8), motor graders (Cat 160) and 20 m^3 water trucks.

Additional surface mobile equipment consists of SUVs, dual-cabs, an ambulance, fire truck, forklifts, skid-steer loader, and cranes. This equipment is in place to support the underground and process plant operations, but additional equipment would be purchased for the open pit.

16.9 Comments on Section 16

In the opinion of the QPs:

- The mining methods used and planned are appropriate to the deposit styles and employ conventional mining tools and mechanization;

- The mine plan has been appropriately developed to maximize mining efficiencies, based on the current knowledge of geotechnical, hydrological, mining and processing information on the Project;
- The equipment and infrastructure requirements required for life-of-mine operations are well understood. Conventional underground mining equipment is used to support the underground mining activities. This equipment is standard to the industry and has been proven on site. The life-of-mine (LOM) fleet requirements are appropriate to the planned production rate and methods;
- Open pit mining is planned to also use conventional methods and conventional mining fleets;
- The predicted mine life to 2026 is achievable based on the projected annual production rate and the Mineral Reserves estimated.

There is upside potential that with additional drilling, estimation of additional Mineral Resources, or upgrade in Mineral Resource confidence categories, conversion of some or all of those Mineral Resources to Mineral Reserves may be possible.

17.0 RECOVERY METHODS

17.1 Process Flow Sheet

The process plant and associated service facilities process run-of-mine (ROM) ore that is delivered to the primary crusher.

The flowsheet incorporates the following major process operations:

- Primary crushing with the product directly feeding the milling circuit via a covered coarse ore pile;
- Conventional closed circuit milling;
- Pre-leach thickening;
- Leaching;
- Counter-current decant solution washing;
- Pregnant solution clarification;
- Zinc precipitation and doré smelting
- Cyanide destruction and tailings disposal
- Fresh and reclaim water supply;
- Reagent preparation and distribution.

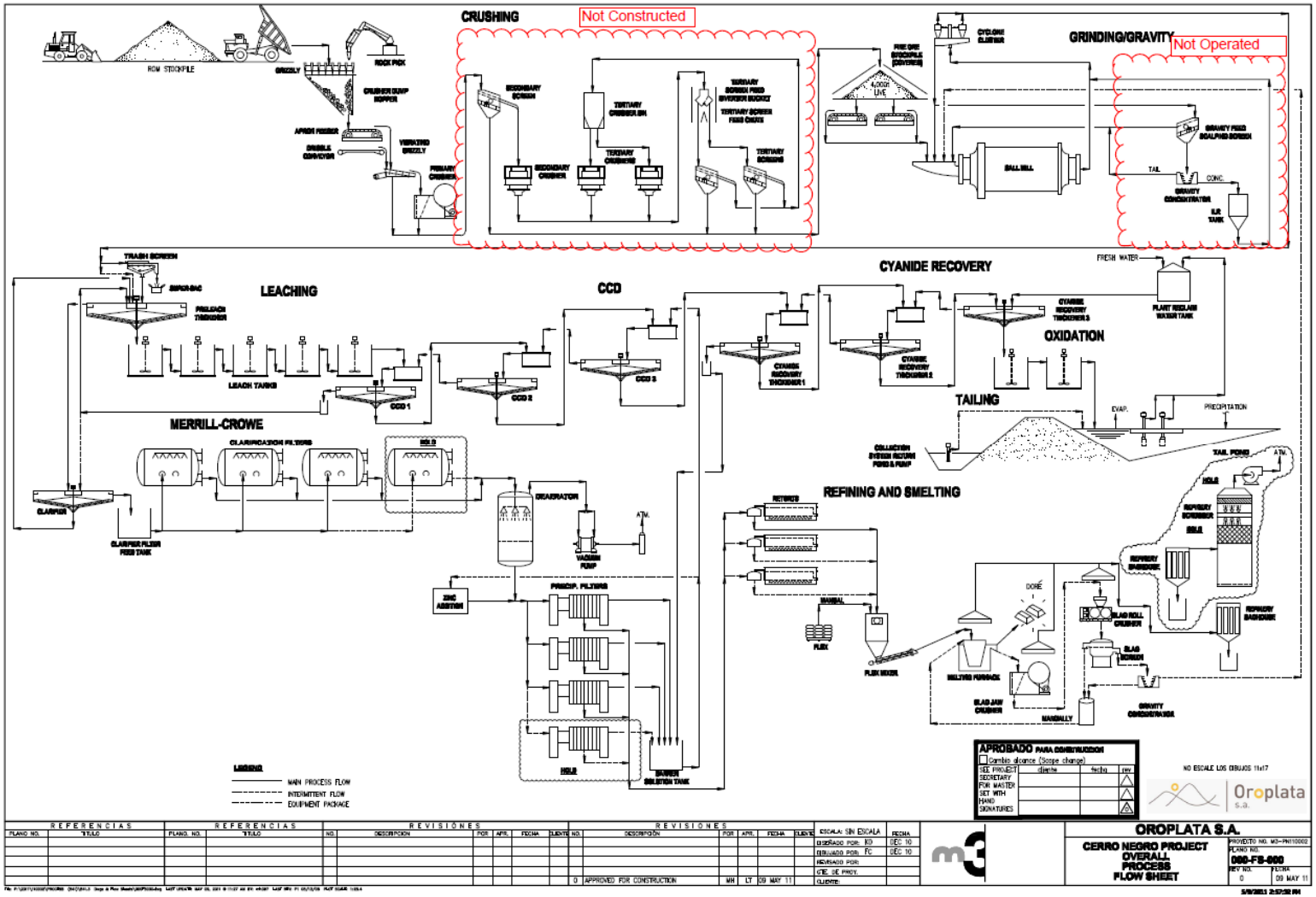
The overall plant flowsheet is shown in Figure 16-1.

The plant commenced initial feed on July 5, 2014 and first gold was poured on July 25, 2014. The plant is expected to process 4,000 t/d once the mines have ramped-up to full production capacity. Due to the ramp-up, insufficient ore is currently available from the mining operations for this capacity, and the plant is currently operating at about 3,590 t/d.

17.1.1 Primary Crushing and Reclaim

ROM rock is dumped from haul trucks or a front-end loader (FEL) through a 400 mm square-grid grizzly into a 60 t dump hopper. A 1,250 mm wide apron feeder is used to transfer ore from the dump hopper to the vibrating grizzly screen. The grizzly screens material finer than 120 mm, with the oversize reporting directly to the 1,250 x 950 mm single toggle jaw crusher. The jaw crusher is designed to operate with a closed side setting of 125 mm and produce a product with 80% passing (P80) 115 mm. The crusher operates in open circuit with the crushed product combining with the grizzly undersize, and the ensuing product is conveyed to the covered coarse ore pile.

Figure 17-1: Process Flowsheet



Note: Figure prepared by M3 for Goldcorp, 2011.

The coarse ore pile has a live capacity of 4,000 t or approximately 24 hours of mill feed. Total capacity is 15,000 t. Two reclaim belt feeders at the base of the coarse ore pile reclaim ore for milling.

17.1.2 Grinding

The reclaimed crushed ore feeds the mill at a controlled rate. Discharge from the ball mill gravitates through a trommel and into the cyclone sump pump. The trommel undersize slurry is pumped to the mill cyclone cluster, operating in closed circuit configuration with the ball mill. The trommel oversize is removed to a pebble storage where fines and cyanide solution are washed off prior to transfer to the stock pile by skid steer.

Barren solution from the cyanide recovery thickener circuit overflow is added to the cyclone feed sump pump to achieve the required cyclone feed pulp density. Cyclone underflow is directed to the ball mill feed hopper and the cyclone overflow flows by gravity to the leach feed vibrating trash screen.

The grinding circuit includes a single 6.1 m diameter by 10.1 m long (EGL) ball mill in closed circuit with cyclones.

A gravity concentrator is installed on the cyclone underflow stream but it is not currently operating.

17.1.3 Pre-Leach Thickening

Cyclone overflow slurry gravitates to the leach feed trash screen. The trash screen underflow slurry gravitates to the 25 m diameter high rate pre-leach thickener along with pregnant solution from the counter-current decant (CCD) circuit. Diluted flocculant and barren solution are added to the feed box of the thickener to assist in solids settling and thickening. The flocculant addition rate is adjustable by a variable speed metering pump. The nominal underflow pulp density is 53% solids w/w. Thickener underflow is pumped to the leaching circuit. The pregnant solution overflowing the pre-leach thickener is pumped to the clarifier thickener.

17.1.4 Leaching

Pre-leach thickener underflow slurry is pumped to the leaching circuit. Feed to the leach circuit is 53% solids w/w. Leaching of precious metals by cyanide occurs in a series of five 16.3 m diameter x 16.9 m high A-36 carbon steel-welded agitated leach tanks, with 3,200 m^3 operating capacity, to provide a total leach residence time of 60 hours. Slurry exiting leach tank no. 5 flows by gravity to the CCD recovery circuit.

Sodium cyanide solution is dosed to the leaching circuit via a pressurized ring-main. Air is injected into the leach tanks via blowers and in-tank distribution cones to assist with maintaining sufficient dissolved oxygen in the slurry for optimal leaching. Slaked lime

slurry, used to provide alkalinity to maintain pulp pH levels, is added to the leach feed and third tanks.

17.1.5 Counter-Current Decantation Concentrate Solution Recovery

The CCD circuit recovers precious metals leached into solution via three-stage counter-current thickener washing. Leached slurry gravitates to the feed box of the first CCD thickener from the leach circuit. The thickened underflow is pumped to the next CCD thickener where it is washed with recovered solution from the third CCD thickener. The CCD thickeners are 25 m diameter.

Thickened underflow slurry from the third CCD thickener is pumped to the cyanide recovery circuit. The wash solution flows counter-current to the solids flow, increasing in precious metal concentration as it proceeds to the second and first CCD thickener. The pregnant solution from the first CCD thickener is pumped to the pre-leach thickener.

17.1.6 Solution Clarification and Zinc Precipitation

Overflow from the pre-leach thickener is pumped to the 30 m diameter clarifier to further remove suspended solids. This solution, combined with flocculant and a recycle stream of clarifier underflow, feed the clarifier. The clarifier underflow is predominantly recycled to increase the solids density in the feedwell. The bed mass is maintained by periodically pumping the underflow to the pre-leach thickener.

Clarifier overflow gravitates to pump column and is pumped to the 1,100 m^3 polishing filter circuit feed tank, (10 m diameter x 14 m high). Solution is then pumped from the tank to the polishing filter circuit. The majority of the remaining suspended solids in the clarified solution is removed by the three clarification pressure leaf filters. Diatomaceous earth is metered into the suction piping of the filter feed pumps to maintain filter cake porosity in the polishing filters. Diatomaceous earth is also used for pre-coating the filters prior to the introduction of clarified solution. The filter cake is discharged by an automatic backwash cleaning sequence to the clarification filter sludge sump, and subsequently pumped to the cyclone feed sump pump.

The clarified pregnant solution flows from the clarification filter to the de-aeration tower. The de-aerated pregnant solution is then pumped by the variable speed precipitation filter feed pumps to the zinc precipitation filters. Zinc dust is metered from the zinc cone with lead nitrate to precipitate gold and silver from the de-aerated solution. This mix is added to the suction line on the precipitate filter feed pumps carrying the de-aerated solution being pumped through the precipitate filters.

Three recessed plate filter presses are used for the precipitate filtration duty. Precipitate containing the precious metals is emptied into trays and then loaded into the retort oven by electric forklift. Barren solution leaving the precipitate filters is stored in the filter

discharge tank. Barren solution is then pumped from the tank to the barren solution tank.

17.1.7 Gold Room

After precipitate filtration, the filter cake is dried with high pressure air prior to discharge. Filter cake discharges from the filters into trays that are loaded by forklift into a mercury retort oven. The mercury is separated from the precipitate, then recovered and stored in sealed containers. To date, minor amounts of mercury have been detected and recovered in the retort oven. Once the mercury is removed from the calcine cake, the calcine is mixed with smelting fluxes and charged to the reverb furnace. The calcine is smelted and the doré is poured into ingots.

Slag from the smelt is crushed first on a jay crusher and then on a roll crusher. Precious metals entrained in the slag recovered by centrifugal concentrator. The concentrate is returned to the smelting furnace, while the centrifugal concentrator tails returned to the grinding circuit.

17.1.8 Cyanide Recovery

Thickened tailings from the third CCD thickener are subjected to additional three stage counter current washing to recover cyanide and residual precious metals in solution prior to tailings disposal. Cyanide recovery thickeners are 25 m diameter units.

Process water is pumped to the third cyanide recovery thickener. Thickener overflows advance to the front of the circuit. The overflow from the first thickener is pumped to the barren solution tank.

Thickened tails are pump advanced to the next washing stage. The underflow from the third thickener is then pumped to the cyanide destruction circuit at approximately 55% solids.

17.1.9 Tailings Detoxification

The cyanide destruction process takes place in two 7 m diameter by 8 m high tanks with 283 m^3 each of operational capacity. Each tank is agitated to assist with reagent dispersion in the slurry and provides 76 minutes of residence time.

The sulphur dioxide is added as metabisulphite and air is supplied through a sparging system to oxidize both free cyanide (CN_{Free}) and weak acid dissociable (CN_{WAD}) in solution. The slurry is fed into the system at a density of 55% solids. The circuit has residence time of 152 minutes at the rated throughput.

The cyanide feed concentration of 370 mg/L is reduced to less than 50 mg/L in the discharge to the tailings storage facility (TSF). Other reagents used in the oxidation

process are milk of lime to maintain the required 8.5 pH level and copper sulphate ($CuSO_4$) to catalyze the oxidation reactions.

17.1.10 Tailings Pumping and Solution Recovery

The discharge from the second cyanide destruction tank is pumped to the TSF.

Tailings from the cyanide destruction are discharged to a tailings pump box from where they are pumped by duty/standby two-stage centrifugal pumping system to the tailings storage facility. Decant water from the TSF is recovered by pump and returned to the process water tank in the plant.

The tailings discharge piping runs in a containment channel to prevent a spill in case of pumping system or pipe failure. Piping returning recovered water from the TSF runs in the same containment channel.

17.2 Plant Design

Table 17-1 lists the major equipment for the Cerro Negro plant. Items listed under the 200 area corresponding to the planned fine crushing circuit were purchased, but have not yet been installed.

17.3 Product/Materials Handling

A blending plan procedure has been implemented to meet the monthly throughput and metal production targets. The Ore Control Department is responsible for generating the detailed blending and delivery plans.

The delivery plan provides the Surface Operations group with total tonnage by mine to be transported, daily estimated tonnage required by the process plant and a detailed daily and daily tonnage required by mine.

The Ore Control and the Surface Operations groups coordinate the delivery of ore to the process plant.

17.4 Energy, Water, and Process Materials Requirements

17.4.1 Energy

Electrical power supply for the operation is provided by a 132 kV high voltage line interconnected to the national grid by a transformer station located near the process plant. A 33 kV grid was built to distribute power to the Mariana and Eureka areas.

Power draw for the entire plant has averaged 5.8 MW over the period where the production averaged 3,590 t/d.

Table 17-1: Plant Design and Equipment

Item	Description	Quantity		Comments
		Operating	Stand-by	
AREA 100 — PRIMARY COARSE CRUSHING				
Primary Jaw Crusher	36" x 48" Feed Opening Metso C125	1		
Dribble Conveyor	1524 mm wide x 6 m long	1		
Apron Feeder	Metso Model AF5-60MN-23-25HP 60" width x 23 feet long	1		
Vibrating Grizzly Feeder	162 mm openings 1500mm wide, 4 m long	1		
Primary Crushing Bridge Crane	20 tonne capacity double girder overhead crane	1		
Rock Breaker	Stationary Mount, 8 m horizontal reach boom assembly	1		
Primary Grizzly	450 mm openings, stationary	1		
AREA 150 — COARSE ORE CONVEYING				
Coarse Ore Conveyor	36" belt width, 164 meters long x 17.3 meters lift	1		
Coarse Ore Scale		1		
AREA 200 - FINE CRUSHING - FINE ORE STORAGE				
Tertiary Crusher Bin	100 t live capacity	1		Purchased / Not Installed
Secondary Crusher	Standard Cone Crusher	1		Purchased / Not Installed
Tertiary Crusher	Short Head Cone Crusher	2		Purchased / Not Installed
Crusher Discharge Conveyor	36" belt width, 166 m long x 25 m lift	1		Purchased / Not Installed
Tertiary Crusher Feed Conveyor	36" belt width, 152 meters long x 12 meters lift	1		Purchased / Not Installed
Stockpile Feed Conveyor	36" belt width, 357 meters long x 25 meters lift	1		Purchased / Not Installed
Tertiary Screen Feeder	Feed to Tertiary Screen / 84" (2133 mm) wide x 4.2 m long	2		Purchased / Not Installed
Tertiary Crusher Feeder	Feed to Tertiary Crusher / 48" (1220 mm) wide x 11.7 m long	2		Purchased / Not Installed

Item	Description	Quantity		Comments
		Operating	Stand-by	
Secondary Screen	Double Deck Vibrating Screen, 1829 mm x 6100 mm (6' x 20')	2		Purchased / Not Installed
Tertiary Screen	Double Deck Multi-Slope Vibrating Screen, 1829 mm x 6100 mm (6' x 20')	2		Purchased / Not Installed
AREA 250 - FINE CRUSHING - BYPASS SYSTEM				
Mobile Conveyor No. 1	36" x 30 m long with 4m lift	1		
Mobile Conveyor No. 2	36" x 30 m long with 4m lift	1		
Mobile Conveyor No. 3	36" x 30 m long with 4m lift	1		
Mobile Conveyor No. 4	36" x 30 m long with 4m lift	1		
Mobile Conveyor No. 5	36" x 30 m long with 4m lift	1		
Stacker Conveyor No. 6	36" x 34 m long with 9m lift	1		
AREA 300 — GRINDING				
Ball Mill Feed Conveyor	36" belt width, 228 meters long x 20 meters lift	1		
Cyclone Cluster	(12) gMAX15 cyclones,	10	2	
Grinding Area Bridge Crane	50 / 10 tonne Bridge Crane	1		
Mill Liner Handler		1		
Ball Mill	6.1 m (20 ft) diameter by 10.1 m (33 feet) EGL (estimated) c/w 9,700 HP motor and VFD	1		
Ball Mill Motor (Spare)	Spare Motor - 9700 HP, 3150V, 3ph, 50HZ		1	
Gravity Concentrator	1067 mm (42 in) bowl	1		Installed / non-operating
Gravity Concentrator Scalping Screen	Screen Area: 2.134 m wide x 4.877 m long	1		Installed / non-operating
AREA 400 — LEACHING				
Cleaning Screen	Single Deck, Horizontal Vibrating Screen	1		
Grinding Thickener	25 m diameter	1		
Leach Tanks	Leach Tank; 16.3 m (53.5') diameter x 16.9 m (55.4') high	5		
AREA 410 — CCD & CYANIDE RECOVERY				
CCD Thickener	25 m diameter	3		
Cyanide Recovery Thickener	25 m diameter	3		

Item	Description	Quantity		Comments
		Operating	Stand-by	
AREA 450 — MERRILL CROWE-PREGNANT-BARREN				
De-aeration Tank	13' dia x 20' straight wall ASME section VIII certified (Pressure Vessel) 75 m^3 packing	1		
Clarifier	30 m diameter thickener / Thickener tank is bolted construction.	1		
Deaerator Vacuum Pump	6", 1080 RPM - 1890 m^3/hr @ 500mm Hg	1	1	
AREA 500— REFINERY				
Mercury Retort System	40 ft3 batch capacity, 815 degree C max operating temperature	2		
Melting Furnace	Fuel oil fired tilting reverberatory furnace, w/ combustion air blower and controls	1		
AREA 600 — TAILINGS - CYANIDE OXIDATION - RECLAIM WATER				
Tailings Pump	Rubber Lined, Horizontal./Centrifugal Slurry Pump, 6 x 4, c/w 1500 HP motor	4		
Reclaim Water Pump	107 m3/hr @ 48m TDH, SS Submersible Pump	2		
Cyanide Oxidation Tank	Cyanide Oxidation Tank; 7 m (23') diameter x 8 m (26.25') high	2		
Reclaim Water Transfer Tank	5.1m dia x 4.6m high, carbon steel 284m^2 operating volume			
AREA 650 — WATER SUPPLY				
Emergency Pond	Included in Site Infrastructure - Earthworks 2000 m^3			
Potable Water Well Pump	Stainless Steel Submersible Well Pump / 21 m^3/hr Well VZ1 Potable	3		
Fresh Water Well Pump	SS Well Pump / 30m^3/hr @ 202m TDH / Well P5	4		
Reclaim Water Tank Pump	Horizontal End Suction Centrifugal Pump for Water Service 480 m^3/hr @ 35m TDH	2		
Barren Solution Distribution Pump	Horizontal / Centrifugal. Process Pump / 1474 m3 @ 35 MTDH, Mark 3 10 x 8	2		
High Pressure Seal Water Pump	Vertical Inline Centrifugal Pump 17 m^3/hr @ 222m TDH	2		
Fresh/Fire Water Tank	14 m dia x 9.75 m high, covered, carbon steel	1		
Plant Reclaim Water Tank	20m dia x 6m high, carbon steel 1602 m^3 operating volume	1		
Barren Solution Tank	8 m dia 8 m high, open top, carbon steel 374 m^3 operating volume	1		
Potable Water Tank	7 m dia x 8.35 m high, closed top, carbon steel 284 m^3 operating volume	1		
Seal Water Tank	3 m dia x 3 m high, closed top, carbon steel 18 m^3 operating volume	1		
Mine Water Tank	7 m dia x 5 m high, closed top, carbon steel 173 m^3 operating volume	1		

17.4.2 Reagent Mixing Storage and Distribution

A standard reagent suit for precious metal leaching and recovery is used in processing the mineralized rock to produce gold/silver doré, and includes:

- Zinc powder;
- Sodium cyanide;
- Lime;
- Diatomite;
- Copper sulphate;
- Sodium metabisulphite;
- Coagulant;
- Flocculant;
- Lead nitrate;
- 3" ball (7.6 cm);
- 5" ball (12.6 cm).

17.4.3 Process Water

Water for the process plant operation is sourced mainly from wells (fresh water) and the tailings water facility (reclaimed water.) These sources provide an average of 26% and 72%, respectively, of total process water. Excess mine discharge water has also been used for plant make up water since August 2015, and accounts for about 2%.

17.5 Comments on Section 17

In the opinion of the QPs, the mill throughput, process and associated recovery factors are considered appropriate to support Mineral Resource and Mineral Reserve estimation, and mine planning.

The plant is expected to process 4,000 t/d once the mines have ramped-up to full production capacity. Insufficient ore is currently available from the mining operations during the ramp-up period for this capacity, and the plant is currently operating at about 3,590 t/d.

18.0 PROJECT INFRASTRUCTURE

An infrastructure layout is presented in Figure 18-1 for Eureka and Figure 18-2 for Mariana. The current and proposed layout for the Vein Zone area is included in Figure 18-3.

18.1 Road and Logistics

Project access is discussed in Section 5. Haul and service roads link the Vein Zone plant to the Marianas complex and Eureka mine. The haul road from the Vein Zone pit to the plant is currently permitted but not constructed.

18.2 Surface Infrastructure

Existing and planned buildings and infrastructure include:

- Open pit;
- Underground mine;
- Water wells for water supply;
- Tailings storage facility;
- Main administration building with medical centre and training room;
- Security office;
- Security gatehouse;
- Laboratory;
- Metallurgical office/laboratory;
- Plant mess and training room;
- Plant workshop and warehouse;
- Reagent storage and sodium cyanide storage;
- Grinding building;
- Filtration building;
- Reagents building;

Figure 18-1: Eureka Infrastructure Layout

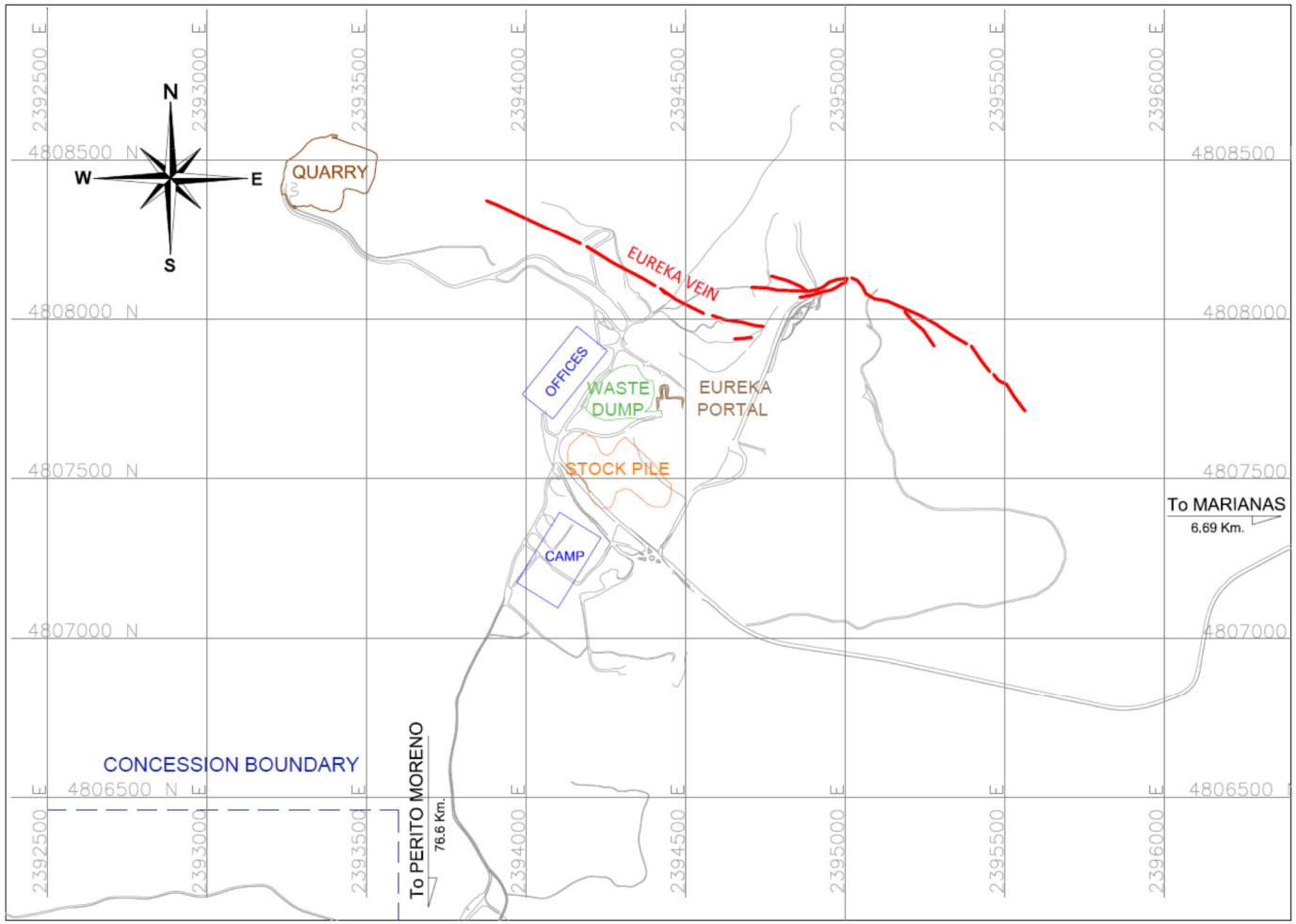


Figure prepared by Goldcorp, 2015.

Figure 18-2: Marianas Infrastructure Layout

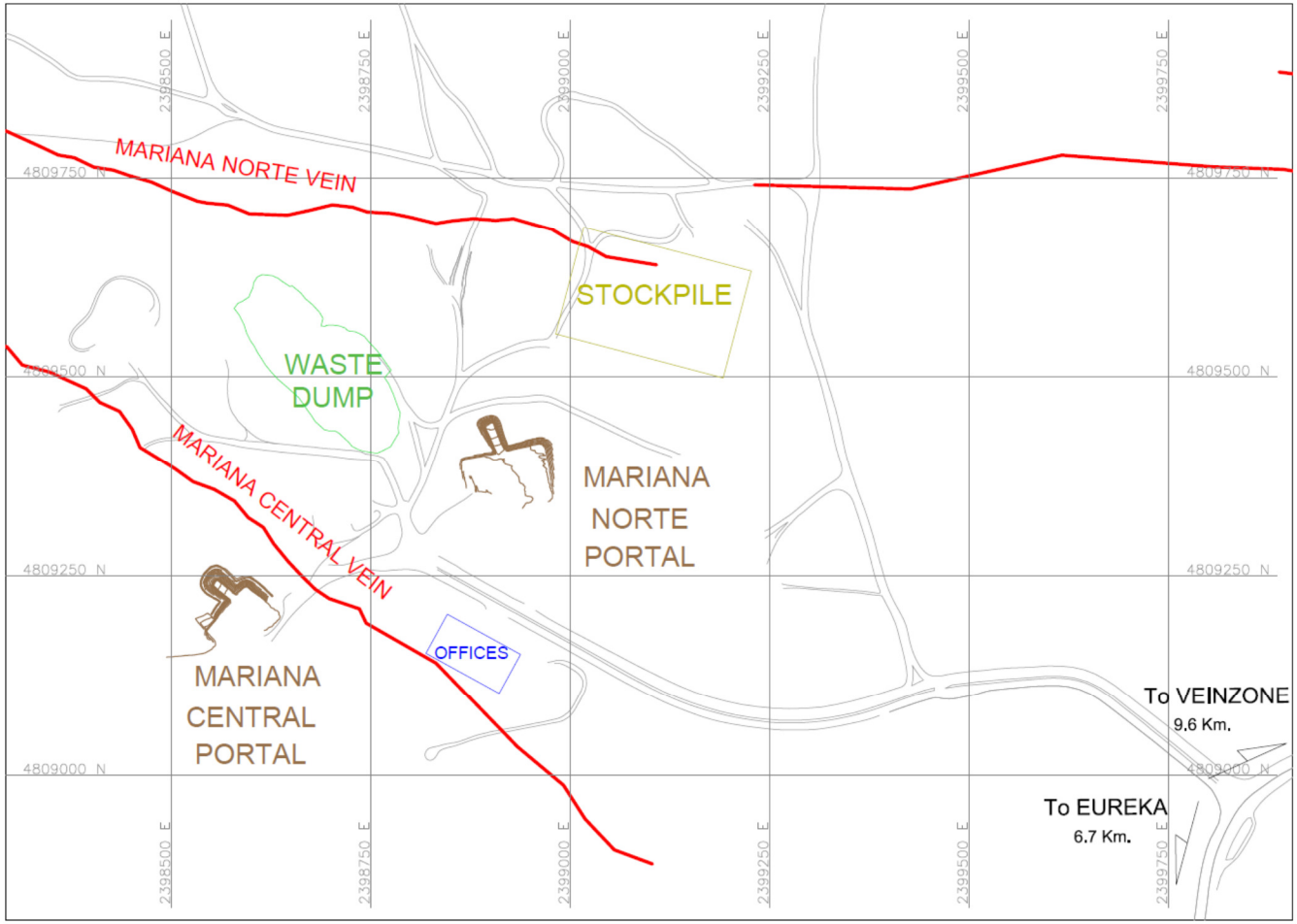


Figure prepared by Goldcorp, 2015.

Figure 18-3: Vein Zone Existing and Proposed Infrastructure Layout

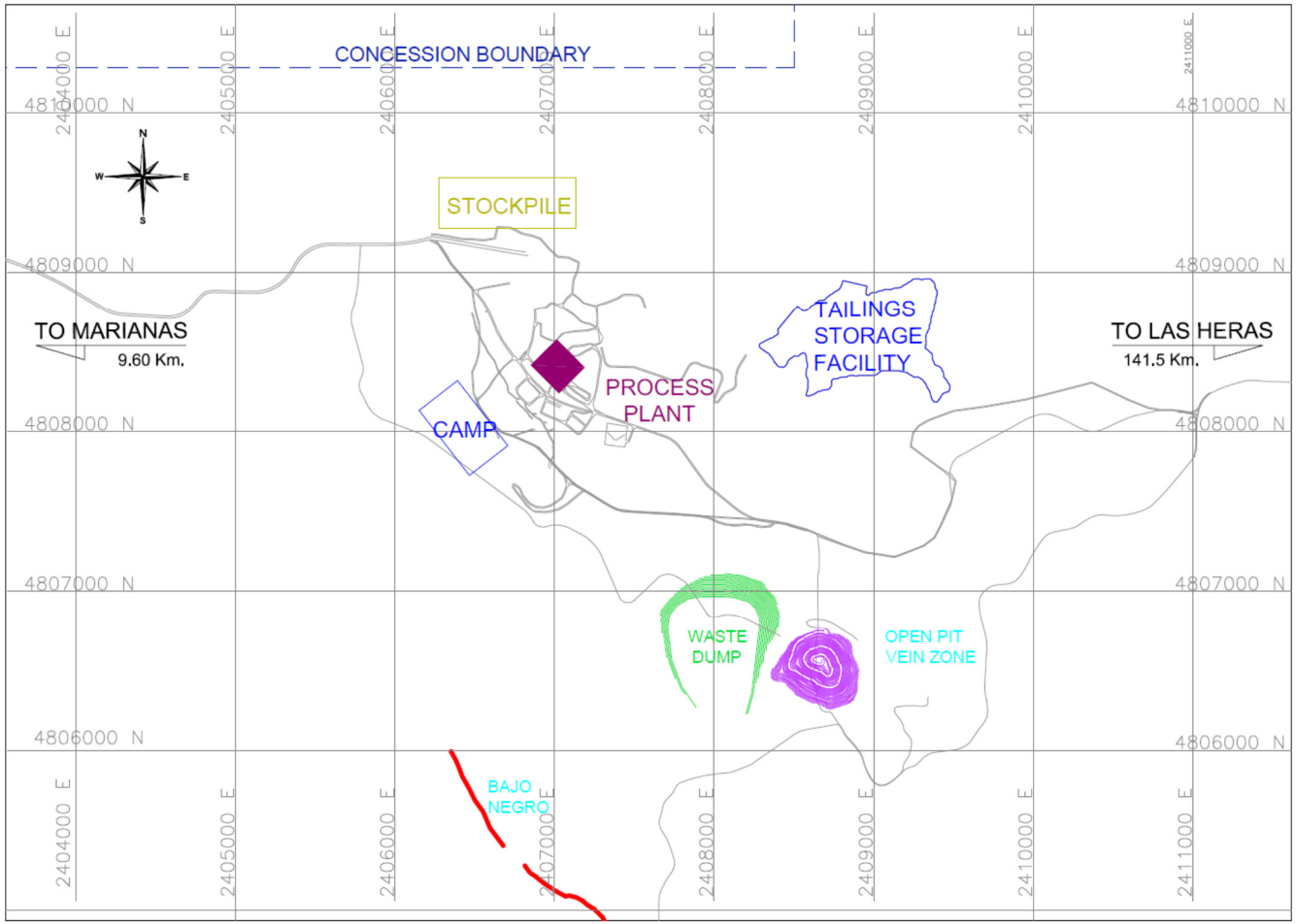


Figure prepared by Goldcorp, 2015.

- Refinery;
- Mine change house and training centre;
- Mine workshops, maintenance facilities and warehouses;
- Fuel storage facilities;
- Sewage treatment works.

The Cerro Negro Operations have a projected maximum power demand of 25 MW. Major infrastructure consists of:

- A 132 kV overhead transmission line, 58 km long, from the Maria Aike substation on the regional power grid to the principal substation at the process plant;
- A principal substation that is equipped with two 132/33/13.2 kV step-down transformers of 20 MVA capacity each and associated switchgear;
- A 33 kV overhead transmission line, 16 km long, from the process plant to the Mariana Central and Eureka mines with 33/13.2 kV step-down transformers of 7.5 MVA and 5 MVA, respectively, at each portal;
- Transformers in plant and in various levels in underground mines to step voltage down to 380V working voltage used by most fixed and mobile equipment;
- Backup diesel generation is installed which provides enough power for all mining activities, but only enough for standby power in the process plant (no milling).

18.3 Comment on Section 18

The QPs note that the infrastructure required to support mining operations at Eureka, Mariana Central and Mariana Norte, and subsequent processing of ores from those mines is in place or currently being constructed. Additional infrastructure will be required to support mining operations at the San Marcos, Bajo Negro, and Vein Zone areas.

19.0 MARKET STUDIES AND CONTRACTS

19.1 Market Studies

Cerro Negro´s doré is sold to Goldcorp's Trading entity located in Switzerland. After the refining process, the Trading entity´s in-house marketing experts sell bullion on the spot market. The terms contained within the sales contracts are typical of and consistent with standard industry practices, and are similar to supply contracts elsewhere in the world.

19.2 Commodity Price Projections

Commodity prices used for Mineral Resource and Mineral Reserve estimates are set by Goldcorp Corporate.

19.3 Comment on Section 19

Doré production from the Cerro Negro Operations is marketed in a similar manner to, and use similar sales contracts to, that of existing Goldcorp operations.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 Baseline Studies

The key baseline studies completed over the Project area in support of the original environmental assessment included:

- Geology and geomorphology;
- Acid rock drainage;
- Climate;
- Air quality;
- Hydrology and hydrogeology;
- Water quality;
- Soil and soil quality;
- Flora;
- Fauna;
- Ecosystem characterization;
- Landscape;
- Sociocultural;
- Archaeology;
- Paleontology.

20.2 Environmental Impact Study and Study Updates

An environmental impact study (EIS; or IIA in the Spanish acronym) was prepared in June 2010, based on the 2010 feasibility study and 2008 baseline environmental studies. Updates are required to be presented every two years.

20.2.1 2010 Study

The object of the 2010 EIS was to identify and evaluate potential environmental impacts associated with construction, operation, and closure of a mine, access routes, high-tension power lines, process plant, waste storage facilities, camps, and installations associated with the Project. It assumed:

- Mines at Eureka, Marianas, Bajo Negro, and Vein Zone;

- Waste rock storage;
- Stockpiles;
- Process plant in the Vein Zone area;
- East and west access roads;
- Camps at Eureka and Vein Zone with auxiliary facilities;
- Systems for capture and treatment of underground water.

The 2010 EIS was adapted to requirements established by National Law 24.585 for Environmental Protection for Mining Activities (ley Nacional 24.585 de Protección Ambiental para la Actividad Minera) and law 2.659, Evaluation of Environmental Impact (ley 2.658, de Evaluación de Impacto Ambiental) and ordinance (Decreto Reglamentario) 007 of the Province of Santa Cruz with the principal environmental laws in Argentina and the Santa Cruz region.

20.2.2 2011 Update

Changes to the 2010 EIS, including modifications to projected throughput rates and infrastructure capacities, were captured in the 2011 update. Additional supporting baseline studies were completed, including:

- Update to the physical and biological environmental descriptions to cover additional areas that could be impacted by mining operations; this included updated archaeology, paleontology, geology, geomorphology, flora, and fauna studies;
- Update to the socio-cultural environmental data, using updated Census information;
- Update of the Project description;
- Update of potential environmental impacts due to changes in the Project description;
- Review of the Environmental Management plan.

20.2.3 2013 Update

The 2013 update documented changes to the 2010 and 2011 EIS assumptions. Changes included:

- Trench at Eureka (slot cut);
- New development levels at the Eureka and Mariana Central mines;
- Deferral of production from Mariana Norte and San Marcos;
- Access road;
- Haul road connecting the mines with the process plant;

- Construction of an electric line and internal distribution system;
- Opening of aggregate quarries;
- Changes in the process plant;
- Construction of a tailings storage facility and services roads for tailings pipeline;
- Changes in camp infrastructure;
- Construction of a high-tension electric line.

20.2.4 2015 Update

The 2015 update included additional studies, such as:

- Geology and geomorphology including seismic hazards;
- Climatology;
- Hydrology and hydrogeology including characterization of surficial and underground water;
- Soil characterization;
- Flora including ongoing monitoring;
- Fauna including ongoing monitoring and study results;
- Ecosystem characterization;
- Landscape characterization;
- Socioeconomic and cultural aspects including education, health, and economics;
- Archaeology and paleontology studies including studies of sites with historical value.

The current environmental management plan is described in detail and includes measures and actions to prevent and mitigate environmental impacts, cyanide management, chemical and petroleum management, barren rock and tailings management, and water management. The environmental monitoring program is discussed. Community involvement and agreements with communities are described.

20.3 Environmental Considerations

20.3.1 Environmental Monitoring

Environmental monitoring is ongoing at the Project and will continue over the life of the operations. Key monitoring areas include air, water, noise, effects on ecosystems, and waste management.

20.3.2 Cyanide Code

The Cerro Negro site meets International Cyanide Management Code requirements, and Goldcorp signed the voluntary agreement on 25 July 2007. Site certification is expected in 2016.

20.4 Waste Rock Storage

Waste storage for Eureka was designed at the northwest side of the portal where enough space to stockpile all the waste material extracted during the development period is available. This site is also adequate for the requirements for the Eureka surface facilities and utilities. During backfilling, this waste stockpile will be totally consumed.

Waste storage for Bajo Negro is located at the west side of the portal where sufficient space is available to stockpile all the waste material extracted during development. Approximately 1 Mt of waste is estimated from development. During backfilling, this waste will be totally consumed.

A total of 19 Mt of waste will be produced during Vein Zone's life of mine. This waste will be stored in a single waste dump, located to the west of the pit. The maximum height of the dump will be 90 m. Some of the waste will be used for underground backfill, as well as periodic raises of the tailings storage facility embankment.

20.5 Tailings Storage Facility

The Cerro Negro Operations includes a tailings storage facility (TSF) which has been engineered by Golder Associates. The current design of the TSF will store approximately 16.3 Mt of tailings. It consists of four phases of construction, or lifts, of which the first was completed prior to commissioning of the plant in 2014.

The tailings basin area is approximately 50 ha. Basin elevations range from a high of 880 masl along the southern perimeter to 740 masl in the drainage channels at the north of the footprint. Containment of the tailings within this basin is achieved by two dams: Dam 1 on the northwest side of the basin, and Dam 2 on the north side of the basin. Surface water diversion channels have been constructed around the perimeter of the basin. These channels discharge into the natural water courses downstream of the two dams.

The tailings dams will be constructed in four stages to provide the storage capacity required to hold tailings generated by processing all ore currently in Mineral Reserves. The first phase is currently constructed to an elevation of 775 masl. The second phase will be constructed in 2017 to an elevation of 780 masl, the third phase in 2019 to an elevation of 788 masl, and the fourth phase in 2024 to an elevation of 792 masl. The dams are homogeneous earth-fill dams with an underdrain to prevent the development

of a phreatic surface. The primary impermeable element is a geomembrane installed on the upstream face and connected to the geomembrane liner of the fully lined TSF basin. The upstream and downstream faces of the dams are constructed at 1V:2H. The crest width is 10 m.

Seepage is collected below the dams and pumped back into the facility.

Future expansions of the TSF are possible and will be designed if additional Mineral Reserves can be estimated.

20.6 Closure Plan

Although there is no specific legislation relating to mine closure, a voluntary conceptual closure plan was submitted and approved in the 2010 IIA, updated in 2013, and updated for a second time in 2015. A detailed closure plan that includes a closure framework for the life of mine is in progress and should be completed in early 2016.

The conceptual closure plan approved in 2010 describes actions related to the closure process. Components of closure were identified and conceptual plans discussed in accordance with control standards expected by Goldcorp´s Sustainability Excellence Management System (SEMS).

The key objectives of the reclamation and closure plan include:

- Minimizing erosion damage and protect surface and ground water resources through control of water runoff;
- Establishing physical and chemical stability of the site and its facilities;
- Ensuring that all cyanide and process chemicals are safely removed from the site at closure and equipment is properly decontaminated and decommissioned;
- Establishing surface soil conditions conducive to the regeneration of a stable plant community through stripping, stockpiling and reapplication of soil material and/or application of waste rock suitable as growth medium;
- Repopulating disturbed areas with a diverse self-perpetuating mix of plant species in order to establish long-term productive plant communities compatible with existing land uses;
- Maintaining public safety by stabilizing or limiting access to landforms that could constitute a public hazard.

Goldcorp annually reviews and updates estimated closure costs, and these costs are audited by a third party and disclosed publicly by Goldcorp. Closure costs are currently estimated at US$86.9 million. This estimate includes dismantling the process plant, camp, and surface infrastructure.

20.7 Permitting

Exploration and mining activities by Goldcorp are undertaken under the appropriate local, Provincial and Federal laws. A number of permits are required for continuing exploration and mining operations. Key permits required for exploration and mining operations in Santa Cruz Province, Argentina are summarized in Table 20-1.

At this time, all required permits are valid and Goldcorp is in compliance with the provisions of those permits.

20.8 Considerations of Social and Community Impacts

The Project has no formal settlements within its boundaries. The closest towns are Perito Moreno (approximately 4,200 inhabitants), located approximately 75 km by road from the Project, and Las Heras (approximately 12,206 inhabitants), located 215 km by road from the Project.

As part of permitting activities, a number of baseline social and community studies were completed, focusing primarily on Project impacts to Perito Moreno. Additional studies have continued since mine start-up.

Goldcorp initiated community support programs in terms of education and agriculture, and committed 1% of the eventual net profit (under Argentine General Accepted Accounting Principles) of the operations to supporting sustainable activities within Perito Moreno. Since 2013, Goldcorp has invested approximately US$3.6 million in Perito Moreno. Those investments include a new municipal stadium, expansion of the community hospital (eight rooms and equipment), schools, infrastructure improvements (water, sewage, electricity, gas, etc.), archaeological museum, and scholarships for university and internships.

Goldcorp has met with, and will continue to meet with, regional and local officials to better define and prioritize the needs of the area and better define the action plan. These meeting have identified projects and priorities for future management and investment.

Table 20-1: Key Project Permit Requirements

Subject Matter	Permits Required	Corresponding Government Authority	Applicable Legislation
Mining Regulations	Exploration Permit	Mining Secretary of Santa Cruz Province	Section 25 through 43 of the Argentine Mining Code. Provincial Law No. 990 (Provincial Mining Procedural Code).
	Mining Concession Request	Mining Secretary of Santa Cruz Province	Section 44 through 71 of the Argentine Mining Code. Law No. 990 (Provincial Mining Procedural Code).
	Measurement and Mining Request	Mining Secretary of Santa Cruz Province	Section 81 through 93 of the Argentine Mining Code. Law No. 990 (Provincial Mining Procedural Code).
	Request of formation of Mining Group	Mining Secretary of Santa Cruz Province	Section 138 through 145 of the Argentine Mining Code. Law No. 990 (Provincial Mining Procedural Code).
	Certificate of Payment of Mining Fee	Mining Secretary of Santa Cruz Province	Section 215 of the Argentine Mining Code. Law No. 990 (Provincial Mining Procedural Code).
	Request for Approval of Investment Plan	Mining Secretary of Santa Cruz Province	Section 217 through 225 of the Argentine Mining Code. Law No. 990 (Provincial Mining Procedural Code).
	Approval of the Environmental Impact Report	Mining Secretary of Santa Cruz Province	Section 246 through 268 of the Argentine Mining Code. Law No. 990 (Provincial Mining Procedural Code). Provincial Law No. 2658.
	Plant Authorization Request	Provincial Industry and Commerce Direction - Mining Secretary of Santa Cruz Province	Argentine Mining Code, Provincial Law No. 1589 and Provincial Decree No. 9/1992
	Camp Installation Permit	Provincial Industry and Commerce Direction -Mining Secretary of Santa Cruz Province	Argentine Mining Code, Provincial Law No. 1589 and Provincial Decree No. 9/1992
	Living Facilities Construction in the town of Perito Moreno	Perito Moreno Municipality Commerce and Industry Agency	Municipal Resolution
Water Regulations	Water Use Authorization	Provincial Water Resources Direction	Provincial Law No. 1451 and Provincial Law No. 2625. Disposition No. 3/2003 of the Provincial Water Resources Direction.
	Permits for the administration of liquid effluents	Provincial Water Resources Direction	Provincial Law No. 1451. Disposition No. 4/1996 of the Provincial Water Resources Direction.
Explosive Regulations	Explosive Use Authorization	National Registry of Weapons. ("RENAR" for its Spanish acronym)	Law No. 20.429 - Executive Decree No. 302/1983 - RENAR's Disposition No. 99/2004.
	Approval of a Blasting Equipment Manufacturing Plant	National Registry of Weapons. ("RENAR" for its Spanish acronym)	Law No. 20.429 - Executive Decree No. 302/1983 - RENAR's Disposition No. 99/2004.
	Approval of a Blasting Equipment Storage Facility	National Registry of Weapons. ("RENAR" for its Spanish acronym)	Law No. 20.429 - Executive Decree No. 302/1983 - RENAR's Disposition No. 99/2004.
	Authorization to import and export Blasting Equipment.	National Registry of Weapons. ("RENAR" for its Spanish acronym)	Law No. 20.429 – Executive Decree No. 302/1983 - RENAR's Disposition No. 99/2004.
	Authorization to install an Ammonium Nitrate storage facility.	National Registry of Weapons. ("RENAR" for its Spanish acronym)	Law No. 20.429 – Executive Decree No. 302/1983 - RENAR's Disposition No. 140/2007.
Foreign Exchange Regulations	Registration to Import and Export	National Customs Administration	Argentine Customs Code.
Safety Inspection Regulations	Safety, Policy and Environment Control	Mining Agency of Santa Cruz Province	Section 242 of the Argentine Mining Code.
Mining Investments Regulations	Certificate of Mining Investment Registration	National Mining Secretary	Law No. 24.196 – Executive Decrees No. 2686/1993 and 1089/2003.

Subject Matter	Permits Required	Corresponding Government Authority	Applicable Legislation
	Fiscal Stability Certificate Registration as a Mining Producer Mineral Transportation Guides Request	National Mining Secretary Mining Agency of Santa Cruz Province Mining Agency of Santa Cruz Province	Law No. 24.196 – Executive Decrees No. 2686/1993 and 1089/2003. Provincial Law No. 1992 and Provincial Executive Decrees No. 2040/1992 and 1463/1994. Provincial Law No. 1992 and Provincial Executive Decrees No. 2040/1992 and 1463/1994.
Environmental Regulations	Provincial Registration as Generator, Transporter and Operator of Hazardous Waste National Registration as Generator and Operator of Hazardous Waste Request for Registration of PCB Transformation (*not anticipated for Cerro Negro at this time*)	Direction of Sustainable Development and Environmental Regulations of the Provincial Subsecretary of Environment National Secretary of Environment Provincial Subsecretary of Environment	Provincial Law No. 2.567 – Provincial Executive Decree No. 712/2002 – Provincial Law No. 2703. Law No. 24.051 – Executive Decree No. 831/1993 – Law No. 25.675. Provincial Subsecretary of Environment's Disposition No. 7-SMA/03.
Radio Communications Regulations	Radio Frequency Use Authorization – Radio Communications Antenna Installation	National Communications Commission	Schedule No. 4 of Executive Decree No. 764/2000.
Use of Hydrocarbon Regulations	Request for Registration for Outlets for Private Use and Storage Facilities for Hydrocarbon Fuel and Natural Compressed Gas Request for Storage and Permits for Fuel Tanks	Secretary of Energy - Subsecretary of Fuels Secretary of Energy, Subsecretary of Fuels	Secretary of Energy's Resolution No. 1102/2004. Secretary of Energy's Resolutions No. 404/1994 and 266/2008.
Use of Chemicals Regulations	Request for Registration of Chemicals Predecessors	Secretary for the Prevention of Drug Addiction and for the Surge against Drug Trafficking ("SEDRONAR" for its Spanish acronym)	Law No. 23.737 Law No. 26.045 SEDRONAR's Resolution No. 231/2001. SEDRONAR´s Disposition No. 1/2009
Labor Risks Related Regulations	Registration of Carcinogenic Substances Request for the Registration for the Prevention of Major Industrial Accidents	Superintendence of Labor Risk ("SRT"). SRT	SRT's Resolution No. 415/2002. SRT's Resolution No. 753/2003.
Transportation Regulations	Request for Passenger Transportation Permit Request for Cargo Transportation Permit Registration of motor vehicles Authorization for Road Construction that connects to a National Route	Direction of Transportation of the Province of Santa Cruz Direction of Transportation of the Province of Santa Cruz National Registry of Motor vehicles and Pledge Credits National Roads Direction	Provincial Law No. 799/1973 – Provincial Law No. 2992 – Provincial Executive Decree No. 364/1991 – Dispositions No. 49/2003 and 119/2003 of the General Direction of Transportation. National Law No. 24.449. Provincial Law No. 799/1973 – Provincial Executive Decree No. 364/1991 – Dispositions No. 49/2003 and 119/2003 of the General Direction of Transportation. National Law No. 24.449. Executive Decree No. 1114/1997 Law No. 505/1958

Subject Matter	Permits Required	Corresponding Government Authority	Applicable Legislation
Medical Facilities Regulations	Authorization of the Medical Service Facility of the Deposit	Provincial Social Affairs Ministry – Public Health Subsecretary – General Direction of Legal and Sanitary Audit.	Provincial Executive Decree No. 86/1980.
Energy Use Related Regulations	Permit for self-generation of Electricity	Secretary of Energy, National Organism for Electricity Control ("ENRE" for its Spanish acronym), and the appointed dispatch authority the Major Electricity Market Administrating Company ("CAMMESA" for its Spanish acronym)	Law No. 24.065.
	Admission as a member of the *Mercado Eléctrico Mayorista* (major users of energy).	Secretary of Energy, ENRE and CAMMESA	Secretary of Energy's Resolution No. 61/1992
	Authorization to access the SADI	Secretary of Energy, ENRE and CAMMESA	Secretary of Energy's Resolution No. 61/1992
Air Transport Regulations	Approval of the proposal for the installation of an air facility	Civil Airports National Administration	Law No. 19.030 – Executive Decree No. 239/2007.
	Authorization to operate an Airstrip. Registration of Airstrip operators.	Direction of Aerial Transit ("DTA" for its Spanish acronym) - Civil Airports National Administration	Law No. 19.030 – Executive Decree No. 239/2007. DTA's Disposition No. 95/2005.

20.9 Comments on Section 20

Environmental baseline studies and on-going environmental monitoring exceed the minimum requirements of the various regulatory agencies. Reporting is current and in accordance with Argentine law.

At the effective date of this Report, environmental liabilities are limited to those that are expected to be associated with three underground mines, mill, associated infrastructure, and exploration projects.

The closure plan is currently conceptual, but a detailed plan is in progress. Estimated closure costs are reasonable.

All required State and Federal permits are in hand. Compliance with the permits is closely monitored. Applications for new permits are submitted in a timely manner to ensure no stoppages because of the lack of permits.

As of the effective date of this report, the QPs consider relations with local communities to be good. The Project enjoys broad support from the community. Investment in the local community is significant and will continue.

Labor unions are very strong in Argentina and labor actions are frequent occurrences in the country. A small number of labor actions, both legal and illegal, have occurred at Cerro Negro causing production stoppages. Labour actions are likely to occur in the future and may pose a risk to estimated production.

21.0 CAPITAL AND OPERATING COSTS

21.1 Capital Cost Estimates

All capital expended prior to 1 January 2016 was considered as initial project capital ("sunk" capital), either spent or committed to be spent, and so was not included in the economic evaluation. Exploration expenditures were not included in the financial analysis. Exploration drilling will be performed in the future to target mineralization that may lead to an increase in Mineral Resources and Reserves. Because these future exploration drilling expenditures do not pertain to the current Mineral Reserves, they were not included in the financial model.

Capital costs are based on the latest mine construction data, budgetary figures and quotes provided by suppliers. Capital cost estimates include funding for infrastructure, mobile equipment, development and permitting, and miscellaneous costs. Infrastructure requirements were incorporated into the estimates as needed. Sustaining capital costs reflect current price trends. Inflationary impacts are expected to be offset by local currency devaluation in the financial analysis.

The sustaining and expansionary capital cost estimates are included as Table 21-1.

21.2 Operating Cost Estimates

Operating costs were estimated by Goldcorp personnel, and are based on the draft of the 2016 life-of-mine (LOM) budget available when Mineral Reserves were calculated. Labour cost estimation is based on Goldcorp's 2015 salary scale and fringe benefits in force, as well as expected inflation in 2016. Mining consumables are based on 2015 costs and contracts and the costs for future operational consumables (such as mill reagents, and grinding media) are based on recent supplier quotations.

The operating cost estimate over the LOM is presented in Table 21-2 and includes allocations for processing and overhead costs.

The estimated average annual operating cost is US$154/t once the mine reaches steady-state production. This consists of US$38/t for processing, US$55/t for mining, US$59/t for general and administrative costs, and $2/t for other costs.

Inflation of future capital and operating costs in local currency is expected to be offset by devaluation of the local currency with respect to the US$.

Table 21-1: Capital Cost Estimate

Area	Life-of-Mine (US$ million)
Sustaining	903.6
Expansionary	1.6
Grand Total	***905.2***

Note: Exploration is not included. Sustaining expenditures includes development.

Table 21-2: Operating Cost Estimate

Area	Life-of-Mine (US$/t)
Process Plant	38.00
Mining Operations	55.00
General & Administration	59.00
Other costs	2.00
Grand Total	***154.00***

21.3 Comments on Section 21

The capital cost estimates are based on a combination of quotes, vendor pricing, and Goldcorp's experience with the Cerro Negro Operations. The capital cost estimates include direct and indirect costs.

Operating costs were based on estimates from first principles for major items; the costs include allowances or estimates for minor costs.

22.0 ECONOMIC ANALYSIS

Goldcorp is using the provision for producing issuers, whereby producing issuers may exclude the information required under Item 22 for technical reports on properties currently in production.

Mineral Reserve declaration is supported by a positive cashflow.

22.1 Comments on Section 22

The operations demonstrate positive economics over the life-of mine.

23.0 ADJACENT PROPERTIES

This section is not relevant to this Report.

24.0 OTHER RELEVANT DATA AND INFORMATION

This section is not relevant to this Report.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 Introduction

In the opinion of the responsible QPs, the following interpretations and conclusions are appropriate to the current status of the Project.

25.2 Mineral Tenure, Surface Rights, Agreements, and Royalties

- Information from legal experts and Goldcorp's in-house experts support that the mining tenure held is valid and sufficient to support a declaration of Mineral Resources and Mineral Reserves;
- Goldcorp currently holds sufficient surface rights in the Project area to support the mining operations, including provisions for access and power lines;
- Goldcorp has access and occupation agreements (easements) with the owners of La Unión, Los Tordos, Cerro Negro, and El Retiro estancias in force; these agreements allow company access to ground that it does not control and allow certain mining and exploration activities to be conducted;
- The Newcrest $1 million royalty has been paid. A net royalty of 3% is payable to the Province of Santa Cruz for the life of the mine, adjusted for certain costs. Goldcorp is obligated to an additional voluntary contribution to the Province based on monthly sales. The additional royalty is based on a sliding scale of up to 1%and the price of gold set by the LBMA. A voluntary royalty of 1% of net earnings is payable to the municipality of Perito Moreno for the life of the mine. A 0.6% Bank Transaction Fee applies to all transactions except receipt of revenues derived from exports;
- Goldcorp is not aware of any significant environmental, social or permitting issues that would prevent continued exploitation of the Project deposits.

25.3 Geology and Mineralization

- Knowledge of the deposit settings and lithologies, as well as the structural and alteration controls on mineralization and the mineralization style and setting, is sufficient to support Mineral Resource and Mineral Reserve estimation;
- Deposits within the Cerro Negro Operations are considered to be examples of epithermal gold–silver deposits.

25.4 Exploration, Drilling and Data Analysis

- The exploration programs completed to date are appropriate to the style of the deposits identified within the Project. The research work supports Goldcorp's genetic and affinity interpretations for the deposits;
- Sampling methods are acceptable, meet industry-standard practice, and are acceptable for Mineral Resource and Mineral Reserve estimation and mine planning purposes;
- The quality of the gold, silver, and base metals analytical data is reliable and sample preparation, analysis, and security are generally performed in accordance with exploration best practices and industry standards;
- The quantity and quality of the lithological, geotechnical, collar and down-hole survey data collected during the exploration and delineation drilling programs are sufficient to support Mineral Resource and Mineral Reserve estimation. The collected sample data adequately reflect deposit dimensions, true widths of mineralization, and the style of the deposits. Sampling is representative of the metal grades in the deposits, reflecting areas of higher and lower grades;
- The QA/QC programs adequately address issues of precision, accuracy and contamination. Drilling programs typically included blanks, duplicates and SRM samples. QA/QC submission rates meet industry-accepted standards. The QA/QC programs did not detect any material sample biases;
- The data verification programs concluded that the data collected from the Project adequately support the geological interpretations and constitute a database of sufficient quality to support the use of the data in Mineral Resource and Mineral Reserve estimation;
- Exploration potential remains within the extensive Cerro Negro Operations area. The veins for which Mineral Resources have been estimated to date are still deemed to have potential for expansion either along strike or down dip. Significant potential exists to increase the known mineralization of the West Belt by continued drilling of the currently known gold–silver-bearing quartz veins. Exploration of known veins in the East Belt is continuing.

25.5 Metallurgical Testwork

- Metallurgical testwork and associated analytical procedures were performed by recognized testing facilities, and the tests performed were appropriate to the type of mineralization;

- Metallurgical testwork has shown that the mineralization is amenable to being processed using conventional technologies, and acceptable recoveries were returned;
- Projected recoveries have been supported by plant performance data.
- No known deleterious elements are present. High clay-content materials have required blending. A review of carbon content of some ores is under consideration as there are currently no carbon data.

25.6 Mineral Resource Estimation

- The Mineral Resource estimation for the Project conforms to industry practices and meets the requirements of CIM (2014);
- Factors which may affect the Mineral Resource estimates include metal prices and exchange rate assumptions, assumptions which are used in the LG shell constraining Mineral Resources, including mining, processing and G&A costs, metal recoveries, geotechnical and hydrogeological assumptions, and assumptions that the operation will maintain the social licence to operate.

25.7 Mineral Reserve Estimation

- The Mineral Reserve estimation for the Project conforms to industry practices and meets the requirements of CIM (2014);
- Factors which may affect the Mineral Reserves estimates are: metal price and exchange rate assumptions, capital and operating cost assumptions, royalties and taxes, geotechnical stability and dilution assumptions, hydrogeological constraints, geological interpretations, environmental and permitting status, and maintaining a social license to operate.

25.8 Mine Plan

- The proposed mine life is 11 years;
- Mining operations can be conducted year-round;
- Underground mining is primarily conducted using transverse and longitudinal long-hole sublevel stoping. Two underground mines are operational, at Eureka and Mariana Central;
- Conventional open pit truck and loader techniques are planned to be used at the Vein Zone;

- The production rate is 4,000 t/d over the LOM once Mariana Norte mine begins production. Production forecasts are achievable with the current equipment and plant, replacements have been acceptably scheduled;
- There is some upside for the Project if the Inferred Mineral Resources that are identified within the Mineral Resource open pit can be upgraded to higher confidence Mineral Resource categories;
- As part of day-to-day operations, Goldcorp will continue to undertake reviews of the mine plan and consideration of alternatives to and variations within the plan. Alternative scenarios and reviews may be based on ongoing or future mining considerations, evaluation of different potential input factors and assumptions, and corporate directives.

25.9 Process Plan

- The process plant uses conventional design and conventional technology to produce doré;
- The throughput is designed for 4,000 t/d; however, insufficient ore is currently available from the mining operations for this capacity, due to the ramp-up phase, and the plant is currently operating at about 3,590 t/d.

25.10 Infrastructure Considerations

- The current built infrastructure will support the current mining activities;
- Additional infrastructure will be required to support the planned future underground mines and Vein Zone open pit mine.

25.11 Markets and Contracts

- Doré production from the Cerro Negro Operations is marketed in a similar manner to, and use similar sales contracts to, that of existing Goldcorp operations.

25.12 Environmental, Social Issues and Permitting

- Goldcorp has sufficiently addressed the environmental impact of the operation, and subsequent closure and remediation requirements that Mineral Resources and Mineral Reserves can be declared, and that the mine plan is appropriate and achievable;
- Closure provisions are appropriately considered in the mine plan;
- Permits held by Goldcorp for the Project are sufficient to ensure that mining activities within the Project are conducted within the regulatory framework required by the

Argentinean Government and the Province of Santa Cruz, and that Mineral Resources and Mineral Reserves can be declared.

25.13 Capital and Operating Cost Estimates

- The capital cost estimates are based on a combination of quotes, vendor pricing, and Goldcorp experience with similar-sized operations;
- Capital costs total US$905.2 million, comprising US$903.6 million of sustaining capital and US$1.6 million of expansionary capital over the life-of-mine;
- An average unit operating cost of US$154/t was estimated over the life-of-mine.

25.14 Financial Analysis

- Using the assumptions detailed in this Report, the Cerro Negro Operations have positive economics until the end of the mine life documented in the Mineral Reserves mine plan, which supports Mineral Reserve estimation.

25.15 Conclusions

- In the opinion of the responsible QP, the Cerro Negro Operations that are outlined in this Report have met corporate objectives in that Mineral Resources and Mineral Reserves have been estimated, and a mine has been constructed;
- Inferred Mineral Resources above the cutoff grade were treated as “waste” in this evaluation. This mineralization represents upside potential for the Cerro Negro Operations if some or all of the Inferred Mineral Resources identified within the LOM production plan can be upgraded to higher-confidence Mineral Resource categories, and eventually to Mineral Reserves.

26.0 RECOMMENDATIONS

26.1 Introduction

The recommended work programs include continued exploration and sequenced mine development. These comprise two phases of work, and the elements of each phase can be conducted concurrently, with no program dependent on the results of another. The total cost of the exploration and development work programs in the first phase of work is in the range of US$60–80 million annually for the next five years (2016–2021); planned capital development expenditure in the second phase of work for 2016 is about US$50 million.

26.2 Exploration

Drilling campaigns are planned for the next several years at the Cerro Negro Operations. Six surface core drills were active during the first three quarters of 2015 and drilling will continue in 2016 with three drills initially. The 2016 drilling program budget is in the range of $15–20 million. Similar expanded drilling programs and budget ranges are anticipated for the next five years to 2021. Exploration activities will be dominated by core drilling, assays, and geological investigations.

The exploration program is aimed at identifying additional mineralization and supporting estimation of Indicated Mineral Resources.

26.3 Mine Development

Additional development is required to sustain production levels at both the Eureka and Mariana Central mines. Further development may be required if additional Mineral Resources are identified or Inferred Mineral Resources are converted and brought into Mineral Reserves. Development will continue at Mariana Norte in 2016 in order to prepare the mine for production in 2017. The total budgeted capital expenditure for development in 2016 is about US$50 million.

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