Pre-Feasibility Study of the Ixtaca Gold-Silver Project Puebla State, Mexico

Submitted to:
Almaden Minerals Ltd.

Effective Date: 17 May 2017

Submitted By:	**Company:**
Jesse Aarsen, P.Eng.	Moose Mountain Technical Services
Kristopher Raffle, P.Geo.	Apex Geoscience Ltd
G.H. Giroux, P.Eng.	Giroux Consultants Ltd
Tracey Meintjes, P.Eng.	Moose Mountain Technical Services
Ken Embree, P.Eng.	Knight Piésold Ltd

DATE & SIGNATURE PAGES

I, **Tracey Meintjes, P.Eng.**, of Vancouver B.C. certify that I have overseen the assembly of this Technical Report titled "***Preliminary Feasibility Study of the Ixtaca Project***" dated 17 May 2017. I have relied on the expert opinions of the Qualified Persons listed in the report for areas outside of my relevant experience. This report fairly and accurately represents the information that has been made available to myself as of the date of the report and complies with the National Instrument 43-101 standards.

"ORIGINAL SIGNED AND SEALED"

Tracey Meintjes P.Eng

Dated the 17th day of May 2017.

CERTIFICATE & DATE

I, Jesse J. Aarsen, B.Sc. Mining Engineering, P.Eng., of Penticton B.C. do hereby certify that:

1. I am an Associate (Mining Engineer) with Moose Mountain Technical Services with a business address of 1975-1st Avenue South, Cranbrook BC, V1C 6Y3.
2. This certificate applies to the technical report entitled "Preliminary Feasibility Study of the Ixtaca Gold-Silver Project" dated 17 May 2017 (the "Technical Report")
3. I graduated with a Bachelor of Science degree in Mining Engineering Co-op from the University of Alberta in April 2002.
4. I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (#38709).
5. I have worked as a mining engineer for a total of 13 years since my graduation from university. I have also taken a 2 year period for personal travel throughout the world. My relevant experience for the purpose of the Technical Report includes:
    - 2002 to 2005 – employed at complex coal mine in the Elk Valley working as a short range, long range, dispatch, and pit engineer. Preparation of budget levels mine plans and cost inputs, oversaw operation of personal designs and acting in supervisory-role positions as needed.
    - Since 2007 – Consulting mining engineer specializing in mine planning and project development. Completion of mine plans for complex coal operating mines in north-eastern British Columbia and an open-pit copper/molybdenum mine in central British Columbia. Supervisory role in large multi-disciplinary studies for projects in both coal and hard-rock settings in Canada and Mongolia. Responsible for building several coal geology and block models and calculation of mineral resources under the supervision of a P.Geo.
6. I have read the definition of "qualified person" set out in National Instrument 43-101 ("the Instrument") and certify that by reason of my education, affiliation with a professional associations and past relevant work experience, I am a "Qualified Person" for the purposes of the Instrument.
7. I have visited the site on April 30-May 01, 2013, August 27-28, 2014, March 15-16, 2016 and Dec 12-16, 2016.
8. I have prepared and am responsible for the mining, components of Chapter 1, 25 and 26; as well as Chapters 15 and 16 of the Technical Report.
9. I am independent of Almaden Minerals applying the tests in Section 1.5 of the Instrument.
10. I have been involved with the Ixtaca Project during the preparation of previous Technical Reports.
11. I have read the Instrument, and the Technical Report has been prepared in compliance with the Instrument.
12. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated the 17th day of May 2017

"ORIGINAL SIGNED AND SEALED"

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Signature of Qualified Person

Jesse J. Aarsen, B.Sc., P.Eng.

I, Kristopher J. Raffle, B.Sc., P.Geo., of Vancouver B.C. do hereby certify that:

1. I am a Principal (Geologist) of APEX Geoscience Ltd. with a business address 200-9797, 45 Avenue, Edmonton, Alberta, Canada T6E-5V8.
2. This certificate applies to the technical report entitled "Preliminary Feasibility Study of the Ixtaca Gold-Silver Project" dated 17 May 2017 (the "Technical Report").
3. I graduated with a Bachelor of Science degree in Geology (Honours) from the University of British Columbia in 2000.
4. I am a member of the Association of Professional Engineers and Geoscientists of British Columbia (#31400).
5. I have worked as an exploration geologist for a total of 14 years since my graduation from university. My relevant experience for the purpose of the Technical Report includes:
    - I have supervised numerous exploration programs specific to low sulphidation epithermal gold-silver deposits having similar geologic characteristics to the Tuligtic Property throughout British Columbia, Canada; and Jalisco, Nayarit and Puebla States, Mexico.
    - I have authored three previous Technical Reports with respect to the Tuligtic Property dated March 13, 2013, February 12, 2014, and January 22, 2016.
    - During 2013 and 2014, I supervised the compilation of surface geological, geochemical, and geophysical and data for the Tuligtic Property, and conducted a review and audit of Almaden's drill hole and QA/QC databases.
6. I have read the definition of "qualified person" set out in National Instrument 43-101 ("the Instrument") and certify that by reason of my education, affiliation with a professional associations and past relevant work experience, I am a "Qualified Person" for the purposes of the Instrument.
7. I have visited the site on three (3) separate occasions: October 17-20, 2011; September 23, 2012 and most recently on November 20, 2013.
8. I have prepared and am responsible for Chapters 2 through 12, 23, 24 and 27; including relevant portions of Chapters 1 and 26 of the Technical Report.
9. I am independent of Almaden Minerals applying the tests in Section 1.5 of the Instrument.
10. I have had no previous involvement with the Property that is the subject of the Technical Report than that which is stated in 5 and 7 above.
11. I have read the Instrument, and the Technical Report has been prepared in compliance with the Instrument.
12. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated the 17th day of May 2017

"ORIGINAL SIGNED AND SEALED"

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Signature of Qualified Person

Kristopher J. Raffle, B.Sc., P.Geo.

I, G.H. Giroux, P.Eng. MASc, of Vancouver B.C., do hereby certify that:

1. I, G.H. Giroux, of 982 Broadview Drive, North Vancouver, British Columbia, do hereby certify that:
2. I am a consulting geological engineer with an office 982 Broadview Dr. North Vancouver, British Columbia.
3. I am a graduate of the University of British Columbia in 1970 with a B.A. Sc. and in 1984 with a M.A. Sc., both in Geological Engineering.
4. I am a member in good standing of the Association of Professional Engineers and Geoscientists of the Province of British Columbia.
5. I have practiced my profession continuously since 1970. I have had over 40 years' experience estimating mineral resources. I have previously completed resource estimations on a wide variety of precious metal deposits both in B.C. and around the world, many similar to the Ixtaca project.
6. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, past relevant work experience and affiliation with a professional association (as defined in NI 43-101), I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
7. I am responsible for the preparation of Section 14 and relevant portions of Chapters 1 and 26 of the Technical Report titled "Preliminary Feasibility Study of the Ixtaca Gold-Silver Project" dated 17 May 2017 (the "Technical Report").
8. I have not visited the Property.
9. I have completed previous resource estimates on the Property that is the subject of the Technical Reports in 2013 and 2014.
10. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the portions of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading.
11. I am independent of the issuer applying all of the tests in Section 1.5 of NI 43-101.
12. I have read NI 43-101, and the portions of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101.

Dated the 17th day of May 2017

"ORIGINAL SIGNED AND SEALED"

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Signature of Qualified Person
G. H. Giroux, P.Eng., MASc.

I, Tracey Meintjes, P.Eng., of Vancouver B.C. do hereby certify that:

1. I am a Metallurgical Engineer with Moose Mountain Technical Services with a business address at 1975 1st Avenue South, Cranbrook, BC, V1C 6Y3.
2. This certificate applies to the technical report entitled "Preliminary Feasibility Study of The Ixtaca Project" dated 17 May 2017 (the "Technical Report").
3. I am a graduate of the Technikon Witwatersrand, (NHD Extraction Metallurgy – 1996)
4. I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (#37018).
5. My relevant experience includes process engineering and supervision in South Africa and North America. My precious metals project experience includes both operations and metallurgical process development. I have been working in my profession continuously since 1996.
6. I am a "Qualified Person" for the purposes of National Instrument 43-101 (the "Instrument").
7. I visited the Property from 01 July 2014 to 02 July 2014, 15 March 2016 to 16 March 2016 and 04 October 2016 to 05 October 2016.
8. I am responsible for Sections 13, 17, 18.1 to 18.4, 19, 21 and 22; including metallurgical and processing portions of Chapters 1,25 and 26 of the Technical Report.
9. I am independent of Almaden Minerals as defined by Section 1.5 of the Instrument.
10. I have been involved with the Ixtaca Project during the preparation of previous Technical Reports.
11. I have read the Instrument and the Technical Report has been prepared in compliance with the Instrument.
12. As of the date of this certificate, to the best of my knowledge, information, and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated the 17th day of May 2017

"ORIGINAL SIGNED AND SEALED"

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Signature of Qualified Person

Tracey D. Meintjes, P.Eng.

I, Ken Embree, P.Eng., of Vancouver B.C. do hereby certify that:

1. I am consulting geological engineer employed as Managing Principal at Knight Piésold Ltd. with an office at 1400 – 750 West Pender St, Vancouver, BC Canada.
2. I am a graduate of the University of Saskatchewan with a Degree (B.A.Sc.) in Geological Engineering, 1986.
3. I have practiced my profession continuously since 1986.
4. I am a Professional Engineer (17,439) in good standing with the Association of Professional Engineers and Geoscientists of British Columbia and Professional Engineers of Ontario (100040332).
5. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am independent of the Issuer and related companies applying all of the tests in Section 1.5 of the National Instrument 43-101;
7. I am responsible for and/or shared responsibility for Section numbers 18.6 and 20; and including relevant portions of Chapters 1 and 26 of the Technical Report titled “Preliminary Feasibility Study of the Ixtaca Gold-Silver Project” dated 17 May 2017 (the “Technical Report”).
8. I visited the Ixtaca Project site on March 10 to 12, 2015, March 15 to 16, 2016 and October 4 to 5, 2016.
9. I have been involved with the Ixtaca Project during the preparation of previous Technical Reports.
10. As of the date of this certificate, to the best of my knowledge, information and belief, this Technical Report contains all scientific and technical information that is required to be disclosed to make the portions of the Technical Report for which I am responsible not misleading;
11. I am independent of the issuer applying all the tests in Section 1.5 of NI 43-101.
12. I have read NI 43-101, and the portions of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

Dated the 17th day of May 2017

“ORIGINAL SIGNED AND SEALED”

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Signature of Qualified Person
Ken Embree, P.Eng.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 Summary

1.1 Introduction

This Technical Report on the Preliminary Feasibility Study ("PFS") of the Ixtaca Gold-Silver Project (the "Project") has been prepared for Almaden Minerals Ltd. ("Almaden" or "the Company") by Moose Mountain Technical Services ("MMTS") in conjunction with APEX Geoscience Ltd., Giroux Consultants Ltd, ("GCL") and Knight Piésold Ltd. ("KP"). The Ixtaca Project is 100% owned by Almaden, subject to a 2% NSR owned by Almadex Minerals Limited ("Almadex"), and encompasses the Ixtaca Zone Deposit (Ixtaca Gold-Silver Deposit) that includes the Ixtaca Main, North, and Chemalaco Zones of the Tuligtic Property.

All currency amounts are referred to in U.S. dollars (USD) unless otherwise indicated.

The PFS uses:

- An updated resource model;
- The Rock Creek Mill with average throughput of 7,650 tonnes per day;
- A throughput rampup to 15,300 tonnes per day in Year 5;
- Smaller, payback focussed starter pits;
- A mine production schedule which targets higher grades earlier;
- Base case metal prices of $US 1250/oz gold and $US 18/oz silver (69:1 silver-to-gold ratio).

PFS highlights**:**

- Proven and Probable Mineral Reserves of 65 million tonnes averaging 0.62 g/t gold and 37.8 g/t silver (average head grade of 1.16 g/t gold equivalent using a 69:1 silver to gold ratio);
- Total LOM production of 1.04 million ounces of gold and 70.9 million ounces of silver doré produced on site (2.07 million gold equivalent ounces, or 143 million silver-equivalent ounces at a 69:1 silver to gold ratio);
- Average annual production over the first 9 years of 88,780 ounces gold and 5.47 million ounces silver (168,100 gold equivalent ounces, or 11.6 million silver equivalent ounces);
- Initial Capital is $116.9 Million;
- Operating cost $706 per gold equivalent ounce, or $10.20 per silver equivalent ounce;
- All-in Sustaining Costs ("AISC"), including operating costs, sustaining capital, expansion capital, private and public royalties, refining and transport of $862 per gold equivalent ounce, or $12.50 per silver equivalent ounce.
- After-tax payback of initial capital in 2.2 years.
- Pre-tax NPV(5%) of $484 million and internal rate of return of 54%;
- After-tax NPV(5%) of $310 million and internal rate of return of 41%;

1.2 Property Description and Location

The Tuligtic Property (the "Property" or the "Tuligtic Property") is held 100 percent (%) by Compania Minera Gorrión S.A. de C.V. (Minera Gorrión), a wholly owned subsidiary of Almaden Minerals Ltd. (together referred to as "Almaden"). The Property originally consisted of approximately 14,000 hectares, but during 2015 Almaden filed an application to reduce the aggregate claim size to those areas still considered prospective. The Tuligtic Property currently comprises seven mineral claims totalling 7,220 hectares (ha) located within Puebla State, 80 kilometres (km) north of Puebla City, and 130km east of Mexico City. Almadex Minerals Limited holds a 2% Net Smelter Return Royalty (NSR) on the Property.

1.3 Accessibility, Climate, Local Resources, Infrastructure, Physiography

The Tuligtic Property is road accessible and is located within Puebla State, 80 kilometres (km) north of Puebla City, and 130km east of Mexico City. The Ixtaca Deposit within the Tuligtic Property is located 8km northwest of the town of San Francisco Ixtacamaxtitlán, the county seat of the municipality of Ixtacamaxtitlán, Puebla State.

The topography on the Tuligtic Property is generally moderate to steep hills with incised stream drainages. Elevation ranges from 2,300 metres (m) above sea level in the south to 2,800m in the north. Vegetation is dominantly cactus and pines and the general area is somewhat cultivated with subsistence vegetables, bean and corn crops. The region has a temperate climate with average temperatures ranging from 16°C in June to 12°C in December. The area experiences an average of 600 to 720 mm of precipitation annually with the majority falling during the rainy season, between June and September.

Electricity is available on the Property from the national electricity grid that services nearby towns such as Santa Maria and Zacatepec.

Almaden has secured through purchase agreements roughly 1,018 hectares from numerous independent owners, the majority of that required for the proposed production plan. This was completed through friendly land purchase agreements with locals, considering fair market value. There are no communities that require relocation as part of the Project development. Mineral Claim owners have the right to obtain the temporary occupancy, or creation of land easements required to carry out exploration and mining operations, under the Federal Mining Law.

1.4 History

Throughout the Property there is evidence that surficial clay deposits have once been mined prior to Almaden's acquisition of the project. Almaden acquired the Cerro Grande claims of the Tuligtic Property by staking in 2001 following the identification of surficial clay deposits that have been interpreted to represent high-level epithermal alteration. Subsequent geologic mapping, rock, stream silt, soil sampling, and induced polarization (IP) geophysical surveys identified porphyry copper and epithermal gold targets within an approximately 5 x 5km area of intensely altered rock. In July 2010, Almaden initiated a diamond drilling program to test epithermal alteration within the Tuligtic Property, resulting in the discovery of the Ixtaca Zone. The first hole, TU-10-001 intersected 302.42 metres (m) of 1.01g/t Au and 48g/t Ag and multiple high grade intervals including 44.35m of 2.77g/t Au and 117.7g/t Ag.

1.5 Geological Setting and Mineralization

The Tuligtic Property covers a roughly 5 by 5 kilometre area of high level epithermal alteration characterised by intense kaolinite-alunite alteration and silicification in volcanic rocks. This alteration is interpreted to represent the upper portion of a well preserved epithermal system.

The epithermal system is hosted by both volcanic rocks and older carbonate units. Minor disseminated and vein mineralisation is hosted by the volcanic rocks (referred to as tuff, ash and volcanics). The bulk of the deposit is hosted by the carbonate units as vein swarms.

Within the Tuligtic Property, variably cherty and bedded light grey to dark coloured limestone (referred to as limestone) of the Late Jurassic to Early Cretaceous Upper Tamaulipas formation is underlain by transitional calcareous clastic rocks including minor brown grainstones, and thinly bedded grey, black and green coloured shaley units (referred to as shale or black shale). The brown grainstone marks the transition between limestone and shale. During the Laramide orogeny, this entire carbonate package was intensely deformed into a series of thrust-related east verging anticlines. The shale units appear to occupy the cores of the anticlines while the limestone units occupy the cores of major synclines at the Ixtaca Zone. The carbonate units are crosscut by intensely altered intermediate composition dykes. The deformed Mesozoic sedimentary sequence is discordantly overlain by epithermal altered Cenozoic bedded crystal tuff of the upper Coyoltepec subunit (referred to as volcanic, ash and tuff).

The Ixtaca deposit is a low sulphidation epithermal vein system. Most of the gold silver mineralisation occurs as zones of high grade vein and veinlets (vein swarms) in the carbonate basement units. A small portion of the gold silver mineralisation occurs above the unconformity as disseminated mineralisation in the altered volcanic rocks. The mineralisation is not oxidised and is hosted by classic banded and colloform low-sulphidation style carbonate-quartz veining. Spatially widespread polished section and SEM mineralogic studies of mineralised epithermal veins demonstrate that the gold is dominantly hosted by electrum (an alloy of gold and silver) and the gold-silver sulphide uytenbogaardtite ($Ag3,AuS$). Apart from electrum and uytenbogaardite, the dominant silver minerals are silver rich polybasite, pyrargerite, proustite and naumannite. The ore minerals are accompanied by minor pyrite, galena (no silver detected in the SEM work on the galena) and sphalerite. The mineral assemblage is very similar to other precious metal low sulphidation vein systems worldwide with low base metal contents.

To date two main vein orientations have been identified in the Ixtaca deposit:

- 060 degrees trending sheeted veins hosted by limestone;
- 330 degrees trending veins hosted by shale;

The bulk of the resource and over 80% of the recoverable metal in the PFS is hosted by the limestone in the Main Ixtaca and Ixtaca North zones as swarms of sheeted and anastomosing high grade banded epithermal veins. There is no disseminated mineralisation within the host rock to the vein swarms, which is barren and unaltered limestone. To the northeast of the limestone hosted mineralisation, the Chemalaco zone, a 330 striking and west dipping vein zone hosted by shale, also forms part of the deeper resource.

The Main Ixtaca and Ixtaca North vein swarms are spatially associated with two altered and mineralised sub parallel ENE (060 degrees) trending, sub-vertical to steeply north dipping dyke zones. The Main Ixtaca dyke zone is approximately 100m wide and consists of a series of 2m to over 20m true width dykes. The Ixtaca North dyke zone is narrower and comprises a steeply north-dipping zone of two or three discrete dykes ranging from 5 to 20m in width.

Individual veins within the Main Ixtaca and Ixtaca North vein zones cannot be separately modelled. Wireframes were created that constrain the higher grade, more densely veined areas, however as the vein swarms are anastomosing and sheeted in nature, these wireframes include significant barren limestone material enclosed by veins within the vein swarm.

The Main and North zones have been defined over 650m and tested over 1000m strike length with high-grade mineralization intersected to depths up to 350m vertically from surface. The strike length of the Chemalaco Zone has been extended to 450m with high-grade mineralization intersected to a vertical depth of 550m, or approximately 700m down-dip. In 2016 Almaden conducted a drill program to test for additional veins to the north of the Ixtaca North Zone. This program resulted in better definition of the Ixtaca North zone and was successfully demonstrated that limestone mineralisation remains open to the north and at depth.

The Chemalaco Zone dips moderately-steeply at approximately 22 degrees to the WSW. An additional sub-parallel zone has been defined underneath the Chemalaco Zone dipping 25 to 50 degrees to the WSW, intersected to a vertical depth of 250m, approximately 400m down-dip over a 250m strike length. The Chemalaco zone remains open to depth and along strike to the northwest. Additional parallel veins further to the east have been identified in core and the zone is remains open in this direction as well.

1.6 Exploration

Between 2001 and 2013, Almaden's exploration at the Tuligtic Property included geologic mapping and prospecting, alteration mineralogical characterization, rock and soil geochemical sampling, ground magnetics, IP and resistivity, Controlled Source Audio-frequency Magnetotelluric (CSAMT), and Controlled Source Induced Polarization (CSIP) geophysical surveys resulting in the identification of additional anomalous zones including the Ixtaca, Ixtaca East, Caleva, Azul, and Sol zones. Since 2010, a total of 514 diamond drillholes have been drilled at the Tuligtic Property, totalling 166,944 m (not including metallurgical and geotechnical holes).

1.7 Drilling

The 230 holes drilled between July, 2010 and November 13, 2012 totalled 83,346m and identified the Main Ixtaca, Ixtaca North and Chemalaco zones. Diamond drilling at 25 to 50m section spacing defined the Main Ixtaca and Ixtaca North as NE-oriented sub-vertical zones and a strike length of approximately 650m. High-grade mineralization was intersected to depths of 200 to 300m vertically from surface. The Chemalaco Zone was identified as dipping moderately-steeply over a strike length of 350m along a series of five ENE (070 degrees) oriented sections spaced at intervals of 50 to 100m. High grade mineralization having a true-width ranging from less than 30 and up to 60m was intersected beneath approximately 30m of tuff to a vertical depth of 550m, or approximately 600m down-dip.

During 2013 and subsequent to the November 13, 2012 cut-off of the maiden mineral Resource Estimate, Almaden drilled 198 holes totalling 55,467m. A total of 79 holes were drilled at the Main Ixtaca Zone, 40 holes at the Ixtaca North Zone and 79 holes at the Chemalaco Zone. Drilling during 2013 focused on expanding the deposit and upgrading resources previously categorized as Inferred to higher confidence Measured and Indicated categories.

Drilling during 2014 and 2015, subsequent to the current Resource Estimate, Almaden had completed 52 additional drill holes totalling 17,128m (49 within the Ixtaca Deposit and 3 exploration drill holes outside the Ixtaca Deposit. Of the holes drilled within the Ixtaca Deposit during 2014 through 2016, 4 were metallurgical holes that twinned existing holes. The remainder were exploration holes testing mineralized zones at depth.

Drilling during 2014 through 2016 comprised 86 additional drill holes totalling 28,131m (including 3 exploration drill holes at the (Casa) Azul Zone, and 1 at the Tano Zone). Of the holes drilled within the Ixtaca Deposit during 2014, 2015, and 2016, 4 were metallurgical holes that twinned existing holes and 27 were geotechnical holes. During 2016 a total of 33 holes totalling 10,514m further delineated and expanded the Ixtaca North Zone mineralization as well as identifying new veins to the north and at depth. The remainder were exploration holes testing mineralized zones at depth below the PEA pit described in this report. Past drilling at the Casa Azul zone intersected porphyritic intrusive and limestone-skarn mineralization returning locally elevated zinc, copper and silver values.

1.8 Sample Preparation, Analyses and Security

All strongly altered or epithermal-mineralized intervals of core have been sampled. Almaden employs a maximum sample length of 2 to 3m in unmineralized lithologies, and a maximum sample length of 1m in mineralized lithologies. During the years 2010 and 2011 Almaden employed a minimum sample length of 20cm. The minimum sample length was increased to 50cm from 2012 onwards to ensure the availability of sufficient material for replicate analysis. Drill core is half-sawn using industry standard diamond core saws. After cutting, half the core is placed in a new plastic sample bag and half are placed back in the core box. Sample numbers are written on the outside of the sample bags and a numbered tag placed inside the bag. Sample bags are sealed using a plastic cable tie. Sample numbers are checked against the numbers on the core box and the sample book.

ALS Minerals (ALS) sends its own trucks to the Project to take custody of the samples at the Santa Maria core facility and transports them to its sample preparation facility in Guadalajara or Zacatecas, Mexico. Prepared sample pulps are then forwarded by ALS personnel to the ALS North Vancouver, British Columbia laboratory for analysis.

Drill core samples have been subject to gold determination via a 50 gram (g) AA finish FA fusion with a lower detection limit of 0.005ppm Au (5ppb) and upper limit of 10ppm Au (ALS method Au-AA24). Over limit gold values (>10ppm Au) are subject to gravimetric analysis (ALS method Au-GRA22). Silver, base metal and pathfinder elements for drill core samples are analyzed by 33-element ICP-AES, with a 4-acid digestion, a lower detection limit of 0.5ppm Ag and upper detection limit of 100ppm Ag (ALS method ME-ICP61). Over limit silver values (>100ppm Ag) are subject to 4-acid digestion ICP-AES analysis with an upper limit of 1,500ppm Ag (ALS method ME-OG62). Ultra-high grade silver values (>1,500ppm Ag) are subject to gravimetric analysis with an upper detection limit of 10,000ppm Ag (Ag-GRA22).

Drill core samples are subject to Almaden's internal QA/QC program that includes the insertion of analytical standard, blank and duplicate samples into the sample stream. A total of fifteen QA/QC samples are present in every 100 samples sent to the laboratory. QA/QC sample results are reviewed following receipt of each analytical batch. QA/QC samples falling outside established limits are flagged and subject to review and possibly re-analysis, along with the ten preceding and succeeding samples.

1.9 Data Verification

Mr. Kristopher J. Raffle, P.Geo., first visited the Tuligtic Property from October 17 to October 20, 2011. Additional visits to the Tuligtic Property have been carried out by Mr. Raffle on September 23, 2012 and

November 20, 2013. During each of the property visits Mr. Raffle completed a traverse of the Ixtaca Zone, observed the progress of ongoing diamond drilling operations, and recorded the location of select drill collars. Almaden's complete drill core library has been made available and Mr. Raffle reviewed mineralized intercepts from a series of holes across the Ixtaca Zone. Mr. Raffle has collected quartered drill core samples as 'replicate' samples from select reported mineralized intercepts.

Based on the results of the traverses, drill core review, and 'replicate' sampling Mr. Raffle has no reason to doubt the reported exploration results. The analytical data is considered to be representative of the drill samples and suitable for inclusion in the Resource Estimate. In addition to the in-house Quality Assurance Quality Control (QAQC) measures employed by Almaden, Kris Raffle, P.Geo. of APEX Geoscience Ltd., completed an independent review of Almaden's drillhole and QAQC databases. The review included an audit of approximately 10% of drill core analyses used in the mineral resource estimate. A total of 10,885 database gold and silver analyses were verified against original analytical certificates. Similarly, 10% of the original drill collar coordinates and down hole orientation survey files were checked against those recorded in the database; and select drill sites were verified in the field by Kris Raffle, P.Geo. The QAQC audit included independent review of blank, field duplicate and certified standard analyses. All QAQC values falling outside the limits of expected variability were flagged and followed through to ensure completion of appropriate reanalyses. No discrepancies were noted within the drillhole database, and all QAQC failures were dealt with and handled with appropriate reanalyses.

1.10 Metallurgy

Following extensive mineralogy which showed the gold and silver in the epithermal veins to be free and non-refractory in nature, metallurgical testwork was undertaken on each of the Ixtaca Zone metallurgical domains between 2012 and 2017 at a number of laboratories.

There are 3 distinct metallurgical domains hosting precious metal mineralization at Ixtaca:

- Limestone ore contains most of the economic mineralization and contributes 82% of metal production in the PFS (98% of metal production in the payback period).
- Volcanic ore contributes 8% of metal production in the PFS.
- Black Shale ore contributes 10% of metal production in the PFS with medium hardness.

The testwork has consistently demonstrated that economic mineralization responds well to processing by gravity concentration and flotation followed by concentrate regrind and cyanidation under Carbon-in-Pulp (CIP) conditions. Gravity concentrate is subjected to an intensive cyanide leach.

The majority of gold mineralization is fine grained and requires a primary grind of P_{80} 75 µm for liberation, and regrind prior to leaching.

This test work indicates overall process recoveries to average 90% for gold and silver for limestone hosted mineralisation.

Testwork on volcanic and blackshale units support overall recoveries of 90% for silver and 50% for gold. Additional testwork is underway to improve gold recoveries for these domains.

1.11 Resource Estimate

On January 31, 2013 the Company announced a maiden resource on the Ixtaca Zone, which was followed by a resource update on January 22, 2014. Since that time 33,618 metres of drilling have been completed in 122 holes, and this data is also included in the Mineral Resource Estimate which has been prepared in accordance with NI 43-101 by Gary Giroux, P.Eng., qualified person ("QP") under the meaning of NI 43-101, and summarised in the Table 1 below. The data available for the resource estimation consisted of 545 drill holes assayed for gold and silver. Wireframes constraining mineralised domains were constructed based on geologic boundaries defined by mineralisation intensity and host rock type. Higher grade zones occur where there is a greater density of epithermal veining. These higher grade domains have good continuity and are cohesive in nature.

Of the total drill holes, 472 intersected the mineralised solids and were used to make the resource estimate. Capping was completed to reduce the effect of outliers within each domain. Uniform down hole 3 meter composites were produced for each domain and used to produce semivariograms for each variable. Grades were interpolated into blocks 10 x 10 x 6 meters in dimension by ordinary kriging. Specific gravities were determined for each domain from drill core. Estimated blocks were classified as either Measured, Indicated or Inferred based on drill hole density and grade continuity.

Table 1-1 shows the Measured, Indicated and Inferred Mineral Resource Statement with the Base Case 0.3 g/t AuEq Cut-Off highlighted from the January 2017 Resource Statement. Also shown are the 0.5, 0.7 and 1.0 g/t AuEq cut-off results. AuEq calculation based average prices of $1250/oz gold and $18/oz silver.

Table 1-1 Ixtaca Zone Measured, Indicated and Inferred Mineral Resource Statement

MEASURED RESOURCE							
AuEq Cut-off	Tonnes > Cut-off	Grade>Cut-off			Contained Metal x 1,000		
(g/t)	(tonnes)	Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEq (ozs)
0.30	**42,450,000**	**0.57**	**35.74**	**1.09**	**779**	**48,780**	**1,482**
0.50	30,940,000	0.71	44.39	1.34	701	44,160	**1,337**
0.70	23,310,000	0.83	52.47	1.59	625	39,320	1,192
1.00	16,430,000	1.01	62.28	1.91	533	32,900	1,006
INDICATED RESOURCE							
AuEq Cut-off	Tonnes > Cut-off	Grade>Cut-off			Contained Metal x 1,000		
(g/t)	(tonnes)	Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEq (ozs)
0.30	**83,370,000**	**0.45**	**22.54**	**0.77**	**1,195**	**60,410**	**2,064**
0.50	50,220,000	0.60	29.56	1.02	964	47,730	1,650
0.70	32,280,000	0.75	35.72	1.26	776	37,070	1,311
1.00	18,260,000	0.97	43.47	1.59	568	25,520	936
INFERRED RESOURCE							
AuEq Cut-off	Tonnes > Cut-off	Grade>Cut-off			Contained Metal x 1,000		
(g/t)	(tonnes)	Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEq (ozs)
0.30	**47,050,000**	**0.30**	**19.15**	**0.58**	**457**	**28,970**	**874**
0.50	19,860,000	0.45	27.31	0.85	288	17,440	540
0.70	10,260,000	0.61	32.98	1.09	202	10,880	359
1.00	4,430,000	0.88	38.50	1.43	125	5,480	204

- This Mineral Resource Estimate was prepared by Gary Giroux, P.Eng. in accordance with NI 43-101, with an effective date of January 17, 2017.
- **Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.**
- The estimate of Mineral Resources may be materially affected by environmental, permitting, legal or other relevant issues. The Mineral Resources have been classified according to the CIM Definition Standards for Mineral Resources and Mineral Reserves in effect as of the date of this news release.
- All figures were rounded to reflect the relative accuracy of the estimates.
- Metal assays were capped where appropriate.

1.12 Proposed Development Plan

A PFS level mining design, production schedule, and cost model has been developed for the Ixtaca Zone of the Tuligtic Property. This current work focuses on the near surface high grade limestone hosted portions of the Ixtaca Zone deposit. The mine schedule includes an open pit mining operation with a process plant to produce gold and silver doré. The plant will operate initially at an average plant throughput of 7,650 tonnes per day (tpd) and expanding to 15,300 tpd by Year 5. The process plant includes conventional crushing, grinding, gravity, flotation, and concentrate leaching using CIP. Mining will use a contractor owned and operated fleet.

A series of pit optimizations have been completed using the resource block model, applying a range of metal prices and recoveries, estimated costs for mining, processing, and pit slopes. The operational pits are designed based on the optimized shell, and the potentially mineable portion of the resource is estimated within those pits. The ultimate pit contains a total of 65.1 million tonnes of mill feed at a strip ratio of 5.01:1. The mill feed tonnages include a mining loss dilution. Mineral Reserves are shown in the Table below assuming an NSR cut-off grade of $15.40/t and are stated as Run Of Mine (ROM) which represent tonnes of ore delivered to the mill:

Table 1-2 Recovered In-pit Resources and Diluted Grade

	ROM Tonnes	Diluted Average Grades		Contained Metal	
	(millions)	Au (g/t)	Ag (g/t)	Au – '000 ozs	Ag – '000 ozs
Proven	28.4	0.68	45.0	623	41,032
Probable	36.8	0.57	32.0	669	37,793
TOTAL	**65.1**	**0.62**	**37.7**	**1,292**	**78,825**

Notes to Mineral Reserve table:

- *The qualified person responsible for the Mineral Reserves is Jesse Aarsen, P.Eng of Moose Mountain Technical Services. Jesse Aarsen is independent of Almaden Minerals Ltd.*
- *The cut-off grade used for ore/waste determination is NSR>=$15.40*
- *Mineral Reserves have an effective date of March 30, 2017. All Mineral Reserves in this table are Proven and Probable Mineral Reserves. The Mineral Reserves are not in addition to the Mineral Resources, but are a subset thereof. All Mineral Reserves stated above account for mining loss and dilution.*
- *Associated metallurgical recoveries (gold and silver, respectively) have been estimated as 90% and 90% for limestone, 50% and 90% for volcanic, 50% and 90% for black shale.*
- *Reserves are based on a US$1,250/oz gold price, US$18/oz silver price and an exchange rate of US$1.00:MXP20.00.*
- *Reserves are converted from resources through the process of pit optimization, pit design, production schedule and supported by a positive cash flow model.*
- *Rounding as required by reporting guidelines may result in summation differences.*

1.13 Production and Processing

The PFS incorporates the Rock Creek process plant which was optioned by Almaden in October, 2015. The plant will operate initially at an average throughput of 7,650 tpd expanding to 15,300 tpd by year 5, producing gold and silver doré on site. The process plant includes the following key design criteria:

- Three-stage crushing followed by grinding to P80 passing 75 microns;
- Gravity concentration with intensive leaching of gravity concentrate;
- Flotation of gravity concentration tails;
- CIP to recover gold and silver from flotation concentrate and gravity leach tails;
- An elution circuit to strip loaded carbon, electrowinning and smelting to produce a precious metal doré;
- Cyanide destruction;
- Final tailings are thickened, then delivered to the tailings management facility.

The Rock Creek mill located in Nome, Alaska was constructed, commissioned and operated for three months before mining operations were shut down due to the 2008 global financial crisis, environmental issues, and problems with mineral reserves.

Key features of the Rock Creek mill include:

- The flowsheet closely matches that of the Ixtaca Project.
- It was built with good quality, mostly new equipment. The ball mill was bought second hand and refurbished before installation.
- The mill package includes all the processing facilities on site including the metallurgical, chemical and fire assay laboratories, and a number of spare parts for the ball mill and crushers, including an ozone water purification plant, spare ball mill bearings, liners and transmission. The existing Rock Creek building structures will not be transported to Mexico.
- Majority of the engineering required for the Ixtaca process is complete, this will result in reduced engineering durations and procurement times.
- All the equipment is available with its associated electrical systems and controls.

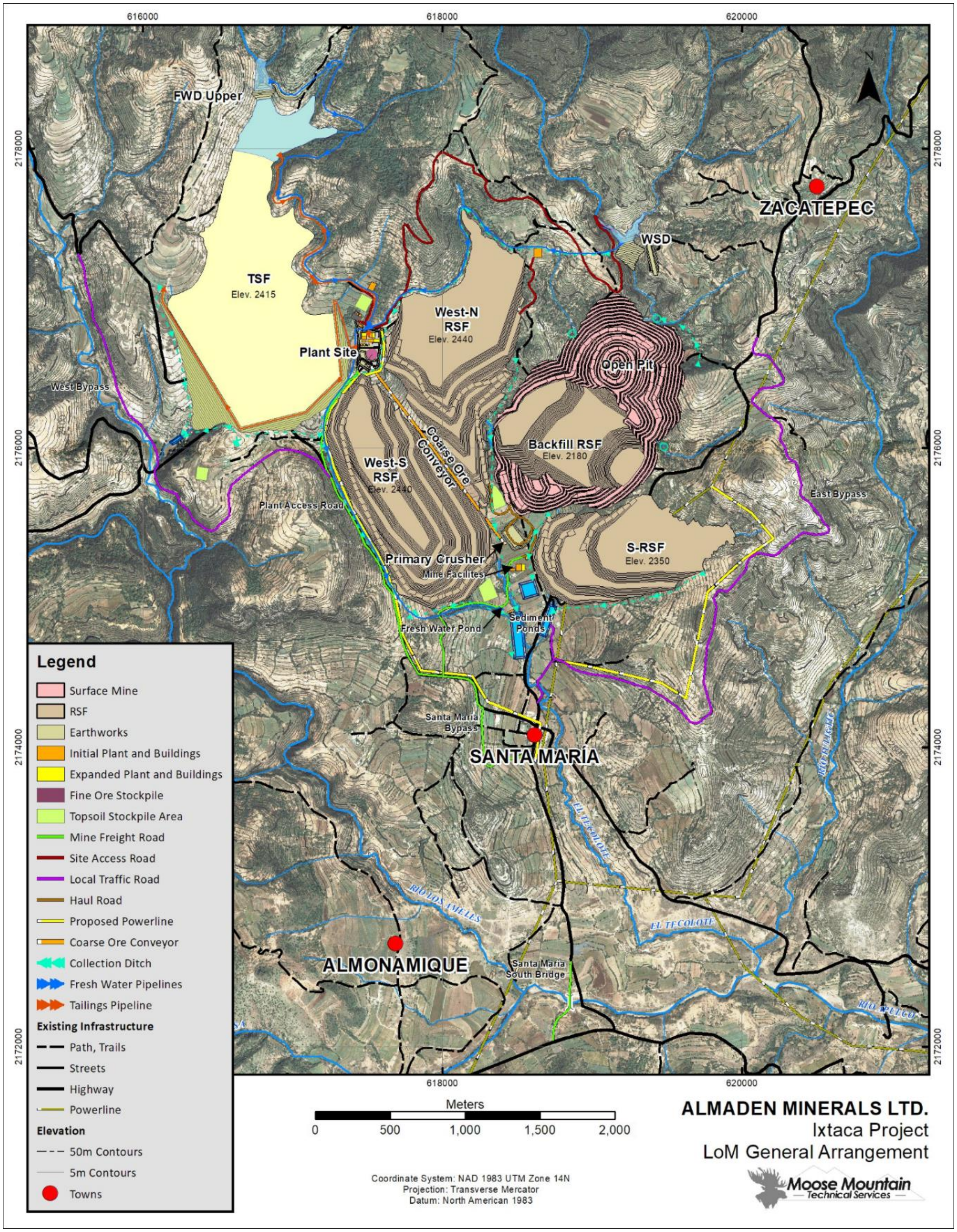


Figure 1-1 Ixtaca General Arrangement

1.14 Capital and Operating Costs

The capital cost and operating estimates for the Ixtaca Project are developed to a level appropriate for a PFS. As such, the level of accuracy is +/-20%. All capital and operating costs are reported in USD unless specified otherwise.

The total estimated initial capital cost is $116.9 million and sustaining capital (including expansion capital of $72 million) is $119.7 million over the LOM. The estimated expansion capital of $72.1 million will be funded from cashflow. The estimated LOM operating costs are $22.5 per tonne mill feed.

The initial capital costs are summarized in Table 1-3 below:

Table 1-3 Projected Initial Capital Costs (USD million)

	Base Case
Mining	$12.1
Process	$35.6
Tailings Management Facility (TMF)	$11.7
Water Management	$5.4
Onsite Infrastructure	$7.6
Offsite Infrastructure	$7.8
Environmental	$1.8
Indirects, EPCM, Contingency and Owner's Costs	$34.9
Total	$**116.9**

** Numbers may not add due to rounding*

The total LOM operating costs for the Ixtaca Project are $22.5/tonne mill feed. This estimate includes the contractor mining, processing, G&A, GME, re-handle, reclamation and TMF and water management operating costs during the period of operations (initial capital costs are not included in the LOM operating costs). The LOM average costs are summarized in Table 1-4 below:

Table 1-4 Summary of Average LOM Operating Costs ($/tonne mill feed)

	Base Case	
Mining costs	$1.70	$/tonne mined
Mining costs	$10.0	$/tonne milled
Processing	$11.6	$/tonne milled
G&A	$0.8	$/tonne milled
Total	$22.5	**$/tonne milled**

**Numbers may not add due to rounding*

1.15 Economic Analysis

The PFS project economics are based on gold price of $1250/oz and silver price of $18/oz. These prices are a combination of recent spot and current common peer usage. The project revenue is split between gold and silver with 51% of the revenue coming from gold and 49% from silver. The after-tax economic analysis includes a corporate income tax rate of 30% as well as the two new mining duties:

a) 7.5% special mining duty and,
b) 0.5% extraordinary mining duty.

LOM Revenue for gold and silver are summarized in Table 1-5.

Table 1-5 Revenue before transport, refining, and royalties

	Revenue	
	$ million	**%**
Gold	1,301	51%
Silver	1,264	49%
Total	**2,565**	**100%**

All in unit sustaining costs are summarized in Table 1-6.

Table 1-6 Summary All-in sustaining cost (exclusive of initial capital)

	Total $ million	**$/ Oz AuEq**	**$/ Oz AgEq**
Cash operating Cost	1,463	706	10.2
Sustaining Capital Cost	119	58	0.8
Almadex Royalty	50	24	0.4
Mexican royalty taxes	74	36	0.5
Refining + Transport	79	38	0.6
Total	**1,785**	**862**	**12.5**

A summary of financial outcomes comparing base case metal prices to two alternative metal price situations is presented below. The PFS base case prices are derived from a combination of spot prices and current common peer usage, while the alternate cases consider the project's economic outcomes at varying prices witnessed at some point over the three years prior to this study.

Table 1-7 Summary of Economic Results and Sensitivities to Metals Price ($ Million)

	Lower Case		**Base Case**		**Upper Case**	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Gold Price ($/oz)	$1150		**$1250**		$1350	
Silver Price ($/oz)	$15		**$18**		$21	
NPV (5% discount rate)	$275	$175	**$484**	**$310**	$693	$443
Internal Rate of Return (%)	38%	28%	**54%**	**41%**	70%	52%
Payback (years)	2.4	2.6	**2.0**	**2.2**	1.6	1.9

The operating costs ("Opex") are projected to be US$22.5 per tonne milled. The following table shows the sensitivity of project economics to a 10% change in the operating costs, assuming base case metals prices.

Table 1-8 Summary of Economic Results and Sensitivities to Operating Costs ($ Million)

	Lower Case		Base Case		Upper Case	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Opex ($/t milled)	-10%		$22.5/t		+10%	
NPV (5% discount rate)	$581	$372	$484	$310	$386	$248
Internal Rate of Return (%)	61%	46%	54%	41%	48%	35%
Payback (years)	1.9	2.1	2.0	2.2	2.1	2.3

The Ixtaca Project is also sensitive to the exchange rate between U.S. dollars and Mexican Pesos ("MXN"). The PFS assumes an exchange rate of 20 MXN per U.S. dollar, and the following table shows the sensitivity of project economics to different exchange rates assuming base case metals prices.

Table 1-9 Summary of Economic Results and Sensitivities to Exchange Rate ($ Million)

	Lower Case		Base Case		Upper Case	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Exchange Rate (MXN:USD)	18		**20**		22	
NPV (5% discount rate)	$380	$243	**$484**	**$310**	$569	$364
Internal Rate of Return (%)	47%	35%	**54%**	**41%**	60%	45%
Payback (years)	2.1	2.3	**2.0**	**2.2**	1.9	2.1

The Initial Capital cost is estimated to be US$116.9 million. The following table shows the sensitivity of project economics to a 10% change in the initial capital costs, assuming base case metals prices.

Table 1-10 Summary of Economic Results and Sensitivities to Capital Cost ($ Million)

	Lower Case		Base Case		Upper Case	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Initial Capital ($m)	-10%		**116.9**		+10%	
NPV (5% discount rate)	$495	$318	**$484**	**$310**	$473	$302
Internal Rate of Return (%)	60%	45%	**54%**	**41%**	50%	37%
Payback (years)	1.9	2.1	**2.0**	**2.2**	2.1	2.3

The above sensitivity tables demonstrates robust economics.

1.16 Environmental and Social Considerations

Almaden has undertaken significant Environmental and Community/Social programs. These will continue as the Project progresses into advanced studies. The Environmental Impact Assessment is underway to support project permitting, with an estimated submission of the second quarter of 2017. Currently there are no known issues that can materially impact the ability to extract the mineral resources at the Ixtaca

Project. Previous and ongoing environmental studies include meteorology, water quantity and quality, and flora and fauna.

Baseline data has been collected at site and collated to regional stations for several parameters. Streamflow and hydrogeological metrics, along with water quality have are being catalogued to integrate with Project design. It is important to accommodate downstream water users, and it is anticipated that the Project may have positive impacts on both the water supply and the water quality.

The geochemical program concluded that the geologic materials exposed, excavated and processed during mining have little potential to produce acid rock drainage or to leach contained metals. The materials contain large amounts of neutralizing potential and relatively small amounts of sulphide sulphur. Based on these testing and previous results, there is more than enough neutralizing potential present in site materials to neutralize any acid generated and no segregation of material by ARD potential is warranted. The site materials are not expected to generate leachate with concentrations of metals at or above levels of concern.

Flora and fauna diversity is low, as the Project area has been previously disturbed by logging and ranching.

The mine will not require the resettlement of any communities. Successful engagement with the local communities proximate to the Project has been a cornerstone of the operation to date and continues to be a key focus for Almaden through Project development.

Open, transparent communication with stakeholders has been fundamental to Almaden's approach since staking the original Tuligtic claims in 2001. Over the past several years, Almaden has interacted with over 20,000 people from over 53 communities and 8 different states in the following ways:

- Coordinated seven large community meetings, with total attendance at these meetings approaching 2,600 people;
- Taken a total of approximately 440 people, drawn from local communities, to visit 22 mines;
- Arranged 25 sessions of "Dialogos Transversales", wherein community members are invited to attend discussions with experts on a diverse range of issues relating to the mining industry such as an overview of Mexican Mining Law, Human Rights and Mining, mineral processing, explosives, water in mining, risk management, and mine infrastructure amongst other things;
- Opened a central community office in the town of Santa Maria Zotoltepec, which is continually open to community members and includes an anonymous suggestion box;
- Invested in a "mobile mining module" which allows company representatives to establish a temporary presence in communities more distant from the project, and allows for those interested to learn more about the project;
- Employed as many local people as possible, reaching up to 70 people drawn from 5 local communities. Almaden operates the drills used at the project, and hence can draw and train a local workforce as opposed to bringing in external contractors;
- Initiated a program of scholarships for top performing local students, with 80 scholarships granted to date to individuals from 23 different communities (44 women and 36 men);

- Established several clubs, including reading, dancing, football, music, and theatre clubs, to contribute to the vitality of local communities;
- Focused on education, enabling 2,441 people to be positively impacted by our investments, such as rehabilitation of school-related infrastructure, donation of electronic equipment, and scholarships for top-performing students.

Positive impacts to the socio-economy of the region are expected to continue as the Project is developed into a mine and becomes a source of more jobs. Almaden plans to continue its open communication with the communities to provide for realistic expectations of any proposed mining operation and the social impacts of such a development.

1.17 Project Execution Plan

Key milestones for the project execution plan include:

- Permit submission by July 2017
- Permit Approvals by Q3 2018
- Rock Creek relocation starts in June 2018
- Ixtaca construction starts in Q3 2018
- Plant startup in Q2 2019

Preparations are currently underway at the Rock Creek plant for a 2018 plant relocation.

1.18 Conclusions and Recommendations

The Ixtaca deposit is well suited for a potential mining operation. A PFS level 14-year mine plan has robust economics and it is recommended that the Project proceed to Feasibility level.

A detailed budget and plan for a Feasibility Study has been recommended with the additional work plans included for geotechnical, geomechanical, hydrological, metallurgical testing, mine planning optimization and permit advancement.

A significant opportunity to produce byproducts from the limestone waste and tailings is described in Section 26 and should be investigated in the next phase of study.

2 Introduction

Almaden Minerals Ltd. requested Moose Mountain Technical Services ("MMTS") prepare a Technical Report (the Report) on the results of a pre-feasibility study for the Ixtaca Gold-Silver Project in Mexico. The Ixtaca Gold-Silver Deposit (or "Ixtaca Project") of the Tuligtic Property, is 100 percent (%) held by Compania Minera Gorrión S.A. de C.V. (Minera Gorrión), a wholly owned subsidiary of Almaden Minerals Ltd. (together referred to as "Almaden"), subject to a 2% NSR in favour of Almadex Minerals Limited. The Tuligtic Property currently comprises seven mineral claims totalling 7,220 hectares (ha) within Puebla State, Mexico (Figure **4-1** and Figure 4-2).

The following people served as the Qualified Persons (QPs) as defined in National Instrument 43-101, Standards of Disclosure for Mineral Projects:

- Tracey Meintjes P.Eng., Principal Consultant, MMTS
- Jesse Aarsen P.Eng., Senior Associate - Mine Engineering, MMTS
- Gary Giroux P.Eng., Consulting geological engineer, Giroux Consultants Ltd
- Kris Raffle P.Geo., Principal (Geologist), APEX Geoscience Ltd
- Ken Embree P.Eng., Managing Principal, Knight Piésold Ltd

QPs site visits to the Project are shown in **Table 2-1**.

Table 2-1 QPs, Areas of Report Responsibility, and Site Visits

Qualified Person	Site Visit	Sections of Responsibility
Tracey Meintjes	01 to 02 July 2014 15 to 16 March 2016 04 to 05 October 2016	1, 13, 17-19, 21-22, 25-26
Jesse Aarsen	30 April to 01 May 2013 27 to 28 August 2014 15 to 16 March 2016 12 to 16 December 2016	1,15-16, 25- 26
Gary Giroux	No Site Visit	1, 14, 26
Kris Raffle	17 to 20 October 2011 23 September 2012 20 November 2013	1,2-12, 23-24, 26, 27
Ken Embree	10 to 12 March 2015 15 to 16 March 2016 04 to 05 October 2016	1, 18, 20, 26

The authors, in writing this report use sources of information as listed in the references section. Government reports have been prepared by qualified persons holding post-secondary geology, or related university degree(s), and are therefore deemed to be accurate. These reports, which are used as background information, are referenced in this Report in the "Geological Setting and Mineralization" Section 7.0 below.

All currency amounts are referred to in USD where indicated. All units in this Report are metric and Universal Transverse Mercator (UTM). Coordinates in this report and accompanying illustrations are referenced to North American Datum (NAD) 1983, Zone 14.

3 Reliance on Other Experts

With respect to legal title to the seven mineral claims which together comprise the Tuligtic Property, the authors have relied on the opinion of Lic. Alberto M. Vàzquez. In a report provided to the authors on 16 May 2017, Mr. Vàzquez warrants that Minera Gorrión maintains 100% ownership of the seven mineral claims comprising the Tuligtic Property via a December 13, 2011 Assignment of Rights Agreement completed with Minera Gavilán, S.A. de C.V., which at the time was also a wholly owned subsidiary of Almaden, and via an application to reduce the aggregate claim size which was filed in May, 2016.

4 Property Description and Location

The Tuligtic property was staked by Almaden in 2001, following the identification of surficial clay deposits that were interpreted to represent high-level epithermal alteration. The Property originally consisted of approximately 14,000 hectares, but during 2015 Almaden filed applications to reduce the aggregate claim size at Tuligtic to those areas still considered prospective. The Property is held 100% by Minera Gorrion S.A. de C.V., a subsidiary of Almaden Minerals Ltd. through the holding company, Puebla Holdings Inc., subject to a 2% NSR in favour of Almadex Minerals Limited. The Property currently consists of seven mineral claims totaling 7,220 hectares (Table 4-1, and Figure 4-2).

Table 4-1 Tuligtic Property Mineral Claims

Claim Name	Claim Number	Valid Until Date	Area (hectares)
Cerro Grande - R1	219469	March 5, 2059	2773
Cerro Grande -R3	219469	March 5, 2059	824
Cerro Grande - R4	219469	March 5, 2059	540
Cerro Grande - R5	219469	March 5, 2059	785
Cerro Grande - R6	219469	March 5, 2059	938
Cerro Grande 2 - R2	233434	February 23, 2059	652
Cerro Grande 2 - R3	233434	February 23, 2059	708
		Total	**7220**

Claim numbers shown in Table 4-1 reflect the pre-reduction titles. Updated claim numbers for the reduced areas will be issued following the completion of the Mexican claim reduction process.

The Property is located at: 19 degrees 40 minutes north latitude and 97 degrees 51 minutes west longitude; or UTM NAD83 Zone 14 coordinates: 618,800m east and 2,176,100m north. The Tuligtic Property is road accessible and is located within Puebla State, 80 kilometres (km) north of Puebla City, and 130km east of Mexico City.

Following an amendment to the Mining Law of Mexico (the "Mining Law") on April 28, 2005, there is no longer a distinction between the exploration mining concessions and exploitation mining concessions. The Mining Law permits the owner of a mining concession to conduct exploration for the purpose of identifying mineral deposits and quantifying and evaluating economically usable reserves, to prepare and to develop exploitation works in areas containing mineral deposits, and to extract mineral products from such deposits. Mining concessions have duration of 50 years from the date of their recording in the Registry and may be extended for an equal term if the holder requests an extension within five years prior to the expiration date.

To maintain a claim in good standing holders are required to provide evidence of the exploration and/or exploitation work carried out on the claim under the terms and conditions stipulated in the Mining Law, and to pay mining duties established under the Mexican Federal Law of Rights, Article 263. Exploration work can be evidenced with investments made on the lot covered by the mining claim, and the exploitation work can be evidenced the same way, or by obtaining economically utilizable minerals. The

Regulation of the Mining Law indicates the minimum exploration expenditures or the value of the mineral products to be obtained (**Table 4-2**).

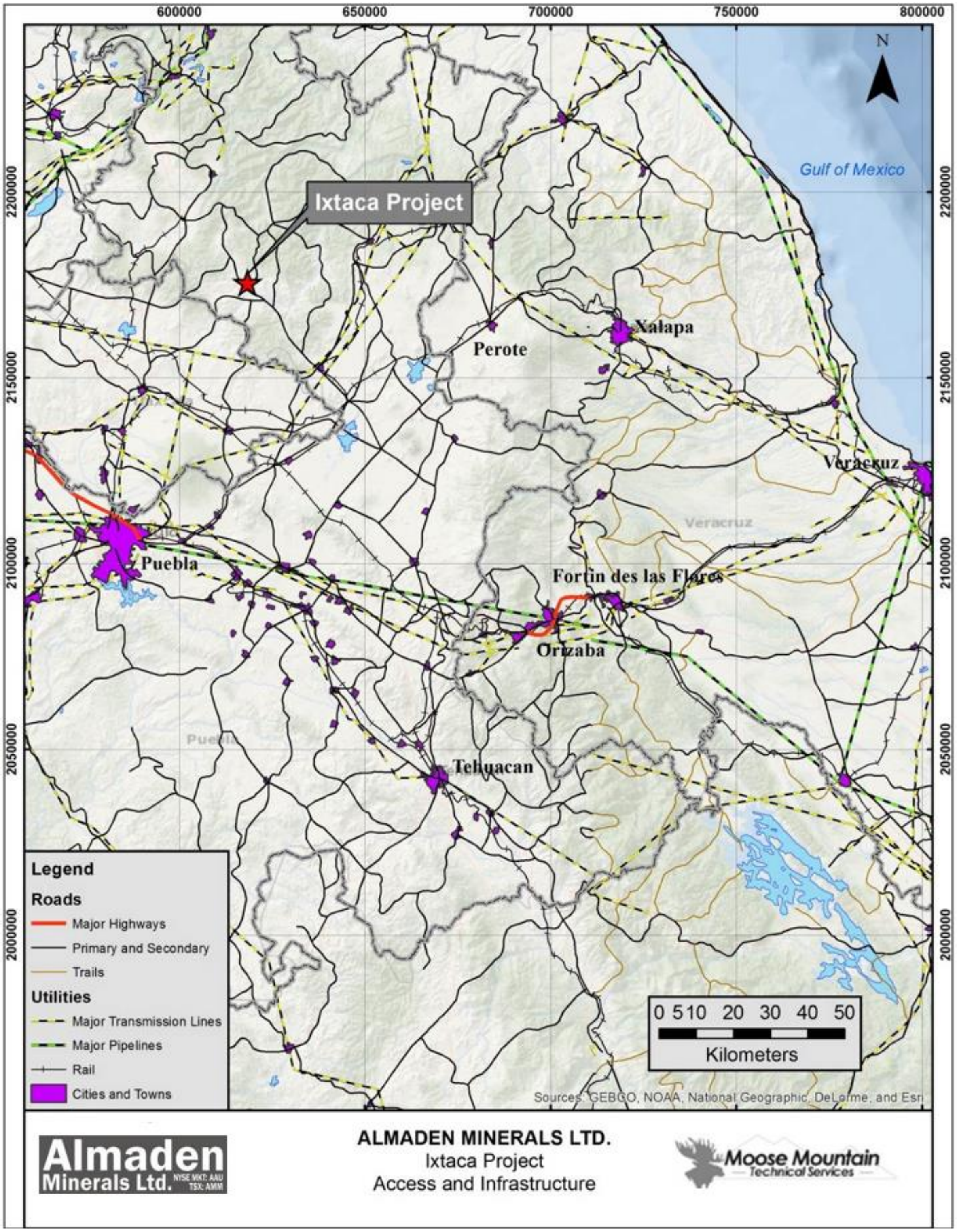


Figure 4-1 General Location

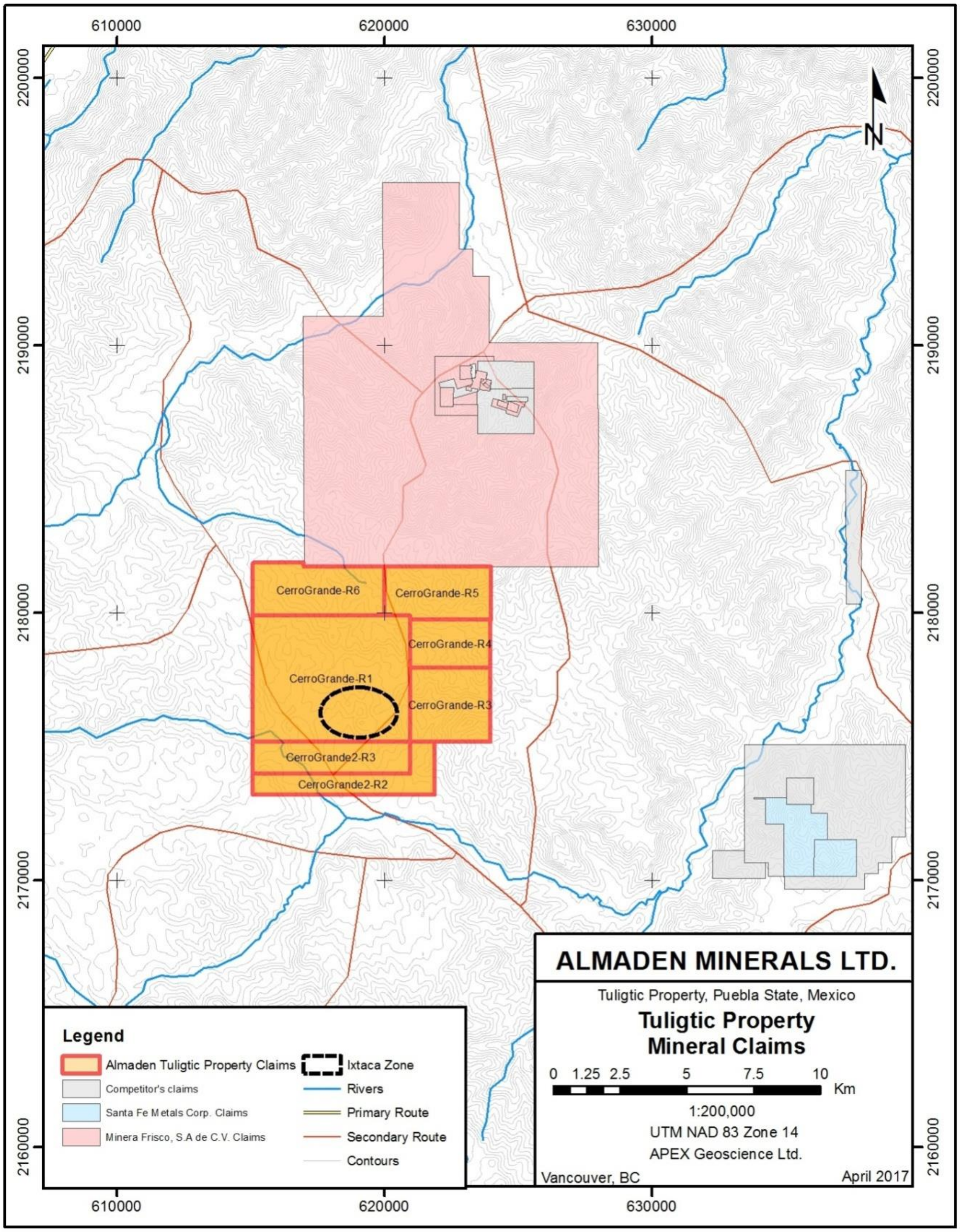


Figure 4-2 Tuligtic Property Mineral Claims

Table 4-2 Exploitation Claim Minimum Expenditure/Production Value Requirements

Area (hectares)	Fixed quota in	Additional annual quota per hectare in Pesos			
	(USD)	Year 1	Year 2-4	Year 5-6	Year 7+
<30	262.24	10.48	41.95	62.93	63.93
30 - 100	524.49	20.97	83.91	125.88	125.88
100 - 500	1,048.99	41.95	125.88	251.75	251.75
	3,146.98	38.81	119.91	251.75	503.51
1000 - 5000	6,293.97	35.66	115.39	251.75	1,007.03
	22,028.92	32.52	111.19	251.75	2,014.07
> 50000	209,799.28	29.37	104.9	251.75	2,014.07

**Using a conversion of 1 MEX peso = 0.08USD*

The Tuligtic Property is currently subject to annual exploration/exploitation expenditure requirements of approximately CAD$1.3MM per year however the Company has significant historic expenditures to offset these requirements as appropriate.

Subject to the Mexico Mining Laws, any company conducting exploration, exploitation and refining of minerals and substances requires previous authorization from the Secretary of Environment and Natural Resources (SEMARNAT). Because mining exploration activities are regulated under Official Mexican Norms (specifically NOM-120) submission of an Environmental Impact Statement ("Manifestacion de Impacto Ambiental" or "MIA") is not required provided exploration activities do not exceed disturbance thresholds established by NOM-120. Exploration activities require submission to SEMARNAT of a significantly less involved "Preventive Report" (Informe Preventivo) which outlines the methods by which the owner will maintain compliance with applicable regulations. If the exploration activities detailed within the Preventive Report exceed the disturbance thresholds established by NOM-120, SEMARNAT will inform the owner that an MIA is required within a period of no more than 30 days.

The present scale of exploration activities within the Tuligtic Property are subject to NOM-120 regulation. In future, if significantly increased levels of exploration activities are anticipated submission of an Environmental Impact Statement may be required. Almaden has negotiated voluntary surface land use agreements with surface landowners within the exploration area prior to beginning activities. To date Almaden has secured through purchase agreements over 1,018 hectares, from numerous independent owners.

The authors are not aware of any environmental liabilities to which the Property may be subject, or any other significant risk factors that may affect access, title, or Almaden's right or ability to perform work on the Property.

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Ixtaca deposit, the epithermal gold-silver target within the Tuligtic Property, is located 8km northwest of the town of San Francisco Ixtacamaxtitlán, the county seat of the municipality of Ixtacamaxtitlán, Puebla State.

The Project is accessible by driving 40km east along Highway 119 from Apizaco; an industrial centre located approximately 50km north of Puebla City, and then north approximately 20km along a paved road to the town of Santa Maria. The trip from Apizaco to site can be driven in approximately 1.5 hours. There is also access to the Property using gravel roads from the northeast via Tezhuitan and Cuyoaco, from the south via Libres and from the northwest via Chignahuapan. The Xicohtencatl Industrial complex lies 30km southwest by paved road from the Tuligtic Property, and houses agricultural, chemical, biomedical and industrial manufacturing facilities and is serviced by rail. Puebla, the fourth largest city in Mexico has a population in excess of 4 million people, and includes one of the largest Volkswagen automotive plants outside Germany.

The topography on the Tuligtic Property is generally moderate to steep hills with incised stream drainages. Elevation ranges from 2,300 metres (m) above sea level in the south to 2,800m in the north. Vegetation is dominantly cactus and pines and the general area is somewhat cultivated with subsistence vegetables, bean and corn crops. The region has a temperate climate with mean monthly temperatures ranging from 16°C in June to 12°C in January. The area experiences approximately 714 mm of precipitation annually with the majority falling during the rainy season, between June and September. Annual evapotranspiration is estimated to be 774 mm.

Exploration can be conducted year round within the Property; however, road building and drilling operations may be impacted by weather to some degree during the rainy season.

Electricity is available on the Property from the national electricity grid that services nearby towns such as Santa Maria and Zacatepec.

6 History

Throughout the Property there is evidence that surficial clay deposits have once been mined. This clay alteration attracted Almaden to the area and has been interpreted to represent high-level epithermal alteration. To the authors' knowledge no modern exploration has been conducted on the Project prior to Almaden's acquisition of claims during 2001 and there is no record of previous mining; as such, this is a maiden discovery.

On May 9, 2002, Almaden entered into a joint venture agreement with BHP Billiton World Exploration Inc. (BHP) to undertake exploration in eastern Mexico. Initial helicopter-borne reconnaissance programs were completed in May 2003 and March 2004 on select targets within the joint venture area of interest. The work resulted in the acquisition of five (5) separate properties, in addition to the previously acquired Cerro Grande claim of the present day Tuligtic Property. Following a review of the initial exploration data, effective January 20, 2005, BHP relinquished its interest in the six properties to Almaden (Almaden, 2005). The joint venture was terminated in 2006 (Almaden, 2006).

During January 2003, Almaden completed a program of geologic mapping, rock, stream silt sampling and induced polarization (IP) geophysical surveys at the Tuligtic Property (then known as the "Santa Maria Prospect"). The exploration identified both a porphyry copper and an epithermal gold target within an approximately 5 x 5km area of intensely altered rock. At the porphyry copper target, stockwork quartz-pyrite veins associated with minor copper mineralization overprint earlier potassic alteration within a multi-phase intrusive body. A single north-south oriented IP survey line identified a greater than 2km long elevated chargeability response coincident with the exposed altered and mineralized intrusive system. Volcanic rocks exposed 1km to the south of the mineralized intrusive display replacement silicification and sinter indicative of the upper parts of an epithermal system (the "Ixtaca Zone"). Quartz-calcite veins returning anomalous values in gold and silver and textural evidence of boiling have been identified within limestone roughly 100m below the sinter. The sinter and overlying volcanic rocks are anomalous in mercury, arsenic, and antimony (Almaden, 2004).

Additional IP surveys and soil sampling were conducted in January and February 2005, further defining the porphyry copper target as an area of high chargeability and elevated copper, molybdenum, silver and gold in soil. A total of eight (8) east-west oriented lines, 3km in length, spaced at intervals of 200m have been completed over mineralized intrusive rocks intermittently exposed within gullies cutting through the overlying unmineralized ash deposits (Almaden, 2006).

The Tuligtic Property was optioned to Pinnacle Mines Ltd. in 2006 and the option agreement has been terminated in 2007 without completing significant exploration (Almaden, 2007).

The Property was subsequently optioned to Antofagasta Minerals S.A. (Antofagasta) on March 23, 2009. During 2009 and 2010 Antofagasta, under Almaden operation, carried out IP geophysical surveys and a diamond drill program targeting the copper porphyry prospect (**Figure 7-2**, **Figure 9-1**). Three additional IP survey lines were completed, and in conjunction with the previous nine (9) IP lines, a 2 x 2.5km chargeability high anomaly, open to the west and south, was defined (Almaden, 2011). The 2009 drilling consisted of 2,973m within seven (7) holes that largely intersected skarn type mineralization.

Highlights of the drill program include:

- 38m of 0.13% Copper (Cu) from 164 to 202m and 0.11% Cu from 416 to 462m within hole DDH-01;
- 20m of 0.17% Cu from 94 to 114m and 26m of 0.14% Cu from 316 to 342m in hole DDH-02;
- 58m of 0.17% Cu from 366 to 424m in hole DDH-03 (including 14m of 0.27% Cu from 410 to 424m);
- 2m of 0.63% Cu from 18 to 20m in hole DDH-04; and
- 20m of 0.11% Cu from 276 to 296m and 8m of 0.13% Cu in hole DDH-05.

Molybdenum values are anomalous ranging up to 801 parts-per-million (ppm) (0.08%). Elevated gold values were also encountered including 2m of 1.34 grams-per-tonne (g/t) from 178 to 180m in DDH-01.

On February 16, 2010, Almaden announced that Antofagasta terminated its option to earn an interest in the Property (Almaden, 2009).

In July 2010, Almaden initiated a preliminary diamond drilling program to test epithermal alteration within the Tuligtic Property, resulting in the discovery of the Ixtaca Zone. The target was based on exploration data gathered by Almaden since 2001 including high gold and silver in soil and a chargeability and resistivity high anomaly (derived from an IP geophysical survey conducted by Almaden) topographically beneath Cerro Caolin, a prominent clay and silica altered hill. This alteration, barren in gold and silver, was interpreted by Almaden to represent the top of an epithermal system which required drill testing to depth. The first hole, TU-10-001 intersected 302.42 metres of 1.01g/t gold and 48g/t silver and multiple high grade intervals including 44.35 metres of 2.77g/t gold and 117.7g/t silver.

7 Geological Setting and Mineralization

7.1 Regional Geology

The Ixtaca Project is situated within the Trans Mexican Volcanic Belt (TMVB), a Tertiary to recent intrusive volcanic arc extending approximately east-west across Mexico from coast to coast and ranging in width from 10 to 300km (**Figure 7-1**). The TMVB is the most recent episode of a long lasting magmatic activity which, since the Jurassic, produced a series of partially overlapping arcs as a result of the eastward subduction of the Farallon plate beneath western Mexico (Ferrari, 2011). The basement rocks of the eastern half of the TMVB are Precambrian terranes, including biotite orthogneiss and granulite affected by granitic intrusions, grouped into the Oaxaquia microcontinent (Ferrari et al., 2011; Fuentes-Peralta and Calderon, 2008). These are overlain by the Paleozoic Mixteco terrane, consisting of a metamorphic sequence known as the Acatlan complex and a fan delta sedimentary sequence known as the Matzitzi formation. Another sedimentary complex is found on top of the Mixteco terrane, represented by various paleogeographic elements such as the Mesozoic basins of Tlaxiaco, Zongolica, Zapotitlan, and Tampico-Misantla (Fuentes-Peralta and Calderon, 2008). The subducting plates associated with the TMVB are relatively young, with the Rivera plate dated at 10Ma (million years) and the Cocos plate at 11 to 17Ma.

The timing and nature of volcanism in the TMVB has been described by Garcia-Palomo et al. (2002). The oldest volcanic rocks in the central-eastern part of the TMVB were erupted approximately 13.5Ma ago, followed by a nearly 10Ma hiatus. Volcanic activity in the area resumed around 3.0-1.5Ma. The composition of volcanic rocks ranges from basalt to rhyolite and exhibits calc-alkaline affinity. Extensive silicic volcanism in this area has been related to partial melting of the lower crust, hydrated by infiltration of slab-derived fluids during flat subduction (Ferrari et al., 2011). The Sierra Madre Occidental (SMO) style of volcanism is silicic and explosive as opposed to intermediate and effusive volcanism characteristic of the TMVB. Volcanic centres in the region have been controlled by NE-SW trending normal faults, associated with horst-and-graben structures, resulting from a stress field with a least principal stress ($\sigma 3$) oriented to the NW.

The regional trend of the arc rocks is WNW; though more northerly trending transforms faults, forming at a high angle to the TMVB, provide a structural control on the volcanic units (Coller, 2011). Compressional strike-slip and extensional faults also developed as a result of compressional and extensional periods during subduction. The NE-SW San Antonio fault system, which is still active during Late Pliocene, before the reactivation of the Taxco-Queretaro fault system, is characterized by extensional left-lateral oblique-slip kinematics (Coller, 2011). Bellotti et al. (2006) show that NNW trending regional faults have been right lateral in the Miocene, whereas the NNE to N-S trending faults observed at Ixtaca by Coller (2011) are related to the regional horst-and-graben development and likely to be purely extensional with possibly a component of right lateral movement, or transtensional.

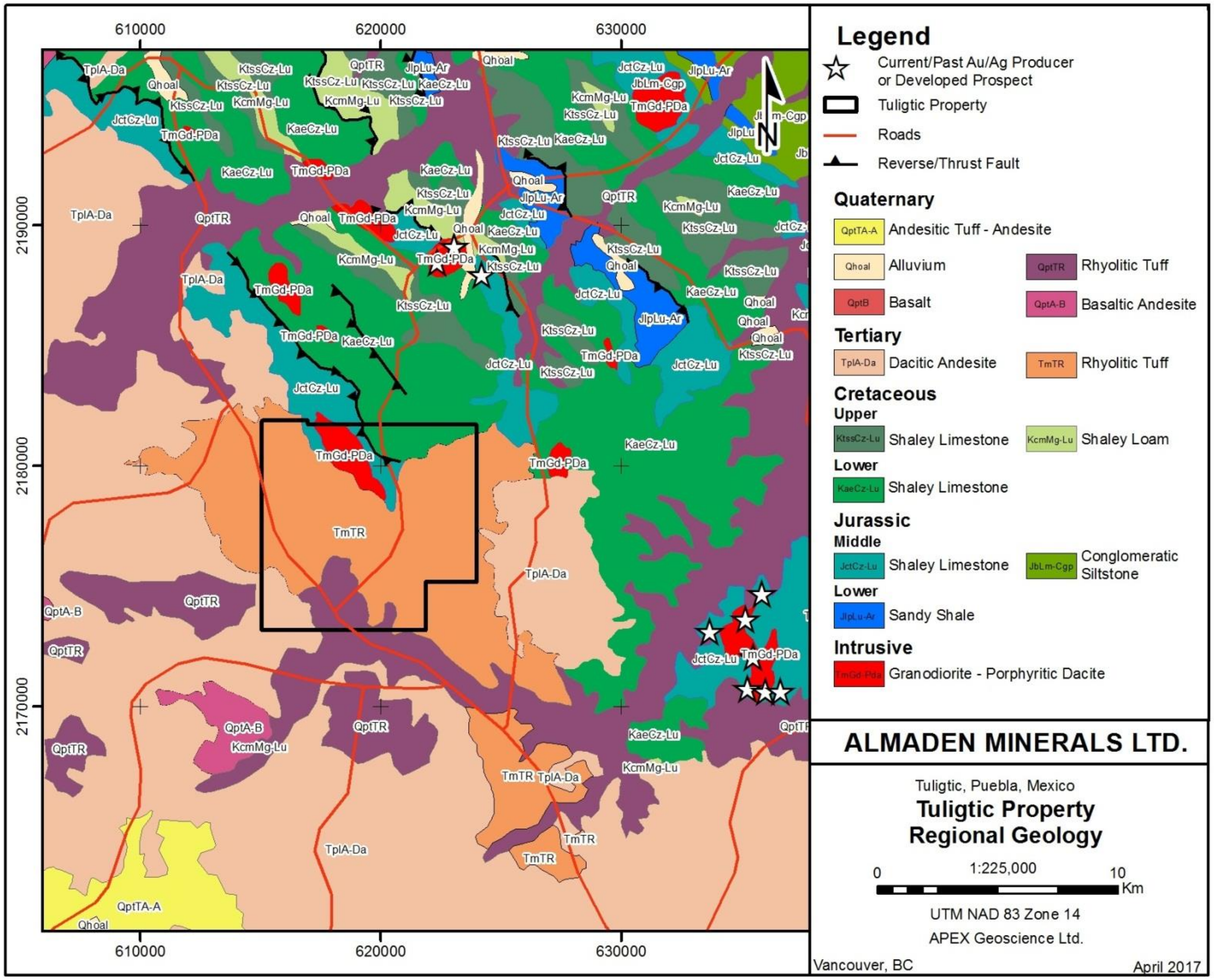


Figure 7-1 Regional Geology

7.2 Property Geology

The stratigraphy of the Tuligtic area can be divided into two main sequences: a Mesozoic sedimentary rock sequence related to the Zongolica basin and a sequence of late Tertiary igneous extrusive rocks belonging to the TMVB (Fuentes-Peralta & Calderon, 2008; Tritlla et al., 2004). The sedimentary sequence is locally intruded by plutonic rocks genetically related to the TMVB (**Figure 7-2**). The sedimentary complex at Tuligtic corresponds to the Upper Tamaulipas formation (Reyes-Cortes 1997). This formation, Late Jurassic to Early Cretaceous in age, is regionally described (Reyes-Cortes, 1997) as a sequence of grey-to-white limestone, slightly argillaceous, containing bands and nodules of black chert (**Figure 7-3**). The drilling conducted by Almaden allows for more detailed characterisation of the Upper Tamaulipas Formation carbonate units in the Tuligtic area. The sequence on the Project consists of clastic calcareous rocks. The limestone unit variably bedded, generally light grey but locally dark grey to black, with local chert rich sections graded into what have been named transition units and shale (also black shale). The transition units are brown calcareous siltstones and grainstones. These rocks are not significant in the succession but mark the transition from limestone to underlying calcareous shale. Typical of the transition units are coarser grain sizes. The lower calcareous “shale” units exhibit pronounced laminated bedding and is typically dark grey to black in colour, although there are green coloured beds as well. The shale units appear to have been subjected to widespread calc-silicate alteration (**Figure 7-4**).

Both the shale and transition units have very limited surface exposure and may be recessive. The entire carbonate package of rocks has been intensely deformed by the Laramide orogeny, showing complex thrusting and chevron folding in the hinge zones of a series of thrust-related east verging anticlines in the Ixtaca area (Tritlla et al., 2004; Coller, 2011). The calcareous shale units appear to occupy the cores of the anticlines while the thick bedded limestone units occupy the cores of major synclines identified in the Ixtaca zone.

The Tamaulipas Formation carbonate rocks are intruded in the mid-Miocene by a series of magmatic rocks. The compositions are very variable, consisting of hornblende-biotite-bearing tonalites, quartz-plagioclase-hornblende diorites, and, locally, aphanitic diabase dykes (Carrasco-Nunez et al., 1997). In the central part of the Tuligtic Property porphyry mineralization is hosted by and associated with a hornblende-biotite-quartz phyric granodiorite body. The contact between the granodiorite and the limestone is marked by the development of a prograde skarn.

In the Ixtaca deposit epithermal area of the Project, the limestone basement units are crosscut by intermediate dykes that are often intensely altered. In the vicinity of the Ixtaca zone these dykes are well mineralized especially at their contacts with limestone country rock. Petrography has shown that epithermal alteration in the dykes, marked by illite, adularia, quartz and pyrite overprints earlier calc-silicate endoskarn mineralogies (Leitch, 2011). Two main orientations are identified for dykes in the Ixtaca area; 060 degrees (parallel to the Main Ixtaca and Ixtaca North zones) and 330 degrees (parallel to the Chemalaco Zone).

An erosional unconformity surface has been formed subsequent to the intrusion of the porphyry mineralization-associated granodiorites. This paleo topographical surface locally approximates the current topography. Although not well exposed the unconformity is marked by depression localised accumulations of basal conglomerate comprised of intrusive and sedimentary boulders.

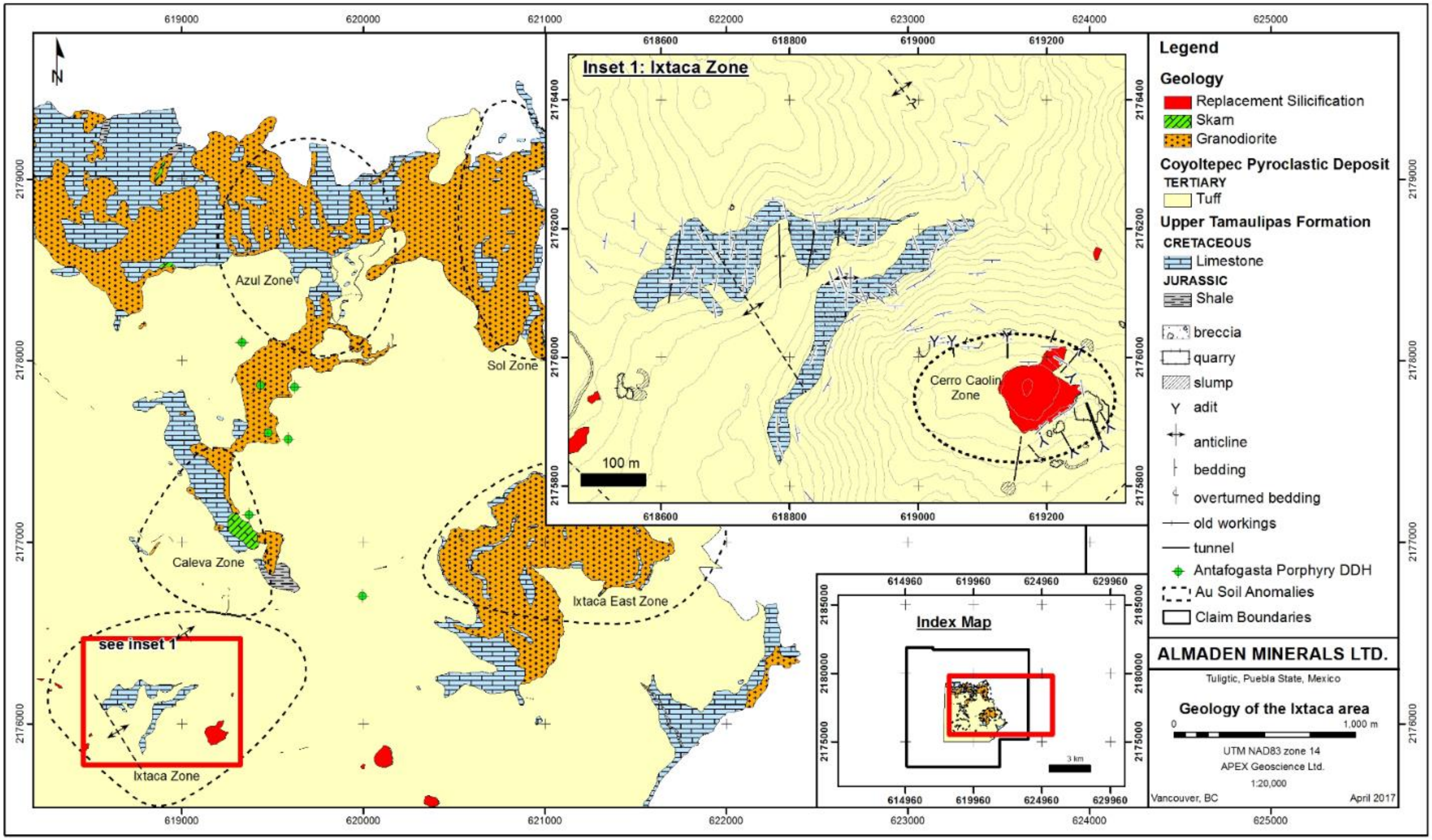


Figure 7-2 Geology of the Ixtaca Area

Figure 7-3 Chert Limestone

This deformed Mesozoic sedimentary sequence is discordantly overlain by late Cenozoic extrusive rocks whose genetic and tectonic interrelations are yet to be fully explained. Two main volcaniclastic units are recognized in the area of Tuligtic: the Coyoltepec Pyroclastic deposit and the Xaltipan Ignimbrite (Carrasco-Nunez et al., 1997). Both units are covered by a thin (up to 1m) quaternary 'tegument' (Morales-Ramirez 2002) of which only a few patches are left in the area of the Property, but it is still widespread in the surrounding areas. This tegument is unconsolidated and composed of a very recent ash fall tuff rich in heavy minerals (mainly magnetite, apatite, and pyroxene).

The extensively altered pre-mineral Coyoltepec pyroclastic deposit is divided by Carrasco-Nunez et al. (1997) into two subunits: the lower Coyoltepec subunit, which is not exposed in the area of the Project, consists of a stratified sequence of surge deposits and massive, moderately indurated pyroclastic flow deposits with minor amounts of pumice and altered lithic clasts.

The upper Coyoltepec subunit, the main unit outcropping in the Tuligtic area, consists of a basal breccia or conglomerate overlain by bedded crystal tuff (volcanic). The basal breccia is comprised of a lithic rhyolite tuff matrix composed of massive, indurated, coarse-gravel sized, lithic-rich pyroclastic flow deposits with pumice, andesitic fragments, free quartz, K-feldspar, plagioclase crystals, and minor amounts of limestone and shale clasts (Tritlla et al., 2004). The Coyoltepec volcanics (referred to as ash, volcanic and tuff) are altered and mineralized. Gold silver mineralization is marked by widespread disseminated pyrite and quartz-calcite veinlets. The Coyoltepec volcanics are locally oxidised and weathered near surface and along structures.

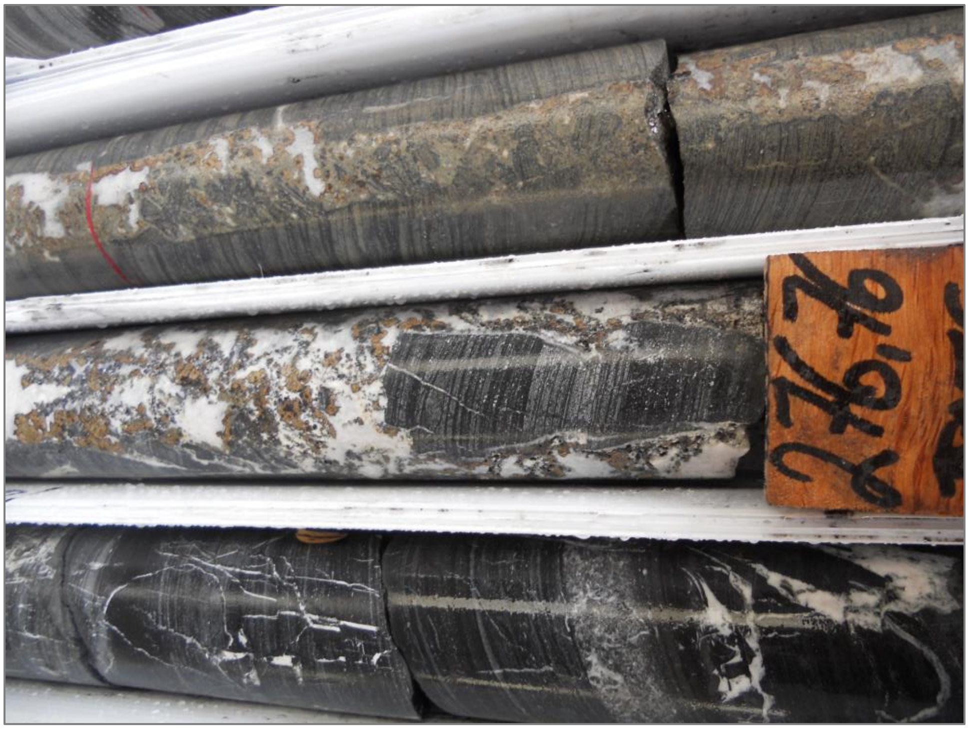


Figure 7-4 Shale (Calcareous Silstone) from the Chemalaco Zone

The post-mineral Xaltipan ignimbrite is not seen in the Ixtaca area and mainly found in topographic lows south of the Tuligtic Property. It consists of a very recent (0.45 ± 0.09Ma, Carrasco-Nunez et al., 1997), pinkish to brownish-grey rhyolitic ignimbrite unit with different grades of welding, containing abundant pumice fragments, andesite lithic fragments, and small clasts of black obsidian (Tritlla et al., 2004; **Figure 7-5**).

Figure 7-5 Post Mineral Unconsolidated Volcanic Ash Deposits. Generally less than 1m thick

7.3 Mineralization

Two styles of alteration and mineralization are identified in the area: (1) copper- molybdenum porphyry style alteration and mineralization hosted by diorite and quartz- diorite intrusions; (2) silver-gold low-sulphidation epithermal quartz-bladed calcite veins hosted by carbonate rocks and spatially associated with overlying volcanic hosted texturally destructive clay alteration and replacement silicification.

Outcropping porphyry-style alteration and mineralization is observed in the bottoms of several drainages where the altered intrusive complex is exposed in erosional windows beneath post mineral unconsolidated ash deposits. Multiple late and post mineral intrusive phases are identified crossing an early intensely altered and quartz-veined medium-grained feldspar phyric diorite named the Principal Porphyry. Other intrusive types include late and post mineral mafic dykes and an inter-mineral feldspar-quartz phyric diorite. Late mineral mafic dykes are fine grained and altered to chlorite with accessory pyrite. Calc-silicate (garnet-clinopyroxene) altered limestone occurs in proximity to the intrusive contacts and is crosscut by late quartz-pyrite veins. Early biotite alteration of the principal porphyry consists of biotite-orthoclase flooding of the groundmass. Quartz veins associated with early alteration have irregular boundaries and are interpreted to be representative of A-style porphyry veins. These are followed by molybdenite veins which are associated with the same wall rock alteration. Chalcopyrite appears late in the early alteration sequence. Late alteration is characterized by intense zones of muscovite-illite-pyrite overprinting earlier quartz-K-feldspar-pyrite ± chalcopyrite veining and replacing earlier hydrothermal orthoclase and biotite. Stockwork quartz-pyrite crosscuts the A-style veins and is associated with muscovite-illite alteration of biotite. The quartz-sericite alteration can be texturally destructive resulting in white friable quartz-veined and pyrite rich rock. Pyrite is observed replacing chalcopyrite and in some instances chalcopyrite remains only as inclusions within late stage pyrite grains.

Epithermal mineralization on the Tuligtic Property is considered to have no genetic relationship to the porphyry alteration and mineralization described above. The epithermal system is well preserved and there is evidence of a paleosurface as steam heated kaolinite and replacement silica alteration occur at higher elevations where the upper part of the Coyoltepec pyroclastic deposit is preserved (**Figure 7-6** below looks to the toward Cerro Caolin with Relative positions of Altered Volcanics, Unconformity, Limestone and the Main Ixtaca Vein Swarm).

The Upper Tamaulipas formation carbonates (limestone and shale units), the dykes that crosscut it and the upper Coyoltepec volcanic subunit (variously referred to as volcanics, tuff or ash) are the host rocks to the epithermal system at Ixtaca. The epithermal alteration occurs over a roughly 5 by 5 kilometre area and occurs as intense kaolinite-alunite alteration and silicification in volcanic rocks. This alteration is interpreted to represent the upper portion of a well preserved epithermal system. The bulk of the mineralisation occurs in the carbonate (limestone and shale) as colloform banded epithermal vein zones(**Figure 7-7**and **Figure 7-8**). Unlike many epithermal vein systems in Mexico, the bulk of the veining in the Ixtaca zone has low base metal contents and gold and silver occur as electrum and other sulphides. SEM work has demonstrated that silver does not occur with galena or tetrahedrite in any significant way. In the main limestone unit (80% of recoverable metal in the PFS) the silver to gold ratio of the mineralisation is roughly estimated to average ~65:1 while in the shale it is roughly estimated to be slightly higher at ~75:1.

The veining of Ixtaca epithermal system displays characteristics representative of low and intermediate sulphidation deposits. These include typical mill feed and gangue mineralogy (electrum Ag-sulphides, sphalerite, galena, adularia, quartz and carbonates), mineralization dominantly in open space veins (colloform banding, cavity filling).

At the base of the overlying clay altered volcanics disseminated gold-silver mineralisation occurs in association with pyrite and minor veining (**Figure 7-9**). Locally this mineralisation can be high grade but largely is associated with lower Ag;Au ratios roughly estimated to average 20:1.

To date two main vein orientations have been identified in the Ixtaca deposit:

- 060 trending sheeted veins hosted by limestone;
- 330 trending veins hosted by shale;

The bulk of the resource and over 80% of the mill feed is hosted by the limestone in the Main Ixtaca and Ixtaca North zones as swarms of sheeted and anastomosing high grade banded epithermal veins. There is no disseminated mineralisation within the host rock to the vein swarms, which is barren and unaltered limestone. To the northeast of the limestone hosted mineralisation, the Chemalaco zone, a 330 striking and west dipping vein zone hosted by shale, also forms part of the deeper resource.

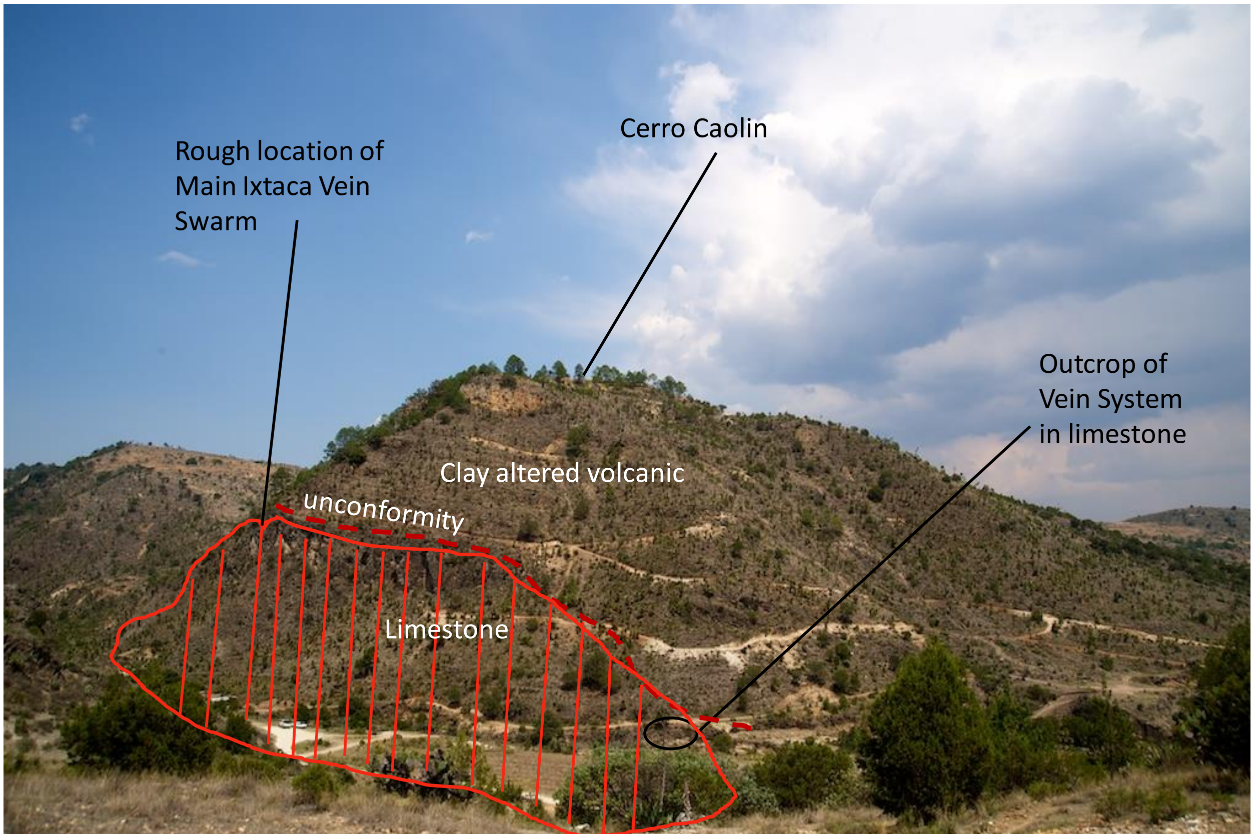


Figure 7-6 Looking to the east of Cerro Caolin with Relative positions of Altered Volcanics, Unconformity, Limestone and the Main Ixtaca Vein Swarm

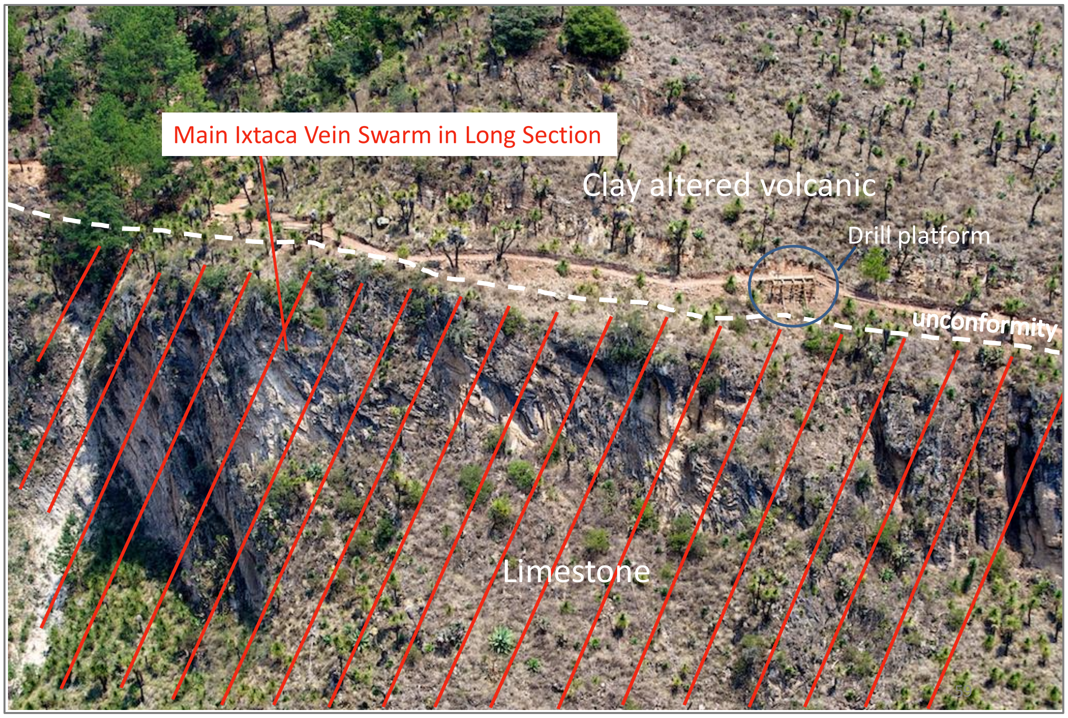


Figure 7-7 **Photo of Cerro Caolin of the Main Ixtaca Vein Swarm From North Looking to the South Showing the Contact between the Clay Altered Volcanic and Limestone Units**

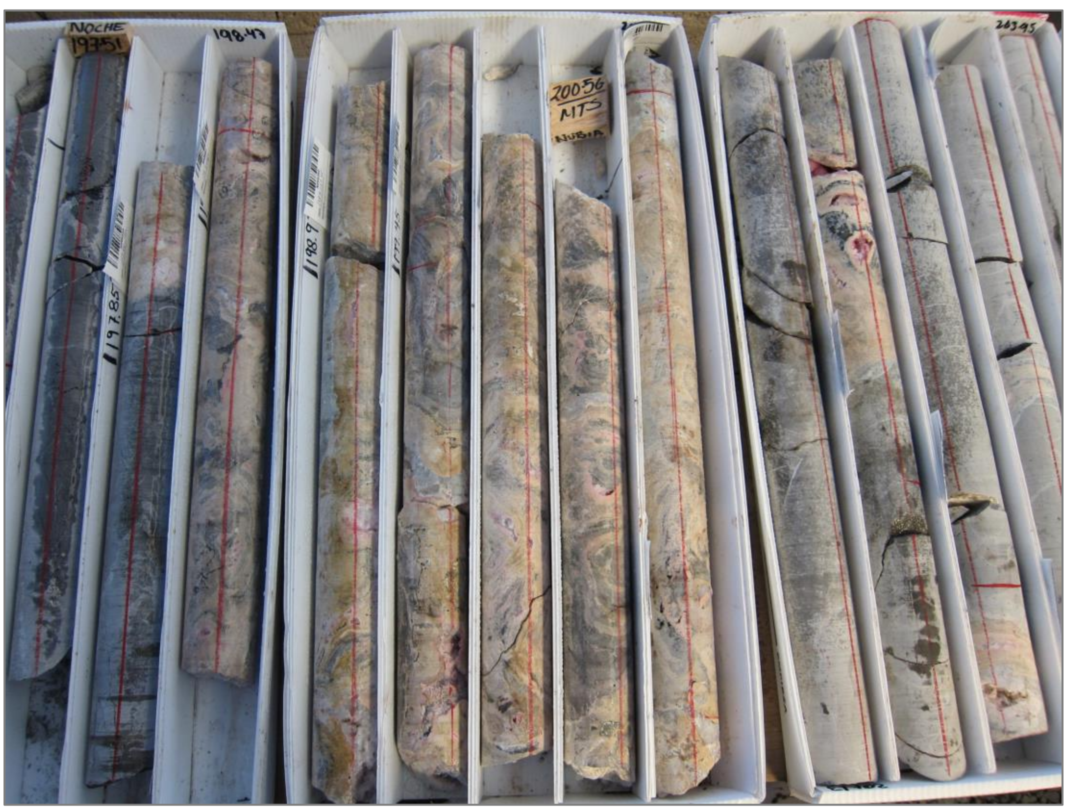


Figure 7-8 **Example of Banded Veining of the Main Ixtaca Vein Swarm Zone of**

The Main Ixtaca and Ixtaca North vein swarms are spatially associated with two altered and mineralised sub parallel ENE (060 degrees) trending, sub-vertical to steeply north dipping dyke zones. The Main Ixtaca dyke zone is approximately 100m wide and consists of a series of 2m to over 20m true width dykes. The Ixtaca North dyke zone is narrower and comprises a steeply north-dipping zone of two or three discrete dykes ranging from 5 to 20m in width.

Individual veins and veinlets within the Main Ixtaca and Ixtaca North vein swarm zones cannot be separately modelled. The vein swarms are modelled as zones which include the vein zone is comprised of anastomosing veins. Wireframes were created that constrain the higher grade, more densely veined areas, however as the vein swarms are anastomosing and sheeted in nature, these wireframes include significant barren limestone material enclosed by veins within the vein swarm.

The Main and North zones have been defined over 650m and tested over 1000m strike length with high-grade mineralization intersected to depths up to 350m vertically from surface. The strike length of the Chemalaco Zone has been extended to 450m with high-grade mineralization intersected to a vertical depth of 550m, or approximately 700m down-dip. In 2016 Almaden conducted a drill program to test for additional veins to the north of the Ixtaca North Zone. This program resulted in better definition of the Ixtaca North zone and was successfully demonstrated that limestone mineralistation remains open to the north and at depth.

The Chemalaco Zone dips moderately-steeply at approximately 22 degrees to the WSW. An additional sub-parallel zone has been defined underneath the Chemalaco Zone dipping 25 to 50 degrees to the WSW, intersected to a vertical depth of 250m, approximately 400m down-dip over a 250m strike length. The Chemalaco zone remains open to depth and along strike to the northwest. Additional parallel veins further to the east have been identified in core and the zone is remains open in this direction as well. In the Chemalaco zone, assays indicate that, while mineralisation appears similar in core, higher silver grades occur in the upper portion of the drilled area and higher gold grades occur at depth.

The Main Ixtaca, Ixtaca North and Chemalaco vein zones are largely concealed by overlying altered volcanic rocks although the limestone and Main Ixtaca zone of veining does crop out on the west side of Cerro Caolin, the hill under which the Main Ixtaca Zone occurs. The volcanic above the Main Ixtaca Zone are intensely clay altered and locally silicified but barren of significant gold and silver at surface. The Cerro Caolin volcanic hosted clay alteration zone extends to the SE roughly 1 kilometer and represents a significant drill target.

Figure 7-9 Altered, Veined and Mineralised Volcanics

Studies of mineral assemblages in hand specimen, transmitted and reflected light microscopy and SEM analyses have been carried out in order to construct a paragenetic sequence of mineral formation. This work completed by Herrington (2011) and Staffurth (2012) reveals that veining occurs in three main stages. The first stage is barren calcite veining. This is followed by buff brown and pink colloform carbonate and silicate veins containing abundant silver minerals and lower gold. The third stage of veining contains both gold and silver mineralization. The dominant gold-bearing mineral is electrum, with varying Au:Ag ratios. The majority of grains contain 40-60wt (weight) % gold but a few have down to 20wt% (Staffurth, 2012). Gold content occasionally varies within electrum grains, and some larger grains seem to be composed of aggregates of several smaller grains of differing composition (Staffurth, 2012). Electrum often appears to have been deposited with late galena-clausthalite both of which are found as inclusions or in fractures in pyrite. It is also closely associated with silver minerals as well as sphalerite and alabandite. Gold is also present in uytenbogaardtite (Ag3AuS2). This mineral is associated with electrum, chalcopyrite, galena, alabandite, silver minerals, and quartz in stage three mineralization (Herrington, 2011; Staffurth, 2012). Apart from electrum, the dominant silver bearing minerals are polybasite (-pearceite) minor argentian tetrahedrite plus acanthite-naumannite, pyrargyrite and stephanite. They are associated with sulphides or are isolated in gangue minerals (Staffurth, 2012).

7.3.1 Steam Heated Alteration, Replacement Silicification and Other Surficial Geothermal Manifestations at Ixtaca

One of the most striking features of the Ixtaca epithermal system is the kaolinite alteration, replacement silicification, and sinter carapace that remains uneroded immediately above the Ixtaca Zone (**Figure 7-10**). This alteration has been identified over a roughly 5 x 5km area and is interpreted to represent the upper levels of a preserved epithermal system. All three alteration types have formed in the volcanic units.

When the source alkali- choride epithermal fluids boil, along with water vapour, CO_2 and H_2S also separate. These gases rise and above the water table H_2S condenses in the vadose zone forming H_2SO_4. Near surface the H_2SO_4 alters volcanic rocks to kaolinite and alunite and can dissolve volcanic glass (Hedenquist and Henley 1985b). This process is interpreted to be responsible for the kaolinite alteration, known as steam-heated alteration in the economic geology literature (eg. White and Hedenquist, 1990). The resulting silica laden fluid can transport and re precipitate silica at the water table in permeable host rocks. This mechanism can result in large tabular alteration features often referred to as a silica caps. Since gold is not transported by the gases or sulphuric acid, the silica cap is usually devoid of gold and silver, which is the case at Ixtaca (White and Hedenquist, 1990).

Sinter is diagnostic of modern epithermal systems where silica-rich fluids emanate as hot springs at the earth's surface. Sinters are the highest level manifestation of an epithermal system and consequently the first feature to be removed by erosion. Most epithermal gold-silver deposits that have been recognized show some degree of erosion and ancient sinters are typically poorly preserved in the geological record. The presence of preserved steam heated and replacement silica alteration and sinter at Ixtaca is thus a clear indication that the deposit has not been significantly affected by erosion. At Ixtaca, the sinter facies and replacement silicification, where preserved, are located within the altered volcanic units.

Large areas of steam heated alteration zone remain unexplored on the property and, like at the Ixtaca deposit, have the potential to overlie epithermal gold silver veins. Perhaps most significantly the SE volcanic hosted clay alteration zone extends for a kilometer to the southeast from Cerro Caolin.

Figure 7-10 Photo (2001) of Historic Clay Exploration Pits in Clay Altered Volcanic Rocks. Looking to West. Photo Taken from near Section 10+300

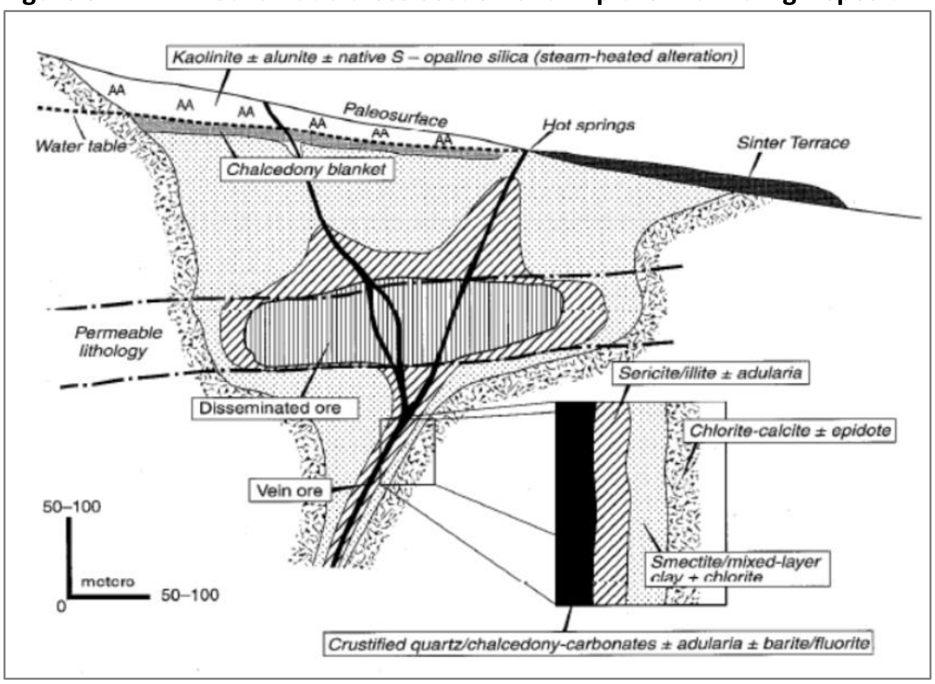
8 Deposit Types

The principal deposit-type of interest on the Tuligtic Property is low- to intermediate- sulphidation epithermal gold-silver mineralization (Figure 8-1) This style of mineralization is recognised at the Ixtaca Zone but property scale high level epithermal alteration suggests that mineralization of this type can exist elsewhere on the Project. These deposits are described more fully below. The Tertiary bodies intruding the Tamaulipas Limestones and the tertiary volcanics, makes the Property also prospective for Porphyry copper-gold-molybdenum (Cu-Au-Mo) and peripheral Pb-Zn Skarn deposits.

8.1 Epithermal Gold-Silver Deposits

Gold and silver deposits that form at shallow crustal depths (<1,500m) are interpreted to be controlled principally by the tectonic setting and composition of the mineralizing hydrothermal fluids. Three classes of epithermal deposits (high-sulphidation, intermediate-sulphidation and low-sulphidation) are recognized by the oxidation state of sulphur in the mineralogy, the form and style of mineralization, the geometry and mineralogy of alteration zoning, and the mill feed composition (Hedenquist et al., 2000; Hedenquist and White, 2005). Overlapping characteristics and gradations between epithermal classes may occur within a district or even within a single deposit. The appropriate classification of a newly discovered epithermal prospect can have important implications to exploration (Table 8-1).

Figure 8-1 Schematic Cross-section of an Epithermal Au-Ag Deposit



High-sulphidation and intermediate-sulphidation systems are most commonly hosted by subduction-related andesite-dacite volcanic arc rocks, which are dominantly calc-alkaline in composition. Low-sulphidation systems are more restricted, generally to rift-related bimodal (basalt, rhyolite) or alkalic volcanic sequences. The gangue mineralogy, metal contents and fluid inclusion studies indicate that near neutral pH hydrothermal fluids with low to moderate salinities form low- and intermediate-sulphidation class deposits whereas high-sulphidation deposits are related to more acidic fluids with variable low to high salinities. Low- and intermediate-sulphidation deposits are typically more vein-style while high-sulphidation deposits commonly consist primarily of replacement and disseminated styles of mineralization with subordinate veining. The characteristics of silver-gold mineralization in the Ixtaca Zone include banded, colloform and brecciated carbonate-quartz veining including locally abundant Mn-carbonate and rhodochrosite indicate that this is primarily a low to intermediate-sulphidation epithermal district (Figure 8-2).

Several of the larger examples of this deposit type occur in Mexico and include the prolific historic epithermal districts of Pachuca, Guanajuato and Fresnillo. Nevertheless these districts are base metal rich while Ixtaca is a precious metals deposit.

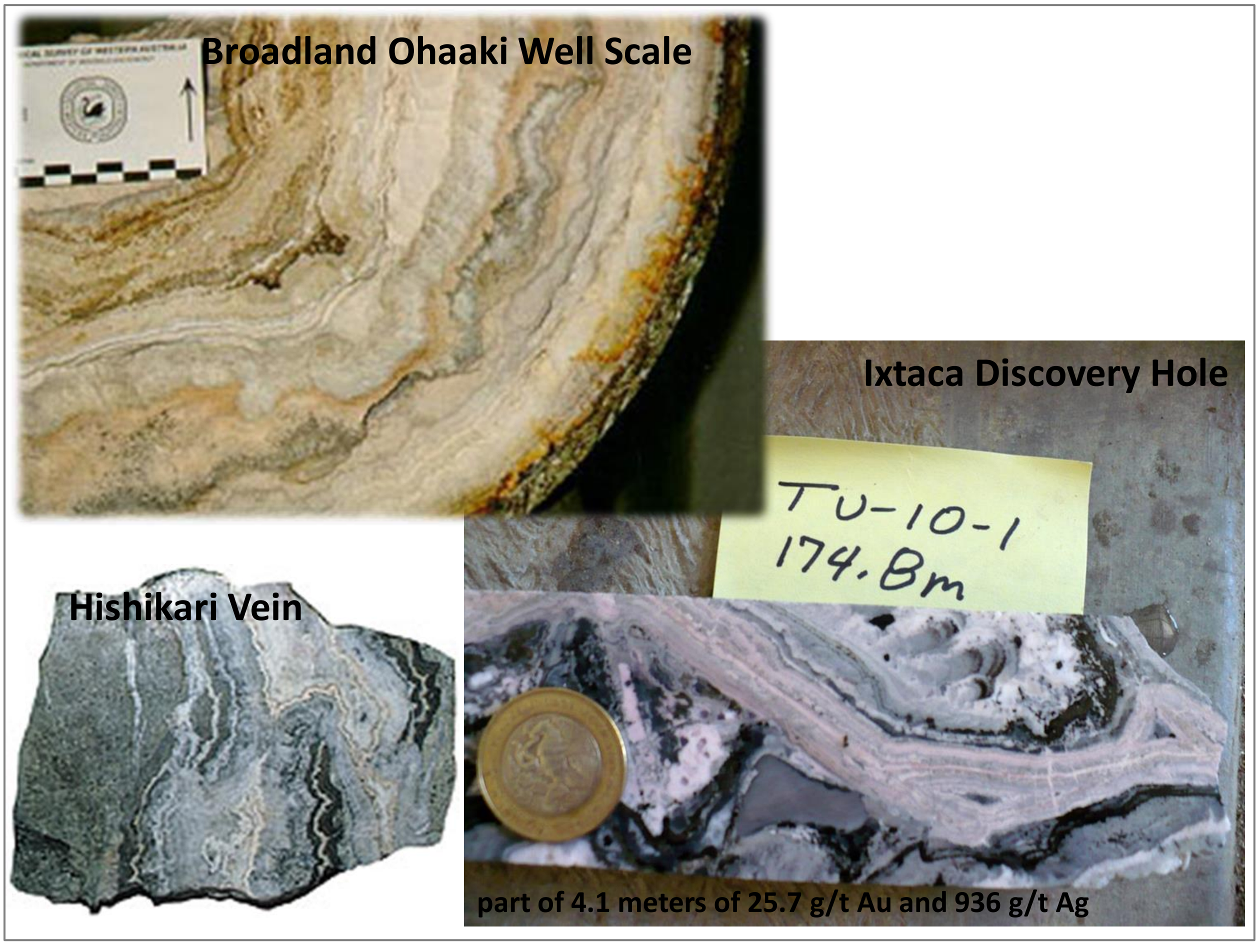


Figure 8-2 **Photos of Epithernal Veining from Ixtaca, Hishikari Japan and Well Scale from the Active Geothermal System, Broadlands Ohaaki, New Zealand**

Table 8-1 Classification of Epithermal Deposits

	Low-Sulphidation	Intermediate-Sulphidation	High-Sulphidation
Metal Budget	Au- Ag, often sulphide poor	Ag - Au +/- Pb - Zn; typically sulphide rich	Cu - Au - Ag; locally sulphide-rich
Host Lithology	bimodal basalt-rhyolite sequences	andesite-dacite; intrusion centred district	andesite-dacite; intrusion centred district
Tectonic Setting	rift (extensional)	arc (subduction)	arc
Form and Style of Alteration/ Mineralization	vein arrays; open space veins dominant; disseminated and replacement mill feed minor stockwork mill feed common; overlying sinter common; bonanza zones common	vein arrays; open space veins dominant; disseminated and replacement mill feed minor; stockwork mill feed common; productive veins may be km-long, up to 800m in vertical extent	veins subordinate, locally dominant; disseminated and replacement mill feed common; stockwork mill feed minor.
Alteration Zoning	mill feed with quartz-illite-adularia (argillic); barren silicification and propylitic (quartz-chlorite-calcite +/- epidote) zones; vein selvedges are commonly narrow	mill feed with sericite-illite (argillic-sericitic); deep base metal-rich (Pb-Zn +/- Cu) zone common; may be spatially associated with HS and Cu porphyry deposits	mill feed in silicic core (vuggy quartz) flanked by quartz-alunite-kaolinite (advanced argillic); overlying barren lithocap common; Cu-rich zones (enargite) common
Vein Textures	chalcedony and opal common; laminated colloform-crustiform; breccia; bladed calcite (evidence for boiling)	chalcedony and opal uncommon; laminated colloform-crustiform and massive common; breccias; local carbonate-rich, quartz-poor veins; rhodochrosite common, especially with elevated base metals	chalcedony and opal uncommon; laminated colloform-crustiform veins uncommon; breccia veins; rhodochrosite uncommon
Hydrothermal Fluids	low salinity, near neutral pH, high gas content (CO_2, H_2S); mainly meteoric	moderate salinities; near neutral pH	low to high salinities; acidic; strong magmatic component?
Examples	McLaughlin, CA; Sleeper and Midas, NV; El Penon, Chile; Hishikari, Japan	Arcata Peru; Fresnillo Mexico; Comstock NV; Rosia Montana Romania	Pierina Peru; Summitville CO

**Altered after Taylor, 2007*

The low- and intermediate-sulphidation epithermal gold-silver deposits are generally characterised by open space fill and quartz-carbonate veining, stockworks and breccias associated with gold and silver often in the form of electrum, argentite and pyrite with lesser and variable amounts of sphalerite, chalcopyrite, galena, rare tetrahedrite and sulphosalt minerals, which form in high-level (epizonal) to near-surface environments.

The epithermal veins form when carbonate minerals and quartz precipitate from a cooling and boiling alkali-chloride fluid. Alkali-chloride geothermal fluids are formed from magmatic gases and convecting groundwater and are near neutral in composition. These fluids convect in the upper crust perhaps over a 10km deep vertical interval and can transport gold, silver and other metals. At roughly 2km depth, these fluids begin to boil, releasing CO_2 and H_2S (carbon-dioxide and hydrogen-sulphide). Both these now separated gases form separate fluids, each forming alteration zones with distinct mineralogy (Hedenquist et al., 2000).

Above the water table H_2S condenses in the vadose zone to form a low pH H_2SO_4 (hydrogen-sulphate) dominant acid sulphate fluid (Hedenquist and White, 1990). These fluids can result in widespread tabular steam-heated alteration zones dominated by fine grained and friable kaolinite and alunite. Steam-heated waters collect at the water table and create aquifer-controlled strataform blankets of dense silicification known as silica caps (Shoenet al., 1974; Hedenquist et al.,, 2000). Since gold is not transported by the gases or sulphuric acid, the silica cap and overlying kaolinite alteration is usually devoid of gold and silver (Hedenquist et al. 2000).

Bicarbonate fluids are the result of the condensation of CO_2 in meteoric water. These fluids are also barren of gold and silver and generally form carbonate dominated alteration on the margins of the geothermal cell.

As the source alkali chloride fluids boil and cool quartz and carbonate deposit in the fractures along which the fluids are ascending to form banded carbonate-quartz veins. Gold and silver present within the fluid also precipitate in response to the boiling of the fluid. Potassium-feldspar adularia is also a common mineral that deposits in the veins in response to boiling. As carbonate and quartz precipitates individual fractures can be sealed and the boiling fluid must then find another weak feature to continue rising. Gases which accumulate beneath the sealed fracture causes the pressure to increase until the seal is broken. This results in a substantial change in pressure, which propagates catastrophic boiling in turn causing gold, bladed calcite, and amorphous silica to precipitate rapidly. Once the fluids return to equilibrium the quartz crystals again precipitate under passive conditions and seal the vein again until the process recurs. This episodic sealing and fracturing results in the banded textures common in these vein systems.

Mill feed zones are typically localized in structures, but may occur in permeable lithologies. Upward-flaring mill feed zones centred on structurally controlled hydrothermal conduits are typical. Large (bigger than 1m wide and hundreds of metres in strike length) to small veins and stockworks are common with lesser disseminations and replacements. Vein systems can be laterally extensive but mill feed shoots have relatively restricted vertical extent. High-grade ores are commonly found in dilational zones in faults at flexures, splays and in stockworks.

These deposits form in both subaerial, predominantly felsic, volcanic fields in extensional and strike-slip structural regimes and island arc or continental andesitic stratovolcanoes above active subduction zones. Near-surface hydrothermal systems, ranging from hot spring at surface to deeper, structurally and permeability focused fluid flow zones are the sites of mineralization. The mill feed fluids are relatively dilute and cool solutions that are mixtures of magmatic and meteoric fluids. Mineral deposition takes place as the solutions undergo cooling and degassing by fluid mixing, boiling and decompression.

8.1.1 The Ixtaca Zone Epithermal System

The epithermal veining at the Ixtaca deposit occurs largely as vein swarms in the host carbonate rocks. Veins also occur in the overlying altered volcanics but the volcanic mineralisation is largely disseminated in nature. Fluid flow is interpreted to have been restricted to fractures in the basement carbonate units, forming veins. In the more permeable volcanic units above fluids appear to have dispersed forming lower grade mineralisation associated with disseminated pyrite (**Figure 8-1**).

The bulk of the epithermal veining in the Ixtaca deposit occurs as subparallel branching veins and veinlets and local stockworks called vein swarms (**Figure 8-3**). This is common for epithermal vein systems that occur in brittle lithologies like the limestone host rock at Ixtaca. Similar vein swarms occur and have been mined in several epithermal systems worldwide including Waihi New Zealand, McLauphlin and Mesquite California (Sillitoe, 1993).

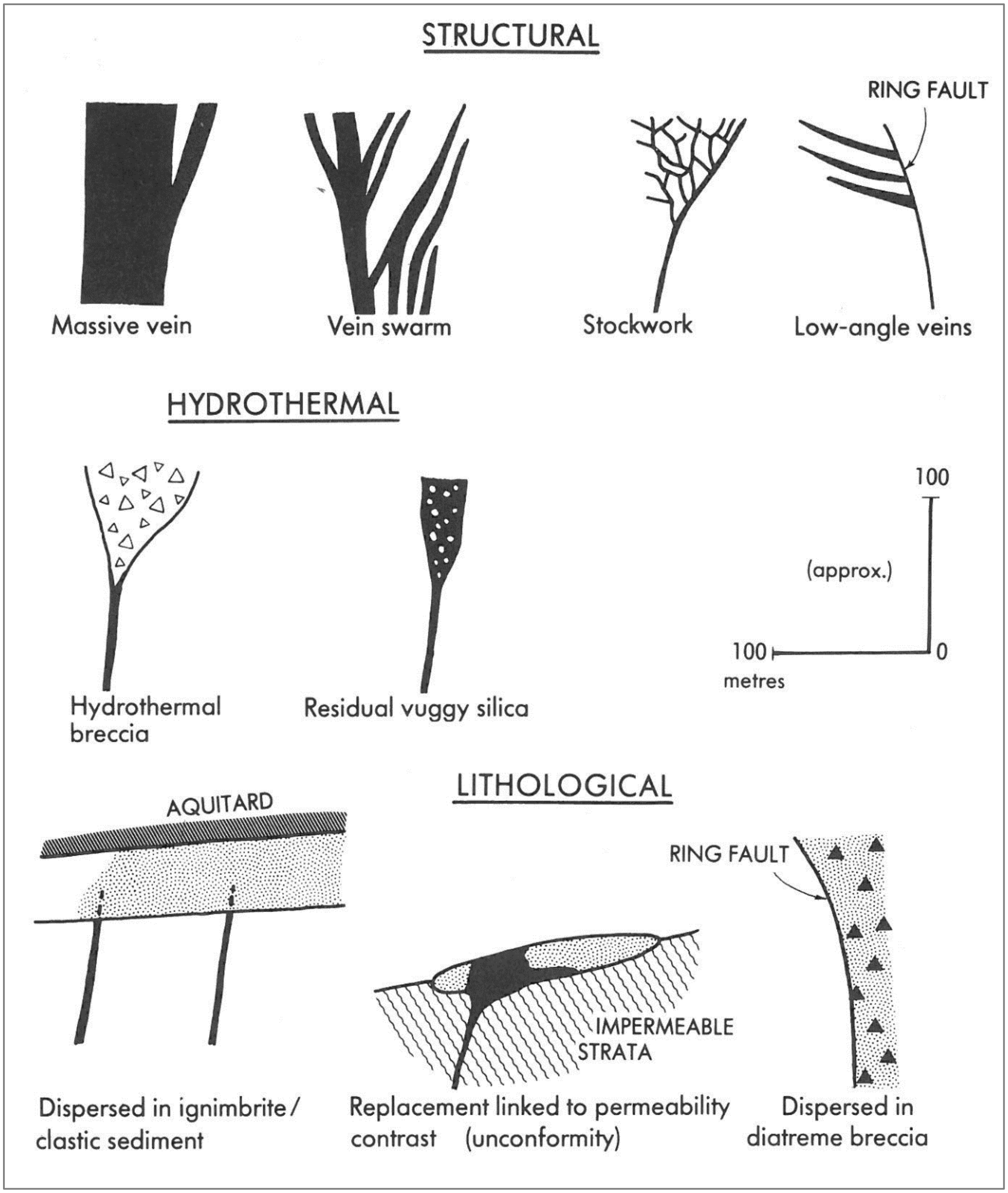


Figure 8-3 **Selected styles and geometry of epithermal deposits illustrating the structural setting of the limestone hosted veining at Ixtaca, a vein swarm and local stockwork. Taken from Sillitoe (1993).**

8.2 Porphyry Copper-Gold-Molybdenum and Lead-Zinc Skarn Deposits

In Porphyry Cu-Au-Mo deposit types, stockworks of quartz veinlets, quartz veins, closely spaced fractures, and breccias containing pyrite and chalcopyrite with lesser molybdenite, bornite and magnetite occur in large zones of economically bulk-mineable mineralization in or adjoining porphyritic intrusions and related breccia bodies. Disseminated sulphide minerals are present, generally in subordinate amounts. The mineralization is spatially, temporally and genetically associated with hydrothermal alteration of the host rock intrusions and wall rocks.

These deposit types are commonly found in orogenic belts at convergent plate boundaries, commonly linked to subduction-related magmatism. They also occur in association with emplacement of high-level stocks during extensional tectonism related to strike-slip faulting and back-arc spreading following continent margin accretion (Panteleyev, 1995).

Many Au skarns are related to plutons formed during oceanic plate subduction, and there is a worldwide spatial, temporal and genetic association between porphyry Cu provinces and calcic Au skarns. The Au skarns are divided into two types. Pyroxene-rich Au skarns tend to be hosted by siltstone-dominant packages and form in hydrothermal systems that are sulphur-rich and relatively reduced. Garnet-rich Au skarns tend to be hosted by carbonate-dominant packages and develop in more oxidizing and/or more sulphur-poor hydrothermal systems. The gold is commonly present as micron-sized inclusions in sulphides, or at sulphide grain boundaries. To the naked eye, mill feed is generally indistinguishable from waste rock. Due to the poor correlation between Au and Cu in some Au skarns, the economic potential of a prospect can be overlooked if Cu-sulphide-rich outcrops are preferentially sampled and other sulphide-bearing or sulphide-lean assemblages are ignored (Ray, 1998).

9 Exploration

Between 2004 and 2014, Almaden's exploration at the Tuligtic Property has included ASTER satellite hydroxyl alteration studies, surface lithology and alteration mapping, rock and soil geochemical sampling, ground magnetics, IP and resistivity, Controlled Source Audio-frequency Magnetotelluric (CSAMT), and Controlled Source Induced Polarization (CSIP) geophysical surveys. The work to date has resulted in the identification of eight anomalous areas: the Ixtaca, SE Clay Alteration, Tano, Ixtaca East, Caleva, Azul West, Azul and Sol zones (Figure 7-2 and Figure 9-1, Figure 9-2). Detailed exploration results for the Tuligtic Property have been disclosed in a previous Technical Report for the Tuligtic Property by Raffle et al. (2013) and are summarized below.

9.1 Rock Geochemistry

Between 2004 and 2014 a total of 468 rock geochemical samples have been collected on the Property over a 6 x 6km area. Rock sampling, guided by concurrent soil geochemical surveys, has been concentrated around the Ixtaca Zone and an area extending 4km to the NNE over the copper porphyry target located between the Caleva and Azul zone soil geochemical anomalies (Figure 7-2, Figure 9-1, Figure 9-2).

Rock grab samples collected by Almaden are from both representative and apparently mineralized lithologies in outcrop, talus and transported boulders within creeks throughout the Property. Rock samples ranging from 0.5 to 2.5 kilograms (kg) in weight and are placed in uniquely labelled poly samples bags and their locations are recorded using handheld GPS accurate to plus or minus 5m accuracy.

Of the 468 rock grab samples collected, a total of 48 samples returned assays of greater than 100 parts-per-billion (ppb) gold (Au), and up to 6.14 grams-per-tonne (g/t) Au. A total of 51 rock samples returned assays of greater than 10g/t silver (Ag) and up to 600g/t Ag.

Gold and silver mineralization occurs within the Ixtaca Zone, and is associated with anomalous arsenic, mercury (± antimony). To the northeast of the Ixtaca Zone zinc, copper and locally anomalous gold, silver and lead (± arsenic) values occur in association with calc-silicate skarn and altered intrusive rocks.

Basement carbonate units, altered intrusive, and locally calc-silicate skarn mineralization occur as erosional windows beneath altered and locally mineralised volcanic. Surface mineralization at the Ixtaca Zone occurs as limestone boulders containing quartz vein fragments and high level epithermal alteration within overlying volcanic rocks as well several small outcrops of epithermal veined limestone. Epithermal alteration and mineralization is observed overprinting earlier skarn and porphyry style alteration and mineralization. Numerous small skarn-related showings exist at the north end Project. Near the Caleva soil anomaly, a small (200 x 100m)skarn zone hosts sphalerite, galena and chalcopyrite quartz vein stockwork mineralization along the contact zone between limestone and altered and mineralized intrusive rocks to the east.

New mapping at the Tano zone and immediately west of the PFS pit has identified outcropping epithermal quartz-carbonate veining that has never been tested by drilling. Rock samples taken from these rock samples have been submitted to the laboratory and results are pending at time of writing.

9.2 Soil and Stream Sediment Geochemistry

The collection of 4,760 soil samples by Almaden between 2005 and 2011 resulted in the identification of eight anomalous areas: the Ixtaca, SE Clay Alteration Zone, Tano, Ixtaca East, Tano, Caleva, Azul West, Azul and Sol zones (Figure 7-2). During 2013, an additional 1,035 soil samples have been collected to extend soil grid lines to the west and locally infill existing grid lines, for a total of 5,795 soil samples.

Samples have been collected at 50m intervals along a series of 200m spaced east-west oriented lines. Infill lines spaced at 100m have been completed over gold and silver anomalies at the Caleva and Ixtaca East zones, and The Tano Zone roughly 2.5km west of the Ixtaca Zone. Subsequently, detailed 50m x 50m grid sampling of the Ixtaca Zone and select grid infill of the Azul and Sol zones was completed. Soil samples are collected by hand from a small hole dug with a non-metallic pick or hoe. The sample depth is typically 10cm, or at least deep enough to be below the interpreted surficial organic layer. Sample bags are labelled with a unique sample number.

Based on the distribution of soil geochemical anomalies and the mapped geology it is apparent that the locally occurring thin (<2 m thick overlying and unconsolidated post mineral volcanics and soil deposits obscure rock geochemical anomalies from the underlying epithermal system. Significant and anomalous precious metal in soils occur where this unit has been eroded away and volcanic and carbonate hosted mineralisation occurs at surface. Anomalous thresholds (greater than the 95^{th} percentile) for gold and silver are calculated to be 17.1ppb Au and 0.59ppm Ag, respectively. A total of 288 samples contain anomalous Au, including 141 samples with coincident Ag anomalies.

The Ixtaca Zone drainage area produces the largest Au and Ag response within the Tuligtic Property (Figure 9-1, Figure 9-2). Base metals do not correlate significantly with the Ixtaca Zone, and epithermal trace metal suite elements anomalies occur peripherally within altered volcanic rocks.

Roughly 2 km to the southwest at ~240 degrees, along strike from the Ixtaca deposit is the Tano zone of high gold and silver in soil where there has been a limited number of exploration holes drilled (highest gold intercept of 2.00 meters of 1.76 g/t gold and 5.45 g/t silver in hole TZ-12-003). In the intervening 2 kilmeters between the Tano Zone and Ixtaca deposit soils were not significantly anomalous but this is an area covered in post mineral material.

Similarly, along strike at 060 azimuth, roughly 2 km to the northeast the Ixtaca deposit, is the Ixtaca East zone of clay alteration and high gold in soil. Two drainages from this area returned high gold in silt, 700 and 900 ppb respectively.

Base metals correlate well with Au-Ag at the Caleva, Azul, and Sol zones to such an extent they are best termed Cu-Zn (Au-Ag) anomalies. (Figure 7-2, Figure 9-1. Figure 9-2). Significant high level epithermal suite trace element soil anomalies occur from Cerro Caolin (immediately above the Main Ixtaca Zone) to over a kilometer to the southeast in an area of outcropping clay altered volcanic. This anomaly and clay alteration defines the SE Alteration zone.

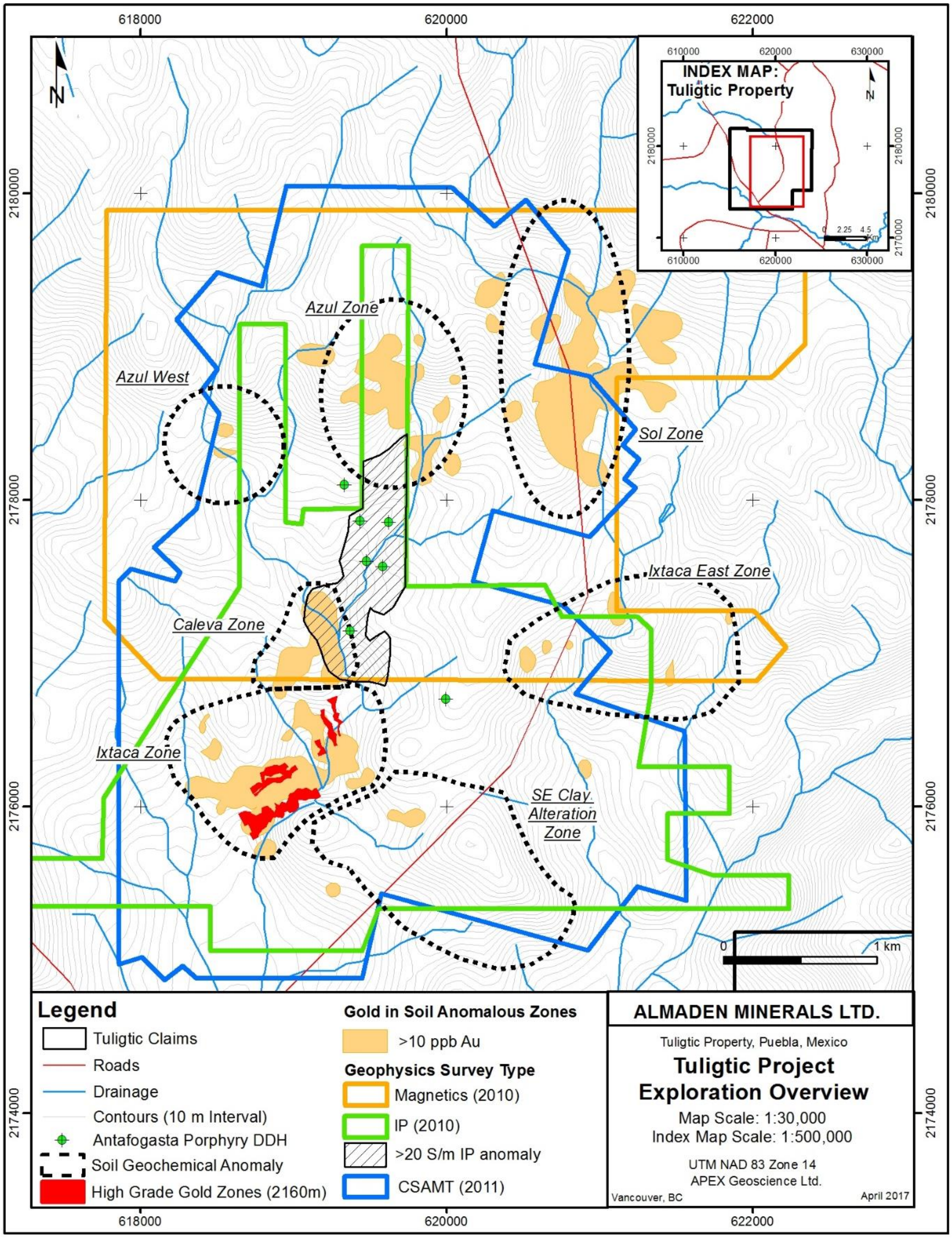


Figure 9-1 Exploration Overview Showing Gold in Soil Anomalies and Extent of Geophysical Surveys

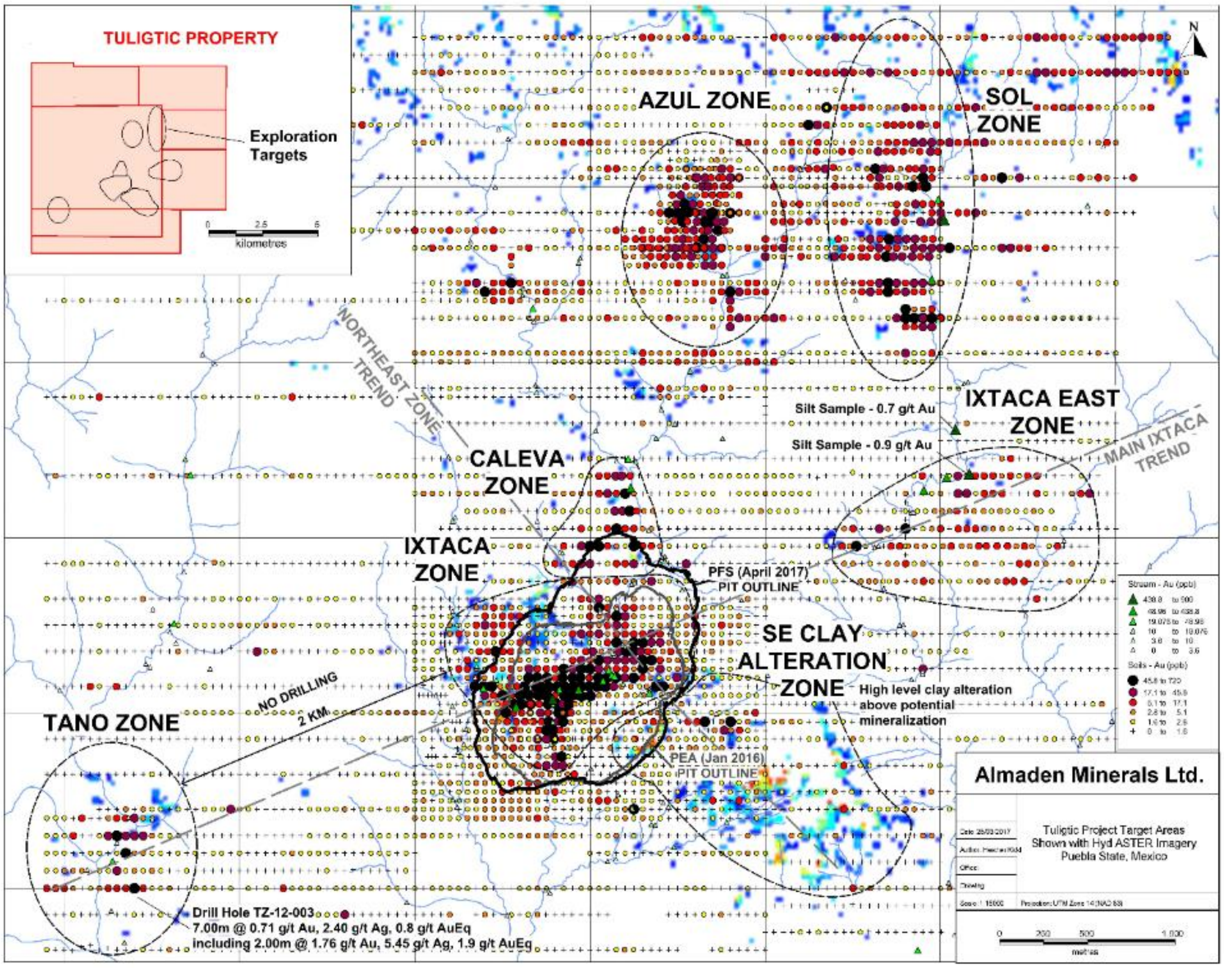


Figure 9-2 Gold in Soil Anomalies, ASTER Satellite Hydroxyl responses and Target Areas

9.3 Ground Geophysics

9.3.1 Magnetics

During 2010, Almaden completed an 84 line-km ground magnetic survey over a 4km by 4.5km area covering the copper porphyry target area north of the Ixtaca Zone (**Figure 9-1**). The survey comprised a series of 200m spaced east-west oriented lines with magnetic readings collected at 12.5m intervals along each line.

The survey identified a broad poorly defined, approximately 100 nano-Tesla (nT) magnetic high anomaly that corresponds in part with mapped altered quartz-monzonite porphyry rocks. Numerous, 30 to 50nT short strike length NNW trending linear magnetic high anomalies parallel the regional structural grain, and the strike of bedding within Upper Tamaulipas formation calcareous rocks suggesting structural and/or lithologic control of magnetic anomalies.

9.3.2 Induced Polarization/Resistivity

Concurrent with 2010 ground magnetic surveys, Almaden completed 108 line-km of 100m "a" spacing pole-dipole induced polarization (IP) / resistivity geophysical surveys over the project area. The survey employed a series of overlapping east-west and north-south oriented lines spaced at intervals of 100m.

Resistivity anomalies appear to be controlled largely by the distribution of more resistive basement carbonate lithologies. Resistivity low (conductive) anomalies are common along local topographic high ridges and plateaus where significant thicknesses of more conductive altered volcanic rocks remain. Nevertheless the discovery drillhole TU-10-001, targeted a coincident chargeability and resistivity high interpreted to represent epithermal veining beneath the barren clay alteration of Cerro Caolin. The Main Ixtaca vein zone was intersected where this anomaly occurs. Many similar resistivity and chargeability highs were detected in the IP survey and require drill testing.

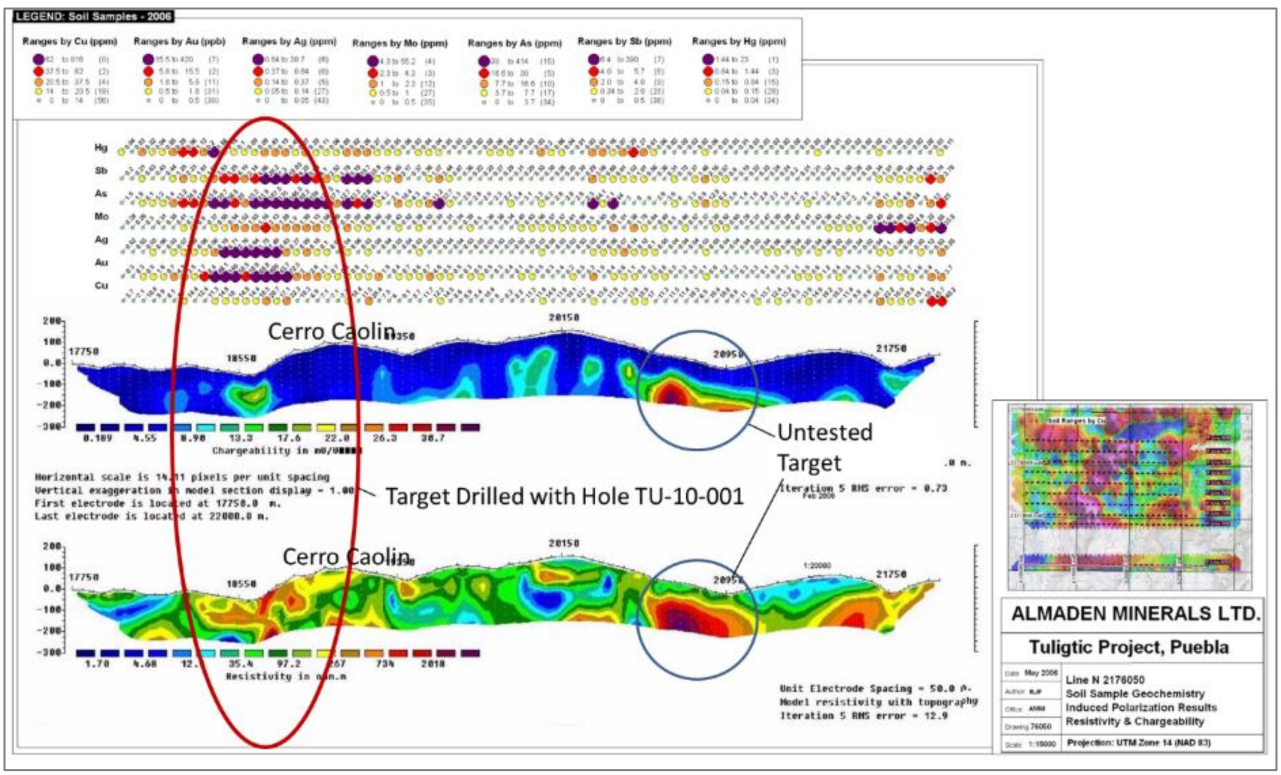


Figure 9-3 IP Chargeability and Resistivity Section Showing Soil Results and Targets. The red target was drill tested with hole TU-10-001 and resulted in the Discovery of the Main Ixtaca Vein Swarm Zone

The survey also defines a 1,000 x 200m north-northwest trending 20 to 30mV/V chargeability anomaly coincident with mapped calc-silicate skarn mineralization and the Caleva Zone soil geochemical anomaly (Figure 9-3). While poorly constrained by a single north-south oriented survey line, the anomaly extends a further 1 km north over the porphyry copper anomaly area. Partial survey coverage of the Ixtaca East Zone multi-element soil geochemical anomaly defines a 700 x 500m elliptical 7 to 15mV/V chargeability anomaly along its western margin.

9.3.3 CSAMT/CSIP

During 2011, Zonge International Inc. on behalf of Almaden completed a Controlled Source Audio-frequency Magnetotelluric (CSAMT) and Controlled Source Induce Polarization (CSIP) geophysical survey at the Tuligtic Property over a 6 by 4km area (**Figure 9-1**).

The survey totalled 48.5 line-km, including six lines oriented N-S (N16E azimuth, CSAMT and CSIP), and eight perpendicular E-W oriented lines (N104E azimuth, CSAMT only). Survey line spacing varied from 170 to 550m utilizing an array of six 25m dipoles.

2-D (N-S Line) smooth-model resistivity data defines a NW trending resistivity anomaly west of the Ixtaca Main Zone, and an E-W trending resistivity anomaly through the Ixtaca Zone. The NW trending anomaly passes through drill sections 10+200E to 10+400E, and may reflect limestone rocks on the west limb of an east-verging antiform. A similar NW trending conductive anomaly immediately to the east may represent calcareous shale rocks within the core of the antiform. The significance of the E-W trending anomaly is not known given the context of the current geologic model.

2-D (E-W Line) smooth-model resistivity data shows a strong resistivity anomaly associated with the core of the Ixtaca Main Zone, and surface outcropping limestone. To the northeast, a resistivity anomaly coincident with the Chemalaco Zone may reflect complex structural geology patterns and the relatively resistive limestone and Chemalaco Dyke lithologies.

A number of subvertical resistivity and conductivity anomalies are evident in the 1-D and 2-D inversions. These anomalies likely represent structures that could also host veins. Further review of this data is planned in order to better define drill targets based on this survey.

9.4 Exploration Potential

The Ixtaca deposit occurs within a large zone of high level epithermal alteration hosted by volcanic rocks, the distribution of which is readily defined by ASTER satellite hydroxyl responses (**Figure 9-2**). The Ixtaca deposit was found in 2010 with hole TU-10-001, which was designed to test a coincident high gold and silver in soil anomaly along with a high chargeability/ high resistivity induced polarisation response occurring underneath a portion of the high level epithermal volcanic hosted clay alteration zone (Cerro Caolin). This hole intersected the core of the Main Ixtaca North vein swarm. Subsequent drilling since 2010 focussed on developing and upgrading confidence of a resource immediately adjacent to this discovery, as well as holes required for engineering and hydrologic purposes. During this timeframe the Company focussed on this resource and development work which has meant that many of the epithermal targets have not yet been tested by drilling.

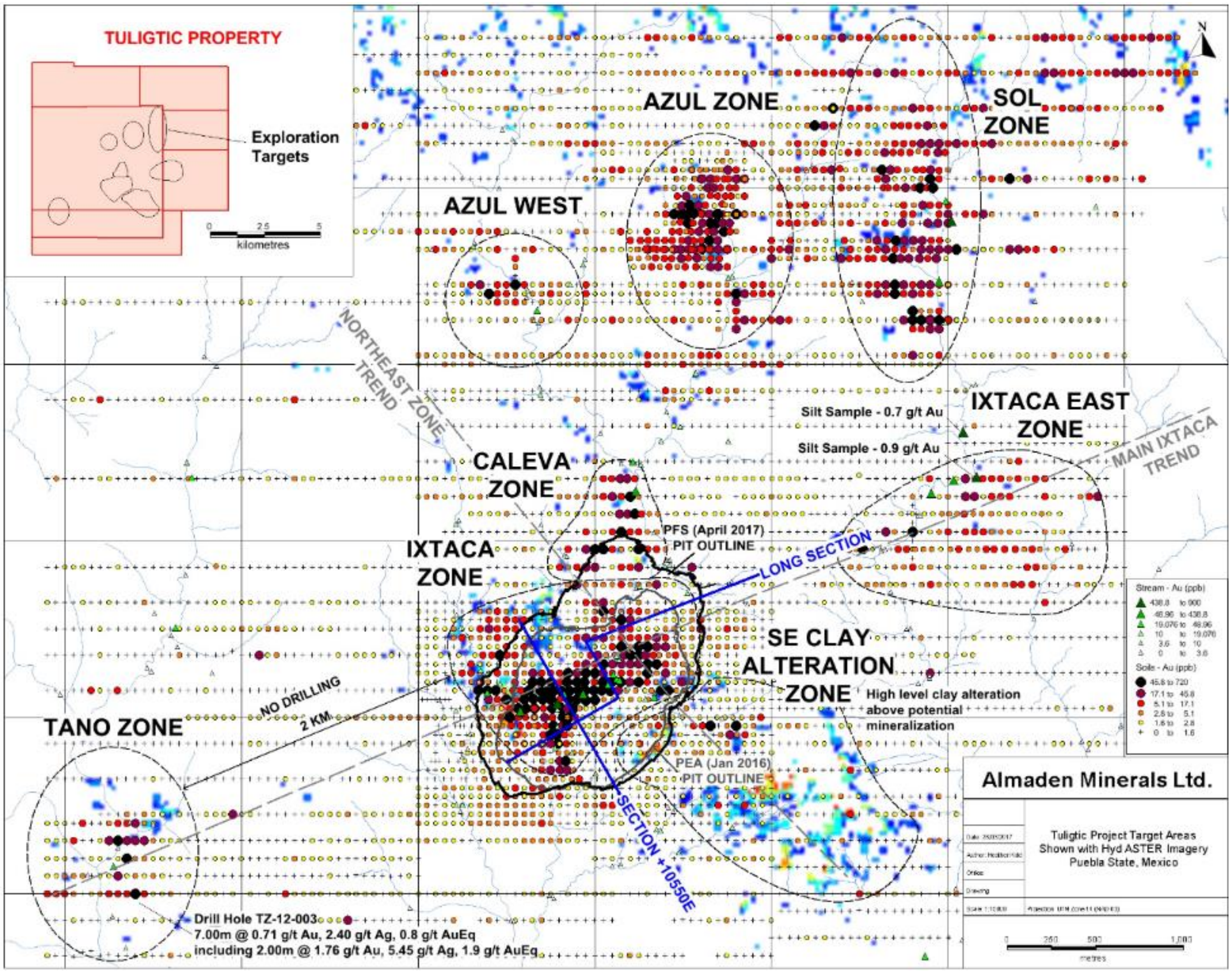


Figure 9-4　　Exploration Targets on the Tuligtic Project

The known vein zones remain open in several directions. A drill program in 2016 was focussed on testing veins to the north of the Ixtaca North vein swarm and successfully identified several new zones of veining in this direction, suggesting that the potential for further veins to the north exists. To the south additional drilling is required to fully define the extent of the Main Ixtaca vein swarm beyond the known extents of which there is significant alteration at surface in the overlying volcanic. At depth the Chemalaco Zone remains open as it does along strike to the north.

The history of exploration at Cerro Caolin shows that the clay altered volcanics overlie significant epithermal vein deposits in this area. The alteration from Cerro Caolin extends to the south and southeast over a kilometer from Cerro Caolin. This area is highly anomalous in epithermal trace elements and is a high priority drill target for concealed epithermal veins.

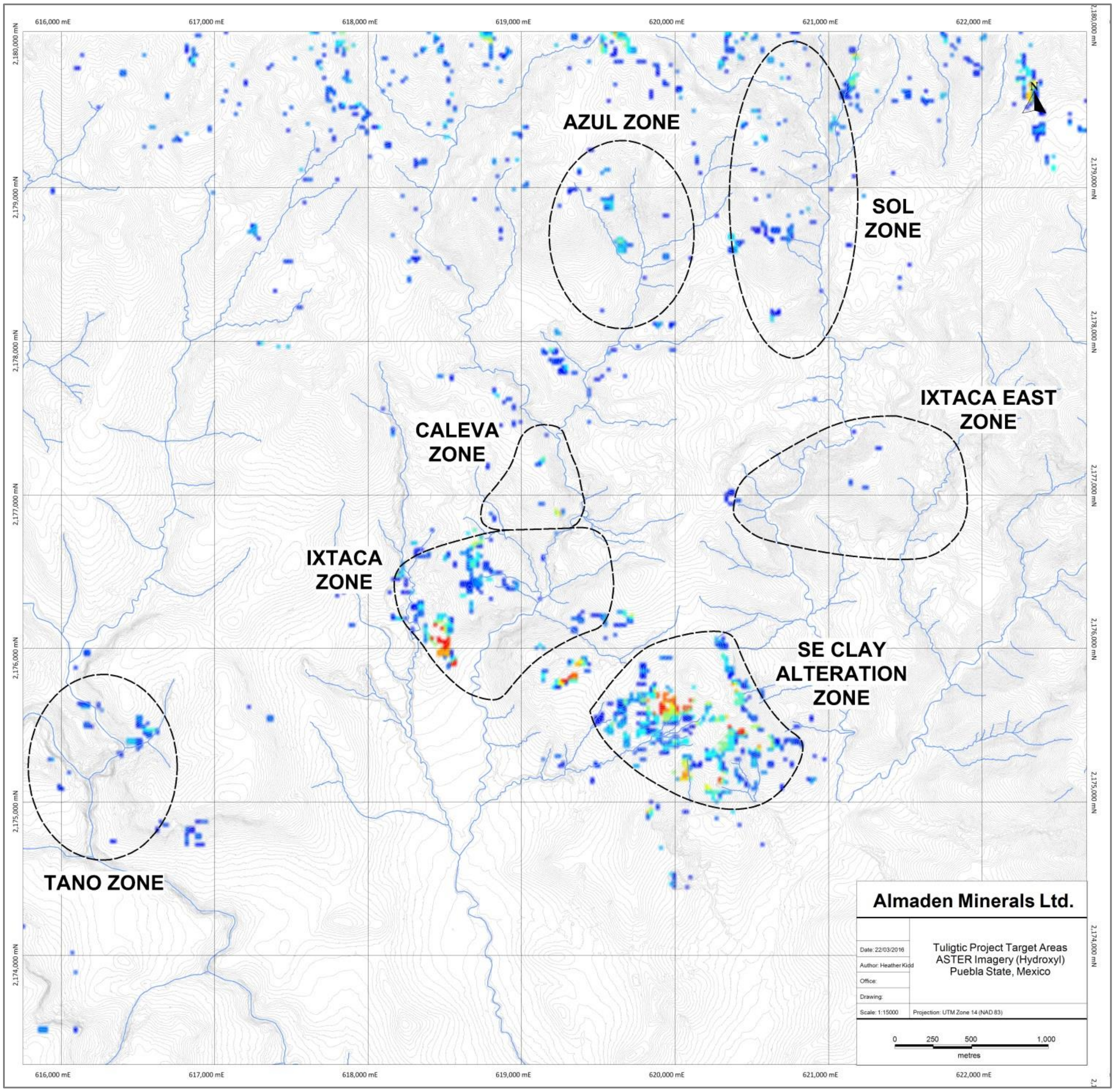


Figure 9-5 ASTER Satellite Hydroxyl (Clay) responses Outlining Clay Altered Volanics

To the west and southwest mapping and geochemistry is hampered by the thin layer of unconsolidated post mineral volcanic cover. Nevertheless, gold in soil geochemistry and hydroxyl responses have highlighted the Tano zone, located roughly 2 km along the strike extent of the Ixtaca vein system to the southwest (240/060 Azimuth) in a window of exposure beneath the post mineral cover. While the limited drilling to date at the Tano zone has identified veining and gold silver mineralisation (2.00 meters of 1.76 g/t gold and 5.45 g/t silver in hole TU-12-003) this work clearly indicates that the system persists to the southwest beyond the Ixtaca zone and highlights this ~2 km distance as prospective for concealed veins beneath cover (Figure 9-4 and Figure 9-5).

Similarly to the Northeast, roughly 2 km at 060 along strike from the Ixtaca deposit, a zone of alteration and gold in soils has been identified and named the Ixtaca East zone. Significant gold in stream sediments have been returned from drainages of this area (700 and 900 ppb gold respectively) and indicate the potential for the epithermal to extend into this area.

The Ixtaca vein deposit was discovered beneath barren alteration. Much of the property is either covered by this alteration or thin post mineral cover. The Ixtaca vein deposit is an epithermal low sulphidation vein system that manifests itself as vein swarms in the brittle carbonate host rocks and disseminated mineralisation in the more permeable volcanic rocks that overly the carbonates. At the Waihi deposit in New Zealand, an epithermal system that formed under similar geochemical conditions with similar vein textures, new discoveries have been made over a more than 100 years of exploration history. Some of the most recent discoveries at Waihi, including the Favona vein system, do not have surface manifestations (Figure 9-6 and Figure 9-7). The clay alteration footprint at Ixtaca clearly indicates the potential for additional concealed veins at Ixtaca.

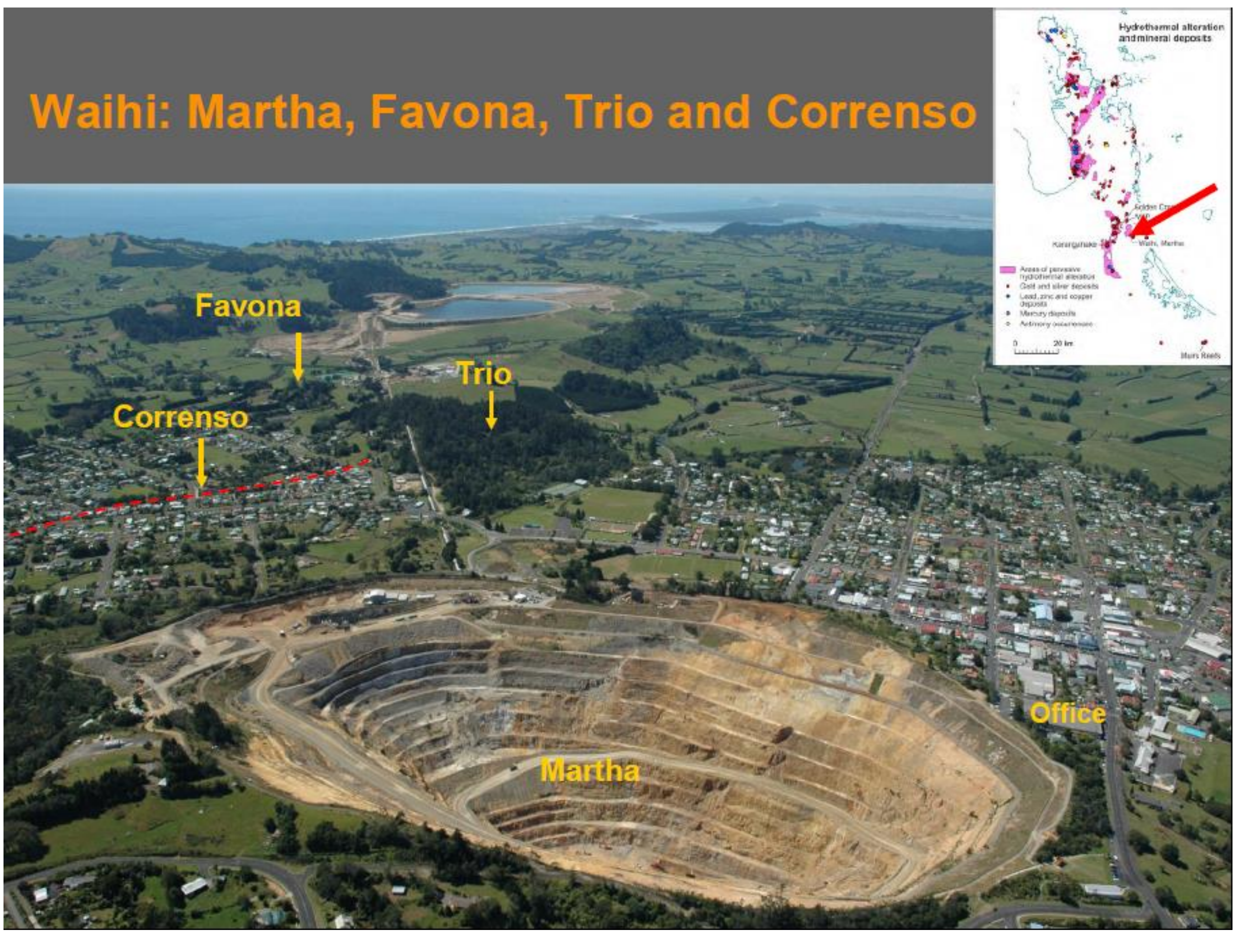


Figure 9-6 **Overview Photo of the Waihi Vein Deposit New Zealand. Historic Martha Pit on vein swarm in foreground. Surface projections of the concealed and more recently discovered Favona and Correnso veins also shown.**

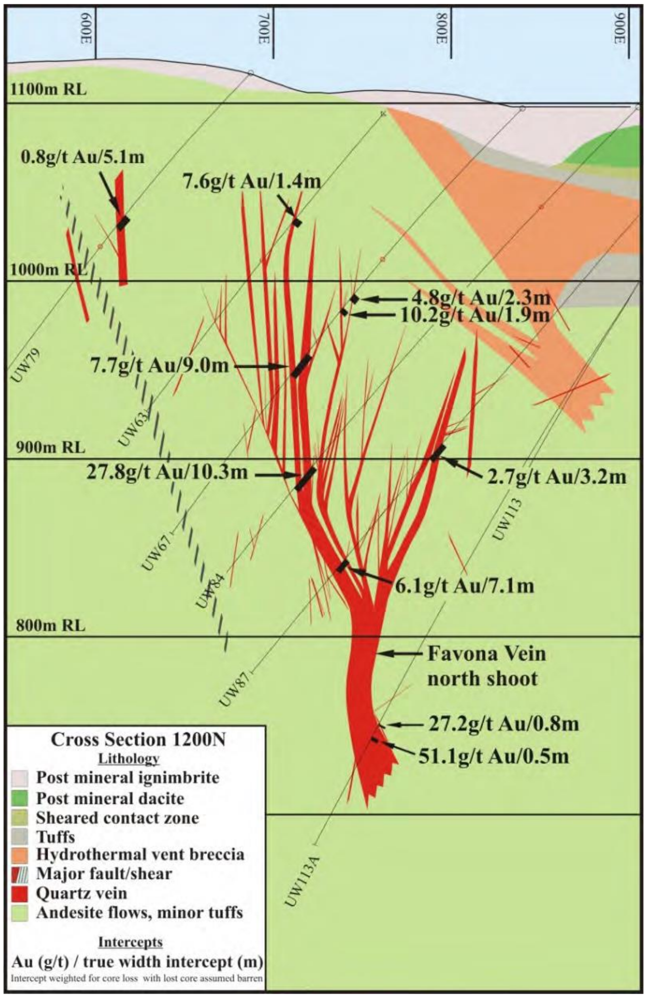


Figure 9-7 Cross Section of the Favona Vein Swarm and System, Waihi Deposit New Zealand showing the concealed nature of the deposit

Based on the data gathered to date from the drilling and the Ixtaca deposit, and taken in the context of how epithermal systems manifest worldwide, an exploration model for further exploration has been developed by Almaden and is presented in Figure 9-8.

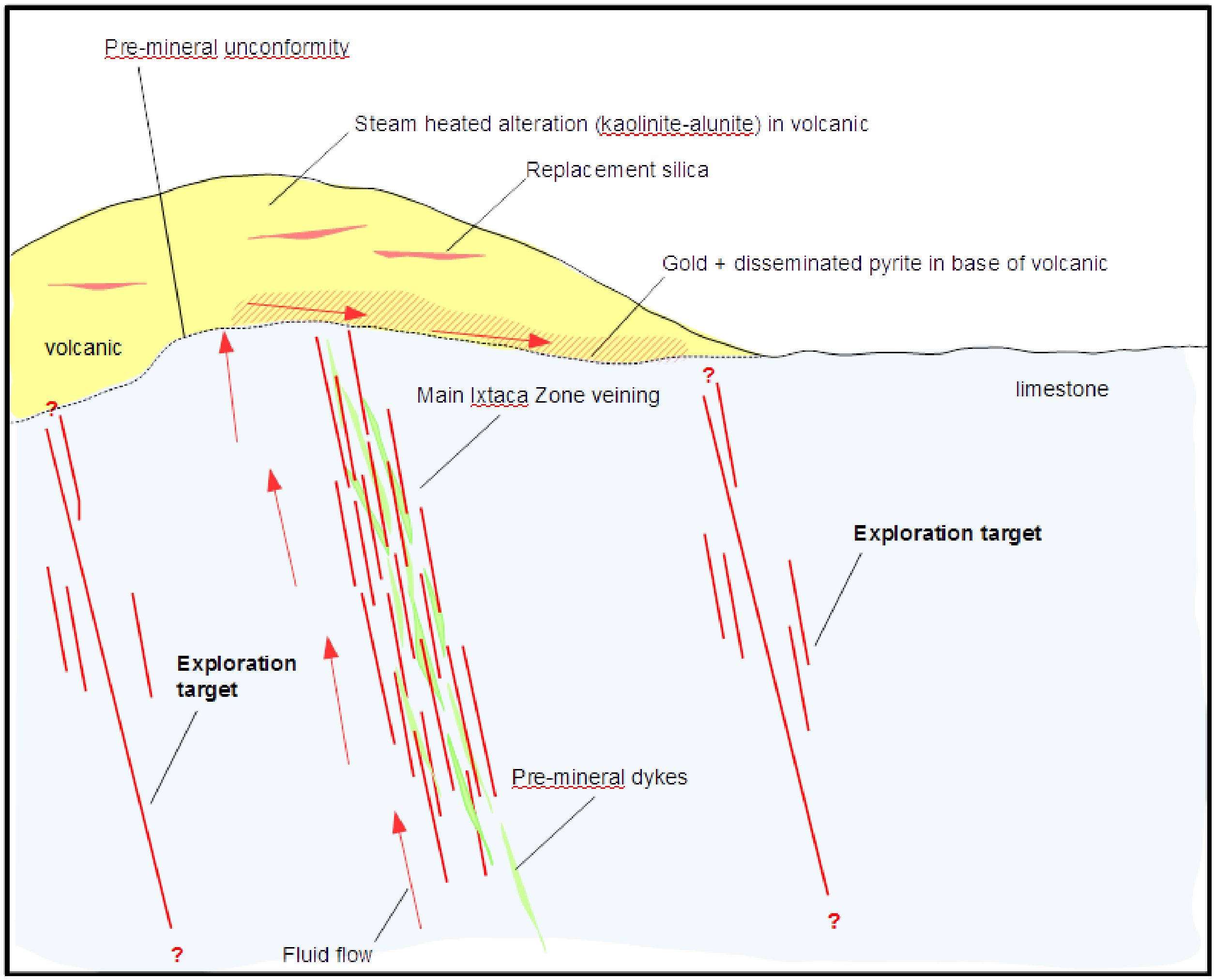


Figure 9-8 Model for Further Exploration at the Tuligtic Project

10 Drilling

The purpose of the 2017 Technical Report is to provide a technical summary and updated mineral Resource Estimate with respect to the Ixtaca Deposit in relation to diamond drilling completed subsequent to the November 13, 2012 cut-off date of the maiden mineral Resource Estimate (Raffle et al., 2013). Since 2010, a total of 514 diamond drillholes have been drilled at the Tuligtic Property, totalling 166,944 m (not including 31 geotechnical holes) (Figure 10-2). Drilling progress since 2010 is summarized below (Table 10-1).

The Main Ixtaca Zone of mineralization has been defined as a sub-vertical body trending northeast over a 650m strike length (Figure 10-2). The Ixtaca North Zone has been further defined over a 400m strike length as two discrete parallel sub-zones having a true-thickness of 5 to 35m, and spaced 20 to 70m apart (Figure 10-4). The Chemalaco Zone (Figure 10-2, Figure 10-5) is moderate to steeply WSW dipping that has been defined over a 450m strike length with high-grade mineralization intersected to a vertical depth of 600m or approximately 700m down-dip.

Table 10-1 Tuligtic Property Drilling Summary 2010-2016

Year	Holes Drilled (total m)	Main Ixtaca Zone	Ixtaca North Zone	Chemalaco Zone
2010	14 (6,465m)	- Discovered as sub-vertical body trending NE defined over 400m strike		
2011	85 (30,644m)	- Defined over 600m strike	- Discovered as parallel sub-vertical zone to Ixtaca Main	
2012*	131 (46,237m; *includes 5 holes 1,375m at Tano Zone outside resource area)	- Defined over 650m strike - High-grade mineralization intersected to 300m	- Defined over 400m strike - High-grade mineralization intersected to 300m	- Discovered as a WSW moderate-steeply dipping body, defined over 350m strike, trending approximately N-S - High-grade mineralization intersected to 550m (600m down-dip)
2013**	198 (55,467m)	- Tested over 1,000m strike - High-grade mineralization intersected to 300m	- Delineated as two distinct parallel zones - High-grade mineralization intersected to 32m	- Defined over 450m strike as splayed body dipping 55 degrees WSW with overall down-dip 700m - Splayed subzone dips 25-50 degrees, defined over 250m strike, 400m down-dip
2014	40 (13,967m; *includes 3 holes 1,359m at Azul Zone	- Metallurgical test holes twinning existing holes	- Exploration holes testing mineralization outside and at depth below PEA pit	- Exploration holes testing mineralization outside and at depth below PEA pit - Metallurgical test holes twinning existing holes

Year	Holes Drilled (total m)	Main Ixtaca Zone	Ixtaca North Zone	Chemalaco Zone
	outside resource area)			
2015	12 (3,161m)	- Exploration holes testing mineralization outside and at depth below PEA pit -		- Exploration holes testing mineralization outside and at depth below PEA pit -
2016	34 (11,004m; *includes 1 hole 490m at Tano Zone outside resource area)		- Further delineation and expansion of the North Zone	-

*All holes drilled up to November 12, 2012 Maiden Mineral Resource Estimate Cut-off
**All holes drilled subsequent to November 12, 2012 Cut-off, and all 2013 drilled holes

In July 2010 Almaden initiated a preliminary diamond drilling program to test epithermal alteration within the Tuligtic Property, resulting in the discovery of the Main Ixtaca Zone. The first hole, TU-10-001, intersected 302.42m of 1.01g/t Au and 48g/t Ag and multiple high grade intervals including 1.67m of 60.7g/t Au and 2,122g/t Ag (Figure 10-1). Almaden drilled 14 holes totalling 6,465m during 2010, defined the Main Ixtaca Zone over a 400m strike length, and initiated drilling along 50m NNW oriented sections. During 2011, Almaden drilled an additional 85 holes totalling 30,644m, which resulted in the discovery of the Ixtaca North Zone and testing of the Main Ixtaca Zone over a 600m strike length on 50m sections. Almaden discovered the Chemalaco Zone in early 2012 and continued drilling of the Ixtaca North and Main Ixtaca zones. Almaden drilled 131 holes totalling 46,237m on the Property from the beginning of 2012 until the November 13, 2012 maiden mineral Resource Estimate cut-off, for a total of 83,346m in 230 drillholes.

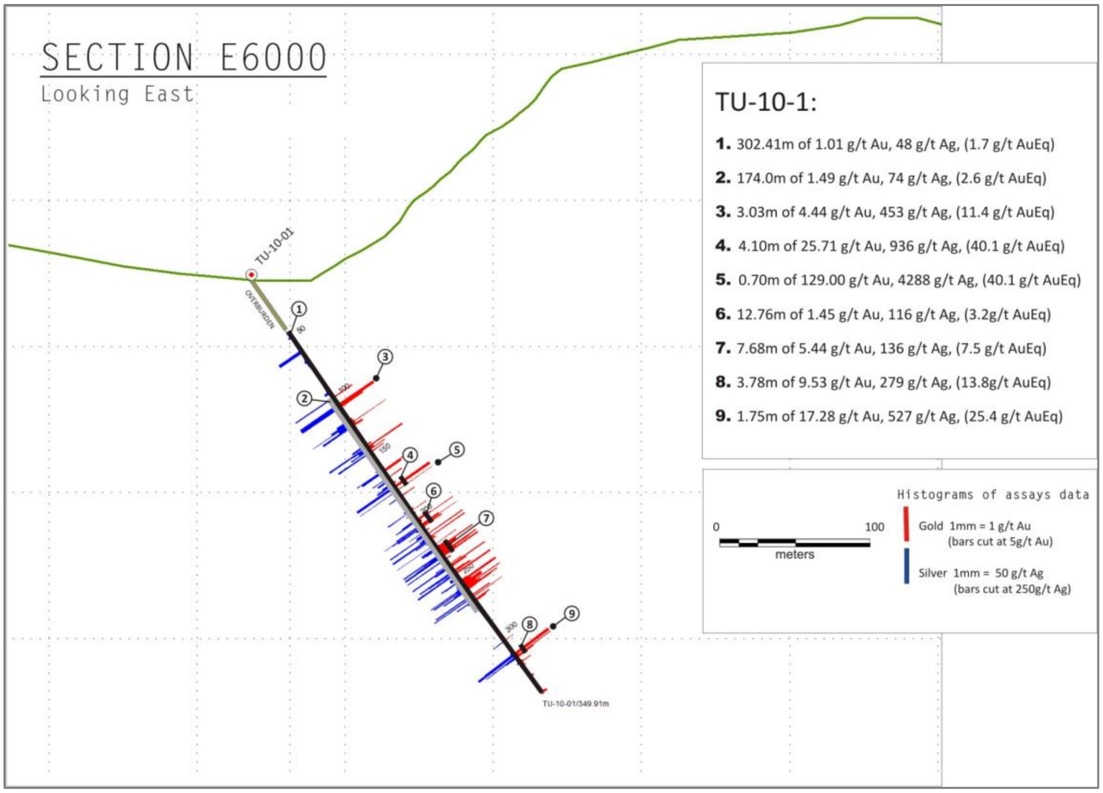


Figure 10-1 100 Azimuth Section (Looking East) Showing the Assay Results of Discovery hole TU-10-001 which intersected the Main Ixtaca Zone Vein Swarm

During 2013 and subsequent to the November 13, 2012 cut-off of the maiden mineral Resource Estimate, Almaden drilled 198 holes totalling 55,467m (428 holes in total up to the end of 2013 comprising the Resource Estimate of Raffle and Giroux, 2014). A total of 79 holes have been drilled at the Main Ixtaca Zone, 40 holes at the Ixtaca North Zone and 79 holes at the Chemalaco Zone. Drilling during 2013 focused on expanding the deposit and upgrading resources previously categorized as Inferred to higher confidence Measured and Indicated categories.

Drilling during 2014 through 2016 comprised 86 additional drill holes totalling 28,131m (including 3 exploration drill holes at the (Casa) Azul Zone and 1 at the Tano Zone; (Figure 9-1). Of the holes drilled within the Ixtaca Deposit during 2014, 2015, and 2016, 31 were geotechnical holes. During 2016 a total of 33 holes totalling 10,514m further delineated and expanded North Zone mineralization. The remainder were exploration holes testing mineralized zones at depth below the pit described in this report. Drilling at the Casa Azul zone returned intersected porphyritic intrusive and limestone-skarn mineralization returning locally elevated zinc, copper and silver values.

Of the 514 holes to date, approximately 215 holes have been completed on the Main Ixtaca Zone, 148 at the Ixtaca North Zone, and 142 at the Chemalaco Zone (Figure 10-2). The diamond drillholes range from a minimum length of 60m to a maximum of 701m, and average 326m. All drilling completed at the Ixtaca Zone has been diamond core of NQ2 size (5.08 cm diameter). Drilling has been performed using four diamond drills owned and operated by Almaden via its wholly owned operating subsidiary Minera Gavilán, S.A. de C.V. The 2010 through 2016 diamond drill programs have been completed under the supervision of Almaden personnel. Drillhole collars have been spotted using a handheld GPS and compass, and subsequently have been surveyed using a differentially corrected GPS. Each of the holes is marked with a small cement cairn inscribed with the drillhole number and drilling direction.

Drillholes have been surveyed down hole using Reflex EZ-Shot or EX-Trac instruments following completion of each hole. Down hole survey measurements have been spaced at 100m intervals during 2010 drilling and have been decreased to 50m intervals in 2011. During 2012 and 2013, select drillholes within all three mineralized zones have been surveyed at 15m intervals. All drilling during 2014 through 2016 were surveyed at 15m intervals. A total of 5,835 drillhole orientation measurements (excluding 514 collar surveys) have been collected for an average down hole spacing of 29m. A total of 40 drillholes (12,171m), apart from the collar survey, have not been surveyed downhole; and a total of five drillholes (1,672m) have been surveyed at the end of hole only. Drillholes having no down hole survey have been assumed to have the orientation of the collar. Drillhole data has been plotted in the field and has been inspected. Down hole data returning unrealistic hole orientations have been flagged and removed from the database. Down hole survey summary statistics are provided in Table 10-2, below.

At the rig, drill core is placed in plastic core boxes labeled with the drillhole number, box number, and an arrow to mark the start of the tray and the down hole direction. Wooden core blocks are placed at the end of each core run (usually 3m, or less in broken ground). Throughout the day and at the end of each shift drill core is transported to Almaden's Santa Maria core logging, sampling and warehouse facility.

Table 10-2 Tuligtic Property Down Hole Survey Statistics

	Number of Drillholes	Metres
Number of Down Hole Surveys	5,835	166,944
Average Survey Spacing (not including casing)	514	29
Drillholes (No Down Hole Survey)	40 (7%)	12,171
Drillholes (End Of Hole Survey Only)	5 (1%)	1,672
Drillholes (15m Survey Spacing)	294 (55%)	91,044
Drillholes (50m Survey Spacing)	151 (32%)	52,968
Drillholes (100m Survey Spacing)	24 (5%)	9,089

Geotechnical logging is comprised of measurements of total core recovery per-run, RQD (the total length of pieces of core greater than twice the core width divided by the length of the interval, times 100), core photography (before and after cutting), hardness testing and measurements of bulk density using the weight in air-weight in water method.

Drill core is logged based on lithology, and the presence of epithermal alteration and mineralization. All strongly altered or epithermal-mineralized intervals of core are sampled. Almaden employs a maximum sample length of 2 to 3m in unmineralized lithologies, and a maximum sample length of 1m in mineralized lithologies . During the years 2010 and 2011 Almaden employed a minimum sample length of 20cm. The minimum sample length was increased to 50cm from 2012 onwards to ensure the availability of sufficient material for replicate analysis. Geological changes in the core such as major alteration or mineralization intensity (including large discrete veins), or lithology are used as sample breaks.

The Upper Tamaulipas formation, the dykes that crosscut it and the upper Coyoltepec volcanic subunit are the main host rocks to the epithermal vein system at Ixtaca. In the Main and Ixtaca North zones veining strikes dominantly ENE-WNW (060 degrees) parallel to a major dyke trend and at a very high angle to the N to NNW bedding and fold structures within the limestones. The veins of the Chemalaco Zone are hosted by the shaley carbonate units (black shale) and strike to the NNW, dipping to the SSW. In the footwall to Chemalaco Zone a parallel dyke has been identified which is altered and mineralized. The Chemalaco Zone and the dyke are interpreted to strike parallel to bedding and to core an antiform comprised of shale.

10.1 Main Ixtaca and Ixtaca North Zones

The Main Ixtaca and Ixtaca North zones have a strike length of approximately 650m and have been drilled at 25 and 50m section spacing. The vast majority of holes have been drilled at an azimuth of 150 or 330 degrees and at dips between 45 and 60 degrees from horizontal although several holes were drilled with a 100 Azimuth early in the program. Infill drilling at 25m sections has also been completed over the majority of the Ixtaca North Zone and in the central area of the Main Ixtaca Zone. Diamond drilling has intersected high-grade mineralization within the Main Ixtaca and Ixtaca North vein zones to depths of 200 to 300m vertically from surface. High-grade zones occur within a broader zone of mineralization extending laterally (NNW-SSE) over 1000m and to a vertical depth of 600m below surface (Table 10-3 and Figure 10-3).

The epithermal vein system at the Main Ixtaca and Ixtaca North zones is roughly associated with two parallel ENE (060 degrees) trending, subvertical to steeply north dipping dyke zones. The dykes predate mineralization and trend at a high angle to the N to NNW bedding and fold structures within the limestone.

At the Main Ixtaca Zone, a series of dykes ranging from less than 2m to over 20m true width occur within an approximately 100m wide zone (Figure 10-3, Figure 10-4). Wider dykes often correlate within individual drill sections, where they are inferred to pinch or splay. The broader dyke zone itself is relatable between sections, although individual dykes are typically not continuous between sections. The dyke zone hosting the Ixtaca North Zone is narrower, comprising a steeply north-dipping zone of two or three discrete dykes ranging from 5 to 20m in width. Epithermal vein mineralization occurs both within the dykes and sedimentary host rocks, with the highest grades often occurring within or proximal to the dykes. Vein density decreases outward to the north and south from the dyke zones resulting in the formation of two high-grade vein swarms. The dykes are often intensely altered and are interpreted to control the distribution of the epithermal vein system at Ixtaca to the extent that they may have provided a conduit for ascending hydrothermal fluids, and an important rheological contrast resulting in vein formation within and along the margins individual dykes, and laterally within the adjacent limestone. On surface, the Main Ixtaca and Ixtaca North zones are separated by a steep sided ENE trending valley (Figure 10-3, Figure 10-4).

The lateral (WSW-ENE) extent of the epithermal vein system is controlled by N to NNW bedding and fold structures in basement rocks of the limestone unit. Drilling indicates Main Ixtaca and Ixtaca North zone mineralization is bound within an ENE-verging asymmetric synform. The synform is cored by a structurally thickened sequence of limestone that grades laterally and at depth through calcareous siltstone and grainstone transition units, into dark grey to laminated calcareous shale at depth. Based on increased vein density, including the presence of broad alteration zones and networks of intersecting epithermal veins, the relatively brittle limestone is a preferential host to Main Ixtaca and Ixtaca North vein swarms.

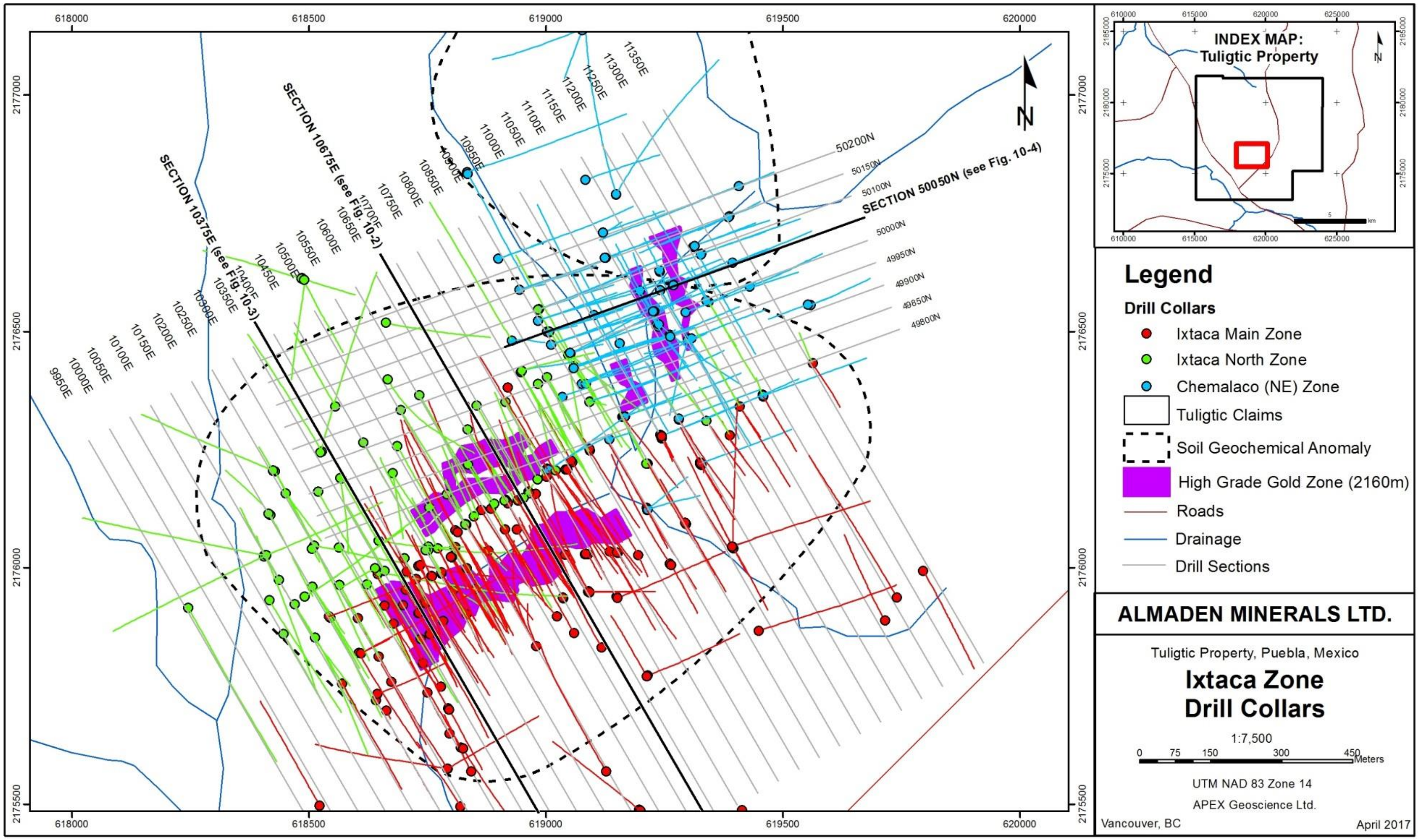


Figure 10-2 Drillhole Locations

Table 10-3 Section 10+675E Significant Drill Intercepts (Main Ixtaca and Ixtaca North Zones)

Hole ID	From (m)	To (m)	Interval (m)	Gold (g/t)	Silver (g/t)	AuEq*(g/t)
TU-12-120	260.9	290.9	30	0.74	96.7	2.6
including	260.9	266.1	5.2	2.78	437	11.3
TU-12-124	116.5	301.5	185	1	60.5	2.2
including	167.5	181.4	13.9	6.04	179.7	9.5
TU-12-127	155.95	186	30.05	0.7	56.7	1.8
including	174	186	12	1.05	105.7	3.1
TU-12-127	210	233.5	23.5	1.02	20.2	1.4
including	213.9	218.3	4.4	3.92	86	5.6
TU-12-127	243	285.6	42.6	0.57	10.8	0.8
TU-12-127	297	314	17	0.38	8.7	0.5
TU-12-132	64.5	204.2	139.7	0.22	18	0.6
including	137	166.6	29.6	0.35	27.8	0.9
including	148.25	153.3	5.05	1.16	79	2.7
including	174.4	204.2	29.8	0.33	34.1	1
TU-12-136	63.1	123.6	60.5	0.84	48.9	1.8
including	82.2	93	10.8	1.1	85.2	2.8
including	98	110.5	12.5	1.84	98.5	3.8
TU-12-138	43.5	87.27	43.77	0.59	4.3	0.7
including	61	71.5	10.5	0.88	4.9	1
including	84	87.27	3.27	2.07	10.5	2.3
TU-12-138	135.5	184.25	48.75	0.22	16.7	0.5
including	179.95	182.5	2.55	2.98	216.4	7.2
TU-12-138	202	359.5	157.5	0.36	41.4	1.2
including	264.3	359.5	95.2	0.54	61.1	1.7
including	292.5	302	9.5	1.27	234.3	5.8
including	304	307	3	3.87	439.9	12.4
TU-12-144	45.5	92.6	47.1	0.52	3.7	0.6
TU-12-144	210	258	48	0.52	32	1.1
including	227.4	235.8	8.4	1.68	59.3	2.8
TU-13-324	32.92	62	29.08	1.31	16.5	1.6
including	42.5	57.75	15.25	2.1	23.7	2.6
including	43	45.25	2.25	1.71	72	3.1
TU-13-324	113.5	128	14.5	0.25	47	1.2
including	120	121	1	0.59	117.5	2.9
including	125	128	3	0.79	155	3.8
TU-13-324	154	174	20	0.08	29.1	0.6
including	160	161	1	0.42	167	3.7
including	167.5	172	4.5	0.07	53.4	1.1
TU-13-325	128.5	136.5	8	0.58	132.2	3.2
TU-13-325	190	236.5	46.5	1.06	53.1	2.1
including	193.4	216	22.6	1.72	97.2	3.6
including	194	195.2	1.2	2.05	147	4.9
including	203.9	205	1.1	3.97	175	7.4

Hole ID	From (m)	To (m)	Interval (m)	Gold (g/t)	Silver (g/t)	AuEq*(g/t)
including	210.5	216	5.5	4.4	240.8	9.1
TU-13-388	199	229.5	30.5	0.67	23.9	1.1
TU-13-388	337.5	346.5	9	1.35	287.5	6.9
including	339.25	340.35	1.1	6.54	1982.7	45.2
TU-13-388	363.5	416	52.5	0.58	50.3	1.6
including	363.5	378.4	14.9	0.74	87	2.4
including	372	378.4	6.4	1.19	138.9	3.9
including	390	403.9	13.9	1.11	82.9	2.7
including	398.6	401.1	2.5	1.78	173	5.1
TU-16-475	44.5	46.6	2.1	2.58	88.2	4.3
TU-16-475	71.8	96.1	24.3	0.58	68.1	1.9
including	90	96.1	6.1	1.55	206.1	5.7
TU-16-475	111.5	128.2	16.7	2.21	160.9	5.4
including	117.9	124	6.1	5.01	352.9	12.1
TU-16-475	138.5	148	9.5	0.18	22.6	0.6
TU-16-475	154.65	175	20.35	2.25	117.9	4.6
including	154.65	168.85	14.2	3.08	161.2	6.3
including	155.35	158.5	3.15	10.45	462.1	19.7
TU-16-475	205.5	212.5	7	0.49	69.1	1.9
TU-16-475	284	290	6	0.53	87.3	2.3
TU-16-476	50	52.35	2.35	0.46	36.3	1.2
TU-16-476	98.5	109	10.5	0.17	16.2	0.5
TU-16-476	125	131.5	6.5	0.43	15.3	0.7
TU-16-476	173	189.45	16.45	0.27	49.4	1.3
including	182.6	183.35	0.75	2.45	627	15
TU-16-482	68	70	2	0.37	56.1	1.5
TU-16-482	90	93	3	0.6	54.1	1.7
TU-16-482	131	143.5	12.5	0.16	22.4	0.6
TU-16-482	154.5	160.3	5.8	0.6	45.9	1.5
including	154.5	155.5	1	2.23	119.5	4.6
TU-16-482	170	177	7	0.38	40.1	1.2
TU-16-482	190	208.5	18.5	0.15	13.8	0.4
TU-16-482	216.5	222.5	6	0.06	30.9	0.7
TU-16-482	244	245	1	0.08	69	1.5
TU-16-482	68	70	2	0.37	56.1	1.5
TU-16-482	90	93	3	0.6	54.1	1.7

Gold Equivalent based on a price of $1,250/ounce gold and $18/ounce silver

Table 10-4 Section 10+375E Significant Drill intercepts (Main Ixtaca Zone)

Hole ID	From (m)	To (m)	Interval (m)	Gold (g/t)	Silver (g/t)	AuEq* (g/t)
TU-11-065	26.00	126.80	100.80	0.58	46.2	**1.5**
including	26.00	74.78	48.78	0.95	77.0	**2.5**
including	43.60	68.00	24.40	1.67	134.4	**4.4**
including	49.80	59.80	10.00	3.05	198.8	**7.0**
TU-11-067	24.30	145.00	120.70	1.02	72.6	**2.5**
including	36.50	136.80	100.30	1.20	85.0	**2.9**
including	54.90	96.30	41.40	1.91	144.1	**4.8**
including	63.55	85.50	21.95	2.75	210.1	**7.0**
including	65.60	80.85	15.25	3.26	253.4	**8.3**
including	107.20	116.95	9.75	2.54	112.6	**4.8**
including	125.55	127.43	1.88	2.51	242.2	**7.3**
TU-12-202	26.50	66.50	40.00	0.35	1.4	**0.4**
including	26.50	38.00	11.50	0.78	0.5	**0.8**
TU-12-202	137.10	172.50	35.40	0.62	12.3	**0.9**
including	139.10	145.10	6.00	2.57	35.4	**3.3**
TU-12-202	249.30	260.80	11.50	0.10	16.7	**0.4**
TU-12-211	31.20	187.85	156.65	0.59	28.6	**1.2**
including	70.70	84.50	13.80	0.97	82.9	**2.6**
including	97.80	105.65	7.85	1.07	59.4	**2.3**
including	129.85	142.40	12.55	1.38	53.3	**2.4**
including	172.85	183.85	11.00	0.91	56.7	**2.0**
TU-13-389	21.34	95.50	74.16	1.02	50.9	**2.0**
including	47.00	71.00	24.00	1.52	60.6	**2.7**
including	51.50	69.00	17.50	1.92	64.4	**3.2**
including	88.60	95.50	6.90	2.54	139.9	**5.3**
TU-13-389	104.00	106.80	2.80	2.86	169.3	**6.2**
TU-13-391	16.00	126.00	110.00	0.62	42.0	**1.5**
including	48.16	89.50	41.34	1.16	76.2	**2.7**
including	48.16	59.30	11.14	1.79	110.9	**4.0**
including	71.80	84.50	12.70	1.40	106.4	**3.5**
including	71.80	74.50	2.70	3.06	230.3	**7.7**
TU-13-393	27.43	141.80	114.37	0.92	53.7	**2.0**
including	54.50	81.50	27.00	1.03	76.0	**2.6**
including	56.00	62.20	6.20	2.21	150.5	**5.2**
including	89.95	124.70	34.75	1.67	70.4	**3.1**
including	100.30	104.00	3.70	2.08	89.0	**3.9**
including	110.40	118.30	7.90	4.42	158.7	**7.6**

**Gold Equivalent based on a price of $1,250/ounce gold and $18/ounce silver*

Mineralized limestone, shale and the cross-cutting dykes are unconformably overlain by bedded crystal tuff, which is also mineralized. Mineralization within tuff rocks overlying the Ixtaca Zone occurs as broad zones of alteration and disseminated sulphides having relatively few veins. High-grade zones of mineralization are locally present within the tuff vertically above the Main Ixtaca and Ixtaca North vein systems and dykes. The high-grade zones transition laterally into low grade mineralization, which together form a broad tabular zone of mineralization at the base of the tuff unit.

10.2 Chemalaco Zone

The Chemalaco Zone (also known as the Northeast Extension) of the Ixtaca deposit has an approximate strike length of 450m oriented roughly north-south (340 azimuth) and has been drilled via a series of ENE (070 degrees) oriented sections spaced at intervals of 25 to 50m, and near-surface oblique NNW-SSE oriented drillholes (Figure 10-2). The Chemalaco Zone dips moderately-steeply at 55 degrees WSW. High grade mineralization having a true-width ranging from less than 30 and up to 60m has been intersected beneath approximately 30m of tuff to a vertical depth of 550m, or approximately 700m down-dip. An additional sub-parallel zone has been defined underneath the Chemalaco having a true-width ranging from 5 to 40m and dipping 25 to 50 degrees to the WSW, resulting in a splayed zone extending from near-surface to a vertical depth of 250m. The sub-parallel zone has an approximate down-dip length up to 400m over a 250m strike length (Table 10-5,Figure 10-5).

The Chemalaco Zone vein lies northeast of the Main Ixtaca Zone and occurs within the hinge zone of a shale cored antiform. Near surface, along the apex of the antiform, a zone of structurally thinned, brecciated, and mineralized limestone is unconformably overlain by mineralized tuff rocks (Figure 10-4). At a vertical depth of 80m below surface, high-grade shale-hosted mineralization dips moderately-steeply at 25 to 55 degrees WSW sub-parallel to the interpreted axial plane of the antiform. The footwall of the high-grade zone is marked by a distinct 20 to 30m true-thickness felsic porphyry dyke (Chemalaco Dyke), which is also mineralized. The Chemalaco Dyke has been interested in multiple drillholes ranging from 250 to 550m vertically below surface, and its lower contact currently marks the base of Chemalaco Zone mineralization.

The Chemalaco Zone remains open to depth and long strike to the north. The system also remains open to the east as the limit of veining has not been defined across strike in the direction.

Table 10-5 Section 50+050N Significant Drill intercepts (Chemalaco Zone)

Hole ID	From (m)	To (m)	Interval (m)	Gold (g/t)	Silver (g/t)	AuEq* (g/t)
TU-12-190	85.00	89.00	4.00	0.25	0.5	**0.3**
TU-12-190	100.00	112.00	12.00	0.17	1.9	**0.2**
TU-12-190	259.00	272.90	13.90	0.17	12.3	**0.4**
TU-12-190	278.85	321.00	42.15	1.06	47.4	**2.0**
including	293.50	300.50	7.00	1.34	72.0	**2.7**
including	306.00	317.80	11.80	1.67	71.7	**3.1**
including	310.00	314.00	4.00	2.45	116.4	**4.7**
TU-12-190	377.90	386.00	8.10	0.24	2.8	**0.3**
TU-12-194	83.50	87.50	4.00	0.46	2.8	**0.5**
TU-12-194	112.60	124.00	11.40	0.22	4.4	**0.3**
TU-12-194	272.50	279.50	7.00	0.15	40.9	**0.9**
TU-12-194	294.50	300.00	5.50	0.14	81.1	**1.7**
TU-12-194	313.00	371.80	58.80	1.04	19.4	**1.4**
including	317.60	347.00	29.40	1.63	23.9	**2.1**
TU-12-199	66.00	70.00	4.00	0.26	2.4	**0.3**
TU-12-199	91.00	93.80	2.80	0.19	3.0	**0.2**
TU-12-199	344.20	424.00	79.80	0.84	20.6	**1.2**
including	365.70	385.70	20.00	1.19	25.6	**1.7**
including	396.50	402.50	6.00	1.43	16.0	**1.7**
including	408.30	423.40	15.10	1.48	37.6	**2.2**
including	414.30	416.10	1.80	4.90	175.5	**8.3**
TU-12-205	81.00	132.00	51.00	0.51	6.0	**0.6**
including	101.50	106.00	4.50	3.41	6.1	**3.5**
TU-12-205	254.50	293.50	39.00	0.61	88.8	**2.3**
including	255.50	281.20	25.70	0.86	127.8	**3.3**
including	256.00	272.40	16.40	1.08	164.8	**4.3**
including	256.00	265.00	9.00	1.57	244.5	**6.3**
TU-12-205	312.00	319.00	7.00	0.19	207.2	**4.2**
TU-13-265	488.40	531.80	43.40	0.50	9.2	**0.7**
including	500.60	507.20	6.60	2.15	11.6	**2.4**
including	504.20	507.20	3.00	3.36	17.1	**3.7**
TU-13-265	539.00	545.00	6.00	0.07	22.2	**0.5**
TU-13-265	550.30	558.00	7.70	0.07	28.1	**0.6**
TU-13-268	41.30	56.25	14.95	0.05	11.5	**0.3**
TU-13-268	61.25	120.50	59.25	0.11	41.1	**0.9**
including	74.90	79.75	4.85	0.25	126.9	**2.7**
including	103.00	106.00	3.00	0.23	81.2	**1.8**
TU-13-268	133.00	138.00	5.00	0.03	22.3	**0.5**
TU-13-268	151.50	208.00	56.50	0.36	42.0	**1.2**
including	166.00	178.50	12.50	0.56	91.4	**2.3**
including	166.00	167.50	1.50	0.74	223.7	**5.1**
including	192.00	199.50	7.50	0.75	51.6	**1.8**
TU-13-268	222.75	239.00	16.25	0.08	14.6	**0.4**
TU-13-272	48.00	138.50	90.50	0.20	31.4	**0.8**

Hole ID	From (m)	To (m)	Interval (m)	Gold (g/t)	Silver (g/t)	AuEq* (g/t)
including	66.05	70.20	4.15	0.44	49.5	**1.4**
including	77.50	84.80	7.30	0.29	71.1	**1.7**
including	112.75	119.75	7.00	0.43	40.1	**1.2**
including	129.00	138.50	9.50	0.41	114.0	**2.6**
TU-13-272	146.00	161.00	15.00	0.22	47.1	**1.1**
including	147.00	148.50	1.50	0.65	252.7	**5.6**
TU-13-272	187.00	193.50	6.50	0.11	11.5	**0.3**
TU-13-272	220.00	231.00	11.00	0.14	9.5	**0.3**
TU-13-275	68.50	84.00	15.50	0.15	10.6	**0.4**
TU-13-275	105.00	112.00	7.00	0.11	15.8	**0.4**
TU-13-275	120.00	134.50	14.50	0.18	6.2	**0.3**
TU-13-275	149.00	227.00	78.00	0.39	23.8	**0.9**
including	164.50	193.50	29.00	0.43	43.3	**1.3**
TU-13-275	254.00	258.00	4.00	0.01	13.5	**0.3**
TU-13-287	106.00	131.00	25.00	0.11	15.2	**0.4**
including	122.00	125.00	3.00	0.30	50.3	**1.3**
TU-13-287	156.50	182.00	25.50	0.66	102.3	**2.7**
including	168.00	170.08	2.08	4.35	975.0	**23.3**
TU-13-289	134.00	153.00	19.00	0.22	48.4	**1.2**
including	144.50	151.80	7.30	0.40	82.8	**2.0**
TU-13-289	160.00	188.00	28.00	0.21	10.8	**0.4**
TU-14-419	52.00	122.50	70.50	0.17	33.7	**0.8**
including	92.25	115.50	23.25	0.27	64.9	**1.6**
including	110.00	115.50	5.50	0.34	114.4	**2.6**
TU-14-419	131.00	168.00	37.00	0.37	70.4	**1.8**
including	161.75	165.00	3.25	2.50	420.8	**10.9**
TU-14-419	189.00	194.00	5.00	0.20	39.1	**1.0**
TU-14-420	52.40	102.00	49.60	0.27	21.1	**0.7**
including	81.00	89.50	8.50	0.85	54.1	**1.9**
TU-14-420	114.00	186.00	72.00	0.25	22.1	**0.7**
including	212.00	223.00	11.00	0.14	12.2	**0.4**

**Gold Equivalent based on a price of $1,250/ounce gold and $18/ounce silver*

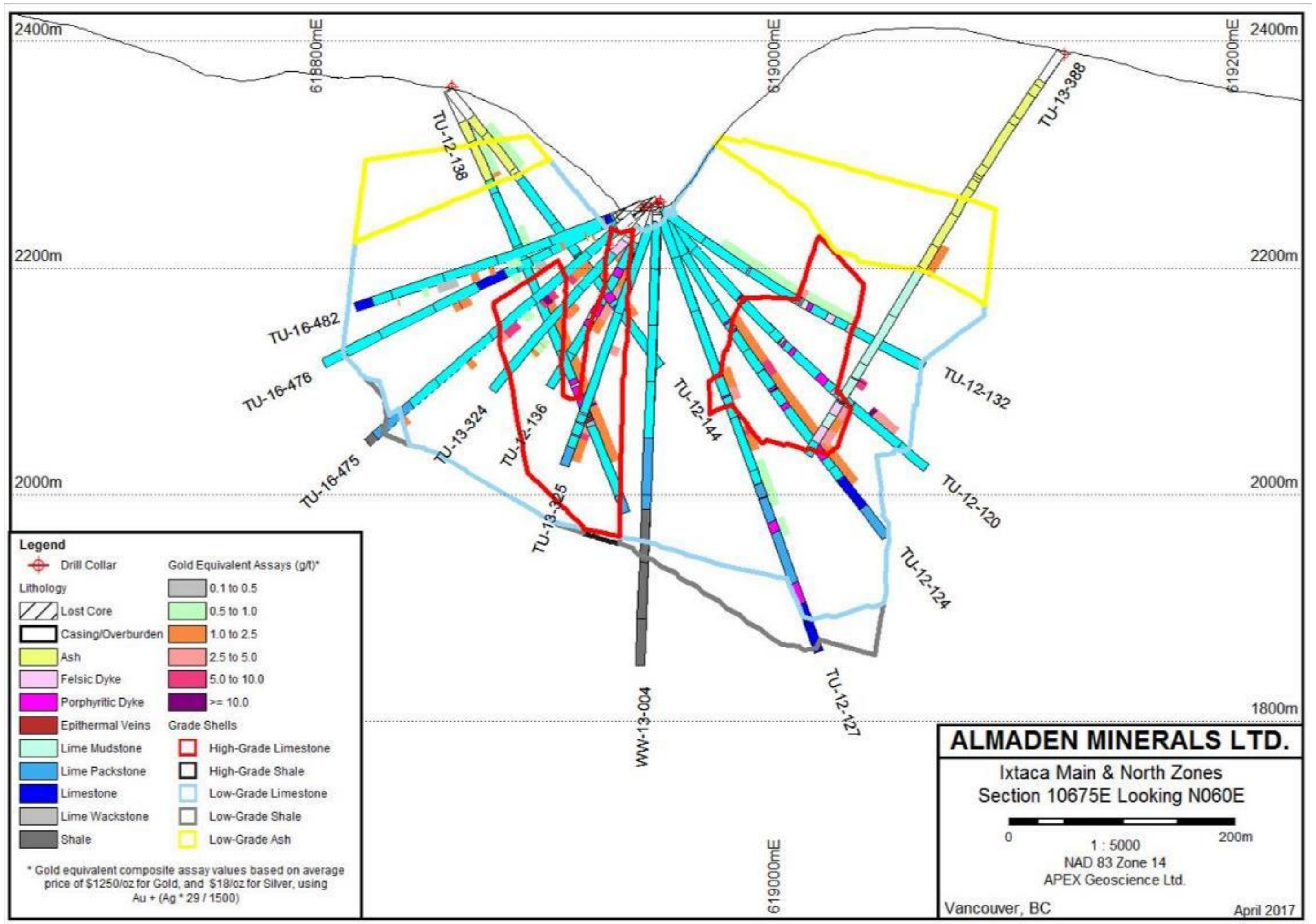


Figure 10-3 **Section 10+675E through the Ixtaca Main and North Zones**

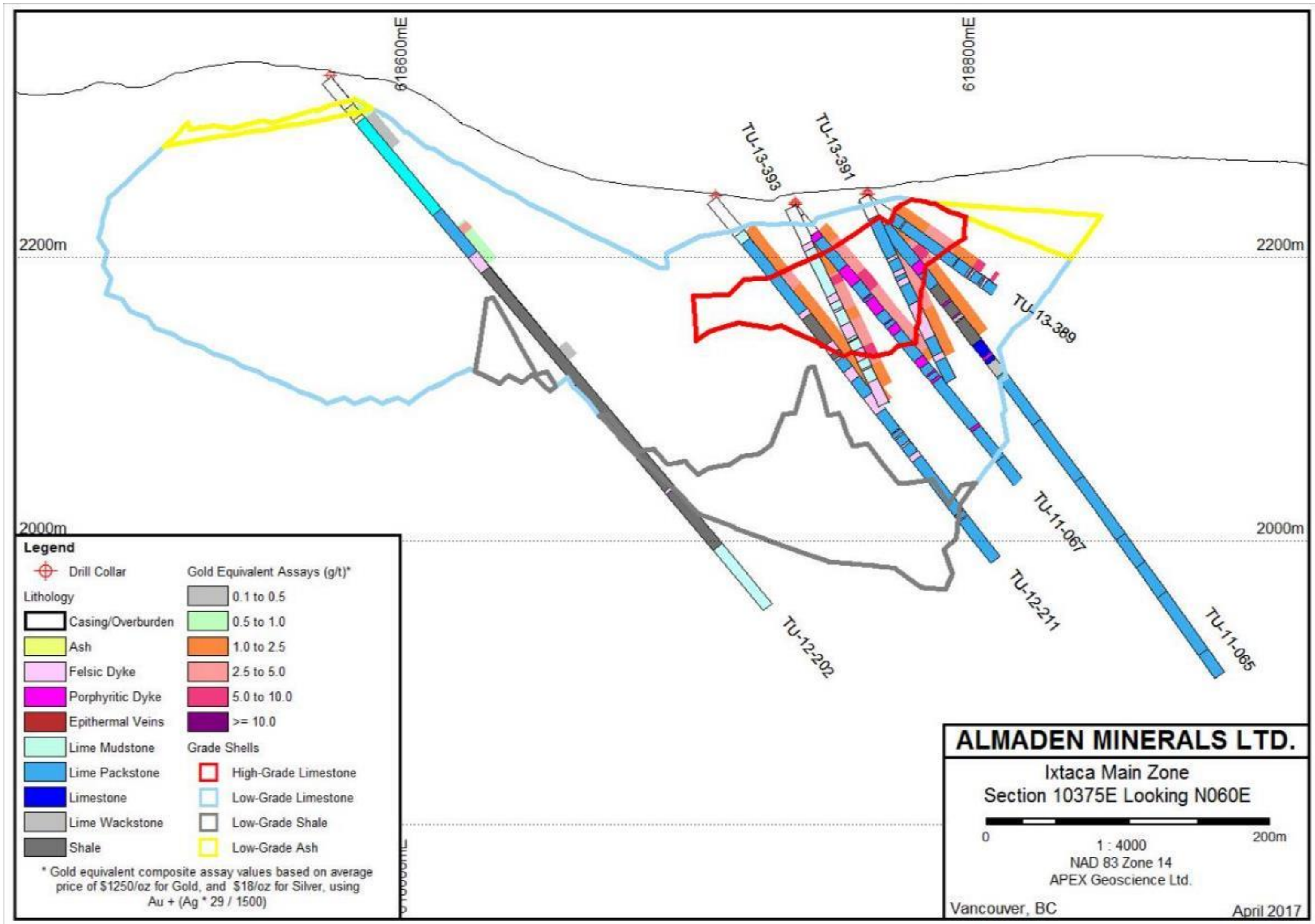


Figure 10-4 Section 10+375E through the Ixtaca Main Zone

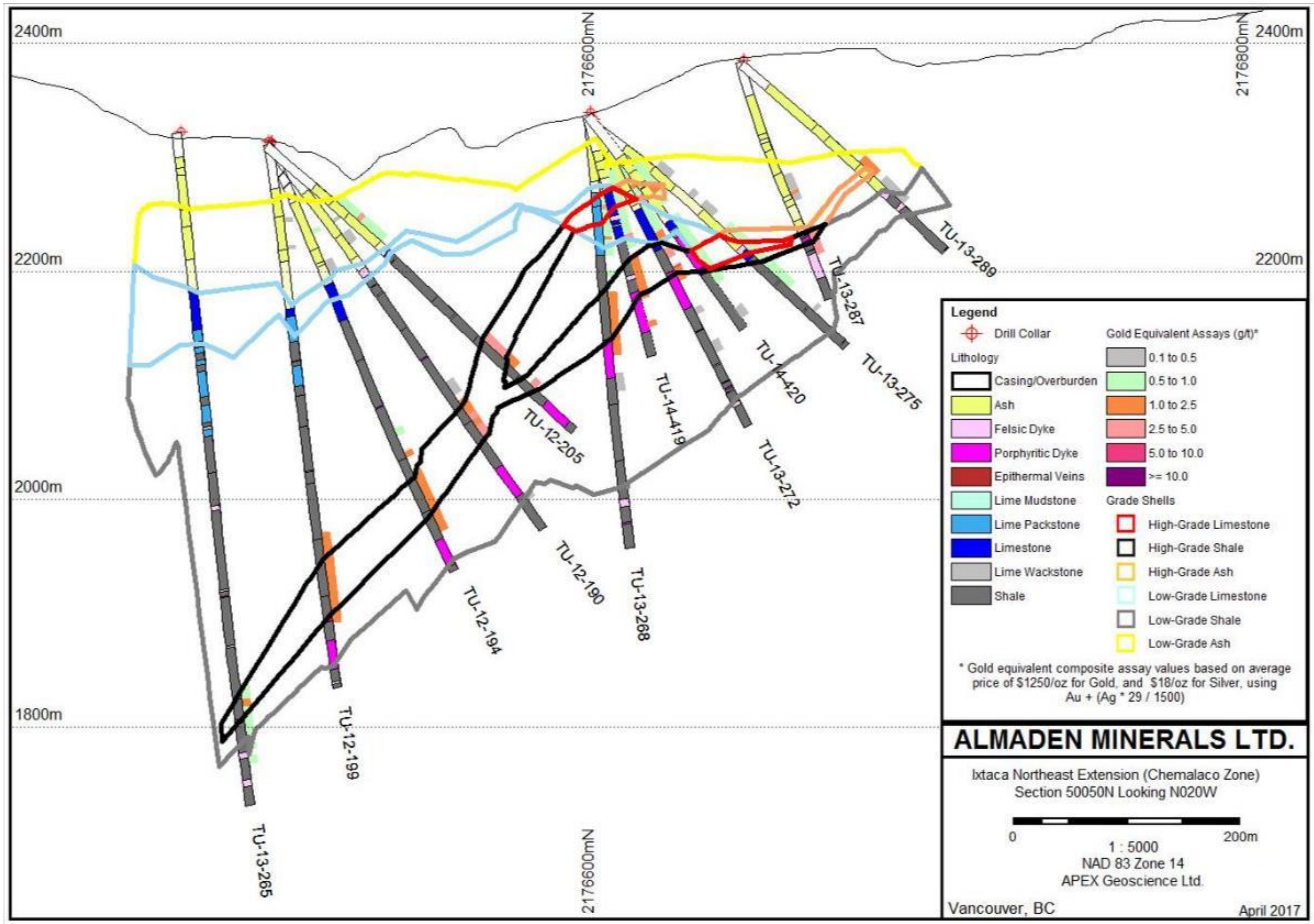


Figure 10-5 Section 50+050N through the Chemalaco Zone

11 Sample Preparation, Analyses and Security

11.1 Sample Preparation and Analyses

11.1.1 Rock Grab and Soil Geochemical Samples

Rock grab and soil geochemical samples have been transported by Almaden field personnel to the Santa Maria core facility where they are placed in into sealed plastic twine (rice) sacks, sealed using single plastic cable ties. Custody of samples is handed over to ALS Minerals (ALS) at the Santa Maria core facility. ALS sends its own trucks to the Project to transport samples to its sample preparation facility in Guadalajara or Zacatecas, Mexico. Prepared sample pulps are then forwarded by ALS personnel to the ALS North Vancouver, British Columbia laboratory for analysis.

ALS is an International Standards Organization (ISO) 9001:2008 and ISO 17025-2005 certified geochemical analysis and assaying laboratory. ALS is independent of Almaden and the authors.

ALS reported nothing unusual with respect to the shipments, once received and Mr. Kristopher J. Raffle, P.Geo., has no reason to believe that the security of the samples has been compromised.

At the ALS Zacatecas and Guadalajara sample preparation facilities, rock grab samples are dried prior to preparation and then crushed to 10 mesh (70% minimum pass) using a jaw crusher. The samples are then split using a riffle splitter, and sample splits are further crushed to pass 200 mesh (85% minimum pass) using a ring mill pulverizer (ALS PREP-31 procedure). Soil samples are dried and sieved to 80mesh.

Rock grab samples are subject to gold determination via a 50 gram (g) fire-assay (FA) fusion utilizing atomic absorption spectroscopy (AA) finish with a lower detection limit of 0.005ppm Au (5 ppb) and upper limit of 10ppm Au (ALS method Au-AA24). A 50 gram (g) prepared sample is fused with a mixture of lead oxide, sodium carbonate, borax, silica and other reagents as required, inquarted with 6mg of gold-free silver and then cupelled to yield a precious metal bead. The bead is digested in 0.5ml dilute nitric acid and 0.5ml concentrated hydrochloric acid. The digested solution is cooled, diluted to a total volume of 4ml with de-mineralized water, and analyzed by atomic absorption spectroscopy against matrix-matched standards.

Soil samples are subject to gold determination via is digestion of a 50g prepared sample in a mixture of 3 parts hydrochloric acid and 1 part nitric acid (aqua regia). Dissolved gold is then determined by ICP-MS.

Silver, base metal and pathfinder elements for rock and soil samples are analyzed by 33-element inductively coupled plasma atomic emission spectroscopy (ICP-AES), with a 4-acid digestion (ALS method ME-ICP61). A 0.25g prepared sample is digested with perchloric, nitric, hydrofluoric and hydrochloric acids. The residue is topped up with dilute hydrochloric acid and the resulting solution is analyzed by ICP-AES. For rock samples only, following this analysis, the results are reviewed for high concentrations of bismuth, mercury, molybdenum, silver and tungsten and diluted accordingly. Samples meeting this criterion are then analyzed by inductively coupled plasma mass spectrometry (ICP-MS, ALS method ME-MS61). Results are corrected for spectral inter-element interferences. Four acid digestions are able to dissolve most minerals; however, depending on the sample matrix, not all elements are quantitatively extracted.

11.1.2 Almaden Drill Core

All strongly altered or epithermal-mineralized intervals of core have been sampled. Almaden employs a maximum sample length of 2 to 3m in unmineralized lithologies, and a maximum sample length of 1m in mineralized lithologies. During the years 2010 and 2011 Almaden employed a minimum sample length of 20cm. The minimum sample length was increased to 50cm from 2012 onwards to ensure the availability of sufficient material for replicate analysis. Sampling always begins at least five samples above the start of mineralization. Geological changes in the core such as major alteration or mineralization intensity (including large discrete veins), or lithology are used as sample breaks.

Drill core is half-sawn using industry standard gasoline engine-powered diamond core saws, with fresh water cooled blades and “core cradles” to ensure a straight cut. For each sample, the core logging geologist marks a cut line down the centre of the core designed to produce two halves of equal proportions of mineralization. This is accomplished by marking the cut line down the long axis of ellipses described by the intersection of the veins with the core circumference.

Areas of very soft rock (e.g. fault gouge), are cut with a machete using the side of the core channel to ensure a straight cut. Areas of very broken core (pieces <1cm) are sampled using spoons. In all cases, the right hand side of the core (looking down the hole) is sampled. After cutting, half the core is placed in a new plastic sample bag and half is placed back in the core box. Between each sample, the core saw and sampling areas are washed to ensure no contamination between samples. Field duplicate, blank and analytical standards are added into the sample sequence as they are being cut.

Sample numbers are written on the outside of the sample bags twice and the numbered tag from the ALS sample book is placed inside the bag with the half core. Sample bags are sealed using single plastic cable-ties. Sample numbers are checked against the numbers on the core box and the sample book.

Drill core samples collected by the Almaden are placed into plastic twine (rice) sacks, sealed using single plastic cable ties. ALS sends its own trucks to the Project to take custody of the samples at the Santa Maria core facility and transport them to its sample preparation facility in Guadalajara or Zacatecas, Mexico. Prepared sample pulps are then forwarded by ALS personnel to the ALS North Vancouver, British Columbia laboratory for analysis.

Drill core samples are subject to gold determination via a 50 gram (g) AA finish FA fusion with a lower detection limit of 0.005ppm Au (5ppb) and upper limit of 10ppm Au (ALS method Au-AA24). A 50g prepared sample is fused with a flux mixture, inquarted with 6mg of gold-free silver and then cupelled to yield a precious metal bead. The bead is digested in 0.5ml dilute nitric acid and 0.5ml concentrated hydrochloric acid. The digested solution is cooled, diluted to a total volume of 4ml with de-mineralized water, and analyzed by atomic absorption spectroscopy against matrix-matched standards.

Over limit gold values (>10ppm Au) are subject to gravimetric analysis, whereby a 50g prepared sample is fused with a mixture of lead oxide, sodium carbonate, borax, silica and other reagents in order to produce a lead button. The lead button containing the precious metals is cupelled to remove the lead. The remaining gold and silver bead is parted in dilute nitric acid, annealed and weighed as gold (ALS method Au-GRA22).

Silver, base metal and pathfinder elements for drill core samples have been analyzed by 33- element ICP-AES, with a 4-acid digestion, a lower detection limit of 0.5ppm Ag and upper detection limit of 100ppm Ag (ALS method ME-ICP61). A 0.25g prepared sample is digested with perchloric, nitric, hydrofluoric and hydrochloric acids. The residue is topped up with dilute hydrochloric acid and the resulting solution is analyzed by ICP-AES (ALS method ME-ICP61). Four acid digestions are able to dissolve most minerals; however, depending on the sample matrix, not all elements are quantitatively extracted.

Over limit silver values (>100ppm Ag) have been subject to 4-acid digestion ICP-AES analysis with an upper limit of 1,500ppm Ag (ALS method ME-OG62). A prepared sample is digested with nitric, perchloric, hydrofluoric, and hydrochloric acids, and then evaporated to incipient dryness. Hydrochloric acid and de-ionized water is added for further digestion, and the sample is heated for an additional allotted time. The sample is cooled and transferred to a 100ml volumetric flask. The resulting solution is diluted to volume with de-ionized water, homogenized and the solution is analyzed by ICP-AES. Ultra-high grade silver values (>1,500ppm Ag) are subject to gravimetric analysis with an upper detection limit of 10,000ppm Ag (Ag-GRA22).

11.1.3 Author's Drill Core

The collected drill core samples have been placed into sealed plastic bags and transported by Mr. Kristopher J. Raffle, P.Geo., (considered "the author" in this Section of the report) to ALS North Vancouver, British Columbia laboratory for gold FA and ICP-MS analysis. The author did not have control over the samples at all times during transport; however the author has no reason to believe that the security of the samples has been compromised.

The samples are dried prior to preparation and then crushed to 10mesh (70% minimum pass) using a jaw crusher. The samples are then split using a riffle splitter, and sample splits are further crushed to pass 200mesh (85% minimum pass) using a ring mill pulverizer (ALS PREP-31 procedure).

Drill core samples collected by Kristopher J. Raffle, P.Geo., have been subject to gold determination via a 50 gram (g) AA finish FA fusion with a lower detection limit of 0.005ppm Au (5ppb) and upper limit of 10ppm Au (ALS method Au-AA24). A 50g prepared sample is fused with a flux mixture, inquarted with 6mg of gold-free silver and then cupelled to yield a precious metal bead. The bead is digested in 0.5mL dilute nitric acid and 0.5mL concentrated hydrochloric acid. The digested solution is cooled, diluted to a total volume of 4mL with de-mineralized water, and analyzed by atomic absorption spectroscopy against matrix-matched standards.

Silver, base metal and pathfinder elements for rock and soil samples are analyzed by 33-element inductively coupled plasma atomic emission spectroscopy (ICP-AES), with a 4-acid digestion. A 0.25g prepared sample is digested with perchloric, nitric, hydrofluoric and hydrochloric acids. The residue is topped up with dilute hydrochloric acid and the resulting solution is analyzed by ICP-AES. Following this analysis, the results are reviewed for high concentrations of bismuth, mercury, molybdenum, silver and tungsten and diluted accordingly. Samples meeting this criterion are then analyzed by inductively coupled plasma mass spectrometry (ICP-MS, ALS method ME-MS61). Results are corrected for spectral inter-element interferences. Four acid digestions are able to dissolve most minerals; however, depending on the sample matrix, not all elements are quantitatively extracted.

Over limit silver values (>100ppm Ag) are subject to 4-acid digestion, ICP-AES analysis with an upper limit of 1,500ppm Ag (ALS method ME-OG62). A prepared sample is digested with nitric, perchloric, hydrofluoric, and hydrochloric acids, and then evaporated to incipient dryness. Hydrochloric acid and de-ionized water is added for further digestion, and the sample is heated for an additional allotted time. The sample is cooled and transferred to a 100ml volumetric flask. The resulting solution is diluted to volume with de-ionized water, homogenized and the solution is analyzed by ICP-AES.

11.2 Quality Assurance / Quality Control Procedures

For the Tuligtic rock grab sample and soil geochemical programs, Almaden relies on external quality assurance and quality control (QA/QC) measures employed by ALS. QA/QC measures at ALS include routine screen tests to verify crushing efficiency, sample preparation duplicates (every 50 samples), and analytical quality controls (blanks, standards, and duplicates). QC samples are inserted with each analytical run, with the minimum number of QC samples dependant on the rack size specific to the chosen analytical method. Results for quality control samples that fall beyond the established limits are automatically red-flagged for serious failures and yellow-flagged for borderline results. Every batch of samples is subject to a dual approval and review process, both by the individual analyst and the Department Manager, before final approval and certification. The author has no reason to believe that there are any issues or problems with the preparation or analyzing procedures utilized by ALS.

Drill core samples are subject to Almaden's internal QA/QC program that includes the insertion of analytical standard, blank and duplicate samples into the sample stream. A total of 15 QA/QC samples are present in every 100 samples sent to the laboratory.

QA/QC sample results are reviewed following receipt of each analytical batch. QA/QC samples falling outside established limits are flagged and subject to review and possibly re-analysis, along with the 10 preceding and succeeding samples (prior to August 7, 2012, a total of five samples preceding and five samples succeeding the reviewable QA/QC sample have been re-analyzed). Where the re-analyses fall within acceptable QA/QC limits the values are added to the drill core assay database. Summary results of Almaden's internal QA/QC procedures are presented below.

In Mr. Raffle's opinion, Almaden's QA/QC procedures are reasonable for this type of deposit and the current level of exploration. A total of 14,731 QA/QC analytical standard, blank and duplicate samples have been submitted for analysis. Based on the results of the QA/QC sampling summarized below, the analytical data is considered to be accurate; the analytical sampling is considered to be representative of the drill sample, and the analytical data to be free from contamination. The analytical data is suitable for inclusion into a mineral Resource Estimate.

11.2.1 Analytical Standards

A total of 19 different analytical standards have been used on the Project. Since November 13, 2012 and drillhole TU-12-221 (the end of the Maiden Resource Estimate cut-off), 9 different analytical standards have been used and are the basis for the section herein. Please refer to the 2013 Almaden NI 43-101 (Raffle et al. 2013) report for a detailed discussion of the previously used standards.

Each standard has an accepted gold and silver concentration as well as known "between laboratory" standard deviations, or expected variability, associated with each standard. The standards include seven multi-element gold-silver standards with accepted values ranging from 0.564 to 3.88g/t Au, and 14.4 to

152.0g/t Ag. One analytical standard for every 20 samples (5%) is inserted into the sample stream at the '05', '25', '45', '65' and '85' positions. QA/QC summary charts showing gold and silver values for each analytical standard in addition to the accepted value, the second, and third "between laboratory" standard deviation are shown in **Figure 11-1** below.

Between 2010 and 2013 Almaden employed two separate criteria by which standards have been assigned "pass" or "reviewable" status.

Up to drillhole TU-12-130 a reviewable standard had been defined as any standard occurring within a reported mineralized interval returning greater than three (3) standard deviations (3SD) above the accepted value for gold or silver. Beginning with drillhole TU-12-131, a reviewable standard is now defined as any standard occurring anywhere in a drillhole returning >3SD above or below the accepted value for gold or silver. In addition, two standards analyzed consecutively returning values >2SD above or below the accepted value for the same element (gold or silver) are classified as reviewable.

All standard samples returning gold or silver values outside the established criteria are reviewed. A decision to conduct reanalysis of samples surrounding the reviewable standard is based on whether the standard returned a value above or below the accepted value (low, or slightly high >3SD values are allowed after data review) or if it occurred within a reported interval (>3SD values are allowed outside of reported intervals) Prior to August 7, 2012, when a reviewable standard has been recognized the five preceding and five succeeding samples, in addition to the standard have been subject to review and possibly re-analysis. After August 7, 2012 when a reviewable standard is recognized, the ten preceding and ten succeeding samples, in addition to the standard is subject to review and possibly re-analysis. The results of re-analysis are then compared to the original analysis. Provided that no significant systematic increase or decrease in gold and silver values is noted and the re-analyzed standard returned values within the expected limits, the QA/QC concern is considered resolved and the re-analyzed standard value and surrounding reanalyzed samples are added to the drillhole database.

A total of 7,283 analytical standards have been inserted into the sample stream of 126,382 assays for gold and silver for the 514 drillholes. Of the 7,283 standards, a total of 2,356 have been subject to review criteria in place up to drillhole TU-12-130. Of the remaining 4,490 samples subject to the current review criteria (TU-12-131 and later), 1,708 samples have been included in the maiden mineral Resource Estimate up to hole TU-12-221 (Raffle et al., 2013). QA/QC results with respect to the remaining 3,219 standards are reported herein (TU-12-222 and later).

Of the 3,219 QA/QC samples inserted into the sample stream since November 13, 2012, a total of 191 (5.9%) have been initially reviewable as a result of two consecutive standards returning >2SD from the accepted value, or a single standard returning >3SD from the accepted value for gold or silver. These standards have been re-analysed and all but 9 passed the repeat analysis (Figure 11-1). Of the 9 re-analysis failures, five (5) were outside reported mineralized intervals. Of the remaining four (4) re-analysis failures occurring within reported mineralized intervals, two (2) returned <3SD below the accepted value for Au, and one (1) >3SD above the accepted value for Ag.

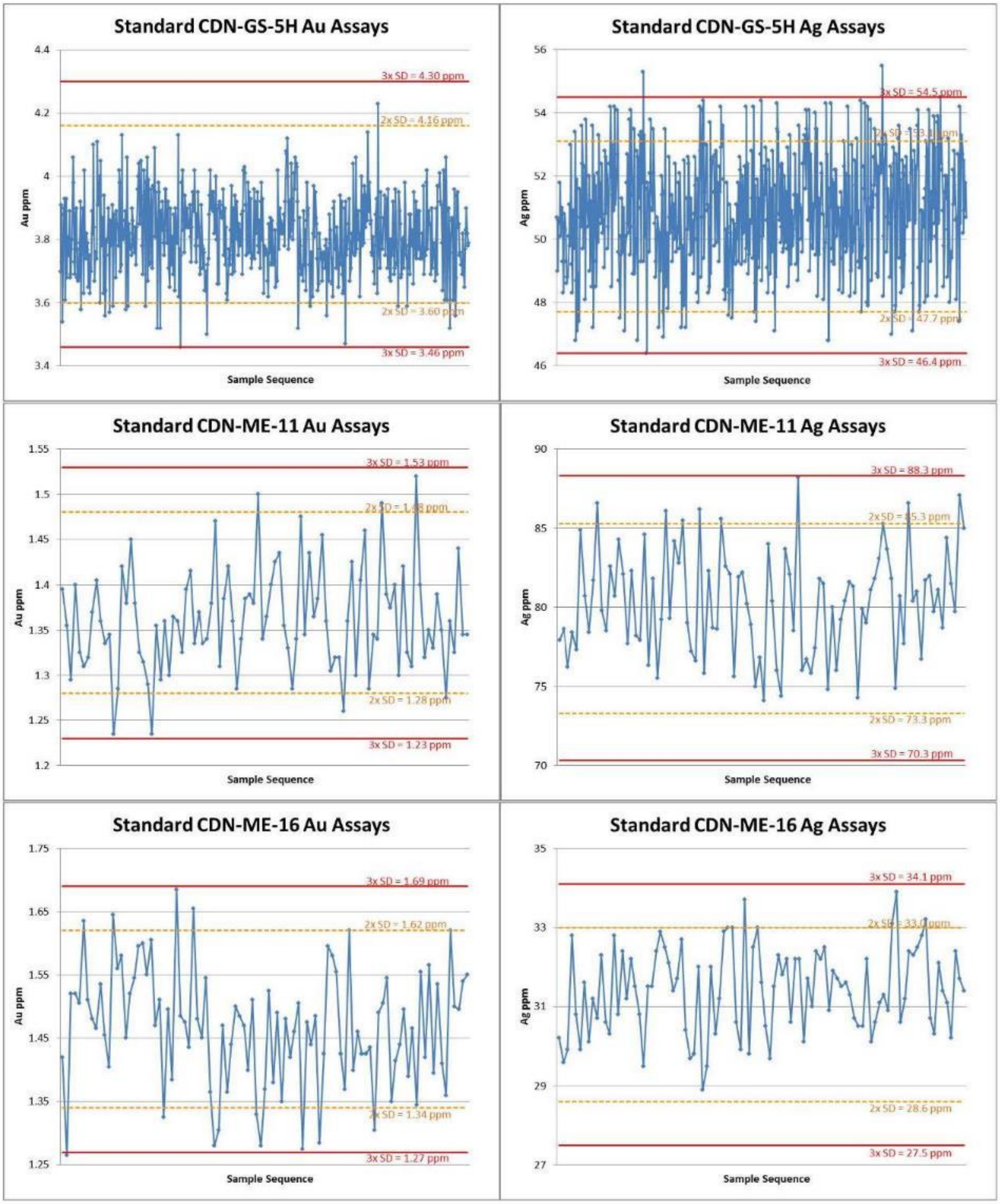


Figure 11-1 QA/QC Analytical Standards

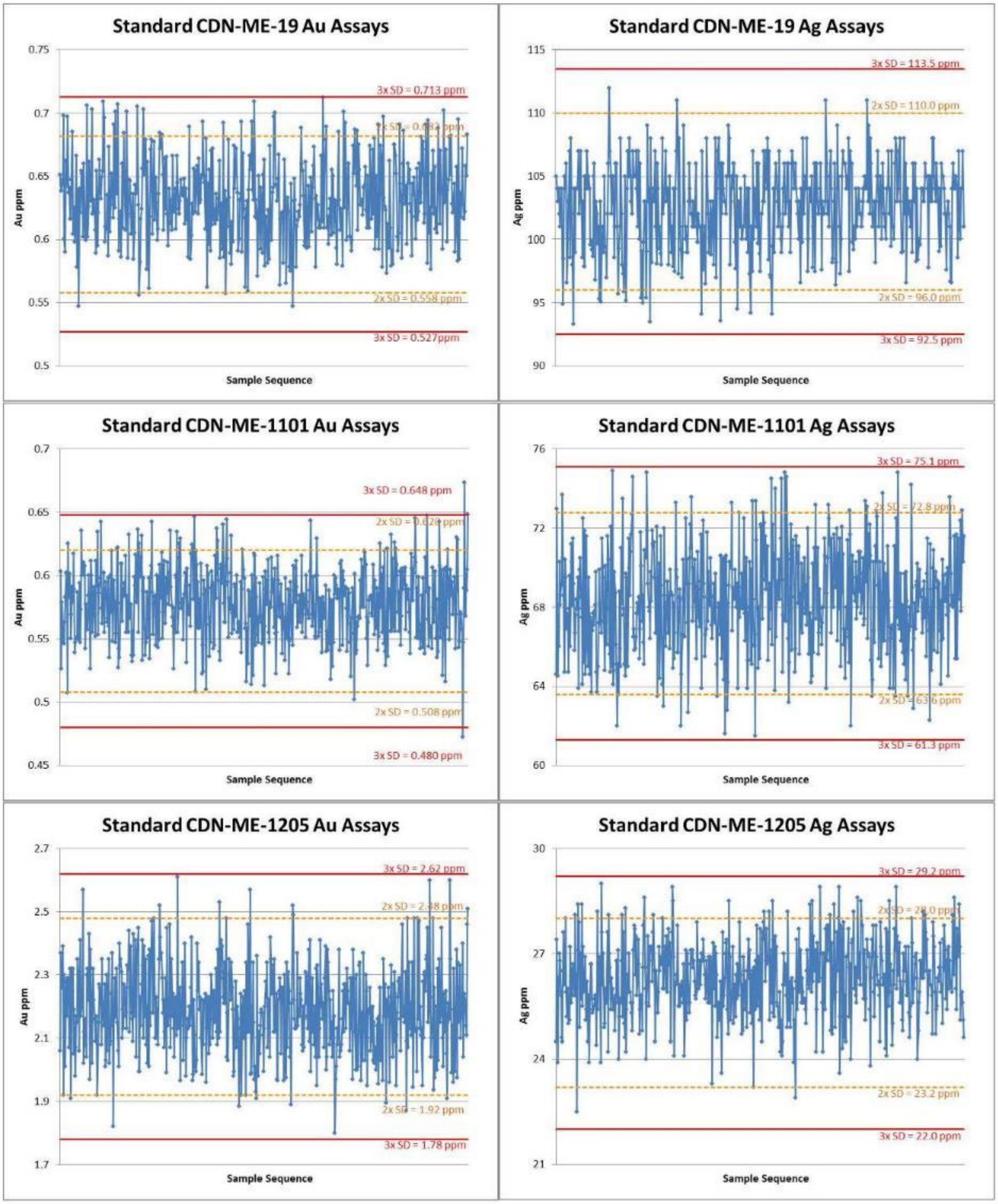


Figure 11-1 QA/QC Analytical Standards cont…

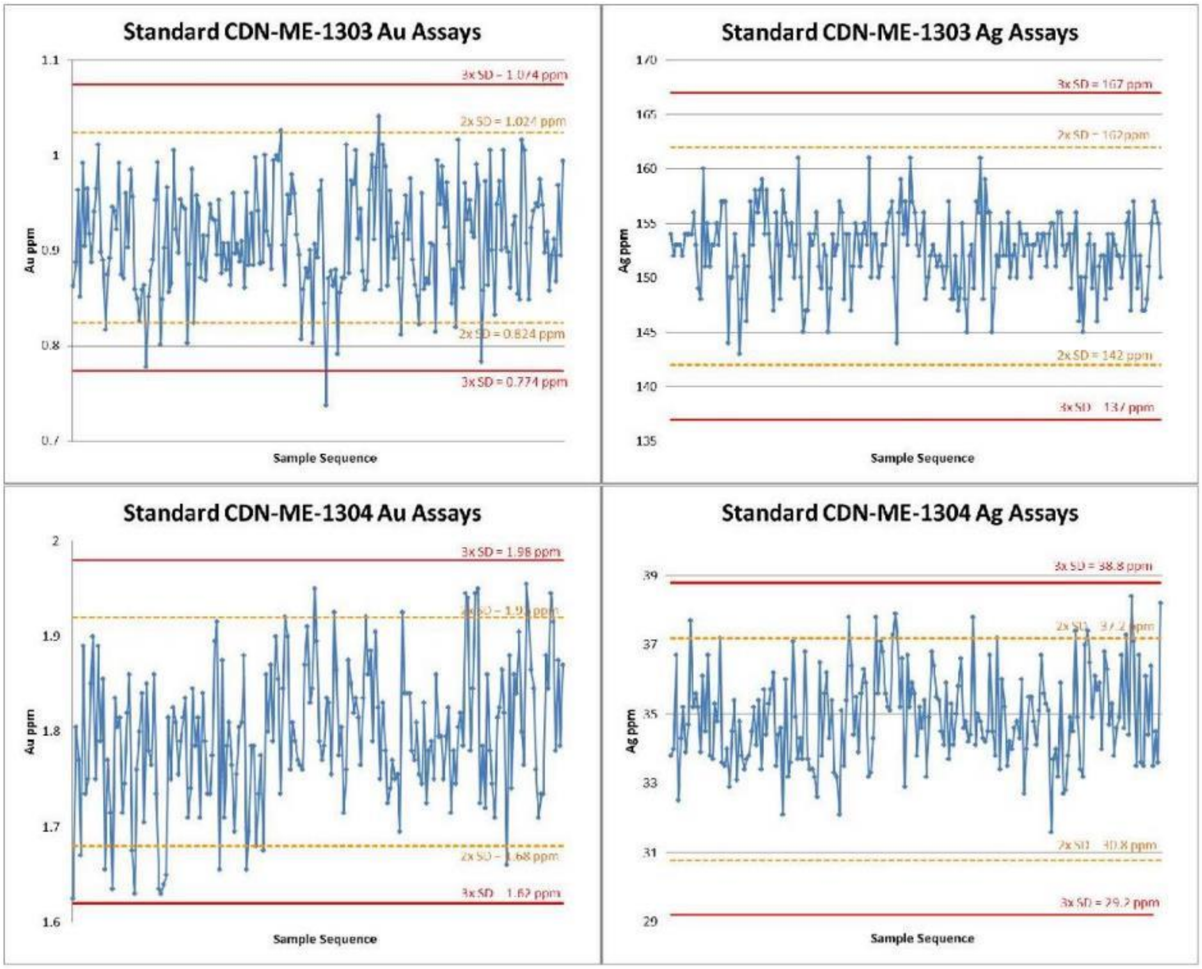


Figure 11-1 QA/QC Analytical Standards cont…

11.2.2 Blanks

Local limestone gravel is used for coarse “blank” samples to monitor potential contamination during the sample preparation procedure. One blank for every 20 samples (5%) is inserted into the sample stream at the ‘10’, ‘30’, ‘50’, ‘70’, and ‘90’ positions. Blank samples returning values of greater than 50ppb Au and/or 5ppm Ag are flagged for review.

Prior to August 7, 2012, reviewable blank samples occurring outside a reported mineralized intercept have not been subject to re-analysis. In the event that a blank returned values above the accepted limits for gold or silver (prior to August 7, 2012), the blank and five samples on either side have been re-analyzed. To provide additional confidence, on August 7, 2012, Almaden increased the number of samples re-analyzed to ten samples on either side of the blank in question. The results of re-analysis are then compared to the original analysis. Provided that no significant systematic increase or decrease in gold and silver values is noted and the re-analyzed blank does not return values above the accepted limits; the QA/QC concern is considered resolved and the re-analyzed blank value and surrounding reanalyzed samples are added to the drillhole database.

Of the 3,184 blank samples analyzed since November 13, 2012, a total of 11 blanks have returned assays greater than the accepted values of 50ppb Au and 5ppm Ag. Of these, nine blanks have returned greater than 50ppb Au, and six blanks returned greater than 5ppm Ag. These blanks occurred within mineralized intervals, and as such have been re-assayed. When re-assayed, all blanks except one sample returned values below the accepted values for Au and Ag (Figure 11-2). The single remaining failed blank sample immediately follows a high grade sample that returned an assay of 5,310ppm Ag and in this case it is reasonable that a certain amount of carryover occurred.

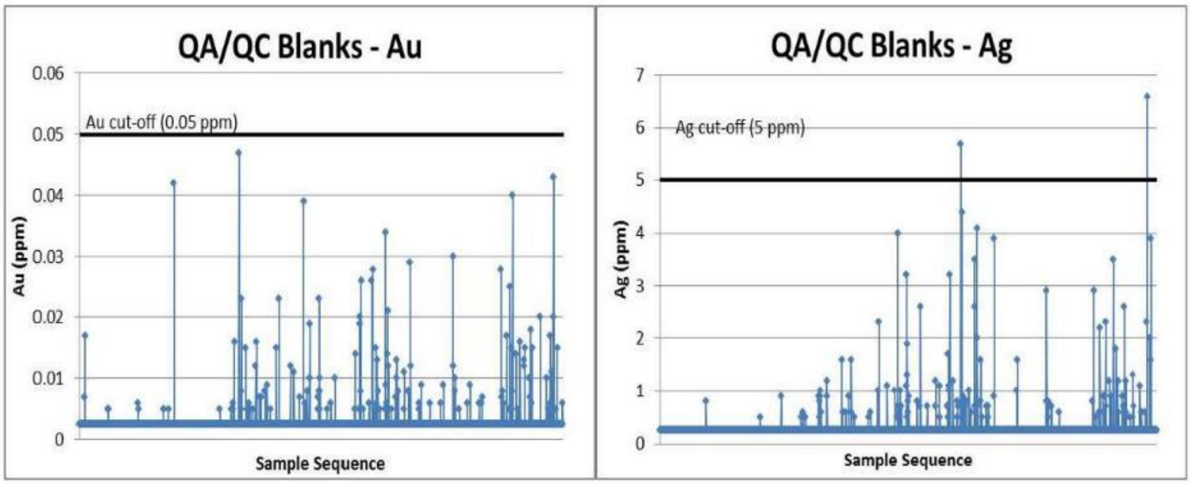


Figure 11-2 QA/QC Blanks

11.2.3 Duplicates

Quartered-core duplicate samples are collected to assess the overall repeatability of individual analytical values. One core duplicate for every 20 samples (5%) is inserted into the sample stream at the '15', '35', '55', '75', and '95' positions. A total of 3,120 quarter-core duplicates have been inserted into the sample stream beginning with drillhole TU-12-222.

As part of their internal QA/QC program, ALS completes routine re-analysis of prep (coarse reject) and pulp duplicates to monitor precision. ALS analyzed a total of 1,031 prep duplicates for gold, and 1,064 for silver. A total of 2,449 pulp duplicates have been analyzed for gold and 1,944 for silver.

Charts showing original versus duplicate quarter-core, prep, and pulp duplicate values for gold and silver show a significant and progressive increase in sample repeatability (**Figure 11-3**). Increased repeatability is expected as the level of duplicate sample homogenization increases from low (quarter-core) to moderate (prep) and high (pulp). The data indicates a high level of repeatability for both prep (coarse reject) and pulp duplicates. This is interpreted to indicate a low "nugget" effect with respect to Ixtaca gold and silver analyses. Excluding primary geologic heterogeneity (quarter-core), the data show a homogenous distribution of gold and silver values within Ixtaca drill core.

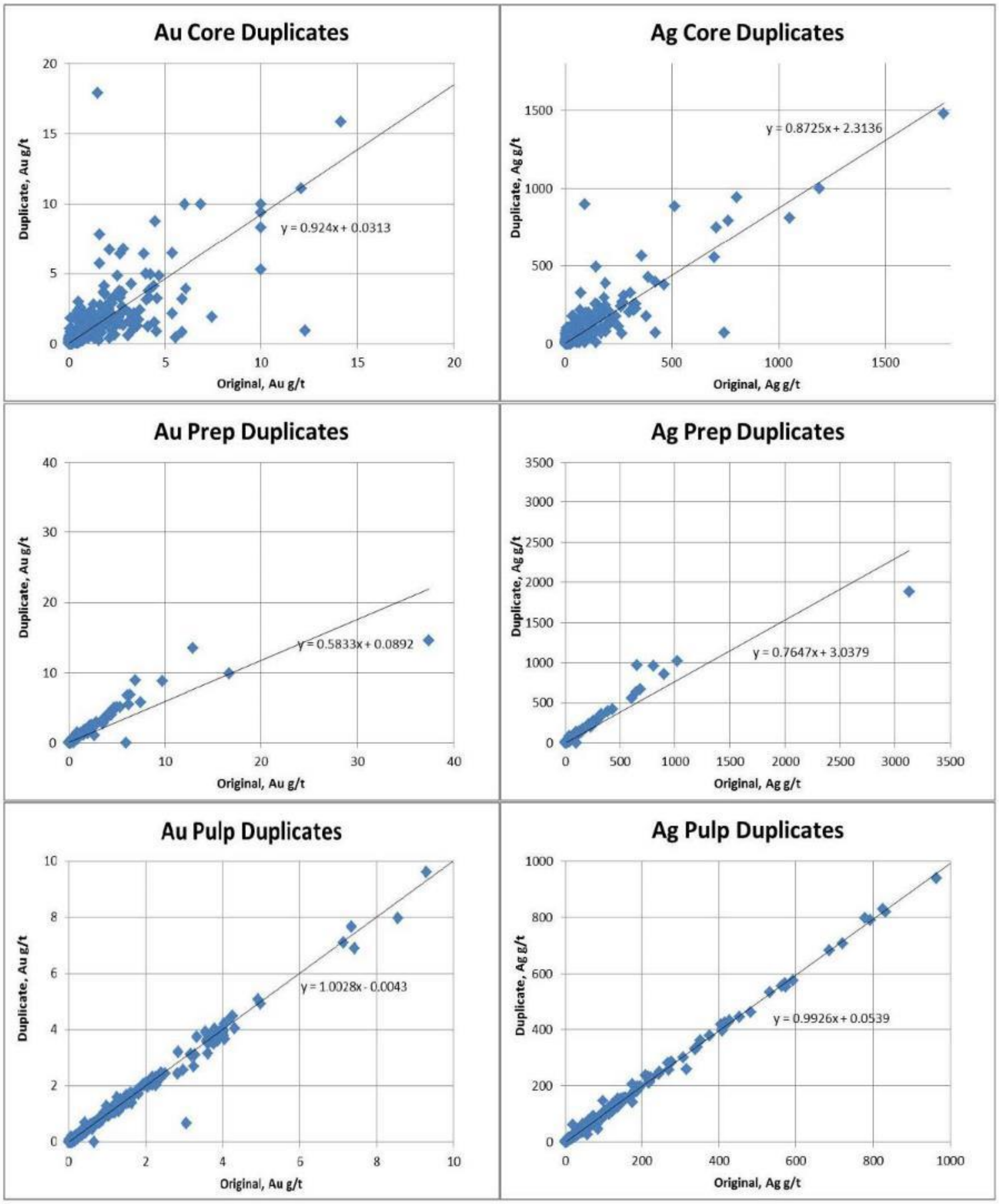


Figure 11-3 QA/QC Duplicates

11.3 Independent Audit of Almaden Drillhole Database

Between August 23 and September 26, 2012 and subsequently January 2 and January 21, 2014 APEX personnel, under the direct supervision of Kristopher J. Raffle, P.Geo., conducted an independent audit of Almaden's drillhole database. The audit included systematic checks of database values for drill collar coordinate, downhole survey, and drill core, analytical standard, duplicate, and blank sample assays against the original field survey files and laboratory certificates. In addition, APEX conducted a review of the Almaden QA/QC database, summary results of which is presented within Section 11.2 above.

11.3.1 Collar Coordinate and Downhole Survey Databases

A total of 22 diamond drillhole collar locations have been confirmed by Kristopher J. Raffle, P.Geo., following site visits to the Tuligtic Property on October 18, 2011, September 23, 2012 and November 20, 2013. The drill locations have been compared with the Almaden database used in the mineral Resource Estimate and are deemed to be accurate. In addition, Almaden has provided APEX with copies of all original down hole survey field records. Original field records for a total of 42 drillholes have been checked against database values used for the mineral Resource Estimate. No discrepancies have been found.

11.3.2 Drill Core Assay Database

A total of 126,382 drill core samples exist within the drill database (514 drillholes in total). The database audit consisted of checking 10,885 database gold and silver values against the original ALS analytical certificates. The audit specifically focused on assays within reported mineralized intercepts. No discrepancies have been identified between the original ALS analytical certificates and Almaden's drillhole database values.

12 Data Verification

Kristopher J. Raffle, P.Geo., (considered "the author" in this Section of the report) conducted a reconnaissance of the Tuligtic Property from October 17 to October 20, 2011 to verify the reported exploration results. The author completed a traverse of the Ixtaca Zone, observed the progress of ongoing diamond drilling operations and recorded the location of select drill collars consistent with those reported by Almaden. Additionally, Almaden's complete drill core library has been made available and the author reviewed mineralized intercepts in drill core from a series of holes across the Ixtaca Zone. The author personally collected quartered drill core samples as 'replicate' samples from select reported mineralized intercepts.

Additional visits to the Tuligtic Property were carried out by the author on September 23, 2012 and November 20, 2013 to observe current operations, review additional mineralized intercepts in drill core, and collect quarter drill core samples from the recently completed drillholes. A comparison of the results of the author's 'replicate' sampling versus original Almaden reported values for gold and silver are presented in **Table 12-1**.

Table 12-1 Authors Independent Drill Core Sample Assays

Authors Sample	Almaden Sample	Drillhole	From (m)	To (m)	Interval (m)	Authors Au (ppm)	Authors Ag (ppm)	Almaden Au (ppm)	Almaden Ag (ppm)
11KRP201	51662	TU-11-036	82.97	83.5	0.53	7.85	525	5.59	504
11KRP202	4596	TU-10-006	332.62	333.66	1.04	3.00	164	2.79	191
11KRP203	45073	TU-11-020	190.57	190.87	0.30	5.49	271	5.19	285
11KRP204	56217	TU-11-051	91.70	92.20	0.50	1.98	229	4.04	349
11KRP205	46586	TU-11-034	140.16	140.50	0.34	32.40	691	29.9	712
11KRP206	45347	TU-11-021	168.67	169.16	0.49	17.60	1130	15.55	1460
12KRP601	086459	TU-12-138	299.50	300.00	0.50	1.745	307	1.545	229
12KRP602	094696	TU-12-164	188.00	188.50	0.50	0.819	126	1.745	134
12KRP603	N298311	TU-12-123	228.60	229.10	0.50	3.45	86.6	4.39	92.5
12KRP604	N296249	TU-12-124	174.80	175.30	0.50	1.165	100	2.01	155
12KRP605	098391	TU-12-166	356.40	357.00	0.60	3.94	13.2	3.64	14.5
12KRP606	071443	TU-12-103	273.50	274.00	0.50	5.20	118	4.36	136
13KRP201	126912	TU-13-238	216.00	216.50	0.50	3.78	92	2.69	63.4
13KRP202	142029	TU-13-287	166.98	168.00	1.02	0.668	48	0.775	87.7
13KRP203	141281	TU-13-308	375.50	376.00	0.50	2.36	19	2.41	33.2
13KRP204	143281	TU-13-309	195.00	195.50	0.50	11.35	756	14.4	1000

Based on the results of the traverses, drill core review, and 'replicate' sampling Mr. Raffle has no reason to doubt the reported exploration results. Slight variation in assays is expected due to variable distribution of mill feed minerals within a core section but the analytical data is considered to be representative of the drill samples and suitable for inclusion in the Resource Estimate.

13 Mineral Processing and Metallurgical Testing

13.1 Summary

Almaden Minerals has completed a total of five metallurgical testing campaigns for Ixtaca Project since metallurgical development for Ixtaca project began in 2011. A sixth campaign started in February 2017 and is still in progress. The history of metallurgical test campaigns is summarized in Table 13-1. The location of the samples used for all metallurgical testing campaigns can be seen in Figure 13-1.

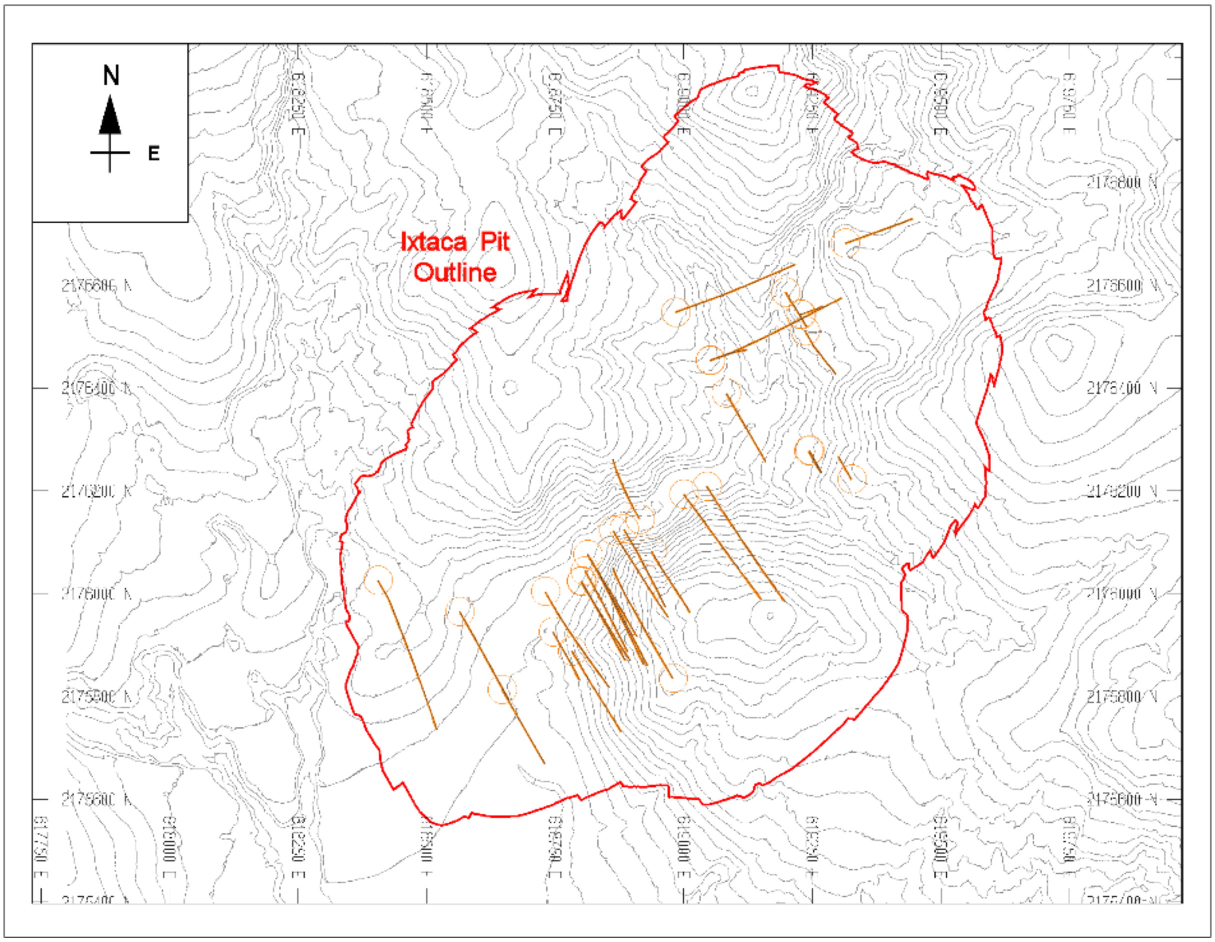


Figure 13-1 Location of Drillholes used for Ixtaca Metallurgical Samples

Table 13-1 History of Metallurgical testing campaigns for the Ixtaca Project

Campaign	Period	Laboratory	Sample type	Ore type/ Composites	Scope	Tests
0	2011	Craig H.B. Leitch, Ph.D., P. Eng.	single core intervals	None defined at the time	Research level	22 samples subjected to petrographic investigation
1	2013 Jan to Sep	Blue Coast in Parksville, BC	Five composites	Limestone, Volcanic, High Grade Limestone-Dyke, and Black Shale	Scoping	10 test including flotation and cyanidation
2	2013 Sep to 2014 May	Blue Coast in Parksville, BC	Three master composite by ore type	Volcanic, Limestone, Black Shale	Scoping	74 tests flotation tests
3	2015 Jan to Aug	McClelland in Sparks, NV	composites by ore type	a) Limestone-conglomerate, Limestone (LS-01 to LS-05) b) Volcanic (VC-01 to VC-03) c) Black Shale (BS-01 to BS-03)	Preliminary	11 gravity concentration, 109 flotation, 63 cyanidation, Qemscan
4	2015 Aug to Dec	Gekko, Ballarat, Victoria, Australia	single core composite	Limestone	Exploratory	coarse gravity concentration (IPJ machine)
5	2016 Aug to 2017 Mar	McClelland laboratory, Sparks, NV, and Met-Solve laboratory, Langley, BC	Composite from core	Limestone (LS-06) Volcanics Black Shale	Prefeasibility	18 gravity concentration, 29 flotation, 48 cyanidation, detox, carbon loading, Merrill-Crowe Qemscan, Comminution.
6	2017 Jan	McClelland in Sparks, NV, and Met-Solve in BC	individual core	Black Shale	ongoing	ongoing

The first two scoping level metallurgical testing campaigns were conducted between 2013 and 2014 at Blue Coast laboratory in Parksville, British Columbia. Initially, ten scoping level tests were completed on four different composite samples, Limestone, Volcanic, High Grade Limestone-Dyke, and Black Shale, all of them representing the spatially known mineralized deposit at the time. A second scoping level testing program started in September 2013 and it was completed in May 2014 using the same original four composite samples. This second scoping program had 74 tests including gravity concentration, flotation, and leaching, with its results presented in the Preliminary Economic Assessment NI 43-101 Report filed in October 2014. These scoping metallurgical testing programs concluded that Ixtaca ores were amenable to flotation and cyanidation with metallurgical recoveries reaching typical values observed in existing Mexican mining operations. A flotation concentrate made from the High Grade Limestone-Dyke composite was subjected to an intense cyanide leach and returned recoveries of 88% and 93% for gold and silver respectively. Additionally, it was concluded that based on its mineralization, lithology and metallurgical performance, the five composites could be grouped into three major ore types: Limestone, Volcanic, and Black Shale.

The third testing campaign (McClelland, 2015) focused on achieving maximum recovery from the three major ore types, Limestone, Volcanic, and Black Shale. At that time, Almaden had acquired exclusive rights to purchase the Rock Creek mill (see Section 17) and the test work program focused on confirming the suitability of the available Rock Creek equipment by defining a flowsheet that incorporated gravity concentration followed by rougher flotation of the gravity tails, and cyanidation of the rougher concentrate (see Figure 13-2). Results from this metallurgical campaign were positive, with both gold and silver reaching overall metallurgical recoveries of approximately 90% for gold and silver in Limestone. Silver recovery in Volcanics and Black Shale also reached 90%, but gold recoveries for these minor ore types was projected at 50% due to fine grained gold in Volcanics and a gold preg-robbing component in Black Shale.

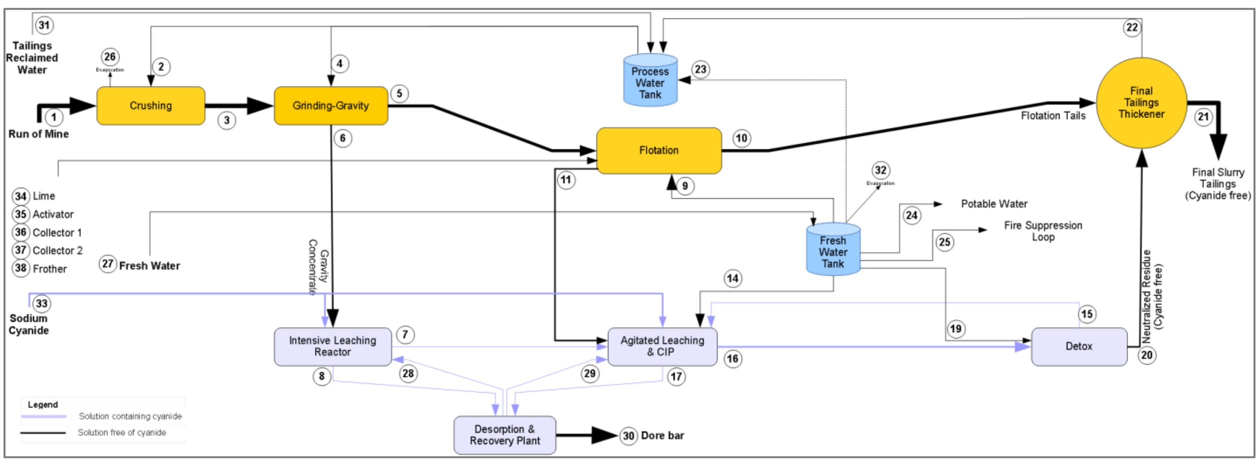


Figure 13-2 Ixtaca Simplified Flowsheet – Block Flow Diagram

A fourth program carried out at Gekko's laboratory in Ballarat, Australia to test an In-Line Pressure Jig showed inadequate recoveries to justify use of this equipment.

The fifth metallurgical testing campaign (McClelland, 2016) focused on the Limestone as the primary ore type as it contributed more than 80% of the PFS recoverable metal (98% of metal production in the payback period). Recovery results from this test work campaign were consistent with the previously achieved recoveries achieving overall metal recovery of 90% for each metal. Sodium cyanide (NaCN) consumption in the leaching of rougher concentrate was consistently below 1.0 kg/tonne of fresh ore.

The Table 13-2 shows the metallurgical recoveries and mass pull projected for every processing stage. The Gravity concentration stage is projected to recover 54% gold and 12% silver in a concentrate mass weighing 0.5% of the feed. The intensive leach stage that will process the gravity concentrate is expected to achieve metal recovery of 98.5% gold and 97.2% silver. The flotation stage is fed with gravity concentration's tails, and it's projected to achieve metallurgical recovery of 90.5% gold and 92.8% silver to a concentrate weighing 9% of the feed. The agitated leaching stage feed is comprised of the reground flotation concentrate stream and the reground intensive leach's tail stream and is projected to achieve metallurgical recovery of 86.7% gold and 95.5% silver. No preg-robbing was observed in the Limestone sample.

Table 13-2 Projected stage metallurgical recovery and mass pull for Limestone ore

	Stage mass pull	Metal Recovery	
		Gold	Silver
Gravity concentration	0.50%	54.0%	12.0%
Intensive Leach	0.09%	98.5%	97.2%
Flotation concentration	9.00%	90.5%	92.8%
Agitated Leach	0.03%	86.7%	95.5%
Global (Overall)	0.0033%	90.0%	90.0%

A new metallurgical testing campaign (sixth testing campaign) started in 2017 February focusing on the Black Shale ore type. Previous preliminary testing of Black Shale samples showed good response to flotation and a strong preg-robbing component during cyanidation. This sixth testing campaign is still in progress.

Overall recoveries recommended for the PFS are summarized in Table 13-3 for each ore type.

Table 13-3 Recommended PFS Process Recoveries

Metallurgical Domain	Gold Overall Process Recovery	Silver Overall Process Recovery
Limestone	90%	90%
Volcanics	50%	90%
Black Shale	50%	90%

13.2 Fifth metallurgical testing campaign (McClelland, 2016)

The fifth metallurgical testing campaign (McClelland, 2016) focused on the Limestone as the primary ore type as it contributed more than 80% of the PFS recoverable metal (98% of metal production in the payback period).

13.2.1 Testwork Results – Ore Hardness

Multiple samples were subject to hardness testing including conventional work index for crushing and ball milling, and abrasion tests. Table 13-4 summarizes the hardness results obtained between 2014 and 2016.

Limestone had crushing work index of 8.11 kWh/tonne, abrasion index of 0.05 grams, and Bond's ball mill work index of 13.5 kWh/tonne, indicating a medium hardness. The narrow difference of approximately 1.0 kWh/tonne between the lowest and highest results for both the ball mill work index and the crushing work index suggest low variability of Limestone hardness throughout Ixtaca deposit.

Volcanic samples had average crushing work index of 6.09 kWh/tonne, abrasion index of 0.07 grams, and Bond's ball mill work index of 11.8 kWh/tonne, indicating medium to soft rock. Volcanics ball mill bond work index varied by up to 2.7 kWh/tonne indicating hardness variability.

Black Shale samples had average crushing work index of 5.86 kWh/tonne, abrasion index of 0.06 grams, and Bond's ball mil work index of 13.4 kWh/tonne. A large difference of approximately 10 kWh/tonne in the ball mill work index is observed suggesting a potential large hardness variability in the Black Shale material.

Additional hardness test on Black Shale and Volcanic samples are recommended to refine the hardness characterization of these ore types.

Table 13-4 Hardness Tests, McClelland 2016

Ore type	Date	Crushing Work Index		Abrasion Index Ai, grams	Ball Mill Work Index	
		kWh/ton	kWh/tonne		kWh/ton	kWh/tonne
Black Shale	2014	-	-	-	-	18.6
Black Shale	2016	4.97	5.48	0.095	12.2	13.4
Black Shale	2016	5.65	6.23	0.0207	7.4	8.2
Limestone	2014	-	-	-	-	13.2
Limestone	2016	6.84	7.54	0.0309	12.0	13.2
Limestone	2016	7.87	8.68	0.0632	12.9	14.2
Volcanic	2014	-	-	-	-	10.5
Volcanic	2016	5.11	5.63	0.0176	-	-
Volcanic	2016	5.94	6.55	0.1232	12.0	13.2

13.2.2 Gravity Concentration

Gravity concentration tests at McClelland and Met-Solve laboratories have been conducted on the Falcon laboratory scale machines.

Met-Solve laboratory tested Limestone and Black Shale samples using the standard Detailed Gravity Recoverable Gold test (DGRG) and modeled the Ixtaca grinding-gravity concentration circuit (see Section 17) to forecast potential gravity recovery at industrial scale. Results for the DGRG and projected industrial scale recovery are shown in Table 13-5.

Table 13-5 DGRG and Projected Industrial Scale Recovery

Sample	Source	Date reported	Head grade		GRG		Projected industrial scale recovery	
			Au g/t	Ag g/t	Au	Ag	Au	Ag
Limestone LS-06	DDH-457	2016-Jul-13	0.73	0.9	60.9%	20.3%	54.0%	18.0%
Black Shale	DDH-458	2017-Feb-23	0.86	74.0	24.3%	9.9%	18.80%	7.7%
Volcanic	DDH-461	2017-Feb-23	1.58	59.0	33.2%	12.8%	24.30%	9.4%

Limestone achieved 60.9% gold recovery in the DGRG test, and is projected to reach 54% gold recovery at industrial scale. The corresponding results for silver are 20.4% DGRG and 18% projected at industrial scale.

Black Shale and Volcanic samples showed significantly lower amenability to gravity concentration with its corresponding DGRG results at 24.3% and 33.2% respectively and projected industrial scale of 18.8% and 24.3% respectively. Projected industrial scale recovery for silver is 7.7% from Black Shale and 9.4% from Volcanic.

McClelland Laboratory replicated the Met-Solve DGRG gold recovery results using multiple passes at varied feed sizes on the Falcon machine. Results from the gravity concentration tests are shown in Table 13-6.

Table 13-6 Gravity Concentration tests

Test	Sample	Feed size	Number of passes	Mass pull %	Au %recovery	Ag %recovery
G-1	Limestone LS-06	80%-212µm	1	0.24	10.4	1.6
G-2 (*)	Limestone LS-06	80%-75µm	2	0.52	55.0	14.6
G-3	Limestone LS-06	80%-62µm	2	1.21	64.5	24.2
G-4	Limestone LS-06	80%-53µm	2	2.18	71.3	31.2
G-5	Limestone LS-06	80%-53µm	1	0.95	50.6	14.4
G-6	Limestone LS-06	80%-53µm	3	3.1	71.7	31.2
G-7	Limestone LS-06	80%-150µm	2	1.34	41.3	15.7
G-8	Limestone LS-06	80%-120µm	2	1.54	49.5	21.0
G-9	Limestone LS-06	80%-75µm	2	1.68	51.2	31.7
G-10 -> G-23	Limestone LS-06	80%-75µm	2	0.74	58.5	14.4
G-34	Limestone LS-06	80%-90µm	2	1.84	62.9	19.2

Test	Sample	Feed size	Number of passes	Mass pull %	Au %recovery	Ag %recovery
G-35	Limestone LS-06	80%-75µm	2	1.65	71.9	20.1
G-36	Limestone LS-06	80%-63µm	2	1.9	68.9	19.8
G-37	Limestone LS-06	80%-53µm	2	2.13	66.7	20.0
G-24	Black Shale BS-04	80%-75µm	1	0.99	22.8	7.2
G-25	Black Shale BS-04	80%-75µm	2	2.14	31.8	13.4
G-26	Black Shale BS-04	80%-75µm	3	3.11	39.1	18.4
G-28	Black Shale BS-04	80%-62µm	2	2.22	30.7	11.7
G-27	Black Shale BS-04	80%-53µm	2	2.3	29.9	11.7
G-29	Volcanic VC-04	80%-75µm	1	1.01	26.6	8.4
G-30	Volcanic VC-04	80%-75µm	2	1.27	33.5	11.4
G-31	Volcanic VC-04	80%-75µm	3	2.45	44.9	20.2
G-39	Volcanic VC-04	80%-75µm	2	7.66	53.4	39.0
G-33	Volcanic VC-04	80%-62µm	2	1.88	38.1	16.2
G-32	Volcanic VC-04	80%-53µm	2	1.56	36.1	12.2

Limestone confirmed its favorable response to gravity concentration. Based on the combined recovery results from gravity concentration and flotation the test conditions from G-2 were selected to continue forward with the test program, these conditions are feed size at P_{80}=75µm and two passes in the Falcon machine to reach an approximate mass pull of 0.5% weight to the gravity concentrate to recover at least 50% of the gold and 12% of the silver metal in the concentrator feed. Gravity concentrate grade is expected to be 73 g/t Au and 880 g/t Ag in the early stages of mine plan.

Black Shale appears to be insensitive to grind size but responded reasonably well to mass pull. Two passes under varied grind sizes consistently reached about 30% gold recovery and approximately 12% silver. Volcanic sample results suggest that recovery may have a strong direct correlation to mass pull. Two passes in the Falcon machine reached gold recovery ranging from 33.5% up to 53.4% when mass pull ranged from 1.27% to 1.88%.

13.2.3 Combined Limestone Gravity Concentration and Flotation

The combined recoveries from the gravity concentration and the flotation concentration when tested in the range of P_{80}= 53 µm to P_{80}=150µm resulted in a tight range for the precious metals, see Table 13-7. Relatively speaking, lower recovery in gravity was compensated with higher recovery in flotation and vice versa, therefore the combination of both processes always yielded above 96% gold when P_{80} ranged from 53 µm to 75 µm. The silver performance shows a similar trend to that of gold, with a combined silver recovery in the order of 93% or above.

A bulk gravity concentration and flotation test (G-10 to G-23 and F-34 to F-68) was executed to generate enough concentrate for leaching test. Results from the flotation bulk test confirmed initial stage recovery estimation as follows:

- 50.2% of gold and 11.8% of silver reported to gravity concentrate weighing 0.52% of the feed (mass pull)
- 46.2% of gold and 81.6% of silver reported to flotation rougher concentrate weighing 8.2% of the feed (mass pull).

- The combined gravity concentration and flotation recovery results are 96.4% for gold and 93.4% for silver.
- Flotation concentrate grade achieved Au 4.3 g/t and Ag 388 g/t.
- Gravity concentrate grade achieved Au 73.4 g/t and Ag 880 g/t.

Table 13-7 Combined Gravity and Flotation Results

Gravity Test →		**G-2**	**G-2**	**G-1**	**G-1**	**G-1**	**G-7**	**G-8**	**G-9**	**G-2**	**G-10-G-23**
Flotation Test →		**F-2**	**F-3**	**F-4**	**F-5-F-8**	**F-12**	**F-9**	**F-10**	**F-11**	**F-1**	**F-34-F68**
Feed Size →		**80%-62µm**	**80%-53µm**	**80%-53µm**	**80%-53µm**	**80%-53µm**	**80%-150µm**	**80%-120µm**	**80%-75µm**	**80%-75µm**	**80%-75µm**
Weight (%)	Gravity concentrate	1.9	1.9	0.03	0.03	0.03	1.34	1.54	1.68	1.9	0.52
Weight (%)	Flotation Rougher Concentrate	13.34	12.16	16.99	9.4	10	6.02	5.32	4.92	14.62	8.16
Weight (%)	Flotation Rougher Tail	84.76	85.94	82.98	90.57	89.97	92.64	93.14	93.4	83.48	91.32
Weight (%)	Combined Concentrate	15.24	14.06	17.02	9.43	10.03	7.36	6.86	6.6	16.52	8.68
Gold Distribution (%)	Gravity concentrate	49.6	60.5	12.9	9.9	10	41.3	49.5	51.1	59.8	50.2
Gold Distribution (%)	Flotation Rougher Concentrate	46.8	36.1	81.8	85.7	86.6	49.3	44.3	42.1	35.9	46.2
Gold Distribution (%)	Flotation Rougher Tail	3.6	3.4	5.3	4.4	3.4	9.4	6.2	6.8	4.3	3.6
Gold Distribution (%)	Combined Concentrate	96.4	96.6	94.7	95.6	96.6	90.6	93.8	93.2	95.7	96.4
Silver Distribution (%)	Gravity concentrate	14.7	19.3	1.3	1.5	1.3	15.7	21	31.7	19.6	11.8
Silver Distribution (%)	Flotation Rougher Concentrate	78.4	71.5	92.1	93.3	89.7	70	66.9	61.1	71.3	81.6
Silver Distribution (%)	Flotation Rougher Tail	6.9	9.2	6.6	5.2	9	14.3	12.1	7.2	9.1	6.6
Silver Distribution (%)	Combined Concentrate	93.1	90.8	93.4	94.8	91	85.7	87.9	92.8	90.9	93.4
Gold grade (g/t)	Gravity concentrate	24.19	24.19	267	267	267	24.3	24.2	21	24.19	73.4
Gold grade (g/t)	Flotation Rougher Concentrate	3.25	2.26	2.99	7.4	6.94	6.47	6.27	5.9	1.89	4.31
Gold grade (g/t)	Flotation Rougher Tail	0.04	0.03	0.04	0.04	0.03	0.08	0.05	0.05	0.04	0.03
Gold grade (g/t)	Combined Concentrate	5.86	5.22	3.46	8.23	7.72	9.72	10.3	9.74	4.45	8.45
Gold grade (g/t)	Head calculated	0.93	0.76	0.62	0.81	0.8	0.79	0.75	0.69	0.77	0.76
Gold grade (g/t)	Head assayed	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Silver grade (g/t)	Gravity concentrate	380	380	1655	1655	1655	455	526	739	380	880
Silver grade (g/t)	Flotation Rougher Concentrate	288	220	206	343	357	451	485	486	180	388
Silver grade (g/t)	Flotation Rougher Tail	4	4	3	2	4	6	5	3	4	2.8
Silver grade (g/t)	Combined Concentrate	299	238	373	494	507	451	490	515	203	417
Silver grade (g/t)	Head calculated	49	37	38	35	40	39	39	39	37	39
Silver grade (g/t)	Head assayed	42	42	42	42	42	42	42	42	42	42

Reagent optimization carried out during the flotation tests provided the recommended conditions shown in Table 13-8.

Table 13-8 Flotation Conditions

Primary grind size	80% -75µm
Flotation concentration	33% w/w
Activator	Copper sulfate 0.125 kg/t
Collector	SIPX 0.125 kg/t, AERO3477 0.0625 kg/t
Frother	Aerofroth 65 0.1 kg/t

13.2.4 Agitated Leaching

Cyanidation tests were carried out on flotation concentrate slurry generated from the bulk gravity concentration-flotation tests. The tests evaluated:

- grind size (regrind time);
- point of addition for lime;
- carbon in leaching (CIL) vs direct agitated leaching (CN);
- slurry pre-treatment with air sparging;
- calcium peroxide;
- solids concentration;
- sodium cyanide concentration;

Selected results from the leaching program are shown in Table 13-9 and in Figure 13-3.

Leaching stage recovery of gold reached values up to 88.8% and silver reached up to 97.2% when using a P80=75µm. Metal recovery shows a direct correlation with cyanide consumption that appears to be optimum in the range of 7.35 to 10.41 kg of NaCN per tonne of concentrate.

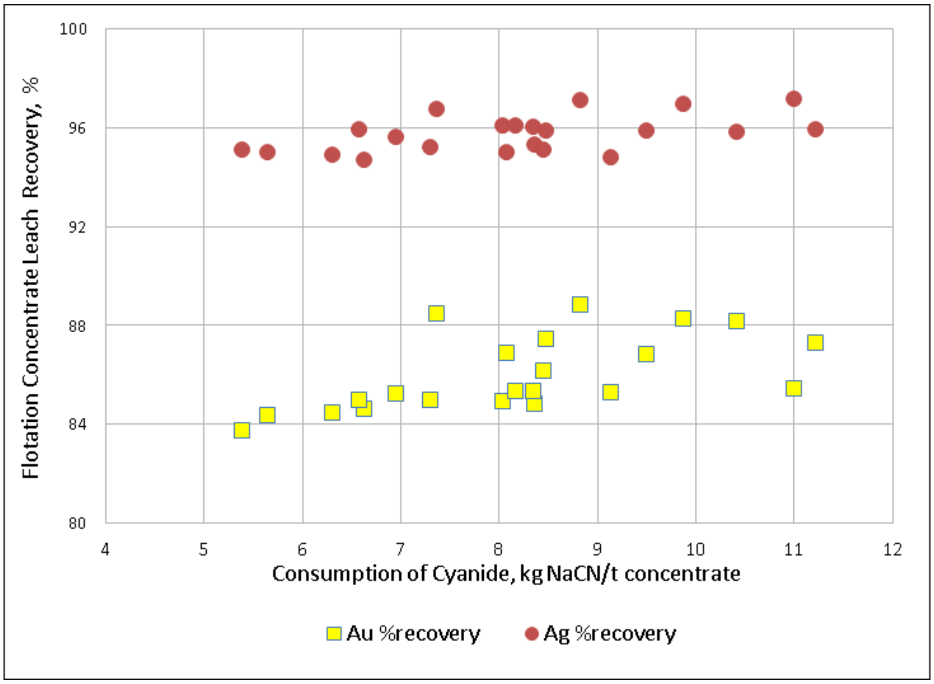
Selected leaching conditions are as follows:

- Flotation concentrate regrind for 60 minutes;
- lime added during the regrind stage;
- no pre-treatment;
- sodium cyanide concentration maintained at 5.0 g/L;
- lime addition approximately 5 kg/t of concentrate;

Table 13-9 Leaching of Flotation Concentrate

Flotation Feed Size P_{80}	Leaching					Flotation Feed Basis Weight %		Lime during Regrind	Leaching								
	Test #	Regrind (min)	Lime during Regrind	CN/CIL	Pretreat	Ro. Conc.	Ro. Tail		hours total	NaCN concentration g/L	Test Type	Au leach recovery %	Ag leach recovery %	Au head calculated g/t	Ag head calculated g/t	NaCN Consumption kg per t concentrate	Lime Added kg per t concentrate
75µm	CY-53	60	No	CN	No	8.2	91.8	No	120	5.0	CN	83.8	95.1	4.19	369	5.39	8.6
75µm	CY-56	60	No	CN	No	8.2	91.8	No	120	5.0	CN	84.6	94.7	4.22	376	6.62	8.0
65µm	CY-68	60	Yes	CN	No	9.8	90.2	Yes	120	6.5	CN	84.5	94.9	3.22	254	6.30	4.0
75µm	CY-54	60	No	CN	No	8.2	91.8	No	120	5.0	CN	84.4	95.0	4.22	380	5.64	8.0
75µm	CY-52	60	No	CN	No	8.2	91.8	No	120	10.0	CN	85.3	94.8	4.35	383	9.14	8.2
75µm	CY-70	60	No	CIP	No	NA	NA	Yes	120	6.5	CIP	84.8	95.3	3.62	300	8.36	4.0
75µm	CY-29	30	Yes	CN	No	10.2	89.8	Yes	96	5.0	CN	85.0	95.2	3.06	272	7.30	6.0
75µm	CY-57	60	No	CN	No	8.2	91.8	No	120	8.0	CN	85.2	95.6	4.33	388	6.95	8.0
75µm	CY-55	60	No	CN	No	8.2	91.8	No	120	5.0	CN	85.0	95.9	4.19	370	6.57	8.0
75µm	CY-59	60	No	CN	No	8.2	91.8	No	120	8.0	CN	85.0	96.1	4.32	381	8.04	8.2
75µm	CY-48	60	Yes	CN	No	8.2	91.8	Yes	120	8.0	CN	86.2	95.1	4.26	370	8.45	4.0
75µm	CY-58	60	No	CN	No	8.2	91.8	No	120	8.0	CN	85.3	96.0	4.30	379	8.34	8.0
75µm	CY-60	60	No	CN	No	8.2	91.8	No	120	8.0	CN	85.3	96.1	4.23	385	8.17	8.2
75µm	CY-47	60	Yes	CN	No	8.2	91.8	Yes	120	8.0	CN	86.9	95.0	4.20	361	8.07	4.4
75µm	CY-31	30	Yes	CN	No	10.2	89.8	Yes	96	10.0	CN	85.4	97.2	3.02	284	10.99	6.0
75µm	CY-43	60	Yes	CN	No	10.2	89.8	Yes	120	10.0	CN	86.9	95.9	3.50	290	9.49	4.0
75µm	CY-44	60	Yes	CN	No	10.2	89.8	Yes	120	8.0	CN	87.3	95.9	3.39	295	11.21	4.0
75µm	CY-46	60	Yes	CN	No	10.2	89.8	Yes	120	5.0	CN	87.4	95.9	3.50	292	8.47	4.8
75µm	CY-45	60	Yes	CN	No	10.2	89.8	Yes	120	8.0	CN	88.2	95.8	3.55	289	10.41	4.2
75µm	CY-33	30	Yes	CIL	No	10.2	89.8	Yes	96	5.0	CIL	88.3	97.0	3.15	263	9.87	6.0
75µm	CY-30	60	Yes	CN	No	10.2	89.8	Yes	96	5.0	CN	88.5	96.8	3.65	279	7.36	3.5
55µm	CY-69	60	Yes	CN	No	5.1	94.9	Yes	120	6.5	CN	88.8	97.1	3.40	241	8.83	4.2

Figure 13-3 Flotation Concentrate Leach Test – Recovery vs Cyanide Consumption



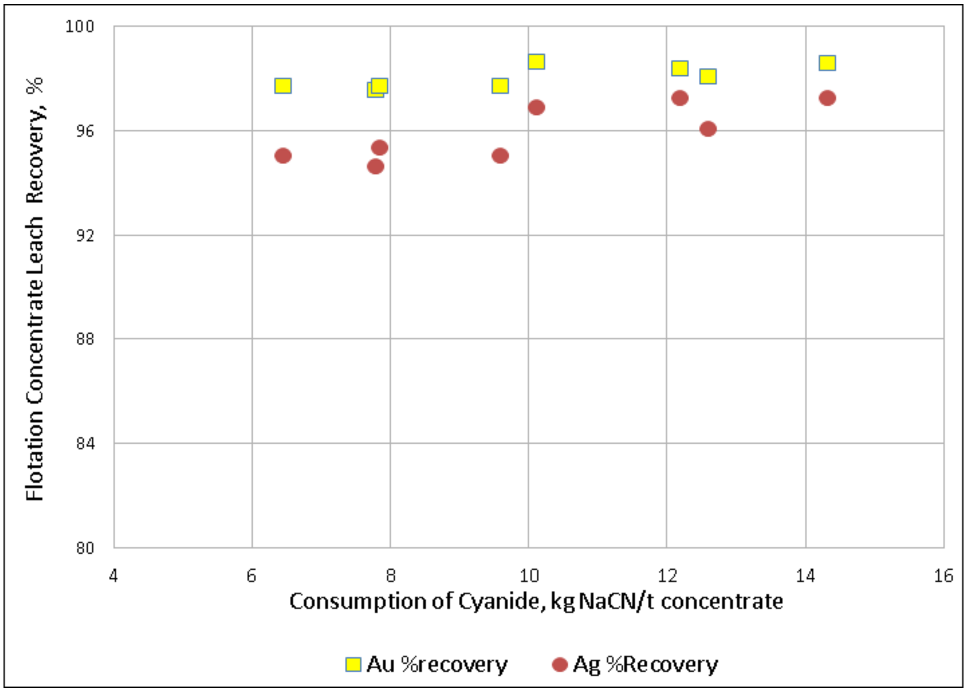
13.2.5 Testwork Results – Intensive Cyanidation

Intensive cyanidation of limestone gravity concentrate tested regrind time, lime addition, leach residence time, and sodium cyanide concentration. The overall results were consistently high for both metals, gold recovery reach a maximum of 98.7%, and silver reached a maximum of 97.3%. Sodium cyanide consumption showed a direct correlation with metal recovery and it is estimated at 14 kg/tonne of concentrate, see Figure 13-4.

Table 13-10 Intensive Cyanidation of Gravity Concentrates

Regrind, min	Lime during regrind	Leaching time, hours	NaCN g/l	NaCN, hours	Au %recovery	Calc. Head Au g/t	Ag %Recovery	Head Au g/t	NaCN consumption g/t conc.	Lime consumption g/t conc.
15	Yes	120	5	96	97.6	68.05	94.6	928	7.79	3.3
15	No	120	5	96	97.7	68.78	95.1	851	9.59	1.3
15	Yes	120	10	96	97.7	72.79	95.4	943	7.83	3.3
15	No	120	10	96	97.7	75.35	95.1	1003	6.45	2.0
60	Yes	24	13	Initial	98.1	58.34	96.1	848	12.61	NA
60	Yes	120	10	96	98.4	72.47	97.3	955	12.19	3.3
60	No	120	20	96	98.6	71.81	97.3	954	14.32	2.7
60	No	120	10	96	98.7	77.95	96.9	978	10.1	2.7

Figure 13-4 Gravity Concentrate Intensive Leach – Recovery vs Cyanide Consumption



13.2.6 Specific Gravity

Specific gravity was measured for various streams of the flowsheet. The results summarized in Table 13-11 are reasonably consistent with the relative expected values.

Table 13-11 Limestone Specific Gravities

Stream	Sample Source	Specific Gravity
Whole Ore	LS-06 fresh feed	2.49
Gravity Cleaner Concentrate	G-10 thru G-23 Comp.	3.04
Recombined Gravity (Cleaner + Rougher) Tailings/Flotation Feed	G-10 thru G-23 Comp.	2.49
Flotation Rougher Concentrate	F-34 thru F-68 Comp.	2.52
Flotation Ro. Conc. CN Leached Residue	CY-50	2.64
Flotation Rougher Tailings	F-34 thru F-68 Comp.	2.51

13.2.7 Testwork Results – Detoxification

A leaching tails sample generated from the limestone agitated leach test was subject to a combined 21 detoxification tests to destroy cyanide using three commercially available technologies including:

- Caro's Acid;
- SO_2/Air;
- Combinox®;

The tests were carried out at the Cyanco Corporation's laboratory in Sparks, Nevada. Out of the three technologies, SO2/Air and Combinox® were successful.

13.2.8 Testwork Results – Carbon Adsorption and Merrill-Crowe

Precious metal adsorption on activated carbon was tested in six tests at carbon concentration varying from 0.1 g/L up to 20 g/L. Merrill-Crowe was tested under four different ratios of Zn to precious metals ranging from Zn/PM=5 to Zn/PM=50., see selected final conditions in Table 13-12.

Table 13-12 Carbon Loading and Merrill-Crowe tests

	PLS Au mg/L	PLS Ag mg/L	Carbon Concentration g/L	Carbon Loading Au g/t	Carbon Loading Ag g/t	Ratio Zn/Precious Metals	Au %recovery	Ag %recovery
Carbon loading	2.4	222.5	20	924	29,000		98.8	96.8
Merrill-Crowe	1.18	113.2				50	97.5	99.9

Both Merrill-Crowe and carbon adsorption proved to be successful at recovering precious metals from the pregnant leach solution (PLS). Merrill-Crowe had a marginally better Ag recovery. The above carbon loading and Merrill Crowe tests require further optimization.

Carbon loading with a CIP circuit has been selected as the base case for the PFS because the Rock Creek plant already includes a carbon circuit.

14 Mineral Resource Estimates

At the request of Morgan Poliquin, President of Almaden, Giroux Consultants Ltd. (GCL) was retained to produce an updated Resource Estimate on the Ixtaca Main Zone of the Tuligtic Property located in Puebla State, Mexico. There have been 122 additional diamond drillholes completed on the Tuligtic Property by Almaden since the last NI 43-101 Resource Estimate (J. Aarsen, et.al. January 22, 2016) bringing the total number of drillholes on the Property to 545. The effective date for this estimate is January 17, 2017, the date the data was received.

Gary Giroux is the qualified person responsible for the Resource Estimate. Mr. Giroux is a qualified person by virtue of education, experience and membership in a professional association. He is independent of the company applying all of the tests in Section 1.5 of National Instrument 43-101. Mr. Giroux has not visited the Property.

14.1 Data Analysis

Almaden has supplied a total of 545 drillholes with 6,419 down hole surveys and 125,456 assays for gold and silver. Of these drillholes, 472 totalling 151,165m outline the Ixtaca Main zone and NE Extension which are estimated in this resource. All drillholes are included in Appendix A with the holes used in this resource highlighted. A total of 926 gaps have been found in the from – to record and in these gaps values of 0.001g/t Au and 0.01g/t Ag are inserted. Included in these gaps are 513 intervals at the start of holes that are not sampled due to broken rock which is cased and the remainder are in areas that are not considered mineralized.

Almaden also supplied a series of geologic solids for the Ixtaca Zone, which outlined the following mineralized domains:

Code	**Description**
ASH	A clay altered tuff overlying the mineralized carbonate rocks
MHG	The Main Ixtaca High Grade Mineralized Zone comprised of varying density of carbonate-quartz epithermal veining
NHG	The North Limb High Grade Mineralized Zone
NEHG	A North east trending extension of High Grade carbonate-quartz epithermal veining
LGLS	A lower grade envelope within the Main Zone Limestone unit
LGSHW	A lower grade envelope within the Western Shale unit
LGSHE	A lower grade envelope within the Eastern Shale unit

From this list, three dimensional solids for each domain have been created in Gemcom software by Almaden geologists, to constrain the estimation. Figure 14-1 shows the various mineralized domains.

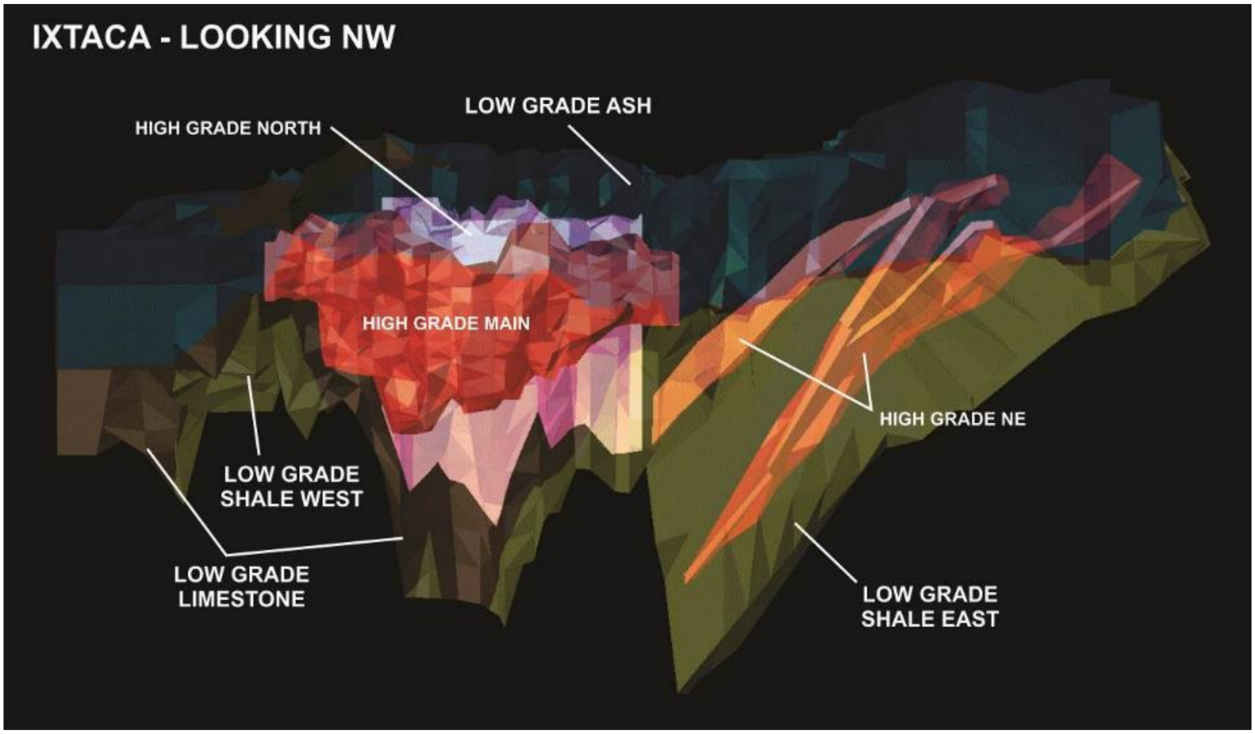


Figure 14-1 Isometric View Looking NW Showing the Geologic Solids

These mineralized domains were further subdivided for metallurgical reasons.

<u>HG Zones</u>
HG Main – Limestone
HG Main – Shale

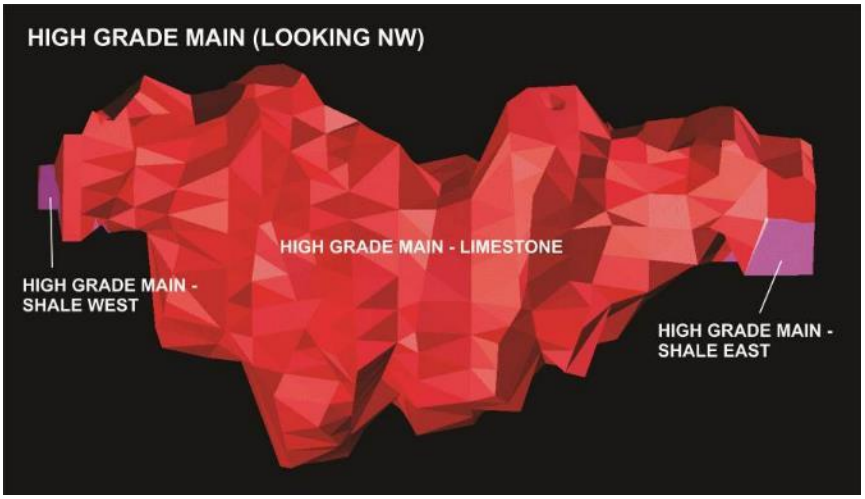


Figure 14-2 Isometric View Looking NW Showing the High Grade Main Solids

HG North – Limestone
HG North - Shale

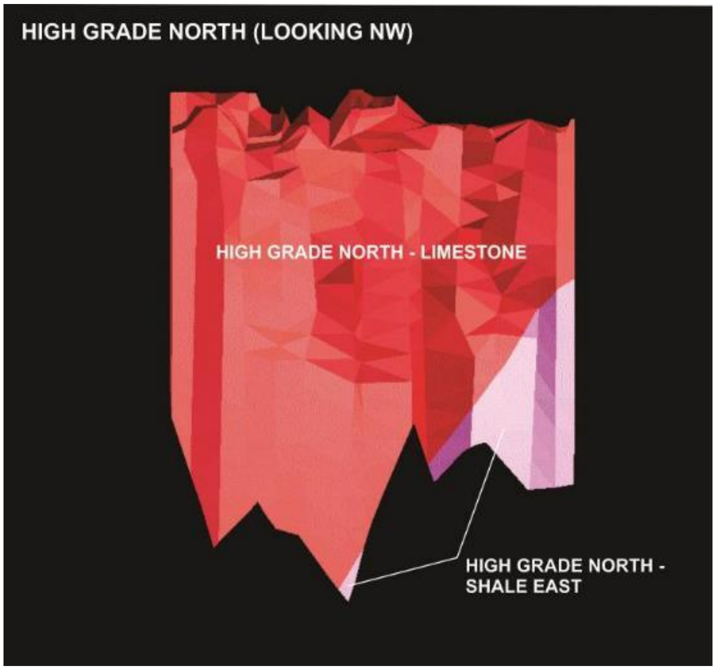


Figure 14-3 Isometric View Looking NW Showing the High Grade North Solids

HG NE-EXT – Ash
HG NE-EXT – Limestone
HG NE-EXT – Shale

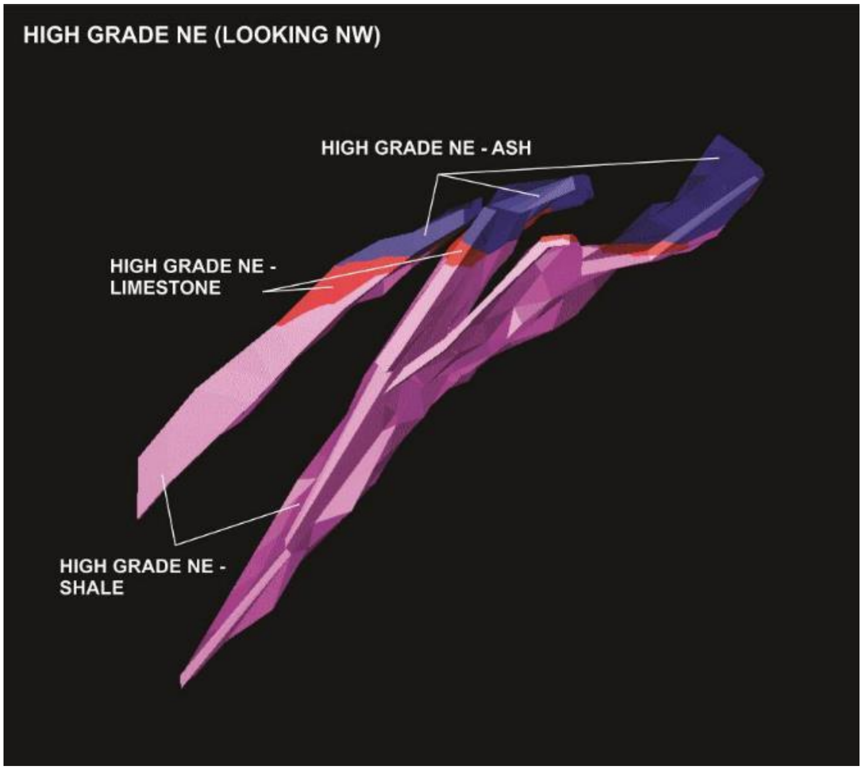


Figure 14-4 Isometric View Looking NW Showing the High Grade NE Solids

LG Zones
LG – Ash
LG – Limestone
LG – Shale (West)
LG – Shale (East)

Drillholes have then been compared to the solids and each assay has been tagged with a code. The statistics for gold and silver are tabulated in Table 14-1 below sorted by mineralized zone. Assays outside the mineralized solids are tagged as waste.

Table 14-1 Assay Statistics for Gold and Silver Sorted by Mineralized Zone

Domain	Variable	Number of Assays	Mean Grade	Standard Deviation	Minimum Value	Maximum Value	Coefficient of Variation
ASH	Au (g/t)	16,300	0.390	4.252	0.001	470.00	10.91
	Ag (g/t)		9.21	56.75	0.01	4340.00	6.16
MHG	Au (g/t)	11,353	1.224	5.101	0.001	336.00	4.17
	Ag (g/t)		76.73	217.81	0.01	9660.00	2.84
NHG	Au (g/t)	6,457	0.717	2.341	0.001	54.50	3.26
	Ag (g/t)		51.68	189.37	0.01	6770.00	3.66
LGLM	Au (g/t)	37,690	0.247	1.936	0.001	167.00	7.84
	Ag (g/t)		16.51	91.11	0.01	5310.00	5.52
LGSHW	Au (g/t)	3,126	0.125	0.914	0.001	38.00	7.31
	Ag (g/t)		9.23	58.51	0.01	2370.00	6.34
LGSHE	Au (g/t)	20,860	0.103	0.979	0.001	94.00	9.54
	Ag (g/t)		9.48	47.30	0.01	3140.00	4.99
NEHG	Au (g/t)	5,856	0.728	2.408	0.001	96.40	3.31
	Ag (g/t)		49.92	119.41	0.01	2720.00	2.39
WASTE	Au (g/t)	18,095	0.014	0.097	0.001	9.71	6.79
	Ag (g/t)		0.93	11.56	0.01	827.00	12.42

To determine if each of these geologic domains is unique the lognormal cumulative frequency plots for gold and silver are examined. The two high grade units are significantly different from the low grade units so these subdivisions should be honoured. While the low grade units in the Ash and Limestone are reasonably similar they do occur in different geographic areas so they should be modelled separately. The two shale units are also very similar but occur on different ends of the deposit.

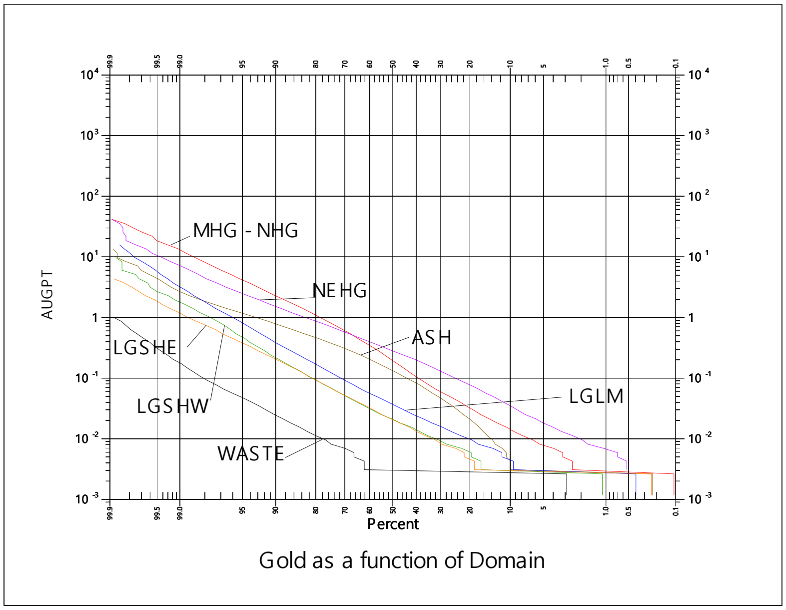


Figure 14-2 Lognormal Cumulative Frequency Plot for Au as a Function of Domain

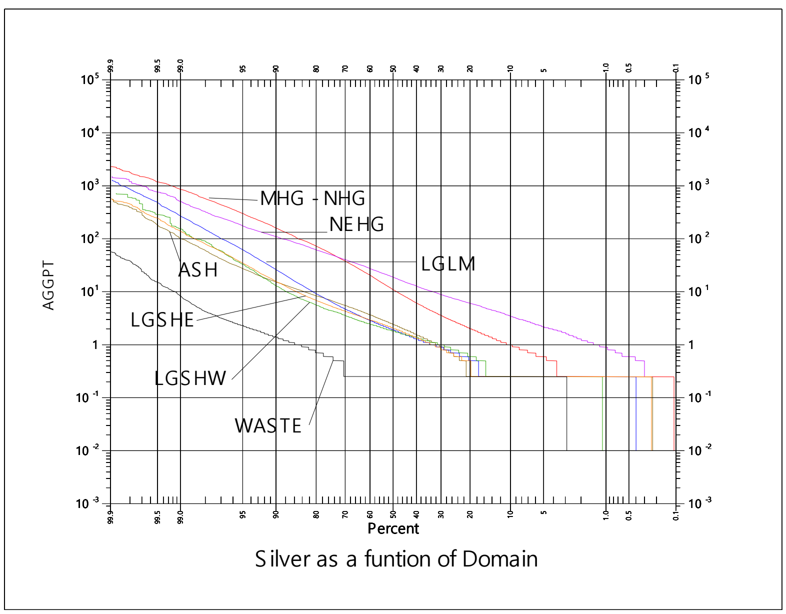


Figure 14-3 Lognormal Cumulative Frequency Plot for Ag as a Function of Domain

The grade distributions for gold and silver, within each mineralized domain, have been examined to determine if capping is required and if so, at what levels. Both elements show skewed distributions in all domains and have been converted to lognormal cumulative frequency plots. Each variable has been examined within each domain with thresholds selected for capping if required. (Table 14-2)

Table 14-2 Capped Levels for Gold and Silver

Domain	Variable	Cap Level (g/t)	Number of Assays capped
MHG	Au	56.0 g/t	6
	Ag	2300.0 g/t	12
NHG	Au	41.0 g/t	2
	Ag	2300.0 g/t	6
ASH	Au	20.0 g/t	11
	Ag	500.0 g/t	18
LGLM	Au	43.0 g/t	11
	Ag	2200 g/t	7
LGSHW	Au	6.0 g/t	5
	Ag	360.0 g/t	9
LGSHE	Au	13.0 g/t	4
	Ag	1100.0 g/t	4
NEHG	Au	17.0 g/t	9
	Ag	1000.0 g/t	17
WASTE	Au	0.5 g/t	47
	Ag	50.0 g/t	20

The effects of capping are shown in the following Table 14-3 with minor reductions in mean grade but significant reductions in standard deviations and coefficients of variation.

Table 14-3 Capped Assay Statistics for Gold and Silver Sorted by Domain

Domain	Variable	Number of Assays	Mean Grade	Standard Deviation	Minimum Value	Maximum Value	Coefficient Of Variation
ASH	Au (g/t)	16,300	0.337	0.861	0.001	20.00	2.55
	Ag (g/t)		8.43	29.43	0.01	500.00	3.49
MHG	Au (g/t)	11,353	1.172	3.274	0.001	56.00	2.79
	Ag (g/t)		75.11	182.61	0.01	2300.00	2.43
NHG	Au (g/t)	6,457	0.713	2.256	0.001	41.00	3.16
	Ag (g/t)		50.23	159.00	0.01	2300.00	3.17
LGLM	Au (g/t)	37,690	0.234	1.325	0.001	43.00	5.66
	Ag (g/t)		16.25	81.80	0.01	2200.00	5.03
LGSHW	Au (g/t)	3,126	0.105	0.390	0.001	6.00	3.73
	Ag (g/t)		7.82	29.51	0.01	350.00	3.77
LGSHE	Au (g/t)	20,860	0.095	0.371	0.001	13.00	3.92
	Ag (g/t)		9.35	41.47	0.01	1100.00	4.44
NEHG	Au (g/t)	5,856	0.678	1.406	0.001	17.00	2.07
	Ag (g/t)		48.30	96.95	0.01	1000.00	2.01
WASTE	Au (g/t)	18,095	0.012	0.037	0.001	0.50	2.96
	Ag (g/t)		0.74	2.51	0.01	50.00	3.39

14.2 Composites

Of the 101,452 assays, within the seven domains (not including waste), 100,865 or 99.4% are less than or equal to 3m in length. As a result, a 3m composite length was selected. Down hole composites 3m in length are formed to honour the domain boundaries. Composite intervals at the domain boundaries that are less than 1.5m in length are combined with adjoining samples while those greater than or equal to 1.5m are left alone. As a result, the composites form a uniform support of 3 ± 1.5m. Material outside the seven mineralized solids is considered waste. (See Table 14-4)

Table 14-4 3m Composite Statistics for Gold and Silver Sorted by Mineralized Zone

Domain	Variable	Number of Assays	Mean Grade	Standard Deviation	Minimum Value	Maximum Value	Coefficient Of Variation
ASH	Au (g/t)	7,604	0.267	0.530	0.001	13.60	1.98
	Ag (g/t)		6.43	17.12	0.01	362.94	2.66
MHG	Au (g/t)	2,852	0.847	1.410	0.001	19.02	1.67
	Ag (g/t)		54.13	80.25	0.01	758.72	1.48
NHG	Au (g/t)	2,062	0.481	1.083	0.001	21.50	2.25
	Ag (g/t)		31.17	72.31	0.01	1340.03	2.18
LGLM	Au (g/t)	13,993	0.144	0.490	0.001	15.49	3.41
	Ag (g/t)		9.48	31.11	0.01	1033.85	3.28
LGSHW	Au (g/t)	1,147	0.072	0.183	0.001	2.54	2.52
	Ag (g/t)		5.36	14.58	0.01	227.94	2.72
LGSHE	Au (g/t)	7,552	0.066	0.188	0.001	8.88	2.86
	Ag (g/t)		6.51	21.09	0.01	514.53	3.24
NEHG	Au (g/t)	1,532	0.568	0.793	0.001	7.82	1.39
	Ag (g/t)		40.84	55.65	0.01	531.09	1.36
WASTE	Au (g/t)	13,694	0.008	0.022	0.001	0.78	2.91
	Ag (g/t)		0.42	1.28	0.01	50.84	3.02

To determine if hard or soft boundaries are required between the geologic domains, a series of Contact Plots have been produced. These plots examine the contact area between two geologic domains and compare the average grade for the variable being examined as a function of distance away from this contact. Where large differences appear at the contact, a Hard Boundary should be used with samples from one side of the contact not allowed to influence blocks on the other side. If, on the other hand, the differences are minimal or gradational then a Soft Boundary can be set up with samples allowed to influence block grades from both sides of a contact.

The grades for gold across the contacts are sufficiently different for the LGLM-ASH, LGLM-LGSHE, ASH-LGSHE, MHG-LGLM, NHG-LGLM and NEHG-LGSHE boundaries to make these all Hard Boundaries.

In the case of the LGLM-LGSHW contact, the grades are similar for gold across the contact which makes this a Soft Boundary.

The grades for silver across the contacts are significantly different for the ASH-LGSHE, MHG-LGLM, NHG-LGLM and NEHG-LGSHE contacts which make these all Hard Boundaries.

For silver along the LGLM-ASH, LGLM-LGSHW and LGLM-LGSHE contacts, the grades are sufficiently similar to make these Soft Boundaries.

14.3 Variography

Pairwise relative semivariograms have been produced for gold and silver within the each of the geologic domains. In all cases except for waste, a geometric anisotropy has been observed and nested spherical models are fit to the three principal directions. Due to the high correlation between Au and Ag in each of the domains, gold and silver show similar directions of anisotropy. (Table 14-5)

Table 14-5 Pearson Correlation Coefficients for Au – Ag Geologic Domains

Au:Ag	ASH	MHG	NHG	LGLM	LGSHW	NEHG	LGSHE	WASTE
Correlation Coef.	0.7195	0.9112	0.8681	0.8361	0.8200	0.6425	0.8136	0.8114

Within the Main High Grade zone the longest direction of continuity for both Au and Ag is along azimuth 60^o dip 0^o with the second longest range dipping -35^o along azimuth 150^o. Anisotropy is also demonstrated for both gold and silver within the North High Grade zone with longest ranges along azimuth 60^o dip 0^o and azimuth 330^o dipping -55^o.

Similar directions of anisotropy are observed within both the Low Grade Limestone unit and the Low Grade Shale West unit that surround the Main High Grade and North High Grade Zones.

For the North East extension High Grade mineralization, the longest horizontal ranges for both gold and silver are found along azimuth 20^o Dip 0^o and azimuth 290^o dip -50^o. The shales within the Low Grade Shale East unit that surrounds the NE High Grade show longest ranges for both gold and silver along azimuth 357^o dip 0^o.

Within the Ash zone both gold and silver have been modelled with anisotropic models with longest ranges along azimuth 155^o dip 0^o and down dip along azimuth 245^o dip -45^o.

For all of these models nested anisotropic spherical models are applied.

Within waste, both gold and silver show isotropic nested structures.

The semivariogram parameters are tabulated in Table 14-6.

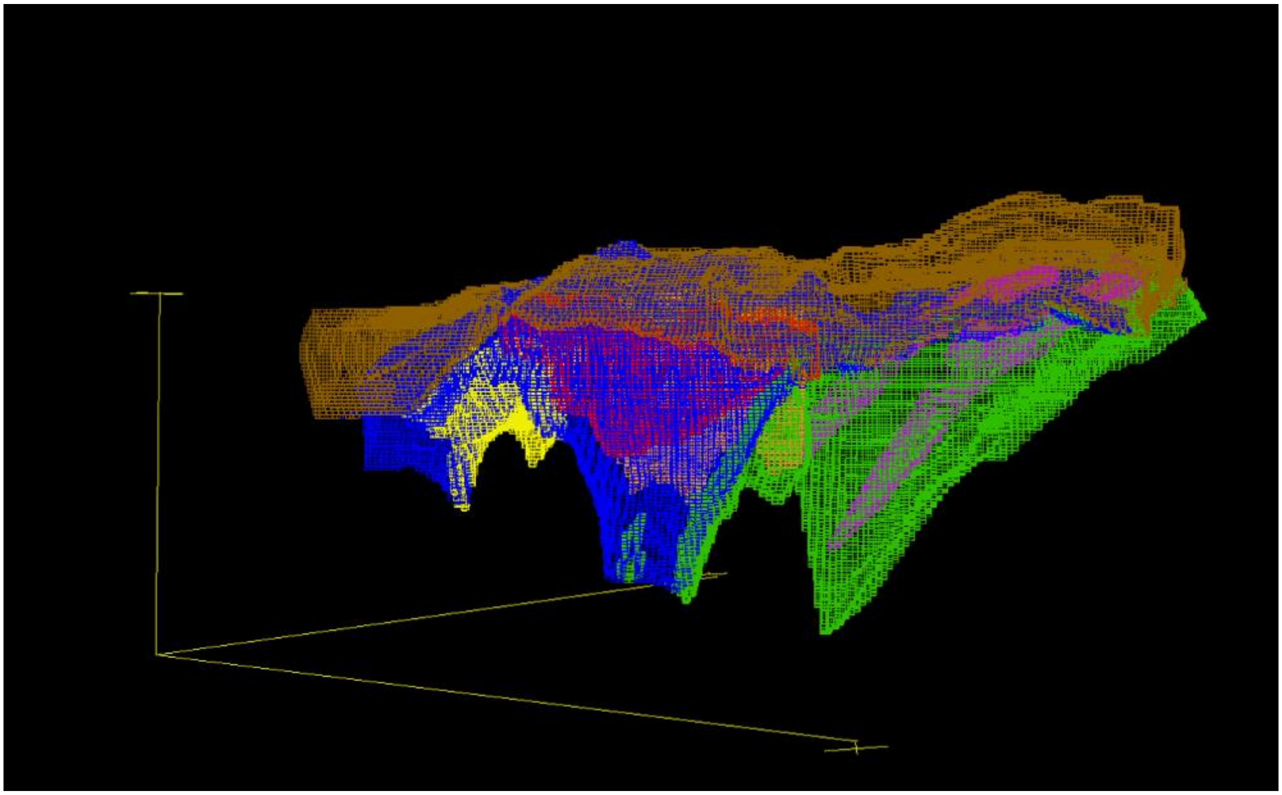
Table 14-6 Semivariogram Parameters for Gold and Silver

Domain	Variable	Az/Dip	C_0	C_1	C_2	Short Range (m)	Long Range (m)
MHG	**Au**	60° / 0°	0.40	0.47	0.15	40.0	120.0
		330° / -55°				20.0	100.0
		150° / -35°				20.0	120.0
	Ag	60° / 0°	0.40	0.55	0.07	40.0	140.0
		330° / -55°				20.0	100.0
		150° / -35°				20.0	120.0
NHG	**Au**	60° / 0°	0.40	0.44	0.17	15.0	80.0
		330° / -55°				20.0	90.0
		150° / -35°				10.0	30.0
	Ag	60° / 0°	0.45	0.43	0.15	20.0	80.0
		330° / -55°				18.0	80.0
		150° / -35°				12.0	30.0
ASH	**Au**	155° / 0°	0.15	0.46	0.34	40.0	120.0
		65° / -45°				25.0	50.0
		245° / -45°				15.0	84.0
	Ag	155° / 0°	0.20	0.40	0.30	40.0	120.0
		65° / -45°				20.0	60.0
		245° / -45°				15.0	80.0
LGLM	**Au**	60° / 0°	0.30	0.39	0.20	12.0	120.0
		330° / -55°				25.0	80.0
		150° / -35°				22.0	120.0
	Ag	60° / 0°	0.35	0.48	0.11	10.0	120.0
		330° / -55°				25.0	80.0
		150° / -35°				20.0	100.0
LGSHW	**Au**	60° / 0°	0.30	0.36	0.19	16.0	40.0
		330° / -55°				20.0	70.0
		150° / -35°				45.0	64.0
	Ag	60° / 0°	0.20	0.40	0.34	10.0	30.0
		330° / -55°				15.0	90.0
		150° / -35°				40.0	80.0
LGSHE	**Au**	357° / 0°	0.20	0.18	0.34	15.0	84.0
		267° / -55°				15.0	80.0
		87° / -35°				5.0	20.0
	Ag	357° / 0°	0.20	0.15	0.43	12.0	50.0
		267° / -55°				5.0	20.0
		87° / -35°				10.0	60.0
NEHG	**Au**	20° / 0°	0.20	0.43	0.20	20.0	130.0
		290° / -50°				15.0	100.0
		110° / -40°				30.0	80.0
	Ag	20° / 0°	0.38	0.28	0.24	30.0	120.0
		290° / -50°				15.0	80.0
		110° / -40°				20.0	60.0
WASTE	**Au**	Omni Directional	0.10	0.10	0.21	15.0	50.0
	Ag	Omni Directional	0.05	0.20	0.30	15.0	44.0

14.4 Block Model

A rotated block model with blocks 10m NE-SW, 10m NW-SE and 6m high has been superimposed over the mineralized solids. This differs from previous models which used 5m high blocks. The model is rotated 30° counter clockwise to line up with drill sections and line up with the mineralized structures. Within each block, the percentage below surface topography and the percentage inside each mineralized solid are recorded. These percentages are checked to assure there is no overlap. The block model origin shown in Figure 14-4 is as follows:

Lower Left Corner		
618578 E	Column size = 10m	180 columns
2175235 N	Row size = 10m	150 rows
Top of Model		
2604 Elevation	Level size = 6m	169 levels
Rotation 30° counter clockwise		



Note: ASH in brown, MHG in red, NHG in orange, LGLM in blue, LGSHE in green, NEHG in purple and LGSHW in yellow

Figure 14-4 Isometric View Looking NW Showing Blocks

14.5 Bulk Density

A total of 425 specific gravity determinations have been collected on a routine basis across the Ixtaca mineralized zone on cross sections 250E (western border of Ixtaca), 550E (central part of zone) and 1150E (eastern section of zone).

- Section 250E: Drillholes TU-11-030, TU-11-033, TU-11-040, TU-11-045, TU-11- 074 and TU-11-075.
- Section 550E: Drillholes TU-10-011, TU-10-013, TU-11-016, TU-11-019, TU-11- 059, TU-11-066 and TU-11-078.
- Section 1150E: Drillholes TU-11-041, TU-11-046, CA-11-002 and CA-11-003.

The measurements have been made on drill core samples using the Archimedes (weight in air-weight in water) method. The relative number of analysis is shown in the Table below:

Table 14-7 Specific Gravity Determinations Sorted by Cross Section

Cross Section	Number of Samples	Minimum SG	Maximum SG	Average SG
550 E	223	1.33	3.28	2.57
250 E	88	1.42	2.69	2.41
1150 E	114	1.43	3.21	2.60
Total	**425**	**1.33**	**3.28**	**2.55**

The data is also sorted by lithology.

Table 14-8 Specific Gravity Determinations Sorted by Lithology

Lithology Code	Lithology	Number of Samples	Average SG
Ash	Ash unit	33	1.67
Bx/Lm	Breccia / Limestone	3	2.45
Df	Felsic Dyke	71	2.46
Dm	Mafic Dyke	7	2.70
Dp	Porphyritic Dyke	25	2.59
Lch	Limestone/chert	58	2.65
Lg	Lime < 10% mud	10	2.67
Lm	Lime Mudstone	72	2.67
Lp	Lime Packstone	37	2.59
Ls	Limestone undifferentiated	2	2.65
Lw	Lime wackestone	2	2.58
Min	Mineralized qtz. veining	7	2.96
Pp	Principal Porphyry	2	2.58
ShB	Shale	56	2.61
ShG	Green Shale	3	2.44
Skn	Skarn	20	2.89
Slt	Siltstone	17	2.71

Table 14-8 summarizes specific gravity values for all lithologies studied in all three sections. Values in the Table have been averaged for each lithology. Values from these lithologies have then averaged within the various geologic domains to produce the following specific gravities for converting volumes to tonnes:

- The ash domain has an average specific gravity of 1.67
- The low grade limestone (LGLM) domain has an average specific gravity of 2.66
- The main high grade (MHG) domain has an average specific gravity of 2.63 (this unit contains about 20% Felsic Dyke)
- The main high grade zone (NHG) North limb has an average specific gravity of 2.60 (this north limb contains about 40% Felsic Dyke and 40% Mafic Dyke)
- The low grade shale (LGSHW & LGSHE) domains have an average specific gravity of 2.61
- The North East extension high grade (NEHG) domain has an average specific gravity of 2.65

14.6 Grade Interpolation

Grades for gold and silver have been interpolated into the blocks by Ordinary Kriging. Each domain is treated separately with hard boundaries used, except for the LGLM, LGSH and NELGSH domains where contact plots show a soft boundary is appropriate. For example, blocks with some percentage of MHG present have been kriged for Au and Ag using only composites from within the MHG domain while blocks with some percentage of LGLM can see composites within both the LGLM and LGSH domains. Blocks containing more than one domain are estimated for each domain and a weighted average is then produced.

Each kriging run has been completed in a series of passes with the search ellipse orientation and dimension a function of the semivariogram for the domain and variable being estimated. The first pass uses search dimensions equal to ¼ the semivariogram range in the three principal directions. A minimum of four composites are required to estimate a block with a maximum of three from any given drillhole. In this manner, all blocks are estimated with a minimum of two drillhole. For blocks not estimated in pass 1, a second pass using ½ the semivariogram range has been completed. A third pass using the full range and a fourth pass using twice the range has followed. Finally because there were many blocks containing multiple domains, a fifth pass has often been required to ensure all domains were estimated. In all passes the maximum number of composites used is twelve and if more were found in any search the closest twelve are used.

Once all domains are completed, estimated blocks containing some percentage outside the mineralized domains are estimated in a similar manner using composites from outside the mineralized domains (waste).

Finally for all blocks along the contacts, containing multiple domains, a weighted average grade for gold and silver is produced. The search parameters for gold within each domain and the number of blocks estimated in each pass are tabulated in the following Table 14-9.

Table 14-9 Kriging Parameters for Gold in Each Domain

Domain	Pass	Number Estimated	Az /Dip	Dist. (m)	Az /Dip	Dist. (m)	Az /Dip	Dist. (m)
MHG	1	10,983	60 / 0	30.0	330 / -55	25.0	150 / -35	30.0
	2	4,217	60 / 0	60.0	330 / -55	50.0	150 / -35	60.0
	3	11	60 / 0	120.0	330 / -55	100.0	150 / -35	120.0
NHG	1	1,605	60 / 0	20.0	330 / -55	22.5	150 / -35	7.5
	2	6,583	60 / 0	40.0	330 / -55	45.0	150 / -35	15.0
	3	3,660	60 / 0	80.0	330 / -55	90.0	150 / -35	30.0
	4	798	60 / 0	160.0	330 / -55	180.0	150 / -35	60.0
NEHG	1	5,775	20 / 0	32.5	290 / -50	25.0	110 / -40	20.0
	2	7,674	20 / 0	65.0	290 / -50	50.0	110 / -40	40.0
	3	1,181	20 / 0	130.0	290 / -50	100.0	110 / -40	80.0
	4	17	20 / 0	260.0	290 / -50	200.0	110 / -40	160.0
LGLM	1	44,901	60 / 0	30.0	330 / -55	20.0	150 / -35	30.0
	2	79,033	60 / 0	60.0	330 / -55	40.0	150 / -35	60.0
	3	33,504	60 / 0	120.0	330 / -55	80.0	150 / -35	120.0
	4	5,599	60 / 0	240.0	330 / -55	160.0	150 / -35	240.0
LGSHE	1	4,043	357 / 0	21.0	267 / -55	20.0	87 / -35	5.0
	2	35,464	357 / 0	42.0	267 / -55	40.0	87 / -35	10.0
	3	65,242	357 / 0	84.0	267 / -55	80.0	87 / -35	20.0
	4	40,165	357 / 0	168.0	267 / -55	160.0	87 / -35	40.0
LGSHW	1	425	60 / 0	10.0	330 / -55	17.5	150 / -35	16.0
	2	4,037	60 / 0	20.0	330 / -55	35.0	150 / -35	32.0
	3	7,459	60 / 0	40.0	330 / -55	70.0	150 / -35	64.0
	4	3.651	60 / 0	80.0	330 / -55	140.0	150 / -35	128.0
ASH	1	13,116	155 / 0	30.0	65 / -45	12.5	245 / -45	21.0
	2	49,244	155 / 0	60.0	65 / -45	25.0	245 / -45	42.0
	3	49,522	155 / 0	120.0	65 / -45	50.0	245 / -45	84.0
	4	12,838	155 / 0	240.0	65 / -45	100.0	245 / -45	168.0
WASTE	1	844	Omni Directional			12.5		
	2	4,911	Omni Directional			25.0		
	3	23,186	Omni Directional			50.0		
	4	39,466	Omni Directional			100.0		
	5	17,272	Omni Directional			200.0		

14.7 Classification

Based on the study herein reported, delineated mineralisation of Ixtaca is classified as a resource according to the following definitions from National Instrument 43-101 and from CIM (2014):

"In this Instrument, the terms "Mineral Resource", "Inferred Mineral Resource", "Indicated Mineral Resource" and "Measured Mineral Resource" have the meanings ascribed to those terms by the Canadian Institute of Mining, Metallurgy and Petroleum, as the CIM Definition Standards (May 2014) on Mineral Resources and Mineral Reserves adopted by CIM Council, as those definitions may be amended."

The terms Measured, Indicated and Inferred are defined by CIM (2014) as follows:

"A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling."

"The term Mineral Resource covers mineralisation and natural material of intrinsic economic interest which has been identified and estimated through exploration and sampling and within which Mineral Reserves may subsequently be defined by the consideration and application of Modifying Factors. The phrase 'reasonable prospects for economic extraction' implies a judgement by the Qualified Person in respect of the technical and economic factors likely to influence the prospect of economic extraction. The Qualified Person should consider and clearly state the basis for determining that the material has reasonable prospects for eventual economic extraction. Assumptions should include estimates of cut-off grade and geological continuity at the selected cut-off, metallurgical recovery, smelter payments, commodity price or product value, mining and processing method and mining, processing and general and administrative costs. The Qualified Person should state if the assessment is based on any direct evidence and testing. Interpretation of the word 'eventual' in this context may vary depending on the commodity or mineral involved. For example, for some coal, iron, potash deposits and other bulk minerals or commodities, it may be reasonable to envisage 'eventual economic extraction' as covering time periods in excess of 50 years. However, for many gold deposits, application of the concept would normally be restricted to perhaps 10 to 15 years, and frequently to much shorter periods of time."

Inferred Mineral Resource

"An 'Inferred Mineral Resource' is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration."

"An 'Inferred Mineral Resource' is based on limited information and sampling gathered through appropriate sampling techniques from locations such as outcrops, trenches, pits, workings and drill holes. Inferred Mineral Resources must not be included in the economic analysis, production schedules, or estimated mine life in publicly disclosed Pre-Feasibility or Feasibility Studies, or in the Life of Mine plans and cash flow models of developed mines. Inferred Mineral Resources can only be used in economic studies as provided under NI 43-101."

"There may be circumstances, where appropriate sampling, testing, and other measurements are sufficient to demonstrate data integrity, geological and grade/quality continuity of a Measured or Indicated Mineral Resource, however, quality assurance and quality control, or other information may not meet all industry norms for the disclosure of an Indicated or Measured Mineral Resource. Under these circumstances, it may be reasonable for the Qualified Person to report an Inferred Mineral Resource if the Qualified Person has taken steps to verify the information meets the requirements of an Inferred Mineral Resource."

Indicated Mineral Resource

"An 'Indicated Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve."

"Mineralisation may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralisation. The Qualified Person must recognise the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Preliminary Feasibility Study which can serve as the basis for major development decisions."

Measured Mineral Resource

"A Measured Mineral Resource is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve."

"Mineralisation or other natural material of economic interest may be classified as a Measured Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such that the tonnage and grade or quality of the mineralisation can be estimated to within close limits and that variation from the estimate would not significantly affect potential economic viability of the deposit. This category requires a high level of confidence in, and understanding of, the geology and controls of the mineral deposit."

Modifying Factors

"Modifying Factors are considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors."

At Ixtaca, the geologic continuity has been established through surface mapping and drillhole interpretation. This has resulted in a multi domain interpretation that has been used to constrain the Resource Estimate. The grade continuity within each domain has been quantified by semivariogram analysis. The semivariograms have been used to determine the search directions and distances for each pass in the kriging procedure. Using the semivariogram range to estimate blocks would normally allow classification as follows:

- Blocks estimated in Pass 1 for both Au and Ag using ¼ of the semivariogram range are considered Measured.
- Blocks estimated in Pass 2 using ½ of the semivariogram range are considered Indicated
- All other blocks would be classified as Inferred.

A range of cut-offs are presented to demonstrate the sensitivity of the deposit to grade variations.

The Resource Tables are shown below using gold equivalent cut-offs where:
Gold –price of $1250 / oz
Silver –price of $18 / oz

Preliminary metallurgy has shown roughly equivalent metal recoveries for Au and Ag so for now the Au Equivalent equation is:

AuEq = Au + (Ag * 18 / 1250)

In the author's judgement and experience the resource stated has reasonable prospects of economic extraction. A cut-off of 0.30g/t AuEq has been highlighted as a possible cut-off for open pit mining based on studies described in later sections of this report where an NSR based cut-off is determined and the resource present within an optimized pit shell is tabulated.

Table 14-10 Measured Resource for Total Blocks

AuEq Cut-off (g/t)	Tonnes > Cut-off (tonnes)	Grade>Cut-off			Contained Metal x1000		
		Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEQ (ozs)
0.10	65,310,000	0.41	25.28	0.77	853	53,090	1,617
0.20	51,100,000	0.50	31.03	0.94	817	50,980	1,551
0.25	46,380,000	0.54	33.46	1.02	798	49,890	1,517
0.30	**42,450,000**	**0.57**	**35.74**	**1.09**	**779**	**48,780**	**1,482**
0.40	36,080,000	0.64	40.09	1.22	741	46,510	1,412
0.50	30,940,000	0.71	44.39	1.34	701	44,160	**1,337**
0.60	26,790,000	0.77	48.45	1.47	663	41,730	1,264
0.70	23,310,000	0.83	52.47	1.59	625	39,320	1,192
0.80	20,590,000	0.89	56.04	1.70	592	37,100	1,126
1.00	16,430,000	1.01	62.28	1.91	533	32,900	1,006

Table 14-11 Indicated Resource for Total Blocks

AuEq Cut-off (g/t)	Tonnes > Cut-off (tonnes)	Grade>Cut-off			Contained Metal x1000		
		Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEQ (ozs)
0.10	157,030,000	0.28	14.55	0.49	1,434	73,440	2,494
0.20	110,260,000	0.37	18.85	0.64	1,315	66,820	2,276
0.25	95,370,000	0.41	20.74	0.71	1,254	63,600	2,171
0.30	**83,370,000**	**0.45**	**22.54**	**0.77**	**1,195**	**60,410**	**2,064**
0.40	64,110,000	0.52	26.12	0.90	1,076	53,840	1,851
0.50	50,220,000	0.60	29.56	1.02	964	47,730	1,650
0.60	40,000,000	0.67	32.75	1.14	864	42,110	1,471
0.70	32,280,000	0.75	35.72	1.26	776	37,070	1,311
0.80	26,460,000	0.82	38.47	1.38	699	32,730	1,171
1.00	18,260,000	0.97	43.47	1.59	568	25,520	936

Table 14-12 Inferred Resource for Total Blocks

AuEq Cut-off (g/t)	Tonnes > Cut-off (tonnes)	Grade>Cut-off			Contained Metal x1000		
		Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEQ (ozs)
0.10	134,510,000	0.17	10.38	0.32	727	44,890	1,371
0.20	76,120,000	0.24	14.79	0.45	582	36,200	1,104
0.25	59,430,000	0.27	16.98	0.52	516	32,440	984
0.30	**47,050,000**	**0.30**	**19.15**	**0.58**	**457**	**28,970**	**874**
0.40	30,120,000	0.37	23.37	0.71	360	22,630	687
0.50	19,860,000	0.45	27.31	0.85	288	17,440	540
0.60	14,140,000	0.53	30.42	0.97	240	13,830	439
0.70	10,260,000	0.61	32.98	1.09	202	10,880	359
0.80	7,690,000	0.70	34.79	1.20	173	8,600	297
1.00	4,430,000	0.88	38.50	1.43	125	5,480	204

Table 14-13 Measured + Indicated Resource for Total Blocks

AuEq Cut-off (g/t)	Tonnes > Cut-off (tonnes)	Grade>Cut-off			Contained Metal x1000		
		Au (g/t)	Ag (g/t)	AuEq (g/t)	Au (ozs)	Ag (ozs)	AuEQ (ozs)
0.10	222,350,000	0.32	17.70	0.58	2,288	126,530	4,111
0.20	161,370,000	0.41	22.71	0.74	2,132	117,800	4,109
0.25	141,750,000	0.45	24.90	0.81	2,051	113,500	3,828
0.30	**125,830,000**	**0.49**	**26.99**	**0.88**	**1,974**	**109,200**	**3,686**
0.40	100,190,000	0.56	31.15	1.01	1,817	100,340	3,547
0.50	81,160,000	0.64	35.22	1.15	**1,665**	**91,890**	3,262
0.60	66,790,000	0.71	39.04	1.27	1,527	83,840	2,987
0.70	55,590,000	0.78	42.74	1.40	1,401	76,390	2,735
0.80	47,050,000	0.85	46.16	1.52	1,290	69,830	2,502
1.00	34,690,000	0.99	52.38	1.74	1,101	58,420	2,296

Where Total Blocks means one would mine complete 10 x 10 x 6 m blocks taking in dilution around the edges of the mineralized solids.

14.8 Block Model Verification

To check the results, level plans have been produced on 50m intervals through the deposit. Estimated block grades have been checked against composite grades above and below the bench level. The results matched reasonably well with no bias indicated. Another check on the results has been completed by comparing the average composite grade for each domain with the average kriged grades for that domain (Table 14-14). Again no bias is indicated.

Table 14-14 Comparison of Composite Mean Au Grade to Block Mean Au Grade

Domain	Variable	Number of Assays	Mean Grade Composites	Number of Blocks	Mean Grade Blocks
ASH	Au (g/t)	7,604	0.27	124,717	0.20
	Ag (g/t)		6.43		6.26
MHG	Au (g/t)	2,852	0.85	15,211	0.85
	Ag (g/t)		54.13		54.43
NHG	Au (g/t)	2,062	0.48	12,646	0.42
	Ag (g/t)		33.17		28.41
LGLM	Au (g/t)	13,993	0.14	163,036	0.14
	Ag (g/t)		9.48		7.64
LGSHW	Au (g/t)	1,147	0.07	15,572	0.14
	Ag (g/t)		5.36		7.17
NEHG	Au (g/t)	1,532	0.57	14,657	0.64
	Ag (g/t)		40.84		36.27
LGSHE	Au (g/t)	7,552	0.07	144,914	0.08
	Ag (g/t)		6.51		7.19
WASTE	Au (g/t)	13,680	0.008	85,179	0.019
	Ag (g/t)		0.42		1.06

15 Mineral Reserve Estimates

Detailed pit designs are engineered from the results of the Lerchs-Grossman (LG) analysis, and the contents of these designed pits are run with the following cut-offs and loss and dilution factors.

15.1 Cut-Off Grade

The multiple metals along with varying gold/silver grade ratios and process recoveries require that an economic cut-off grade is used for ore/waste definition. Net-Smelter-Return (NSR) values ($/t) are calculated for each mineralized block in the resource model using Base Case Net Smelter Prices (NSP). NSP is based on the market price and applies refining and transport costs to arrive at an internal price value. The NSP is used along with the metal grades and process recoveries to calculate the $/t value (NSR) of each mineralized block. NSP values used in the cut-off grade calculation are shown in the table below:

Table 15-1 Metal Prices and NSP

	Metal Price ($/oz)	NSP ($/oz)	NSP ($/gram)
Au	$1,250	$1,236.50	$39.76
Ag	$18	$16.22	$0.52

The process recoveries used in the NSR calculation are shown in the Table below:

Table 15-2 Process Recoveries for NSR coding

Rock-Type	Au recovery	Ag recovery
Volcanic	50%	90%
Limestone	90%	90%
Shale	50%	90%

NSR is calculated for each block as follows:

NSR($/t) = [NSP(Au) * Au(g/t) * Recovery(Au)] + [NSP(Ag) * Ag(g/t) * Recovery(Ag)]

Where:

- NSP(Au) = Net Smelter Price for gold ($/gram)
- NSP(Ag) = Net Smelter Price for silver ($/gram)
- Au(g/t) = Gold grade of the block in grams/tonne
- Ag(g/t) = Silver grade of the block in grams/tonne
- Recovery(Au) = Process Recovery for gold (%)
- Recovery(Ag) = Process Recovery for silver (%)

A cut-off grade of NSR>=$15.40/tonne is used for Mineral Reserve calculations.

15.2 Loss and Dilution

A mining recovery of 95% is applied to in-situ material.

Dilution is applied to in-situ material with dilution grades varying by rock-type according to the following Table 15-3.

Table 15-3 Dilution Grades

		Dilution Grades		
Rock-Type	**Dilution %**	**Au – g/t**	**Ag – g/t**	**NSR - $/t**
Volcanic	6%	0.39	12.67	10
Limestone	4%	0.17	11.54	10
Shale	6%	0.17	18.57	9

Dilution tonnes are added to mining recovered tonnes to calculate run-of-mine (ROM) tonnes delivered to the mill.

15.3 Mineral Reserves

Only Measured and Indicated Resource Class materials are included in the Mineral Reserves. All Inferred Resource Class material is treated as waste in calculating economic pit limits and in subsequent reserves reporting, scheduling and economics.

Proven and Probable Reserves are derived from the Measured and Indicated Resource Class blocks within the designed pits and are summarized in the following Table 15-4. Mineral Reserves are stated as Run Of Mine (ROM) and represent mined ore delivered to the mill.

Table 15-4 Mineral Reserves

	ROM Tonnes	Diluted Average Grades		Contained Metal	
	(millions)	**Au (g/t)**	**Ag (g/t)**	**Au – '000 ozs**	**Ag – '000 ozs**
Proven	28.4	0.68	45.0	623	41,032
Probable	36.8	0.57	32.0	669	37,793
TOTAL	**65.1**	**0.62**	**37.7**	**1,292**	**78,825**

Notes to Mineral Reserve table:

- *The qualified person responsible for the Mineral Reserves is Jesse Aarsen, P.Eng.. of Moose Mountain Technical Services. Jesse Aarsen is independent of Almaden Minerals Ltd.*
- *The cut-off grade used for ore/waste determination is NSR>=$15.40*
- *Mineral Reserves have an effective date of March 30, 2017. All Mineral Reserves in this table are Proven and Probable Mineral Reserves. The Mineral Reserves are not in addition to the Mineral Resources, but are a subset thereof. All Mineral Reserves stated above account for mining loss and dilution.*
- *Associated metallurgical recoveries (gold and silver, respectively) have been estimated as 90% and 90% for limestone, 50% and 90% for volcanic, 50% and 90% for black shale.*
- *Reserves are based on a US$1,250/oz gold price, US$18/oz silver price and an exchange rate of US$1.00:MXP20.00.*
- *Reserves are converted from resources through the process of pit optimization, pit design, production schedule and supported by a positive cash flow model.*
- *Rounding as required by reporting guidelines may result in summation differences.*

16 Mining Method

16.1 Introduction

A PFS level mine plan, mine production schedule, and mine capital and operating costs have been developed for the Project. The following section describes the results of the mine planning completed for this study, including: ultimate pit limits, pit phasing and designs, haul road and Rock Storage Facility (RSF) designs, mine production scheduling, mine operations planning, and mine fleet selection.

The mine engineering in this study has been done with the MineSight® suite of programs. The mining model considers whole block tonnes and grades.

All costs in this section are in USD unless stated otherwise.

16.2 Mining Study Basis

16.2.1 Mine Planning Datum

Topography is based on a survey done using WorldView2 satellite with 50cm resolution in stereo. One metre contour lines generated from this survey are used to form the topography surface used for Mineral Reserve and volume calculations.

16.2.2 Resource Classes

Only Measured and Indicated Resources are included in the Ixtaca mine plan. Inferred Resources are treated as waste.

16.2.3 Process Recovery for Mine Planning

Process recoveries used for pit optimization and cut-off grade estimation very by rock-type and are shown in the Table below:

Table 16-1 Process Recoveries

Rock-Type	Au Recovery	Ag Recovery
Volcanics	50%	90%
Limestone	90%	90%
Shale	50%	90%

16.2.4 Cut-off Grade

Based on the multiple metals, varying metal grade ratios and varying process recoveries, an economic value for each block is calculated. The NST ($/t) value takes in-situ grades, off-site prices, and process recoveries into account in is described in Section 15. The cut-off grade used is NSR>=$15.40.

16.2.5 Mining Dilution and Loss

Mining recovery and dilution are applied to pit reserves. The in-situ resource estimate already includes internal dilution as whole block grades are considered. Additional mining dilution is added to the in-situ resources to account for the waste that is mined along the waste/ore contact edge. The greater number of waste contacts an ore block has, the higher amount of mining dilution expected. The dilution study performed calculates the total dilution percentages and grades by rock-type. Results of the dilution study are shown in Section 15.

Mining recovery includes mining losses along the ore/waste boundary and plus other losses during material handling. Mining recovery is 95% for all rock-types.

16.2.5.1 Mining Recovery of Low-Grade Material

An elevated cut-off grade is used in the early parts of the mining schedule to improve the project economics. Marginally economic material is placed in a stockpile and reclaimed at various times throughout the mining schedule.

16.3 Economic Pit Limits

The economic pit limit is determined using the Lerchs Grossman (LG) algorithm. The algorithm considers the grades and tonnages for each block in the 3D block model and compares the expected costs to extract and process the block to the potential revenue from processing the block (if the block has grade in it). Each block is assigned with a net value (either positive or negative). Pit wall angle inputs determine which upper blocks need to be mined to extract lower economic blocks. The routine uses input economic and engineering parameters and expands upwards and outwards until the net value sum of all the blocks extracted reach break-even economics.

In this study, various cases or pit shells are generated by varying the input gold price and comparing the resultant waste and mill feed tonnages along with gold grades for each pit shell. Additional cases are included in the analysis to evaluate the sensitivities of resources to process costs, mining cost, and recoveries.

By varying the economic parameters while keeping inputs for metallurgical recoveries, pit slopes, and processing costs constant, successively larger pit cases are evaluated to determine where the incremental pit shells produce marginal or negative economic returns. Mining costs are increased incrementally for lower benches to represent longer hauls and increased costs to move lower material out of the pit. The change from positive to negative economic returns results from increasing strip ratios and higher mining costs associated with larger and deeper pit shells. The economic margins from the expanded cases are evaluated on a relative basis to test for payback on capital and return for the project. At some point, further expansion does not add significant value. An ultimate pit limit can then be chosen that has a suitable economic return. The chosen pit shell is used as the basis for more detailed design and mine scheduling.

16.3.1 LG Cost Inputs

Potential block revenues are calculated based on the gold and silver price, process recoveries and gold/silver grades within each block. For this analysis a Net Smelter Return (NSR) value in $/tonne is used which considers the Net Smelter Price (NSP), process recoveries and metal grades. NSP and NSR are described in Section 15.

The following operating costs are used in the LG algorithm against the block NSR value to generate pit shells.

Table 16-2 LG Operating Cost Inputs

Activity	Cost ($/tonne)
Base Mining Cost	$1.50
Incremental Haulage Cost	Additional $0.015 per every 12m bench below the pit rim (added to the base mining cost)
Process Cost	$16.50

The pit rim is selected at the south end of the deposit where the primary crusher is located and is at 2232m elevation.

Process cost includes conveyance from the primary crusher at the pit rim to the mill.

16.3.2 LG Slope Inputs

Geotechnical parameters are provided by KP for the Ixtaca open pit. These parameters prescribe bench face angles, berm widths and inter-ramp slope angles for different azimuths and rock types within the potential open pit.

The following tables show pit slope inputs used for generating the Ixtaca LG pit shells.

Table 16-3 Bench Face Angles

Azimuth Start (°)	**000**	**070**	**075**	**110**	**115**
Azimuth End (°)	**070**	**075**	**110**	**115**	**360**
Volcanic	65°	65°	65°	65°	65°
Limestone/Shale	70°	67°	65°	67°	70°

Table 16-4 Inter-Ramp Angles

Azimuth Start (°)	**000**	**070**	**075**	**110**	**115**
Azimuth End (°)	**070**	**075**	**110**	**115**	**360**
Volcanic	46°	46°	46°	46°	46°
Limestone/Shale	49°	46°	43°	46°	49°

16.3.3 LG Sensitivity Cases

The economic pit limits are based on the current cost and metal price assumptions, but are applied to approximately 15 years of mine life. Since these economic parameters are estimates, especially gold price, the sensitivity of the ultimate economic pit limits has been evaluated. This is done by varying the economic parameters in a series of cases. The pit shells generated from these cases are also used to evaluate potential pit pushbacks or phases.

For this analysis the input gold price is varied from $375 USD/oz to $1,625 USD/oz while silver price is varied from $5.40 USD/oz to $23.40 USD/oz. The operating costs are kept constant in this analysis. This is not a price sensitivity, as cut-off grades are not varied when calculating the contents of the resultant pit shells.

Mining recovery and dilution is not included at the LG level of design since it is determined that these factors do not have an impact on the ultimate pit limit selection.

Only Measured and Indicated Resource classes are used in the LG economics. Inferred Resource class is considered as waste.

The figure below shows the generated LG pit shells for Ixtaca. An inflection point can be seen in the cumulative resources by pit case. Case 16 indicates a point at which larger pit shells will not produce significant increases to the pit resource. Pit resources are generated using a cut-off grade of NSR>=$15.40.

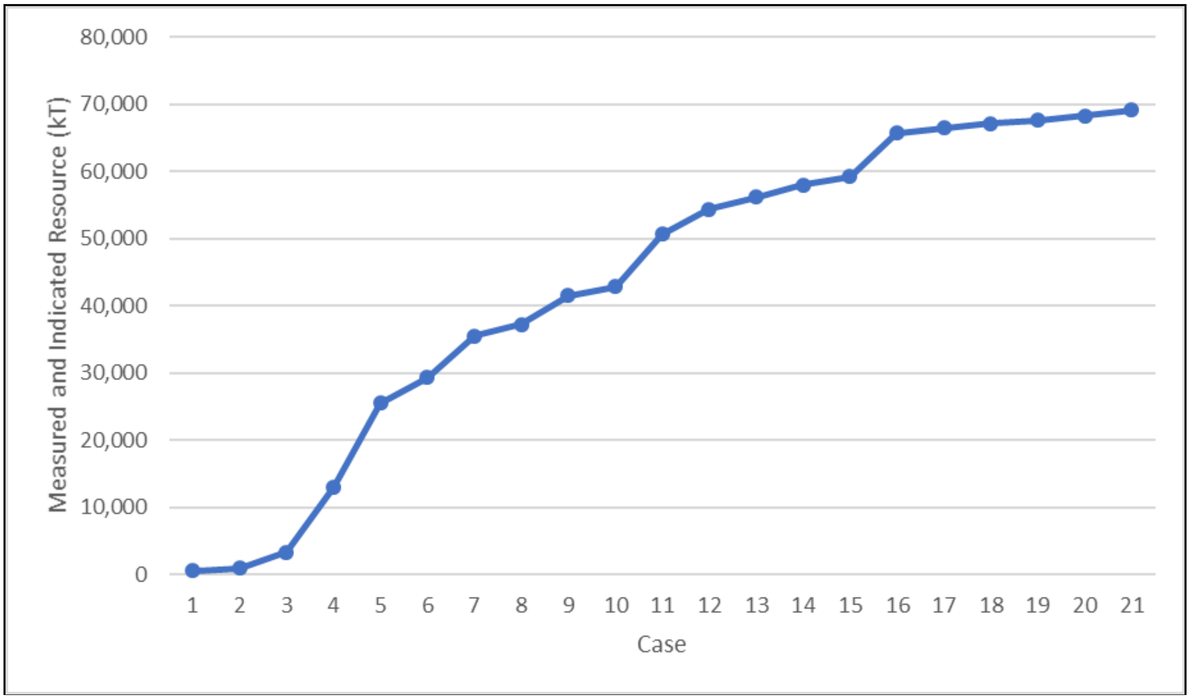


Figure 16-1 Ixtaca Pit Shell Resource Contents by Case

The pit shell generated from Case 16 is selected as the ultimate pit limit for Ixtaca and is used as the basis for detailed pit designs which include berms and ramps. The LG pit limited resource for Ixtaca is shown in the table below:

Table 16-5 Ixtaca Ultimate Pit Limit Contents (NSR>=$15.40)

Pit Shell Reference	16	
Mill Feed	65,718	kT
Gold grade	0.651	g/t
Silver grade	39.23	g/t
Waste	305,396	kT
Strip ratio	4.65	

The following figure shows a plan view of Case 16 pit shell.

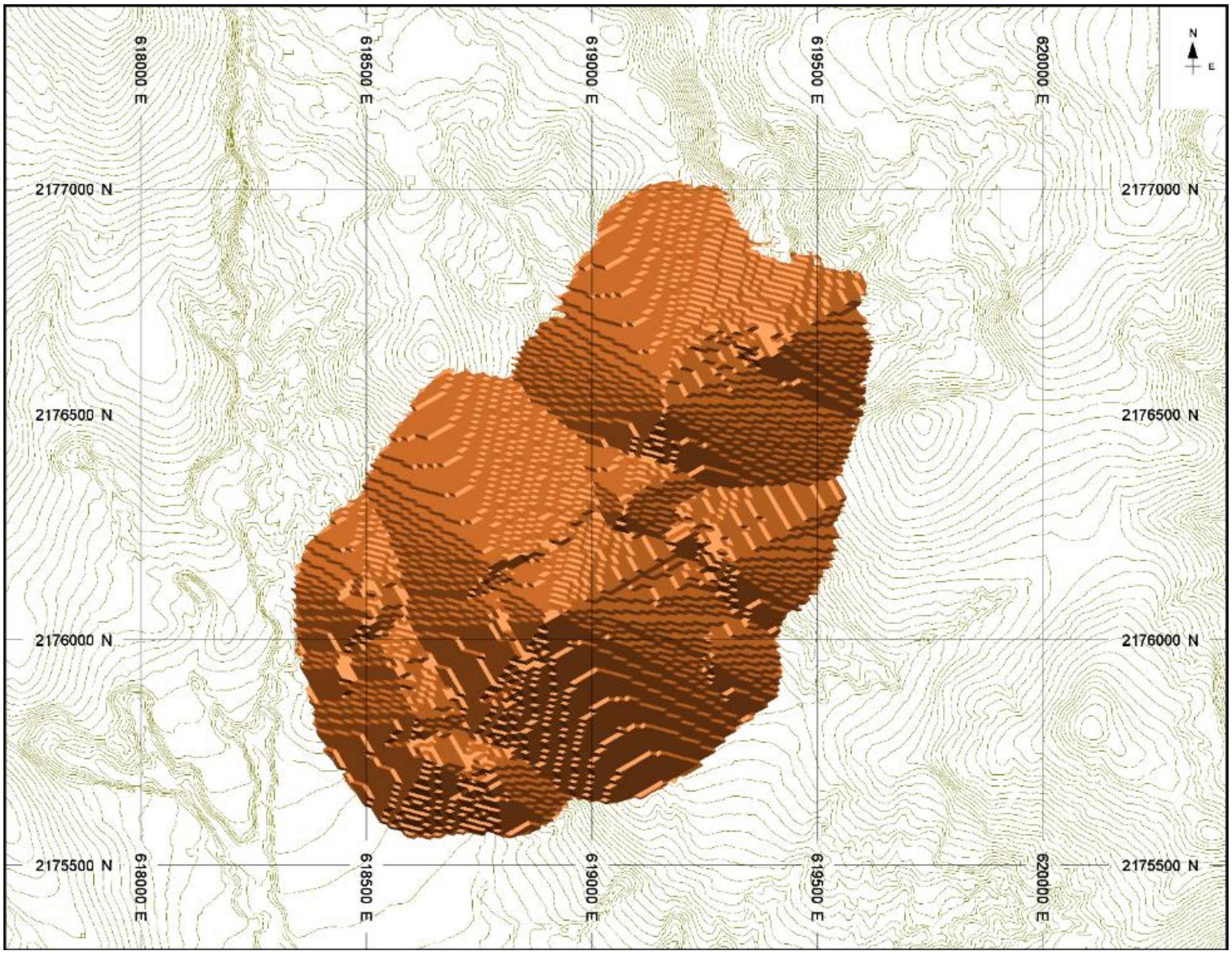


Figure 16-2 Plan view of selected LG shell (Case 16)

16.4 Detailed Pit Designs

MMTS has completed PFS level pit designs using standards for road widths and minimum mining widths, based on efficient operation for the size of mining equipment chosen for the project. Pits are designed that demonstrate the viability of accessing and mining the Ixtaca deposit.

16.4.1 Pit Phase Selection

The ultimate pit limit is split into phases or pushbacks to target higher economic material earlier in the mine life.

16.4.2 Pit Design Slope Inputs and Bench Configuration

Pit designs are configured on 12m bench heights with berms every two benches. The slope design parameters include variable bench face angles, berm widths and inter-ramp slope angles for each rock-type as specified in Table 16-3 and Table 16-4.

Maximum heights of inter-ramp slopes are limited to 200 m. The overall slope angles for 400 m deep pit walls are typically 43° to 45° after flatter upper slopes, haul ramps and/or wider benches are incorporated.

16.4.3 Haul Road Design Parameters

Two-way haul roads of 22.4 m width are designed for all in-pit haul roads. This width allows the efficient passing of trucks. Access ramps are not designed for the bottom two benches of each phase on the assumption that the bottom ramp segments will be mined out using retreat mining techniques. The lowest two benches of ramp segments left in the pit bottoms are designed using a one-way width of 16.3m since bench volumes are small and traffic flow will be reduced in these areas. Ramp grades are limited to a maximum of 10%.

16.4.4 Pit Design Results

The following section describes the pit designs including figures showing plan views. Reserves for the ultimate pit are in Section 15 of this Technical Report.

16.4.4.1 Phase 1

Phase 1 targets approximately1¼ yrs of mill feed in the Main zone of the Ixtaca deposit.

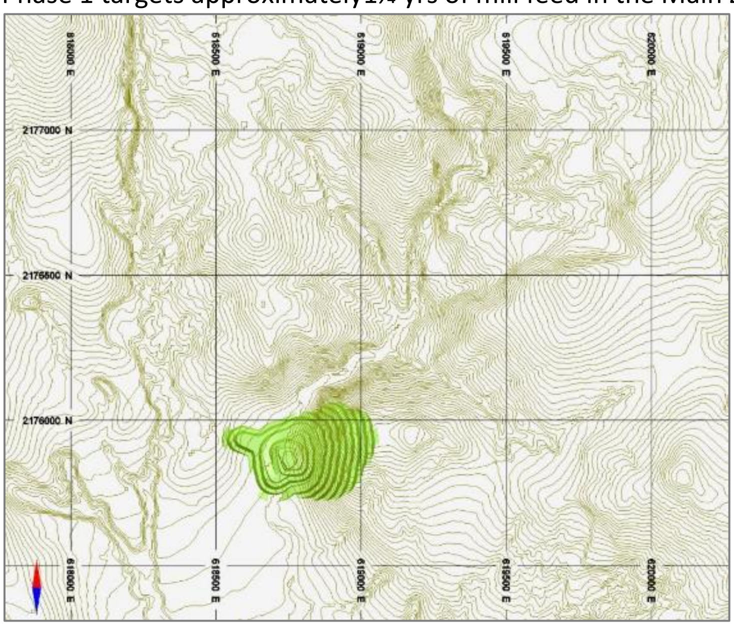


Figure 16-3 Phase 1

16.4.4.2 Phase 2

Phase 2 is a pushback to the East.

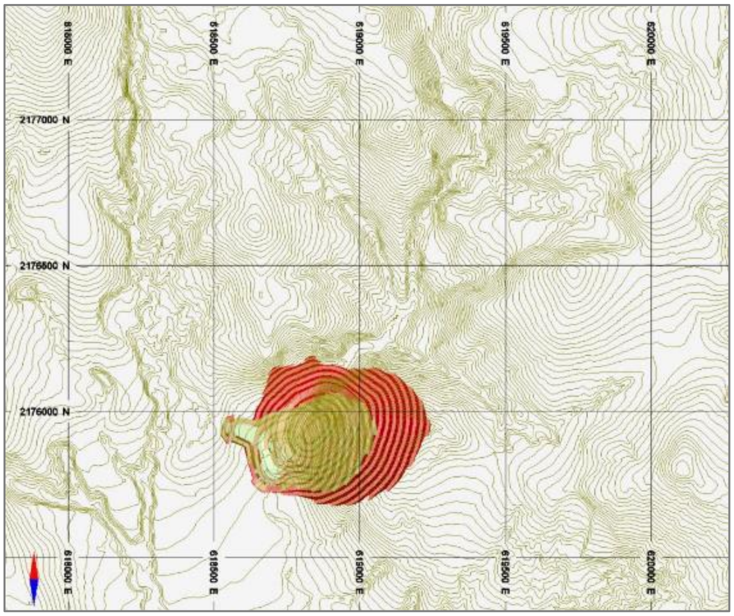


Figure 16-4 Phase 2

16.4.4.3 Phase 3

Phase 3 goes to final East wall in the upper portion of the pit.

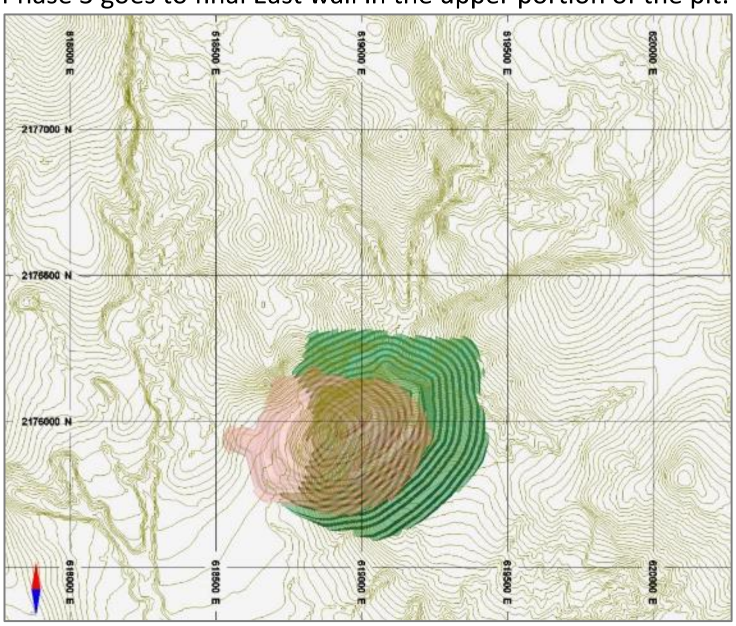


Figure 16-5 Phase 3

16.4.4.4 Phase 4

Phase 4 is a pushback to the West.

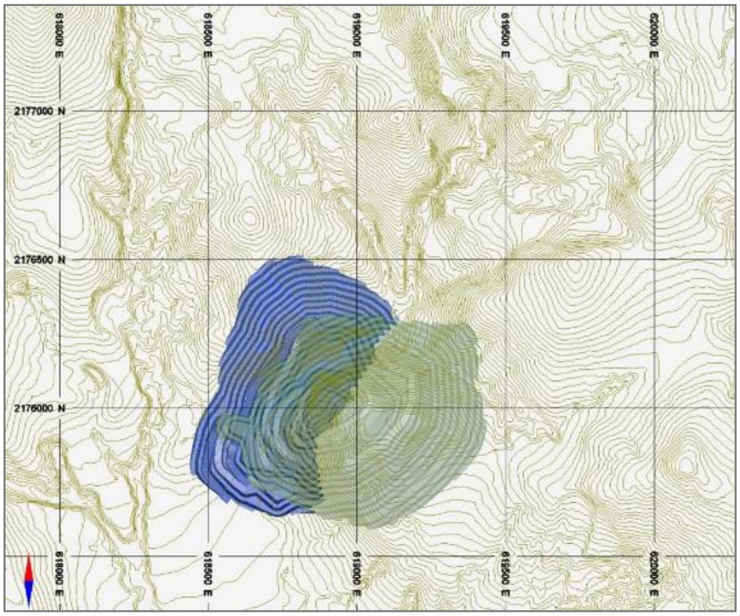


Figure 16-6 Phase 4

16.4.4.5 Phase 5

Phase 5 is a pushback to the North.

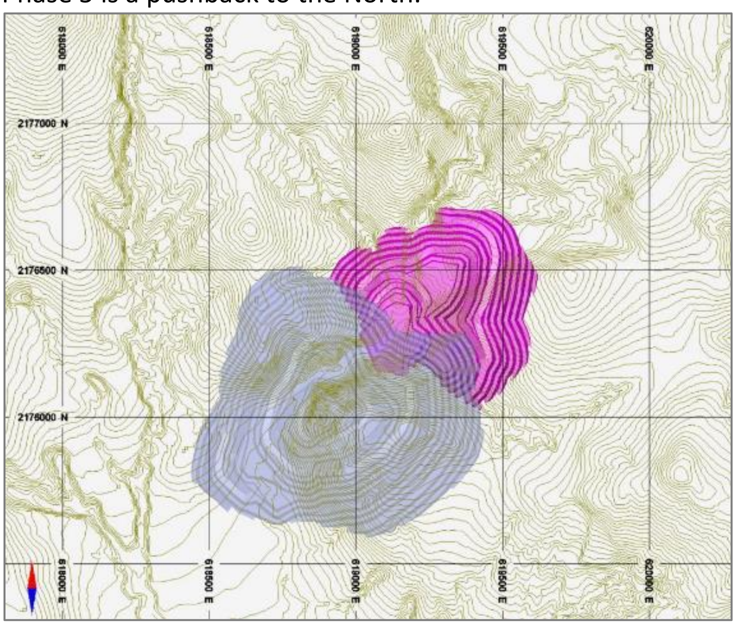


Figure 16-7 Phase 5

16.4.4.6 Phase 6

Phase 6 is a pushback to the final West wall and pit bottom in the Main and North zones of the Ixtaca deposit. Phase 6 can be mined prior to Phase 5.

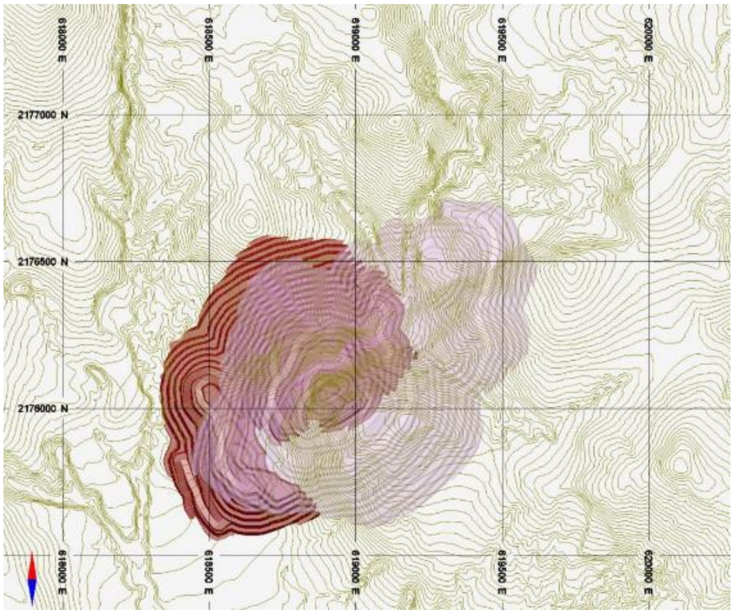


Figure 16-8 Phase 6

16.4.4.7 Phase 7

Phase 7 is the final pushback to the North and pit bottom in the NE zone of the Ixtaca deposit.

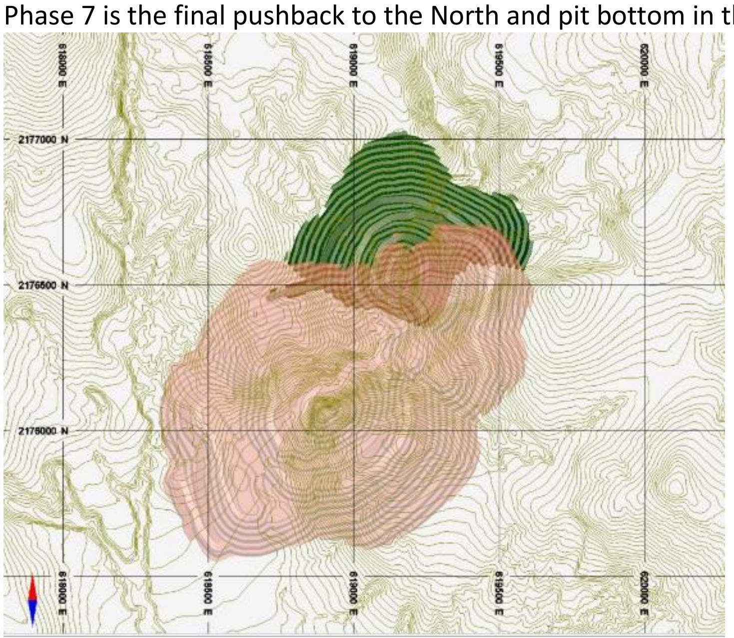


Figure 16-9 Phase 7

16.5 Rock Storage Facilities

Material that does not meet economic cut-off grade will be stored in Rock Storage Facilities (RSFs) to the South and West of the ultimate pit limit. A backfill location is also utilized for storage of Phase 5 and 7 un-economic material.

The RSFs are located around the ultimate pit to keep haul distances to a minimum. The proposed West-S RSF and South RSF have capacity to store 66 and 28 Mm^3 of waste rock, respectively. The West-N RSF will store approximately 41 Mm^3.The West-N RSF has contingency capacity to store up to 60 Mm^3. The proposed West-S RSF has a maximum height of 210 m and will be constructed at 1.3H:1V benched slopes with a 2.1H:1V overall slope angle. The South RSF has a maximum height of 120 m. The overall slope of the lower portion is 2.5H:1V with bench face slopes of 1.3H:1V. The upper bench of the South RSF has a slope of 1.3H:1V. Material will also be hauled to the TMF for use in embankment construction after Year 2.

Geochemical characterization of site materials has confirmed that waste rock is not expected to be net acid producing and no waste rock segregation is required.

16.5.1 RSF Design Inputs

The following inputs are used as design criteria for the RSFs:

- Max lift height – 50m
- Face angle for each lift – 37 degrees (angle of repose)
- Maximum overall slope angle – 26.6 degrees (2H:1V)
- Volcanic in-situ default density – 1.7 tonnes/BCM
- Limestone/Shale in-situ default density – 2.64 tonnes/BCM
- Swell factor – 25%
- Maximum ramp grade – 10%
- Limestone “shell” on outside face of RSF - 100 m

Topsoil will be salvaged as required from all disturbed areas and stockpiled in designated locations south of the pit.

The location and designed capacities of the RSFs are shown below:

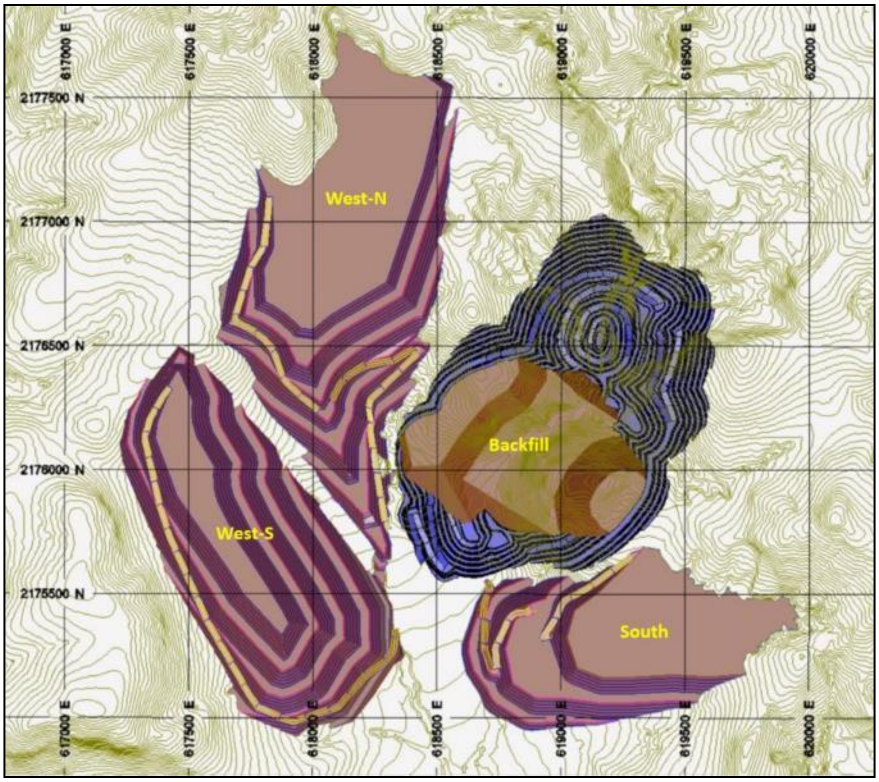


Figure 16-10 RSF Locations

Table 16-6 RSF Capacities

	Designed Capacity '000 m³
South	27,700
West-S	66,500
West-N	59,600
Backfill	55,000
TOTAL	**208,800**

16.6 Mine Haul Road Designs

Mine haul roads external to the open pit are designed to haul ore and waste materials from the open pit to the scheduled destinations. The haul roads are designed with the following inputs:

- 22.4m width to incorporate dual lane running width and a berm on the outside edge (where applicable)
- 10% maximum grade
- Balanced cut and fill areas built by excavators, dozers and graders
- Road capping using sinter rock or crushed limestone

16.7 Ore Stockpiles

When ore is mined from the pit it will either be delivered to the primary crusher or the ore stockpiles. The grade of the material sent to the ore stockpile each year is dependent on the best economics determined by the mine scheduling program. Ore is stockpiled on mid and upper lifts of the South RSF. The maximum stockpile size is 11.5M tonnes and occurs in Year 9 of operations. The ore stockpile is fully reclaimed at the end of the mine life.

16.8 Mine Production Schedule

The mine production schedule for Ixtaca is developed with MineSight Strategic Planner (MSSP), a long range schedule optimizing tool. It is typically used to produce a life-of-mine schedule that will maximize the Net Present Value of a property subject to specified conditions and constraints. Inputs include production requirements, mine operating considerations, product prices, recoveries, destination capacities, equipment performance, haul cycle times and operating costs. From this the program develops an optimal production schedule from the given pit phase reserves.

The open pit mine production schedule is based on the following parameters:

- One year of pre-production and pre-stripping
- Mill feed of 7,650tpd for Years 1-4, ramping up to 15,300tpd from Year 5 onwards
- Phased pit bench reserves are used as input to the mine production schedule
- Maximum 12 benches mined from a single phase in one year (1 bench per month)
- Maximum of 3 partial benches mined in a single period
- Ore tonnes mined in excess of the mill capacity is stockpiled
- Volcanic material mill throughput is 28% higher than Limestone and Shale (due to the soft nature of Volcanic material)

The mine production schedule is shown in the following tables and graphs. Note that all gold and silver grades shown in the tables and graphs are diluted. Gold equivalent grade is calculated using the ratio of the base case metal prices ($1,250/oz for gold and $18/oz for silver – results in 69:1 silver to gold ratio). Ore is reported using a cut-off grade of NSR>=$15.40/tonne.

Table 16-7 Production Schedule Summary

		TOTAL	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14
Waste																	
Volcanic	kT	**165,456**	5,992	9,511	8,652	18,036	20,054	10,490	6,647	8,220	12,644	224	15,430	34,143	15,083	330	0
Rock	kT	**160,506**	8	3,440	10,337	1,647	8,335	16,458	23,345	15,947	26,110	24,047	3,405	806	10,192	15,795	633
Total	kT	**325,962**	6,000	12,951	18,989	19,683	28,389	26,948	29,992	24,167	38,754	24,271	18,835	34,949	25,275	16,125	633
Pit To Mill																	
Ore	kT	**48,833**	0	2,183	2,799	2,792	2,430	5,359	5,216	5,584	3,551	5,599	666	2,377	6,035	3,622	621
Au	g/t	**0.725**	0	0.783	0.692	1.140	0.811	0.732	0.656	0.789	0.956	0.693	0.996	0.625	0.526	0.435	1.125
Ag	g/t	**43.43**	0	57.65	51.89	68.64	35.25	52.26	38.65	53.59	19.46	39.96	20.84	27.29	36.49	47.12	46.82
Au Eq	g/t	**1.35**	0	1.61	1.44	2.13	1.32	1.48	1.21	1.56	1.24	1.27	1.30	1.02	1.05	1.11	1.80
Pit to Stockpile																	
Ore	kT	**16,272**	3	885	2,671	920	838	1,871	1,668	1,550	1,098	3,327	186	365	732	158	0
Au	g/t	**0.293**	0.528	0.280	0.287	0.323	0.386	0.273	0.260	0.254	0.346	0.301	0.407	0.390	0.218	0.202	0
Ag	g/t	**20.31**	18.64	22.60	24.50	25.54	15.76	21.65	18.21	20.43	11.79	19.77	6.38	16.14	21.99	24.63	0
Au Eq	g/t	**0.59**	0.80	0.61	0.64	0.69	0.61	0.59	0.52	0.55	0.52	0.59	0.50	0.62	0.53	0.56	0
Stockpile to Mill																	
Ore	kT	**16,272**	0	2	0	0	607	237	417	0	2,115	0	4,918	3,667	0	1,962	2,346
Au	g/t	**0.293**	0	0.531	0.000	0.000	0.367	0.367	0.275	0.000	0.255	0.000	0.279	0.283	0.000	0.262	0.374
Ag	g/t	**20.31**	0	18.73	0.00	0.00	31.72	31.72	22.84	0.00	21.05	0.00	19.46	19.01	0.00	19.77	19.39
Au Eq	g/t	**0.59**	0	0.80	0.00	0.00	0.82	0.82	0.60	0.00	0.56	0.00	0.56	0.56	0.00	0.55	0.65
Mill Feed																	
Ore	kT	**65,105**	0	2,185	2,799	2,792	3,037	5,595	5,633	5,584	5,666	5,599	5,584	6,044	6,035	5,584	2,967
Au	g/t	**0.617**	0	0.782	0.692	1.140	0.723	0.717	0.628	0.789	0.694	0.693	0.364	0.417	0.526	0.374	0.531
Ag	g/t	**37.65**	0	57.61	51.89	68.64	34.54	51.39	37.48	53.59	20.05	39.96	19.63	22.26	36.49	37.51	25.13
Au Eq	g/t	**1.16**	0	1.61	1.44	2.13	1.22	1.46	1.17	1.56	0.98	1.27	0.65	0.74	1.05	0.91	0.89

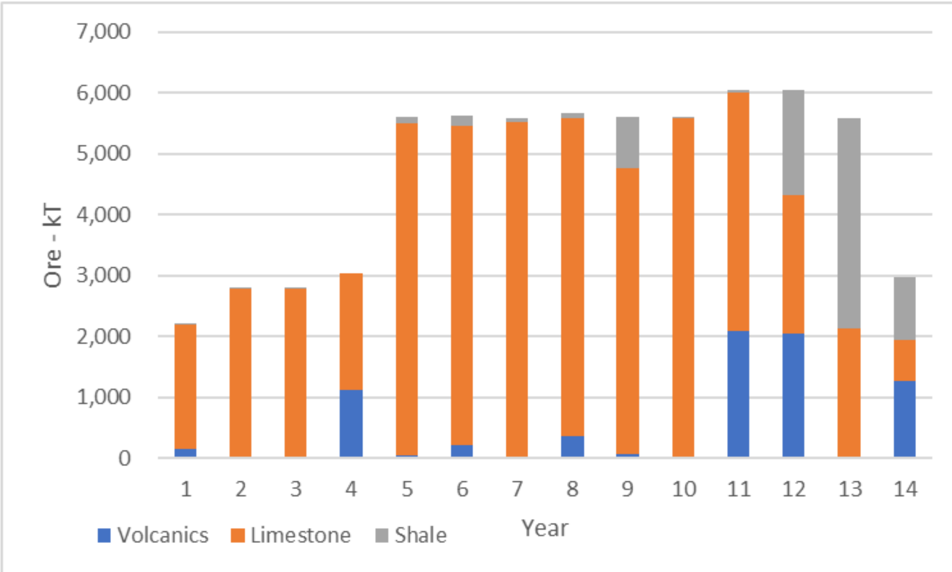


Figure 16-11 Mill Feed Summary by Rock Type

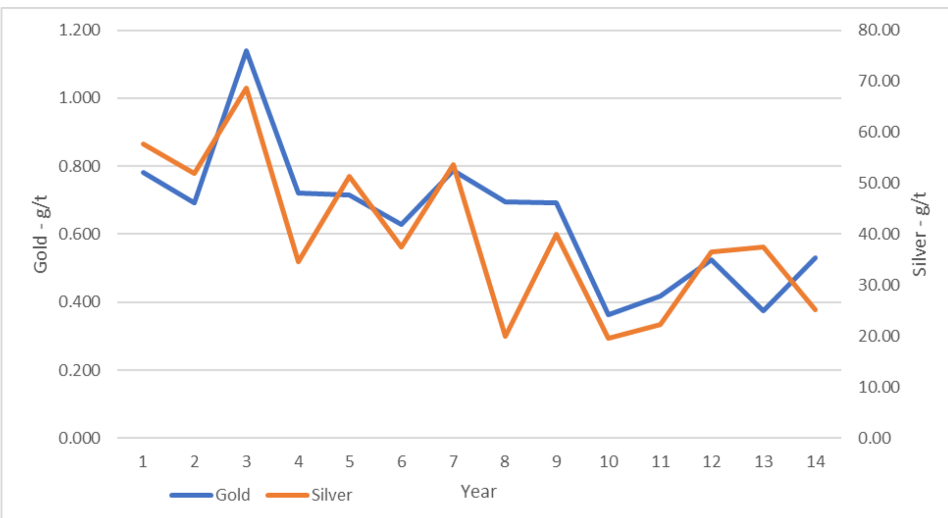


Figure 16-12 Gold and Silver Grades by Year

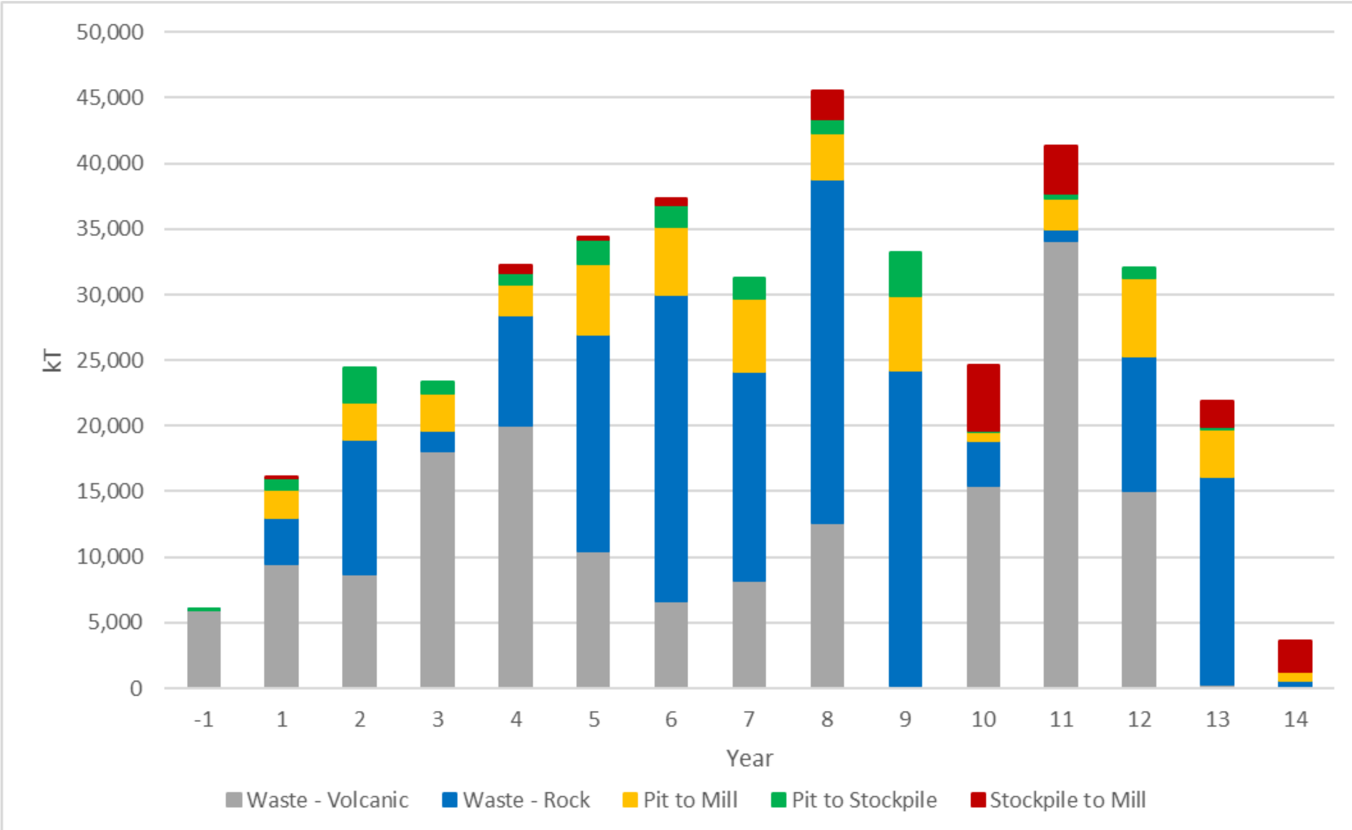


Figure 16-13 Material Movement by Year

16.8.1 End of Period Maps

The following figures show End of Period (EOP) maps at Year -1, 1, 5 and 14. The end of Year 14 is also referred to as Life of Mine (LOM).

16.8.2 Pre-Production Mine Operations (Year -1)

Pre-production at Ixtaca includes the following tasks which will take approximately 1 year.

- Clearing and grubbing of areas for ex-pit haul roads, RSF footprints, topsoil storage, infrastructure locations, phase 1 pit area and dams
- Removal and stockpiling of topsoil from pit, RSF and road areas
- Construction of by-pass roads and ex-pit haul roads
- Construction of TMF starter dam, Water Storage Dam and Lower Fresh Water Dam (rock for these dams is sourced from local borrow areas)
- Mining down to 2292 m elevation in Phase 1 and 2376 m elevation in Phase 2 (rock is stored in South RSF and ore is stockpiled near the primary crusher)
- Construction of primary crusher pad and conveyor to the mill

The following figure illustrates the mine operations configuration after the pre-production period, and at the start of mill operations.

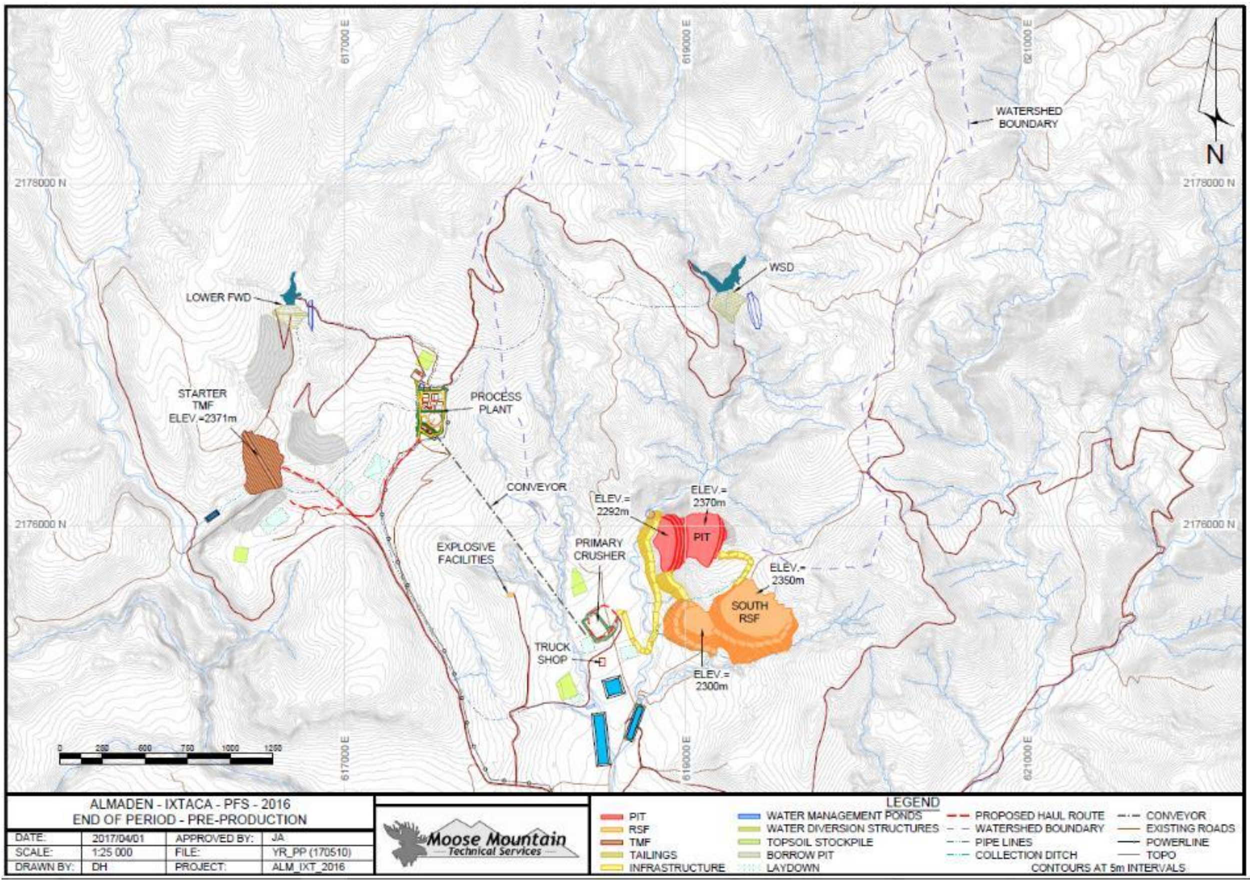


Figure 16-14 End of Pre-Production Period

16.8.2.1 End of Year 1

- Phase 1 is mined down to 2172m elevation
- Phase 2 is mined down to 2304m elevation
- At the end of Year 1 there is 886kT of ore in stockpile
- Waste material is stored in the South RSF

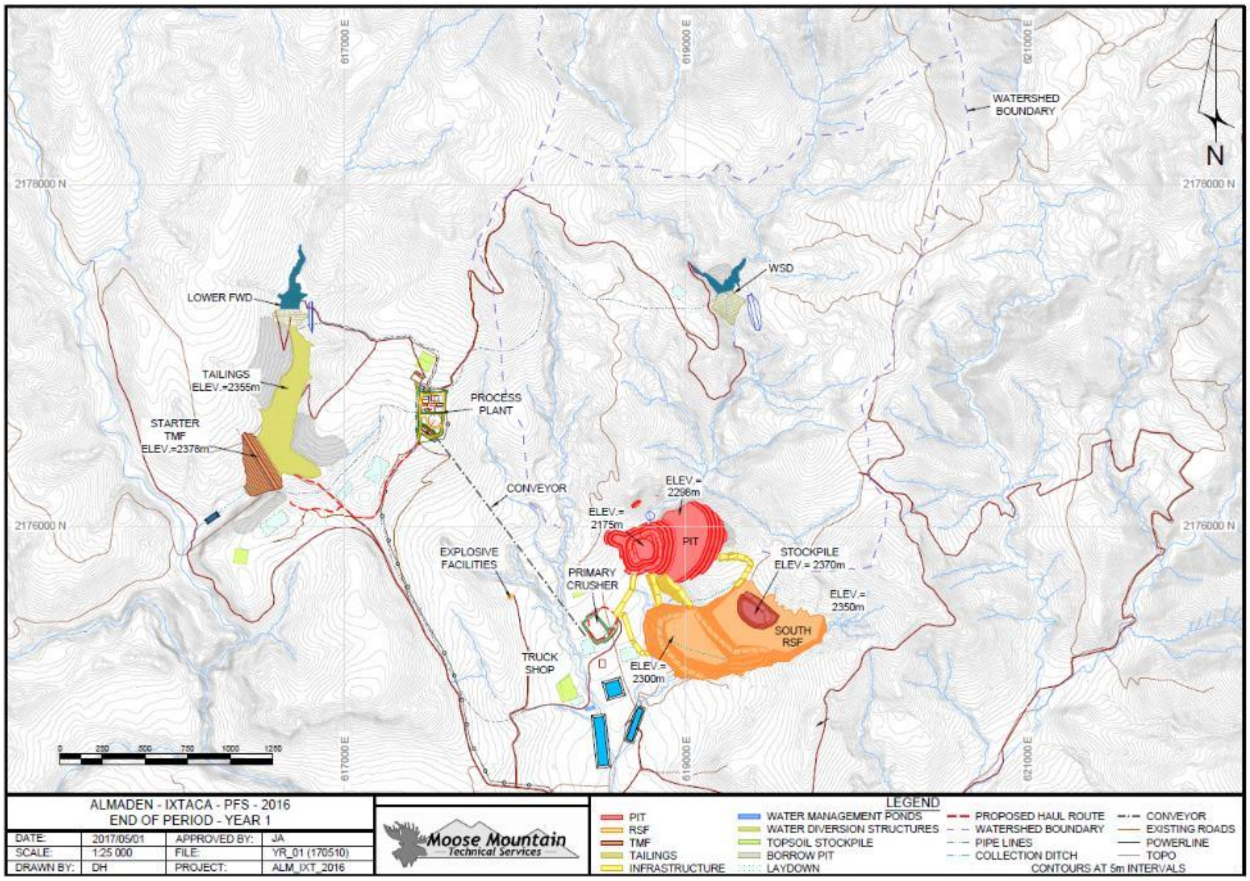


Figure 16-15 End of Year 1

16.8.2.2 End of Year 5

- Phases 1 and 2 are mined to completion
- Phase 3 is mined down to 2064m elevation
- Phase 4 is mined down to 2274m elevation
- The South RSF is filled
- Waste material is hauled to the West-N and West-S RSFs
- Limestone material is hauled to the TMF to raise the dam ahead of tailings production
- At the end of Year 5 there is 6,342kT of ore in stockpile (on the mid and upper lifts of the South RSF)

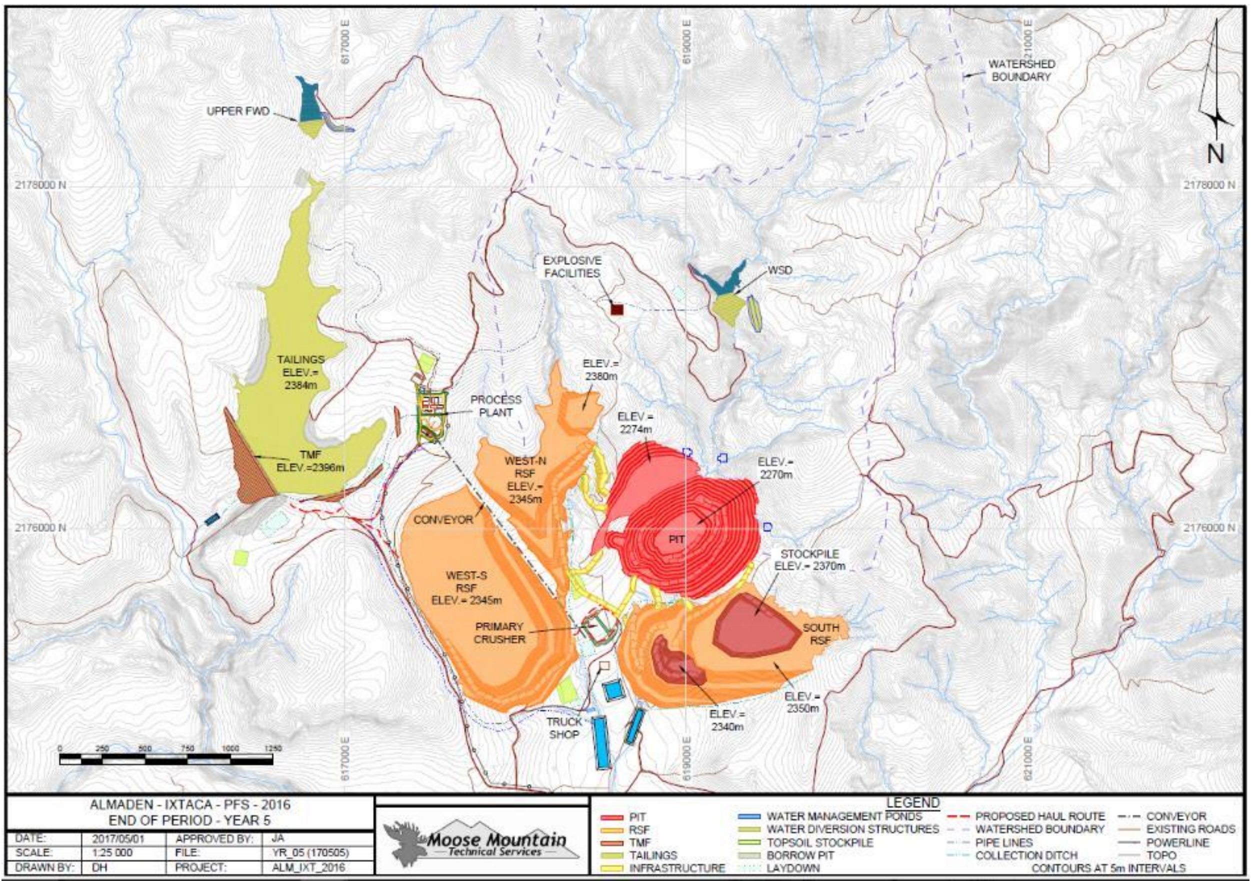


Figure 16-16 End of Year 5

16.8.2.3 End of Year 14 (LOM)

- The ore stockpile is fully reclaimed
- All phases are mined to completion
- Phase 5 and 7 waste material is stored in the pit backfill RSF

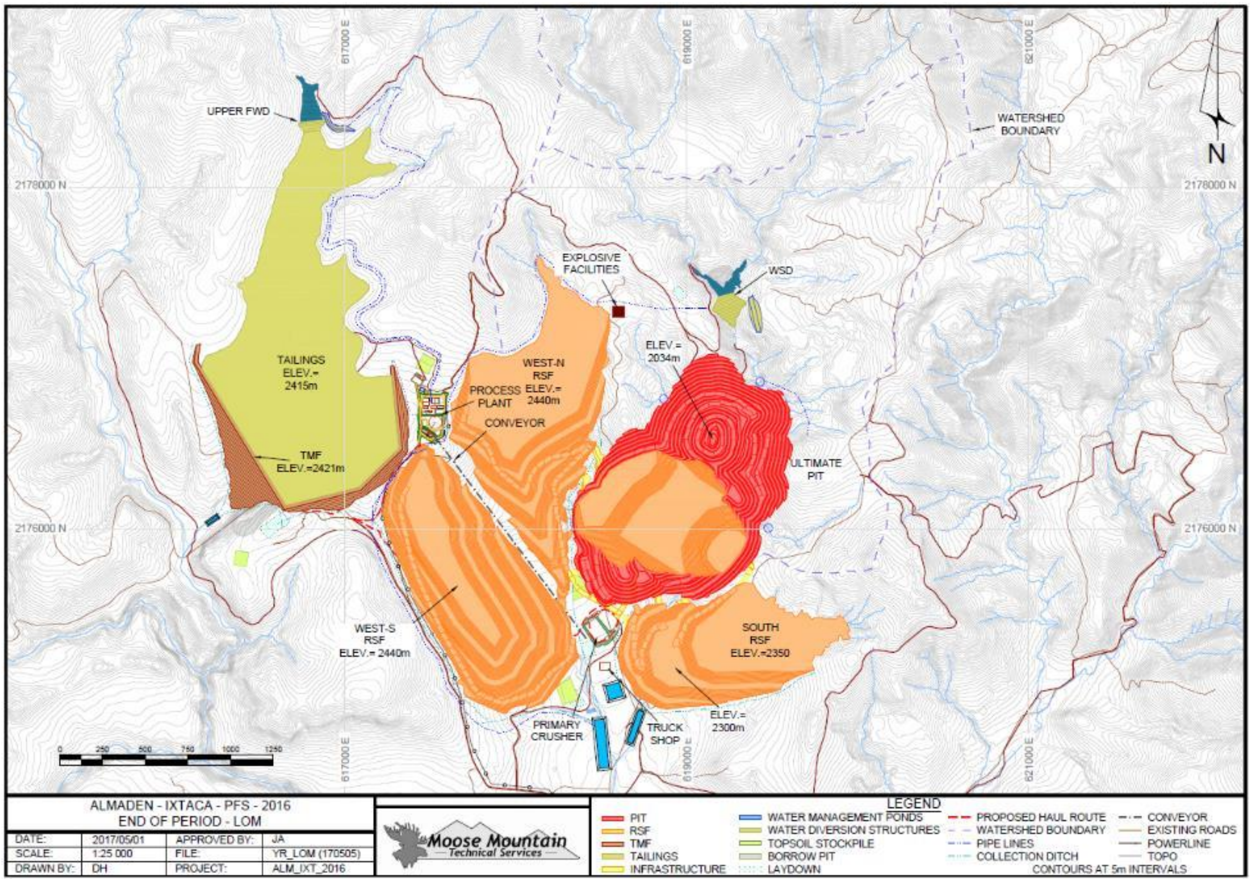


Figure 16-17 End of Year 14 (Life of Mine)

16.9 Mine Operations

The mine operations are planned to be typical of similar small scale open pit operations and are organized into two areas: Direct Mining and General Mine Expense (GME).

Direct Mining includes the equipment operating costs and operating labour for the following:

- Grade Control Drilling
- Production Drilling
- Blasting
- Loading
- Hauling
- Pit Services
- Mine Maintenance

Each unit operation accounts for all equipment consumables and parts, manpower required (both operating and maintenance) and all material costs (blasting). This also includes the distributed mine maintenance items such as maintenance labour and repair parts plus off-site repairs which contribute to the hourly operating cost of the equipment.

GME includes the supervision for the direct mining activities. GME also includes technical support requirements from Mine Engineering and Geology functions. More detailed descriptions of the mine organization and unit mining activities follows.

In this study Direct Mining and Mine Maintenance is planned as Contract mining operations. The contract mining company will be responsible for all equipment mob/demob, operating, and labour costs as well as maintenance of the mining equipment. Blasting unit operations will be performed by a specific blasting company contractor. Supervision, geology and mine planning will be done by the Owner.

16.9.1 Direct Mining Unit Operations (Contractor)

Direct mining activities will be done by a contract mining company. Estimates received from different Mexican-based contractors confirm the mining equipment sizes assumed for this study.

16.9.1.1 Ore Control Drilling

An ore control system (OCS) is planned to provide field control for the loading equipment to define the ore/waste boundary as well as selectively mine low/medium/high grade ore for stockpiling.

Variable angle reverse circulation (RC) drilling will be done on alternating benches throughout the mineralized areas of the deposit. Sampling will be done on the angled drill holes to determine various grade cut-off boundaries. Sample results will be used to build a short range mine planning model to be used for dig limit calculations.

Ore control drilling will be supervised by the Owner and sampling will be performed by the Owner. The sampling program has only been estimated at this point for the PFS and will need more detailed evaluation in future studies.

16.9.1.2 Production Drilling

The ore and waste rock at Ixtaca will require drilling and blasting. The Volcanic material is generally softer than the Limestone and Shale material and will have a higher drilling penetration rate. Production drilling will be carried out with 273mm (10 ¾") diesel hydraulic rotary drills. Estimated effective penetration rates range from 28m/hr (Limestone and Shale) up to 43m/hr (Volcanics).

The production drills will also be adequate for drilling the pre-shear and buffer blast holes on the ultimate pit highwall. The assumed drill productivity for highwall drilling activity is the same as the primary drilling fleet productivity.

16.9.1.3 Production Blasting

A powder factor of 0.15kg/tonne is assumed for volcanic material and 0.21kg/tonne for Limestone and Shale material based on results from a blasting study performed by MMTS in 2015. Production blasting will be done with ANFO where possible or emulsion if the holes are too wet (during the rainy season or in pit bottoms).

The blasting activities are planned to fall under a contract service agreement with a local explosives supplier, including supply of explosives, direct labour and blast-hole loading trucks. The Owner will provide an on-site explosives storage facility (silos), perimeter fencing around the storage facility and portable offices. The Owner will also pit supervision and planning for blasting operations.

16.9.1.4 Loading

The mine production plan requires a maximum of five 12m^3 bucket hydraulic excavators which are sized to handle 90 tonne payload haul trucks. The hydraulic excavators are specified to handle the bulk excavation from the pits including all identified mineralized zones and waste rock in those mineralized zones. An excavator-type configuration will allow for greater flexibility in separation of ore into grade bins for stockpiling.

The excavator size is chosen based on its ability to minimize losses and dilution for the proposed ore control operations, as well as its proven reliability and equipment ownership by various contract mining groups. The chosen excavator can work in a 6m split bench configuration for greater ore selectivity as well as full 12m bench operations.

16.9.1.5 Hauling

Ore and waste rock haulage will be handled with 90 tonne payload haul trucks. Some of the haul trucks will be equipped with side-boards to allow full weight capacity when hauling volcanic material, since the density of this material is low. Haul profiles are estimated from each bench centroid to each potential dumping location. The following hauler productivity parameters are applied to calculate the cycle times.

Table 16-8 Hauler Cycle Time Assumptions

Maximum Haul Grade	10%
Rolling Resistance on Hauls	3%
Rolling Resistance near shovels and on RSF surfaces	5%
Truck Speed Limit	50 km/hr
Operator Efficiency	90%
Loading + Spot + Waiting Time	3.42 minutes

16.9.1.6 Primary Mining Equipment

A summary of the major mining equipment fleet is presented in the table below.

Table 16-9 Primary Mining Fleet Schedule For Key Periods

	Y -1	Y5	Y8	Y10
Drilling				
Primary Drill - 270 mm	1	2	2	2
Secondary Drill - 270 mm	0	2	3	2
Loading				
Hydraulic Shovel - 12 m3	1	4	5	5
Hauling				
Haul Truck - 91 tonne payload	3	33	44	20

16.9.1.7 Pit Services

Pit services include:

- Haul road maintenance

- Pit floor and ramp maintenance
- RSF maintenance
- Ditching
- Dewatering
- Lighting
- Transporting personnel and operating supplies

The following table summarizes the equipment chosen to fhandle these pit service functions.

Table 16-10 Mine Operations Support Equipment For Key Periods

		Y -1	Y5	Y10
Blasthole Loader	Blast hole stemmer	1	2	1
Dozer - 306 kW	Shovel support - in-pit	1	2	1
Fuel/Lube Truck	4000 litres	1	1	1
Water Truck	Haul Roads - 4000 gallons	1	2	2
Dozer - 306 kW	RSF Maintenance	2	3	2
Grader - 221 kW	Road Grading	1	2	2
FEL - 373 kW	Multi-tool, tire changing, cable reeler	1	1	1
Dozer - 433 kW	Utility Dozer	1	1	1
Excavator - 301 kW	Utility Excavator	1	2	1
Mobile Screening Plant	Road Crush	1	1	0
Jaw Crusher	Road Crush	1	1	0
Forklift	10 tonnes	1	1	1
Light Plant	20 kW	4	4	2
Mobile Crane	130 tonnes	0	1	1
Crew Van	15 passenger	1	2	1
Warehouse Truck	1 tonne	1	1	1
Crew Cab Pickup	Crew Cabs, Supervisor trucks	4	6	2
Service Truck	maintenance + overhauls	1	1	1
Welding Truck	Welding Truck	1	1	1
Picker Truck	Picker Truck	1	1	1
Truck and Tandem Dump		1	1	1

Haul Road Maintenance

The grader is used to maintain the haul routes for the haul trucks and other equipment within the pits and on all routes to various RSF locations and the primary crusher. The grader ensures the haul roads are free of debris and that they conform to the design parameters of the routes for cross-section and grade.

The water truck is outfitted with a water tank to spray the width of the haul roads to control dust that creates both visibility (productivity) and environmental issues. The water truck will also spray the active in-pit areas and the active RSF areas.

An in-pit dewatering system will be established as the pit is mined out.

RSF Maintenance
Up to 3 track dozers (306kW) are included to handle rock that is dumped at the RSFs. The dozer will push free dumped piles over the dump face edge as well as keep berms along the dump face edge and ensure the dumping area is clean and free of large boulders that would cause damage to haul truck tires.

Pit Dewatering
Water will be collected on active benches and directed to in-pit sumps where it can be pumped from the pit. Bench floors can be sloped slightly to facilitate drainage of water away from the working face(s). All surface water and precipitation in the pit will be handled by submersible pumps installed in each active pit bottom.

16.9.1.8 Mine Fleet Maintenance

Mine fleet maintenance activities will be generally performed in the maintenance facility located just south of the primary crusher near the pit rim. Maintenance activities will be the responsibility of the contract mining group.

Expected maintenance of the mining equipment will include break-down maintenance, field maintenance and repairs, regular PMs, component change-outs and field fuel, lube and tire change-outs. Fuel, lube and maintenance support in the pit will be by mobile service truck. The mobile maintenance fleet is included as a category under direct mining unit operations.

16.9.2 GME and Technical (Owner)

Mine GME will include mine operations supervision. The General Manager will assume responsibility for the entire project and will have an Administrative Assistant to help with logistics, communications, planning and reporting. The Mine Operations Manager will oversee and direct the contract mining group as well as direct the technical services group.

The Technical Services department includes engineers, surveyors and geologists. The mine planning engineer will be responsible for directing the short and long-range scheduling and destination of materials (stockpile, crusher, RSF location, TMF, etc.). The topography field chief and assistant (surveyors) will work in the field to ensure that contract mining group is following the mine plan. They will also provide reconciliation of material movement volumes against the numbers supplied by the contract mining group. The Senior Geologist will be responsible for ore control planning and provide guidance on construction of the short range geology model using sampling inputs. The geologist and sampler will be responsible for collecting samples from the Ore Control Drilling program and feeding assay results back into the geology and mine planning model. The geologist will also work in the field to help ensure that ore is sent to the correct destination.

16.9.3 Mine Operations Organizational Chart

The following Organizational Chart describes the structure of the planned mining department staff and contract companies.

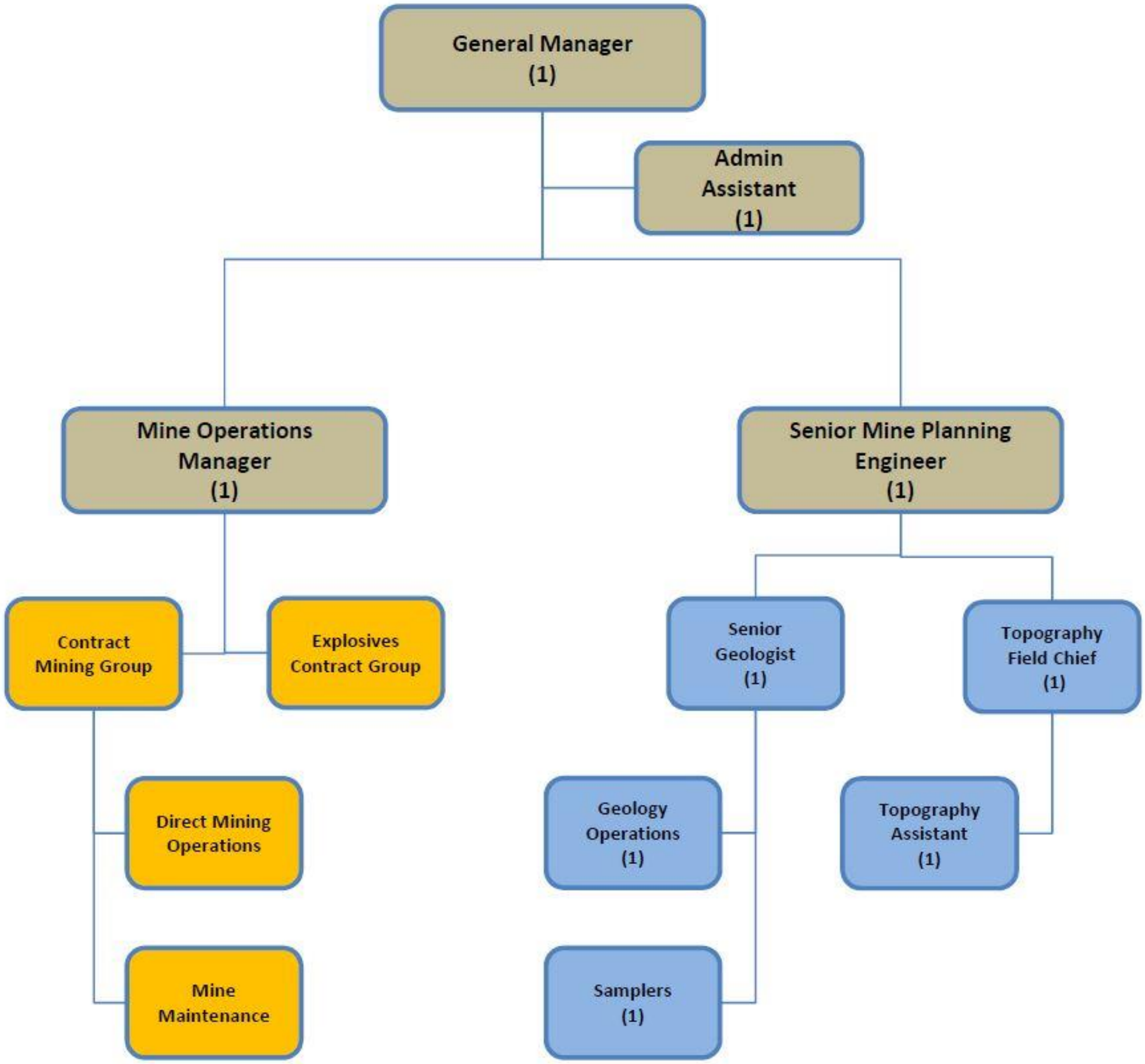


Figure 16-18 Org Chart

17 Recovery Methods

17.1 Introduction

Metallurgical testwork results discussed in Section 13 indicate that mill feed from the Ixtaca deposit can be processed using gravity concentration, flotation, and leaching of a flotation concentrate to recover gold and silver in mill feed and produce a gold-silver doré. Figure 17-1 shows the block diagram flowsheet for Ixtaca.

Almaden is proposing to initially operate a processing plant at 7,650 tonnes/day mill feed, and then increase the mill throughput up to 15,300 tonnes/day by year-5 of the life of mine plan.

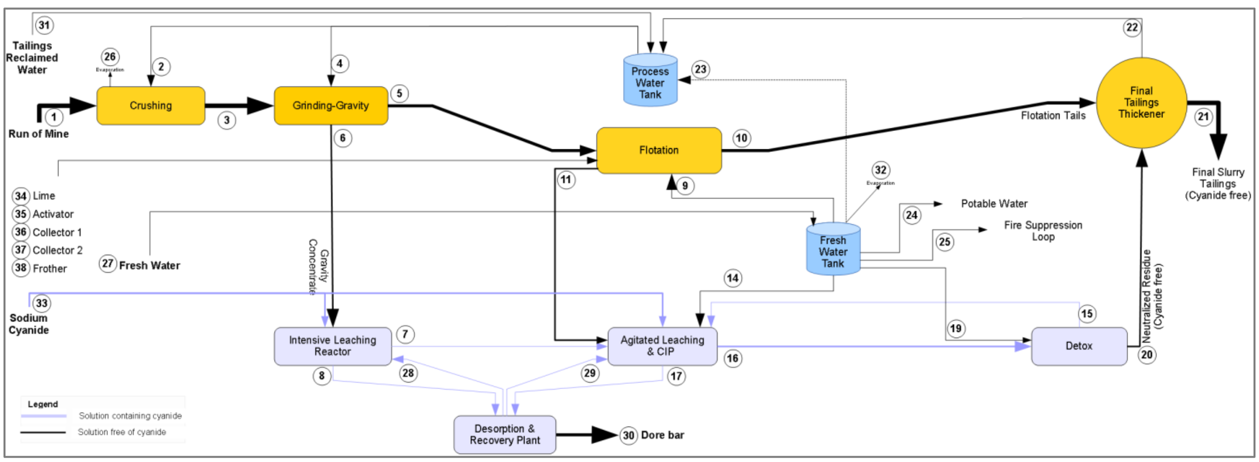


Figure 17-1 Summarized flowsheet for Ixtaca – Block Flow Diagram

17.2 Rock Creek Mill

During 2016 Almaden acquired exclusive rights to purchase the Rock Creek processing facilities and is working towards relocating the them from Nome, Alaska to Mexico for the initial processing plant for Ixtaca project.

The Rock Creek mine located in Nome, Alaska was constructed, commissioned and operated for two months before mining operation were shut down due to the 2008 global financial crisis, environmental issues, and problems with mineral reserves.

The Rock Creek mill matches Ixtaca's flowsheet, with only the flotation stage missing. Some key features of the Rock Creek mill include:

- Its flowsheet closely matches that of Ixtaca Project.
- It was built with good quality, mostly new equipment. The ball mill was bought second hand and refurbished before installation.

- At the time of the definitive shut down the mill was running in steady state condition after solving typical problems derived from the engineering and construction.
- The mill package includes all the processing facilities on site. Buildings will be left at Rock Creek. Metallurgical, chemical and fire assay laboratories are included. A large quantity of plant spares are included.

A plan view of the current Rock Creek plant is shown in the Figure below.

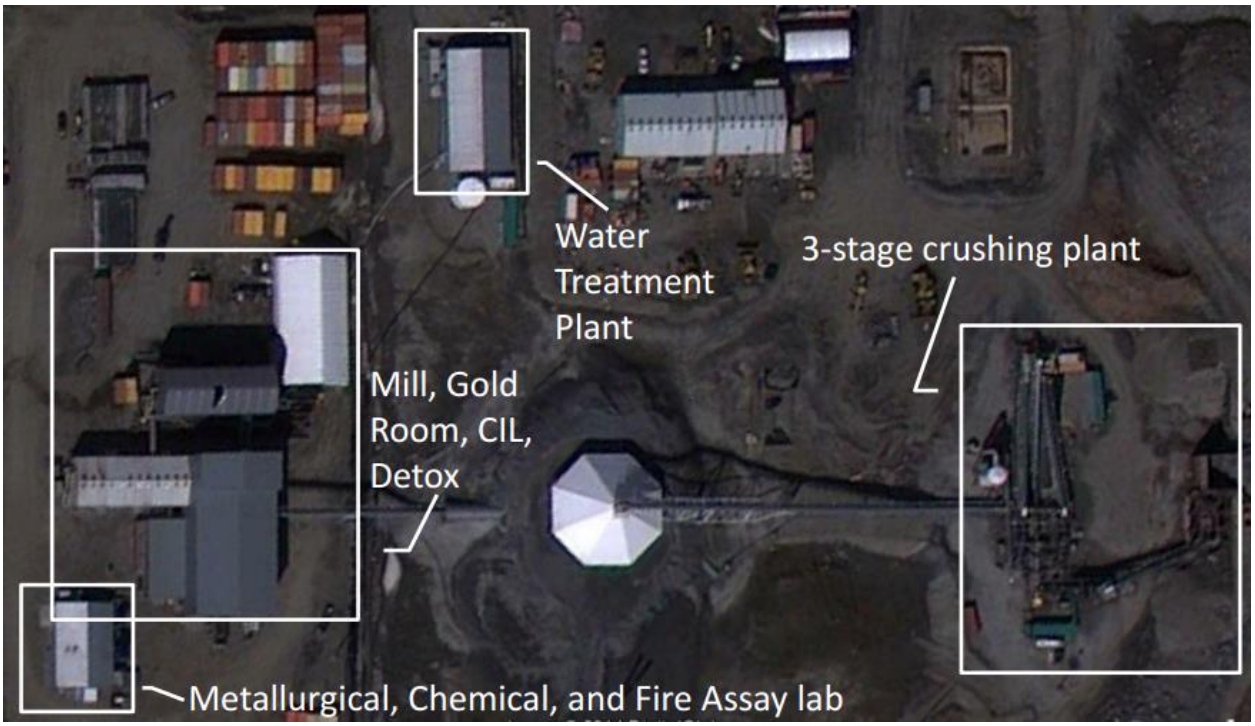


Figure 17-2 Plan View of Rock Creek Process Plant

The Ixtaca plant foot print will be similar to the general arrangement for the Rock Creek mill shown in **Figure 17-2**. Photographs from a site visit in **Figure 17-3** to **Figure 17-6** illustrate the good condition of the process plant.

Figure 17-3 Secondary Crusher and Vibrating Screen

Figure 17-4 Recirculating conveyor in Tertiary Crushing Stage

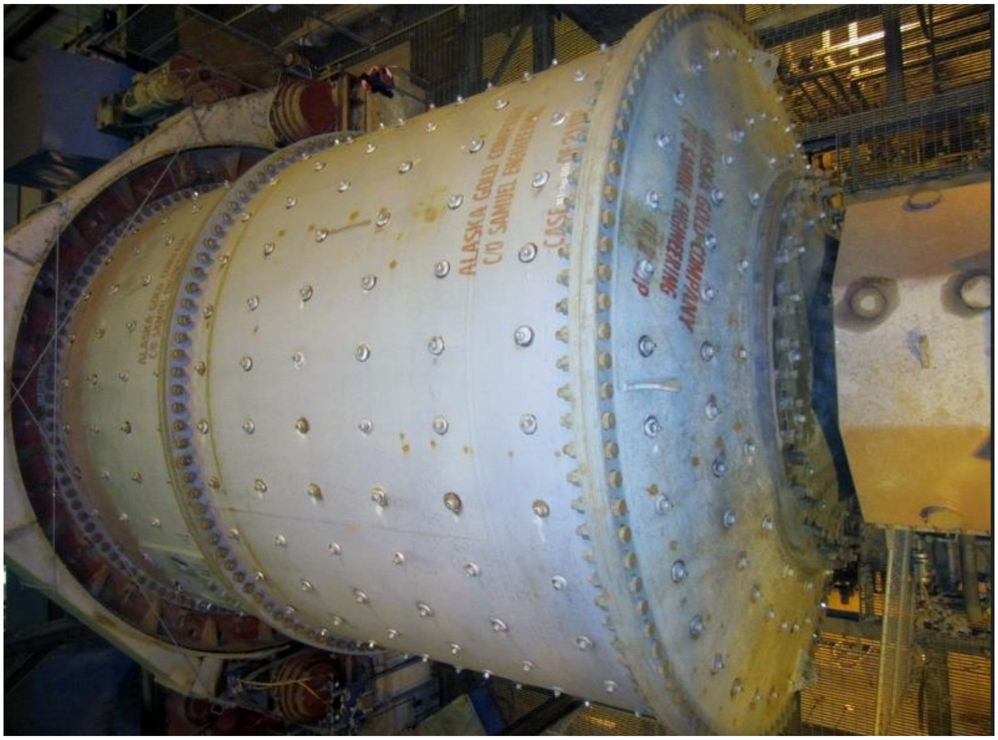


Figure 17-5 Ball Mill 18.4x25.63 ft

Figure 17-6 Four Falcon Gravity Concentrators

17.3 Unit Major Processes

The Rock Creek plant capacity when processing Ixtaca limestone ore is 7,650 tonnes/day. The site general arrangement shown in Figure 16-17 includes primary crushing adjacent to the pit rim. An overland coarse ore conveyor transports primary crusher discharge to the plant site located adjacent to the east site of the TMF. The plant site general arrangement overview shown in Figure 17-7 includes allowance for expansion to be completed by Year 5.

In both initial and expanded throughput scenarios, Ixtaca is projecting to use the following conventional flowsheet to recover the precious metals: three-stage crushing, grinding-gravity concentration, intensive leaching of gravity concentrate, rougher flotation, agitated leaching of the flotation concentrate, carbon-in-pulp, detoxification of leach tails, thickening, and final tails disposal in a conventional tailings dam.

Fresh water to support Ixtaca operation will be sourced from fresh water and water storage dams described in Section 18. Process water will be recirculated from the final tailings thickener, and reclaimed from the TMF.

Most of the estimated 15 MW connected electrical load is used by the process plant. Power requirement increases to 25 MW with the expansion in Year 5.

17.3.1 Crushing

The crushing stage: will reuse all the existing Rock Creek equipment and remain in the original configuration of a three-stage crushing circuit with P80=½”. The primary jaw crusher will operate in open circuit. The secondary cone crushing station operates in open circuit with a pre-classification screen. The tertiary crushing stage operates in close-circuit using two cone crusher stations with pre-classification vibrating screens. All three cone crushing stations have identical configuration and build.

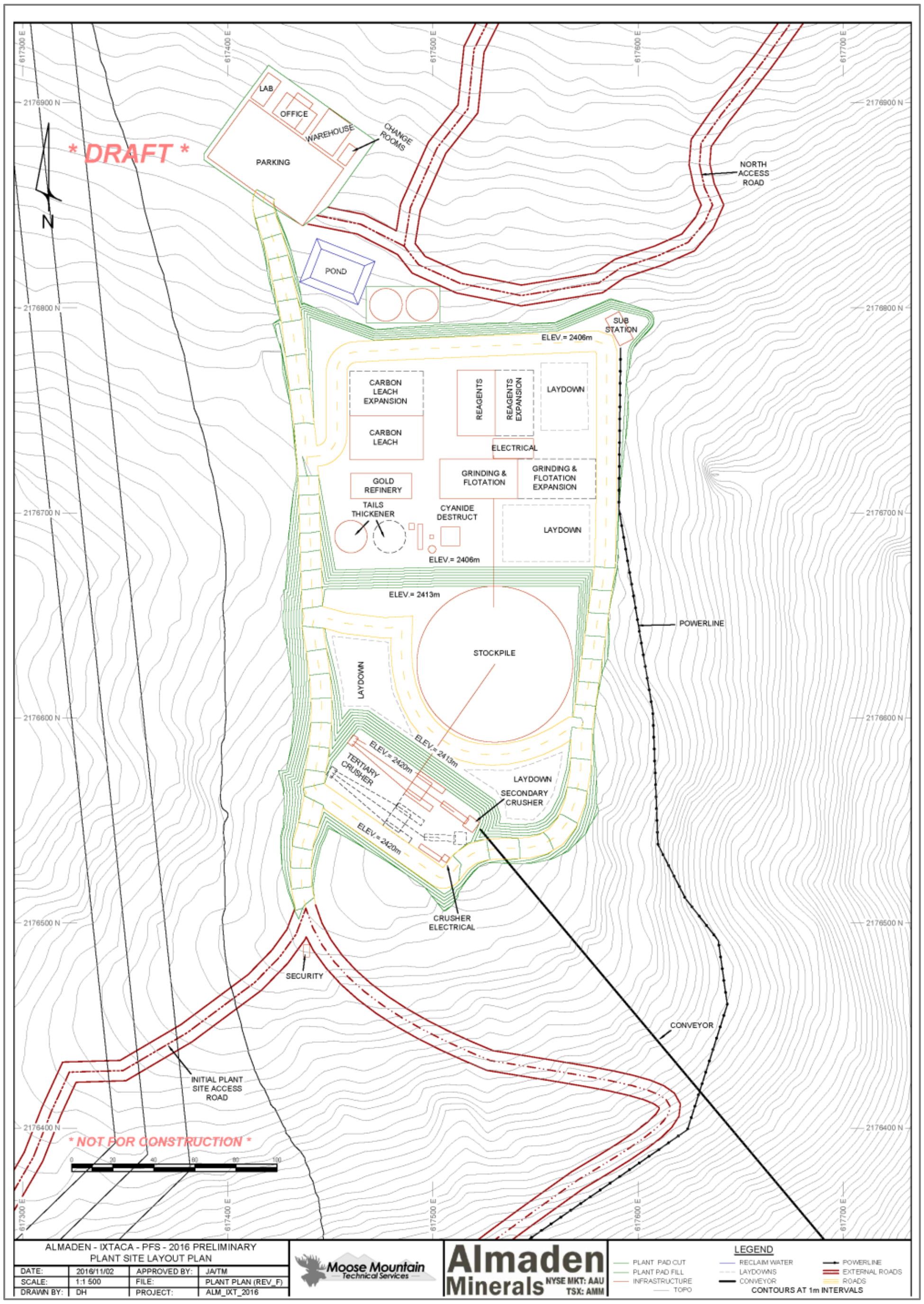


Figure 17-7 Plant Site General Arrangement Overview

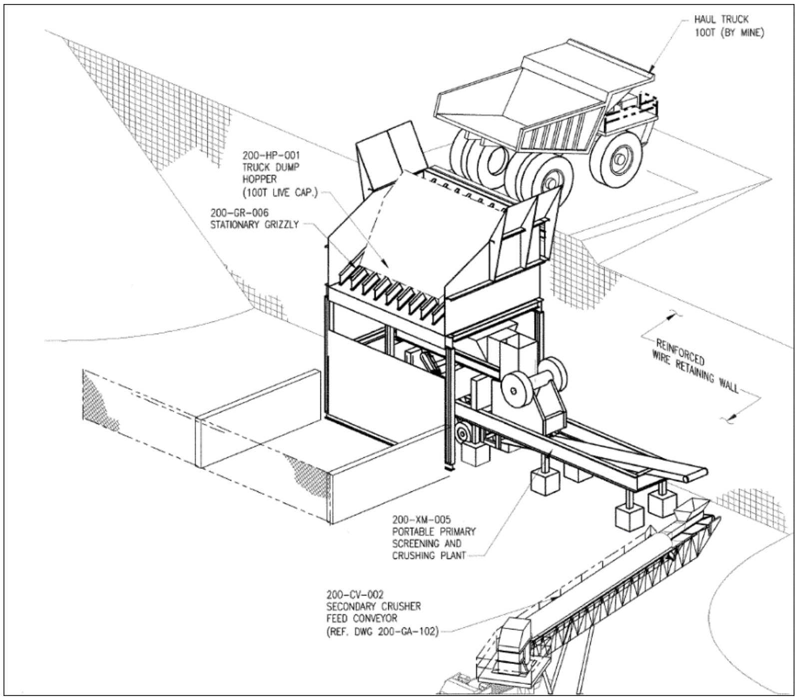


Figure 17-8 Primary Crusher (Rock Creek Layout)

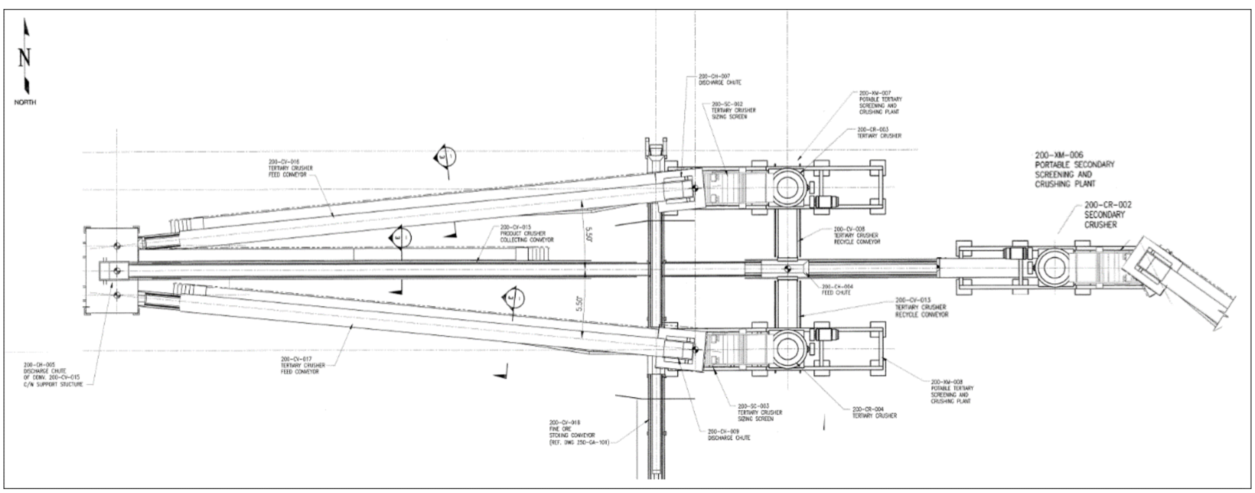


Figure 17-9 Secondary and Tertiary Crusher (Modified from Rock Creek Layout)

17.3.2 Grinding and Gravity Concentration

Grinding and Gravity Concentration stage includes a closed-circuit generating a gravity concentrate and flotation feed stream with particle size P_{80} of 75 mm (see Figure 17-10). Undersize (-2mm) from a pre-classification double deck screen feeds the gravity concentrators, while the screen oversize feeds the existing ball mill (18.43 feet diameter x 25.63 feet length and 2x2,000 kW motors). Ball mill product along with tails from the gravity concentrators is classified using a vibrating screen (Derrick's Stack Screen). The stack screen's oversize is recirculated to the ball mill, or alternatively a fraction of its stream to the pre-classification screen. The stack screen's undersize become the flotation feed stream.

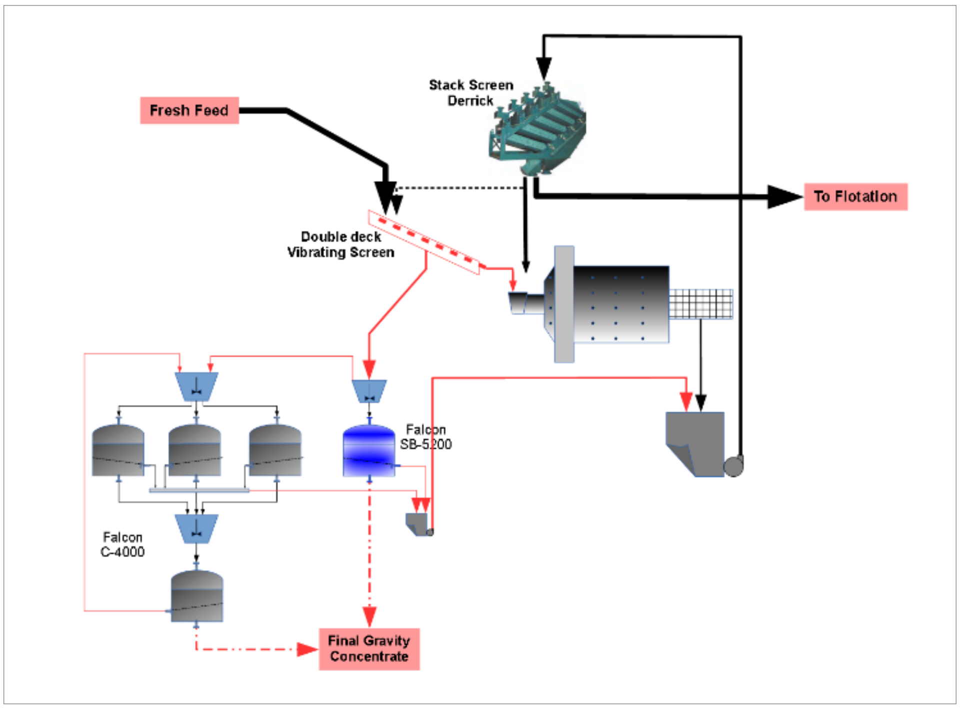


Figure 17-10 Gravity – Grinding Flowsheet

Gravity concentration uses the existing five gravity concentrators equipment from the Rock Creek plant. Due to its high selectivity, the semi-batch concentrator (model SB5200, approximately 300 t/h nominal capacity) will operate as single pass unit. The four continuous concentrators model C4000 and approximately 100 t/h nominal capacity each will be arranged in a configuration that allows them to operate in parallel, in series, or a in combination series/parallel (as shown in Figure 17-10) to match plant's throughput while maximizing metal recovery and selectivity.

17.3.3 Flotation

Flotation includes a single rougher bank consisting of four x 160 m^3 mechanical cells, each using forced-air. Regent consumptions developed from metallurgical test work described in Section 13 are shown in Table 17-1.

Table 17-1 Flotation reagent's consumption

Reagent	Consumption kg/tonne
CuSO4*5H2O	0.125
SIPX	0.125
AERO 3477	0.063
Aerofroth 65	0.060
Lime	0.50

17.3.4 Flotation Concentrate Regrind

Flotation concentrate is reground on a tyre driven ball mill of 2.1m diameter x 6.0 meter long and 330 kW motor before being transferred to the agitated leaching stage.

17.3.5 Intensive Leaching

The gravity concentrate will be subject to a regrind prior to leaching in the intensive cyanidation leach tank with capacity for 96 hours of residence time. Leach residue from intensive leaching is transferred to the agitated leaching stage.

On a gravity concentrate mass basis, the projected sodium cyanide consumption is 12 kg/tonne and lime consumption is 3 kg/tonne, or equivalent to 0.6 kgNaCN/tonne and 0.015 kg/tonne of lime.

17.3.6 Agitated leaching and CIP

Agitated leaching will process the reground flotation concentrate stream and the residue stream from the intensive leaching stage. The total residence time in leaching is 72 hours in 6 tanks operating in series. On a concentrate mass basis, the projected sodium cyanide consumption is 12 kg/tonne which depending on the flotation concentrate mass pull will range between 0.7 kg and 1.0 kg NaCN/tonne of total mill feed. The lime consumption is expected to be 3 kg/tonne of concentrate or equivalent to between 0.25 and 0.50 kg lime/tonne of total mill feed.

Slurry will be contacted with carbon (CIP) using six tanks operating in series accounting to a total of 12 hours of residence time. Carbon concentration in the CIP is projected from test work at 20 g/L.

Existing equipment from the Rock Creek mill will be used for carbon desorption, carbon reactivation, precious metals electrowinning, and pouring a dore bar. Allowance in the initial capital estimate has been made for additional equipment required to treat the carbon inventory resulting from high Ixtaca silver grades at Ixtaca.

The PFS maximizes the utilization of the equipment available with the purchase of the Rock Creek process plant and the carbon circuit remain the PFS basis. It should be noted that in future studies Ixtaca could also use a Merrill-Crowe circuit to recover the precious metals from the PLS solution.

17.3.7 Detoxification

Tails from the CIP stage will be washed, thickened and fed to a detox reactor at 50% solids w/w. Slurry washing-thickening takes place in two-thickeners operating in series. Slurry produced from the detoxification stage is transferred to the final tailings thickener.

17.3.8 Final tailings thickener

The final tailings thickener will combine tailings stream from the flotation plant and from the detoxification plant. Overflow process water from thickener will be recirculated to the process. Thickener's underflow is transferred to the tailings storage facility.

17.4 Process Labour

An organizational chart outlining process labour is shown in Figure 17-11. The total personnel in the process plant facilities is estimated at 67. The personnel will work on 5x5 rotation with 8 hours/day shifts.

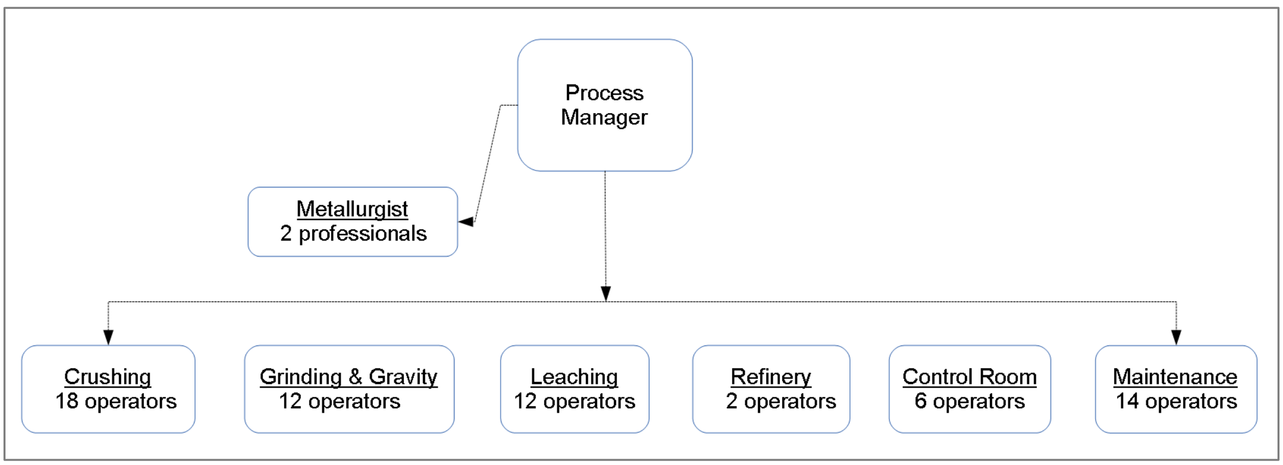


Figure 17-11 Process organization chart

17.5 Major Process Equipment

The Table 17-2 lists the major process equipment projected for Ixtaca's flowsheet for both the initial plant and the Year 5 Expansion.

Table 17-2 Major Process Equipment List, Startup and Expanded Scenario

Equipment	Specification	Initial	Expansion
Primary crusher	Chassis mounted Jaw crusher 42" x 50", 200 HP	Existing, FLSmidth TST 1400	existing
Primary crusher feeder	Vibrating Grizzly feeder 50"x20'x 5" opening, 50	Existing, FLSmidth	existing
Secondary crushing	1 x Chassis mounted, preclassification screen,	Existing, FLSmidth + Conveyor	
Secondary crusher	1 x Cone crusher 5.5' std. head, 400 HP, model	Existing, FLSmidth	add one secondary
Secondary screen	1 x Vibrating double deck screen 6'x20', 50 HP,	Existing, FLSmidth	add one secondary
Tertiary crushing station	2 x Chassis mounted, preclassification screen,	Existing, FLSmidth + Conveyor	
Tertiary crusher	2 x Cone crusher 5.5' std. head, 400 HP, model	Existing, FLSmidth	add one tertiary crusher
Tertiary screen	1 x Vibrating double deck screen 6'x20', 50 HP,	Existing, FLSmidth	add one tertiary screen
Grinding pre-	Double deck vibrating screen 10,000 inch2 , top 5	New	duplicate
Gravity concentration	Gravity concentrator units 1-SB5200, 4 x C4000	Existing, Falcon	Add one SB5200
Grinding	Ball mill 18.43 x 25.63, 2 x 2,000 kW, overflow	Existing, Rauma-Repola	duplicate
Grinding Clasification	Derrick Stack Screen 2SG48-60R/W-5STK	New, Derrick Corporation	duplicate
Flotation cells	1 rougher bank 4 x 160 m3, forced-air, mechanical	New	duplicate
Flotation rougher	Sepro Tyre Drive Mill, 2.1x6.0 m @ 330 kW	New, on skids	duplicate
Gravity concentrate	Sepro Tyre Drive Mill, 1.2 x 2.3 m @ 37 kW	New, on skids	existing
Intensive leach reactor	Agitated tank 2 x 5.6m dimater x 7.6 height	New	duplicate
Agitation leaching	6 x 10.7m diameter x 14m height agitated tank	Existing, modified	duplicate
Carbon in Pulp	6 x 6m diameter x 8m height agitated tank	New	duplicate
Carbon reactivation	reactivation kiln Denver KL001 100 lb	Existing to be expanded	duplicate
Boiler	Boiler Tube 2.4 MM BTU, 4-3000	Existing to be expanded	duplicate
Carbon stripping	Carbon stripping column 3' x 24'	Existing to be expanded	duplicate
Electrowinning	electrowinning cell 2x25kW rectifier	Existing to be expanded	duplicate
Detoxification	2 x high rate thickener 15m diameter	New	duplicate
Detoxification	1 x surge capacity tank		duplicate
Detoxification	Detoxification reactor	New	duplicate

17.6 Electrical Power Supply

The Mexican's electrical power supply authority, the Centro Nacional de Control de Energia (CENACE) has executed two specific studies for Ixtaca Project confirming that electrical power is available off the existing national grid. The studies concluded that Ixtaca's electrical load of 15 MW can be satisfied from the electrical substation Zocac through a 27 kilometers long transmission line operating at 115 kV.

18 Project Infrastructure

18.1 Site Access

The Project is accessible by driving 40 km east along Highway 119 from Apizaco; an industrial center located approximately 50 km north of Puebla City, and then north approximately 20 km along a paved road to the town of Santa Maria. Public gravel roads currently traverse the proposed mining areas.

Site access road requirement are depicted on Figure 18-3.

Public bypass roads are located to the east and west of the Project. A new road is constructed around Santa Maria to bypass mine traffic around the town.

A new bridge will be installed across the Rio Apulco to accommodate mine deliveries.

Most onsite road will only require upgrading of existing roads. Figure 18-3 distinguishes between new and upgraded roads.

18.2 Power

Almaden has engaged Federal Electricity Commission (Comisión Federal de Electricidad or CFE) through one of its departments, the Centro Nacional de Control de la Energía (CENACE) to complete an assessment of power delivery to the Project.

The first study, (Estudio Indicativo) completed by CENACE examined generation capacity and concluded that Ixtaca will be supplied through a 115 kV transmission line from a substation at Apizaco called Zocac. Total length of the transmission line is 27 km.

The Project requires a new 115/4.16 transformer onsite as the connection point to the transmission line.

Plant power distribution from the main substation will be by overhead power lines and buried conduits.

Low voltage power distribution from the transformers will be relocated from the Rock Creek plant.

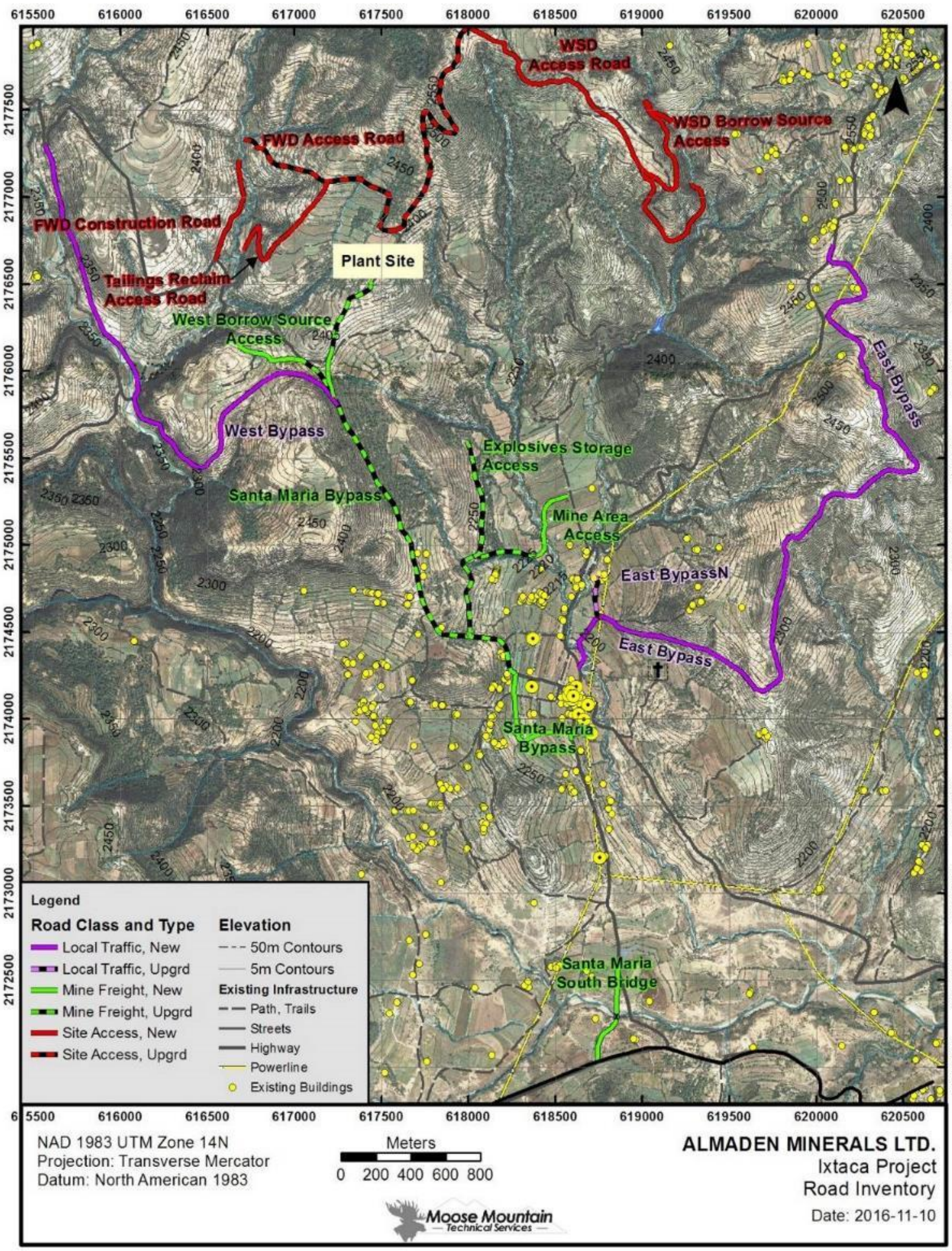


Figure 18-1 Ixtaca Project Roads

18.3 Water Supply

Regional and site specific data were used to determine a monthly distribution of rainfall for the Project. Regional data were compiled for four sites in the Project vicinity and are presented in Table 18-1.

Table 18-1 Regional Rainfall Data

Station Number	Station Name	Easting (m)	Northing (m)	Elevation (masl)	Period of Record	Years of Complete Record	Average Annual Precipitation (mm)	Distance from Ixtaca (km)
21047	Ixtacamaxtitlan	624,340	2,176,063	2,472	1954-2014	52	602	7.7
21021	Capulaque	629,773	2,188,906	2,098	1954-2014	52	976	18.4
21103	Zacapoaxtla	647,802	2,197,903	1,828	1944-2014	57	1411	38.1
21140	Chignahuapan	601,280	2,194,000	2,291	1975-2014	23	776	23.6

A climate station was installed at the Project site in April 2013. The available rainfall data (April 2013 to August 2016) were used to develop a long-term estimate of the monthly distribution of rainfall for the Project as presented in Table 18-2.

Table 18-2 Ixtaca Project Monthly Rainfall Distribution

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (mm)	11	13	19	48	78	130	106	102	125	61	18	10	720

A detailed monthly water balance model was then prepared for the Project using GoldSim. The model incorporated the rainfall distribution and other key parameters and assumptions, as follows:

- Mean annual precipitation: 720 mm
- Mean annual evapotranspiration: 714 mm (estimated from temperature data and project location)
- Daily processing rate (tailings production): 7,500 tonne/day for Years 1-4; 15,300 tonne/day for Years 5-13 and 8,100 tonnes/day for Year 14
- Tailings slurry solids content: 50%
- Ore water content: 4%
- Average tailings settled dry density: 1.3 t/m^3
- Fresh water requirement: 0.7 m^3/tonne ore for Years 1-4 and 0.4 m^3/tonne ore for Years 5-14

The main elements in the water balance model include the Tailings Management Facility (TMF), Water Storage Dam (WSD), Fresh Water Dams (FWDs) within the TMF, the Open Pit, and the Rock Storage Facilities (RSFs). The overall site water management plan for Year 14 is shown on Figure 18-2.

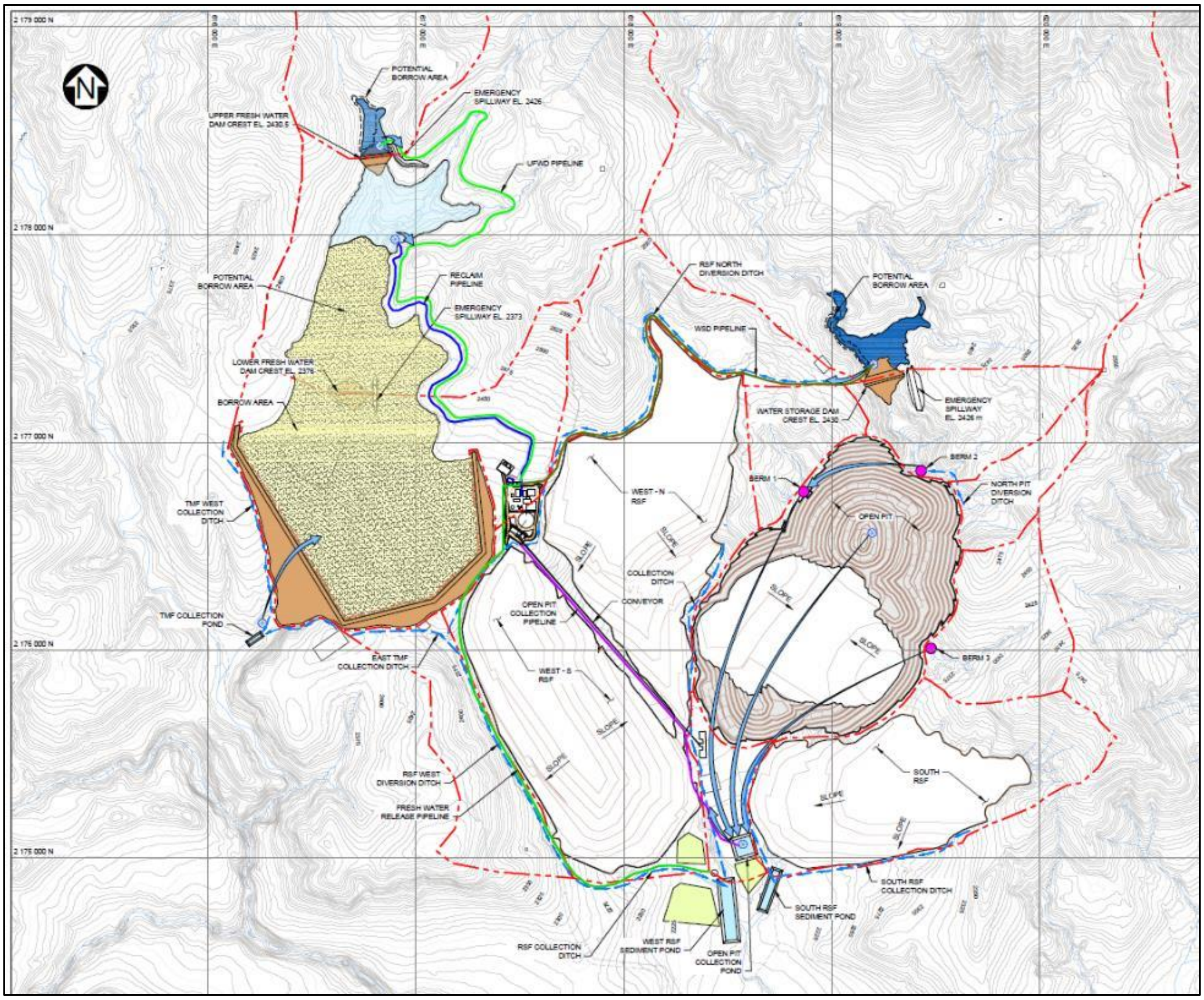


Figure 18-2 Overall Site Water Management Plan – Year 14

The main objectives of the site water management plan are to optimize the use of water, prevent the discharge of water from the TMF, maximize the use of storm water runoff as fresh water supply to the Plant Site, and to maintain a flow of water downstream of the mine for the community. Process plant demands will be met from the following sources:

- Supernatant water reclaimed from the TMF pond
- Fresh water will be provided from various sources including:
    - Surface runoff in the open pit and the Rock Storage Facilities
    - The Lower and Upper FWD in the TMF basin
    - The WSD if required (not expected under average climatic conditions)

In the early years of operations (Years 1 to 4) a water surplus is expected to develop in the TMF because of the higher fresh water demand, and lower use of supernatant water. Mechanical evaporators will be used to prevent the build-up of a large surplus in the TMF and to avoid having to release water. As the tailings beach grows, the amount of evaporation will increase, and therefore the amount of required mechanical evaporation will decrease. After Year 4 the additional rate of reclaiming from the TMF eliminates the need for mechanical evaporation.

The flows between the facilities for Year 1 are presented on Figure 18-3. The values shown are for average precipitation and temperature conditions.

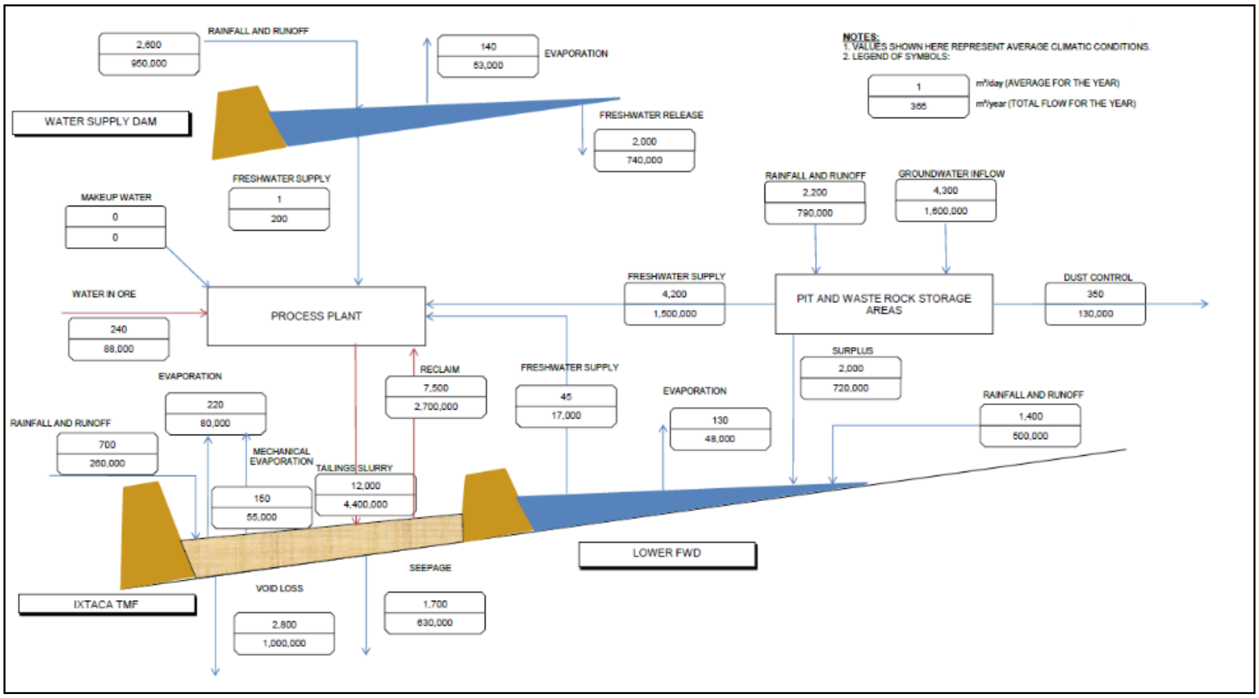


Figure 18-3 Site Water Balance – Year 1

A portion of rainfall or groundwater inflow accumulated in the open pit will be used for dust control during the dry months.

The results of the water balance model illustrate that the mine will operate in a water balance under average climatic conditions when the fresh water supply to the plant is 0.7 m³/tonne of ore in Years 1-4 and 0.4 m³/tonne of ore for the rest of the mine life. The model results are sensitive to the precipitation conditions and runoff coefficient, and detailed monitoring and forecasting will be required during operations. A sensitivity analysis was therefore completed and in all cases, zero discharge from the TMF was achieved as mechanical evaporation was sufficient to control the volume of water in the TMF.

18.4 Maintenance Facility

The maintenance facility location is in the area of the crusher near the pit rim. Major maintenance on haul trucks will be done at the maintenance facility. Mine area administration offices, dry, wash bays, warehouse, and fuel storage will also be located in this area. The maintenance facility will be expanded in Year 4 to accommodate the ramp-up in equipment fleet size which will start in Year 5.

18.5 Tailings Management Facility

The PFS mine plan includes storage of 65 Mt of tailings in the TMF over a 14 year operating period, as follows:

- 7,500 tpd for Years 1 to 4
- 15,300 for Years 5 to 13
- 8,100 tpd for Year 14

18.5.1 Alternative Tailings Management Facility Locations

Alternative TMF arrangements were previously assessed. A preferred TMF location was chosen for development based on technical and operational criteria related to the most efficient storage of tailings and water, embankment fill and construction requirements, mechanical infrastructure, and expansion potential.

18.5.2 Tailings Technology

Tailings are typically described by their condition at delivery. The range is referred to as the tailings continuum, which qualitatively describes the following:

- Solids content
- Thickening effort
- Method of delivery to facility, and
- Segregation during placement.

Solids content is generally accepted as the defining parameter for tailings technology and the various technologies are categorized in Table 18-3.

Table 18-3 Tailings Technology

Tailings Technology	Typical Solids Content at Discharge (by mass)
Conventional Slurry	30-35%
Thickened Slurry	45-50%
Ultra-Thickened Slurry	55-65%
Paste	70-75%
Filtered (Dewatered)	85%

A high level assessment of tailings technology was conducted. Thickened slurry tailings disposal is the recommended technology for the Ixtaca Project based on the availability of surface water, the complexity of other options, and consideration of capital and operating costs.

18.5.3 Design Criteria Summary

The TMF has been designed for a 14-year mine life with an average throughput of 7,650 tpd for Years 1 to 4, 15,300 tpd for Years 5 to 13, and 8,100 tpd for Year 14. The total mill throughput is 65 Mt. Thickened slurry tailings discharge will be utilized, with an assumed slurry solids content of 50% (by mass). The average settled dry density of the tailings was assumed to be 1.3 t/m^3. Tailings will be delivered in a single pipeline and stored within the TMF.

The TMF embankment construction sequence involves starter embankments to store 2 years of tailings and ongoing expansions using the centerline construction method, as described below.

- Stage 1A: provides 6 months of storage. Construction completed prior to startup and costs included in initial capital. Embankment fill will be provided from local borrow areas.
- Stage 1B: 18 months (total 2 years), construction completed immediately after Stage 1A as a downstream expansion and costs included in sustaining capital. Embankment fill will be provided from local borrow areas.
- Ongoing expansions (for Years 3-14): construction completed approx. every 2 years as centerline expansions and costs included in sustaining capital. The bulk fill for the expansions will comprise waste rock from the open pit.

The upstream and downstream overall slopes of the starter embankments are 3H:1V. The final downstream slope of the embankment is 2.5H:1V. The crest width is 20 m.

Key TMF design criteria are summarized in Table 18-4.

Table 18-4 Ixtaca TMF Design Criteria Summary

Life of Mine	14 years
Mill Throughput (Tailings Production)	7,500 tpd (Years 1-4) 15,300 tpd (Years 5-13) 8,100 tpd (Year 14)
Tailings Slurry Solids Content By Weight (Assumed)	50%
Total Tailings **Tailings Average Settled Dry Density** **Total Tailings Volume**	65 Mt 1.3 t/m^3 50 Mm^3
Freeboard Allowance for Probable Maximum Flood (PMF)	Varies: 20 m (Stage 1A) to 4 m (Final)
Upstream and Downstream Starter Embankment Overall Slopes	3H:1V
Final Downstream Embankment Slope	2.5H:1V
Embankment Crest Width	20 m

The general arrangement of the final TMF for Year 14 is shown on Figure 18-4.

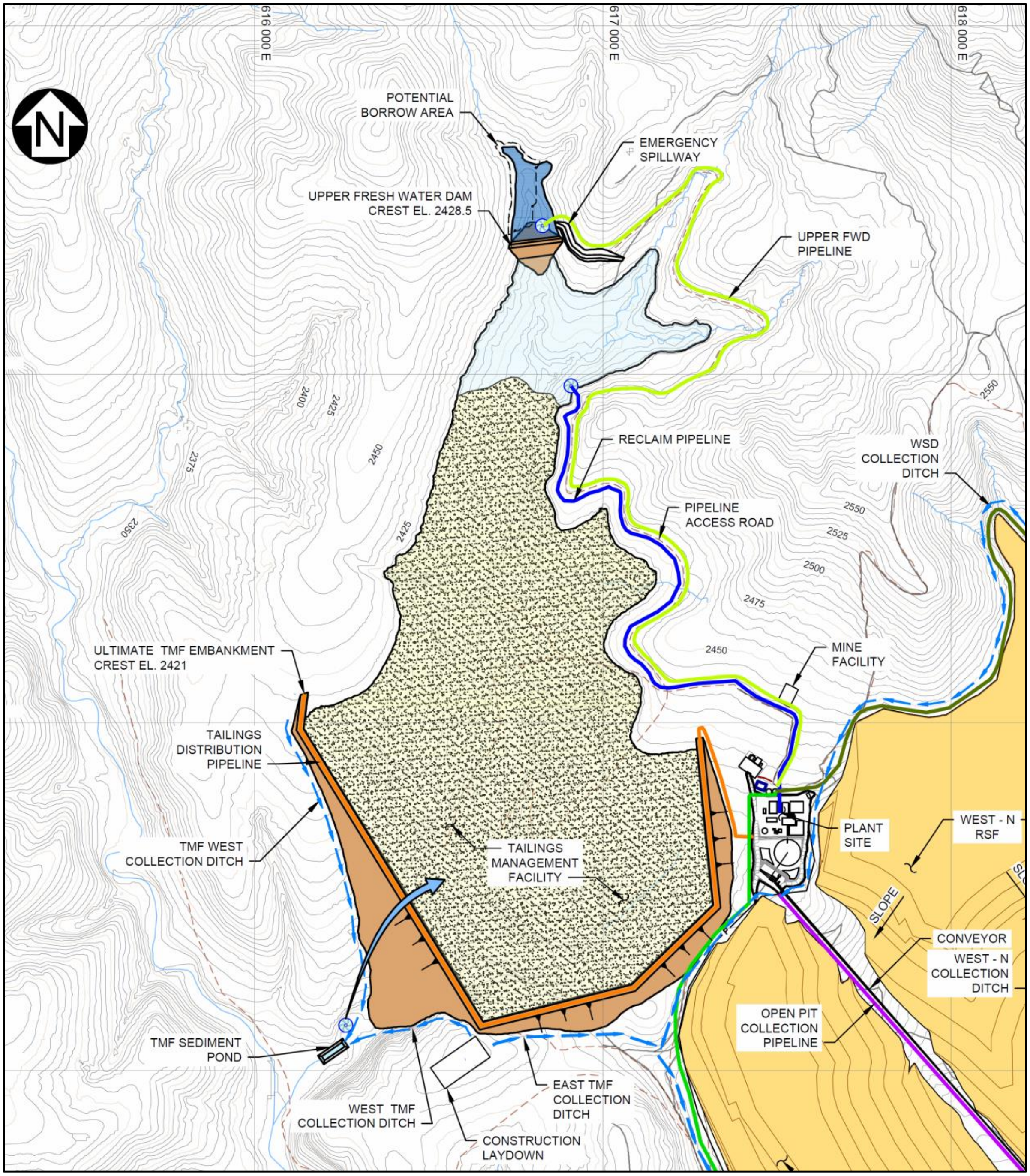


Figure 18-4 Tailings Management Facility General Arrangement - Year 14

18.5.4 TMF Design

The following sections provide a brief description of the TMF design:

Embankment Construction - The TMF embankments are zoned earth/rockfill structures. The fill zones in the embankments are described below.

- Erosion Protection Layer (Zone 1): Random Fill that will not degrade on contact with water. The erosion protection layer will be placed on the upstream face of the embankment as a sacrificial layer to protect the internal zones.
- Low Permeability Core (Zone 2): Low permeability Tuff bedrock from nearby local borrow areas within the TMF basin. This material will generally require no processing except for the removal of oversized particles. The material will be placed and compacted in relatively thin lifts.
- Filter/Transition Zone (Zone 3): Clean, fine to coarse sand will be placed within the core zone to prevent piping of the core zone material and reduce pore pressures within the embankment. This material will generally require processing and will be placed and spread in lifts.
- Shell Zone - Starter Embankments (Zone 2): The Stage 1A and 1B shell zones will be constructed using the same material as the core.
- Shell Zone - Embankment Expansions (Zones 4A and 4B): For expansions past Stage 1B, the embankment shell zones will be constructed using limestone waste rock sourced from the open pit. The waste rock will be placed and compacted in thicker lifts. This material will also be used as erosion protection on the upstream face of the dam above Stage 1B.

The mine plan has indicated there will be sufficient and suitable waste rock available to construct the TMF expansions over the mine life.

The embankment fill zones will require foundation preparation prior to placement of the fill materials. This will include clearing, stripping and grubbing and stockpiling of topsoil materials for later use in reclamation.

The TMF embankment cross section is shown on Figure 18-5.

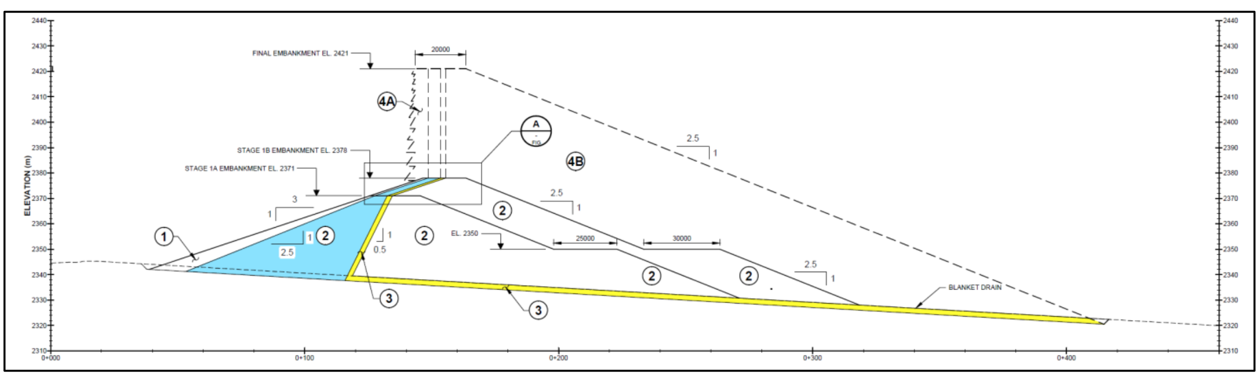


Figure 18-5 Tailings Management Facility Embankment Cross Section - Year 14

Tailings Distribution and Reclaim System - The tailings distribution system will deliver the tailings slurry in a single pipeline for storage within the TMF. A slurry solids content of 50% has been adopted, with an average settled dry density of 1.3 t/m^3. Tailings will be deposited from the TMF embankments over the life of the operations. A pump system will be required for thickened tailings distribution.

Runoff and supernatant water will accumulate in the TMF. A floating pump and pipeline will be installed to allow for water to be reclaimed from the supernatant pond for mill operations. The reclaim barge will be positioned in the location of the initial (start-up) pond and will move with supernatant pond as the tailings level raises. The reclaim water pipeline will extend from the barge to the mill.

Water Management - In addition to tailings solids, the TMF is designed to manage process water, surface runoff, and incident precipitation for the life of the mine. Tailings slurry will be deposited in the TMF, and water will be reclaimed for use in processing. There will not be any discharge of water from the TMF and mechanical evaporation will be used to prevent the accumulation of slurry water (Years 1 to 4). As the tailings beach grows, the amount of natural evaporation increases and therefore the amount of mechanical evaporation will decrease. Under drier conditions when less fresh water may be available, additional water can be reclaimed from the TMF to reduce the need for mechanical evaporation. After Year 4 the additional rate of reclaiming from the TMF eliminates the need for mechanical evaporation.

Water management for the Project also includes a Fresh Water Dam (FWD) within the upper reaches of the TMF basin to provide fresh water for processing. Two FWDs are planned for the life-of-mine:

- Lower FWD: will be constructed prior to start-up and will operate for approx. 4 years or until it is inundated by tailings deposited in the TMF.
- Upper FWD: will be constructed in year 4 and will operate for the remainder of the life of mine.

The FWDs include lined earth/rockfill embankments to impound runoff from the upstream TMF watershed and a pump station and pipeline to transfer collected water to the Plant Site.

Seepage and Runoff Management System - A seepage and runoff management system will be provided for the TMF. This system will include a pond located downstream of the final embankment. Water from the embankment drains will also discharge into the pond. Recycle pumps and pipelines will return the collected water to the TMF.

Embankment Instrumentation - Instrumentation is included for ongoing monitoring of the performance of the TMF embankment. The instrumentation will include vibrating wire piezometers installed in the foundation and embankment fill, in addition to surface movement monuments. Groundwater quality monitoring wells will also be required and would be included under the mine environmental plans.

18.5.5 TMF Closure

The overall objective at closure of the TMF is for a walk-away scenario in which the TMF will be left as an environmentally and physically stable landform, with a landscape and habitat consistent with adjacent land use requiring minimal post closure monitoring and maintenance. The closure concept includes a construction of the closure cap that results in transformation of the Ixtaca TMF to a stable, convex, free-draining landform which will simplify closure water management requirements.

TMF closure and rehabilitation activities will be carried out concurrently during later years of operations and primarily at the end of mining. Closure and rehabilitation activities will be in line with international closure standards. Measures must be taken to ensure that:

- Dust is not emitted from the facility as a result of the loss of moisture from the surface of the TMF.
- Runoff does not affect surface or groundwater.
- The TMF embankment remains stable.

It is expected that supernatant water on the TMF will dry up after the mill is shut down with surplus water removed so the capping can be completed. General aspects of the closure plan include:

- Selective discharge of tailings around the facility during the final years of operations to establish and flatten the final tailings beach to facilitate reclamation.
- All pumps, pipes and other infrastructure related to the tailings, reclaim, and seepage pumping systems will be dismantled and removed from site.
- Removing the TMF seepage collection pumpback systems at such time that suitable water quality for direct release is achieved.
- Removing and re-grading all access roads, ponds, ditches, and borrow areas not required beyond mine closure.
- Long-term stabilization of all exposed erodible materials.
- The facility will be capped with a non-potentially acid generating waste rock layer with slope of approximately 1% to shed water away from the TMF impoundment.
- A 300 mm thick layer of topsoil material that was stockpiled during TMF construction will be spread over the waste rock cap to permit natural revegetation.
- Diversion ditches will be built to divert flows from the upper TMF catchment area.

18.6 Site Wide Water Management

The open pit has a large catchment and a water diversion system is required to prevent uncontrolled runoff from flowing into the open pit. The open pit diversion system includes the Water Storage Dam (WSD), located upstream of the open pit, with a floating pump station and pipeline to transfer water to a collection point at the Plant Site.

The WSD is a zoned earth/rockfill structure designed to store up to approx. 1.8 million m^3 of water. The volume of water stored in the WSD is fairly constant over the year and maintains a full pond under average conditions. During operations, the fresh water release will be varied to manage the volume in the WSD. The primary outflow from the WSD is fresh water release to the downstream community; however, the WSD provides a contingency supply for processing water in the event of dry climatic conditions.

An emergency spillway is located on the left (east) abutment of the WSD to prevent overtopping of the facility during the IDF event. Extreme event flows would be routed through the spillway and discharged into the drainage upstream of the open pit.

Additional site water management measures are included to collect all water from disturbed and undisturbed catchments areas for use in processing. Runoff from disturbed areas will be collected and settled in sediment control ponds. Runoff from undisturbed areas will be collected in collection ponds for use in processing.

Water management measures will be implemented at the open pit and will include horizontal drains to reduce pore water pressure in the pit walls. The pit water management systems will also include dewatering pumps and pipeworks to remove precipitation during the rainy season and after storm events.

19 Market Studies and Contracts

The Ixtaca Project is expected to produce a silver-gold bar assaying approximately 95% silver and 2% gold when assuming 98% purity; these are typical specifications for precious metals produced by the mining industry. The market for silver-gold bars is extensive with numerous buyers operating in the spot market as well as in long term contracts in North America, Europe, and Asia. Ixtaca has not yet entered into sales agreements with potential buyers.

20 Environmental Studies, Permitting and Social or Community Impact

Significant environmental and social study and analyses have been conducted for the Ixtaca Project.

20.1 Environmental Studies

A summary of key physical, chemical, and biological environments is provided in the following sub-sections.

20.1.1 Meteorology

Site-specific climate data collection began in 2013, using an automated climate station established by KP downstream of the proposed tailings management facility (TMF), at an elevation of approximately 2250 m. This station, which is called the Ixtaca Climate station, is currently operating and collects data of air temperature, humidity, solar and net radiation, wind speed and direction, precipitation, and atmospheric pressure.

In 2015, two additional automated precipitation stations were added, both of which consist of a tipping bucket rain gauge and a data logger. The Almeya station is located upstream of the TMF at an approximate elevation of 2615 m, and the Bodega station is located downstream of the proposed Project area at an approximate elevation of 2250 m.

Summary data from the Ixtaca Climate station includes a mean annual temperature of approximately 14°C, with mean monthly temperatures ranging from a low of approximately 12°C to 13°C in December/January to a high of approximately 16°C to 17°C in April/May/June. Other metrics from the station include (Knight Piésold, 2017):

- Relative humidity measurements indicate that the climate is reasonably dry, particularly in the winter months, with an annual average of approximately 70%.
- Over an approximate three-year period, the maximum wind speed was 14.9 m/s, and monthly average wind speeds ranged from 2 m/s to 3 m/s.
- The predominant wind directions were north and north-west.
- Solar radiation is typically greatest in April and least in October, and ranges from approximately 5.9 kWh/m^2 to 3.4 kWh/m^2.
- The mean annual lake evaporation is estimated to be approximately 714 mm, with monthly mean values ranging from approximately 46 mm in December/January to 74 mm in May.
- The long-term mean annual precipitation is estimated to be 720 mm, and occurs entirely as rainfall.
- The wet season is from May to October, when 84% of annual rainfall is expected to occur, on average. The wettest month is typically June.
- Rainfall on site, particularly during the wet season, tends to arrive in short duration, high intensity bursts.
- Barometric pressure is relatively uniform year round at approximately 102.6 kPa.

Additionally, climate data are available from Government of Mexico regional meteorological stations; several of which are located within 35km of the Project, each with over 25 years of daily data on precipitation, evaporation, and minimum and maximum temperatures. The Ixtaca Climate station data were compared to the regional stations and found to have similar data trends.

20.1.2 Surface Hydrology

The local climate, and the size, vegetation cover, and soil and rock types of each drainage basin, are all elements that contribute to how local rivers and streams behave from a hydrologic perspective. It is common in many areas of Mexico for much of the annual precipitation to occur as short duration high-intensity rainstorms. This precipitation regime, combined with the steep topography and relatively little ground cover typical of the Ixtaca Project area, can produce very rapid runoff responses and correspondingly high peak flows. A stream that exhibits this type of runoff response is characterised as being "flashy". This high-intensity pulse type of precipitation pattern, combined with the warm temperatures and high evaporation rates characteristic of the area, furthermore results in intermittent and episodic flow patterns, and some creeks experience frequent and extended periods with little or no flow.

Five hydrology measurement stations in the Project were installed in 2014. Continuous streamflow records for streams in the Project area are currently being collected, with an enhanced program installed in May 2017. Data collected to date include the following (Knight Piésold, 2017):

- The mean annual runoff is estimated to range from 58 mm (1.8 l/s/km2) to 87 mm (2.8 l/s/km2).
- Streams in the area follow an episodic/ephemeral hydrologic regime, and the annual hydrographs mimic the patterns of annual precipitation, with the highest flows typically occurring during the wet season of May to October and the lowest flows occurring during the dry season of November to April.
- The stage records for the Project site stream gauges exhibit the 'flashy nature' of streams in the area, with water levels rising and falling very rapidly in response to short duration high-intensity rainstorms.
- Return period peak discharge values at the Project were calculated to range between 2 m3/s for a 2-year return period, up to 77 m3/s for a 500-year return period.
- Flows typically fall to very low levels during the dry season, and some creeks go completely dry for short and extended periods each year.
- Low flows are typically higher at the Project area in northern upland sites than in southern lowland sites.

20.1.3 Surface Water Quality

The baseline (pre-project) surface water quality analysis is based on data collected from 2009 (prior to any drilling on the property) to November 2016 and reported in Knight Piésold (2017a) from the following catchments and sites:

- Coxalenteme catchment
- El Tecolote catchment
- Río Los Ameles/Río Apulco
- Río Los Lobos

- Río Grande, and
- Río Tuligtic.

The site locations are illustrated on Figure 20-1.

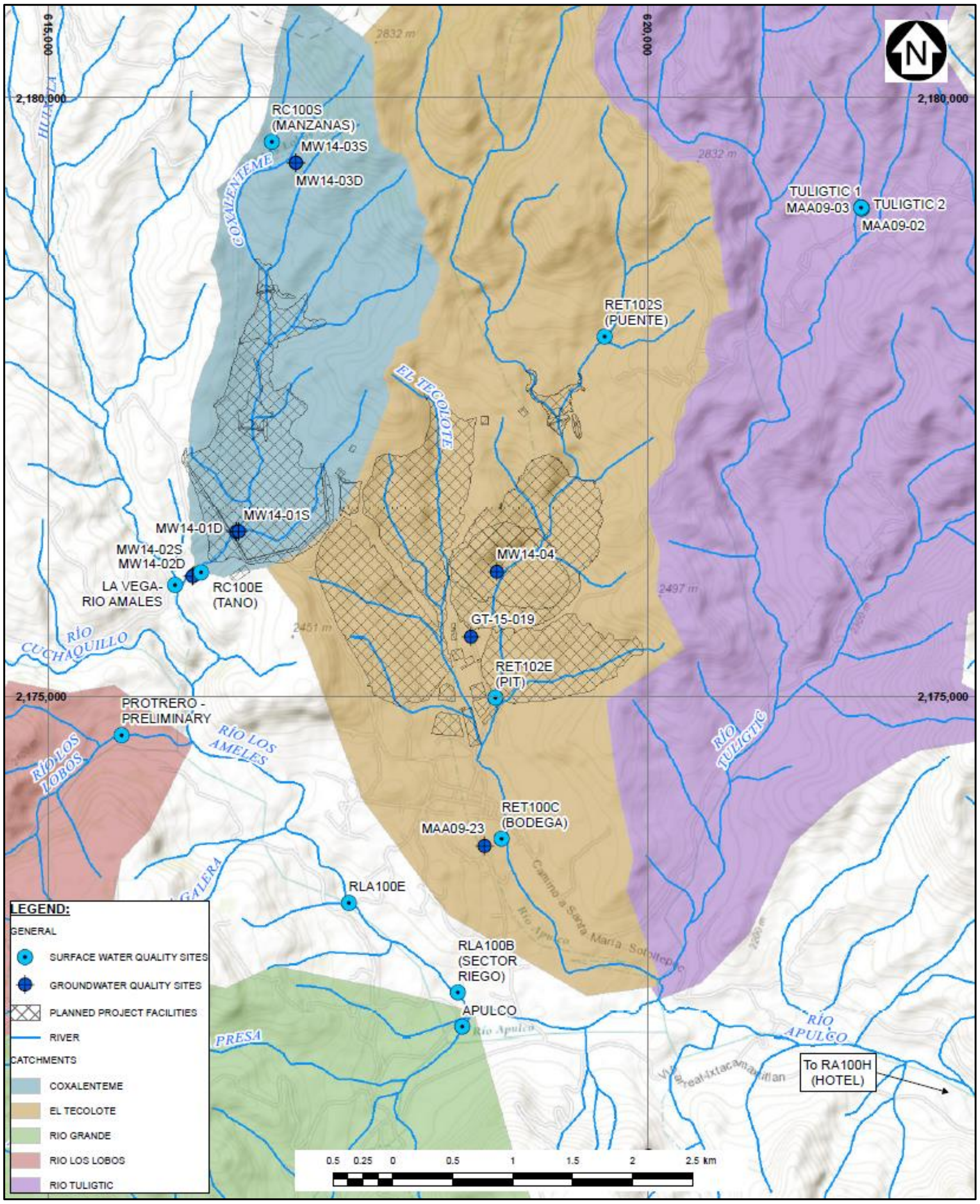


Figure 20-1 Surface and Ground Water Quality Sampling Sites

Upstream sites in the El Tecolote and Coxalenteme catchments had sufficient flow to sample surface water quality year-round but the monitoring sites in the lower reaches of these catchments were frequently reported as dry outside of the rainy season. Flow conditions were always sufficient to collect water quality samples from the monitoring locations further downstream in the Rio Apulco and Rio Los Lobos and only occasionally reported as dry in the Rio Los Ameles.

Ion concentrations generally decreased from upstream to downstream and were higher in the Coxalenteme and El Tecolote catchments than at sites outside of the project area. Water within the project area is generally classified as neutral to slightly basic, hard to very hard and well-buffered, with variable turbidity and total suspended solids (TSS). Turbidity and TSS increased from upstream to downstream within the Coxalenteme and El Tecolote catchments and exceeded the relevant water quality standards at some sites. Total and dissolved concentrations of some metals (aluminum, copper, chromium iron, and lead) increased from upstream to downstream in the El Tecolote catchment and in the Coxalenteme catchment. Metal concentrations were generally highest toward the end of the wet season, in September and October.

Analytical results were compared with the water quality standards included in the following: Ley Federal de Derechos (LFD) and Norma Oficial Mexicana (NOM; NOM-127-DW (drinking water standards) and NOM-001 (discharge standards for irrigation and aquatic life)). The standards were selected based on the potential local uses, which include: Aquatic Life (NOM 001 Aq and LFD-Aq), Irrigation (NOM-001-Irrigation and LFD-Irrigation), and Drinking Water (NOM-127-DW).

20.1.4 Groundwater

The interpretation of site hydrogeological conditions (Knight Piésold, 2017b) considered data collected as part of hydrogeology, hydrometeorology, geotechnical, geomechanical, and geophysical site investigations. Data reviewed included climate and hydrology information, permeability testing at 45 locations, water level monitoring at 38 locations, geophysical surveys along three transects (transient electromagnetic survey), and water quality data collected from eight groundwater locations.

Six lithologic units will control groundwater flow in the project area:

- Overburden – The overburden is generally thin (less than 1 m) but reaches up to 7 m thick in river valleys.
- Volcaniclastics – The volcaniclastic unit is heterogeneous and includes localized sub-layers of fine ash, coarse ash, breccia, and lapilli ash tuff. Permeability of the volcaniclastics varies depending on the degree of consolidation and fracturing. Volcaniclastics material associated with hydrothermal alteration is typically more competent and more prone to fracturing, which increases the permeability.
- Limestone and Shale – The sedimentary units are typically low permeability units but permeability increases locally along fold axes and near the intrusive contact.
- Intrusions – The intrusive body is expected to have a low permeability, except at the contact with the host rock. Fracturing and permeability locally increases in the sedimentary host rock near intrusions.
- Faults – Faults may act as conduits or barriers to groundwater flow. The limited testing conducted across faults during drilling did not identify structures with increased permeability.

- Groundwater flow at the project site will be matrix flow driven within the primary porosity of the weaker (unconsolidated) volcaniclastics and as fracture flow within the secondary porosity (fractures) where the volcaniclastics is hardened by alteration. Groundwater flow through sedimentary units will occur in fractures and joint sets, particularly where it is highly fractured due to folding or near intrusive contacts.

Groundwater in the project area flows south from the topographic high defined by the mountains in the north toward the lowlands. Groundwater discharges to surface in the northern upland portions of the project area catchments and sustains a trickle of streamflow year-round. This streamflow infiltrates the subsurface as streams flow south down the hillslope and onto the lowlands. Streams within the downstream portion of the project area are dry during periods of no rain. Recharge to the groundwater system consists of meteoric recharge and recharge from streams during episodic periods of rain.

Groundwater levels across the site range from 5 mbgs (metres below ground surface) within the downstream portion of the Tailings Management Facility (TMF) valley to greater than 150 mbgs along hilltops. Groundwater levels in the deposit area vary from 15 mbgs to greater than 150 mbgs and vary from 30 to 40 mbgs south of the deposit. Depth to groundwater in the proposed TMF valley increases with distance upstream and ranges from 5 mbgs beneath the proposed south embankment to 30 to 35 mbgs in the central and upstream portions of the proposed TMF footprint. Depth to water within the ridges bounding the TMF are more than 100 mbgs, which indicates the water table is relatively flat within the proposed TMF area and there is little evidence of groundwater mounding beneath ridges. The deep water levels in ridges means that groundwater flow in the southern portion of the Rio Coxalenteme catchment is not directed toward the drainage and may flow across the surface water divide into the Rio El Tecolote catchment. Vertical hydraulic gradients at monitoring sites in the proposed TMF and deposit areas indicate a downward component of flow.

Groundwater flow velocity is estimated to range from 0.002 m/day to 0.7 m/day. The lower velocities represent flow within the unconsolidated volcaniclastic unit in the area of the proposed TMF, and the higher range is expected along the hillslopes north of the Project.

Groundwater use in the project area consists of domestic use of springs occurring in the catchment above the project area. A historic study identified one groundwater well in the project area; however, it was reported to be "without use".

20.1.5 Groundwater Quality

Three dominant groundwater types have been identified in the Project area (Knight Piésold, 2017b): (1) calcium-sulphate, (2) calcium-bicarbonate, and (3) sodium-bicarbonate. A few locations have intermediate water types, specifically with respect to the dominance of carbonate or sulphate. Water types are not well correlated to specific lithological units but are likely influenced by their position within the watershed, localized geochemical enrichment, localized mineral enrichment, and residence time of the groundwater in the vicinity of each of the monitoring wells. Groundwater in the project area is generally characterized as neutral to slightly basic pH, alkaline with strong buffering capacity and varied hardness.

20.1.6 Geochemistry

Rock quality has been reviewed for the presence of Potential Acid Generating (PAG) waste material in a static test Acid Base Accounting (ABA) program. A total of 53 samples were selected from all potential waste rock sources.

Test methods utilized in the static program included:

- Multi-Element ICP Scan by aqua regia digestion with ICP-MS finish
- ABA by the Modified Sobek Method, and
- Leach tests with carbon dioxide equilibrated extract solution.

The testing program was conducted in accordance with Mexican regulations; including NOM-157-SEMARNAT-2009, which establishes procedures to implement mine waste management plans and Anexo Normative 5 of NOM-141-SEMARNAT-2003, which describes the test methods for whole rock chemistry analysis, leach tests and acid base accounting.

The program concluded that the geologic materials exposed, excavated and processed during mining have little potential to produce acid rock drainage or to leach contained metals. The materials contain large amounts of neutralizing potential and relatively small amounts of sulphide sulphur. Based on this testing and previous results, there is more than enough neutralizing potential present in site materials to neutralize any acid generated and no segregation of material by ARD potential is warranted. The site materials are not expected to generate leachate with concentrations of metals at above levels of concern.

20.1.7 Flora and Fauna

Almaden has engaged local consultants who have completed a flora and fauna study for the Project to develop the baseline conditions (COREVI, 2014). Vegetation was studied to determine the structure and diversity of the existing communities and the geographic coverage of each characterized vegetation type.

The Project area is characterised by sparse tree cover, and is primarily used for agriculture / ranching. Native tree cover includes Táscate (Juniper) in the lower elevations, with fragmented Pine - Oak Forest at higher elevations. The lower elevations show significant anthropogenic disturbance and are dominated by agricultural species and/or a shrub layer composed primarily of cactus, agave, and grass species.

During the vegetation study there were no species identified within the Project area that are registered as endemic or protected. There were no species of vegetation identified listed on the NOM-059-SEMARNAT-2010, which defines the protection for native flora and fauna species in Mexico.

Similarly, the faunal abundance and diversity is low. Birds are the most abundant faunal element, with 13 species observed at site. These were dominated by songbirds, with birds of prey, doves, cuckoos, and ground birds also present. Only one species observed at site is listed on the NOM-059-SEMARNAT-2010; the Montezuma quail (*Cyrtonyx montezumae*). This species is widely distributed throughout Mexico and the southern United States. Its habitat is known to be affected by cattle grazing, which removes the ground vegetation it utilizes for cover; however its population is considered stable, to the effect that legal hunting is permitted in the U.S.

Additionally during the faunal study (COREVI, 2014), 3 species of lizard and 11 species of mammal were identified. None of the species were listed as on the NOM-059-SEMARNAT-2010.

Prior to construction, flora and fauna "rescue" programs will be implemented to relocate any protected species from the Project footprint and ensure their ongoing propagation.

20.2 Permitting

Mine permitting in Mexico is administered by the federal government body Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). Guidance for the federal environmental requirements is derived from the Ley General del Equilibrio Ecológico y la Protección al Ambiente (LGEEPA). Article 28 of the LGEEPA specifies that SEMARNAT must issue prior approval to parties intending to develop a mine and mineral processing plant. An Environmental Impact Assessment (Manifestación de Impacto Ambiental (MIA) by Mexican regulations) is the mechanism whereby approval conditions are specified where works or activities have the potential to cause ecological imbalance or have adverse effects on the environment. This is supported by Article 62 of the Reglamento de la Ley Minera. Article 5 of the LGEEPA authorizes SEMARNAT to provide the approvals for the works specified in Article 28.

The LGEEPA also contains articles that are relevant to conservation of soils, tailings management, water quality, flora and fauna, noise emissions, air quality, and hazardous waste management. The Ley de Aguas Nacionales provides authority to the Comisión Nacional de Agua (CONAGUA), an agency within SEMARNAT, to issue water abstraction concessions, and specifies certain requirements to be met by applicants.

Another important piece of environmental legislation is the Ley General de Desarrollo Forestal Sustentable (LGDFS). Article 117 of the LGDFS indicates that authorizations must be granted by SEMARNAT for land use changes to industrial purposes. An application for change in land use or Cambio de Uso de Suelo (CUS), must be accompanied by a Technical Supporting Study (Estudio Técnico Justificativo, or ETJ).

Almaden has engaged a Mexican environmental consultant to develop the MIA, CUS, and ETJ for the Ixtaca Project, with an anticipated submission in the second quarter of 2017.

Guidance for implementation and adherence to many of the stipulations of environmental legislation is provided in a series of Normas Oficiales Mexicanas (NOM). These NOM provide specific procedures, limits, and guidelines, and carry the force of law. The relevant permit application will be developed as the Project progresses.

20.3 Social and Community Engagement

20.3.1 Local Communities

The Ixtaca Project is located within the State of Puebla, in the municipality of Ixtacamaxtitlán. Ixtacamaxtitlán covers approximately 561km^2 and the Project is located in the northern portion of the municipality. Ixtacamaxtitlán is home to approximately 0.4% of the population of the State of Puebla, or

25,326 people (2010 census) and, although located only a short 2-hour drive from large Volkswagen and Audi manufacturing facilities, it is one of Puebla's poorest municipalities.

The local economy is based on activities such as agriculture and livestock ranching which is done on a limited commercial basis, but largely for individual and family use. There are small-scale artisans known locally for fabrication of wooden furniture.

Mexico's Instituto Nacional de Estadística y Geografía ("INEGI") collected extensive census data on Ixtacamaxtitlán in 2010, which provides a good general picture of this part of Mexico. The closest communities to Ixtaca are Santa Maria Zotoltepec, Zacatepec, Vista Hermosa de Lázaro Cárdenas, and Tuligtic.

Generally speaking, these communities have a lack of employment opportunities with a large number of families dependent on social services. The Consejo Nacional de Población (CONAPO) rates their degree of marginalization as "high", which is an index calculation based on levels of illiteracy, and access to basic services and infrastructure (drainage, availability of drinking water, dirt floor, toilet, electric power).

Similarly, the Consejo Nacional de Evaluación de la Politica de Desarrollo Social (CONEVAL) estimates that 25.1% of the municipal population lives in extreme poverty; 56% in conditions of moderate poverty; and 17% of the population are vulnerable to some aspect of social deficiency.

20.3.2 Community Engagement

Open, transparent communication with stakeholders has been fundamental to Almaden's approach since staking the original Tuligtic claims in 2001.

Over the past several years, Almaden has interacted with over 20,000 people from over 53 communities and 8 different states in the following ways:

- Coordinated seven large community meetings, with total attendance at these meetings approaching 2,600 people;
- Taken a total of approximately 440 people, drawn from local communities, to visit 22 mines;
- Arranged 25 sessions of "Dialogos Transversales", wherein community members are invited to attend discussions with experts on a diverse range of issues relating to the mining industry such as an overview of Mexican Mining Law, Human Rights and Mining, mineral processing, explosives, water in mining, risk management, and mine infrastructure;
- Opened a central community office in the town of Santa Maria Zotoltepec, which is continually open to community members and includes an anonymous suggestion box;
- Invested in a "mobile mining module" which allows company representatives to establish a temporary presence in communities more distant from the project, and allows for those interested to learn more about the project;
- Employed as many local people as possible, reaching up to 70 people drawn from 5 local communities. Almaden operates the drills used at the project, and hence can draw and train a local workforce as opposed to bringing in external contractors;

- Initiated a program of scholarships for top performing local students, with 80 scholarships granted to date to individuals from 23 different communities (44 women and 36 men);
- Established several clubs, including reading, dancing, football, music, and theatre clubs, in order to contribute to the vitality of local communities;
- Focused on education, enabling 2,441 people to be positively impacted by our investments, such as rehabilitation of school-related infrastructure, donation of electronic equipment, and scholarships for top-performing students.

Positive impacts to the socio-economy of the region are expected to continue as the Project is developed into a mine and becomes a source of more jobs. Almaden plans to continue its open communication with the communities to provide for realistic expectations of any proposed mining operation and the social impacts of such a development.

20.3.3 Land Acquisition

Almaden has secured through purchase agreements roughly 1,018 hectares, from numerous independent owners, the majority of that required for the proposed production plan. This was completed through friendly land purchase agreements with locals, considering fair market value. There are no communities that require relocation as part of the Project development. Mineral Claim owners have the right to obtain the temporary occupancy, or creation of land easements required to carry out exploration and mining operations, under the Federal Mining Law.

20.3.4 Potential Social or Community Requirements and/or Plans

The Ixtaca project is in an area previously logged and with little to no current land use. The mine will not require the resettlement of any communities. It is currently anticipated that water wells will not be required, as preliminary models indicate that there is sufficient water for operations from collection of rainwater. As the local community draws its water from springs at higher elevations than the mine plan, community water is unlikely to be impacted by mine development.

20.4 Mine Closure

Mexico does not have detailed reclamation legislation, but has national environmental laws and is currently developing more specific mine closure requirements. Guidance for the construction, operation, and closure of tailings impoundments is included in a national regulation revealed in 2003 (NOM-141-SEMARNAT-2003). Post operation criteria are presented in Section 5.7 of NOM-141-SEMARNAT-2003 and include the following:

Upon closure of the TMF, measures must be taken to ensure that:

- Dust is not emitted into the atmosphere as a result of the loss of moisture from the surface of the tailings dam or from the curtain wall, among others;
- Run-off does not affect surface water and groundwater; and
- The tailings dam does not fail.

The closure plan at Ixtaca includes the following:

- Removal and rehabilitation of all facilities except the Water Storage Dam and water supply to Santa Maria
- Re-sloping of waste RSF as required
- Revegetation of all disturbed areas
- TMF closure as described in Section 18.5.5

Progressive reclamation will be carried out where possible.

The Project after closure is illustrated in the image below.

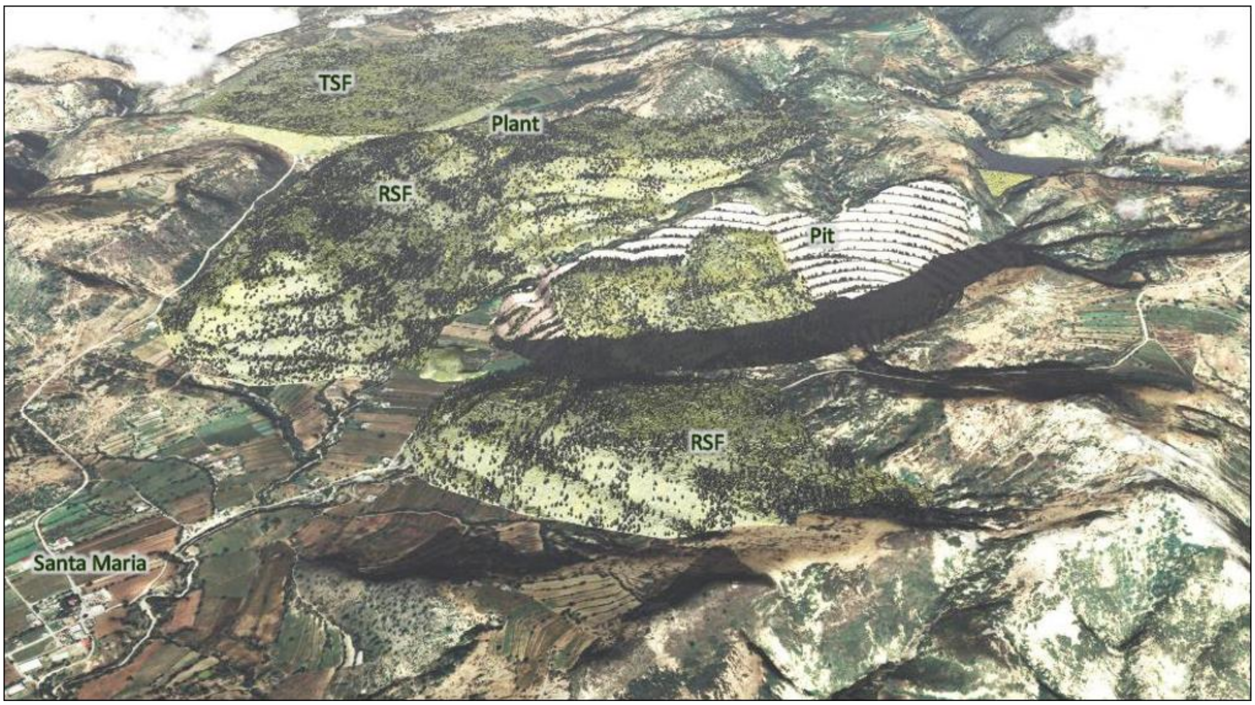


Figure 20-2 Post Closure Illustration – viewed from the southeast.

21 Capital and Operating Costs

21.1 Introduction

Costs for open pit mining, borrow source mining, bulk earthworks and road construction have primarily been priced by local mining contractors through a Request for Proposal (RFP). Similarly, the process and infrastructure costs have been priced using non-binding estimates from local engineering and construction contractors with recent experience in constructing mining projects. The companies that provided these estimates are equipped to carry out the construction of the Project.

All currencies shown in this Section are expressed in USD. A foreign exchange rate of 1USD : 20 MXN Peso has been used. The expected accuracy range of this estimate is in the order of +/-20% which is suitable for a PFS-level study.

21.2 Capital Costs

Initial capital of $116.9 million is estimated for the Ixtaca Project including the relocation the Rock Creek plant. Initial capital costs are estimates derived from a combination of experience in similar projects and consultation with contractors and equipment suppliers. Table 21-1 below shows the breakdown of initial capital, Table 21-2 shows the breakdown of sustaining capital.

Table 21-1 Initial Capital Cost Summary

	$ Millions
Direct Costs	
Mining	$12.1
Process	$35.6
TMF	$11.7
Water Management	$5.4
Onsite Infrastructure	$7.6
Offsite Infrastructure	$7.8
Environmental	$1.8
Subtotal Direct Costs	**$82.0**
Indirects	$14.6
Owners	$5.8
Contingency	$14.5
Total Initial Capital Cost	**$116.9**

Table 21-2 Sustaining Capital Cost Summary

	$ Millions
Direct Costs	
Mining	$15.1

Process	$41.2
TMF and Water Management	$20.3
Infrastructure	$12.2
Closure and Salvage	$6.6
Subtotal Direct Costs	**$95.4**
Indirects and Contingency	$23.8
Total Sustaining Capital Cost	**$119.2**

21.2.1 Responsibilities

The following companies assisted in compiling the estimated capital costs:

- MMTS: Open Pit Mining, Layout & General Arrangement, Plant Infrastructure, Instrumentation and Controls, Piping, External power Supply, Process Plant Electrical Distribution, Mechanical Equipment, and Operating Costs, Environmental, and Owner's Costs.
- KP: Tailings and Water Management
- MMTS was responsible for the assembly of the overall estimate.

21.2.2 Basis of Estimate

Costs for open pit mining, borrow source mining, bulk earthworks and road construction have been priced by local mining contractors through a Request for Proposal (RFP).

Process and infrastructure costs are priced using non-binding estimates from local engineering and construction contractors with recent experience in constructing mining projects. Contractors estimates have been derived from the following:

- A review of the existing Rock Creek "Issued for Construction" (IFC) drawings accompanying the Rock Creek plant acquisition.
- Current general arrangement layouts of the Ixtaca mine and process layout.
- Engineering contractor audit of the Rock Creek plant and logistics plan to move the mill to the Ixtaca site, and estimated cost for the plant relocation from Nome, Alaska to the Ixtaca site.

Costs for non-major equipment not supplied from Rock Creek are based on in-house data or recent quotations.

21.2.2.1 Bulk Earthworks Including Site Preparation and Roads

Unit rates for clearing and grubbing, bulk earthwork, are based on costs provided by local contract miners.

MMTS has applied the estimated contractor miner to site bulk earthworks volumes estimated by MMTS. Waste rock overhaul for primary crusher pad fill has been estimated by MMTS.

Onsite and offsite roads costs have been estimated by contract miners.

21.2.2.2 Concrete

Costs were provided by area as defined by the issued for construction (IFC) Rock Creek Drawings and layouts with revisions described in the RFP.

21.2.2.3 Structural Steel

Structural steel costs have been derived from the existing Rock Creek IFC construction drawings with revisions as required.

21.2.2.4 Mechanical

The estimate was prepared from mechanical equipment lists and process flow diagrams designed and supplied from the Rock Creek facility.

The mechanical pricing is based on receiving free issue mechanical equipment and estimated erection and installation costs.

Historical data was used to assess costs for other major equipment, and all other mechanical equipment which will be not be delivered from Rock Creek. These costs are based on recent quotes and similar projects.

21.2.2.5 Platework and Liners

Costs for all platework and metal liners (measured in kilograms), for tanks, launders, pumpboxes, and chutes have been assessed from the Rock Creek IFC drawings.

21.2.2.6 Piping

Estimates for piping have been prepared from the existing IFC drawings at Rock Creek and adjusted for the Ixtaca facility.

21.2.2.7 Site Services

The following services were estimated from the Rock Creek IFC drawings:

- Install Plant Air system Installation (equipment is supplied)
- Construct and install Cooling Water system (equipment is supplied)
- Construct and install pump station for tailings reclaim water (pump and motor are supplied)
- Construct and install pump station for TMF water reclaim (pump and motor are supplied)
- Construct and install pump station for Water Storage Dam freshwater supply (pump and motor are supplied)
- Construct and install plant site storage pond
- Construct and install process water storage tanks
- Install potable water treatment plant, storage tanks and water distribution
- Install waste water (sewage) treatment and disposal
- Construct a landfill for non-nuisance waste

21.2.2.8 On Site Electrical Distribution

Electrical costs were estimated from the current Ixtaca layout and the IFC Rock Creek Drawings.

21.2.2.9 Off Site Electrical Distribution

The cost estimate for permanent electrical power supply by means of a transmission line to the site's substation costs have developed by the engineering contractor. This includes interaction with the external power network, transmission line right of way and proposed design concept.

21.2.2.10 Instrumentation

Plant control system costs are based on the installation of a Distributed Control System (DCS). Cost of the DCS is based on budgetary quotes.

Field Instruments will be based on the Rock creek IFC drawings, including necessary junction boxes and cabling.

Site communication costs are based on Rock creek IFC drawings.

21.2.2.11 Open Pit Mining

Contract miner quotes have been used for:

- Estimated earthworks unit rates.
- Equipment mobilization costs
- Explosive related facilities

MMTS has included allowance for mine operations management, mine planning, and mine technical services in EPCM.

21.2.2.12 Tailings, Water Management, and Closure

KP supplied cost estimates associated with tailings disposal and water management, based primarily on MTOs estimated by KP and unit rates from MMTS, which were provided by local contract miners. Other rates were derived from experience on the design and construction of waste and water management facilities for other mines.

21.2.2.13 Environmental

MMTS costs for environmental include estimated CONAFOR compensation for habitat disturbance. Allowance has also been made for environmental management during construction.

21.2.2.14 Estimate base currency

The estimate has been prepared with US dollars (US$) as the base currency. Estimates provided by Mexican mining contractor were based in Mexican Peso (MXN) and converted to USD using 1 US$ = 20 MXN. Fluctuations in foreign exchange rates were not considered in this PFS estimate.

21.2.2.15 Labour Cost

Labour costs for the PFS are by contractor's budgetary quotations for the following:

- Contract mining
- Process and infrastructure
- Tailing and Water Management (pump and piping estimates by KP)

- Dismantling, Refurbishment, Transportation and Delivery to site

Travel and living out allowance is included in the contractor's quoted rates. It is expected that most personnel will be hired locally by the contractor. The location is close to several small towns, and 50km from Apizaco a major industrial zone. It is expected that the contractor will arrange their own accommodation.

The construction work week will be based on 10 hrs a day with 3 weeks on and 1 week off.

A productivity factor has been built into the Contractor's costs and applied to the labour portion of the estimate to allow for the inefficiency.

21.2.2.16 Owner's costs

A 5% allowance has been made for Owner's costs to cover the following items:

- Corporate office staff assigned to the project
- Owner's project management staff
- Owner's home office travel
- Owner's home office general expense
- Owner's field staffing
- Owner's field travel
- Owner's field general expenses
- Recruitment Allowance
- Training programs for operations staff
- Builders risk insurance, general liability insurance, political risk insurance and miscellaneous allowances for deductible claims
- Property Taxes
- Sustainability commitments
- Site security
- Housing assistance allowance
- Project legal costs
- Product marketing
- Land surveys (including roads during construction)
- Relocation costs and assignment costs
- Supplemental Geotechnical work and drilling programs
- Metallurgical test-work programs
- Permits and licenses
- Commissions and royalties
- Miscellaneous outside consultants
- Right-of-way and land purchase costs
- Sunk costs or acquisition costs
- Partnership or joint venture costs
- Goodwill and local infrastructure contributions
- Environmental costs allowance
- Reclamation surety bond allowance

21.2.2.17 Contingency

Contingency is an allowance for undefined items of work that reside within the current scope of the project which have not been foreseen or described at the time the estimate. A contingency based on the total direct and indirect costs is included to cover undefined costs. The contingency includes funding for items that have been inadvertently missed during the estimating phase or adjusted during the execution phase of the project.

Contingency Excludes:

- Major scope changes such as changes in end product specification, capacities, building sizes, and location of the asset or project.
- Extraordinary events such as major strikes and natural disasters.
- Management reserves.
- Escalation and currency effects.

Contingency is generally included in most estimates, and is expected to be expended. Varying amounts of contingency have been applied to reflect the varying degrees of risk of different components of the project.

Table 21.3 shows the Allowances for Contingencies.

Table 21.3 Allowances for Contingencies

Section	Description	(%)
01	Tailings Management	20
02	Water Management	20
06	Mining Pre-production	0
07	Mining Mobile Equipment	15
10	Earthworks (Bulk)	20
13	Earthworks (Detail)	18
20	Concrete	18
30	Structural Steel	18
50	Mechanical	18
60	Piping	18
70	Electrical	18
80	Instrumentation	18
91	Construction Indirects	18
92	Spares	15
93	Initial Fills and WH Inventory	15
94	Freight and Logistics	15
96	EPCM	15
98	Owner's Costs	15

21.2.2.18 Exclusions

The following items are excluded from the initial capital cost estimate:

- Working capital (included in the financial model)

- Cost escalation during construction
- Taxes and duties
- Schedule delays
- Costs such as those caused by:
  - scope changes
  - unidentified adverse ground conditions
  - extraordinary climatic events
  - labor disputes
  - permit applications
  - receipt of information beyond the control of EPCM contractors
  - cost of financing
  - sunk costs
  - research and exploration drilling
  - royalties
  - sustaining capital (but will be included in the financial model)
  - permitting costs
  - closure costs (estimated separately)
  - salvage values
  - Duties and taxes - sales taxes should be identified in all costing so that exemptions can be estimated
  - Foreign exchange fluctuations
- Financing costs.
- Refundable taxes and duties.
- Currency fluctuations.
- Lost time due to severe weather conditions.
- Lost time due to force majeure.
- Customs duties and brokerage, are excluded from the freight and logistics estimate.
- Additional costs for accelerated or decelerated deliveries of equipment, materials and services resultant from a change in project schedule.
- Warehouse inventories other than those supplied in initial fills.
- Owner's costs unless provided by owner.
- Option payments for acquisition of the Rock Creek mill prior to a construction decision.
- Environmental bond cost.
- Any project sunk costs including this study.
- Mine reclamation and closure costs (included in sustaining capital costs).
- Escalation after Q2 2017.
- Community relations.

21.3 Operating Cost Estimate

21.3.1 Operating Cost Summary

The total life of mine operating costs for the Ixtaca Project are $22.5/tonne mill feed. Operating costs are summarized in the Tables below:

Table 21-4 LOM Operating Cost Summary

Mining costs	$1.70	$/tonne mined
Mining costs	$10.0	$/tonne milled
Processing	$11.6	$/tonne milled
G&A	$0.8	$/tonne milled
Total	**$22.5**	**$/tonne milled**

Note: numbers may not add up due to rounding.

21.3.2 Mining

Operating costs for mining are based on estimates supplied by local contractor mining companies. Average LOM Mine operating costs of $1.70/tonne also include GME costs for owner supervision and technical services.

21.3.3 Processing

A breakdown of process operating unit costs is presented in Table 21-5.

Table 21-5 Process Operating Cost Summary

	Year 1 to 4		Year 5 to 14	
	Average Annual Cost ($M)	**Unit Cost ($/t)**	**Average Annual Cost ($M)**	**Unit Cost ($/t)**
Electricity	$9.92	3.67	$15.48	2.85
Labour	$1.38	0.51	$1.49	0.27
Crushing	$1.53	0.57	$2.66	0.49
Overland Conveyor	$0.29	0.11	$0.43	0.08
Gravity concentration	$0.66	0.24	$0.69	0.13
Grinding	$3.09	1.14	$4.89	0.90
Flotation	$2.83	1.05	$5.37	0.99
Leaching	$9.26	3.42	$18.30	3.37
Refinery	$6.24	2.31	$11.92	2.19
Tailings	$0.08	0.03	$0.11	0.02
Total	**$35.28**	**13.05**	**$61.34**	**11.30**

Note: numbers may not add up due to rounding.

An additional allowance of $250,000/yr is estimated for the operating costs for TMF.

Power

The annual power cost estimate is based on the power of all major equipment and a unit cost of 0.085 $/kWh based on in-house data from similar operations in Mexico.

Labour

Process labour averages 67 personnel in the first four years of operation, and peaks at 73 personnel. Labour will be locally sourced living with 20 minutes from the mine site. Labour rates are based on in-house data from local Mexican mining operations. A 5 day shift rotation with 3 x 8 hour shifts is planned.

Consumables

Consumable are based on reagent consumptions described in Section 17 and in-house unit costs or vendor quotes.

21.3.4 General & Administration (G&A)

Annual G&A cost is $3.68 M per year. including allowance for the following:

- Personnel
- Office Supplies
- Professional Associations
- Consultants
- Insurance
- Legal Services
- Regulatory Compliance/Audit
- Travel & Expenses
- Communications: Tel Fax Internet
- Computer and IT Services and Supplies
- Services, potable water, sewage, HVAC, etc.
- Community Public Relations & Donations
- Recruitment
- Training
- Power Costs
- Safety & Training Supplies
- Medical Services/First Aid
- Security Supplies
- Property Taxes
- Environmental
- Purchasing and Logistics, including warhouse costs
- External Assays/Testings
- Janitorial
- Light Vehicle Allowance
- Powerline Maintenance
- Road Maintenance

- Crew Transportation
- Miscellaneous

22 Economic Analysis

22.1 Assumptions

The economic analysis assumes the Ixtaca Project is a 100% equity financed project. All dollar amounts in this analysis are expressed in Q2 2017 US dollars, unless otherwise specified.

The Economic analysis includes the entire project life, comprising 1 year of construction and 14 years of mining and milling.

The valuation date on which the Net Present Value (NPV) and Internal Rate of Return (IRR) are measured is the commencement of construction in Year -1.

Details of the capital and operating cost estimates are described in Section 21. The production schedule used for the economic analysis is described in Section 16.

The PFS Update base case prices are derived from a combination of recent spot prices and current common peer usage.

Table 22-1 Inputs for Economic Analysis

Parameter	Value	Unit
Gold Price	1,250	$US/oz
Silver Price	18	$US/oz
AU Payable	99.8	%
AG Payable	99.0	%
Refining and Transport	1.10	US$/Oz
Almadex NSR Royalty	2.0	%
Extraordinary Mining Duty	0.5	%
Special Mining Duty	7.5	%
Income Tax	30.0	%

22.2 Taxes and Mining Duties

Effective January 1, 2014, the Mexican Tax Reform increased corporate income tax rate from 28% to 30% and introduced two new mining duties. The Tax Reform includes the implementation of a 7.5% Special Mining Duty (SMD) and a 0.5% Extraordinary Mining Duty (EMD) on gross revenue from the sale of gold, silver and platinum. The SMD is applicable to earnings before income tax, depreciation, depletion, amortization and interest. The SMD and EMD are tax deductible for income tax purposes. Total taxes and mining duties for the life of the Project amount to $248 million.

22.3 Analysis

The Project Cash Flow is summarized in **Table 22-2**.

Table 22-2 Cash Flow Summary

		-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	TOTAL
Production																	
Waste	**mt**	6.0	13.0	19.0	19.7	28.4	26.9	30.0	24.2	38.8	24.3	18.8	34.9	25.3	16.1	0.6	**326**
Mill Feed	mt	-	2.2	2.8	2.8	3.0	5.6	5.6	5.6	5.7	5.6	5.6	6.0	6.0	5.6	3.0	**65.1**
AU	g/t		0.782	0.692	1.140	0.723	0.717	0.628	0.789	0.694	0.693	0.364	0.417	0.526	0.374	0.531	**0.617**
AG	g/t		57.6	51.9	68.6	34.5	51.4	37.5	53.6	20.1	40.0	19.6	22.3	36.5	37.5	25.1	**37.7**
Dore Produced																	
AU	kOz		48	56	92	47	115	98	127	109	107	59	55	61	41	27	**1,043**
AG	kOz		3,643	4,203	5,546	3,036	8,320	6,110	8,659	3,288	6,474	3,171	3,894	6,372	6,060	2,157	**70,932**
Revenue																	
Payable Au	$m		60	69	115	59	143	123	158	136	134	73	69	77	51	34	**1,301**
Payable Ag	$m		65	75	99	54	148	109	154	59	115	57	69	114	108	38	**1,264**
Less Refining	$m		4	5	6	3	9	7	10	4	7	4	4	7	7	2	-
Less Royalty	$m		$2	$3	$4	$2	$6	$4	$6	$4	$5	$3	$3	$4	$3	$1	**50**
Net Payable	**$m**		**$119**	**$137**	**$203**	**$107**	**$277**	**$220**	**$297**	**$187**	**$237**	**$124**	**$131**	**$179**	**$149**	**$69**	**2,436**
Operating Costs																	
Process	$m		$29	$37	$37	$38	$64	$64	$64	$65	$64	$64	$65	$65	$64	$32	**$755**
TMF and Water	$m		$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	**$4**
G&A	$m		$4	$4	$4	$4	$4	$4	$4	$4	$4	$4	$4	$4	$4	$4	**$51**
Mine	$m		$23	$32	$33	$55	$59	$66	$68	$86	$67	$32	$38	$53	$31	$9	**$654**
Total Operating Costs	**$m**		**$56**	**$73**	**$74**	**$97**	**$128**	**$134**	**$136**	**$155**	**$135**	**$100**	**$108**	**$122**	**$99**	**$45**	**$1,463**
Net Income	**$m**		**$63**	**$64**	**$129**	**$10**	**$149**	**$86**	**$161**	**$32**	**$102**	**$23**	**$23**	**$57**	**$50**	**$24**	**973**
Total Capital Costs	**$m**	**$117**	**$11**	**$1**	**$4**	**$72**	**$3**	**$2**	**$2**	**$2**	**$3**	**$2**	**$5**	**$2**	**$2**	**$2**	**236**
Pretax Cash Flow	**$m**	**-$117**	**$52**	**$62**	**$124**	**-$62**	**$146**	**$83**	**$159**	**$31**	**$99**	**$22**	**$18**	**$55**	**$48**	**$22**	**737**
Total Taxes	**$m**	**$0**	**$5**	**$10**	**$41**	**$1**	**$44**	**$25**	**$52**	**$6**	**$30**	**$3**	**$2**	**$14**	**$13**	**$3**	**248**
After-Tax Cash Flow	**$m**	**-$117**	**$47**	**$52**	**$83**	**-$63**	**$102**	**$58**	**$107**	**$25**	**$68**	**$19**	**$16**	**$41**	**$36**	**$19**	**489**

The pre-tax cashflow is shown in Figure 22-1.

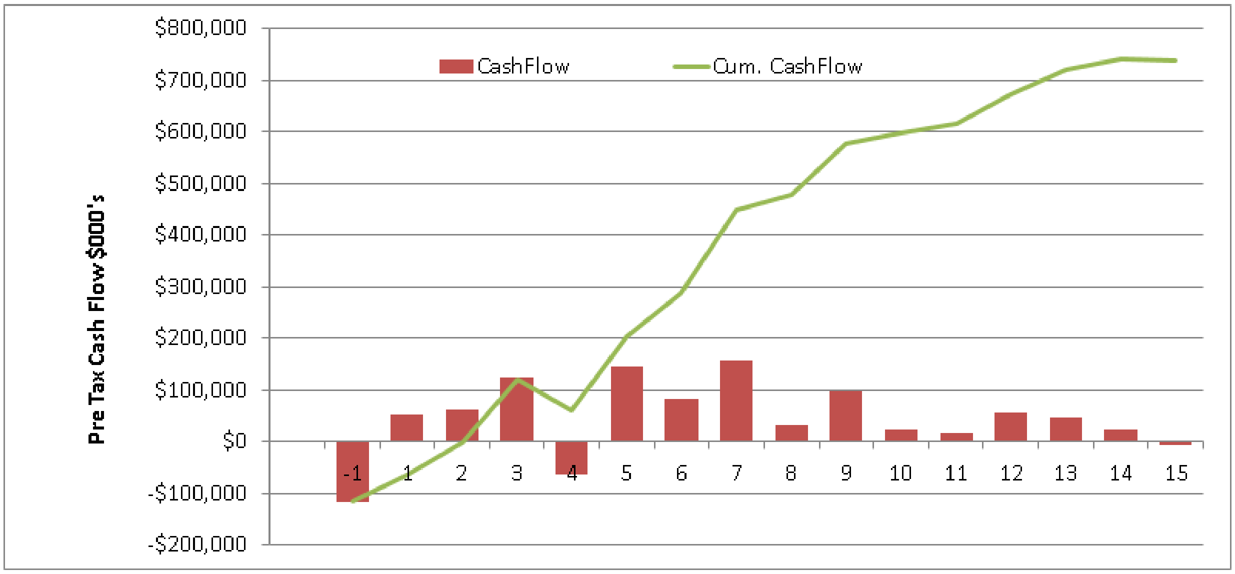


Figure 22-1 Pre-Tax Cashflow

22.4 Economic Results

A summary of financial outcomes comparing base case metal prices to two alternative metal price situations is presented below. The PFS base case prices are derived from a combination of spot prices and current common peer usage, while the alternate cases consider the project's economic outcomes at varying prices witnessed at some point over the three years prior to this study.

Table 22-3 Summary of Economic Results and Sensitivities to Metals Price ($ Million)

	Lower Case		Base Case		Upper Case	
	Pre-Tax	After-Tax	Pre-Tax	After-Tax	Pre-Tax	After-Tax
Gold Price ($/oz)	$1150		**$1250**		$1350	
Silver Price ($/oz)	$15		**$18**		$21	
NPV (5% discount rate)	$275	$175	**$484**	**$310**	$693	$443
Internal Rate of Return (%)	38%	28%	**54%**	**41%**	70%	52%
Payback (years)	2.4	2.6	**2.0**	**2.2**	1.6	1.9

22.5 Sensitivity Analysis

The operating costs ("Opex") are projected to be US$22.5 per tonne milled. The following table shows the sensitivity of project economics to a 10% change in the operating costs, assuming base case metals prices.

Table 22-4 Summary of Economic Results and Sensitivities to Operating Costs ($ Million)

	Lower Case		**Base Case**		**Upper Case**	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Opex ($/t milled)	-10%		$22.5/t		+10%	
NPV (5% discount rate)	$581	$372	$484	$310	$386	$248
Internal Rate of Return (%)	61%	46%	54%	41%	48%	35%
Payback (years)	1.9	2.1	2.0	2.2	2.1	2.3

The Ixtaca project is also sensitive to the exchange rate between U.S. dollars and Mexican Pesos (“MXN”). The PFS assumes an exchange rate of 20 MXN per U.S. dollar, and the following table shows the sensitivity of project economics to different exchange rates assuming base case metals prices.

Table 22-5 Summary of Economic Results and Sensitivities to Exchange Rate ($ Million)

	Lower Case		**Base Case**		**Upper Case**	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Exchange Rate (MXN:USD)	18		**20**		22	
NPV (5% discount rate)	$380	$243	**$484**	**$310**	$569	$364
Internal Rate of Return (%)	47%	35%	**54%**	**41%**	60%	45%
Payback (years)	2.1	2.3	**2.0**	**2.2**	1.9	2.1

The Initial Capital cost is estimated to be US$116.9 million. The following table shows the sensitivity of project economics to a 10% change in the initial capital costs, assuming base case metals prices.

Table 22-6 Summary of Economic Results and Sensitivities to Capital Cost ($ Million)

	Lower Case		**Base Case**		**Upper Case**	
	Pre-Tax	**After-Tax**	**Pre-Tax**	**After-Tax**	**Pre-Tax**	**After-Tax**
Initial Capital ($m)	-10%		**116.9**		+10%	
NPV (5% discount rate)	$495	$318	**$484**	**$310**	$473	$302
Internal Rate of Return (%)	60%	45%	**54%**	**41%**	50%	37%
Payback (years)	1.9	2.1	**2.0**	**2.2**	2.1	2.3

The above sensitivity analysis demonstrates robust economics.

23 Adjacent Properties

23.1 Cuyoaco Property

The Cuyoaco Property is located approximately 4km south east of the Tuligitic Property and it covers 643 hectares over two mineralized targets: the Pau copper-silver-gold skarn, and the Santa Anita gold Project.

23.2 Minera Frisco S.A. de C.V. Espejeras

The Espejeras Property is 100% owned by Minera Frisco S.A. de C.V. It is located roughly 7km north of the Tuligtic Property (**Figure 4-1**). Information on the exploration work carried out in the area to date is very limited. The area is considered prospective for gold and silver.

24 Other Relevant Data and Information

24.1 Preliminary Development Schedule

A preliminary project construction schedule and project execution plan has been developed as part of the PFS.

Key activities and milestones are shown in the summarized Gantt Chart below:

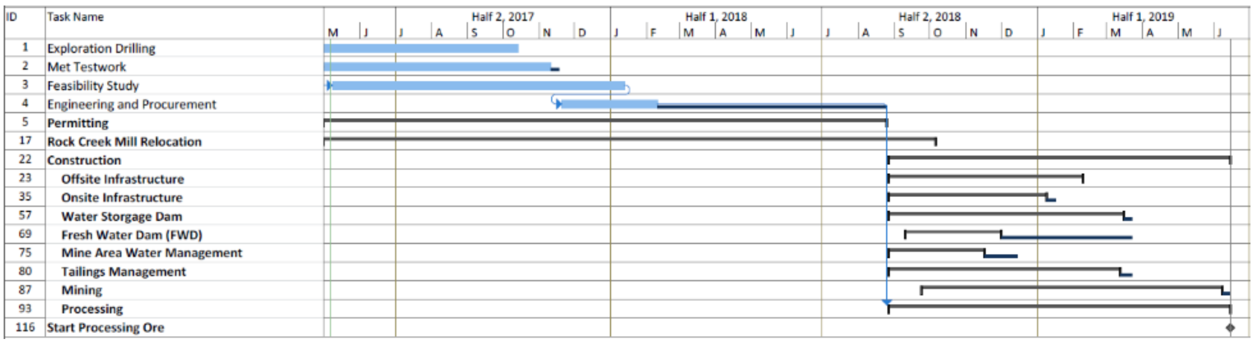


Figure 24-1 Summarized Project Implantation Gantt Chart

25 Interpretation and Conclusions

A PFS open pit mine plan has been developed for the Ixtaca Project using a NI 43-101 compliant Resource Estimate. The PFS mine plan shows robust economics and it is recommended that Almaden proceed with a Feasibility Study based on the following:

a) The Ixtaca deposit is well suited for open pit mining with higher grade material near surface, easy access to infrastructure and close access to the regional power grid.
b) Previous social community work done by the client has allowed for a social license to explore in the area.
c) The Project demonstrates strong economic viability at a variety of metal prices with a significant upside potential should metal prices regain previous strengths seen in the three-year trailing average.
d) The Project has strong economics even with a shortened mine life with an after-tax payback of 2.6 years, depending on the metal price used.
e) The initial capital has been significantly reduced (with the option to purchase the Rock Creek Mill) and still demonstrates good economic viability.

A full risk assessment will be required prior to the feasibility Study. The following summarizes potential risks to be addressed:

- Variability on the ore hardness for the minor ore types (Volcanics and Black Shale) should be evaluated.
- Permitting delays could impact the ability to start construction in the preferred season.
- Ocean access to Nome Alaska is limited to the summer months when the ice breaks up. It is essential to be prepared for the Rock Creek dismantle and relocation during this window. Any delay could have a significant impact on ability to construct the Project in the project timeline.

26 Recommendations

The PEA of the Ixtaca deposit indicates its potential as an economically viable mining operation. The Qualified Persons recommend that the Project should proceed to a pre-feasibility study (PFS). Costs are listed in Canadian currency.

The following activities are recommended to progress the Project forward.

26.1 Geology and Exploration

The following exploration drilling is recommended:

- Higher resolution drilling of the starter pit area to improve the definition of start-up mill feed
- Step out exploration of the north high grade limestone
- Step out exploration of the north east black shale potential underground mining target

The exploration drilling costs are estimated to be $1 million.

26.2 Tailings, Rock, and Water Management Recommendations

Additional geotechnical field data collection and testing is recommended and will include drilling and test pits, as follows:

- TMF embankment footprint and borrow sources
- FWD embankment footprints, spillways and borrow sources
- WSD embankment footprint, spillway and borrow sources
- RSF footprints

Additional tailings testing is also recommended to confirm that the samples used in the design are representative. Detailed laboratory testing should be completed on new tailings samples.

The geotechnical field data collection and tailings testing programs are estimated to cost $200,000 to $300,000.

The feasibility engineering design for the TMF, FWDs, WSD and water management structures is estimated to cost approximately $300,000 to $400,000. The total feasibility engineering costs from these items is estimated to be $500,000 to $700,000.

26.3 Mining Recommendations

26.3.1 Open Pit Mining

The pit limit, pit phase designs, mining method/equipment, and production schedule will be further optimized and detailed at a design level to support a FS. These recommendations reflect the ongoing level of detail required to advance the Project through the permitting phase and into operations.

Activities involved in updating the mining section include (but are not limited to):

- Optimize the production schedule through examining various stockpiling scenarios and stockpile locations as well as RSF locations
- Develop a short-range mine plan for Years -1, 1 and 1.
- Update the operating cost estimates using detailed quotes from local mining contractors
- Develop a detailed reclamation plan.
- Drill off Phase 1 and 2 in higher detail to confirm and update the geology model
- Additional geomechanical site investigation program for the open pit slopes, estimated to cost approx. $200,000.

Total open pit mining costs estimated between $400,000 and $500,000.

26.3.2 Underground Mining Potential

Potential underground mining has not been considered for the PFS. Contiguous mineralized high grade zones beneath the PFS open pit are potential underground mining (UG) resources. Figure 26-1 shows an section view below the pit with 60 m wide high grade mineralization that could be amenable to long hole open stoping.

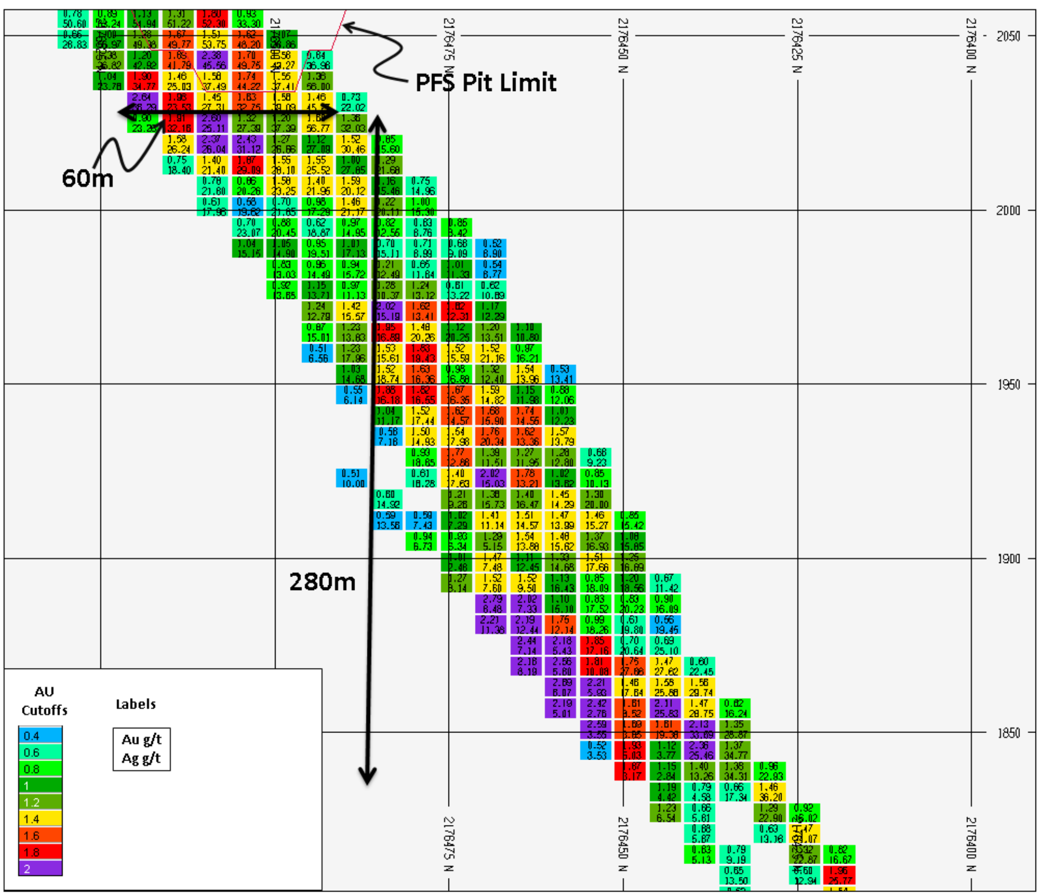


Figure 26-1 Section View of Au>=$0.5 below the PFS pit - looking South -East

Engineering studies are recommended to determine the technical and economic viability of underground mining. Estimated cost to investigate potential underground mining is $150,000.

26.4 Metallurgy and Process Recommendations

Additional Metallurgical testwork is required to test metallurgical performance using samples from various locations within each ore domain.

Testwork should be carried out on Black Shale to improve gold recovery and overcome the preg-robbing properties. Black shale tests should include a carbon liberation analysis to determine optimum conditions for organic carbon liberation, organic carbon poisoning/blinding tests, resin in leach (RIL).

Above metallurgical testing work is estimated to cost $600,000.

Process plant feasibility engineering design is estimated to cost approximately $300,000.

26.5 Environmental Recommendations

It is recommended to continue with the long lead environmental baseline studies, including climate, hydrology, and water quality to support permitting and feasibility study requirements. Advanced groundwater and surface water predictive models are recommended to interpret potential impacts and better mitigate for them. Costs for ongoing environmental work are estimated at approximately $300,000. The Environmental Assessment (Manifestación de Impacto Ambiental or MIA) and associated documents are being completed and should be submitted to the Mexican regulatory body SEMARNAT in order to receive the appropriate permits for construction and operation of the Project. Cost to complete the Environmental Assessment is approximately $100,000.

26.6 Infrastructure Recommendations

Ixtaca already initiated the process to secure 15 MW of electrical power supply off the Mexican's national grid with the local authority (CENACE). The two major cost items to complete this process includes a payment guarantee of USD600,000 estimated by CENACE to cover the cost of modifying the tie-in point to the national grid, and the right of way for the 27 km long transmission line.

Additional Geotechnical investigations are recommended for the mine infrastructure (primary crusher, truck shop, conveyor, plant site area). The investigations and design recommendations are estimated to cost approximately $100,000.

26.7 Aggregate Potential

A large portion of the Ixtaca Waste rock is non-mineralized limestone. Limestone waste rock is Geo-chemical and geo-mechanical tests indicate that most of the limestone waste rock is likely suitable for use as an aggregate. The high calcium content also makes it potentially suitable for agriculture.

The potential to supply aggregate to the >60 million tonne per year Mexican aggregate market should be investigated.

Aggregate assessment is estimated to cost $100,000.

26.8 Cement Potential

Chemical analysis of limestone flotation tailings show high calcium content with low impurities. An investigation is recommended to determine if Ixtaca flotation tailings are a potential feedstock for a cement production process. Cost estimate to evaluate cement potential is $100,000.

26.9 Risk Assessment

A detailed project risk assessment is recommended prior to completing a Feasibility Study. Estimated cost is $50,000.

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APPENDIX A - LIST OF DRILL HOLES

Holes used in Resource Estimate are highlighted.

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
CA-11-001	619100.90	2176535.30	2302.30	410.87
CA-11-002	619148.11	2176789.80	2402.17	597.77
CA-11-003	619147.74	2176790.16	2403.33	575.46
CA-11-004	619154.90	2176474.60	2298.50	276.76
CZ-14-001	619529.80	2179001.20	2749.90	374.29
CZ-14-002	619445.00	2178781.00	2562.20	502.31
CZ-14-003	619430.70	2178680.30	2660.90	482.50
GM-14-001	619132.10	2176272.00	2262.00	290.47
GM-14-002	619062.50	2175860.40	2393.80	290.47
GM-14-003	619239.90	2176591.00	2327.00	380.39
GM-14-004	618794.50	2176338.70	2372.80	200.56
GT-14-001	617985.50	2177975.60	2542.70	221.89
GT-14-002	617803.80	2177636.40	2562.20	34.75
GT-14-003	617896.90	2177445.10	2545.80	209.70
GT-14-004	617247.20	2176309.00	2393.00	227.99
GT-14-005	617049.20	2177187.20	2423.70	206.65
GT-14-006	616767.70	2176972.40	2346.70	157.89
GT-14-007	618389.40	2175286.40	2231.19	49.99
GT-14-008	616412.00	2177312.00	2411.20	206.65
GT-14-009	617558.70	2178820.30	2517.60	60.66
GT-14-009A	617558.70	2178820.30	2517.60	124.36
GT-14-010	616689.00	2177236.80	2356.80	51.51
GT-14-010A	616689.00	2177236.80	2356.80	188.37
GT-14-011	617549.50	2178593.10	2495.10	44.99
GT-14-011A	617549.50	2178593.10	2495.10	200.56
GT-14-012	618143.20	2178255.70	2551.10	49.99
GT-14-012A	618143.20	2178255.70	2551.10	49.99
GT-14-013	616709.60	2176024.20	2417.40	200.56
GT-14-014	617722.60	2178069.10	2510.50	60.66
GT-14-015	616725.00	2177470.00	2379.00	60.66
GT-15-16	617405.86	2177106.90	2442.07	60.66
GT-15-17	616595.96	2176622.39	2339.64	60.66
GT-15-18	616174.94	2177518.33	2438.82	69.80
GT-15-19	618522.25	2175497.89	2244.37	49.99
GT-15-20	619390.09	2177297.26	2443.79	121.62

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
GT-15-21	619058.00	2177261.00	2458.00	30.18
GT-16-023	617224.13	2176813.20	2411.52	72.85
GT-16-034	618138.00	2175507.00	2258.00	75.90
TU-10-001	618734.70	2176006.60	2247.50	349.91
TU-10-002	618751.50	2176045.20	2248.40	377.34
TU-10-003	618726.10	2175977.20	2244.40	391.67
TU-10-004	618753.70	2176128.70	2278.70	446.60
TU-10-005	618753.70	2176128.70	2278.70	490.12
TU-10-006	618834.80	2176219.10	2323.70	529.74
TU-10-007	618777.90	2175748.90	2245.40	442.54
TU-10-008	618644.40	2175987.60	2252.10	559.61
TU-10-009	618646.40	2176057.90	2264.60	341.90
TU-10-010	618646.60	2175990.60	2252.60	611.43
TU-10-011	618790.20	2176155.60	2277.70	458.72
TU-10-012	618751.50	2176045.20	2248.40	544.98
TU-10-013	618790.20	2176155.60	2277.70	559.07
TU-10-014	618751.50	2176037.40	2246.44	361.49
TU-11-015	618916.80	2176140.30	2252.20	291.39
TU-11-016	618978.70	2175835.20	2375.70	480.36
TU-11-017	618916.80	2176140.30	2252.20	468.78
TU-11-018	618964.10	2176158.20	2253.50	302.97
TU-11-019	618978.70	2175835.20	2375.70	455.98
TU-11-020	618964.10	2176158.20	2253.50	356.86
TU-11-021	619004.50	2176206.60	2255.00	319.43
TU-11-022	619004.50	2176206.60	2255.00	392.58
TU-11-023	618793.40	2175702.98	2243.80	465.12
TU-11-024	619002.30	2176209.90	2255.10	389.53
TU-11-025	619260.60	2176009.30	2382.10	438.42
TU-11-026	619055.30	2176223.60	2253.30	319.43
TU-11-027	619092.80	2176248.00	2255.20	340.46
TU-11-028	618659.20	2175993.80	2250.50	282.24
TU-11-029	618863.25	2176122.30	2244.04	324.31
TU-11-030	618602.40	2175894.08	2246.20	230.43
TU-11-031	618806.97	2176043.89	2242.90	344.12
TU-11-032	619154.90	2176474.60	2298.50	356.01
TU-11-033	618509.50	2176044.90	2285.40	406.60
TU-11-034	618779.10	2175987.80	2243.30	316.38
TU-11-035	618700.72	2176020.35	2245.20	401.12
TU-11-036	618745.96	2175925.12	2242.21	166.73

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-11-037	618512.46	2175852.96	2263.82	437.69
TU-11-038	618739.65	2175798.95	2241.21	285.90
TU-11-039	618962.37	2176161.65	2252.40	263.04
TU-11-040	618450.56	2176157.40	2298.56	198.12
TU-11-041	619241.11	2176587.53	2327.99	569.37
TU-11-042	618244.68	2175915.65	2269.83	639.26
TU-11-043	619311.04	2176678.66	2374.59	407.82
TU-11-044	619100.90	2176535.30	2302.30	276.76
TU-11-045	618791.29	2175575.38	2231.13	480.36
TU-11-046	619241.11	2176587.53	2327.99	301.14
TU-11-047	619161.37	2176320.10	2262.40	243.23
TU-11-048	618916.80	2176140.30	2252.20	365.15
TU-11-049	619091.07	2175947.99	2410.11	465.12
TU-11-050	619164.04	2176319.31	2263.80	304.19
TU-11-051	618914.70	2176144.40	2250.88	316.38
TU-11-052	619091.27	2176252.37	2253.45	167.03
TU-11-053	618863.70	2176122.61	2244.04	410.87
TU-11-054	619040.03	2176028.18	2392.35	471.22
TU-11-055	619052.21	2176227.51	2251.21	231.04
TU-11-056	618829.90	2176092.90	2243.06	392.58
TU-11-057	618806.97	2176043.89	2242.90	480.97
TU-11-058	619082.10	2176028.70	2385.65	187.76
TU-11-059	618979.23	2175834.90	2371.00	701.34
TU-11-060	618758.23	2175983.00	2237.90	176.17
TU-11-061	618743.77	2175929.00	2239.70	420.01
TU-11-062	618758.23	2175983.00	2237.90	292.00
TU-11-063	618795.80	2175650.00	2232.90	432.21
TU-11-064	618782.92	2175888.24	2260.66	285.90
TU-11-065	618754.18	2175860.52	2243.76	420.01
TU-11-066	618979.23	2175834.90	2371.00	630.02
TU-11-067	618730.44	2175904.32	2237.56	261.52
TU-11-068	618803.94	2175953.38	2269.96	234.09
TU-11-069	618749.80	2175736.77	2237.57	465.73
TU-11-070	618832.54	2175999.74	2271.01	319.43
TU-11-071	618820.40	2175620.41	2236.10	255.42
TU-11-072	619022.54	2175897.56	2403.24	486.46
TU-11-073	618832.51	2175901.98	2300.06	219.15
TU-11-074	618819.30	2175495.40	2234.40	288.95
TU-11-075	618792.10	2175575.61	2227.00	477.93

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-11-076	618851.70	2175955.88	2294.90	238.66
TU-11-077	618795.50	2175440.40	2236.30	453.54
TU-11-078	618877.90	2176036.30	2312.20	309.68
TU-11-079	619035.90	2175935.80	2409.90	359.66
TU-11-080	619795.60	2175994.20	2393.60	432.21
TU-11-081	618913.60	2176081.90	2320.80	325.53
TU-11-082	619035.70	2175937.80	2408.90	462.08
TU-11-083	618831.60	2176091.70	2247.08	365.15
TU-11-084	619302.70	2176484.90	2331.90	429.16
TU-11-085	619089.90	2175950.80	2413.90	532.18
TU-11-086	618913.60	2176081.90	2320.80	288.95
TU-11-087	619301.40	2176485.60	2330.70	298.09
TU-11-088	618831.80	2176091.40	2246.50	517.55
TU-11-089	619088.50	2175950.10	2413.10	221.28
TU-11-090	619240.50	2176626.30	2321.00	243.23
TU-11-091	618937.70	2176081.90	2322.50	274.76
TU-11-092	619091.20	2175948.70	2413.70	239.57
TU-11-093	619238.90	2176628.90	2320.70	209.70
TU-11-094	619198.10	2176586.50	2309.80	246.28
TU-11-095	618937.70	2176081.90	2322.50	224.94
TU-12-096	618883.70	2176125.60	2251.52	401.73
TU-12-097	618977.90	2176157.10	2250.00	413.92
TU-12-098	619235.90	2176510.50	2326.96	404.77
TU-12-099	619151.20	2176032.30	2396.50	474.27
TU-12-100	619235.90	2176510.50	2326.96	267.61
TU-12-101	618883.70	2176125.60	2251.52	538.89
TU-12-102	618964.10	2176158.20	2253.50	292.00
TU-12-103	619232.80	2176513.50	2325.50	401.73
TU-12-104	618964.10	2176158.20	2253.50	264.57
TU-12-105	618791.30	2175575.40	2231.13	346.25
TU-12-106	619235.90	2176510.50	2326.40	343.20
TU-12-107	618919.10	2176136.80	2254.90	465.73
TU-12-108	619040.90	2176208.50	2258.70	325.53
TU-12-109	619235.90	2176510.50	2326.40	368.20
TU-12-110	618450.80	2176157.50	2305.00	331.01
TU-12-111	619044.60	2176208.50	2254.10	295.05
TU-12-112	619000.50	2176193.30	2253.20	413.92
TU-12-113	619237.70	2176515.40	2333.40	325.53
TU-12-114	618510.00	2176047.30	2288.90	425.50

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-12-115	619044.60	2176208.50	2254.10	365.15
TU-12-116	619299.20	2176482.80	2330.80	197.51
TU-12-117	619000.50	2176193.30	2253.20	307.24
TU-12-118	618510.00	2176047.30	2288.90	321.87
TU-12-119	618685.90	2176257.90	2374.10	615.09
TU-12-120	618940.60	2176142.30	2257.40	331.62
TU-12-121	619000.50	2176193.30	2253.20	267.61
TU-12-122	618506.50	2175961.00	2283.00	395.02
TU-12-123	618813.10	2176076.20	2247.10	356.01
TU-12-124	618940.60	2176142.30	2257.40	356.01
TU-12-125	618693.04	2176334.10	2376.90	404.77
TU-12-126	618813.10	2176076.20	2247.10	393.19
TU-12-127	618940.60	2176142.30	2257.40	420.01
TU-12-128	618506.50	2175961.00	2283.00	425.50
TU-12-129	618732.40	2176365.60	2377.80	444.40
TU-12-130	618813.10	2176076.20	2247.10	288.95
TU-12-131	618506.50	2175961.00	2283.00	431.60
TU-12-132	618940.60	2176142.30	2257.40	273.71
TU-12-133	618813.10	2176076.20	2247.10	261.52
TU-12-134	618732.40	2176365.60	2377.80	438.30
TU-12-135	618813.10	2176076.20	2247.10	438.30
TU-12-136	618939.90	2176143.10	2252.90	185.32
TU-12-137	618621.50	2175965.70	2247.90	331.01
TU-12-138	618834.20	2176293.00	2358.80	404.77
TU-12-139	618705.70	2175991.60	2247.70	349.30
TU-12-140	619082.70	2176389.60	2274.40	218.85
TU-12-141	618544.70	2175894.40	2263.20	362.10
TU-12-142	618705.70	2175991.60	2247.70	443.79
TU-12-143	619082.70	2176389.60	2274.40	200.56
TU-12-144	618834.20	2176293.00	2358.80	307.24
TU-12-145	619051.20	2176453.70	2295.50	441.35
TU-12-146	618705.70	2175991.60	2247.70	248.72
TU-12-147	618564.10	2175964.80	2256.90	296.57
TU-12-148	618705.70	2175991.60	2247.70	312.72
TU-12-149	618853.10	2176343.20	2353.70	340.77
TU-12-150	618677.90	2175882.90	2245.30	294.44
TU-12-151	619051.20	2176453.70	2295.50	392.58
TU-12-152	618563.20	2176043.90	2268.10	319.43
TU-12-153	618613.80	2176265.30	2348.10	334.67

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-12-154	618646.60	2175813.20	2239.60	259.38
TU-12-155	619051.20	2176453.70	2295.50	380.39
TU-12-156	618673.20	2175759.90	2238.70	270.05
TU-12-157	618518.50	2176161.10	2312.30	423.06
TU-12-158	618639.10	2175999.90	2252.50	145.69
TU-12-159	619051.20	2176453.20	2295.50	371.25
TU-12-160	618640.40	2175720.50	2239.40	382.83
TU-12-161	618914.70	2176351.30	2330.00	282.85
TU-12-162	619051.20	2176453.20	2295.50	395.63
TU-12-163	618469.30	2175923.20	2277.70	432.21
TU-12-164	618730.70	2176004.10	2244.50	327.96
TU-12-165	618914.70	2176351.30	2330.00	407.82
TU-12-166	619051.20	2176453.20	2295.50	453.54
TU-12-167	618405.00	2176026.00	2267.90	487.07
TU-12-168	618734.10	2176005.90	2246.50	373.68
TU-12-169	618946.40	2176414.40	2308.50	413.92
TU-12-170	618984.30	2176547.10	2323.60	392.58
TU-12-171	618435.90	2175974.50	2272.00	444.40
TU-12-172	618745.60	2176037.90	2246.00	571.80
TU-12-173	618946.40	2176414.40	2308.50	416.97
TU-12-174	618984.30	2176547.10	2323.60	407.82
TU-12-175	619001.70	2176403.90	2299.00	313.33
TU-12-176	618407.50	2176026.90	2272.60	535.84
TU-12-177	618604.70	2175820.10	2247.40	416.36
TU-12-178	618984.30	2176547.10	2323.60	426.11
TU-12-179	619001.70	2176403.90	2299.00	349.91
TU-12-180	618984.30	2176547.10	2323.60	420.01
TU-12-181	619001.70	2176403.90	2299.00	224.94
TU-12-182	618569.60	2175756.10	2245.50	446.84
TU-12-183	618408.31	2176025.50	2272.60	264.57
TU-12-184	618982.70	2176546.50	2323.60	434.04
TU-12-185	618408.31	2176025.50	2272.60	167.03
TU-12-186	619166.30	2176320.60	2262.00	352.96
TU-12-187	618408.00	2176026.90	2272.60	200.56
TU-12-188	618416.10	2175932.00	2273.80	443.79
TU-12-189	618404.50	2176024.40	2270.90	490.12
TU-12-190	619006.00	2176498.30	2312.40	413.92
TU-12-191	619165.40	2176319.80	2265.30	395.63
TU-12-192	618446.00	2175860.50	2273.00	316.38

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-12-193	618427.70	2176204.10	2302.30	130.45
TU-12-194	619006.00	2176498.30	2312.30	407.82
TU-12-195	618427.70	2176204.10	2302.30	325.53
TU-12-196	619074.90	2176389.50	2271.00	383.44
TU-12-197	618423.40	2176205.70	2302.30	215.80
TU-12-198	618417.50	2176112.00	2286.90	316.38
TU-12-199	619006.00	2176498.30	2312.30	480.97
TU-12-200	618417.50	2176112.00	2286.90	160.93
TU-12-201	619074.90	2176389.50	2271.00	413.92
TU-12-202	618568.40	2176189.60	2327.10	484.02
TU-12-203	618414.40	2176115.20	2286.90	182.27
TU-12-204	619074.90	2176389.50	2271.00	453.54
TU-12-205	619002.20	2176499.80	2312.80	368.20
TU-12-206	618675.70	2176200.30	2361.70	205.13
TU-12-207	618565.40	2176189.80	2326.70	263.96
TU-12-208	619083.80	2176389.60	2271.00	368.20
TU-12-209	618675.70	2176200.30	2361.70	258.47
TU-12-210	619049.20	2176453.30	2291.60	319.43
TU-12-211	618703.40	2175953.70	2242.50	322.48
TU-12-212	618808.70	2176079.40	2244.90	313.33
TU-12-213	619214.50	2176220.80	2298.40	304.19
TU-12-214	619046.70	2176450.80	2292.50	337.72
TU-12-215	618948.30	2176416.70	2307.90	605.94
TU-12-216	619214.50	2176220.80	2298.40	404.77
TU-12-217	618808.70	2176079.40	2244.90	235.61
TU-12-218	619050.70	2176453.90	2287.90	295.05
TU-12-219	619211.60	2176220.30	2301.80	203.61
TU-12-220	619211.60	2176220.30	2301.80	282.85
TU-12-221	618948.30	2176416.70	2307.90	548.03
TU-12-222	619243.40	2176274.20	2302.10	200.56
TU-12-223	618943.70	2176588.20	2337.80	377.34
TU-12-224	619243.40	2176274.20	2302.10	371.25
TU-12-225	619240.90	2176281.30	2300.90	176.17
TU-12-226	619033.90	2176362.00	2282.70	590.70
TU-12-227	619240.90	2176281.30	2300.90	197.51
TU-12-228	618943.70	2176588.20	2337.80	398.68
TU-12-229	619243.70	2176279.70	2305.70	420.01
TU-12-230	618943.70	2176588.20	2337.80	477.93
TU-12-231	619295.40	2176093.20	2334.60	209.70

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-12-232	619243.70	2176279.70	2305.70	416.97
TU-12-233	619295.40	2176093.20	2334.60	264.57
TU-12-234	619280.10	2176314.40	2316.20	154.84
TU-12-235	618899.10	2176653.80	2346.00	499.26
TU-12-236	619393.90	2176045.20	2346.45	252.37
TU-12-237	619280.10	2176314.40	2316.20	279.81
TU-12-238	619393.90	2176045.20	2346.45	313.33
TU-12-239	619280.10	2176314.40	2316.20	145.69
TU-12-240	619395.80	2176041.50	2346.45	316.38
TU-12-241	619280.10	2176314.40	2316.20	203.61
TU-12-242	619395.80	2176041.50	2346.45	237.13
TU-12-243	619280.00	2176316.30	2346.40	218.85
TU-12-244	618899.10	2176653.80	2346.00	413.92
TU-12-245	619293.60	2176095.80	2329.40	221.89
TU-12-246	619132.90	2176271.90	2258.70	325.53
TU-12-247	619293.60	2176095.80	2329.40	148.74
TU-13-248	618609.90	2175819.30	2242.60	508.41
TU-13-249	619005.20	2176207.80	2255.70	343.81
TU-13-250	619343.10	2176562.90	2356.70	267.61
TU-13-251	619005.20	2176207.80	2255.70	392.58
TU-13-252	619343.10	2176562.90	2356.70	319.43
TU-13-253	618609.90	2175819.30	2242.60	159.41
TU-13-254	619092.50	2176352.10	2271.30	413.92
TU-13-255	619343.10	2176562.90	2356.70	237.13
TU-13-256	618490.60	2175939.60	2279.20	441.35
TU-13-257	619092.50	2176352.10	2271.30	383.44
TU-13-258	619338.60	2176565.00	2356.70	325.53
TU-13-259	619092.50	2176352.10	2271.30	426.11
TU-13-260	618490.60	2175939.60	2279.30	468.78
TU-13-261	619294.10	2176541.10	2330.00	257.56
TU-13-262	618927.30	2176480.60	2321.60	444.40
TU-13-263	619294.10	2176541.10	2330.00	334.98
TU-13-264	619393.90	2176045.20	2346.45	425.20
TU-13-265	618927.30	2176480.60	2321.60	593.75
TU-13-266	619294.10	2176541.10	2330.00	322.48
TU-13-267	619212.10	2176127.50	2324.90	234.09
TU-13-268	619269.80	2176598.90	2333.00	377.34
TU-13-269	619213.20	2176122.60	2322.10	261.52
TU-13-270	619429.30	2176595.30	2380.80	288.95

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-13-271	619213.10	2176122.60	2322.10	285.90
TU-13-272	619269.80	2176598.90	2333.00	301.14
TU-13-273	619213.20	2176122.60	2322.10	292.00
TU-13-274	619429.30	2176595.30	2380.80	218.85
TU-13-275	619269.80	2176598.90	2333.00	298.09
TU-13-276	619327.80	2176664.30	2373.50	200.70
TU-13-277	619392.20	2176044.40	2341.30	87.78
TU-13-278	619306.40	2176485.60	2334.30	292.00
TU-13-279	619327.80	2176664.30	2373.50	282.85
TU-13-280	619306.40	2176485.60	2334.30	340.77
TU-13-281	619306.40	2176485.60	2334.30	209.70
TU-13-282	619327.80	2176664.30	2373.50	279.81
TU-13-283	619558.60	2176556.30	2404.40	209.70
TU-13-284	619327.00	2176663.10	2384.20	215.80
TU-13-285	619558.60	2176556.30	2404.40	193.85
TU-13-286	619552.60	2176557.30	2404.40	231.04
TU-13-287	619393.70	2176645.40	2384.60	221.89
TU-13-288	618555.60	2176341.20	2339.00	292.00
TU-13-289	619393.70	2176645.40	2384.60	243.23
TU-13-290	618526.50	2176246.50	2333.90	401.73
TU-13-291	619386.30	2176743.80	2358.60	227.99
TU-13-292	618523.80	2176244.30	2333.90	499.26
TU-13-293	619386.30	2176743.80	2358.60	139.60
TU-13-294	619384.80	2176741.50	2358.60	167.03
TU-13-295	619384.80	2176741.50	2358.60	290.78
TU-13-296	619384.80	2176741.50	2358.60	200.56
TU-13-297	618423.50	2176206.60	2299.30	474.88
TU-13-298	619384.80	2176741.50	2358.60	282.85
TU-13-299	619407.10	2176807.40	2358.50	154.84
TU-13-300MET	618505.90	2176041.03	2284.70	75.59
TU-13-301MET	619242.70	2176277.30	2309.03	145.69
TU-13-302	619407.10	2176807.40	2358.50	170.08
TU-13-303MET	618808.30	2176044.00	2243.60	264.57
TU-13-304	619407.10	2176807.40	2358.50	96.93
TU-13-305	619407.10	2176807.40	2358.50	118.26
TU-13-306	618890.30	2176135.40	2249.50	200.56
TU-13-307	619407.10	2176807.40	2358.50	398.68
TU-13-308	619010.90	2176472.30	2308.80	441.35
TU-13-309	618890.30	2176135.40	2249.50	337.72

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-13-310	619324.70	2176223.30	2361.50	240.18
TU-13-311	619010.90	2176472.00	2308.80	420.01
TU-13-312	619328.00	2176218.20	2350.00	221.89
TU-13-313	618847.70	2176108.90	2252.00	212.75
TU-13-314	619328.00	2176218.20	2350.00	246.28
TU-13-315	619010.90	2176472.30	2308.80	383.44
TU-13-316	618847.70	2176108.90	2252.00	267.61
TU-13-317	619325.20	2176220.90	2346.30	307.24
TU-13-318	618829.70	2176092.00	2247.30	197.51
TU-13-319	619010.90	2176472.00	2308.80	334.67
TU-13-320	619328.00	2176218.00	2350.00	206.65
TU-13-321	618911.97	2176142.43	2253.00	227.99
TU-13-322	619338.50	2176311.50	2353.40	191.41
TU-13-323MET	619006.80	2176499.40	2313.30	377.34
TU-13-324	618950.00	2176147.00	2253.00	218.85
TU-13-325	618950.00	2176147.00	2253.00	243.23
TU-13-326	619338.50	2176311.50	2353.40	209.70
TU-13-327	619338.50	2176311.50	2353.40	185.32
TU-13-328	618982.60	2176522.90	2321.80	374.29
TU-13-329	619338.50	2176311.50	2353.40	209.70
TU-13-330	618982.30	2176187.20	2253.20	234.09
TU-13-331	619387.90	2176281.00	2383.60	197.51
TU-13-332	618982.60	2176522.90	2321.80	356.01
TU-13-333	618982.30	2176187.20	2253.20	267.61
TU-13-334	619387.90	2176281.00	2383.60	224.94
TU-13-335	619387.90	2176281.00	2383.60	231.04
TU-13-336	618982.60	2176522.90	2321.80	368.20
TU-13-337	619019.90	2176205.90	2254.00	200.56
TU-13-338	619387.90	2176281.00	2383.60	234.09
TU-13-339	619019.90	2176205.90	2254.00	246.28
TU-13-340MET	619325.20	2176220.90	2346.30	60.35
TU-13-341MET	619326.60	2176221.50	2361.50	151.79
TU-13-342	619059.40	2176426.30	2282.00	371.25
TU-13-343	619019.90	2176205.90	2254.00	231.04
TU-13-344	619088.30	2176029.40	2399.60	243.23
TU-13-345	619408.90	2176341.60	2409.10	206.65
TU-13-346	619019.90	2176205.90	2254.00	227.99
TU-13-347	619059.40	2176426.30	2282.00	365.15
TU-13-348	619408.90	2176341.60	2409.10	215.80

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-13-349	619134.70	2176035.00	2393.90	259.69
TU-13-350	619408.90	2176341.60	2409.10	276.76
TU-13-351	618771.70	2176041.40	2243.70	279.81
TU-13-352	619059.40	2176426.30	2282.00	346.86
TU-13-353	619134.70	2176035.00	2393.90	199.64
TU-13-354	618771.70	2176041.40	2243.70	313.33
TU-13-355	619059.40	2176426.30	2282.00	349.00
TU-13-356	619408.90	2176341.60	2409.10	255.42
TU-13-357	619134.70	2176035.00	2393.90	310.29
TU-13-358	619408.90	2176341.60	2409.10	313.37
TU-13-359	618771.70	2176041.40	2243.70	200.56
TU-13-360	618982.90	2176389.60	2299.10	279.81
TU-13-361	619134.70	2176035.00	2393.90	298.09
TU-13-362	618771.70	2176041.40	2243.70	246.28
TU-13-363	619456.80	2176366.00	2417.80	212.75
TU-13-364	618982.90	2176389.60	2299.10	252.37
TU-13-365	619457.90	2176362.50	2416.90	243.23
TU-13-366	618771.70	2176041.40	2243.70	157.58
TU-13-367	618982.90	2176389.60	2299.10	322.48
TU-13-368	619194.10	2176027.40	2388.40	322.48
TU-13-369	619457.90	2176364.30	2417.40	362.10
TU-13-370	618801.10	2176022.90	2247.70	342.29
TU-13-371	618918.70	2176381.20	2322.30	346.86
TU-13-372	619194.10	2176027.40	2388.40	288.95
TU-13-373MET	618801.00	2176024.30	2247.70	319.43
TU-13-374	619562.90	2176432.70	2443.30	270.66
TU-13-375	618964.10	2176158.20	2253.50	258.47
TU-13-376	619059.20	2175862.20	2395.50	447.45
TU-13-377	619562.90	2176432.70	2443.30	316.38
TU-13-378	618801.00	2176024.30	2247.70	212.75
TU-13-379	618964.10	2176158.20	2253.50	151.79
TU-13-380	618758.60	2175982.50	2234.50	234.09
TU-13-381	618698.00	2175921.90	2243.20	182.27
TU-13-382	619261.40	2176493.20	2319.20	170.08
TU-13-383	618698.00	2175921.90	2243.20	151.79
TU-13-384	618758.60	2175982.50	2234.50	151.79
TU-13-385	619261.40	2176493.20	2329.20	285.90
TU-13-386	618735.40	2175849.70	2238.70	163.98
TU-13-387	618778.70	2175991.00	2246.60	298.09

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-13-388	619116.80	2175832.30	2387.80	420.01
TU-13-389	618755.40	2175859.30	2243.80	151.79
TU-13-390	619226.40	2176543.40	2327.40	252.37
TU-13-391	618755.40	2175859.30	2243.80	142.65
TU-13-392	618778.70	2175991.00	2246.60	188.37
TU-13-393	618731.20	2175905.00	2236.50	204.52
TU-13-394	619226.40	2176543.30	2327.40	234.09
TU-13-395	618746.10	2175926.10	2245.90	234.09
TU-13-396MET	619226.40	2176543.30	2327.40	206.65
TU-13-397	618643.50	2175733.70	2254.70	386.49
TU-13-398	618542.10	2175897.50	2266.20	383.44
TU-13-399	619148.90	2175939.50	2420.80	261.52
TU-13-400	619198.10	2176586.10	2311.00	240.18
TU-13-401	619198.10	2176586.10	2311.00	243.23
TU-13-402	618409.10	2176027.30	2265.00	401.73
TU-13-403	618833.60	2176836.90	2360.44	608.99
TU-13-404	619198.20	2176586.20	2311.00	270.66
TU-13-405	619214.15	2176123.00	2324.80	252.37
TU-13-406	619149.20	2176033.00	2392.00	197.51
TU-13-407	619196.60	2175488.90	2310.50	369.72
TU-13-408	618834.70	2176833.20	2361.50	426.11
TU-13-409	619149.20	2176033.00	2392.00	246.28
TU-13-410	619214.15	2176123.00	2324.80	288.95
TU-13-411	619084.10	2176030.50	2390.70	224.94
TU-13-412	619199.10	2175486.90	2310.50	325.53
TU-14-413	619058.35	2176422.70	2282.20	334.67
TU-14-414	619058.35	2176422.70	2282.20	343.81
TU-14-415	619050.94	2176455.30	2295.60	322.48
TU-14-416	619313.75	2176680.90	2374.90	209.70
TU-14-417	619313.75	2176680.90	2374.90	200.56
TU-14-418	619261.88	2176489.60	2323.50	304.19
TU-14-419	619268.19	2176598.00	2334.70	218.85
TU-14-420	619268.19	2176598.00	2334.70	231.04
TU-14-421	619228.24	2176542.50	2329.80	182.97
TU-14-422	618800.48	2176022.90	2244.40	276.76
TU-14-423	619244.17	2176278.60	2301.30	156.67
TU-14-424	619392.60	2176045.50	2341.00	493.17
TU-14-425	618824.70	2175618.40	2241.50	310.29
TU-14-426	619448.70	2175866.80	2372.20	501.70

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-14-427	618841.90	2175570.30	2240.80	252.37
TU-14-428	618795.00	2175700.90	2245.20	255.42
TU-14-429	619214.00	2175773.00	2364.84	501.70
TU-14-430	618485.00	2176612.80	2384.70	349.91
TU-14-431	618483.70	2176612.50	2382.80	349.91
TU-14-432	619212.10	2175771.30	2362.60	294.44
TU-14-433	619126.50	2175570.00	2319.00	502.31
TU-14-434	618489.80	2176609.70	2383.10	252.37
TU-14-435	618489.80	2176609.70	2383.10	322.48
TU-14-436	619740.20	2175937.70	2388.30	544.98
TU-14-437	619002.50	2177254.10	2459.80	543.00
TU-14-438	619150.40	2175936.60	2421.90	453.54
TU-14-439	619077.70	2177139.10	2453.00	520.60
TU-14-440	619413.10	2175488.20	2325.40	310.29
TU-14-441	620322.30	2176936.90	2503.70	351.13
TU-14-442	619077.70	2177139.10	2453.40	349.91
TU-14-443	619076.10	2177137.40	2454.60	154.23
TU-14-444	620322.30	2176936.90	2503.70	310.29
TU-14-445	618662.30	2176518.60	2395.60	395.63
TU-14-446	618665.20	2176398.60	2390.30	551.08
TU-14-447	619263.96	2176006.00	2384.95	279.81
TU-14-448	619715.20	2175888.90	2387.40	346.86
TU-14-449	619082.76	2176820.38	2391.99	328.57
TU-15-450	619125.32	2176655.55	2348.36	266.70
TU-15-451	619124.00	2176655.65	2347.28	274.62
TU-15-452	619120.11	2176709.10	2366.39	234.09
TU-15-453	619120.12	2176709.11	2366.40	301.14
TU-15-454	618522.25	2175497.89	2244.37	418.89
TU-15-455	618800.48	2176022.90	2244.40	316.38
TU-15-456	619226.40	2176543.30	2327.40	231.04
TU-15-457	618800.48	2176022.90	2244.40	261.52
TU-15-458	619226.40	2176543.30	2327.40	243.23
TU-15-459	619244.17	2176278.60	2301.33	179.22
TU-15-460	618813.24	2176076.15	2247.00	282.85
TU-15-461	619244.17	2176278.60	2301.33	151.79
TU-16-318A	618830.12	2176092.04	2247.16	371.25
TU-16-462	618830.96	2176092.86	2245.85	304.19
TU-16-463	618831.49	2176091.92	2246.16	505.36
TU-16-464	618830.06	2176092.77	2248.11	313.33

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
TU-16-465	618829.84	2176092.44	2246.23	365.15
TU-16-466	618702.17	2175993.78	2241.98	398.68
TU-16-467	618888.88	2176133.89	2247.14	389.53
TU-16-468	618888.88	2176133.89	2247.14	298.09
TU-16-469	618888.88	2176133.89	2247.14	362.10
TU-16-470	618888.88	2176133.89	2247.14	285.90
TU-16-471	618801.00	2176022.00	2247.70	346.86
TU-16-472	618888.88	2176133.89	2247.14	322.48
TU-16-473	618801.00	2176022.00	2247.70	320.34
TU-16-474	618801.00	2176022.00	2247.70	325.53
TU-16-475	618916.80	2176140.30	2252.30	325.53
TU-16-476	618914.38	2176144.01	2258.58	313.94
TU-16-477	618803.13	2176077.89	2254.89	313.33
TU-16-478	618940.24	2176143.07	2259.27	301.95
TU-16-479	618803.13	2176077.89	2254.89	331.62
TU-16-480	618940.24	2176143.07	2259.27	307.24
TU-16-481	618803.13	2176077.89	2254.89	325.53
TU-16-482	618964.30	2176158.12	2261.26	307.24
TU-16-483	618838.47	2176099.36	2252.18	295.05
TU-16-484	618982.30	2176187.10	2253.23	273.71
TU-16-485	618838.47	2176099.36	2252.18	277.37
TU-16-486	618982.30	2176187.10	2253.23	273.71
TU-16-487	618883.70	2176125.60	2251.50	307.24
TU-16-488	618982.30	2176187.10	2253.23	331.62
TU-16-489	618880.88	2176125.79	2254.71	240.18
TU-16-490	618984.02	2176185.09	2260.87	270.66
TU-16-491	618880.88	2176125.79	2254.71	292.00
TU-16-492	619003.57	2176203.54	2260.30	295.05
TU-16-493	619018.60	2176210.23	2261.58	221.89
TZ-12-001	616201.40	2175374.70	2357.80	349.91
TZ-12-002	616200.50	2175375.30	2357.80	377.34
TZ-12-003	616304.20	2174967.40	2302.60	197.51
TZ-12-004	616303.30	2174966.70	2297.20	200.56
TZ-12-005	616304.50	2174967.90	2296.00	249.33
TZ-16-006	616202.30	2175380.66	2360.79	490.12
WW-13-001	618662.40	2175698.20	2241.20	215.80
WW-13-002	618659.10	2175920.60	2252.70	407.82
WW-13-003	619091.80	2176350.90	2270.30	401.73
WW-13-004	618952.20	2176147.90	2248.90	401.73

HOLE	EASTING	NORTHING	ELEVATION	HOLE LENGTH (m)
WW-13-005	618432.80	2174984.20	2219.30	352.96
WW-13-006	618549.80	2175398.30	2231.10	151.18
WW-13-007	618614.10	2175210.60	2223.40	221.89