***CERRO JUMIL PROJECT, MEXICO***

***2010 Resource Update***

***NI 43-101 Technical Report***

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# *TABLE OF CONTENTS*

1.0 Summary ....9
2.0 Introduction and Terms of Reference ....17
3.0 Reliance on Other Experts ....21
4.0 Property Description and Location ....22
5.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography ....27
6.0 History....27
7.0 Geological Setting....30
7.1 Regional Geology .... 30
7.2 Local and Property Geology .... 31
8.0 Deposit Types ....36
9.0 Mineralization ....37
10.0 Exploration....40
10.1 Exploration Prior to 2003 .... 40
10.2 ESM Exploration Since 2003 Acquisition .... 41
10.2.1 Geological Mapping and Outcrop Sampling .... 41
10.2.2 Soil Geochemical Survey.... 45
10.2.3 Ground Magnetic Survey .... 48
11.0 Drilling....51
11.1 Teck Drilling, 1998.... 54
11.2 ESM Drilling as of June 2010 .... 55
11.2.1 ESM Phase 1 Drilling.... 56
11.2.2 ESM Phase 2 Drilling.... 57
11.2.3 ESM Phase 3 Drilling.... 57
11.2.4 ESM Phase 4 Drilling.... 58
12.0 Sampling Method and Approach ....58
12.1 Sampling Prior to ESM 2003 Acquisition.... 58
12.1.1 RCS Sampling Method and Approach.... 59
12.1.2 Teck Sampling Method and Approach.... 59
12.2 ESM Sampling Method and Approach.... 60
12.2.1 ESM Soil Sampling Method and Approach.... 61
12.2.2 ESM Selective Outcrop or Float Sampling Method and Approach.... 61
12.2.3 ESM Channel Sampling Method and Approach .... 62
12.2.4 ESM Core Sampling Method and Approach.... 62

12.2.5 ESM RC Sampling Method and Approach ... 64
12.2.6 RC and Core Twin Hole Comparison ... 65
12.2.7 RC Fines Overflow Analysis ... 67
12.3 Sample Database ... 70
13.0 Sample Preparation, Analyses and Security ... 71
13.1 Pre-ESM, Prior to 2003 Acquisition ... 71
13.2 ESM Sample Preparation, Analyses and Security ... 71
13.2.1 Sample Preparation, Assaying and Analytical Procedures ... 72
13.2.2 Laboratory Certification ... 73
13.2.3 ESM Quality Control Measures ... 74
13.2.4 Standard Reference Materials ... 75
13.2.5 Blank Samples ... 87
13.2.6 Original Pulp and Duplicate Sample Analysis ... 89
13.2.7 Size Fraction Analysis ... 97
13.2.8 Opinion on Sampling, Preparation, Security and Analytical Methods ... 100
14.0 Data Verification ... 100
14.1 Independent QP Data Verification ... 100
14.1.1 Independent Duplicate Core and RC Samples - 2008 ... 100
14.1.2 Independent Drill Assay Database Audit - 2010 ... 105
14.2 ESM Internal Data Verification ... 106
15.0 Adjacent Properties ... 106
16.0 Metallurgical Testing ... 107
16.1 SGS Metallurgical Testing ... 107
16.2 CAMP Metallurgical Testing ... 110
17.0 Mineral Resource Estimate ... 115
17.1 Drill Hole Database ... 116
17.2 Geologic Model ... 118
17.2.1 Definition of Gold and Silver Mineralized Envelopes ... 118
17.2.2 Interpretation of Geologic Model ... 125
17.3 Assay Cap Grades and Composites ... 132
17.3.1 Gold and Silver Cap Grades ... 132
17.3.2 Compositing and Rock Code Assignments ... 133
17.3.3 Composite Summary Statistics ... 134
17.4 Variography ... 135
17.4.1 General Methodology ... 135
17.4.2 Southeast Zone Variography ... 136

17.4.3 Las Calabazas and West Zone Variography ... 139

17.5 Block Model Definition ... 141

17.5.1 Block Model Definition, Geologic Model, and Density Assignments ... 141

17.5.2 Density Assignments ... 142

17.6 Grade Estimation and Resource Classification ... 142

17.6.1 Search Strategy ... 142

17.6.2 Grade Estimation ... 143

17.6.3 Gold Equivalent Calculation ... 145

17.6.4 Resource Classification ... 146

17.7 Resource Reporting ... 148

18.0 Other Relevant data and information ... 152

18.1 Mine Operations ... 152

18.2 Process Design ... 160

18.3 Heap Leach Design ... 167

18.4 Environmental Considerations ... 169

18.5 Capital Cost Estimates ... 170

18.5.1 Mining ... 171

18.5.2 Processing ... 173

18.5.3 Heap Construction ... 176

18.5.4 Owner Costs ... 177

18.5.5 Closing Costs ... 178

18.6 Operating Cost Estimates ... 179

18.6.1 Mining ... 179

18.6.2 Processing ... 181

18.6.3 Refining and Transportation ... 182

18.6.4 G&A ... 183

18.7 Economic Analysis and Sensitivities ... 185

19.0 Interpretation and Conclusions ... 189

20.0 Recommendations and budgets ... 191

20.1 Exploration Recommendations ... 192

20.2 Metallurgical and Process Testing ... 193

20.3 Mine Design and Pit Stability Geotechnical Studies ... 197

20.4 Heap Leach and Foundation Geotechnical Testing ... 198

20.5 Permitting and Land Acquisition ... 200

21.0 References ... 201

22.0 Certificates of Qualified Persons ... 203

22.1 Dean D. Turner ... 203
22.2 William D. Bond ... 204

## *LIST OF TABLES*

Table 1.0.1 Cerro Jumil Resources Reported at a 0.30 g/t Gold Equivalent Cutoff ... 10
Table 1.0.5 Estimated Budgets for the Recommended Work ... 16
Table 4.0.1 Cerro Jumil Mining Concessions ... 24
Table 10.2.1.1 Quartz Vein and Related Samples in Intrusive ... 45
Table 10.2.2.1 Range in Soil Geochemistry for Silver and Gold ... 46
Table 11.0.1 Summary of Drilling as of July 2010 ... 52
Table 11.1.1 TECK Drill Hole Intervals of Interest ... 55
Table 12.2.6.1 Twin Hole Select Interval Comparison for Au Values ... 67
Table 13.2.3.1 Summary of QC Samples Checked by Primary and Secondary Labs ... 75
Table 13.2.4.1 Standards used for the Cerro Jumil Project ... 76
Table 13.2.4.2 NP2 Standard Secondary Lab Checks ... 77
Table 13.2.6.1 Pulp and Duplicate Summary ... 90
Table 14.1.1.1 Original ESM Drill Sample and Independent Duplicate Gold-Silver Results ... 104
Table 16.1.1 2005 Bottle Roll Tests – West Zone ... 108
Table 16.1.2 2006 Bottle Roll Rests – Southeast Zone ... 109
Table 16.1.3 SGS Column Leach Test Results, Southeast Zone Bulk Sample ... 110
Table 16.2.1. Design Expert Matrix and Measured Responses for Au and Ag. ... 112
Table 16.2.2. Wilfley Table Testing Finer Size Distribution. ... 112
Table 16.2.3. Wilfley Table Testing Finer Size Distribution Results ... 113
Table 16.2.4 Wilfley Table Testing Coarser Size Distribution ... 113
Table 16.2.5. Wilfley Table Testing Coarser Size Distribution Results. ... 113
Table 17.3.3.1 Gold Descriptive Statistics by Zone ... 134
Table 17.3.3.2 Silver Descriptive Statistics by Zone ... 135
Table 17.4.2.1 SEZ Gold Directional VARIOgram MODEL Parameters ... 138
Table 17.4.3.1 LCZ-WZ Gold Directional VARIOGRAM MODEL Parameters ... 140
Table 17.6.4.1 Generalized Resource Classification Criteria ... 147
Table 17.7.1 Cerro Jumil Resources Reported at 0.3 g/t Gold Equivalent Cutoff ... 149

Table 18.1.1 Scenario Results for $800 Whittle Pits ....153
Table 18.1.2 Resources Inside Pit Designs – Contract-Mining Scenario ....156
Table 18.1.3 Resources Inside Pit Designs – Owner-Mining Scenario ....156
Table 18.2.1: Summary of Bottle Roll Test-work Reported....164
Table 18.5.1 Summary of Cerro Jumil Capital Cost Estimates ....170
Table 18.5.1.1 Mining Capital Costs in $USX1000 for Mine Option 1 ....171
Table 18.5.1.2 Mining Capital Costs in $USX1000 for Mine Option 2 ....173
Table 18.5.2.1 Capital Process Costs (US$) – Crushing Option ....174
Table 18.5.2.2 Capital Process Costs (US$) – ROM Option....175
Table 18.5.3.1 Capital Cost (US$) for Heap Leach Pad Construction by Phase ....176
Table 18.5.4.1 Owner Capital Costs (US$) ....178
Table 18.6.1.1 company Owned Mining Fleet Operating Costs (US$)....180
Table 18.6.1.2 Contract Mining Operating Costs (US$) ....181
Table 18.6.2.1 Process Operating Costs ....182
Table 18.6.4.1 Staff Estimate and G&A Calculation....184
Table 18.7.1 Summary of Pretax Cash Flow Models for Cerro Jumil ....185
Table 20.0.1 Estimated Budgets for the Recommended Work....191
Table 20.1.1 Recommended Cerro Jumil Exploration Budget (US $) ....192
Table 20.2.1 Recommended Metallurgical Testing Budget ....196
Table 20.3.1 Estimated Budget for Geotechnical Testing for Leach Pad and Foundations ....199

## *LIST OF FIGURES AND PLATES*

Figure 4.0.1 Cerro Jumil Location Map....22
Figure 4.0.2 Cerro Jumil Mining Concessions ....23
Plate 4.0.1 Local Crops at Cerro Jumil ....25
Plate 4.0.2 Grazing Cattle at Cerro Jumil ....25
Plate 6.0.1 Old Shafts and Trenches ....28
Plate 6.0.2 Adit on Narrow Structures ....28
Plate 7.2.1 Skarn with Ferruginous Jasperoid....33

Plate 7.2.2 Skarn with Jasperoid and Clay ....33
Plate 7.2.3 Limestone and Marble Outcrop ....33
Plate 7.2.4 Post Mineral Breccia ....33
Figure 7.2.1 Cerro Jumil Geology Map ....34
Figure 9.0.1 Cross Section A-A' Showing Geology and Mineralization ....39
Plate 10.2.1.1 Sampled Trenches and Outcrops at Cerro Jumil ....42
Figure 10.2.1.1 Rock Sample Gold Geochemistry and Location Map. ....43
Figure 10.2.2.1 Gold in Soil Geochemical Survey ....47
Figure 10.2.2.2 Silver in Soil Geochemical Survey ....48
Figure 10.2.3.1 Ground Magnetic Survey Map Showing Total Field Intensity ....50
Plate 11.0.1 Layne Drilling RC Drill ....51
Plate 11.0.2 Intercore Diamond Core Drill ....51
Figure 11.0.1 Drill Hole Location Map ....53
Plate 12.2.4.1. Core Photo of DHE-08-62 Drilled in Las Calabazas Area ....63
Figure 12.2.6.1 Twin Hole Comparison between Core and RC Drill methods ....66
Figure 12.2.7.1 Gold and Silver Comparison for Original Vs. Fines Overflow Samples ....69
Figure 13.2.4.1 Gold and Silver Results for Hazen Research NP2 and NBG Standards ....78
Figure 13.2.4.2 Rocklabs Standard OxC44 ....80
Figure 13.2.4.3 Rocklabs Standard OxD43 ....80
Figure 13.2.4.4 Rocklabs Standard OxG38 ....81
Figure 13.2.4.5 Rocklabs Standard OxH52 ....82
Figure 13.2.4.6 Rocklabs Standard OxL25 ....83
Figure 13.2.4.7 Rocklabs Standard OxG70 ....84
Figure 13.2.4.8 Rocklabs Standard OxD73 ....85
Figure 13.2.4.9 OREAS Standard 61d - Gold ....86
Figure 13.2.4.10 OREAS Standard 61d - Silver ....87
Figure 13.2.5.1 Gold and Silver Results in QC Blank Samples ....89
Figure 13.2.6.1 AVRD Charts for Gold and Silver Field Duplicates, Phase 3&4 ....92
Figure 13.2.6.2 AVRD Charts for Gold and Silver Field Duplicates, Phase 1&2 ....93
Figure 13.2.6.3 AVRD Chart for Field Duplicates between ALS Chemex and SGS Mexico ....94

Figure 13.2.6.4 AVRD Chart for Secondary Lab Pulp Checks ....96
Figure 13.2.7.1 ALS Size Fraction Analysis for Gold Distribution in Core Samples ....98
Figure 13.2.7.2 SGS Size Fraction Analysis for Gold distribution in RC samples ....99
Plate 14.1.1.1 Core Duplicate Sampling ....101
Plate 14.1.1.2 Diamond Sawing ¼ Core ....101
Plate 14.1.1.3 ESM Rodeo Storage Facility ....102
Plate 14.1.1.4 RC Duplicate Sampling ....102
Figure 14.1.1.1 Au Sample Scatter Plot ....105
Figure 14.1.1.2 Ag Sample Scatter Plot ....105
Figure 17.1.1 Drill Hole Plan Map with Cross Section Lines ....117
Figure 17.2.1.1 SEZ Drill Hole Gold Log10 Histogram and Probability Plot ....120
Figure 17.2.1.2 LCZ Drill Hole Gold Log10 Histogram and Probability Plot ....121
Figure 17.2.1.3 WZ Drill Hole Gold Log10 Histogram and Probability Plot ....122
Figure 17.2.1.4 LCZ-WZ Drill Hole Silver Log10 Histogram and Probability Plot ....123
Figure 17.2.1.5 Bismuth Histogram ....124
Figure 17.2.1.6 Copper Histogram ....124
Figure 17.2.1.7 Au vs Bi Scatter Plot ....125
Figure 17.2.1.8 Au vs Cu Scatter Plot ....125
Figure 17.2.2.1 Plan Map with Interpreted Gold Mineralization Solid Models ....128
Figures 17.2.2.2 Perspective Views of Gold Mineralization Solid Models ....129
Figure 17.2.2.3 Section A-A’ Geologic Model and Drill Hole Gold ....130
Figure 17.2.2.4 Section B-B’ Geologic Model and Drill Hole Gold ....131
Figure 17.2.2.5 Section C-C’ Geologic Model and Drill Hole Silver ....132
Figure 17.4.2.1 SEZ Down-hole and Directional Gold Variogram Models. ....138
Figure 17.4.3.1 Combined LCZ and WZ Gold Correlograms ....140
Figure 17.6.2.1 Section A-A’ Block Model and Drill Hole Gold ....145
Figure 17.6.3.1 Section A-A’ Block Model Gold Equivalent and Drill Hole Gold ....146
Figure 17.6.4.1 Section A-A’ Block Model Resource Classification ....148
Figure 18.1.1 Configurations of the Whittle Pit Shells ....154
Figure 18.1.2 Typical Cross Sections of the Whittle Pits and Block Model Grades ....155

Figure 18.1.3 Contract Mining Ultimate Pit Design....157
Figure 18.1.4 Owner – Mining Ultimate Pit Design....158
Figure 18.2.1 Schematic of the General Arrangement of the ADR Building....166
Figure 18.3.1 Ultimate Heap Leach Facility Plan....168
Figure 18.6.4.1 Typical Organization Chart of a Heap Leach Gold Operation....185
Figure 18.7.1 Variation in NPV with Changes in Recovery....187
Figure 18.7.2 Variation in NPV with Changes in Capital Costs....187
Figure 18.7.3 Variation in NPV with Changes in Operating Costs....188
Figure 18.7.4 Variation in NPV with Changes in Gold Price....188

## *APPENDICES*

APPENDIX A. Significant Drill Hole Intervals
APPENDIX B. Refining Cost Calculations
APPENDIX C. Cash Flow Models
APPENDIX D. Final Feasibility Study Typical Table of Contents

## 1.0 SUMMARY

This report is principally an update of drill results and resource estimates for Esperanza Resources Corporation's Cerro Jumil gold-silver project in south-central Mexico. Two Cerro Jumil NI 43-101 technical reports precede this 2010 update, and include: 1) the initial resource estimates given in a September 30, 2008 report by W. Bond and D. Turner, and most recently 2) a December 23, 2009 Preliminary Economic Assessment (PEA) authored by Vector Engineering, Inc. The results from Vector's work have not been updated with the new 2010 resources, but their 2009 economic assessments are included for reference.

Since the Preliminary Economic Assessment report was completed by Vector, Esperanza has drilled an additional 9,469 meters in 74 holes, primarily focused in the Las Calabazas area. Data from this in-fill drill program formed the basis for the resource update.

At a 0.3 g/t gold equivalent cutoff, the Cerro Jumil 2010 resources report 935,000 gold equivalent ounces in the measured and indicated categories, and 252,000 gold equivalent ounces in the inferred category (Table 1.0.1). The new resource estimate represents a 46% increase in measured and indicated gold-equivalent ounces in comparison to the original 2008 NI 43-101 resources. The gold equivalent resources are primarily delineated in three gold dominant zones, named the Southeast Zone (SEZ), Las Calabazas Zone (LCZ) and West Zone (WZ), as well as pods of gold mineralization in the hanging and footwall (HW/FW) of these zones. Gold associated silver mineralization is concentrated in the West and Las Calabazas Zones.

**TABLE 1.0.1 CERRO JUMIL RESOURCES REPORTED AT A 0.30 G/T GOLD EQUIVALENT CUTOFF**

| Category | Zone | Tonnes (000) | Au g/t | Ag g/t | Au Equiv g/t | Au oz (000) | Ag oz (000) | Au Equiv oz (000) |
|---|---|---|---|---|---|---|---|---|
| Measured | SEZ | 7,389 | 0.92 | - | 0.92 | 218 | - | 218 |
| | LCZ & WZ | 2722 | 0.73 | 3.4 | 0.77 | 64 | 296 | 67 |
| | Subtotal | 10,111 | 0.87 | 0.9 | 0.88 | 282 | 296 | 285 |
| Indicated | SEZ | 13,799 | 0.78 | nil | 0.78 | 347 | 2 | 347 |
| | LCZ & WZ | 10,496 | 0.84 | 4.9 | 0.90 | 284 | 1,653 | 302 |
| | Subtotal | 24,295 | 0.81 | 2.1 | 0.83 | 630 | 1,655 | 649 |
| **M & I** | **Total** | **34,406** | **0.83** | **1.8** | **0.85** | **913** | **1,951** | **935** |
| | | | | | | | | |
| Inferred | SEZ | 2,230 | 0.80 | - | 0.80 | 57 | - | 57 |
| | LCZ & WZ | 5,319 | 0.90 | 11.1 | 1.03 | 154 | 1,904 | 175 |
| | HW/FW | 1,048 | 0.55 | - | 0.55 | 19 | - | 19 |
| | **Total** | **8,596** | **0.83** | **6.9** | **0.91** | **230** | **1,904** | **252** |

Totals may not sum to 100% due to rounding.

In addition to the gold dominant mineralization, there is an inferred silver dominant resource outside of these zones that hosts a further 2,392,000 tonnes averaging 43.2 g/t silver (3,322,000 contained silver ounces) at a silver cutoff grade of 25 g/t. This silver mineralization is generally adjacent to, or in the hanging wall of, the LCZ and WZ mineralized zones.

The Cerro Jumil property, centered at 18°46’ N, 99°16’ W, is located 80 kilometers south of Mexico City and 12 kilometers from Cuernavaca in the State of Morelos. The property is 3 kilometers from a paved road and is easily accessible year round.

The property consists of the La Esperanza (437 hectares), Esperanza II (1,270 hectares), Esperanza III (1,359 hectares), Esperanza IV (1,338 hectares), and Esperanza V (278 hectares), Esperanza VI (9,704 hectares), and Esperanza VII (639 hectares) mining concessions. Subject to the payment of taxes and work requirements, the concessions are valid until the anniversary dates in 2052, 2053, 2056, 2058, 2059, 2059, and 2059 respectively and can be renewed for an additional 50 year period if necessary. Esperanza Silver de Mexico S.A. de A.V. (ESM) signed an agreement with the owner, Recursos Cruz del Sur S.A. de C.V. (RCS) on October 25, 2003 whereby it can acquire a 100% ownership interest, subject to a 3% Net Smelter Return Royalty (NSR), by making payments totaling US $2,000,000, and issuing 170,000 shares over 5 years in addition to completing US $100,000 in expenditures in each of the initial 2 years. On October 2, 2006, ESM announced that it reached agreement with RCS to amend its existing agreement allowing for the early exercise of its option to complete the purchase of the Cerro Jumil property. Per the amended agreement, Esperanza paid CDN$417,375 in cash and issued 500,000 shares of the corporation to RCS. RCS will maintain a 3% net smelter return royalty on production from the property.

RCS investigated the region in 1993 and subsequently filed for, and received an exploration concession covering the Cerro Jumil area in 1994. Rock chip sampling and geological mapping were carried out by RCS in 1994, and in late 1995 the property was optioned to Minera Teck S.A. de C.V (Teck). Teck continued with surface mapping, sampling, and completed airborne magnetic and radiometric surveys and a limited induced polarization (IP) and resistivity survey in 1996 and 1997 respectively. In 1998 Teck completed four diamond drill holes totaling 822 meters. Teck returned the property to RCS in late 1998.

In 2002, Geo Associados S.A. de C.V., a geophysical survey contractor, completed 20 kilometers of gradient time domain induced polarization and resistivity (GTDIPR) surveys for RCS in order to expand on the IP survey completed by Teck in 1996.

During 2004 through April 2006 ESM completed additional geological mapping and sampling programs identifying two primary gold skarn targets that were named the West and Southeast Zones. Concurrently, ESM completed 4,864 meters of core drilling including 1,369 and 3,495 meters in the West and Southeast Zones, respectively. Subsequent drilling programs during 2007 thru 2010 included an additional 6,963 meters of core and 28,933 meters of reverse circulation drilling. Total core and reverse circulation drilling to date is 41,582 meters (including 822 meters by Teck). All geological exploration on behalf of ESM has been completed by Resource GeoSciences de Mexico S.A. de C.V. (RGM), a geological services organization, under the supervision of Bond. Work required for environmental reports and exploration permits has been contracted through Consultores Ambientales Asociados (CAA), an environmental and remediation consulting company.

Total exploration expenditures on the property are reported as US$272,500 expended by Teck, US$94,000 expended by RCS and CDN $11,181,200 expended by ESM (as of June 30, 2010).

The Cerro Jumil project is located within the Sierra Madre del Sur metallogenic province which is a NW-SE-trending orogenic belt 800 kilometers long. The property is located in an erosional window through Upper Tertiary and Quaternary rocks exposing the Morelos Platform rocks, a sequence of shallow marine sedimentary rocks deposited unconformably over the basement rocks consisting of high grade metamorphic phyllites and schists (Phanerozoic or early Jurassic). These shallow marine sedimentary rocks are unconformably overlain by the Upper Tertiary to Quaternary Cuernavaca formation consisting of continental volcanic, volcaniclastic, and sedimentary rocks.

The oldest rocks exposed on the property are the Lower Cretaceous Xochicalo formation consisting of grey limestone, a unit in the Morelos Platform rocks. The surface exposure of a 500 by 900 meter multi-phase intrusive, dominated by porphyritic leucocratic granite, is in contact with the limestones. Near the intrusive contact the limestone has been recrystallized into marble and varied mineral assemblages that may include tremolite, wollastonite, diopside, garnet, and other skarn minerals. Weak to intense silicification (jasperoids), retrograde alteration, and iron oxide replacement occurs locally within the skarn zone. Sporadic jasperoid outcrops are exposed along the intrusive contact defining the northeasterly trend of the skarn zone.

Gold mineralization is spatially related to the skarn zone where retrograde alteration resulted in the development of epidote, actinolite-tremolite, chlorite, calcite, clays, iron oxide replacement, and jasperoids at the expense of the primary skarn minerals and sulphides. Gold mineralization is best developed in exoskarn, where one or more mineralized zones tend to be sub parallel to the intrusive contact. Strong fracturing, faulting, and brecciation are associated with the zones of retrograde alteration and gold mineralization.

ESM has taken over 1,300 samples from pre-existing trenches, old dumps, and outcrop exposures in the area within and surrounding the intrusive at Cerro Jumil. Mapping has partially delineated the three gold skarn zones referred to as the West, Las Calabazas and Southeast Zones that parallel the intrusive contact along its northwest and southeast contacts. The Las Calabazas Zone may be an extension of the West Zone towards the southwest, although the two zones are offset and separated by a NW-SE trending structural break. Skarn outcrop exposures are difficult to follow due to overburden, vegetation, and locally well-developed caliche that covers much of the area. However, surface sampling and mapping have adequately defined the trend and location of the mineralized zones allowing for effectively designed and implemented drill programs that have partially delineated the subsurface extent of gold mineralization.

ESM has completed 40,760 meters of core and reverse circulation drilling in the West, Las Calabazas and Southeast Zones and as a result, has been able to trace these zones for 350, 550 and 650 meters of strike length, respectively. All three zones have variable drill-defined thicknesses of gold mineralization ranging from 3 meters to over 100 meters true thickness. In the mineralized zones, gold grades typically range between 0.1 and 5 g/t although local variability can be significant as noted in DHE-06-28 where sample numbers 673501 and 672525 returned gold values of 127.0 and 53.1 g/t, respectively, over 1-meter intervals.

ESM has implemented stringent quality control measures that have confirmed that sampling, sample preparation, sample security and analytical methods have met industry standards.

Initial metallurgical testing by SGS laboratories, including bottle roll and column leach tests, returned satisfactory results indicating that gold could be recovered using standard heap leach techniques. Bottle rolls were completed on samples from both the West and Southeast Zones with gold extraction rates varying from 88 to 96%. One column leach test was done on a composite from the Southeast Zone, and results for 1" minus material indicate 72% and 67% extraction rates for gold and silver respectively over a 61 day leach period.

The Center for Advanced Mineral and Metallurgical Processing (CAMP) completed additional testing on Cerro Jumil core samples. Tests completed by CAMP included Automated Mineral Liberation Analysis (MLA), XRD, ICP elemental scans, fire assay, sulfur and carbon speciation, specific gold and silver deportment and comprehensive analysis of a representative Cerro Jumil resource sample. A Bond Work Index and the Relative Abrasion Index of the sample was also determined. Bulk density measurement of WZ and LCZ core samples was also undertaken. Comprehensive bottle roll testing of the sample with variables such as time, pH, pulp density, grind size, reagent concentration and guided by Stat Ease Design of Experimentation software was used to optimize the parameters and assess the potential for heap leaching. Gravity concentration of the sample with Wilfley table concentration was performed. Results of the testing demonstrated that there were no unusual situations in the mineralogical make-up of the ore that might preclude using heap leach as the processing option.

The Preliminary Economic Assessment (Vector, 2009) reviewed four cases for CAPEX and OPEX costs, and an economic model was constructed for each case. Vector's economic models have not been updated with the current (2010) resource base. However, their general conclusion that Cerro Jumil is potentially economic using conventional drill, blast, load, haul mining, and heap leaching techniques justified continued development of the project. Further, Vector provided a series of recommendations that remain current as of the effective date of this report. Those recommendations are intended to guide the project to a feasibility level study, and are summarized as follows:

- Additional metallurgical testing to further characterize the leaching behavior of the various size fractions and crushing characteristics of the ore. The crushing tests should include Bond's crushing index test and the abrasion index test. The recommended leaching tests include a series of leach tests in columns ranging in size from 305 mm (12") to 1220 mm (48") to assess the leaching characteristics of both crushed and ROM ore.
- Geotechnical studies of structure and testing of rock strength should begin with the next drill phase to characterize the site parameters for pit design. Once preliminary work has been completed, the a new pit can be designed.
- Geotechnical field and laboratory testing programs should be conducted to generate sufficient site-specific data to complete the feasibility design of the heap leach facility and infrastructure construction sites. The investigation will consist of boreholes and test pits, and may also include evaluation of potential onsite and offsite sources of borrow materials.

A significant component of the necessary work to carry on with Vector's recommendations has now been accomplished with the 2009-2010 drill program, and the upgrade of the majority of the Cerro Jumil resource base into the measured and indicated categories. A succeeding step is to continue exploration to fully delineate the extent and grade of gold mineralization in the West and Las Calabazas Zones, and to condemn potential sites for the leach pads and waste dumps. In conjunction with this additional drilling, metallurgical testing, geotechnical data collection, permitting, and land acquisition should proceed with the ultimate goal of producing a full feasibility study. The estimated budget for the recommended work needed prior to initiation of the feasibility study is shown in Table 1.0.5.

**TABLE 1.0.5 ESTIMATED BUDGETS FOR THE RECOMMENDED WORK**

| | |
|---|---|
| Exploration Drilling and Support | $1,600,000 |
| Metallurgical Testing | $60,000 |
| Geotechnical Testing Pit Design | $20,000 |
| Geotechnical Heap and foundations | $128,500 |
| Permitting for Production | $75,000 |
| Land Acquisition | $1,500,000 |
| Totals | $3,383,500 |

## 2.0 INTRODUCTION AND TERMS OF REFERENCE

This report is an update of drill results and resource estimates for Esperanza's Cerro Jumil gold-silver project in south-central Mexico. Two recent Cerro Jumil NI 43-101 technical reports precede this 2010 update, and include: 1) the initial resource estimates given in a September 30, 2008 report by W. Bond and D. Turner, and most recently 2) a December 23, 2009 preliminary economic assessment authored by Vector Engineering, Inc. The results from Vector's 2009 work have not been updated with the new 2010 resources, but their economic assessments are included for reference in Section 18.

The authors of this 2010 update report are responsible for its overall content. Revision of the following sections reflects changes to the 2009 report:

Section 1.0 – Summary
Section 2.0 – Introduction and Terms of Reference
Section 3.0 – Reliance on Other Experts
Section 4.0 – Property Description and Location
Section 7.0 – Geological Setting
Section 9.0 – Mineralization
Section 10.0 – Exploration
Section 11.0 – Drilling
Section 12.0 – Sampling Method and Approach
Section 13.0 - Sample Preparation, Analyses and Security
Section 14.0 - Data Verification
Section 17.0 - Mineral Resource Estimate
Section 19.0 – Interpretation and Conclusions
Section 20.0 – Recommendations and Budgets
Section 21.0 – References
Section 22.0 – Certificates of Qualified Persons

In addition to Vector's PEA work given in Section 18, Section 16 - Metallurgical Studies is unchanged in this 2010 update. The other unchanged sections (i.e., 5, 8, and 15) represent general information of a geologic or background nature.

A list of recent project milestones, in time sequential order is:

- 2008). NI 43-101 resources at a 0.3 g/t gold equivalent cutoff given as:

| Category | Tonnes (000) | Au g/t | Ag g/t | Au Equiv g/t | Au oz (000) | Ag oz (000) | Au Equiv Oz (000) |
|---|---|---|---|---|---|---|---|
| **Measured** | 8,003 | 0.90 | 0.01 | 0.90 | 232 | 4 | 232 |
| **Indicated** | 15,225 | 0.83 | 1.0 | 0.84 | 405 | 476 | 410 |
| **M & I Total** | 23,227 | 0.85 | 0.6 | 0.86 | 636 | 479 | 642 |
| | | | | | | | |
| **Inferred** | 15,810 | 0.74 | 11.94 | 0.87 | 378 | 6,068 | 442 |

- 2009). Additional metallurgical testing of core and RC cuttings conducted. Preliminary mine planning utilizing the resource estimates reported by Bond and Turner in 2008. A preliminary pit design and a mining schedule were developed, and CAPEX and OPEX mining costs estimated by Tom Dyer (2009) of Mine Development Associates (MDA) of Reno, Nevada in a report titled Cerro Jumil Preliminary Economic Assessment Mining Study Morelos State, Mexico.
- 2009). Lyntek, Inc of Denver, Colorado reviewed all metallurgical test work and developed a conceptual process design and estimated CAPEX and OPEX process costs utilizing proven heap leach technology. They reported their findings in an August 2009 report titled Cerro Jumil Preliminary Economic Assessment.
- 2009). Khoury et al. of Vector provided conceptual engineering design and construction cost estimates for heap leach pads and ponds in a report titled Conceptual Design of Gold Heap Leach Facility Cerro Jumil Gold/Silver Project, Morelos State, Mexico.
- 2009). Esperanza commissioned Vector to undertake a comprehensive review of the work completed on Cerro Jumil up to a cutoff date of April 2009, and utilize the findings of the review to complete a preliminary economic analysis of the viability of the project. Specific objectives included:

1. Establishing a preliminary pit design, mining schedule, and mining CAPEX and OPEX costs utilizing the resources defined in the September, 2008 Technical Report for the following two options:
    a. Company mining
    b. Contract mining
2. Establishing a preliminary process design including CAPEX and OPEX costs for the following two options:
    a. Run-of-Mine heap leaching
    b. Heap leaching with two stage crushing
3. Develop preliminary engineering design and cost estimates for heap pad construction, infrastructure construction, G&A, and closing costs.
4. Develop a series of economic models to determine the viability of the project and identify which mining and process options provide the best project economics.
5. Make recommendations for future work and present budgets required to advance the property toward final feasibility.

Vector subsequently issued a final NI 43-101 Technical Report titled Cerro Jumil Project, Mexico, Preliminary Economic Assessment, dated December 23, 2009.

Since the Preliminary Economic Assessment report was completed by Vector, Esperanza has drilled an additional 9,469 meters in 74 holes, primarily focused in the Las Calabazas area. Data from this in-fill drill program was utilized for the 2010 resource estimates.

Dean D. Turner, P.Geo., is an independent Qualified Person under the requirements of National Instrument 43-101 (NI 43-101), and is responsible for the Cerro Jumil mineral resource in Section 17 of this report. He is also responsible for independent data verification as discussed in Section 14.1. Turner last visited the property on January 16 and 17, 2008.

William D. Bond, P.Geo., is the Exploration Vice President for Esperanza, and is the Qualified Person under the requirements of National Instrument 43-101 (NI 43-101) responsible for all work completed on the Cerro Jumil property since its acquisition on October 25, 2003 by Esperanza Silver de México, S.A. de C.V. (ESM), a wholly owned subsidiary of Esperanza Resources Corporation. Previous exploration work on the property by Teck and RCS was reviewed by Bond, and integrated into the September 2010 geologic database where appropriate. Bond has visited the property numerous times (over 400 days total) from October 2003 until present, and is responsible for supervision of all exploration activities completed by ESM, including extensive geological mapping, outcrop and trench sampling, and four phases of drilling, now totaling over 41,500 meters. Data integrity was verified by Bond utilizing various quality assurance and control programs. Bond is responsible for all sections of this report other than 14.1 and 17.

Metric units have been used throughout this report. Tonnages are metric tonnes and precious metals (gold and silver) are recorded as grams per metric tonne (g/t) or parts per million (ppm). Gold and silver grams are converted to ounces of gold and silver. Base metals (copper, lead and zinc) are in weight percent. All other references to geochemical analysis of rocks and stream sediments are recorded as parts per million (ppm) for silver, lead, zinc, copper and parts per billion (ppb) for gold. Currency is quoted in U.S. dollars US dollars unless noted as CDN$, Canadian dollars, or MP$, Mexican Pesos.

Common abbreviations used throughout the report include:

Ag – Silver
Au - Gold
CAPEX – Capital Costs
ESM – Esperanza Silver de Mexico S.A. de C.V.
G&A – General and Administrative Costs
g or gms – grams
g/t – grams per tonne
LOM – Life of Mine
Lps – Liters per second
OPEX – Operating Costs
NSR – Net Smelter Return
PEA – Preliminary Economic Assessment
ROM – Run-of-Mine
T – Metric Tonnes
Tpy – Tonnes per year
Tpd – Tonnes per day

## 3.0 RELIANCE ON OTHER EXPERTS

In preparing this report, the authors (Bond and Turner) partially relied on reports, maps, drill logs, and technical papers listed in Section 21.0 and on studies completed for Esperanza in the areas of mining (Dyer, 2009), metallurgy (Lyntek, 2009), heap leach pad construction (Khoury et al, 2009), and the Vector Engineering Preliminary Economic Assessment NI 43-101 report (December 2009). These reports were completed for Esperanza by authors who are considered by the definitions and standards of NI 43-101 as independent "Qualified Persons". The authors of this report consider the work of the aforementioned to be valid, reliable, and relevant. The current authors also co-authored the September 2008 NI 43-101 resource report, and at that time reviewed the previous work from a major international mining company, Teck, who carried out most of the exploration prior to ESM's acquisition of the property. Teck's work is considered to be valid, reliable, and relevant.

This report, of necessity, makes use of information originated by geologists and personnel in the employ of previous operators on the Cerro Jumil property. The qualifications of many of these workers are unknown. Bond has visited the property many times and supervised much of the work for Esperanza and verified that the geology as seen in the field is consistent with the geology described by earlier workers. Sources of information are acknowledged throughout the text where the information is used, and if doubt exists as to the quality of the data, that doubt is so noted.

Section 4.0 of this report reflects the current status of payments and contains information relating to mineral titles, permitting, regulatory matters and legal agreements. While the current authors of this report are generally knowledgeable concerning these issues in the context of the mineral industry, they are not legal or regulatory professionals. Where appropriate within the report, citations are made to information obtained from other experts, with the full reference given in Section 21.0. In particular, the authors have relied on land and title information from the Secretaria de Economia, Estados Unidos Mexicanos, who is responsible for registering the mining concessions. The information in the report concerning these matters is provided as required by Form 43-101F1, but is not a professional opinion on the title of the property. In addition, the authors have relied in part on Consultores Ambientales Asociados for an assessment of the environmental and permitting aspects of the project. The individuals and documents that the authors consulted in compiling that information are identified in the appropriate Sections where their information is used. The metallurgical test work completed by SGS and CAMP as described in Section 16.0 of this report was performed by reputable labs; however the qualifications of the persons responsible for the work and the subsequent report are unknown.

## *4.0 PROPERTY DESCRIPTION AND LOCATION*

The property, centered at 18°46'N, 99°16'W, is located 80 kilometers south of Mexico City, and 12 kilometers southwest from Cuernavaca in the State of Morelos (Figure 4.0.1).

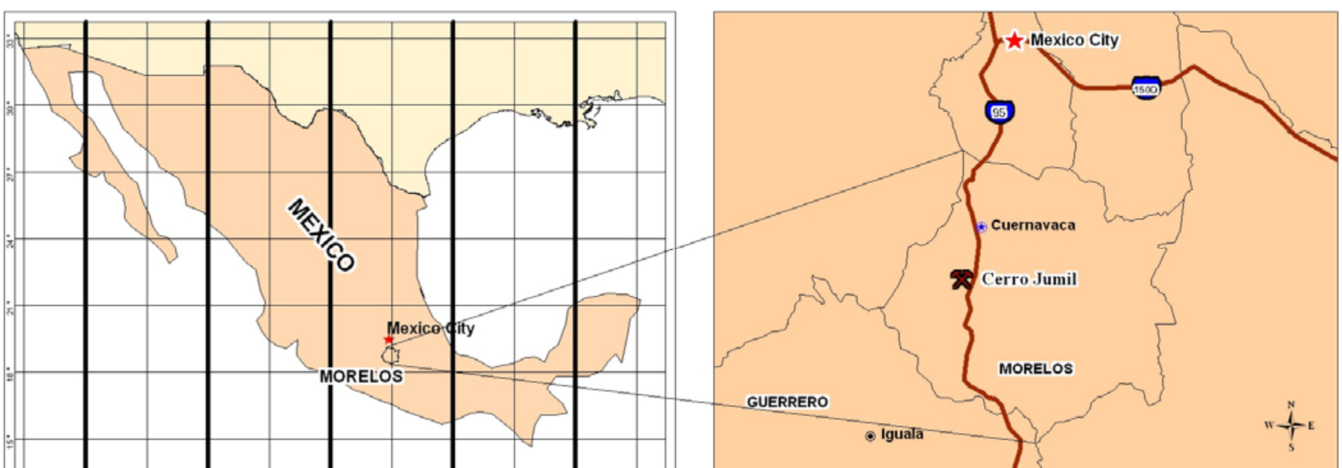



**Figure 4.0.1 Cerro Jumil Location Map**

The property consists of the La Esperanza (437 hectares), Esperanza II (1,270 hectares) Esperanza III (1,359 hectares), Esperanza IV (1338 hectares) , Esperanza V (278 hectares), Esperanza VI (9,704 hectares), and Esperanza VII (639 hectares) mining concessions (Figure 4.0.2).

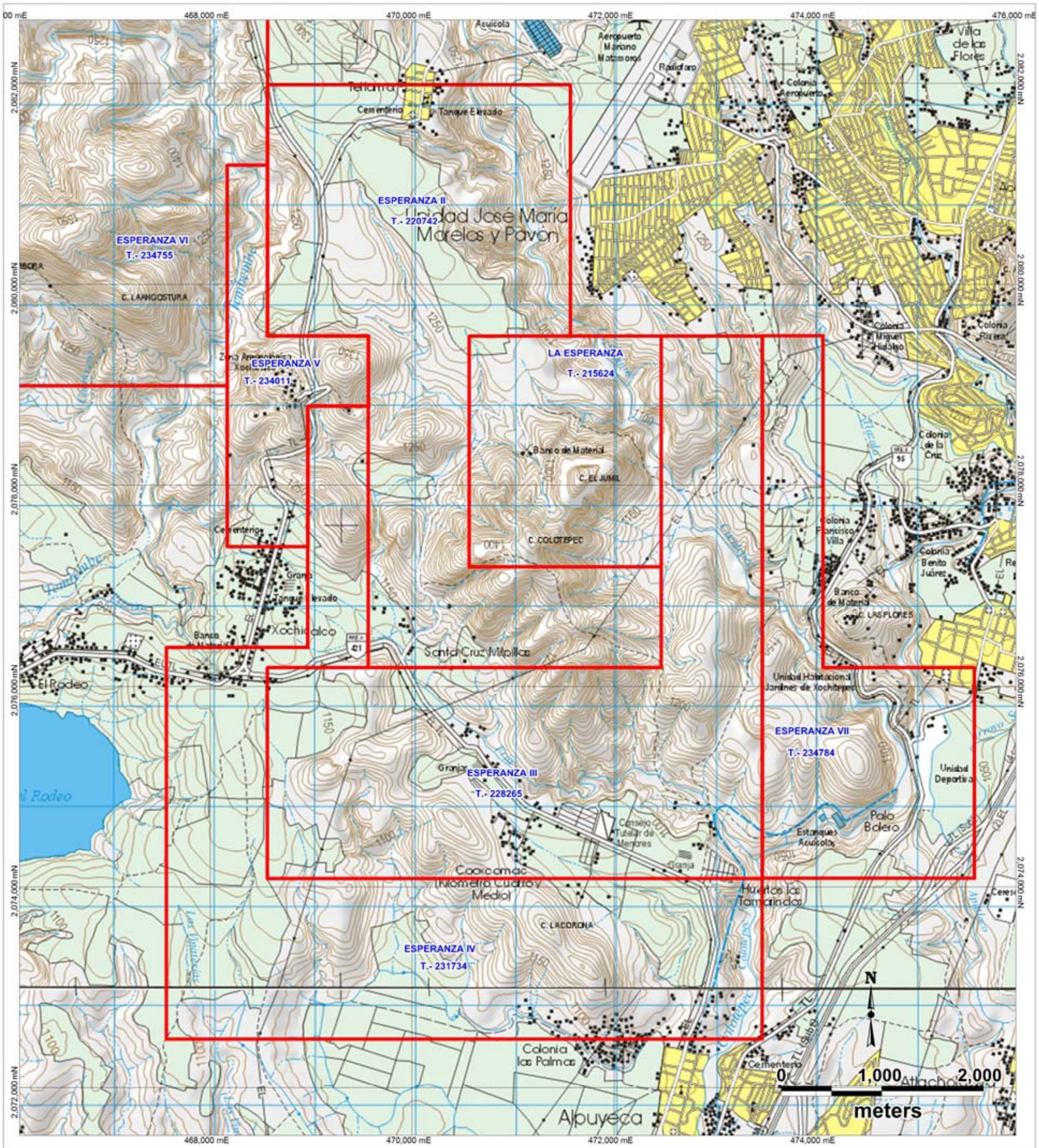



**Figure 4.0.2 Cerro Jumil Mining Concessions**

The mining concessions are subject to the payment of taxes, nominal work requirements, and are effective so long as the necessary payments are made on an annual basis until the anniversary dates of issuance of the concessions in 2052, 2053, 2056, 2058 and 2059 respectively (Table 4.0.1). According to existing mining law, these mining concessions can be renewed for an additional 50 years. Concession taxes have been paid up to January 2010 and sufficient assessment work has been done to hold the concessions for several years. The taxes are due and payable in January and July each year. Taxes paid for the five concessions in 2009 totaled MP$103, 607 (~US$7675).

**TABLE 4.0.1 CERRO JUMIL MINING CONCESSIONS**

| Mining Concession | Title No. | Area (Hectares) | Title Validity | |
|---|---|---|---|---|
| | | | Issued | Expires |
| Esperanza | 215624 | 437 | 5 March 2002 | 4 March 2052 |
| Esperanza II | 220742 | 1,270 | 30 September 2003 | 29 September 2053 |
| Esperanza III | 228265 | 1,359 | 20 October 2006 | 19 October 2056 |
| Esperanza IV | 231734 | 1,338 | 15 April 2008 | 14 April 2058 |
| Esperanza V | 234011 | 278 | 15 May 2009 | 14 May 2059 |
| Esperanza VI | 234755 | 9,704 | 11 August 2009 | 10 August 2059 |
| Esperanza VII | 234784 | 639 | 14 August 2009 | 13 August 2059 |

The Esperanza and Esperanza II mining concessions were owned by RCS a Mexican corporation when ESM entered into an option agreement, October 25, 2003, whereby it could acquire a 100% ownership interest subject to a 3% Net Smelter Return Royalty (NSR) by making payments totaling US $105,000, issuing 170,000 shares over 4 years with a balloon payment of US $1,895,000 due on the 5th anniversary of the agreement and completing US $100,000 in expenditures in each of the initial two years. On October 2, 2006 ESM announced that it reached agreement with RCS to amend its existing agreement allowing for the early exercise of its option to complete the purchase of the Cerro Jumil property. Per the amended agreement Esperanza paid CDN$417,375 in cash and issued 500,000 shares of the corporation to RCS to finalize the purchase of the Cerro Jumil property. RCS will maintain a 3% net smelter return royalty on production from the property.

The community of Tetlama owns the surface rights as both individual ownership lots and common lots. An agreement has been signed (September, 2008) with the community which allows ESM to carry out physical work on the land in the Cerro Jumil area for a period of 3 years. There are no residences on the concessions in the area where project work is being undertaken. A small area of the land, just west of the project area, is agricultural and used to raise crops such as peanuts, tomatoes, corn and agave (Plate4.0.1). Local grassy areas are also used for grazing cattle, horses and goats (Plate 4.0.2).

**Plate 4.0.1 Local Crops at Cerro Jumil**

**Plate 4.0.2 Grazing Cattle at Cerro Jumil**

The area where all exploration has been undertaken includes moderate to rugged terrain consisting of small trees and locally dense vegetation. ACC compiled environmental impact data that is being used to change the land use status to mining. The UN conducted a site inventory of possible archaeological artifacts in the 1960's and identified ruins on the top of Cerro El Jumil. This small area currently has restrictions for new road construction applied to it as determined by the Instituto Nacional de Antropologia e Historia (INAH). Esperanza recently entered into an agreement with INAH and is sponsoring an archeological investigation toward cataloging and, if required, excavating minor known sites in the Cerro Jumil area. Field work is mostly completed and results from the study will be used in preparation of the final environmental impact statement. The Cerro Jumil defined resource is located several kilometers east of the Xochicalo archaeological site.

Permits to carry out work programs are issued by the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). Four separate permits have been issued for drill programs including one by Teck in September 1997 and three by ESM during July 2004, November 2005, and October 2009. The 2004 and 2005 exploration permits have expired although the 2009 permit remains valid. It is likely that a new exploration permit will be required to complete some of the additional geotechnical and infill drilling that has been proposed. This new exploration permit will be applied for in the fall of 2010 and is expected to be issued in early 2011.

There are three historic sanitary landfill sites within the mining concessions that were used by the city of Cuernavaca and surrounding communities. Two landfill sites have been reclaimed, capped and closed for several years. The other site is currently inactive. ACC noted several environmental problems regarding contamination from the landfill areas including oil seepage. Local municipalities are responsible for reclamation and subsequent environmental remediation of the land-fill. There are no other known potential environmental liabilities.

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

Access to the property is by paved road to 7 kilometers north of Alpuyeca along Morelos Highway 55 to where a dirt road turns off to the landfill, and then continues 2.75 kilometers onto the property. The road is passable year round by 2-wheel drive vehicles.

Climatic conditions are temperate and conducive to working the project throughout the year. There is a rainy season that extends from June to September which can create difficult access on unimproved roads. Vegetation in the form of small shrubs and trees can locally become dense during the rainy season, although they are greatly diminished during the remainder of the year as the area dries out.

Infrastructure including major highways, communication services, transportation, and electricity are easily accessible. Cuernavaca has a large airport and Mexico City, the major hub for international flights in Mexico, is within a two-hour drive. Agriculture, tourism, and numerous industrial enterprises support the local economy. Workers are available at the village of Tetlama, with a population of approximately 1000, and Cuernavaca is a city of over 1 million people which can provide most supplies and services that might be required.

Topography is moderately rugged, varying from 1,100 to 1,450 meters elevation.

## *6.0 HISTORY*

There are several inaccessible shafts, adits, and prospect pits on the property of unknown age (Plate 6.0.1 and Plate 6.0.2). A small operation is believed to have operated in the 1970's in several adits developed on narrow high-grade silver-bearing quartz veins hosted within the intrusive. Several older exploration pits and shafts were developed in the skarn zone along the western contact of the intrusive, which may have been related to the 1970's operation. Total mining production was insignificant.

RCS carried out reconnaissance geology in 1993 and acquired an exploration concession over the area in 1994. Rock chip sampling and geological mapping were carried out in 1994 and in late 1995 the property was optioned to Teck.

**Plate 6.0.1 Old Shafts and Trenches**

**Plate 6.0.2 Adit on Narrow Structures**

Teck continued exploration work with additional surface mapping, rock chip sampling, trenching, airborne magnetic and radiometric surveys, and a limited induced polarization survey in 1996.

Terraquest Ltd. carried out the airborne survey for Teck in 1996 using a helicopter-borne high-sensitivity magnetometer and gamma-ray spectrometer survey at a nominal 100-meter terrain clearance and 100-meter line spacing. The results have not been seen by the author although it is reported (Kearvell, 1996), that the magnetic signature is relatively flat. The radiometric survey was useful in outlining the various lithological units.

Teck cleaned and sampled pre-existing trenches in addition to excavating four new trenches, in an area of skarn alteration related to the western contact of the intrusive. Teck took a total of 184 grab and channel samples.
Teck also contracted and completed a gradient time domain induced polarization and resistivity survey, completed by Quantec, in 1997 that covered the southern intrusive contact zone with five lines spaced 150-meters apart. Readings were taken at 25-meter intervals. Transmitter dipole spacing was 850 to 1,700 meters with later detail at 200 to 1,300 meters. Results were plotted on plan maps and stacked gradient cross sections. The work is considered reliable and indicates several geophysical anomalies.

In 1998 Teck completed four diamond drill holes, totaling 822 meters that were directed at several of the geophysical targets. Results of the drilling are discussed in Section 11. Teck returned the property to RCS in 1998.

Prior to the expiry date of the exploration concession in 2000, RCS applied for an exploitation concession that was granted on March 5, 2002. Since that time, the mining laws have changed and all concessions are now considered "mining concessions" with an expiry date of 50 years.

RCS continued to advance the property with another surface geochemical sampling program in 2002. RCS collected a total of 118 samples from outcrop and float material during the 1994 and 2002 campaigns in conjunction with geological mapping.

In 2002 Geo Associados S.A. de C.V. completed 20 kilometers of gradient time domain induced polarization and resistivity for RCS. The survey extended the previous Quantec survey to the north and south. The 1997 survey indicated that the interpreted anomalies are at a depth of 200-300 meters and the 2002 survey was designed to look at similar depths.

ESM signed an agreement with the owner of the property, RCS, on October 25, 2003 whereby it could acquire a 100 percent ownership interest, subject to a 3% NSR Royalty. Subsequently, during 2004 through April 2006 ESM completed additional geological mapping and sampling programs identifying two primary gold skarn targets named the West and Southeast Zones. Subsequently, ESM completed more detailed geological mapping and sampling programs and 40,760 meters of both core and RC drilling directed at evaluating the western and eastern contacts of the intrusive where skarn development and gold mineralization occurs.

Total expenditures are reported to be US $272,500 expended by Teck, US $94,000 expended by RCS and CDN $11,181,200 by ESM (as of June 30, 2010).

# *7.0 GEOLOGICAL SETTING*

## *7.1 Regional Geology*

The Cerro Jumil project is located within the Sierra Madre del Sur metallogenic province, which is a NW-SE-trending orogenic belt 800 kilometers long. The belt consists of a basement of high-grade metamorphic phyllites and schists of Phanerozoic age. In the property area, the schists are part of the Taxco Schists. The Jurassic to Cretaceous Morelos-Guerrero Platform, a sequence of shallow marine sediments have been deposited unconformably over the basement rocks and are overlain by a package of volcanic, volcaniclastic, and continental sedimentary rocks. From the late Cretaceous to Early Tertiary, compressional tectonics deformed the sediments of the Morelos-Guerrero Platform into a fold series with northwesterly trending fold axes. Extensive normal or block faulting occurred during the Eocene-Oligocene. Erosion and uplift continued accompanied by the deposition of continental redbed sedimentary rocks and contemporaneous basalt flows.

The late Eocene through the Pliocene was a period of extensive volcanism with the deposition of rhyolite and ignimbrite. Granodioritic to monzonitic intrusions related with the volcanism are associated with the skarn deposits.

The Upper Tertiary to Quaternary time is marked by the deposition of the Cuernavaca continental clastic sedimentary rocks deposited into tectonic trenches formed by the onset of the east-west volcanic belt. The entire stratigraphic package is currently undergoing uplift and erosion and a thin colluvial cover is present over most of the district.

### *7.2 Local and Property Geology*

The Cero Jumil project is located in an erosional window through which the Morelos Platform rocks are exposed. The oldest rocks seen on the property are the Lower Cretaceous Xochicalco formation consisting of medium to thick-bedded, locally finely laminated, grey to dark grey limestone. A 500 by 900 meter multi-phase intrusive primarily composed of feldspar porphyry with plagioclase phenocrysts and equi-granular granite with >25% k-feldspar, has intruded the limestone. Temporally related quartz porphyry and andesitic or micro-diorite dikes have been identified within the intrusive and near the contact boundaries. The intrusive stock is probably of Tertiary age although has not been dated. Unconformably overlying the intrusive and Cretaceous rocks is the Cuernavaca Formation, which locally consists of continental volcanic, volcaniclastic, and sedimentary rocks. A geological map for the Cerro Jumil area is shown in Figure 7.2.1.

The Lower Cretaceous Xochicalco formation limestone is relatively fresh or unaltered when observed several hundred meters from the intrusive contact.

Approaching the contact the limestone becomes more altered and typically reflects the following progression; 1) coarser grained (recrystallized) grey limestone often containing interbeds of fine to medium-grained marble as seen in Plate 7.2.3, 2) medium- to coarse-grained white marble (locally brecciated), 3) near or at the contact pyroxene (±garnet) wollastonite (±garnet) and/or tremolite/actinolite (±garnet) can be well developed, and 4) below the skarn zone, within the intrusive, there is pervasive alteration (clays) of feldspars near the contact that diminishes rapidly deeper into the intrusive. This typical zonation from fresh limestone to various stages of skarn development is common although the width of each altered zone may be quite variable as noted in several drill holes and in outcrops (Plate 7.2.1 and 7.2.2). The width, extent, and type of skarn development are dependent on the composition of the intruded rocks, local intrusive temperature and related metasomatism. In the southwest area of the project, near Cerro Las Calabazas, skarn development containing an abundance of wollastonite is much more extensive than observed in the northeast area around Cerro Jumil.

**Plate 7.2.1 Skarn with Ferruginous Jasperoid**

**Plate 7.2.2 Skarn with Jasperoid and Clay**

**Plate 7.2.3 Limestone and Marble Outcrop**

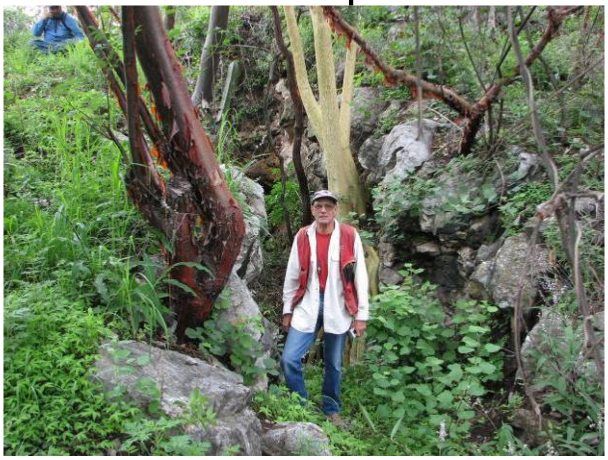


**Plate 7.2.4 Post Mineral Breccia**

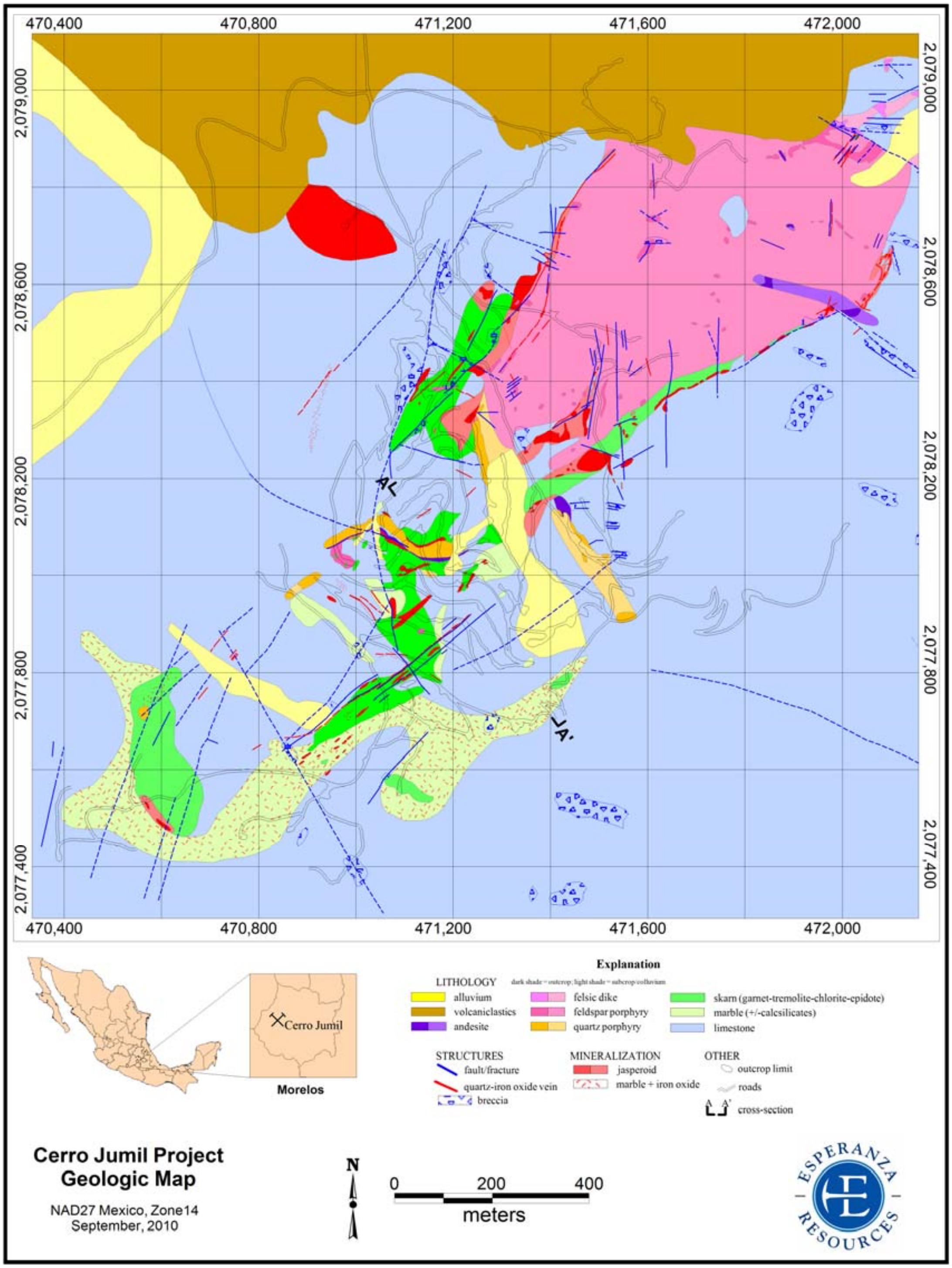



**Figure 7.2.1 Cerro Jumil Geology Map**

Skarn zones vary in width from a few meters to over 100 meters as noted in drill hole intercepts. Both endoskarn and exoskarn occur, although exoskarn assemblages are more extensively developed. The Cerro Jumil project uses the following simplified nomenclature for identifying the various skarn or alteration assemblages;

- Marble Skarn: medium to coarse-grained marble with minor garnet-tremolite/actinolite-epidote-chlorite in bands or veinlets.
- Endoskarn: intrusive rocks with strong alteration consisting of clay, epidote, ±chlorite and rarely calc-silicate minerals.
- Exoskarn: medium- to coarse-grained marble with locally well developed tremolite-actinolite-wollastonite-pyroxene-clay, ±garnet, ±epidote, ±chlorite.

Brecciated zones within the skarn consisting of angular to subangular fragments from 5 millimeters to greater than 5 centimeters are common. The breccia occurs near the intrusive contact or along spatially related fault or fracture zones (Plate 7.2.4). Outcrops are sporadic but geological mapping clearly shows the skarn zones, along the north western and south eastern contacts with the intrusive, are continuous for at least one kilometer.

Jasperoid, hematite-rich red low-temperature silica, is exposed on the surface near the intrusive contact and along faults and fractured zones. It occurs as a fine-grained to amorphous siliceous rock, siliceous limestone, silicified marble skarn, and as siliceous bands along fractures or within limestone beds. The jasperoids are often ferruginous and can contain anomalous gold values. The surface expression of the jasperoid is discontinuous but can be traced intermittently for over one kilometer. Local outcrops can be over 30-meters wide although subsurface intersections in drill core are rarely more than five-meters long. The jasperoids are probably spatially related to the main gold skarn horizon and is interpreted to be best developed at or near surface or at the top of the main gold skarn zones where boiling and silica precipitation occurred. Structural zones strongly influence the location and extent of the jasperoidal outcrops.

Northeast-trending structural lineaments are easily identified on satellite imagery. Both the West and Southeast gold-skarn zones are aligned along this trend which is coincident with the intrusive contact. Geological mapping has identified three other structural trends including north, northwest, and east-west fracture/fault systems. The jasperoids tend to be localized along faults and fractures related to the northeast-, northwest- and north-trending structural lineaments and develop the greatest widths where structural intersections occur. The east-west structures appear to be post mineral and are often associated with brecciated zones that are unmineralized. Towards the northeast of Cerro Jumil is a northwest-trending fault with a fresh micro-diorite/andesite dike within it which may imply that the northwest fracture system was reactivated after the primary period of mineralization. There also appears to be several minor offsets related to this system across jasperoid and skarn zones. The structural system and its relationship to gold mineralization are not clear because of the early stage of exploration although the strong correlation between the gold skarn zones and the northeasterly trending structures is obvious.

Caliche is locally well developed on the property obtaining thicknesses of up to three meters and often covers the local rock units making geological mapping and interpretations challenging.

## 8.0 DEPOSIT TYPES

Cerro Jumil is, in general terms, a gold enriched skarn deposit that developed in contact aureoles between the feldspar porphyry intrusive and limestone host rocks. Hydrothermal and metasomatic activity developed both endoskarn and exoskarn mineral assemblages. Both prograde and retrograde alteration is recognized, and gold appears to be temporally related to the late stage of the prograde process and the onset of retrograde alteration. The zone of gold mineralization dominantly occurs in oxidized zones, although rare sulphide minerals have been identified in some logged intervals (1-15% pyrite-pyrrhotite-<sphalerite-<chalcopyrite-arsenopyrite>) from deeper drill intercepts. It is estimated that over 99% of the original sulphide minerals are oxidized, creating locally abundant hematite, goethite, and other iron oxide alteration products. Exploration to date has identified one gold skarn zone along the southeast intrusive contact (Southeast Zone) and two along the northwest contact (West and Las Calabazas Zones). Recent drilling shows that the Southeast and Las Calabazas Zones merge over the top of the intrusive in the southern area of the deposit.

Within the intrusive rock and near its contact, several narrow, less than one meter and generally 5-10 centimeters in width, quartz veins were previously exploited, presumably for silver. Local high-grade samples exceeding 500 g Ag/t were obtained over widths of several meters in surface outcrops. The quartz veins usually occupy north to northeast-trending fault zones. Drill core analytical results beneath several of these high-grade silver occurrences indicates significantly lower values in the subsurface, generally ranging from 10 to 60 g Ag/t, implying that the higher-grade values at or near the surface resulted from supergene enrichment.

## *9.0 MINERALIZATION*

Primary mineralization consists of gold, and to a lesser extent silver, associated with the skarn zones and spatially related to the intrusive. The skarn is well exposed on the south and west sides of the intrusive, but is inconspicuous in other areas where it is covered by the younger Cuernavaca Formation or caliche. Based on the abundance of altered and mineralized float, the skarn may be present at shallow depths below the cover rocks. Areas where crosscutting structures, north and/or northwest trending, intersect the primary northeast faults tend to produce dilated zones of gold mineralization.

Gold values are often associated with jasperoid that occurs along fractures, in veins, and in narrow lenses within the limestone or marble. Jasperoid outcrops from 1 to greater than 30 meters in thickness have been mapped, although core intercepts generally show that much narrower zones, less than 5 meters, generally exist. Gold assays in jasperoids have produced grades greater than 12 g/t but not all jasperoid contains appreciable gold values, although they are generally strongly anomalous (>100 ppb). The greater thicknesses of jasperoid observed at the surface, versus what is found in drill core, may indicate that the more pervasive silica flooding represents the top of the hydrothermal system.

Prograde alteration is noted by the development of pyroxene minerals, wollastonite, and garnet. The width of gold skarn mineralization is directly related to the extent of prograde alteration and is controlled by the pre-mineral faults and fractures that acted as conduits for the hydrothermal system responsible for mineralization. Some of the greater thicknesses and highest grades of gold are observed in zones of extensive prograde alteration, with minor retrograde alteration, including; DHE-05-01 with 36.3 meters at 2.2 g Au/t, DHE-06-18 with 29.6 meters at 2.08 g Au/t, and DHE-06-22 with 32 meters at 1.57 g Au/t. Numerous individual samples, greater than 10g Au/t, also show strong prograde alteration as in DHE-06-28, where two separate one meter long samples returned values of 127 g Au/t and 53.1g Au/t. Gold mineralization probably occurred during the later stages of prograde metasomatism, although locally there is a strong over printing of retrograde alteration. Retrograde alteration resulted in the development of actinolite-tremolite, epidote, iron oxides, calcite, clay, and quartz. Retrograde minerals observed in the gold skarn zone may imply the gold mineralization is related to retrograde alteration. More research is required to determine if the gold mineralization is preferentially associated with the prograde or retrograde process.

Intense argillic and/or potassic alteration (clays) and epidote development is common within the intrusive near the skarn contact. Although locally anomalous gold may be associated with this zone, the values are generally less than 0.5 g Au/t and thus far appear to be of little economic importance.

A representative cross section, located as A-A' on Figure 7.2.1, is shown in Figure 9.0.1.

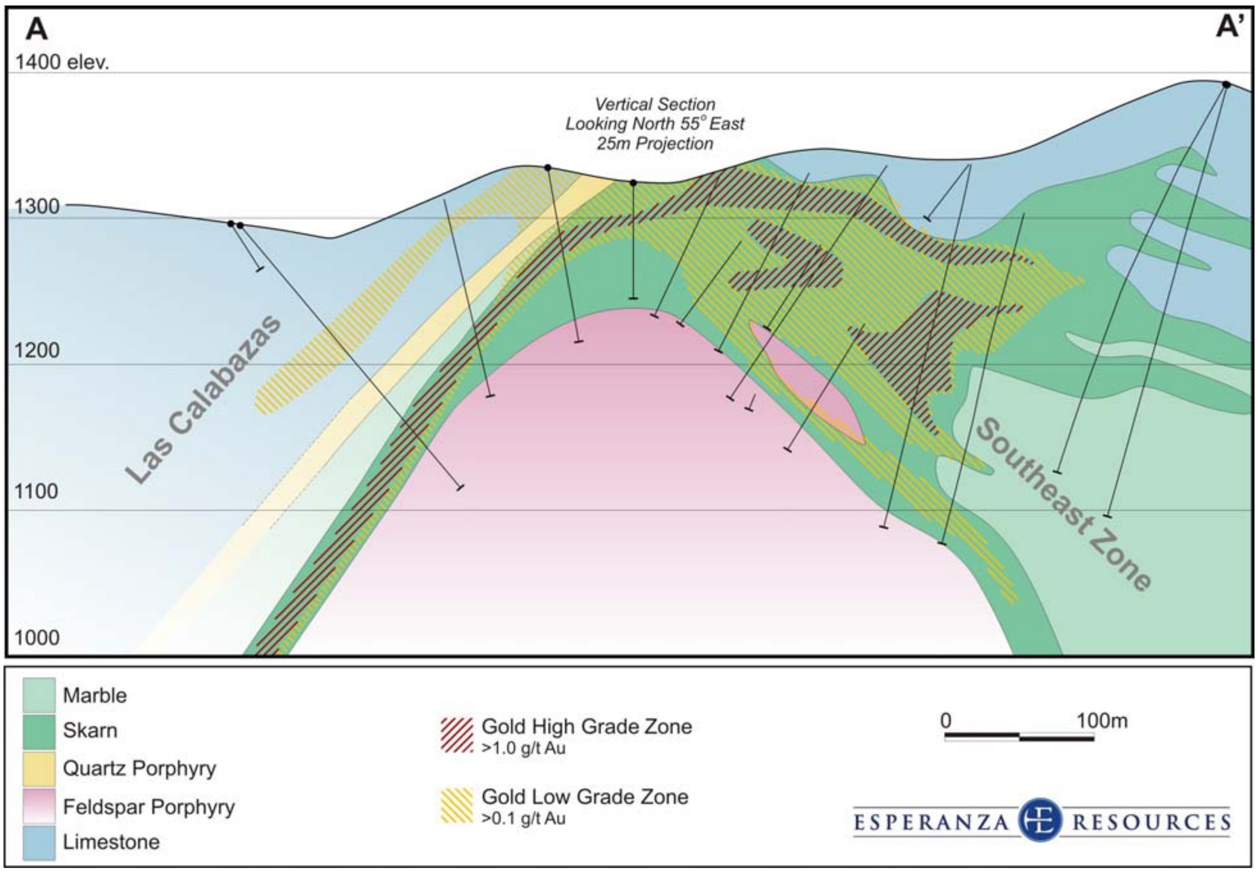



**Figure 9.0.1 Cross Section A-A' Showing Geology and Mineralization**

# 10.0 EXPLORATION

## 10.1 Exploration Prior to 2003

Previous to Esperanza's involvement, exploration at Cerro Jumil included geological mapping, geochemical sampling, geophysical surveys, and a limited drill program.

Over 300 surface samples were collected by RCS and Teck, including select rock chip, channel, and random grab samples. Geochemical results indicated that silver and gold are the elements of primary exploration importance.

Teck contracted with Terraquest Ltd., in 1996, to undertake a high resolution aeromagnetic and radiometric survey. The results were determined to be of limited use in identifying specific exploration targets.

During 1997, an induced polarization and resistivity survey was completed by Quantec, a geophysical survey contractor, over the southern area of the intrusive/limestone contact, on behalf of Teck. The results indicated anomalous chargeabilities in areas where the contact is assumed to be beneath the overburden in this area. The identification of several IP and resistivity anomalies was partially used to design and implement a four-hole drill program to test select targets by Teck.

During 1998 Teck drilled four diamond drill holes totaling 822 meters. The drill holes were designed to test chargeability anomalies identified in the 1997 IP survey. Two holes (BDE-98-1 and -2) drilled granitic rocks for their entire length and did not return any significant geochemical values. Another hole was abandoned (BDE-98-4) due to poor drilling conditions and therefore did not reach its intended target. One hole (BDE-98-3) did penetrate the limestone and intrusive contact where skarn, over a 23-meter intercept length, was observed. Values up to 25.8 ppm silver and 760 ppb gold were obtained from the down-hole intervals 161.8-162.2 and 162.2-165.0, respectively.

In late 2002, RCS contracted with independent geophysical contractor Geo Asociados S.A. de C.V. to expand the IP and resistivity grid. As a result of the geophysical work completed a total of six areas of interest were identified.

## *10.2 ESM Exploration Since 2003 Acquisition*

During the period from late October 2003 up to June 2010, ESM completed detailed mapping and sampling in the Cerro Jumil area, constructed access roads and over 160 drill sites, and completed 40,760 meters of core and RC drilling. A localized soil geochemical survey was also completed. All geological work at Cerro Jumil was performed by RGM under the direct supervision of Bond.

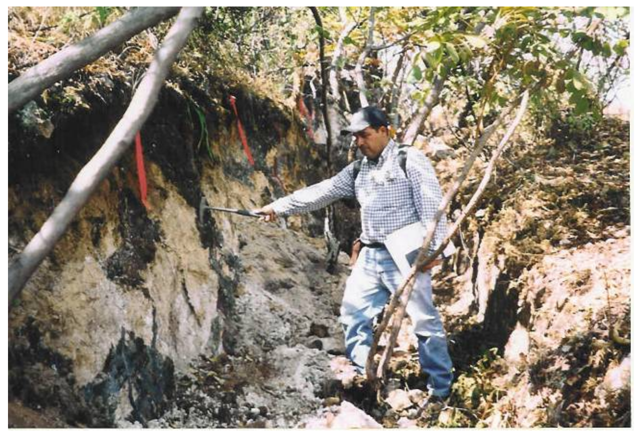
### 10.2.1 Geological Mapping and Outcrop Sampling

Over 1,300 samples have been taken from pre-existing trenches (Plate 10.2.1.1), old dumps, and outcrop exposures in the area within and surrounding the intrusive at Cerro Jumil as shown in Figure 10.2.1.1.

Mapping partially delineated three gold skarn zones (i.e., West, Las Calabazas, and Southeast Zones) that parallel the intrusive contact along its northwest and southeast contacts. Mineralized rocks identified include skarn development associated with marble, and jasperoids which tend to be more resistive to weathering processes. However, as seen in drill intercepts the bulk of gold mineralization occurs within prograde and retrograde altered skarns consisting of pyroxene, wollastonite, actinolite/tremolite, garnet, with epidote, calcite, and clay alteration products that tend to be weathered easily and are generally not observed in surface exposures. Resistant outcrops of jasperoids tend to be the best indicator of subsurface gold skarn mineralization, although not all jasperoids contain appreciable amounts of gold.

The West Zone surface exposure is visually unremarkable, with only a few jasperoid or marble outcrops that returned anomalous gold values. Conversely, drilling has shown that this zone is continuous for over 300 meters with gold values displaying good continuity along strike. Mapping and drill results indicate that the West Zone is open along strike and at depth.

**Plate 10.2.1.1 Sampled Trenches and Outcrops at Cerro Jumil**



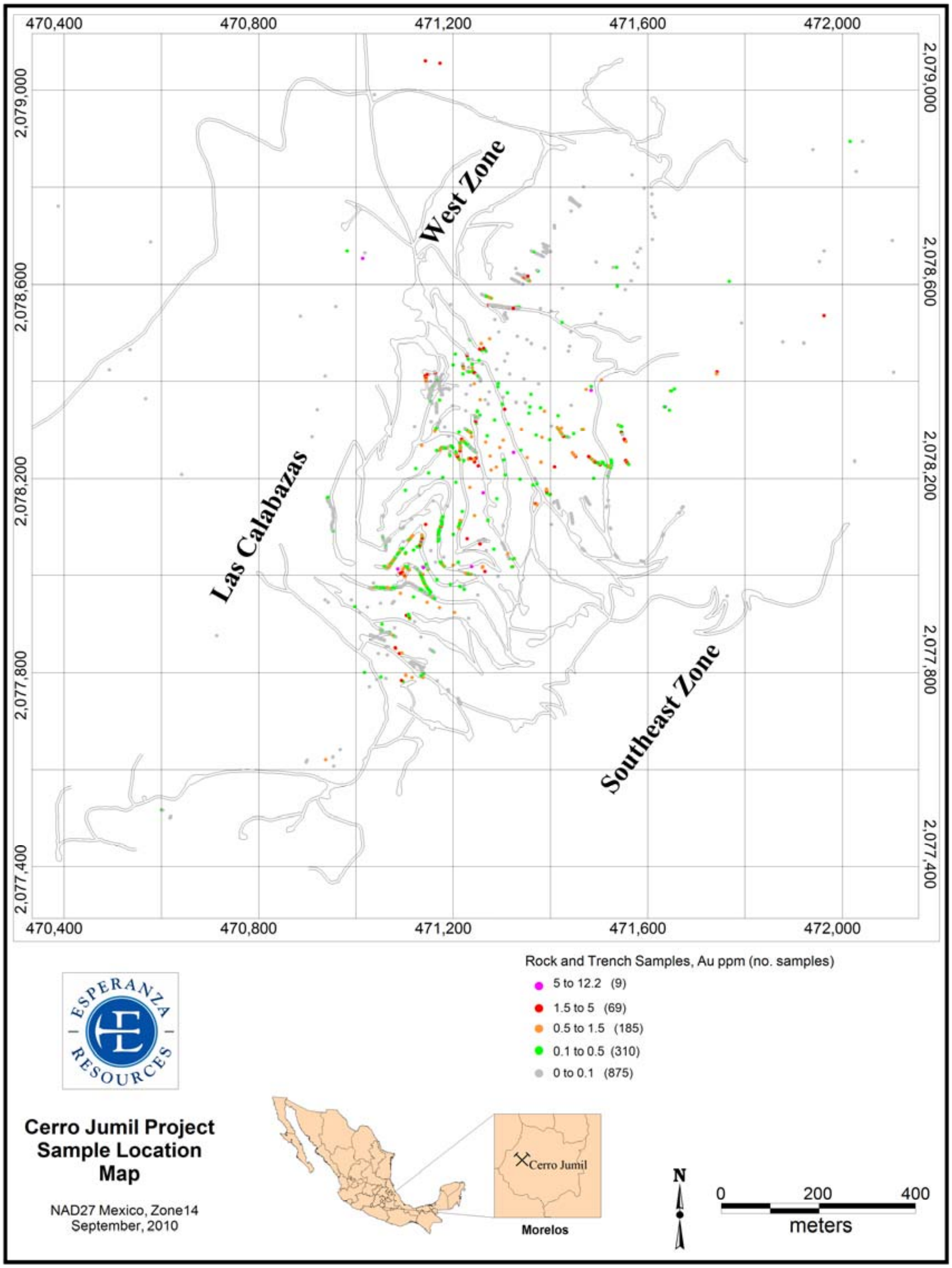



**Figure 10.2.1.1 Rock Sample Gold Geochemistry and Location Map.**

The Southeast Zone tends to have appreciable jasperoid development at the surface in its northern area, and tremolite-actinolite/wollastonite ±garnet skarn development with lesser jasperoid towards the southwest, allowing for better definition of the zone via geological mapping relative to the West Zone. However, caliche development, exceeding several meters in thickness, obscures the possible extension of this zone along strike towards the southwest. Total strike length of the Southeast Zone indicated by geologic mapping is over 1 kilometer. Drilling to date has partially delineated 650 meters of strike length for this zone.

Several veins within the intrusive located just east, approximately 150-200 meters, of the West Zone contact were mapped and sampled. Much of the area is covered with alluvium, although locally narrow 0.3 to 1.5 meter vein widths are exposed. Towards the northeastern end of the identified vein system there are several short adits that exploited an assumed high-grade ore shoot by a small stope. Sample results for silver, summarized in Table 10.2.1.1, have locally high-grade values over appreciable widths. Although the higher-grade silver values tend to be associated with the quartz vein material, there is also significant silver content in both the hanging and footwall host rocks.

**TABLE 10.2.1.1 QUARTZ VEIN AND RELATED SAMPLES IN INTRUSIVE**

| Sample | Width (meters) | Silver ppm | Description |
|---|---|---|---|
| SE-197 | 0.80 | 948.0 | Qz vein w/ fresh and oxide |
| SE-198 | 2.00 | 182.0 | altered porphyry, FW to vein |
| SE-199 | 1.70 | 220.0 | altered porphyry, HW to vein |
| SE-200 | chips | 53.5 | dump sample, qtz vn |
| SE-201 | 0.60 | 327.0 | qtz vn w/ oxidation & sulphides |
| SE-212 | 0.40 | 453.0 | Qtz vein, granite host rock, N5E, 80 |
| SE-213 | 0.60 | 42.4 | Qtz vein, granite host rock, N8E, 78 |
| SE-214 | 0.30 | 130.0 | Qtz vein, granite host rock, N8E, 75 |
| SE-215 | 0.30 | 65.1 | Qtz vein, granite host rock, N12E, |
| SE-216 | 0.50 | 202.0 | Qtz vein, granite host rock, N16E, |
| SE-217 | 0.40 | 495.0 | Qtz vein, granite host rock, N30E, |
| SE-218 | 1.00 | 158.0 | HW of vein sample SE-217 |
| SE-219 | 1.20 | 16.8 | FW of vein sample SE-217 |
| SE-220 | 0.80 | 27.3 | Qtz vein, granite host rock, N35E, |
| SE-221 | 0.45 | 11.6 | Qtz vn, sub parallel stringer to main |
| SE-222 | 0.45 | 21.8 | Qtz vein, granite host rock, N30E, |
| SE-223 | 0.35 | 22.4 | qz vein, host rock granite |
| SE-224 | 1.20 | 7.5 | milky qtz vein milky, strike N8W, 65 |
| SE-225 | 1.50 | 8.4 | qtz vein, same strike |
| SE-226 | 1.50 | 30.5 | Hanging wall to vein of sample SE- |
| SE-227 | 1.80 | 34.1 | qz vein / stockwork veinlets |

Gold values tend to be consistently low (<0.4 ppm) in quartz vein samples relative to those noted in the jasperoid and skarn geochemical analyses. The cross cutting relationship of these quartz veins relative to marble skarn development and some jasperoid zones imply that silver may represent a later-stage of mineralization than that associated with the gold.

### 10.2.2 Soil Geochemical Survey

Along the northwestern flank of Cerro Jumil an area containing local auriferous jasperoid float exists. The jasperoid is randomly distributed and is often incorporated in the caliche. Two jasperoid samples, which were taken from this area by RCS returned 4.5 and 1.6 g Au/t and were strongly anomalous in Ag, Cu, Zn, As, and Sb. A geophysical resistivity high was delineated in this same area during 1997 when Quantec carried out a gradient time domain induced polarization and resistivity survey on behalf of Teck. Based on geochemical results, geological mapping, and the resistivity anomaly it is believed that there is potential for a buried mineralized gold skarn deposit in this area and a geochemical soil survey was initiated to better define the target area. A total of 15 hectares was covered by a soil survey grid consisting of 4 lines oriented N55°W perpendicular to the inferred intrusive-limestone contact. Lines were spaced at 100-meter intervals and each line is 500 meters long with samples collected every 25 meters. A total of 84 samples were taken. Both gold (Figure 10.2.2.1) and silver (Figure 10.2.2.2) geochemical results show similar patterns with elevated values in the southeastern area of the soil grid. Sample distribution based on a range of values is shown in Table 10.2.2.1.

**TABLE 10.2.2.1 RANGE IN SOIL GEOCHEMISTRY FOR SILVER AND GOLD**

| Silver | | Gold | |
|---|---|---|---|
| Ag ppm range | No. Samples | Au ppm range | No. Samples |
| 0.75 to 1.0 | 1 | 0.05 to 0.073 | 2 |
| 0.5 to 0.75 | 11 | 0.025 to 0.05 | 4 |
| 0.25 to 0.5 | 12 | 0.015 to 0.025 | 3 |
| 0 to 0.25 | 60 | 0 to 0.015 | 75 |

The silver and gold geochemical anomalies are coincident with a resistivity high defined by the Quantec 1997 geophysical program at a depth from 70 to greater than 200 meters with a steep easterly dip. It is believed that the geochemical survey has given added support for the possibility of a mineralized gold skarn zone at depth. Further evaluation of this area will be required before determining if it is a viable target.

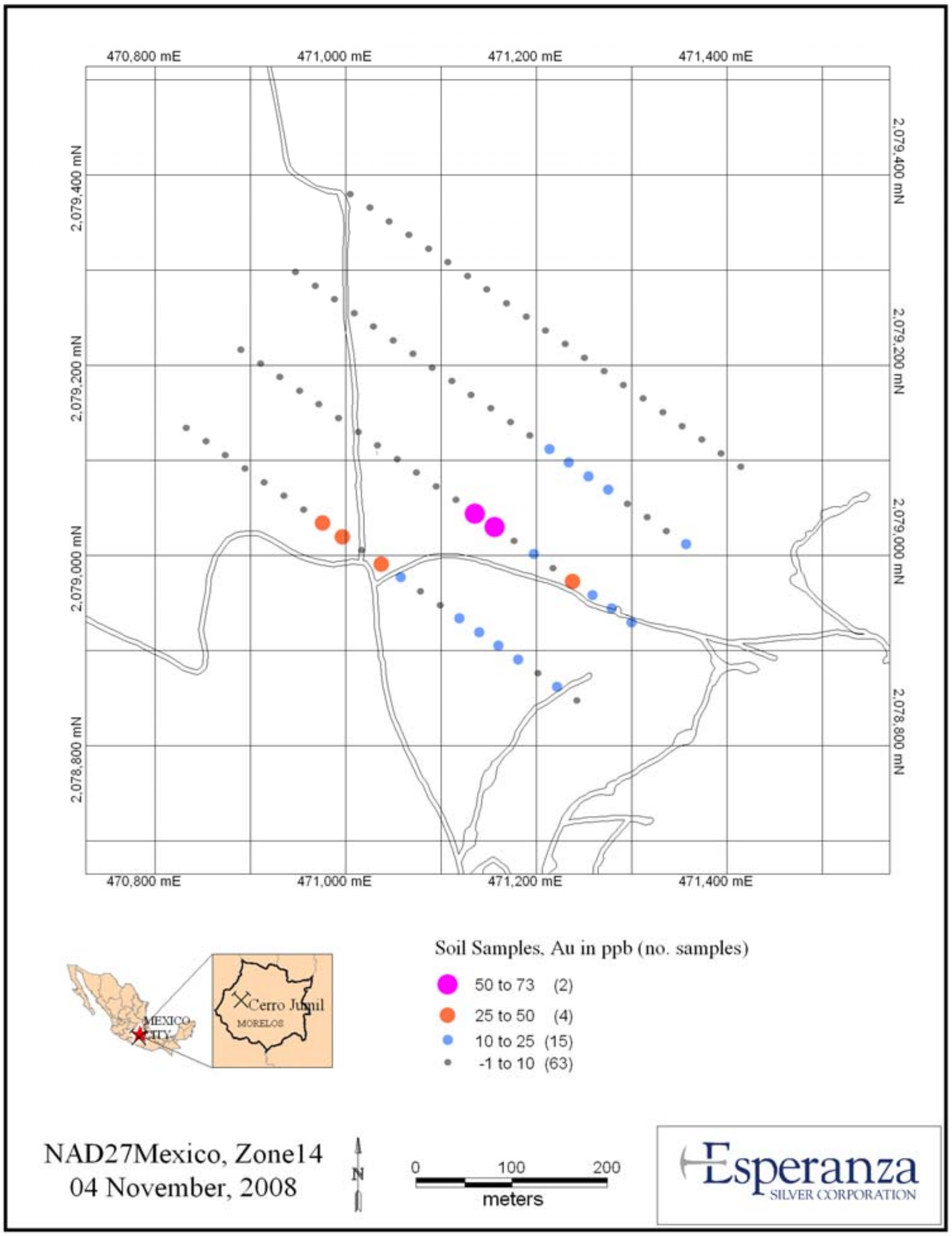



**Figure 10.2.2.1 Gold in Soil Geochemical Survey**

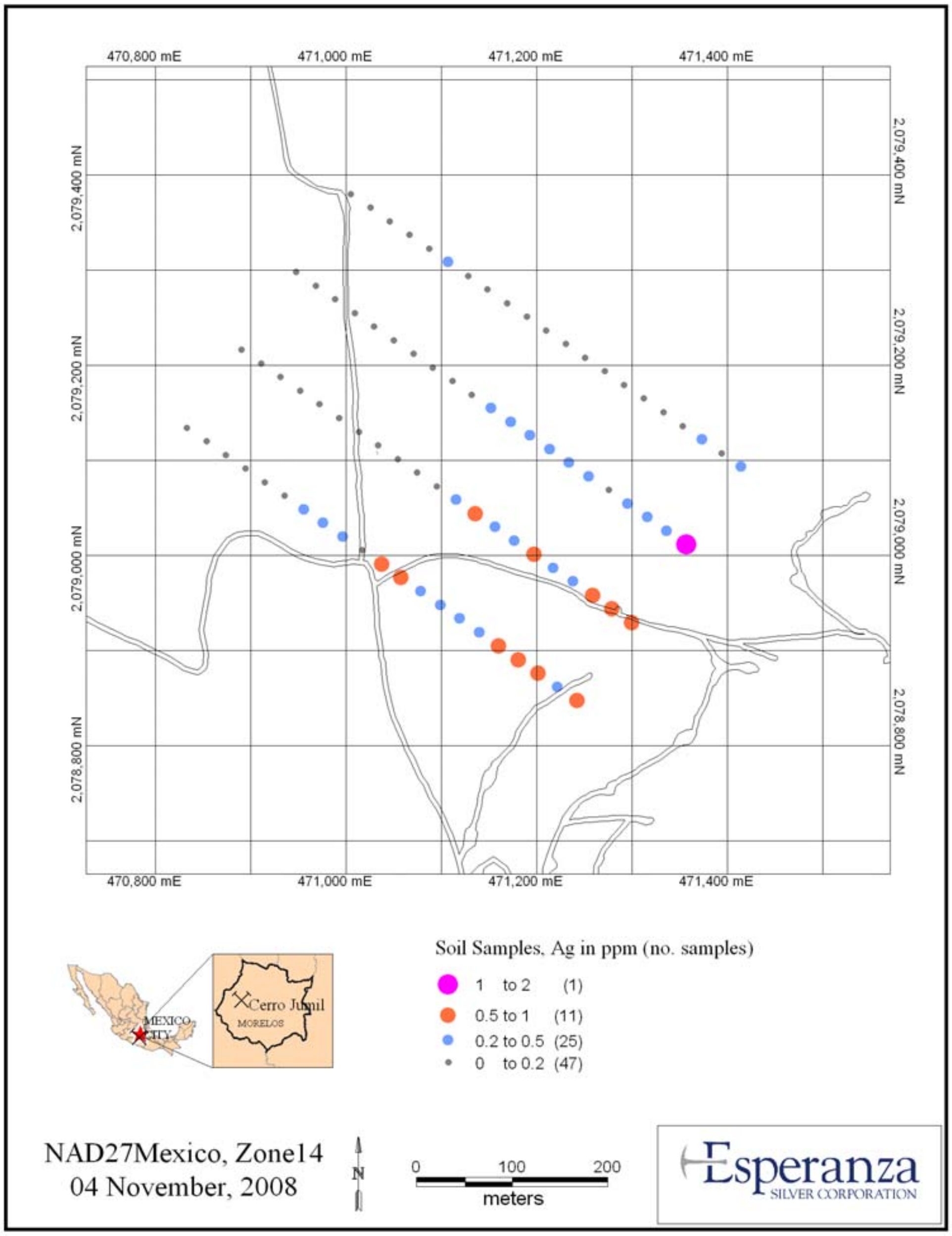



**Figure 10.2.2.2 Silver in Soil Geochemical Survey**

### 10.2.3 Ground Magnetic Survey

In 2008 ESM contracted with Zonge Engineering and Research Organization, Inc. (ZERO) to undertake a ground magnetic survey in order to determine if there was a magnetic response related to the intrusive and its contact with the peripheral gold skarn that could be used to guide exploration drilling. Approximately 65 line kilometers of ground magnetic data were acquired on 41 lines. Lines were oriented northwest-southeast with nominal 50 meters between line spacing. Results are shown in a total field intensity map, Figure 10.2.3.1, with bright colors (magenta and red) showing magnetic highs with lows in blue. The magnetic highs, towards the southeast, define the subsurface expression of the intrusive and several drill holes confirmed the results.

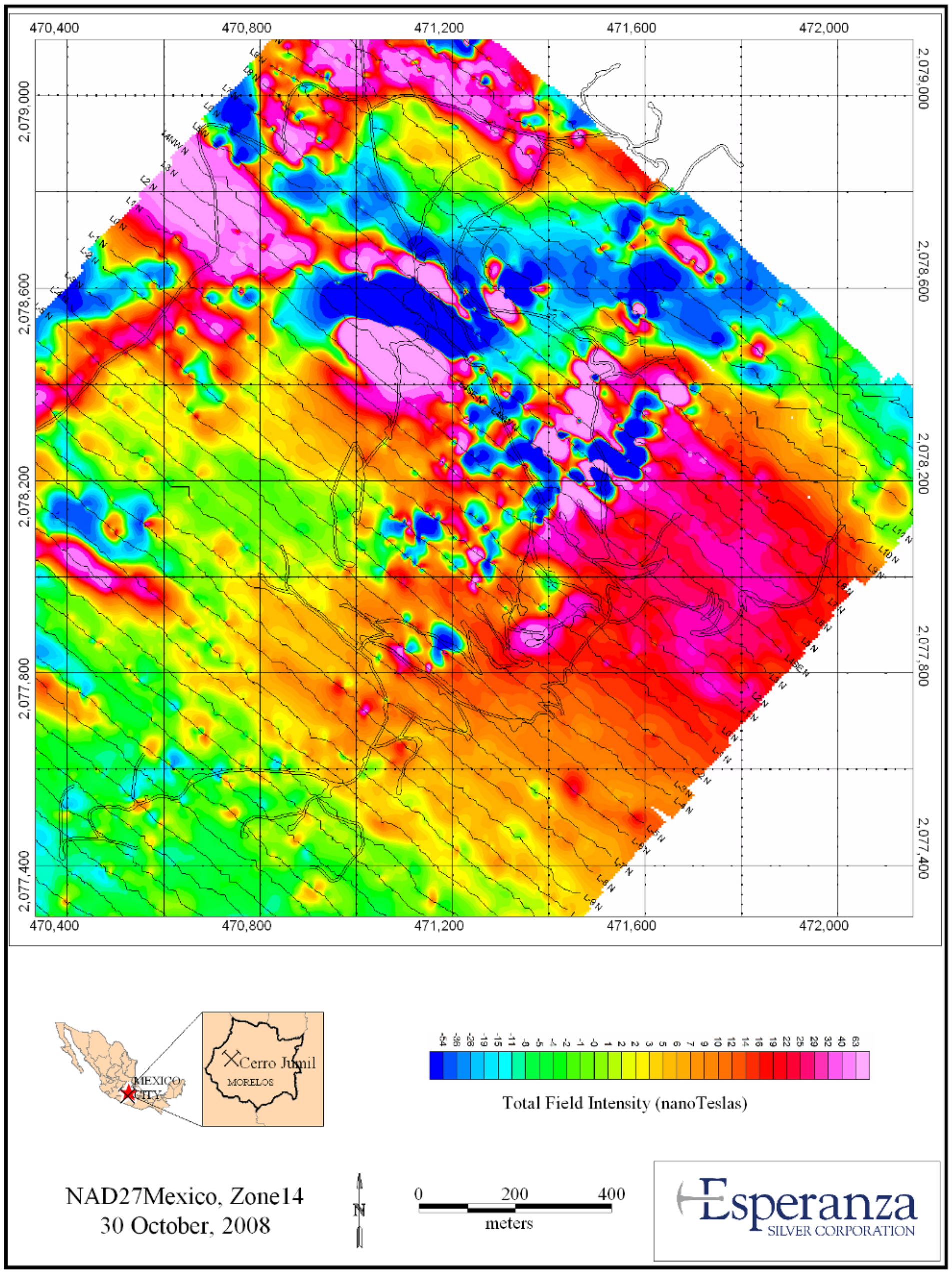



**Figure 10.2.3.1 Ground Magnetic Survey Map Showing Total Field Intensity**

Magnetic highs seen in the northwestern area are related to recent volcanic cover which may mask any possible subsurface expression of the intrusive. The magnetic high seen in the west central area may be a magnetic response to a portion of the intrusive and is a target of interest in the next phase of exploration work.

## 11.0 DRILLING

Exploration drilling at Cerro Jumil has been completed by both reverse circulation (RC) and diamond coring methods (Plates 11.0.1 and 11.0.2).

**Plate 11.0.1 Layne Drilling RC Drill**

**Plate 11.0.2 Intercore Diamond Core Drill**

During July 1998, Teck completed four diamond drill holes totaling 822 meters and ESM drilled an additional 40,760 meters from February 2005 through June 2010. ESM completed four separate drill programs referred to as phase 1, 2, 3 and 4. The objective for drilling during phase 1 & 2 was to identify exploration targets that would be of sufficient size and grade to justify detailed delineation drilling. Phase 3 drilling was mostly undertaken to obtain adequately spaced data that could be used for an initial resource estimate, with a focus on the SEZ. The phase 4 drill program was designed to delineate the resource associated with the Las Calabazas zone and a portion of the SEZ. Significant drill hole intervals intersected by ESM are summarized in Appendix A. All exploration drilling to date is summarized in Table 11.0.1 and drill hole locations are shown in Figure 11.0.1.

**TABLE 11.0.1 SUMMARY OF DRILLING AS OF JULY 2010**

| Drilling Method | Meters | Feet | Holes |
|---|---|---|---|
| Reverse Circulation | 28,933 | 94,926 | 180 |
| Diamond Core | 12,649 | 41,500 | 70 |
| Total | 41,582 | 136,426 | 250 |

| Drill Program Phase | Meters | Feet | Holes |
|---|---|---|---|
| Teck Core Drilling 1998 | 822 | 2,697 | 4 |
| ESM Phase 1 Core Drilling | 1,168 | 3,832 | 8 |
| ESM Phase 2 Core Drilling | 3,672 | 12,047 | 23 |
| ESM Phase 3 Core Drilling | 6,987 | 22,924 | 35 |
| ESM Phase 3 RC Drilling | 19,464 | 63,859 | 106 |
| ESM Phase 4 RC Drilling | 9,469 | 31,067 | 74 |
| Total | 41,582* | 136,426 | 250 |

** Total includes abandoned holes that were re-drilled to reach target area and two core holes used for metallurgical test work. Abandoned holes were not assayed.*

All drill hole locations have been surveyed using a GPS Trimble 4600 LS or similar survey instrument which gives locations to within 0.05 meter accuracy. Down hole orientation surveys were taken approximately every 50 meters.

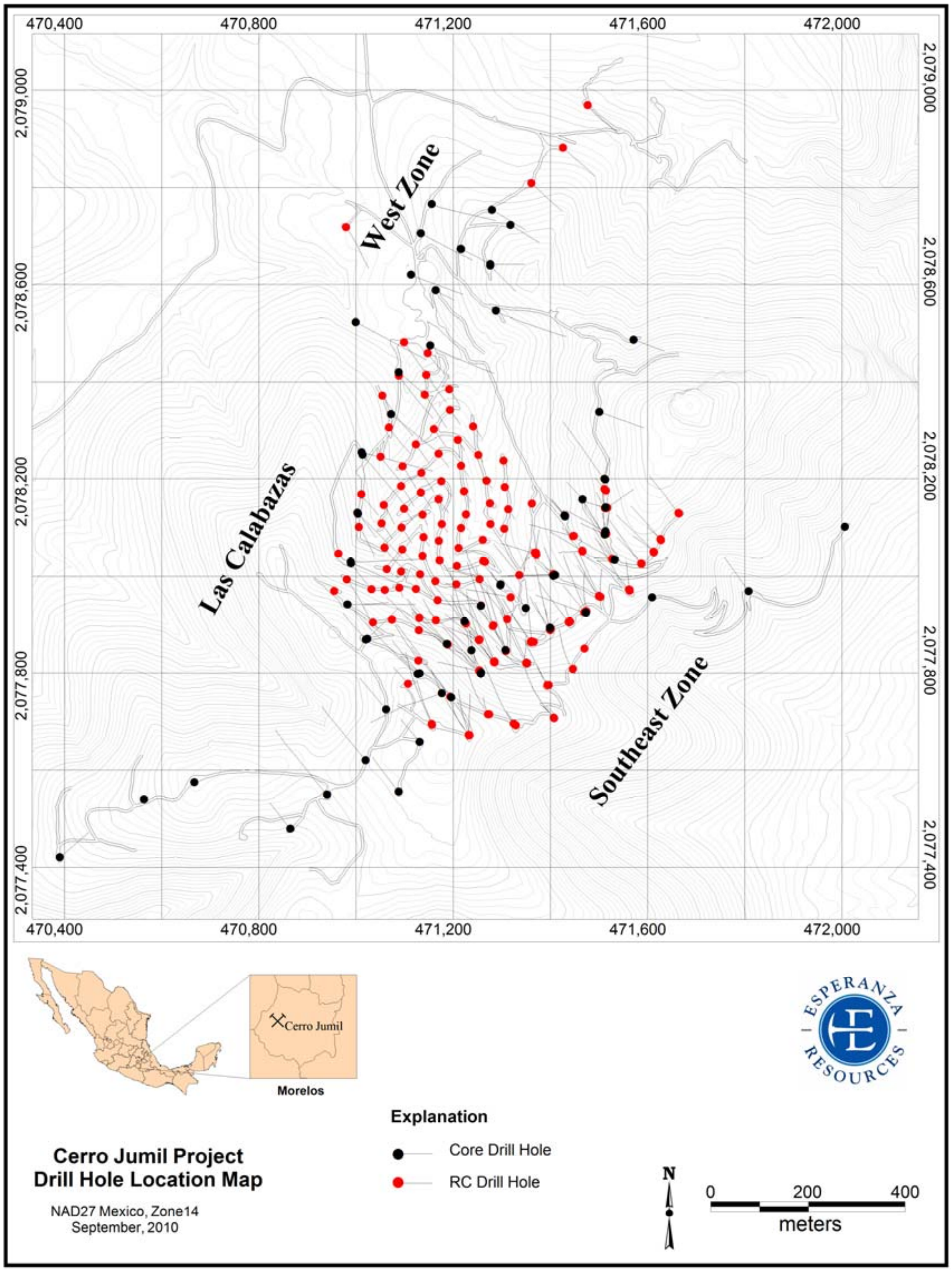



**Figure 11.0.1 Drill Hole Location Map**

## *11.1 Teck Drilling, 1998*

During July 1998, Teck completed four diamond drill holes totaling 822 meters. All holes began using HQ core size and reduced down to NQ prior to completing the hole. Drilling was completed by BDW International Drilling of Mexico S.A. de C.V. In general, core recoveries were adequate based on visual inspection although estimated recoveries per interval were not completed. Initially drill-hole locations were determined from a sample grid and subsequently surveyed by a handheld Geographic Positioning System (GPS). Subsequently, all drill hole collars have been surveyed with a GPS TRIMBLE 4600 LS establishing locations within ±0.5 centimeter accuracy. All holes are marked with a cement monument for easy identification that shows the hole number, inclination, and direction drilled. Down-hole surveys were taken using the hydrofluoric acid test tube etch method at 50-meter intervals to determine inclination deviation.

Holes BDE 98-1, -2, and -4 were designed to test IP chargeability anomalies. Holes BDE 98-1 and -2 remained in intrusive rock their entire length except for a 10.5-meter interval, from 46.5 to 57.0 meters, of limestone in BDE 98-1. In both holes it appears that their depth was inadequate to fully test the IP anomalies. The intrusive rocks are locally silicified and sericitized with 1 to 3% sulphides of pyrite, pyrrhotite and arsenopyrite. Weak mineralization appears to be associated with sulphides. Hole BDE 98-4 intersected oxidized jasperoids with inter-bedded re-crystallized limestone containing fine-grained green garnets from 211 to 225 meters. The hole was terminated at a depth of 225 meters due to poor ground conditions. The rock sequence encountered from 211 meters to the end of the hole is very similar to that observed in the overlying rocks of the West Zone and thus it appears the hole was abandoned just prior to entering the main mineralized skarn zone. Geochemical results tend to support this assumption.

Hole BDE 98-03 was designed to test the skarn at depth. The best mineralization is associated with quartz-hematite veining and jasperoid intersected from 93 to 100 meters. A mixed sequence was encountered from 100 to 144 meters containing intrusive rocks with local lenses of limestone. From 144 to 167 jasperoid, skarn, and limestone were encountered with geochemically anomalous gold and/or silver values. The remainder of the hole was in altered intrusive rock ending at 213 meters. The results imply that the skarn zone continues at depth in this area and follow-up drilling will be required to determine if significant gold mineralization exists.

Table 11.1.1 summarizes intervals of geochemical interest for gold and silver in Teck drill holes. Orientation of the holes relative to the mineralized intercepts may be variable and so it is not possible to relate the interval lengths to a true thickness. However, based on geological interpretations in cross sections the interval length and true width are reasonably close in most instances.

**TABLE 11.1.1 TECK DRILL HOLE INTERVALS OF INTEREST**

| Hole No. | From (meters) | To (meters) | Interval (meters) | Gold g/t | Silver (g/t) |
|---|---|---|---|---|---|
| BDE 98-1 | 55.5 | 57.0 | 1.5 | <0.005 | 37.2 |
| BDE 98-1 | 175.5 | 178.5 | 3.0 | 0.02 | 82.3 |
| BDE 98-2 | 16.5 | 18.0 | 1.5 | 0.025 | 22.6 |
| BDE 98-2 | 144.0 | 147.0 | 3.0 | 0.01 | 34.0 |
| BDE 98-3 | 93.0 | 96.0 | 3.0 | 1.44 | 5.2 |
| BDE 98-4 | 211.0 | 225.0 | 14.0 | 0.156 | 30.3 |

### *11.2 ESM Drilling as of June 2010*

From February 2005 thru June of 2010 ESM completed 11,827 meters of core and 28,933 meters of RC drilling in 66 and 180 holes respectively (Table 11.0.1). Three distinct target areas where drilled to varying degrees including the West (WZ), Las

Calabazas (LCZ), and the Southeast Zones (SEZ). The Las Calabazas and Southeast Zones have had a significant amount of drilling and has the near surface resource well defined with the majority of it being categorized as measured and indicated. Drilling in the West Zone is widely spaced ranging from 50 to 100 meters along strike and down dip of the targeted mineralized zones. Out of the 250 drill holes completed only 14 of them are in the West Zone area. The next phase of drilling will be partially dedicated to an in-fill program designed to evaluate the West Zone resource potential.

Drill hole locations were initially located by hand held GPS units and were assumed to be within 5-meters of the recorded north and east coordinates. Collar elevations were estimated from 1:50,000 scale Carta Topográfica maps obtained from the Instituto Nacional de Estadistica Geofrafia e Informatica (INEGI). Subsequently, all drill hole collars have been surveyed with a GPS TRIMBLE 4600 LS establishing locations within ±0.5 centimeter accuracy. The grid coordinate system used is UTM NAD 27, zone 14 (Mexico). All holes are marked with a cement monument engraved with the hole number, inclination, and direction drilled.

Orientation of the holes relative to the mineralized intercepts may be variable and so it is not possible to relate the interval lengths to a true thickness. However, based on geological interpretations the interval length and true width appear to be reasonably close in most instances.

### 11.2.1 ESM Phase 1 Drilling

Drill holes DHE-05-01 thru -08 resulted in the initial discovery and partial definition of the West Zone. Drilling was completed by Layne Drilling de Mexico S.A. de C.V. utilizing a Hagby Onram 2000 long feed frame drill. All holes were drilled using NQ2 core size and down-hole surveys were taken at approximately 50-

meter intervals using an ACCU-SHOT single shot camera. Survey data included drill-hole inclination and bearing.

### 11.2.2 ESM Phase 2 Drilling

Drill holes DHE-06-09 thru 31 resulted in the initial discovery and partial definition of the Southeast Zone of mineralization (DHE-06-09 was drilled in the West Zone). Drilling was completed by Major Drilling de Mexico S.A. de C.V. utilizing a UDR 200 diamond drill. All holes were drilled using HQ core size although two holes were reduced to NQ due to poor ground conditions. Down-hole surveys were competed for all holes, except for DHE-06-30 which was abandoned at 24 meters (replaced by DHE-06-30A) and DHE-06-24 which only has one survey at the bottom. Down hole surveys were obtained at approximately 50 meter intervals using a Reflex EZ-Shot instrument. Survey information recorded included hole inclination and bearing deviation as well as magnetic field data. Total deviation of the drill-hole inclination and bearing was generally less than $2^{o}$.

### 11.2.3 ESM Phase 3 Drilling

Core drill holes DHE-06-32 thru -66 and RC holes RCHE-07-01 thru -78 and RCHE-08-79 thru -101 representing 6,987 meters of core and 19,464 meters of RC drilling were completed for a total of 26,451 meters during phase 3 exploration. Core drilling was completed by Intercore Perforaciones, S.A. de C.V. and Sierra Drilling International S.A. de C.V. All holes were drilled using HQ core size and several were reduced to NQ due to poor ground conditions. RC drilling was completed by Diversified Drilling, S.A. de C.V. and Layne de Mexico, S.A. de C.V. RC hole diameters ranged from 4.5-5.0 inches. Down-hole surveys were completed for all holes unless ground conditions became unstable and the risk to losing the survey tool became high. Down hole surveys were obtained at approximately 50 meter intervals using a Reflex EZ-Shot instrument. Survey information recorded included hole inclination and bearing deviation.

### 11.2.4 ESM Phase 4 Drilling

All drilling during the phase 4 drill campaign were completed by RC methods including 74 holes, RCHE-09-102 thru 116 and RCHE-10-117 thru 174, totaling 9,469 meters. The RC drilling was completed by Major Drilling de Mexico, S.A. de C.V. utilizing a Prospector 750 drill with a compressor booster. The holes were drilled using a 5 inch diameter bit, drilled under dry conditions, and down-hole surveys were completed using a Reflex EZ-Shot survey instrument. Survey information recorded included hole inclination, bearing deviation and magnetic variances.

## *12.0 SAMPLING METHOD AND APPROACH*

The Cerro Jumil project has had sampling programs carried out by RCS, Teck, and ESM since project inception. Sampling has been mostly restricted to the central portion of the project area within and adjacent to the intrusive identified near Cerro Jumil. Most samples have been taken along or near the intrusive contact where the gold skarn zone is intermittently exposed at the surface. Numerous sample methods have been used including selective rock chip, channel, soil, core, and RC chip sampling.

### *12.1 Sampling Prior to ESM 2003 Acquisition*

Both RCS and Teck collected numerous outcrop and float samples using both selective rock chip and channel samples in order to partially evaluate the rock geochemistry in the immediate Cerro Jumil region. Teck also initiated a limited core drilling program that was designed to test several identified geophysical anomalies.

### 12.1.1 RCS Sampling Method and Approach

Samples taken by RCS in 1993 and 1994 were analyzed by Bondar-Clegg and in 2002 samples were analyzed by Chemex, using standard industry methods: fire assay for gold and acid digestion/ICP for silver, base metals and other elements. Both laboratories had sample preparation facilities in México and sent pulps to their respective Vancouver, B.C., Canada laboratories for analysis. Samples consisted of select and random grab samples of outcrop and float (surface rock fragments randomly scattered or cemented in caliche). Most of the 118 samples collected were selectively taken from rocks containing potential for gold or silver mineralization based on visual alteration and therefore are not necessarily representative of the gold skarn zone.

### 12.1.2 Teck Sampling Method and Approach

Approximately 184 samples were taken by Teck including continuous outcrop chips and numerous random, selective, dump, and float samples. An additional 291 core samples were also analyzed. Continuous chip samples and drill core, usually 1 to 2 meters in length depending on geological contacts, are assumed to be unbiased and representative of the intervals sampled. Most of the remaining samples are selective in nature and therefore, although geologically important, are biased towards rocks with a perceived higher chance of having gold and silver mineralization. Drill core was sawn and half of the core sent to Chemex for analysis. Intervals sent for analysis were generally 1.5 or 3.0 meters in length although some longer intervals were also analyzed. The remainder of the core is stored in the village of Tetlama. All Teck samples were prepared by Chemex in Mexico and analyzed at their laboratory in Vancouver, B.C., Canada, using standard industry methods similar to those above. The core was analyzed using procedures identical to those described above.

ESM used previously acquired data to assist with geological interpretations and considers the continuous channel and core analysis as being representative and unbiased.

### *12.2 ESM Sampling Method and Approach*

ESM has collected over 27,600 samples since acquiring the Cerro Jumil project including 84 soil, over 700 selective outcrop, float or channel and 26,859 core and RC samples.

RGM provided most of the geological support and employees required to collect samples and complete the required geological work under the supervision of Bond.

In general, soil, outcrop, and channel samples were collected while undertaking detailed geological mapping programs in order to identify specific targets that would merit exploration drilling. Subsequently, both core and RC drill programs were implemented to partially evaluate a few of the areas characterized by anomalous gold geochemistry.

All sampling has been conducted under the supervision of experienced geologists in accordance with standard industry practice. For outcrop, soil and other types of field samples the following information is recorded.

- Type of sample (rock, soil, dump, etc.);
- Collection method that includes channel, grab (representative or selective), chip (representative or selective), panel, etc.;
- Location, which includes X,Y,Z coordinates;
- Brief description (including lithology, alteration, or other pertinent information);
- Date sample collected; and
- Person responsible for collecting sample (geologist, supervisor, manager, etc.).

Sampling method and approach for each of the sample types is discussed in the following sections.

### 12.2.1 ESM Soil Sampling Method and Approach

A small area along the northwestern flank of Cerro Jumil contained scattered jasperoid float material with strong gold and silver geochemical values although no rock outcrops are present in the immediate area. In order to determine if the source of the mineralized float was from a subsurface skarn zone a soil sample grid covering an area 500 by 300 meters was designed to analyze soil geochemistry. Four lines spaced at 100-meter intervals, each 500 meters in length, were sampled on 25-meter centers along each line. The lines were laid out perpendicular (N55˚W) to the local trend (N35-40˚E) of identified gold skarn zones. Soil was extracted at approximately a 0.25-meter depth and sieved through a 20-mesh screen to obtain a 1 to 2 kilogram sample which was sent for geochemical analysis. Figure 10.2.2.1 and Figure 10.2.2.2 shows the gold and silver geochemical results, respectively. In both cases, values for the respective elements show a weak anomaly in the southeast portion of the grid. The significance of the apparent anomalies is not known at this time and either additional soil sampling or drilling may be required to determine if a gold skarn target exists.

### 12.2.2 ESM Selective Outcrop or Float Sampling Method and Approach

While geological mapping, small outcrops and areas containing scattered rock fragments were sampled in order to identify geochemical trends for gold and/or silver. These samples were generally selective chip samples of jasperoids and skarn and may not be representative of the underlying mineralized skarn zone. Each sample site is considered as point data and therefore no width is assigned to the sample. Nevertheless, identifying mineralized gold/silver trends based on this type of sampling has proven to be worthwhile in establishing drill targets where continuous outcrops are not exposed due to being covered by alluvium, caliche, or other material. All sample locations were recorded using handheld GPS units with ± 5 meter accuracy.

### 12.2.3 ESM Channel Sampling Method and Approach

The gold skarn zone is locally exposed at the surface due to either excavated trenches, newly constructed roads or naturally occurring outcrops. Gold skarn outcrops represented by jasperoids and/or weakly to moderately silicified skarn are generally more resistant than other types of mineralization. Locations and gold results for continuous channel and other outcrop samples are shown in Figure 10.2.1.1. Representative chip samples, normally 1 to 2 meters in length, were collected perpendicular to the strike of the gold skarn strike or along exposed road cuts. Sample widths are not corrected to true width but rather are based on geological breaks or taken on pre-established intervals. The samples are assumed to be unbiased and geochemical results are therefore representative of the rocks exposed. Visual observations of gold grades in channel samples relative to nearby core samples appear to have good correlation. Channel samples are located by hand-held GPS units with ± 5 meter accuracy.

### 12.2.4 ESM Core Sampling Method and Approach

ESM has completed 11,827 meters of diamond drilling which was completed between February 2005 and May of 2008. A total of 66 holes were drilled (Figure 11.0.1) and sampled. Samples were initially based on geological contacts and sampled lengths ranged from less than one meter up to two meters. It became apparent that the gold mineralization extended across some geological boundaries and therefore the sampling protocol was changed to an interval length of 1.5 meters which is coincident with the sample length for RC drilling. Sample protocol for drill core is as follows:

- Each hole is photographed prior to being disturbed (Plate 12.2.2.1).

**Plate 12.2.4.1. Core Photo of DHE-08-62 Drilled in Las Calabazas Area**


- ♦ A detailed geological log is completed that includes graphic columns depicting rock types, alteration, and mineralization, followed by detailed descriptions for each geological interval.
- ♦ Percent recovery and RQD is calculated and recorded.
- ♦ Specific gravity is calculated and recorded for representative rock types at approximately two meter intervals.
- ♦ Sample intervals are selected and clearly marked in the core box.
- ♦ All intervals are cut in half using a masonry saw and one half of the core is saved for future reference and the other half is sent for geochemical analysis.
- ♦ All sampling is supervised by onsite geologists in order to insure sample integrity.

Specific gravity (SG) is estimated in accordance with standard industry procedures by using either of two methods including; 1) volumetric, or 2) water submersion. SG comparisons between these methods show good correlation for average SG values within different rock types. Over 3,600 SG specimens have been estimated and are included in the Cerro Jumil sample database. Core holes are evenly distributed throughout the West, Las Calabazas, and Southeast Zones and so SG statistics for each rock type is representative for their respective area of the deposit.

### 12.2.5 ESM RC Sampling Method and Approach

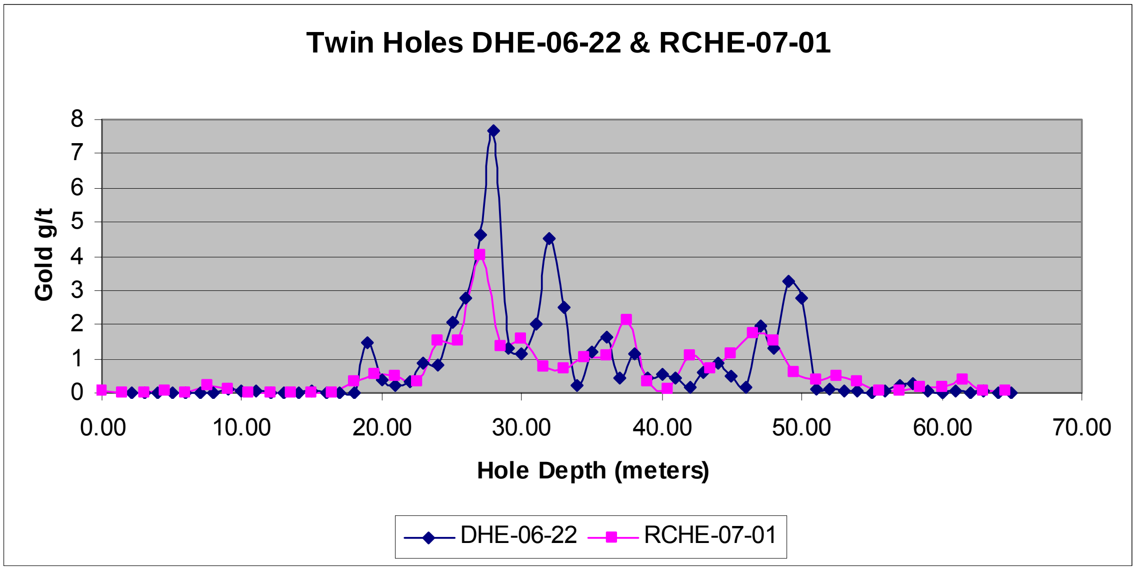
ESM completed 28,933 meters of RC drilling between January 2007 and June of 2010. A total of 180 holes were drilled (Figure 11.0.1) and sampled.

Two different RC sample collection methods were employed depending on if the drilling was completed dry or wet. All holes were collared dry and adequate sample recovery was generally good to depths of around 60 meters during the phase 3 drill program. In general for phase 3 drilling, water was injected into the hole in order to improve or maintain sample recovery due to more difficult drilling conditions as a result of varying mineralogical alteration products and rock fracturing that is commonly associated with the gold skarn zone. The utilization of a compressor booster for the phase 4 drill program allowed for all holes to be drilled dry with very good recoveries. All RC holes were sampled continuously at 1.5 meter intervals. Each interval was split in half using an adjustable riffle splitter resulting in duplicate samples for each interval. One sample was sent to the primary laboratory for analysis and the other was transferred to a secure storage building. After each run the riffle splitter and trays were cleaned with water and air to prevent any contamination of samples. Chips are taken from the storage duplicate and placed in a chip tray for drill hole logging purposes. Sample protocol for RC drill holes is as follows;

- Representative chips collected for each 1.5 meter interval placed in trays and photographed after each hole is completed.
- A detailed geological log is completed that includes graphic columns depicting rock types, alteration, and mineralization, followed by detailed descriptions for each geological interval.
- Sample intervals are based on 1.5 meter intervals.
- All intervals are split in half resulting in two samples of which one is put into storage and the other is sent for geochemical analysis.
- All sampling is supervised by onsite geologists in order to insure sample integrity.

### 12.2.6 RC and Core Twin Hole Comparison

Two core holes were twinned by RC holes in order to see if grade and zone widths could be replicated between the two different drill methods. Both RC holes were collared within 2 meters of their respective core hole twin and drilled at the same azimuth and inclination to the original core hole. Down hole surveys show that the twin holes deviated from their original orientation and the separation between core and RC twins increased with depth. Most of the hole deviations were due to changes in the direction of the hole orientation of approximately 3° that occurred within the first 40 meters or so. Hole inclinations deviated slightly although not as dramatic as noted in the change of direction (azimuth). Deviation differences between the twin holes is considered to be normal for down hole surveys related to the Cerro Jumil deposit and their respective drill methods. Comparison of Au values between core and RC twin holes are shown in the Figure 12.2.6.1 graphs. Sampled intervals for both core and RC are on different intervals for their respective holes. Core interval sample length was based on lithology and alteration for earlier sampled core holes (DHE-06-18 core twin) resulting in variable sample lengths ranging from 0.5 up to 2 meters, and in some of the more recent holes sampling was done on one meter intervals regardless of lithology or alteration (DHE-06-22 core twin). All RC sample intervals are 1.5 meters in length regardless of lithology or alteration changes. Therefore, sample intervals for the core holes are more selective than the standard 1.5 meter RC intervals and so more variability is noted between adjacent core samples than in the approximated equivalent RC sample where grades tend to be smoothed over a longer interval length. After giving consideration to hole deviation, slightly different sample methods and interval lengths, the twin hole graphs show very good correlation for mineralized lengths and average sample grades.



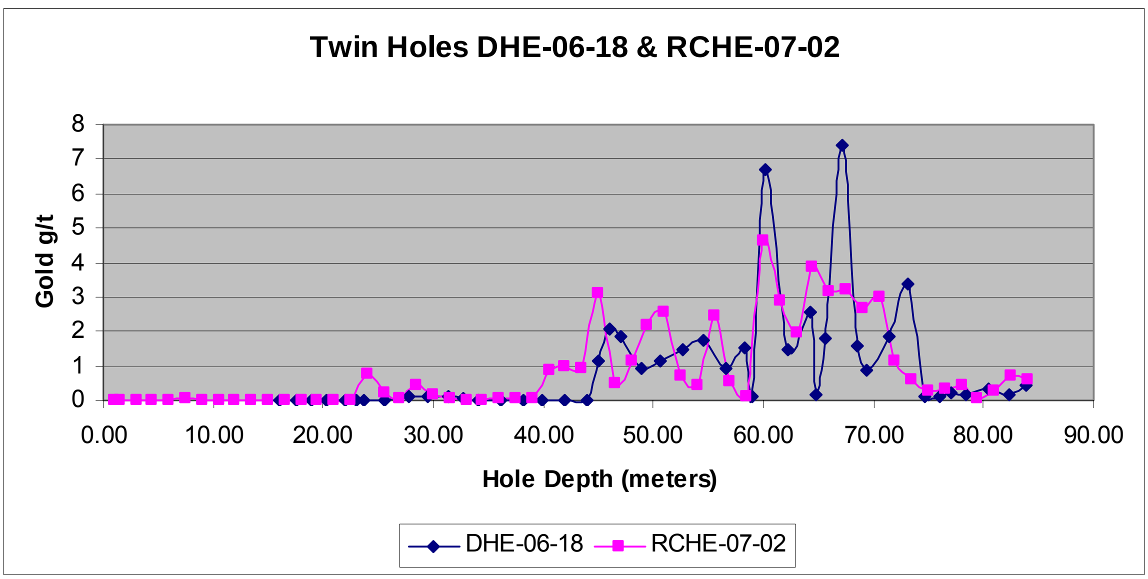




**Figure 12.2.6.1 Twin Hole Comparison between Core and RC Drill methods**

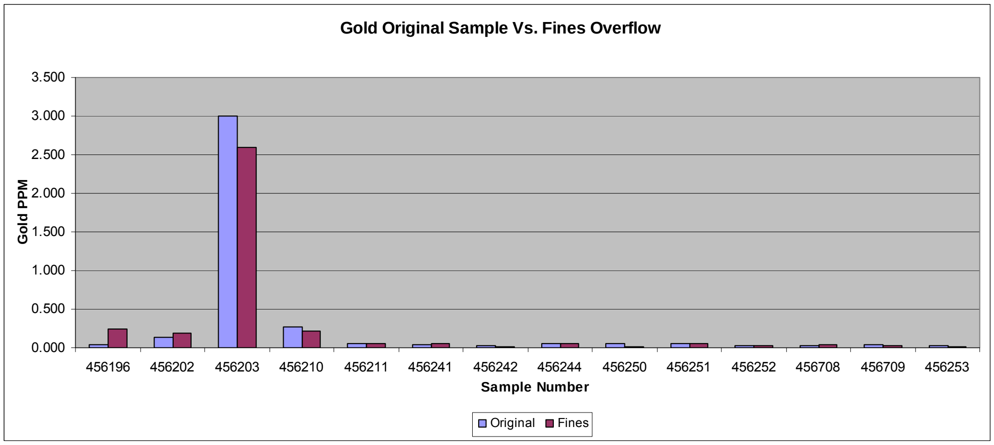
Select intervals and average Au values for each of the twinned pairs including a low grade zone at top of the holes, 0.1 ppm Au bracketed interval, and higher grade zone within 0.1 limits is given in Table 12.2.6.1. For the twin pair DHE-06-18 and RCHE-07-02 the average grade in the selected intervals gives a very good correlation between the core and RC drill sample methods. Twin pair DHE-06-22 and RCHE-07-01 show reasonable comparisons for Au values within the selected intervals although a slight disparity between the two methods can be noted. Hole deviation and deposit grade variability may account for the average Au differences for the select intervals in this twin pair. Sample interval grade correlation between the core and RC twins is considered to be reasonable and no clear bias between the two drilling methods is evident.

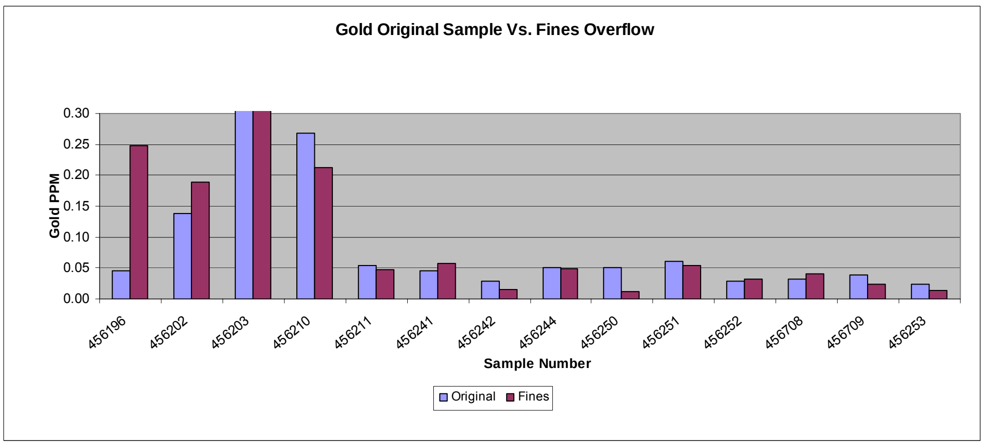
**TABLE 12.2.6.1 TWIN HOLE SELECT INTERVAL COMPARISON FOR AU VALUES**

| Twin Pair | From | To | length | Au ppm | Twin Pair | From | To | length | Au ppm |
|---|---|---|---|---|---|---|---|---|---|
| DHE-06-18 | 8.6 | 45.0 | 36.4 | 0.023 | DHE-06-22 | 2.1 | 19.0 | 16.9 | 0.024 |
| RCHE-07-02 | 1.0 | 39.5 | 39.5 | 0.073 | RCHE-07-01 | 0.0 | 18.0 | 18.0 | 0.044 |
| | | | | | | | | | |
| DHE-06-18 | 45.0 | 89.3 | 44.3 | 1.459 | DHE-06-22 | 19.0 | 51.0 | 32.0 | 1.571 |
| RCHE-07-02 | 40.5 | 85.5 | 45.0 | 1.539 | RCHE-07-01 | 18.0 | 55.5 | 37.5 | 1.032 |
| | | | | | | | | | |
| DHE-06-18 | 45.0 | 74.6 | 29.6 | 2.076 | DHE-06-22 | 19.0 | 51.0 | 32.0 | 1.571 |
| RCHE-07-02 | 40.5 | 75.0 | 30.0 | 2.035 | RCHE-07-01 | 19.5 | 51.0 | 31.5 | 1.121 |

### 12.2.7 RC Fines Overflow Analysis

Consideration was given to the possibility for the loss of gold and silver values in fine material that may have washed away or been lost due to water overflow in sample collection containers. Water was often injected into the hole during the RC drilling process in order to improve sample recovery that could become problematic in areas where there are voids, fractures or clay which is locally common in the zone of skarn development. In order to evaluate the possible loss of gold or silver values the fine sediment from the overflow in the sample collection containers was collected for 14 sample intervals and analyzed for gold and silver. The RC fines analytical results for both Au and Ag content was compared to the original sample and results are shown in Figure 12.2.7.1.




Same graph as above but with the “Gold PPM” scale changed to maximum value of 0.30 in order to easier view <0.3 sample comparisons.

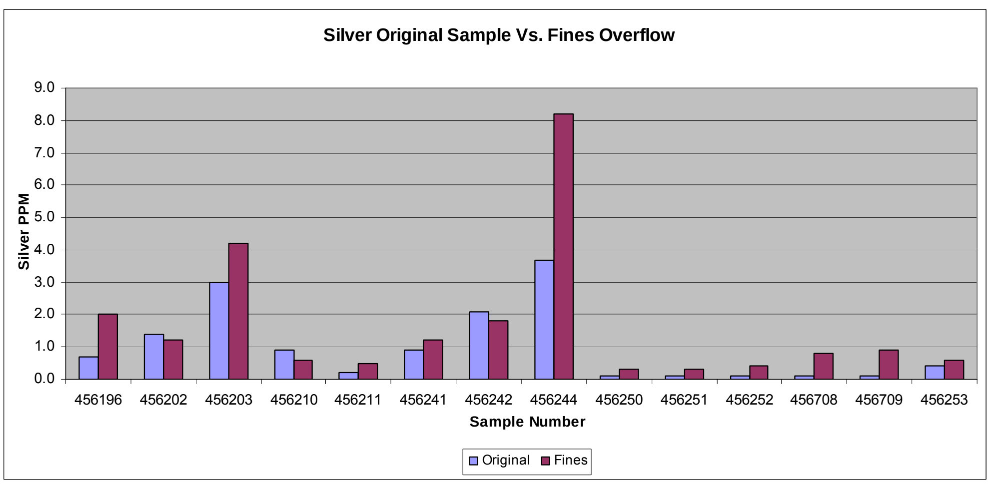



**Figure 12.2.7.1 Gold and Silver Comparison for Original Vs. Fines Overflow Samples**

The comparison shows that loss of gold under wet RC drilling conditions is not problematic at Cerro Jumil as seen in the close correlation between original gold values and the fine overflow material. Additional studies involving gold distribution in various size fractions of sampled material, Section 13.2.7, supports the RC fine overflow study results and so it is concluded that if any sample material is lost due to fine particles being washed away it would not have a significant biasing affect on analytical results.

Silver results relative to wet RC drilling conditions do indicate a possible slight loss in values as seen in the comparison of original and fine overflow samples. However, the fine overflow silver results are from a very low grade silver population and it is difficult to conclude a significant loss in silver values is consistent under wet RC drilling conditions. Additional original to fine (overflow) studies under wet RC drilling conditions will be needed to determine if silver grades are undervalued.

### *12.3 Sample Database*

All information collected from the various sample sources are entered into a "master" database. In general, there are 6 separate categories of information recorded, depending on the data source, including the following;

1. Location Data – includes the collar location for drill holes, starting point for channel samples, and point locations for soil/float and other types of samples, coordinate system used, and other pertinent information.
2. Sample Data – includes sample numbers, hole or channel identification name, intervals (from-to where applicable), quality control (QC) information (standards, blanks, duplicates), rock type, sample date, and geochemical results as well as other pertinent information.
3. Drill Hole Geology Summary – includes drill hole number, from-to intervals, rock type, and geological description.
4. Core Recovery and RQD Data – includes hole number, from-to interval, percent recovery, RQD percent (based on the sum of all lengths greater than 2 times the core diameter for an given interval) and a description of any pertinent observations affecting recovery or RQD.
5. Down-hole Survey – includes, drill hole number, depth survey was taken, true azimuth read from the survey tool used, magnetic azimuth

(corrected true azimuth for local magnetic declination), and hole inclination.

6. Specific Gravity (SG) measurements – taken in all core holes with SG estimates made for representative rock types approximately every two meters.

## 13.0 SAMPLE PREPARATION, ANALYSES AND SECURITY

### 13.1 Pre-ESM, Prior to 2003 Acquisition

There is no information available regarding security of the samples handled by Teck and RCS. However, based on similar geochemical results from re-sampling of numerous trenches and outcrops by ESM that were previously sampled by Teck and RCS, there is no reason to believe that the assays are not representative of the mineralization found on the property. Both companies have a reputation for quality work producing reliable results.

### 13.2 ESM Sample Preparation, Analyses and Security

All sample preparation for geochemical analyses was done by ALS Chemex, a global mining and exploration analytical services company. ALS Chemex maintains a stringent Quality Assurance and Quality Control (QA/QC) program that reports internal analysis of blanks, duplicates, secondary, and standard reference material data to ensure the accuracy of their results.

Samples collected by ESM are taken under the direct supervision of experienced geologists and transported to a secured storage facility until shipped to the analytical laboratory. Up until January of 2006 samples were delivered by ESM personnel to Cuernavaca and shipped via freight (bus) directly to ALS Chemex's preparation facility in Guadalajara where ALS Chemex assumed custody of the samples. During January of 2006 the procedure was changed and arrangements were made for ALS Chemex or RGM to take custody of the samples at the ESM secure storage facility and transport them direct to the ALS Chemex Guadalajara preparation laboratory.

Samples collected by ESM including channel, trench, float, soil and other types of outcrop samples are secured in polyethylene bags with zip ties and shipped direct to ALS Chemex. Samples taken from diamond drill core follow a similar procedure except that the core is sawn in half and one half is put in a secure storage facility while the other half is shipped to ALS Chemex for analysis. Sample bags are clearly marked with the sample number on the outside of the bag and on a waterproof tag inside the bag.

Assay pulps and sample reject material are temporarily stored by ALS Chemex at their preparation facilities in Guadalajara until returned to the secure storage facility at the project site.

### 13.2.1 Sample Preparation, Assaying and Analytical Procedures

ALS Chemex is the designated laboratory for all geochemical analysis and all samples prepared and assayed by ALS Chemex used the following procedures;

- Samples received at ALS Chemex Guadalajara sample preparation facility;
- Samples are logged into a tracking system and a bar code label is attached;
- Fine crushing of samples to better than 70% of the sample passing 2mm;
- Splitting of sample using a riffle splitter;
- Pulverizing the split to better than 85% of the sample passing 75 microns creating two sample pulps; and
- One sample pulp shipped to ALS Chemex North Vancouver analytical laboratory for analysis and the second pulp put in storage for future reference.

All samples were analyzed for 34 or 35 elements using conventional induced coupled plasma (ICP) and atomic emission spectrometry (AES) analysis. In addition to the standard 34/35-element suite, gold was assayed by fire assay with an atomic absorption spectrometry (AAS) finish. Over limit values for silver, copper, lead and zinc were analyzed by ICP-AAS and for gold by fire assay with a gravimetric finish. Internal quality control measures incorporated by ALS Chemex include the insertion of standards, duplicates and blanks (about 10% of the total samples) in each analytical run. The QC data is analyzed to make sure the reference materials and duplicate analyses are within precision and accuracy requirements.

Several secondary laboratories were used as a check for analytical results produced by ALS Chemex including:

- SGS de Mexico S.A. de C.V.
- BSI Inspectorate de Mexico, S.A. de C.V.
- Acme Analytical Laboratories
- International Plasma Labs Ltd.

### 13.2.2 Laboratory Certification

ALS Chemex laboratories in North America are registered to ISO 9001:2000 for the "provision of assay and geochemical analytical services" by QMI Quality Registrars.

In addition to ISO 9001:2000 registration, ALS Chemex's North Vancouver laboratory has received ISO 17025 accreditation from the Standards Council of Canada under CAN-P-1579 "Guidelines for Accreditation of Mineral Analysis Testing Laboratories". CAN-P-1579 is the Amplification and Interpretation of CAN-P-4D "General Requirements for the Accreditation of Calibration and Testing Laboratories" (Standards Council of Canada ISO/IEC 17025). The scope of the accreditation includes the following methods that are used for ESM sample analysis:

- Au and Ag by Fire Assay/Gravimetric Finish;
- Au by Fire Assay/AAS Finish;
- Au, Pt, Pd by Fire Assay/ICP Finish;
- Ag, Cu, Pb, Zn by Aqua Regia Digestion/AAS Finish; and

- Multi-element package by Aqua Regia Digestion/ICP Finish.

### 13.2.3 ESM Quality Control Measures

During the analytical process ESM implemented protocols to insure results were within acceptable accuracy limits. To check the accuracy of geochemical results ESM inserted a series of standards, blanks, and duplicates that totaled approximately 10% of the samples submitted. In addition, ESM has had original pulps checked by secondary laboratories, implemented analytical studies to check gold distribution for various size fractions of sampled material, RC fines overflow analysis, and compared sample variability by analyzing a second pulp from the original rejects or sampled material (A/B splits). A summary of the QC types are as follows;

- Certified Reference Material – Standards;
- Pulp checks - by both primary (ALS Chemex) and secondary laboratories;
- Blanks – derived from either barren limestone outcrops or purchased silica sand;
- Duplicate analysis including:
  - Field duplicates taken from both RC (sampled interval split in ½) and Core intervals (sampled interval quartered);
  - Duplicates derived from original rejects and analyzing a 2nd pulp;
- Size fraction analysis – checking sample variability in both core rejects and RC samples;
- RC fines overflow analysis – produced from the injection of water to improve recoveries;

Routine QC samples submitted to the primary laboratory with each sample shipment during the course of the drill programs included certified standards, duplicates, and blanks. Secondary laboratories were primarily responsible to check original pulps and duplicates. A summary of pulp, blank, duplicate and standards submitted to both primary and secondary laboratories is shown in Table 13.2.3.1.

**TABLE 13.2.3.1 SUMMARY OF QC SAMPLES CHECKED BY PRIMARY AND SECONDARY LABS**

| Sample Type Checks | No. Samples |
|---:|---:|
| Au Original Pulps | 746 |
| Ag Original Pulps | 65 |
| Au Duplicates (A/B split) | 1,026 |
| Ag Duplicates (A/B split) | 918 |
| Blanks | 931 |
| Standards | 639 |

### 13.2.4 Standard Reference Materials

Certified reference material (CRM) or standards were submitted with each sample shipment during the course of the drill programs. A total of seven different standards were used and are summarized in Table 13.2.4.1. The NBG and NP2 standards, prepared by Hazen Research Inc. were used during the phase 1 and 2 drill programs, Rocklabs standards in phase 3, and Rocklabs and Ore Research & Exploration PTY LTD (OREAS) during phase 4. Standard pulps, consisting of 70-80 grams of material, were randomly inserted into each sample batch.

### TABLE 13.2.4.1 STANDARDS USED FOR THE CERRO JUMIL PROJECT

| Standard | Au ppm Average | Std. Dev. | 95% Con.Int. | Source | Material |
|---|---|---|---|---|---|
| NBG | 0.79 | 0.12 | nd | Hazen | Rhyolite with veinlets |
| NP2 | 1.73 | 0.11 | nd | Hazen | Jasperoid with pyrite |
| OxC44 | 0.197 | 0.013 | 0.005 | Rocklabs Ltd | Feldspars with fine Au |
| OxD43 | 0.401 | 0.021 | 0.008 | Rocklabs Ltd | Feldspars with fine Au |
| OxG38 | 1.031 | 0.036 | 0.015 | Rocklabs Ltd | Feldspars with fine Au |
| OxH52 | 1.291 | 0.025 | 0.011 | Rocklabs Ltd | Feldspars with fine Au |
| OxL25 | 5.852 | 0.105 | 0.048 | Rocklabs Ltd | Feldspars with fine Au |
| OxD73 | 0.416 | 0.013 | 0.005 | Rocklabs Ltd | Feldspars with fine Au |
| OxG70 | 1.007 | 0.035 | 0.013 | Rocklabs Ltd | Feldspars with fine Au |
| 61d | 4.76 | 0.070 | nd | OREAS | Barren met-andesite and gold bearing meta-andesite |
| nd=no data | | | | | |

Results for Au and Ag in the NBG and NP2 standards are shown in Figure 13.2.4.1. In standards NBG and NP2 each had one analytical failure for gold. Standard analytical failures are considered to occur when the results are above or below two standard deviations from the mean. When standard failures were identified the sample batch or portion thereof was re-analyzed to ensure sample results reported were within acceptable accuracy limits. Re-analysis of samples above and below the failed NBG and NP2 standards show good replication and therefore the associated data appears to be within acceptable accuracy limits. Not enough material remained from the failed standards for re-analysis and so it was not possible to confirm their stated value. Other standards, blanks, and duplicates within the sample batch returned expected values. The resulting quality control measures therefore validated the sample results.

The NP2 standard returned gold values consistently higher than the established mean but all below the +2 standard deviation threshold which may indicate a slight bias in values returned by ALS Chemex. Therefore, two secondary laboratories, International Plasma Lab Ltd. (IPL) and ACME Analytical Laboratories Ltd. (ACME), were used to analyze an additional 21 NP2 standards in order to verify possible bias in this standard. Table 13.4.2.2 shows the comparison of results between the different laboratories. ALS Chemex and ACME had similar analysis with both returning approximately 5.7-6.3% higher gold values than established by the Hazen mean. IPL results indicate a slight bias below the Hazen mean by approximately 7.4%. In all cases the gold analysis fell with 2 standard deviations of the mean established by the original Hazen NP2 standard (+2SD=1.95 g/t Au, -2SD=1.51 g/t Au).

**TABLE 13.2.4.2 NP2 STANDARD SECONDARY LAB CHECKS**

| Laboratory | NP2 Mean | % Difference Vs. Hazen |
|---|---|---|
| Hazen | 1.730 | ---- |
| ALS Chemex | 1.834 | 5.67 |
| ACME | 1.846 | 6.29 |
| IPL | 1.601 | (7.43) |

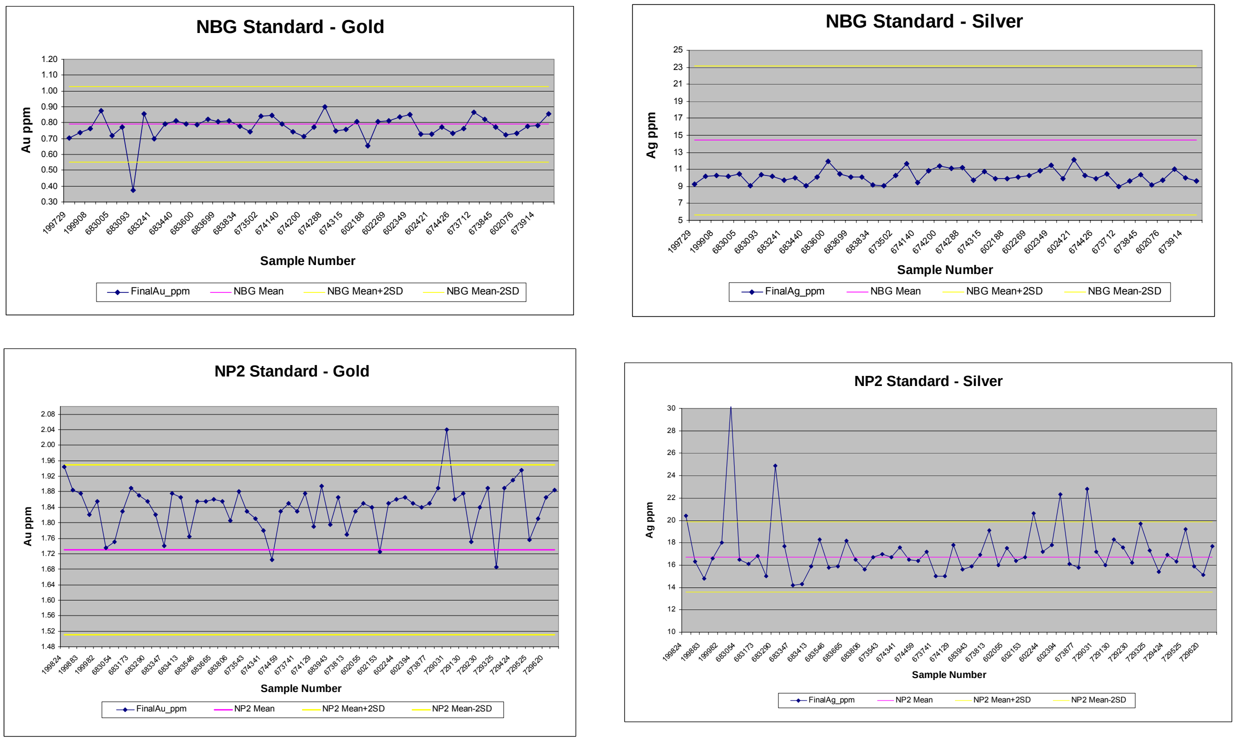



**Figure 13.2.4.1 Gold and Silver Results for Hazen Research NP2 and NBG Standards**

Silver results for standard NBG returned very consistent values that fell between the standard mean and minus two standard deviations which may imply the analytical method used for silver analysis (ICP with aqua regia digestion) may undervalue silver results. This possible low bias reported for silver results as indicated by the NBG standard is considered to be insignificant. Results for Ag in the NP2 standard show several failures above two standard deviations although 90% of the NP2 standards returned acceptable values that clustered above and below the mean grade. Other QC samples including standards, blanks, and duplicates indicated no bias or problems within the sample batches containing the NP2 Ag standard failures. Pulp checks returned expected values and therefore reported Ag results for samples within the sample batches, with the Ag standard failures, do not appear to indicate any analytical problems and Ag values reported are considered reliable.

Other standards used for the Cerro Jumil project were prepared by Rocklabs Limited, located in Auckland New Zealand, and include the standards OxL25, OxC44, OxH52, OxG38, OxD43, OxG70, and OxD73. During the phase 4 drill campaign an additional standard, OREAS 61d, prepared by Ore Research & Exploration PTY LTD was also used. As noted in Table 13.2.4.1 the standard deviation for these reference materials is very low and so the possibility for any analytical variability above or below two standard deviations from the mean is much more problematic than the standards prepared by Hazen where the established standard deviation is significantly greater. Graphs for the standards (Figure 13.2.4.2 thru 13.2.4.10) display lines representing both 2 and 3 standard deviations above and below the mean for reference and standard failures were considered for values above or below 3 standard deviations or if two consecutive standards fell outside of 2 standard deviations from the mean.

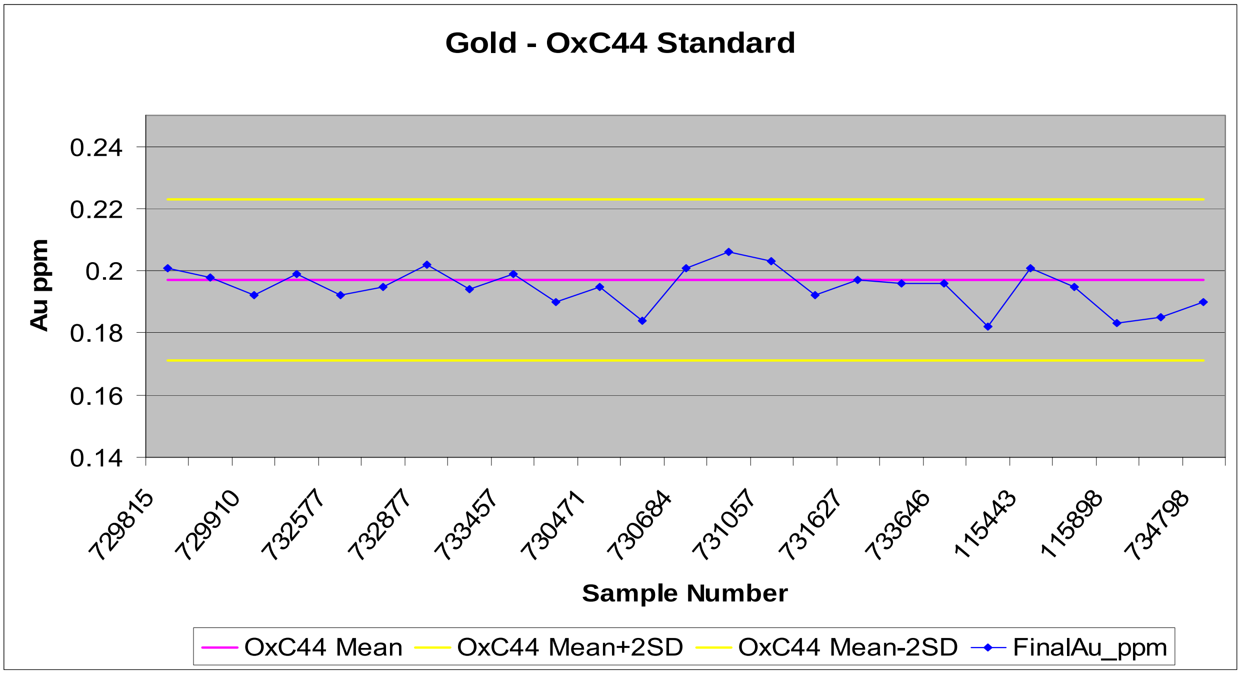



**Figure 13.2.4.2 Rocklabs Standard OxC44**

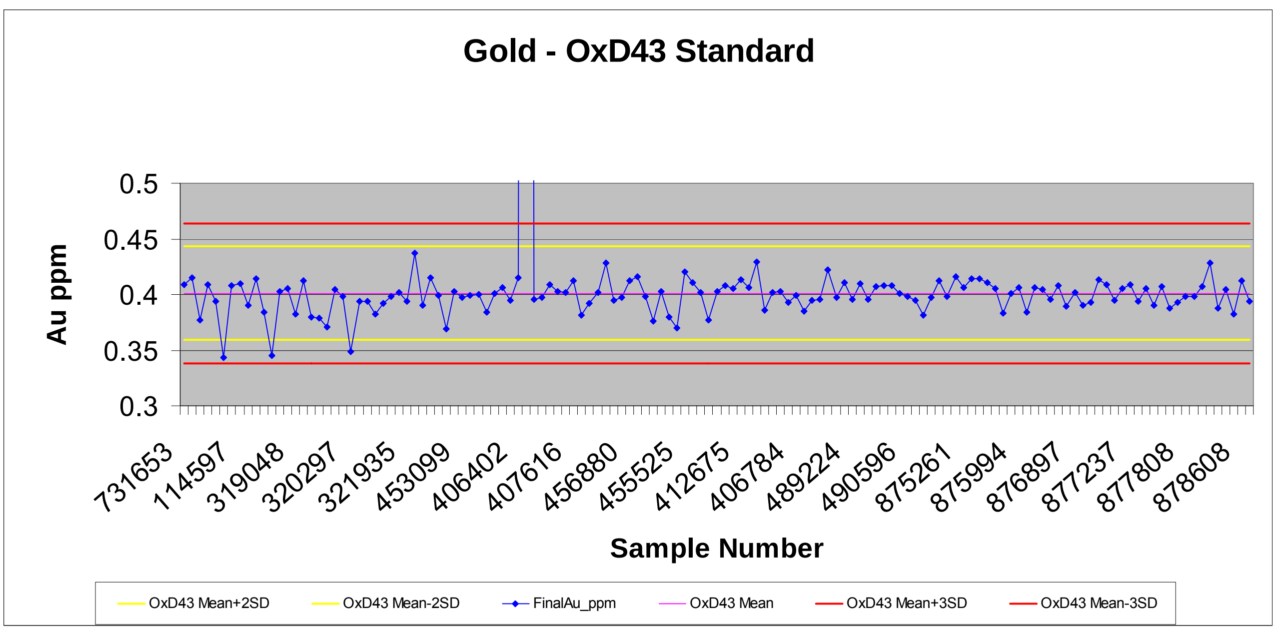



**Figure 13.2.4.3 Rocklabs Standard OxD43**

All analysis for standard OxC44 fell within 2 standard deviations of the standard mean and expected results were clustered around the mean. No analytical problems were associated with this standard.

One failure occurred in the standard OxD43 (sample No.406058) where results returned values of 4.76 and 4.14 g/t Au respectively in the original and re-analysis of the submitted standard. Check analysis for surrounding samples, all of which are near or below detection limits, show good replication implying that the sample results for the standard is erroneous.

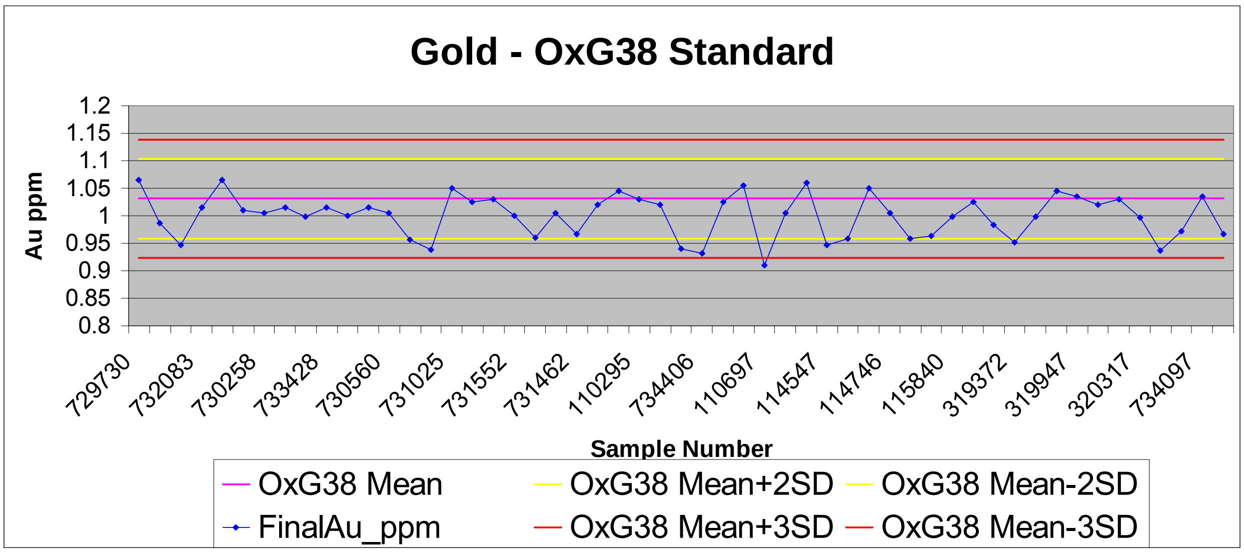



**Figure 13.2.4.4 Rocklabs Standard OxG38**

Results for Standard OxG38 indicate relatively good replication with the exception of samples 110697 and the consecutive samples 734306 and 734406. Re-analysis indicated similar values and check analysis for the surrounding samples within the respective sample batch returned expected results. Other QC samples within each sample batch did not indicate any bias and so the reported results are within acceptable accuracy limits. Overall, the majority of results for standard OxG38 tend to be biased low as seen in the graph where the majority of results tend to fall below the sample mean. Other standards and QC checks do not indicate that the reported results for other samples are biased low and so the results are believed to be within acceptable accuracy limits.

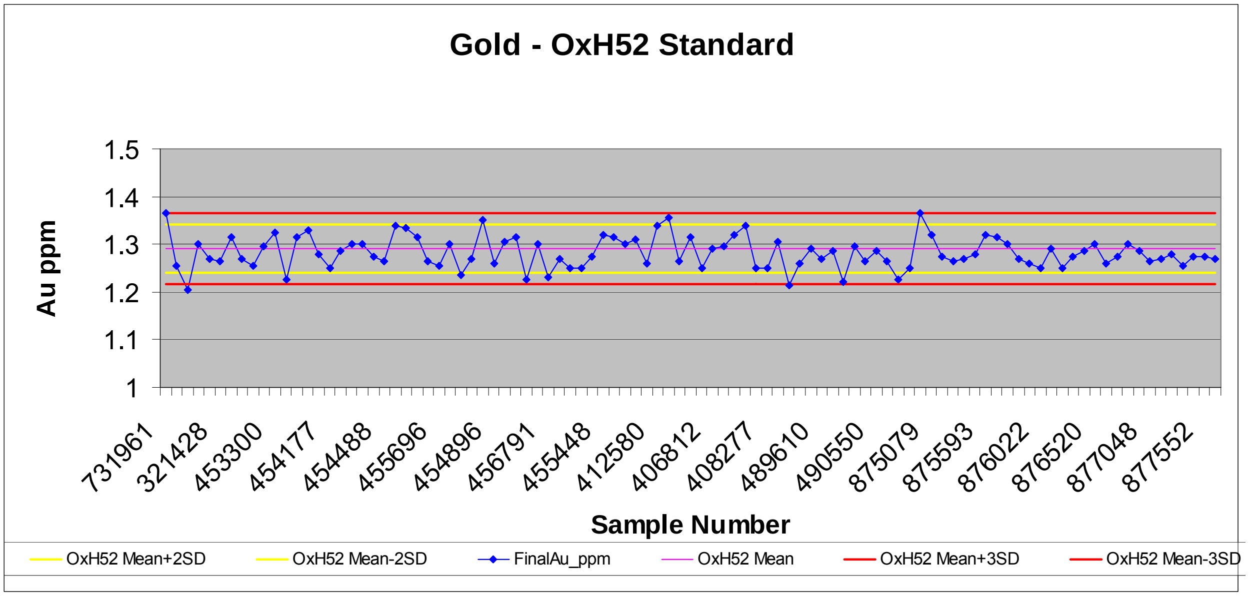



**Figure 13.2.4.5 Rocklabs Standard OxH52**

Only one failure for standard OxH52 occurred (sample 320605) where the original value reported was 1.06 g/t Au and check analysis returned 1.205 g/t Au. Surrounding samples within the sample batch are generally below 0.02 g/t Au and check analysis confirmed their values. Other QC data indicates no bias within the sample batch and so the reported values are considered to be accurate as initially reported.

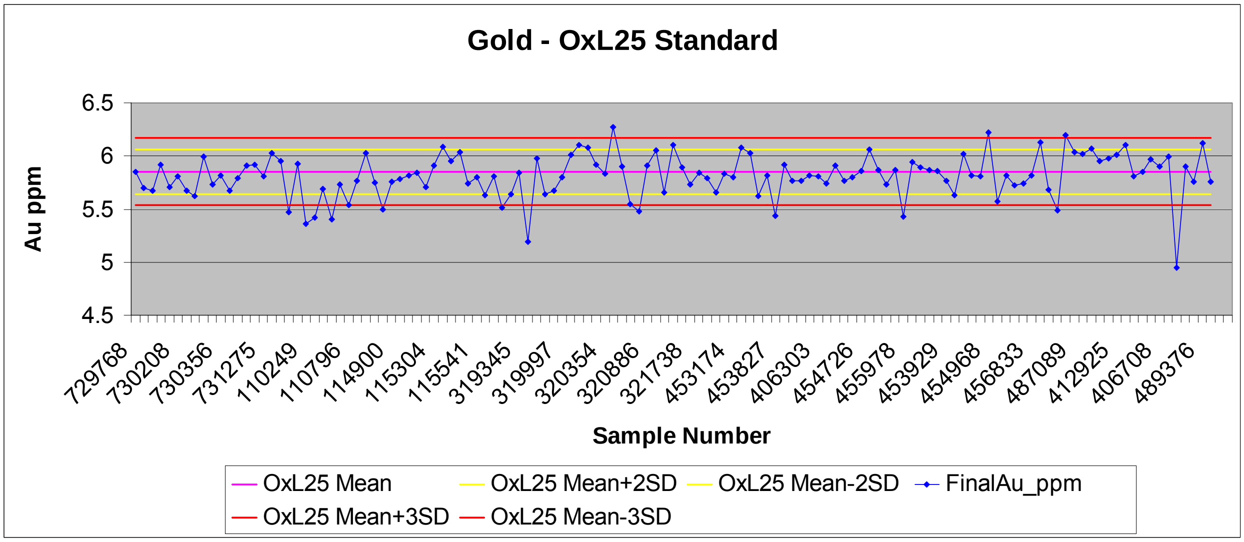



**Figure 13.2.4.6 Rocklabs Standard OxL25**

The Rocklabs standard OxL25 indicates more variability both above and below the mean than was noted in the other Rocklabs standards. Investigation for the cause for this was inconclusive although one possibility was given by ALS Chemex stating that "the majority of standard failures are related to fluxing issues" and this could be problematic with the OxL25 standard. The majority of analysis fall within 2 standard deviations and the remaining failures were investigated extensively. In the majority of cases, re-analysis of samples surrounding the failed standards replicated the original results and other QC data indicated that reported values are within acceptable accuracy limits.

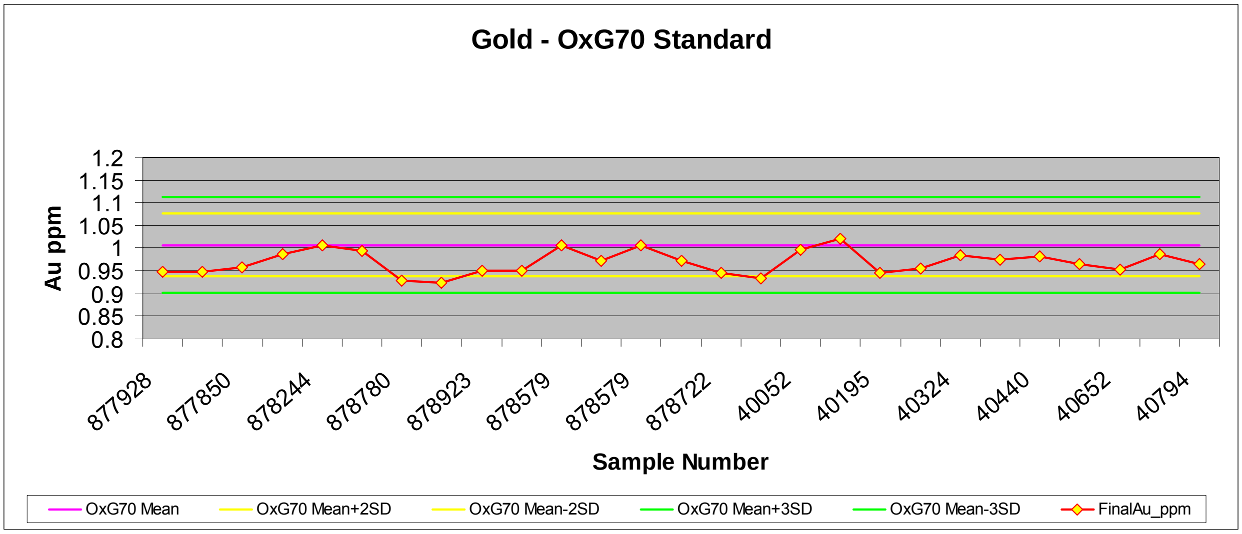



**Figure 13.2.4.7 Rocklabs Standard OxG70**

Results for Standard OxG70 indicate relatively good reproducibility although the majority of results tend to be biased low as seen in the graph where most analysis tend to fall below the sample mean. Other standards and QC checks within the same sample batches do not indicate that the reported results for other samples are biased low and so the results are believed to be within acceptable accuracy limits.

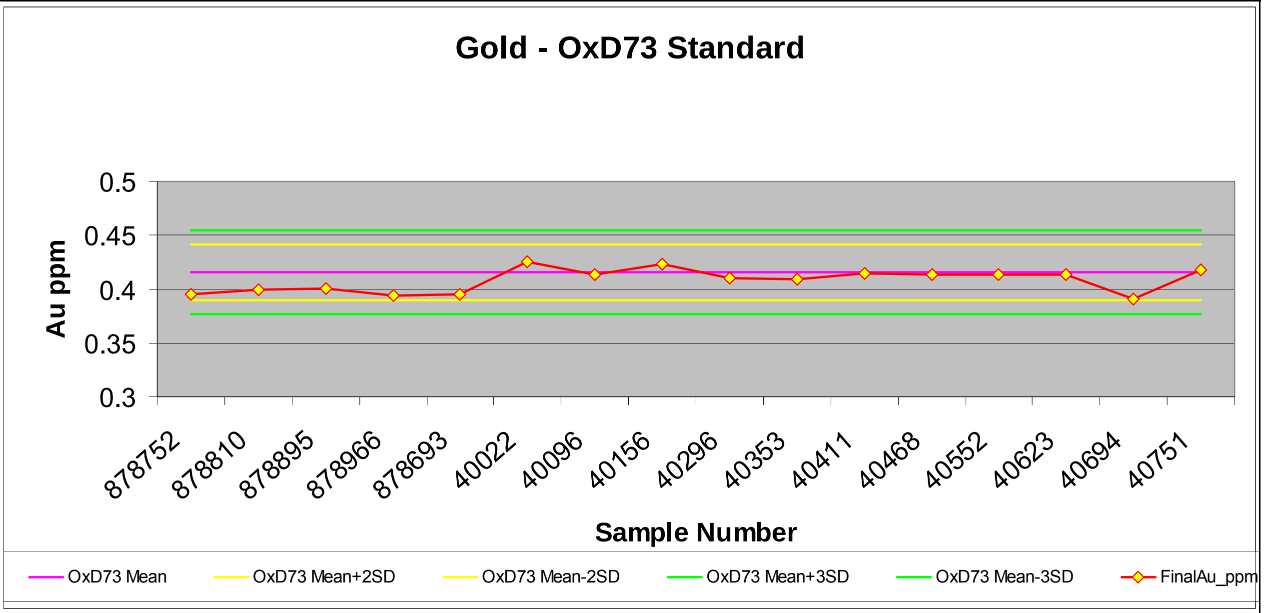



**Figure 13.2.4.8 Rocklabs Standard OxD73**

Results for Standard OxD73 indicate relatively good reproducibility with all results falling within plus or minus two standard deviations of the sample mean. There were no sample failures for this standard and the majority of the analysis are clustered near the sample mean.

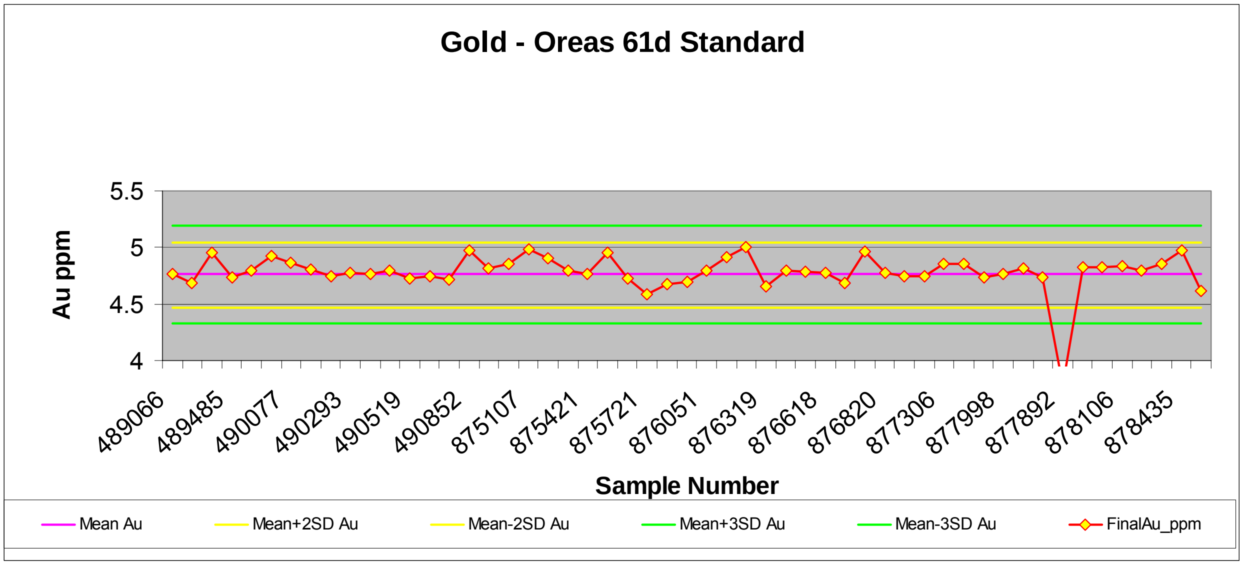



**Figure 13.2.4.9 OREAS Standard 61d - Gold**

Only one failure for Au analysis in standard OREAS 61d occurred (sample 877892) where the original value reported was 3.78 g/t Au well below the expected value. Insufficient sample material remained to check the results of the standard although surrounding samples within the sample batch were checked and the results confirmed the original reported values. Other QC data indicates no bias within the sample batch and so the reported values are considered to be accurate as initially reported.

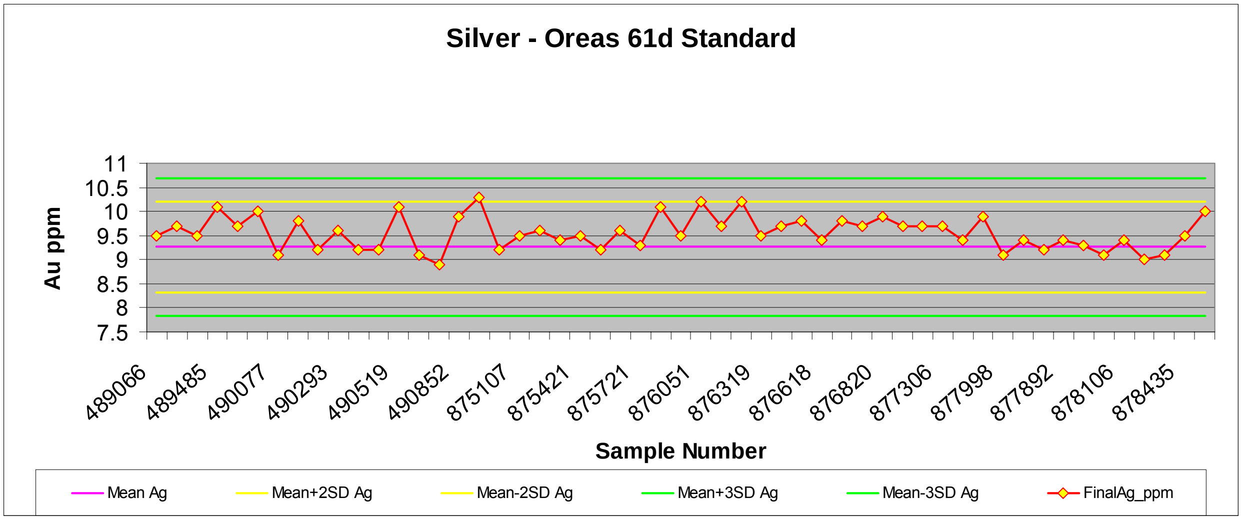



**Figure 13.2.4.10 OREAS Standard 61d - Silver**

Silver results for Standard OREAS 61d indicate relatively good reproducibility with the majority of results falling within plus or minus two standard deviations of the sample mean. Overall the Ag analysis tend to be slightly biased above the expected mean value. There were no Ag sample failures for this standard and results are considered to be within acceptable analytical limits.

Over 300 pulps were re-analyzed by ALS Chemex as a result of monitoring reported results for CRM's and identifying potential analytical problems during the exploration program. If checked pulps indicated a bias or incorrect results from what was originally reported then ALS Chemex issued a "corrected certificate" for the analytical results reported and the Cerro Jumil database was updated with values reported in the corrected certificate.

### 13.2.5 Blank Samples

Blank samples are inserted into the sample stream on average one for every 30 samples submitted. Initially ESM inserted blanks every 20 samples on regular intervals but has since adopted the procedure of inserting them on irregular intervals. The blank samples were initially composed of un-mineralized limestone taken from an outcrop near the property and used for phase 1&2 drill programs. During phase 3 silica sand was purchased and used as the blank material submitted with each sample shipment. While these are not an "official" or "certified" blank samples there have been an adequate number of samples analyzed establishing the grade that indicates the material used is barren. Based on the assumption that the samples are truly "blank", there appears to be a very small and insignificant amount of contamination resulting from sample preparation and analytical procedures as shown in Figure 13.2.5.1. Acceptable values for blank samples are considered to be analysis returning less than five times the lower detection limit (LDL). The LDL for Au and AG are 0.005 and 0.2 ppm respectively and therefore values equal to or less than 0.025 ppm for Au and 1.0 ppm for silver are considered to be within acceptable analytical limits. Of the 931 blanks submitted 97% returned values of less than 0.025 ppm for Au and 98% less than 1.0 ppm for silver.

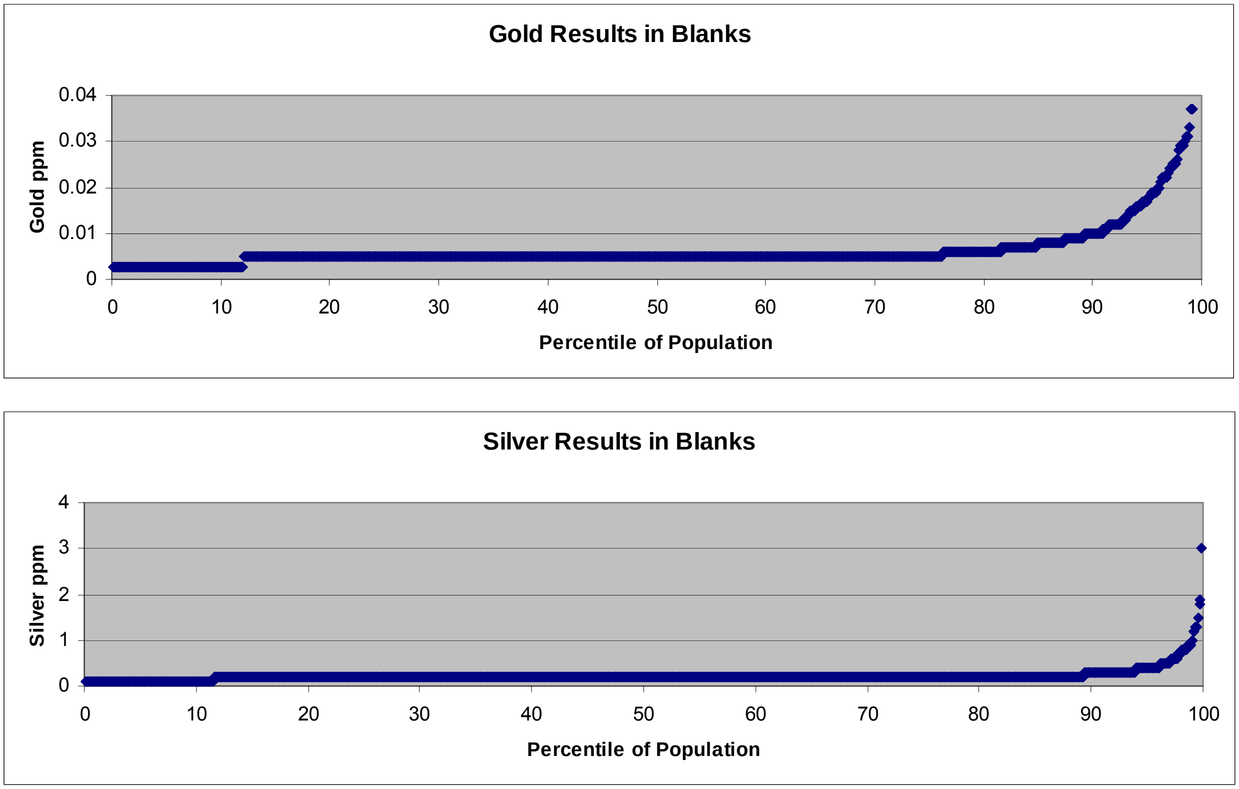



**Figure 13.2.5.1 Gold and Silver Results in QC Blank Samples**

### 13.2.6 Original Pulp and Duplicate Sample Analysis

Numerous QC checks have been completed during the four drill program phases including pulp and duplicate analysis for Au and Ag by both primary and secondary laboratories.

Several different types of duplicate analysis have been completed that include the following;

- Producing a second independent pulp from the reject of the original sample, also referred to as A/B splits by both primary and secondary laboratories (Au and Ag analysis
- For select intervals, producing two independent samples (also referred to as field duplicates or A/B splits) using half of the core and creating two samples from the same interval by splitting it in half again (1/4 core

samples) or in the case of RC samples taking the original sample and splitting it in half (Au and Ag analysis)

- Pulp check analysis, of original pulps, for select Au samples by secondary laboratories.

A summary for the various pulp and duplicate analysis is shown in Table 13.2.6.1 and a discussion for each check analysis type is given in the following paragraphs.

**TABLE 13.2.6.1 PULP AND DUPLICATE SUMMARY**

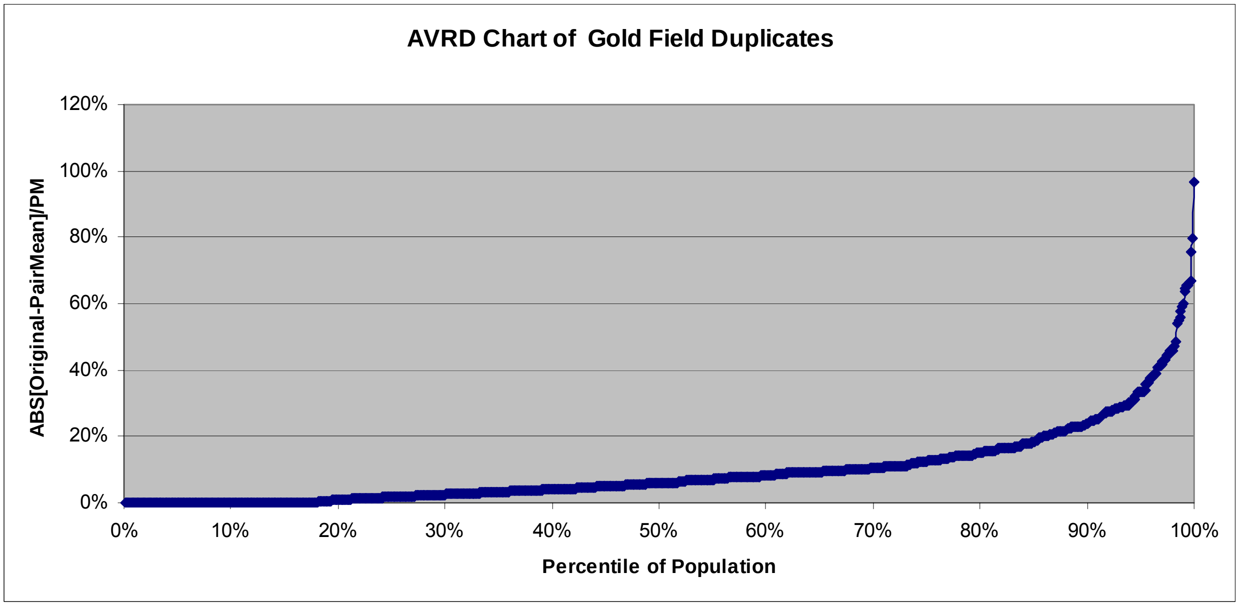
| Check Analysis Type | Number of Samples | Avg Gd Original (ppm) | Avg Gd Duplicate (ppm) | Correl |
|---|---|---|---|---|
| Ag ALS Drill Field Duplicates Ph3&4 | 892 | 3.869 | 3.977 | 0.933 |
| Au ALS Drill Field Duplicates Ph3&4 | 892 | 0.285 | 0.285 | 0.964 |
| Au ALS Reject Dup A/B split - Ph1&2 | 26 | 1.710 | 1.661 | 0.967 |
| Ag ALS Reject Dup A/B split - Ph1&2 | 26 | 4.254 | 4.808 | 0.983 |
| Au ALS vs SGS Dup A/B Split | 108 | 1.889 | 1.645 | 0.986 |
| Au ALS vs Insp Pulp Check | 84 | 1.061 | 1.102 | 0.996 |
| Au ALS vs SGS Pulp Check | 138 | 2.744 | 2.661 | 0.998 |
| Au ALS vs ACME Pulp Check | 181 | 1.221 | 1.172 | 0.988 |

ALS = ALS Chemex Laboratories
Insp = BSI Inspectorate de Mexico, S.A. de C.V.
SGS = SGS Laboratories
ACME Analytical Laboratories LTD.
QC Check = Samples with related QC errors identified
Ph1&2 = Phase 1 and Phase 2 drill programs
Ph3&4 = Phase 3 and 4 drill programs
Correl = Correlation Coefficient

Field duplicates were collected for 892 randomly selected intervals during the phase 3 and 4 drill campaigns including both core and RC sampled intervals. All samples were submitted to the primary laboratory, ALS Chemex, as part of the routine sample shipments. Half of all sampled intervals are archived for future reference, metallurgical testing or check analysis. Therefore, the field duplicates represent the originally sampled interval split in half resulting in ¼ of the original core and

RC intervals sent to the laboratory for analysis (i.e. ¼ of the interval is considered a duplicate and the other ¼ the original sample).

Results for Ag and Au field duplicates, phase 3 and 4 drill programs, are shown on absolute value of the relative difference (AVRD) charts shown in Figure 13.2.6.1 where AVRD is defined as the absolute value of the original sample minus pair mean (PM), where AVRD (%) is the original and duplicate sample averaged, divided by the PM.



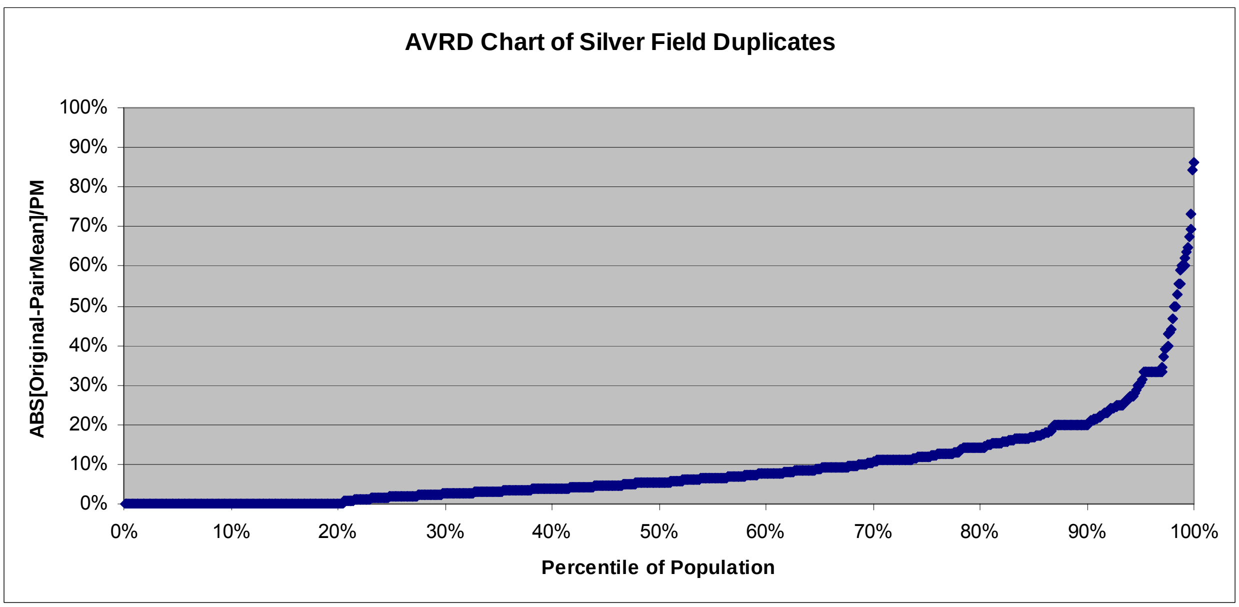
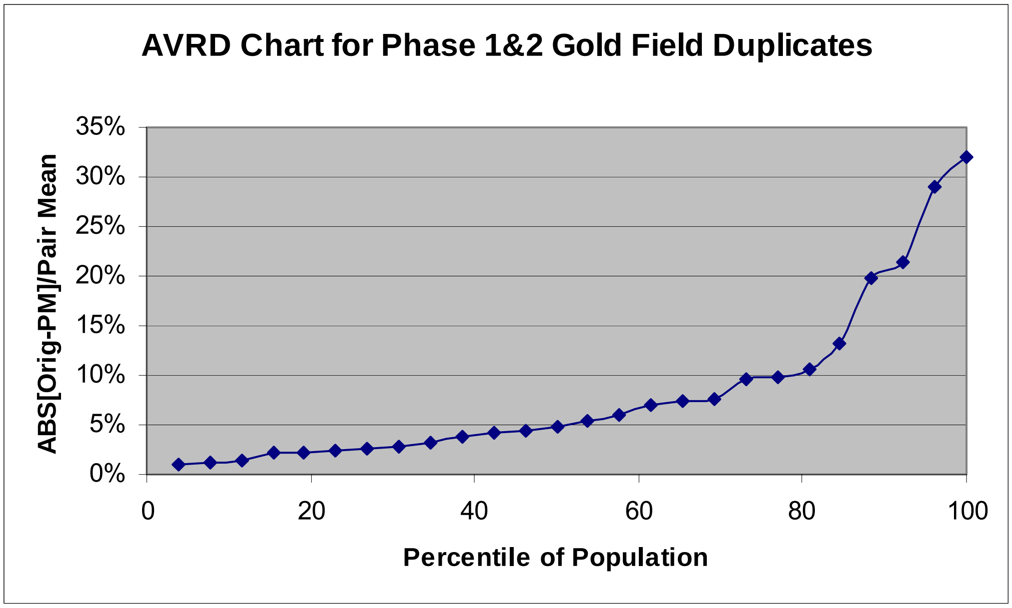




**Figure 13.2.6.1 AVRD Charts for Gold and Silver Field Duplicates, Phase 3&4**

ESM considers field duplicates to have a good correlation if at least 90% of the population has relative differences of less than 30%. At the 90$^{th}$ percentile for Au and Ag relative differences are less than 24 and 22% respectively.

For the phase 1&2 drill programs the duplicate sample was made by taking the original reject and producing a second pulp (A/B split) to be analyzed as the field duplicate. AVRD charts were developed using the same methodology as in the above phase 3 field duplicate charts and results are shown in Figure 13.2.6.2.



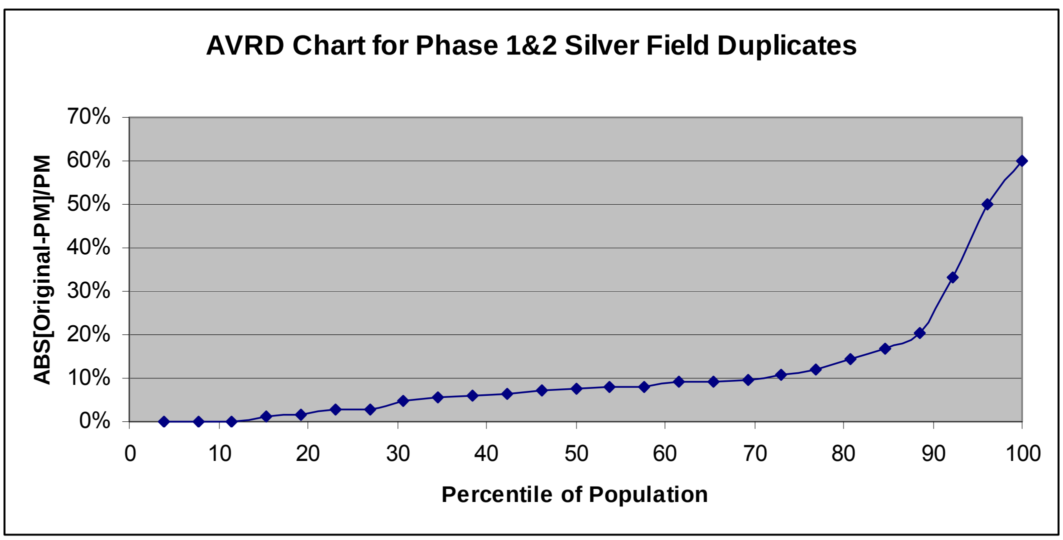




**Figure 13.2.6.2 AVRD Charts for Gold and Silver Field Duplicates, Phase 1&2**

Field duplicates for phase 1&2 drill programs give similar results to values noted in the phase 3 drill program where relative percent difference for field duplicates is less than 30% for samples below the 90th percentile of the population.

Field duplicate checks in phase 1, 2, 3, and 4 drill programs all show good reproducibility for both Au and Ag and fall within acceptable accuracy limits for this type of duplicate sample analysis.

In addition to the above field duplicate analysis a total of 108 field duplicate samples consisting of original rejects were sent to a secondary laboratory, SGS Mexico, and their results are shown in an AVRD chart in Table 13.2.6.3.

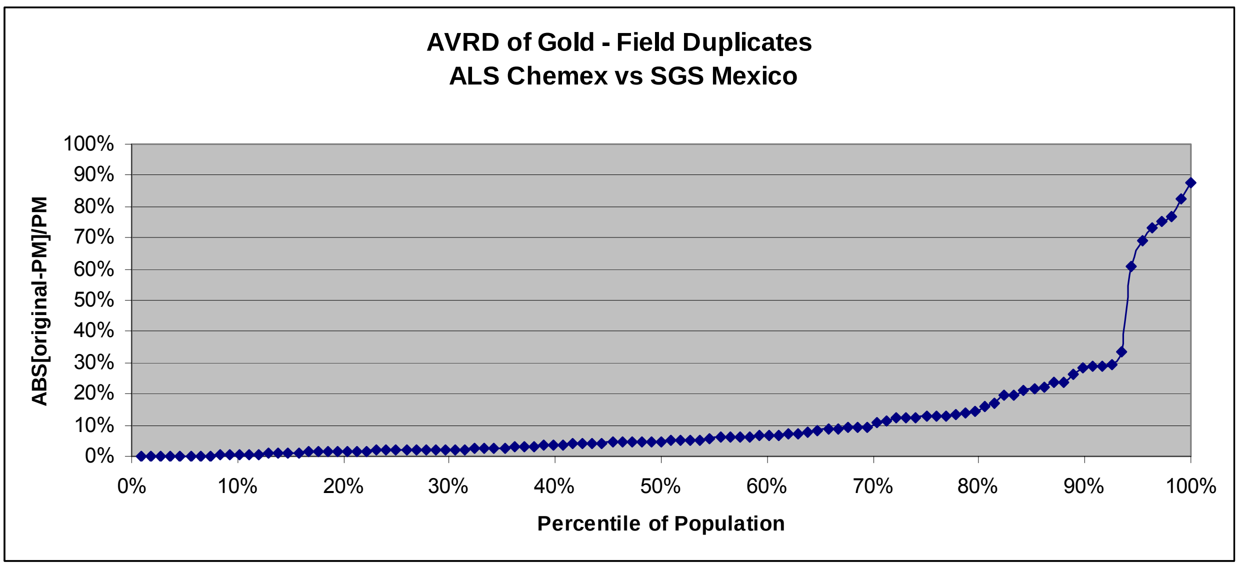
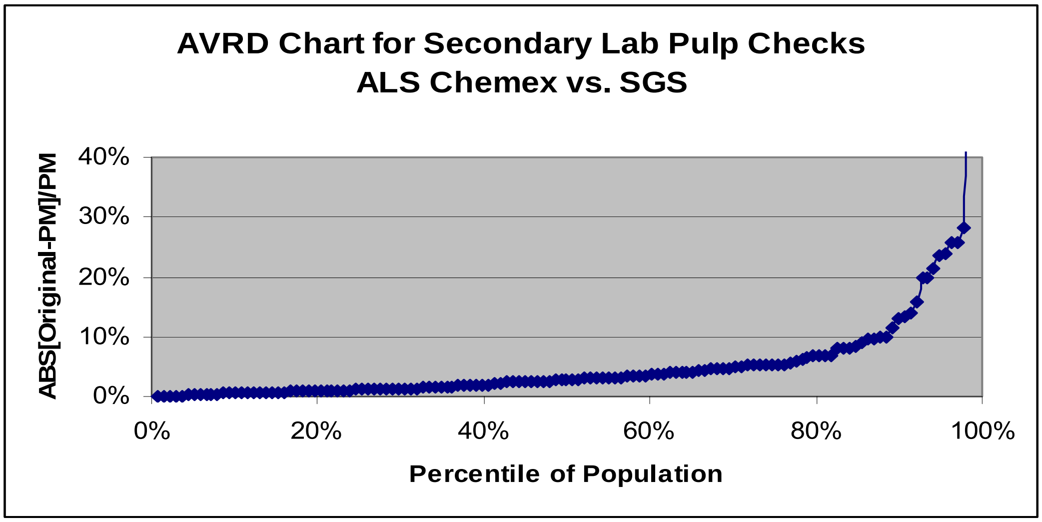


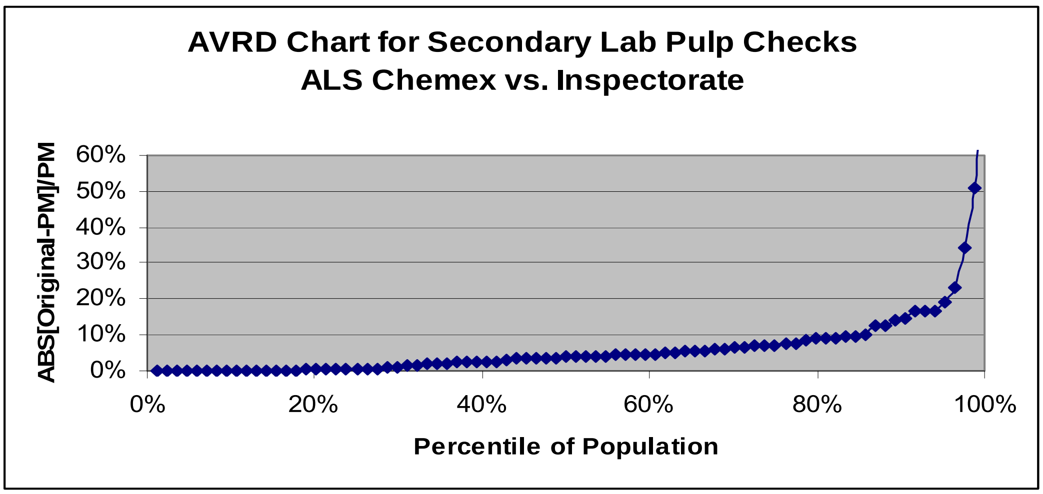

**Figure 13.2.6.3 AVRD Chart for Field Duplicates between ALS Chemex and SGS Mexico**

Overall the results for the field duplicate comparison between ALS Chemex and SGS Mexico indicate good correlation with over 90% of the samples having a relative per cent difference (RPD) of less than 30%.

Three separate studies were completed using secondary laboratories to check analytical results reported by the designated primary laboratory ALS Chemex. Secondary laboratories used for original pulp checks included Inspectorate Laboratories, SGS Mexico, and ACME Analytical Laboratories LTD.. A total of 84 original sample pulps were sent to Inspectorate, 138 to SGS, and 181 to ACME. Results for the secondary laboratory pulp checks are shown in AVRD charts in Figure 13.2.6.4.

All three secondary lab pulp check analysis indicate good replication of the original ALS Chemex Au assay. The correlation coefficient between original and secondary pulp checks ranges from 0.988 to 0.998 indicating very good assay replication. Approximately 90% of the pulps have a relative per cent difference of less than 15% between primary and secondary analysis. Results of the secondary laboratory pulp check analysis is considered to be within acceptable accuracy limits and substantiates ALS Chemex's originally reported values.



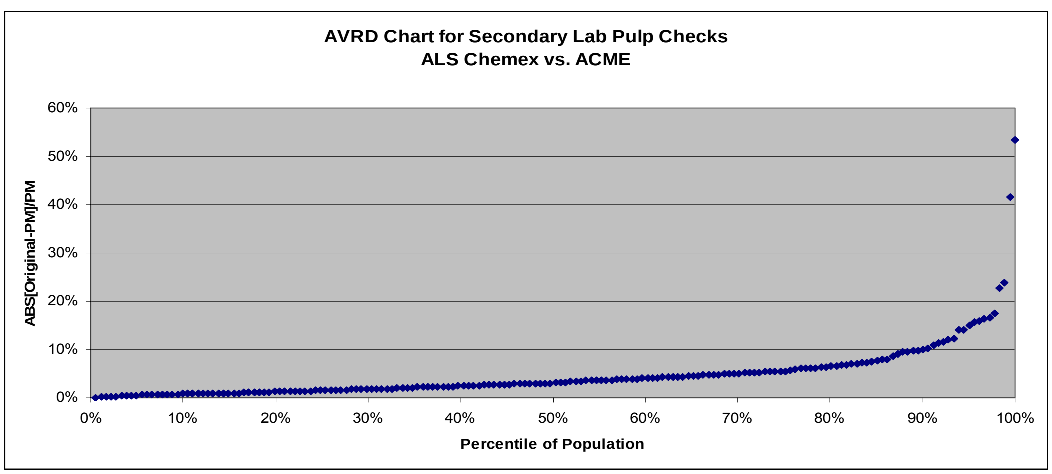




**Figure 13.2.6.4 AVRD Chart for Secondary Lab Pulp Checks**

### 13.2.7 Size Fraction Analysis

An analysis was also undertaken to determine if gold has a preferential size fraction distribution. Alteration, mineralization, faulting and other geologic factors typically influence the amount of recovered material for any given interval and a size fraction analysis helps to establish if a bias, based on the size of material recovered, in gold values reported is problematic. Two separate studies were completed for gold distribution based on various size fractions including 11 samples from core rejects and 11 from RC sample intervals.

Drill core intervals and their reject material were screened into five size fractions and analyzed by ALS Chemex. Results for each size fraction are summarized in Figure 13.2.7.1.

An additional 11 mineralized intervals selected from RC samples were sent to SGS for gold distribution analysis. These samples were screened into seven size fractions and the results for each size fraction are summarized in Figure 13.2.7.2.

Results for both core and RC size fraction analysis indicate a homogeneous gold distribution and therefore no bias in analytical results based on sample recovery is perceived as a problem.

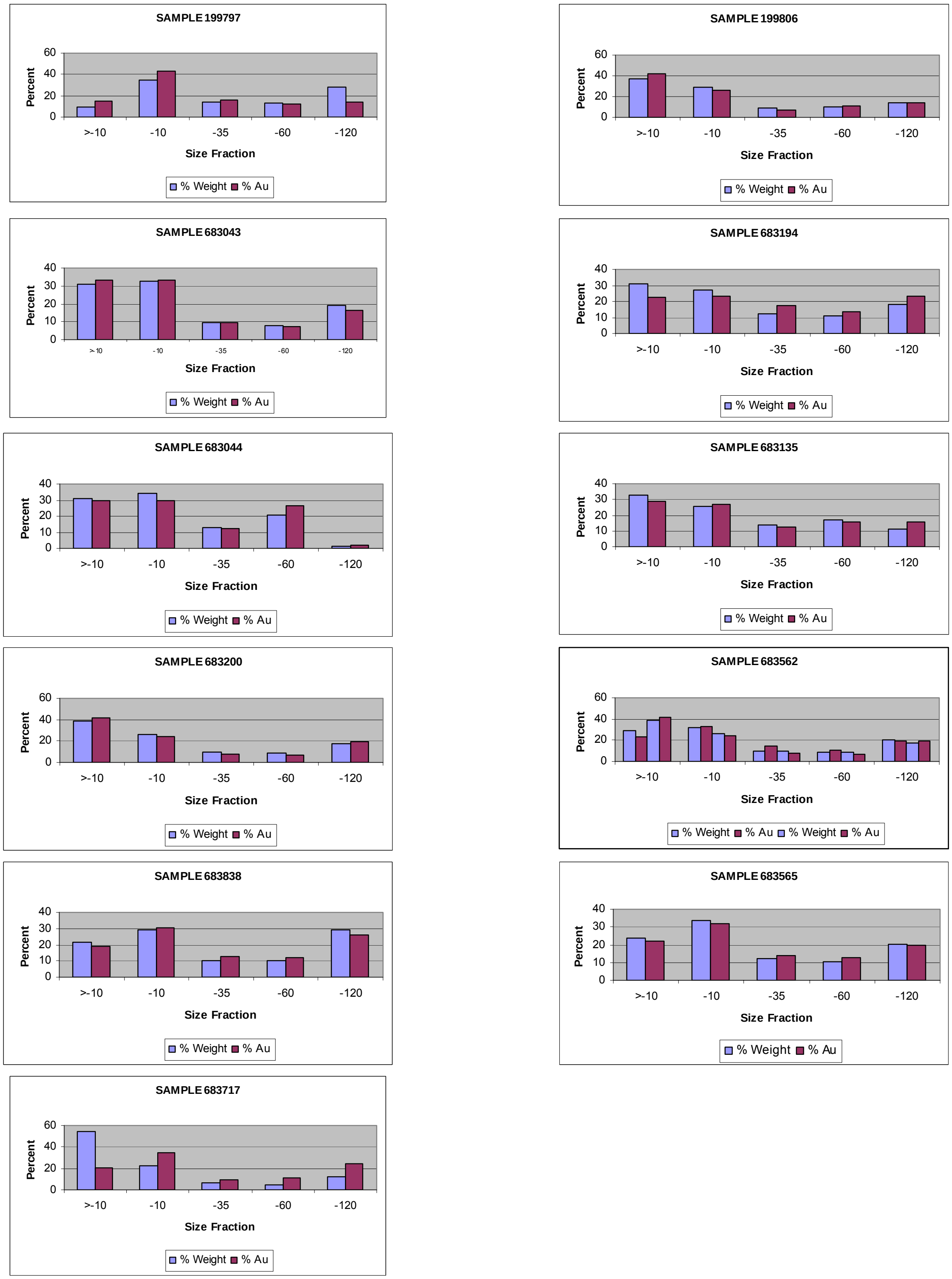



**Figure 13.2.7.1 ALS Size Fraction Analysis for Gold Distribution in Core Samples**

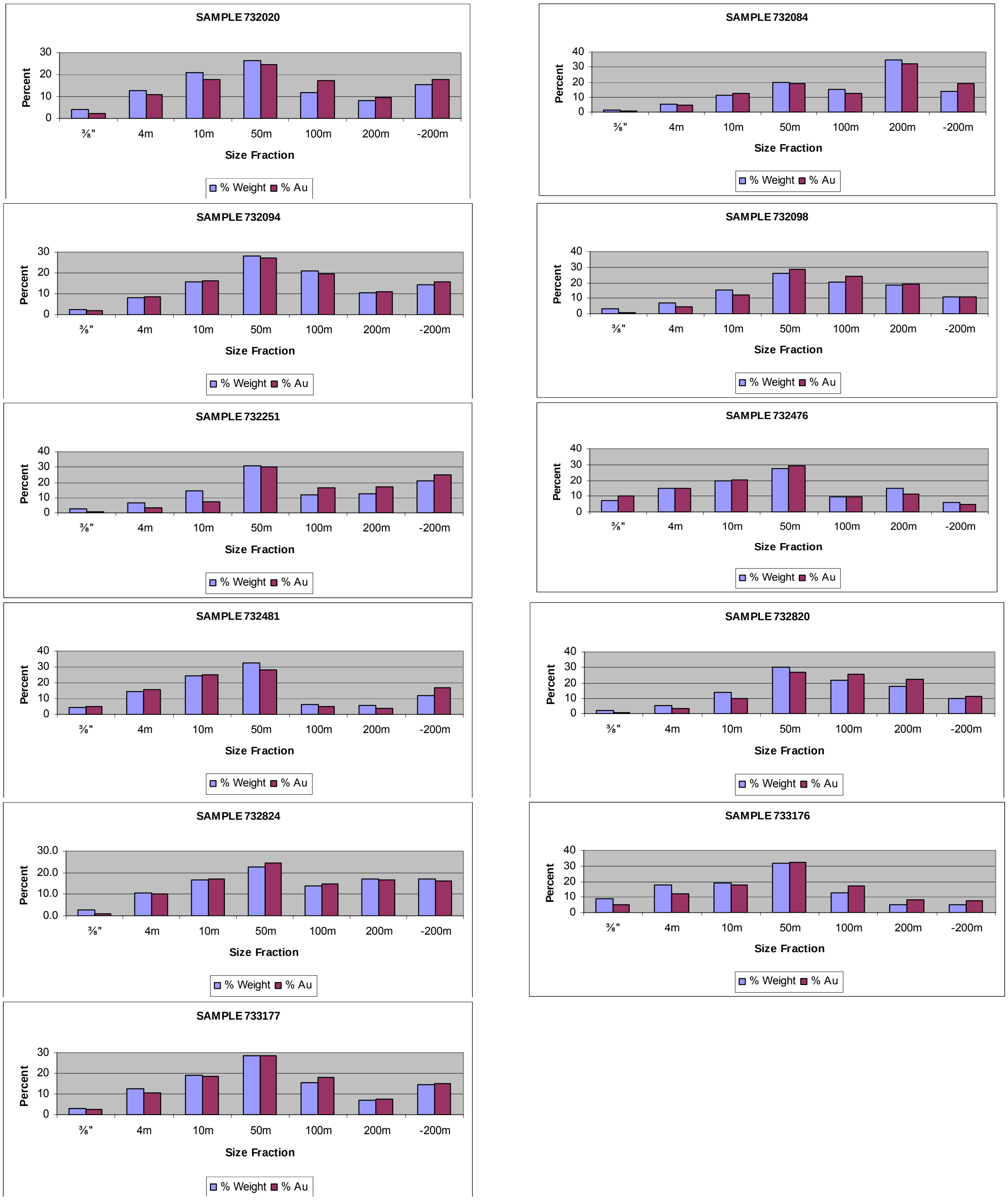



**Figure 13.2.7.2 SGS Size Fraction Analysis for Gold distribution in RC samples**

#### 13.2.8 Opinion on Sampling, Preparation, Security and Analytical Methods

It is the author's opinion that the adequacy of sampling, sample preparation, security and analytical procedures were conducted by reputable personnel and in accordance with standard industry practice. Sampling methods, sample preparation and analytical procedures are appropriate for the type of mineralization recognized at Cerro Jumil.

## *14.0 DATA VERIFICATION*

### *14.1 Independent QP Data Verification*

#### 14.1.1 Independent Duplicate Core and RC Samples - 2008

Co-author Dean Turner, P.Geo., conducted independent verification of sampling results from both core and reverse circulation drill samples during a Cerro Jumil site visit January 16-17, 2008. Additional independent duplicate sampling was not judged necessary for this 2010 update report, as ESM's techniques, procedures, facilities, and personnel have remained consistent since 2008. The following text in this sub-section 14.1.1 is as originally presented in the 2008 NI 43-101 technical report.

Turner selected three core holes, and one RC hole from review of ESM drill logs. The holes were selected to be representative of typical alteration and grade ranges for the mineralized and skarn altered zones at Cerro Jumil. All duplicate samples were taken either directly by Turner, or under his supervision

For the diamond holes chosen, the core boxes were retrieved from ESM's secure, on-site storage building, laid out, and the logs reviewed. Holes DHE-05-01, DHE-05-13, and DHE-06-28 were selected for review. Intervals were identified by Turner for duplicate sampling, and the ½ core sawn into quarters, with ¼ core bagged for duplicate analysis and the other ¼ core retained in the core box archive (Plates

14.1.1.1 and 14.1.1.2). For intervals composed of broken and friable material, efforts were given to take a representative subsample of the core material, with careful attention given to acquiring fine as well as coarse material. The duplicate ¼ core was bagged, labeled with an anonymous sample number, and secured pending shipment.

**Plate 14.1.1.1 Core Duplicate Sampling**

**Plate 14.1.1.2 Diamond Sawing ¼ Core**

For the RC duplicate sampling, ESM's secure sample storage facility in the village of Rodeo, directly adjacent to the Cerro Jumil property, was visited (Plate 14.1.1.3). Hole RCHE-04-07 was selected, and the RC sample splits ('testigos') retained in ESM's archive were retrieved, re-bagged, re-labeled with an anonymous sample number, and secured pending shipment (Plate 14.1.1.4).

**Plate 14.1.1.3 ESM Rodeo Storage Facility**

**Plate 14.1.1.4 RC Duplicate Sampling**

The duplicate samples remained under Turner's control until shipment via commercial bus service to Chemex's sample preparation laboratory in Guadalajara. The samples were analyzed for gold at Chemex's Vancouver laboratory using a one assay ton fire assay with AA finish (Chemex code Au-AA23), and silver underwent aqua regia digestion and analysis via ICP/AES (Chemex code ME-ICP41). Digital assay certificates were sent to Turner, and he subsequently confirmed the reports via direct Internet download from Chemex's Webtrieve system.

QA samples included by Turner with his duplicates were comprised of two 'blank' samples and three gold certified standards from Geostats Pty. Ltd., including one G902-3 (0.42 ppm Au) and two G305-6 (1.48 ppm Au) CRMs. The QA sample gold assays were precisely and accurately reported by Chemex, and passed all QC tests.

The duplicate analyses for gold and silver show good correspondence between the original ESM sample results and the independent sample assays (Table 14.1.1.1 and Figures 14.1.1.1 and 14.1.1.2). However, the original ESM samples on average assayed 10.7% higher for gold and 14.6% higher for silver. These higher averages are due to one high-grade sample (673524) from DHE-06-28 that assayed 14.2 g/t Au and 52.5 g/t Ag versus duplicate analyses of 0.18 g/t Au and 36.2 g/t Ag. Elimination of this outlier sample gives averages of 3.83 g/t Au and 5.81 g/t Ag for the originals versus 4.25 g/t Au (11% higher) and 5.67 g/t Ag (2.4% lower) for the duplicates. Review of the drill core photo for 673524 highlights that this interval is composed of broken and rubbley garnet-wollastinite skarn. Clearly this specific sample interval demonstrates nugget effect. Otherwise, the linear correlation between the original and duplicate drill samples establish that ESM's drill sample assay results for gold and silver are reliable and reproducible within the context of geologic variance expected for a gold skarn deposit.

## TABLE 14.1.1.1 ORIGINAL ESM DRILL SAMPLE AND INDEPENDENT DUPLICATE GOLD-SILVER RESULTS.

| ORIGINAL DRILL SAMPLE | | | | | | DUPLICATE SAMPLE | | |
|---|---|---|---|---|---|---|---|---|
| **Drill Hole** | **Sample #** | **From** | **To** | **Au g/t** | **Ag g/t** | **QP Samp#** | **Au g/t** | **Ag g/t** |
| DHE-05-01 | 199028 | 47.8 | 48.9 | 0.07 | 26.0 | 602514 | 0.13 | 31.7 |
| DHE-05-01 | 199029 | 48.9 | 50.0 | 1.58 | 10.1 | 602515 | 7.25 | 8.2 |
| DHE-05-13 | 199941 | 48.7 | 50.6 | 0.23 | 2.1 | 602510 | 0.21 | 2.3 |
| DHE-05-13 | 199942 | 50.6 | 52.0 | 1.72 | 5.8 | 602512 | 0.70 | 4.1 |
| DHE-05-13 | 199943 | 52.0 | 54.0 | 3.01 | 3.5 | 602513 | 1.87 | 2.7 |
| DHE-06-28 | 673503 | 67.0 | 68.0 | 8.07 | 5.5 | 602501 | 8.83 | 6.6 |
| DHE-06-28 | 673504 | 68.0 | 69.0 | 3.46 | 12.1 | 602502 | 3.03 | 12.5 |
| DHE-06-28 | 673512 | 76.0 | 77.0 | 0.31 | 7.8 | 602503 | 0.30 | 3.1 |
| DHE-06-28 | 673513 | 77.0 | 78.0 | 1.58 | 2.5 | 602504 | 1.89 | 2.1 |
| DHE-06-28 | 673523 | 87.0 | 88.0 | 0.20 | 6.6 | 602507 | 0.20 | 6.1 |
| *DHE-06-28* | *673524* | *88.0* | *89.0* | *14.20* | *52.5* | *602508* | *0.18* | *36.2* |
| RCHE-07-47 | 115236 | 57.0 | 58.5 | 0.25 | 1.5 | 602516 | 0.27 | 1.6 |
| RCHE-07-47 | 115237 | 58.5 | 60.0 | 1.14 | 1.0 | 602517 | 0.98 | 0.8 |
| RCHE-07-47 | 115238 | 60.0 | 61.5 | 2.94 | 0.9 | 602518 | 2.94 | 1.4 |
| RCHE-07-47 | 115249 | 73.5 | 75.0 | 26.60 | 4.2 | 602520 | 28.40 | 3.7 |
| RCHE-07-47 | 115250 | 75.0 | 76.5 | 7.51 | 2.3 | 602521 | 8.14 | 2.8 |
| RCHE-07-47 | 115251 | 76.5 | 78.0 | 2.65 | 1.0 | 602522 | 2.92 | 1.0 |
| ***Average*** | | | | ***4.44*** | ***8.55*** | | ***4.01*** | ***7.46*** |

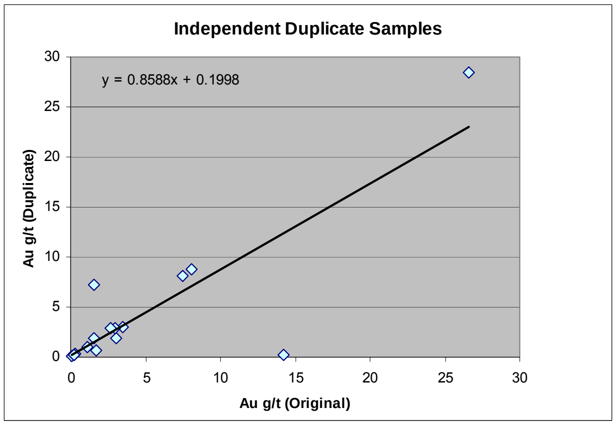



**Figure 14.1.1.1 Au Sample Scatter Plot.**

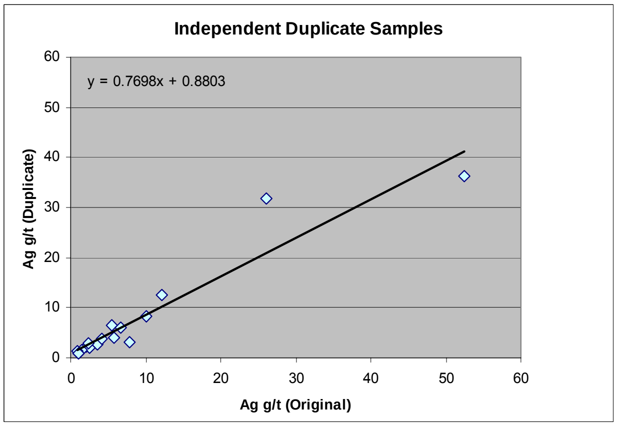



**Figure 14.1.1.2 Ag Sample Scatter Plot.**

### 14.1.2 Independent Drill Assay Database Audit - 2010

Turner supervised an independent drill database audit to ensure the veracity of gold-silver assays used for resource modeling. This work built upon the foundation established by the 2008 independent assay database audit. As a starting point, the vetted 2008 drill hole assay database was cross-checked against the updated July 2010 database provided by ESM. No differences were found for the gold or silver assays, and no significant differences were found for the entire 2008 assay database (i.e., including other fields such as from-to, multi-element analyses, etc.). This verified that the 2010 drill assay database up to, and including, the 2008 results were consistent with the previously vetted version. For the new 2009-2010 data, 10% of the assays were randomly selected, and the gold and silver assays checked against the digital lab certificates. In addition, all gold assays over 5 g/t were reviewed. The gold-silver assays reported in the lab certificates were cross-checked by sample number against the entry in the database, with no errors or discrepancies. This 100% fidelity is a strong endorsement of ESM's data handling protocols and procedures, and firmly establishes the high quality of the 2010 assay database used for resource modeling.

### *14.2 ESM Internal Data Verification*

Both internal and external laboratory quality control procedures, sampling method and handling protocols meet or exceed standard industry practice. Geochemical and/or assay results are added to the database by a computer program that uses the unique sample identification number to download the data and tie it to its appropriate location, sample type, interval, and other pertinent information eliminating manual data entry error. ESM runs routine checks for data verification that include the following;

- Check and review drill site locations and surveyed coordinates
- Examination of assay certificates and ~10% spot check of results input into the database
- Continual review of QAQC procedures and results
- Validation of the database to check for inconsistencies such as missing intervals, out of sequence records, duplicate sample numbers, or typographical errors
- Comparison of drill logs to database information for lithology, sample numbers and other pertinent information
- Review and check of geological plan and cross-section maps with database information
- Frequent project site visits and review of procedures and results derived from ongoing exploration drilling, mapping, sampling and other related activities

The co-author of this report, Bond, has been involved with this project since its inception, and believes that the data verification procedures are adequate, and the results reported are reliable.

## *15.0 ADJACENT PROPERTIES*

There are no significant properties as defined by NI 43-101 adjacent to Cerro Jumil.

# 16.0 METALLURGICAL TESTING

## 16.1 SGS Metallurgical Testing

Preliminary bottle roll testing was completed on one composite sample from the West Zone and two from the Southeast Zone during 2005 and 2006. Based on the geological logs, mineralogical observations, and geochemical results it is believed that the composites are typical for the different areas of the deposit.

In 2005, bottle roll testing examining the effect of grind size and NaCN concentration on gold and silver recovery for the West Zone was done on multiple samples from composite #1. The metallurgical sample was from drill hole DHE-05-01 from 48.9 to 85.2 meters with a weighted average grade of 2.24 Au g/t and 19.52 Ag g/t. ALS Chemex composited the sample from reject material stored at their sample preparation facility in Guadalajara and shipped the composite (#1) directly to SGS Lakefield Research Limited. Metallurgical testing was done by SGS Lakefield's facility in Lakefield, Ontario, Canada.

A 1 kg test charge was ground and split into 500 gram charges. One charge was re-pulped with fresh water to 33% solids in a 2.5 liter bottle. Lime and NaCN were added and the bottle was placed on rolls for 48 hours. NaCN concentration and alkalinity were monitored and maintained throughout the duration of the leach period and dissolved O2 concentration was measured occasionally. At the end of the leach period, the pulp was filtered. The pregnant solution was collected and submitted for Au and Ag analyses. The filter cake was thoroughly washed several times with water. The wash solution was discarded. The filter cake was dried and submitted for Au, Ag and size analyses. Results for composite #1 reagent consumption and 48 hour extraction rates are shown in Table 16.1.1. Composite #1 Au and Ag extractions ranged from 92.3% to 95.6% and 48.3% to 65.1% respectively. Grind size had little effect on overall gold extraction over the size range tested.

Further test work is required to fully characterize the ore and to optimize a processing flowsheet.

**TABLE 16.1.1 2005 BOTTLE ROLL TESTS – WEST ZONE**

| Test | Conditions | | Reag. Cons. | | 48 h Extraction | | Residue | | Head (calc.) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $K_{80}$ µm | NaCN g/L | NaCN kg/t | CaO kg/t | Au % | Ag % | Au g/t | Ag g/t | Au g/t | Ag g/t |
| CN-1 | 94 | 0.5 | 0.64 | 2.68 | **92.3** | **48.3** | 0.18 | 8.7 | 2.34 | 16.8 |
| CN-2 | 94 | 1.0 | 0.73 | 2.74 | **95.6** | **61.1** | 0.10 | 6.4 | 2.29 | 16.5 |
| CN-3 | 44 | 0.5 | 0.66 | 2.83 | **94.6** | **54.6** | 0.12 | 7.4 | 2.23 | 16.3 |
| CN-4 | 44 | 1.0 | 0.78 | 2.80 | **95.2** | **64.4** | 0.11 | 6.2 | 2.31 | 17.3 |
| CN-5 | 32 | 0.5 | 0.87 | 2.91 | **95.2** | **59.5** | 0.11 | 6.9 | 2.31 | 17.0 |
| CN-6 | 32 | 1.0 | 1.04 | 2.99 | **94.1** | **65.1** | 0.13 | 5.9 | 2.22 | 16.9 |

Bottle roll testing to examine the effect of grind size, NaCN consumption and gold recovery from composites #2 and #3 taken from the Cerro Jumil Southeast Zone was completed in 2006. The metallurgical samples were from drill hole's DHE-05-17 (composite #2) and DHE-06-29 (composite #3) composited from 123.9 to 151.0 meters and 33.0 to 101.0 meters, respectively. Average gold grades of the samples making up composite #2 and #3 were 1.09 and 2.88 g Au/t, respectively. ALS Chemex made the composite samples from reject material stored at their sample preparation facility in Guadalajara and shipped them directly to SGS Lakefield Research Limited. Metallurgical testing was done by SGS Lakefield's facility in Lakefield, Ontario, Canada.

A 1-kg test charge was ground and split into 500 g charges. One charge was re-pulped with fresh water to 33% solids in a 2.5 L bottle. Lime and NaCN were added and the bottle was placed on rolls for 48 hours. NaCN concentration and alkalinity were monitored and maintained throughout the duration of the leach period, as described below. At the end of the leach period, the pulp was filtered. The pregnant solution was collected and submitted for Au and Ag analyses. The filter cake was thoroughly washed several times with water. The wash solution was discarded. The filter cake was dried and submitted for Au and size analyses. Results for composite #2 and composite #3 reagent consumption and 48 hour extraction rates are shown in Table 16.1.2.

**TABLE 16.1.2 2006 BOTTLE ROLL RESTS – SOUTHEAST ZONE**

| Test | Sample | Conditions $K_{80}$ µm | NaCN g/L | Reagent Consumption NaCN kg/t | CaO kg/t | 48 h Extraction Au % | Residue Au g/t | Head (calc.) Au g/t |
|---|---|---|---|---|---|---|---|---|
| CN-7 | Comp #1 | 87 | 0.5 | 0.19 | 2.98 | **88.2** | 0.10 | 0.85 |
| CN-8 | Comp #1 | 87 | 1.0 | 0.31 | 2.78 | **89.4** | 0.09 | 0.85 |
| CN-9 | Comp #1 | 46 | 0.5 | 0.17 | 2.86 | **90.2** | 0.08 | 0.82 |
| CN-10 | Comp #1 | 46 | 1.0 | 0.68 | 3.02 | **91.3** | 0.07 | 0.80 |
| CN-11 | Comp #1 | 36 | 0.5 | -0.18 | 2.98 | **90.6** | 0.08 | 0.85 |
| CN-12 | Comp #1 | 36 | 1.0 | 0.34 | 3.12 | **91.2** | 0.07 | 0.80 |
| CN-13 | Comp #2 | 133 | 0.5 | 0.07 | 1.45 | **87.8** | 0.29 | 2.38 |
| CN-14 | Comp #2 | 133 | 1.0 | 0.71 | 1.37 | **89.1** | 0.26 | 2.40 |
| CN-15 | Comp #2 | 57 | 0.5 | 0.06 | 1.47 | **95.2** | 0.12 | 2.48 |
| CN-16 | Comp #2 | 57 | 1.0 | 0.09 | 1.61 | **94.5** | 0.13 | 2.28 |
| CN-17 | Comp #2 | 43 | 0.5 | 0.10 | 1.58 | **95.9** | 0.10 | 2.44 |
| CN-18 | Comp #2 | 43 | 1.0 | 0.12 | 1.61 | **96.1** | 0.10 | 2.54 |

Gold extractions ranged from 88.2% to 91.3% and 87.8% to 96.1% for composite #2 and composite #3 respectively. Due to expected low silver grades, silver was not analyzed for in the two Southeast Zone composites. Grind size had some effect on overall gold extractions over the size range tested, most notably with composite #2. Slightly higher extraction rates were observed using the higher NaCN concentration in both composites. Further test work is required to fully characterize these ores and to optimize a processing flowsheet.

In early 2007 a bulk sample from the Southeast Zone was submitted to SGS Lakefield for column leach testing to determine recovery of gold and silver by cyanidation. Two column tests were prepared using particle sizes of 1" and ¾' material. Each column contained a 50 kilogram sample. The rate of gold and silver extraction was determined by analyzing the pregnant solution daily over a 61 day leach period. After 61 days the two columns were washed until the outflow solution was at a neutral pH. Gold and silver extraction results are given in Table 16.1.3.

**TABLE 16.1.3 SGS COLUMN LEACH TEST RESULTS, SOUTHEAST ZONE BULK SAMPLE**

| Column | Extraction (%) | | Consumption kg/t | |
|---|---|---|---|---|
| | Au | Ag | NaCN | CaO |
| 1" | 72.02 | 67.55 | 1.20 | 35.51 |
| ¾" | 73.14 | 55.54 | 1.09 | 44.82 |

Both column tests indicated that extraction rates peaked around 50 days and no percolation problems were identified within the columns. The very high CaO consumption reported by SGS has been attributed to the use of degraded lime for pH control. Additional testing will be required to determine CaO consumptions during heap leaching.

## *16.2 CAMP Metallurgical Testing*

The Center for Advanced Mineral and Metallurgical Processing (CAMP) completed additional testing on Cerro Jumil core samples from the West Zone (WZ) and the Las Calabazas Zone (LCZ) and on a small amount of material from the southeast Zone (SEZ) totaling about 200 kg of material. Tests completed by CAMP included Automated Mineral Liberation Analysis (MLA), XRD, ICP elemental scans, fire assay, sulfur and carbon speciation, specific gold and silver deportment and comprehensive analysis of the representative Cerro Jumil resource sample. A Bond

Work Index and the Relative Abrasion Index of the sample was also determined. Bulk density measurement of WZ and LCZ core samples supplied from the Cerro Jumil project was also undertaken.

Comprehensive bottle roll testing of the sample with variables such as time, pH, pulp density, grind size, reagent concentration and guided by Stat Ease Design of Experimentation software was used to optimize the potential and parameters for heap leaching. Gravity concentration of the sample with Wilfley table concentration was performed.

Results of the testing demonstrated that there were no unusual situations in the mineralogical make-up of the ore that might preclude using heap leach as the processing option. Specific results for the various tests include:

- **Bond Work and Abrasion Index Testing** - Work and abrasion index testing carried out on WZ/LCZ materials shows the material is moderately hard and deemed moderately abrasive as well. It had Bond Work Index of 12.86 Kw hr/ton to 100 mesh and an abrasion index of 0.230 to 0.430.
- **Bottle Roll Testing –** The results of the bottle roll testing are shown below in Table 16.2.1

## TABLE 16.2.1. DESIGN EXPERT MATRIX AND MEASURED RESPONSES FOR AU AND AG.

| Standard Run No. | Factors | | | | | Responses, % Recovered | |
|---|---|---|---|---|---|---|---|
| | A:Time Hrs | B:NaCN Conc g/L | C:Lime g/L | D:Size inches | E:Solids Conc g/L | [Ag] | [Au] |
| 1 | 168 | 1.5 | 1 | 1.5 | 50 | 47.2 | 76.2 |
| 2 | 24 | 0.5 | 1 | 1.5 | 50 | 39.6 | 54.6 |
| 3 | 24 | 1.5 | 2 | 1.5 | 30 | 40.3 | 58.2 |
| 4 | 24 | 1.5 | 2 | 0.5 | 50 | 37.8 | 61.4 |
| 5 | 168 | 0.5 | 2 | 1.5 | 50 | 42.1 | 73.2 |
| 6 | 24 | 0.5 | 2 | 0.5 | 30 | 36.7 | 59.3 |
| 7 | 168 | 1.5 | 2 | 0.5 | 30 | 48.9 | 78.7 |
| 8 | 168 | 0.5 | 1 | 0.5 | 50 | 43.3 | 74.9 |
| 9 | 168 | 0.5 | 1 | 1.5 | 30 | 42.3 | 73.7 |
| 10 | 24 | 1.5 | 1 | 0.5 | 30 | 43.1 | 63.4 |
| 11 | 96 | 1 | 1.5 | 1 | 40 | 45.4 | 68.5 |
| 12 | 96 | 1 | 1.5 | 1 | 40 | 44.5 | 67.1 |
| 13 | 96 | 1 | 1.5 | 1 | 40 | 46.2 | 69.2 |

- **Gravity Concentration Testing -** Gravity testing of Cerro Jumil ores using Wilfley table concentration guided by Sta ease optimization was conducted for two different size distributions. These are shown in Tables 16.2.2 through 16.2.5.

## TABLE 16.2.2. WILFLEY TABLE TESTING FINER SIZE DISTRIBUTION.

| Size Analysis | | | | Fraction | Fraction |
|---|---|---|---|---|---|
| Size (um) | Wt (g) | % Retained | % Passing | Au, o/T | % Au |
| +106 | 23.09 | 9.38 | 90.62 | 0.058 | 8.19% |
| +75 | 45.89 | 28.02 | 71.98 | 0.088 | 24.71% |
| +63 | 155.48 | 91.19 | 8.81 | 0.060 | 57.07% |
| +325 | 11.59 | 95.90 | 4.10 | 0.078 | 5.53% |
| +400 | 2.06 | 96.74 | 3.26 | 0.094 | 1.18% |
| +20 | 6.73 | 99.47 | 0.53 | 0.059 | 2.43% |
| -20 | 1.3 | 100.00 | 0.00 | 0.111 | 0.88% |

## TABLE 16.2.3. WILFLEY TABLE TESTING FINER SIZE DISTRIBUTION RESULTS

| Wilfley Separation | | | |
|---|---|---|---|
| Section | Au/o/T | % Au | Conc Factor |
| 1 (tails) | 0.023 | 15.19% | 0.592 |
| 2 (mids) | 0.026 | 38.85% | 0.670 |
| 3 (mids) | 0.093 | 27.26% | 2.396 |
| 4 (con) | 0.146 | 18.70% | 3.761 |

## TABLE 16.2.4 WILFLEY TABLE TESTING COARSER SIZE DISTRIBUTION

| Size Analysis | | | | Fraction | Fraction |
|---|---|---|---|---|---|
| Size (um) | Wt (g) | % Retained | % Passing | Au, o/T | % Au |
| +425 | 2.77 | 1.11 | 98.89 | 0.175 | 3.27% |
| +300 | 37.98 | 16.40 | 83.60 | 0.038 | 9.72% |
| +150 | 70.96 | 44.95 | 55.05 | 0.047 | 22.47% |
| +106 | 22.61 | 54.05 | 45.95 | 0.058 | 8.83% |
| +75 | 17.39 | 61.05 | 38.95 | 0.058 | 6.79% |
| +45 | 30.77 | 73.43 | 26.57 | 0.060 | 12.44% |
| -45 | 66.03 | 100.00 | 0.00 | 0.082 | 36.48% |

## TABLE 16.2.5. WILFLEY TABLE TESTING COARSER SIZE DISTRIBUTION RESULTS.

| Wilfley Separation | | | |
|---|---|---|---|
| Section | Au/o/T | % Au | Conc Factor |
| 1 (tails) | 0.023 | 7.19% | 0.506 |
| 2 (mids) | 0.026 | 39.91% | 0.572 |
| 3 (mids) | 0.093 | 21.88% | 2.047 |
| 4 (con) | 0.262 | 31.03% | 5.767 |

Based on the testing completed CAMP provided the following recommendations and conclusions:

- Bottle roll testing of the WZ and LCZ ores seems consistent with past data;
- Further work needs to be done on the SEZ materials. The SEZ material testing should be done on more representative samples of that zone as the number of holes used was minimal;
- Gravity concentration especially when applied to fines from crushing, seems promising and should be further confirmed and optimized;

- All of the column work conducted by SGS is now in doubt due to the issue with the use of old calcified lime and the subsequent massive amounts utilized for pH control. Conceivably, the overuse of these solids in testing may have inhibited the fluid solids reaction path kinetically and thereby artificially decreased the precious metals recovery.

Lyntek (2009) utilized the test results from the SGS and CAMP work to estimate recoveries, reagent use, and design a process flow sheet.

## *17.0 MINERAL RESOURCE ESTIMATE*

The Cerro Jumil gold-silver mineral resource was estimated by co-author Dean Turner, P.Geo., an independent qualified person as defined by National Instrument 43-101. This 2010 mineral resource estimate is an update to the original Cerro Jumil resources reported in the September 30, 2008 NI 43-101 technical report, and takes into account additional ESM drilling conducted in 2009 and 2010. As the 2010 resource model is an update, an underlying premise was to remain as consistent with the geological and geostatistical assumptions used in the 2008 model as supported by the current data and interpretations. This consistency allowed a straight-forward assessment of the impact of the new in-fill drilling on the resource tonnes, grades, and classification. Further, the fact that the 2008 model has been reviewed, checked, and verified by outside parties provides an independent measure of confidence in the previously established resource estimation procedures, parameters, and results.

This Section 17 is the responsibility of Turner, and reports on the modeling procedures and assumptions, grade estimation parameters, and resulting mineral resource estimates and classification. Turner has reviewed the other sections of this report, and supports that the conclusions are accurate, reliable, and fully disclosed. Turner is not aware of any environmental, permitting, legal, title, socio-economic, mining, or metallurgical issues that would materially affect the Cerro Jumil mineral resources.

The Cerro Jumil geologic and resource models were based upon Turner's independent checks and assessment of the drill data, quality assurance/quality control results, and geologic interpretation of the gold-silver mineralized zones.

## *17.1 Drill Hole Database*

The Cerro Jumil geologic model and gold-silver resource estimates were based upon the drill hole database provided by ESM in July 2010. The database represents over 41,500 meters of core and reverse circulation drilling, details of which are described in Section 11 of this report. The 2010 drilling represents a 29% increase over the 2008 drill total of approximately 32,200 meters. The data were provided digitally as 1) surveyed drill collars in UTM meters, 2) down-hole surveys, 3) assays consisting of gold, silver, and multi-element geochemistry, and 4) detailed geologic logs. ESM has diligently followed 43-101 and CIM compliant procedures and protocols for drilling, sampling, assaying, QA/QC, and data verification. As a result, the quality of the drill database used to estimate the Cerro Jumil gold-silver resources is judged to be reliable, accurate, and reproducible. Figure 17.1.1 is a plan map representing the drill database used for resource modeling of the Southeast Zone (SEZ), Las Calabazas Zone (LCZ), and West Zone (WZ), as well as cross section lines referenced elsewhere in this Section 17.

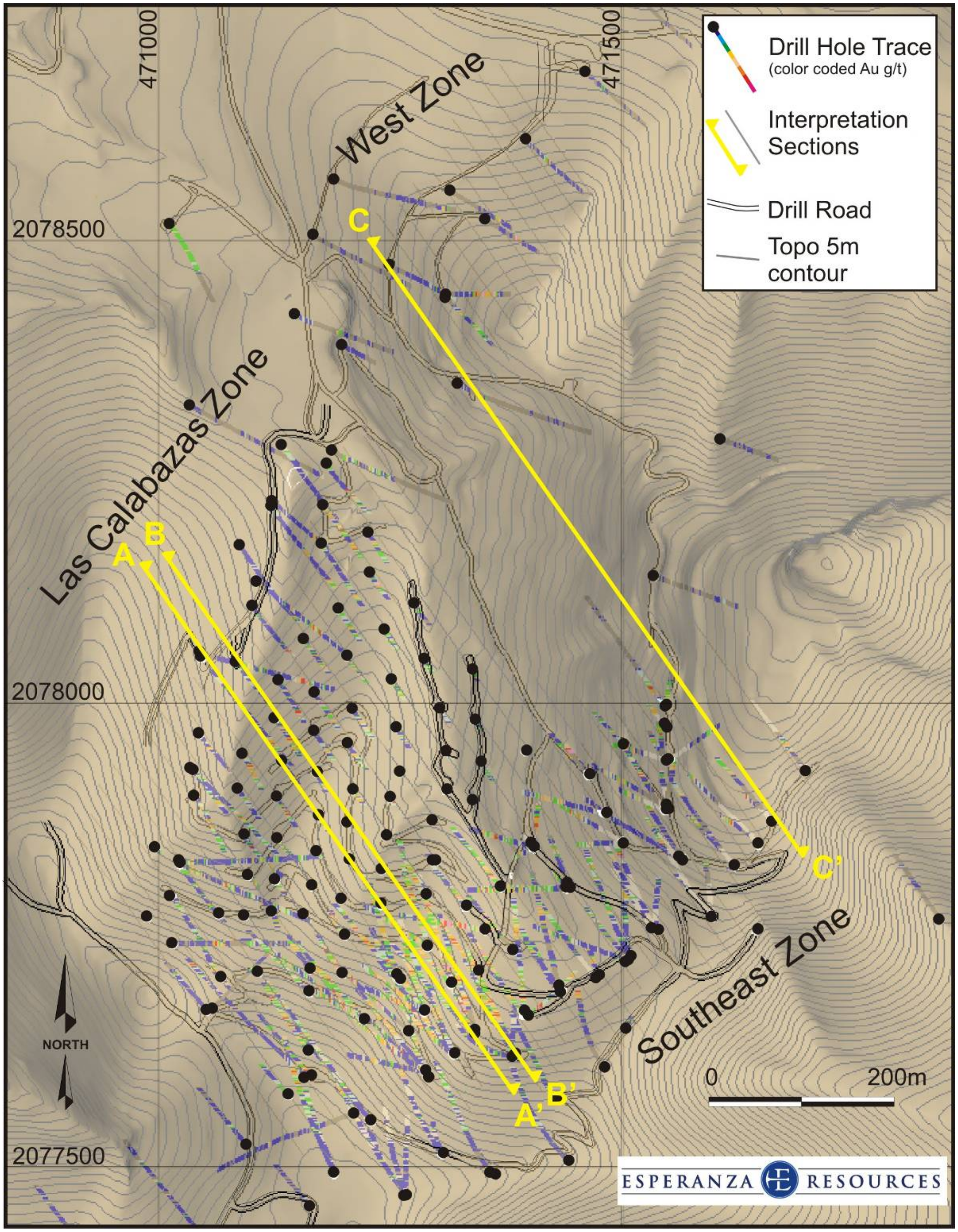



**Figure 17.1.1 Drill Hole Plan Map with Cross Section Lines**

## *17.2 Geologic Model*

The Cerro Jumil geologic model was originally based upon: 1) statistically derived mineralization envelopes from gold and silver drill assays, 2) logged lithology and alteration, and 3) down-hole multi-element anomalies associated with gold and silver mineralization. These data were used to build an integrated geologic model for the gold and silver mineralized zones, as well as for important unmineralized rock units. The 2010 geologic model updates focused on the LCZ, as well as the 'hinge zone' transition between the LCZ and SEZ.

### 17.2.1 Definition of Gold and Silver Mineralized Envelopes

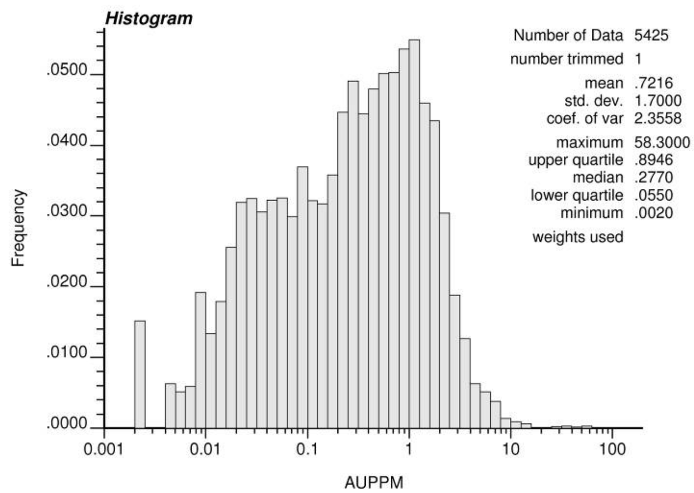
The drill hole assays were statistically analyzed within logged rock and alteration types in order to characterize their geologically controlled grade distributions. As a starting point, this review was conducted on the global database for the combined SEZ, LCZ, and WZ drilling. ESM recorded drill log geologic information including lithology, sub-lithology, and alteration. Statistical summaries by the major rock/alteration types simply confirmed that gold mineralization is preferentially hosted in skarn altered rocks (35 % of the drill intervals, average = 0.67 g/t, median = 0.21 g/t gold). There were also cases of significant mineralization in other alteration types, most importantly marble (29% of the drill intervals, average = 0.17 g/t, median = 0.02 g/t gold). The remaining rock/alteration types (i.e., limestone/marble, limestone, feldspar porphyry) were generally poorly mineralized, or unmineralized, with respect to gold. Most notably, these barren units include the quartz porphyry rocks interpreted as post-mineralization in age that cross-cut the mineralized zones in some cases.

Silver mineralization, which has been interpreted as distinct from the gold mineralizing event by ESM's geologists, is also relatively enriched in the skarn altered rocks (average = 5.96 g/t, median = 3.00 g/t silver). This compares to an average of 3.63 g/t and median of 1.70 g/t silver in the marble units. Clearly, the association of silver mineralization to logged skarn alteration type is not as strong as the gold relationship on a global, property-wide basis.

Univariate statistical review of drill hole gold and silver assays yielded thresholds for interpreting grade envelopes within the skarn-altered and drill log coded SEZ, LCZ, and WZ. The gold data was reviewed for the SEZ, LCZ and the WZ drilling as Log10 histograms, Log10 probability plots, and length-weighted statistics (Figures 17.2.1.1, 17.2.1.2, and 17.2.1.3). This review confirmed the thresholds originally established in 2008, with the significant benefit of having sufficient data to assess the SEZ and LCZ mineralized zones separately.

The SEZ and LCZ statistical distributions are notable for their similarities as polymodal populations, with an obvious break at 0.1 g/t (ppm), a more subtle inflection at 1.0 g/t (ppm), and a high-grade outlier population at 10 g/t (ppm) gold. The WZ distribution also has a polymodal distribution, with a very clear break at 0.1 ppm, a subtler inflection around 1.0 ppm, and an outlier population at 5.0 g/t (ppm) gold. The 0.1 and 1.0 g/t (ppm) thresholds are consistent between the SEZ, LCZ and WZ populations, and were used to delineate low grade and high grade gold envelopes for the geologic model.

Significant silver mineralization primarily occurs either within, or generally parallel to, the LCZ and WZ mineralized zones. The histogram and probability plots for silver portray a symmetric log distribution, with a positive tail starting at 10 to 20 g/t (ppm) and an outlier population at approximately 100 to 125 g/t (ppm) (Figure 17.2.1.4). The 10 g/t (ppm) threshold was selected for defining the silver mineralization envelopes after cross sectional review confirmed that silver mineralization at that cutoff was spatially coherent and continuous.



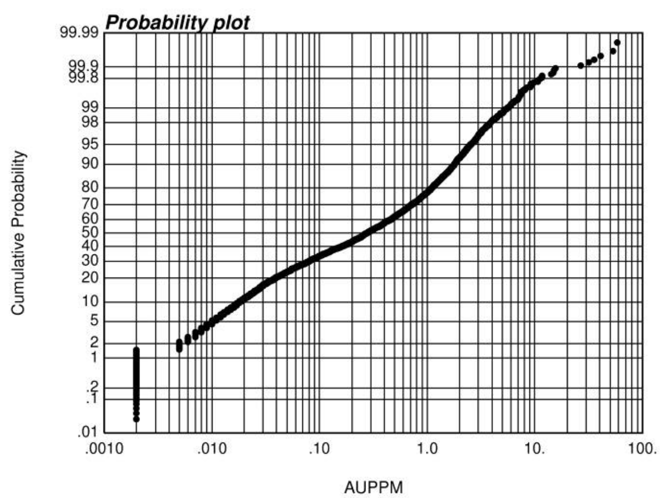




**Figure 17.2.1.1 SEZ Drill Hole Gold Log10 Histogram and Probability Plot**

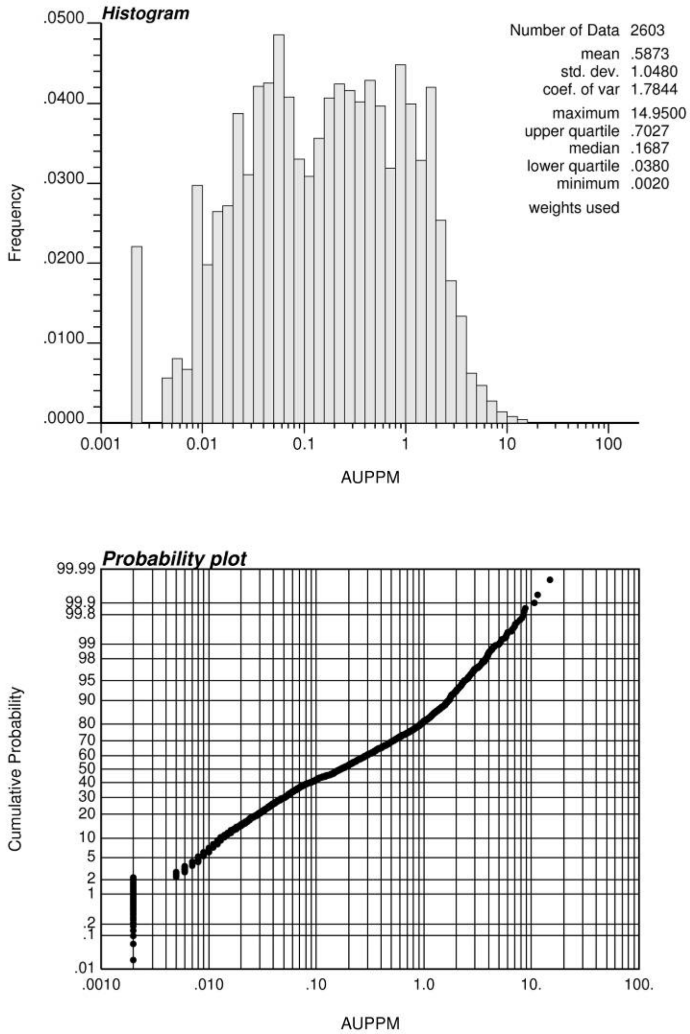



**Figure 17.2.1.2 LCZ Drill Hole Gold Log10 Histogram and Probability Plot**

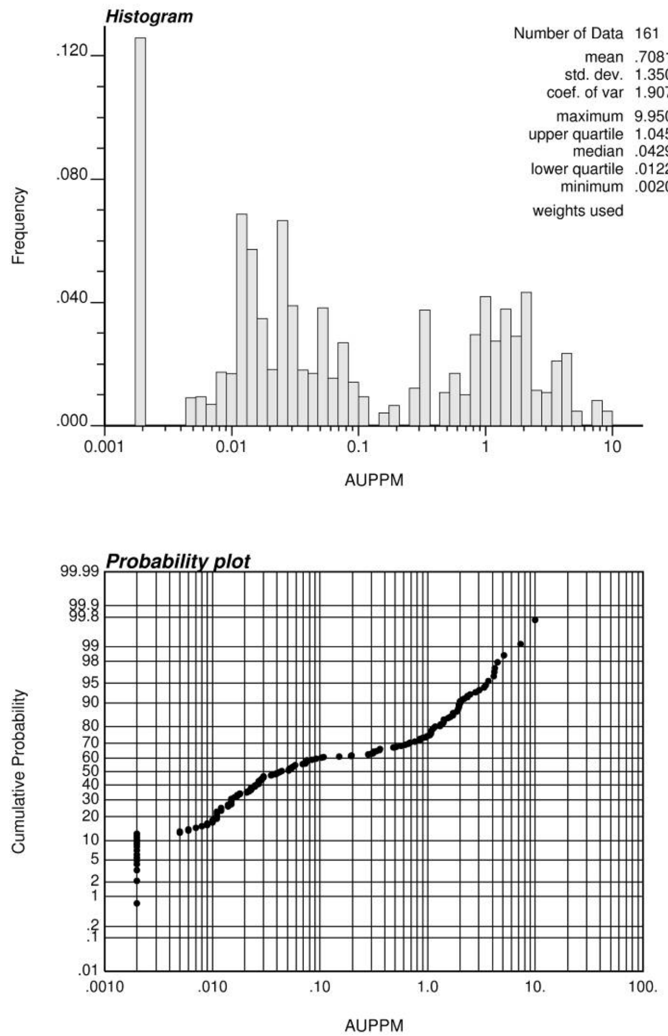



**Figure 17.2.1.3 WZ Drill Hole Gold Log10 Histogram and Probability Plot**

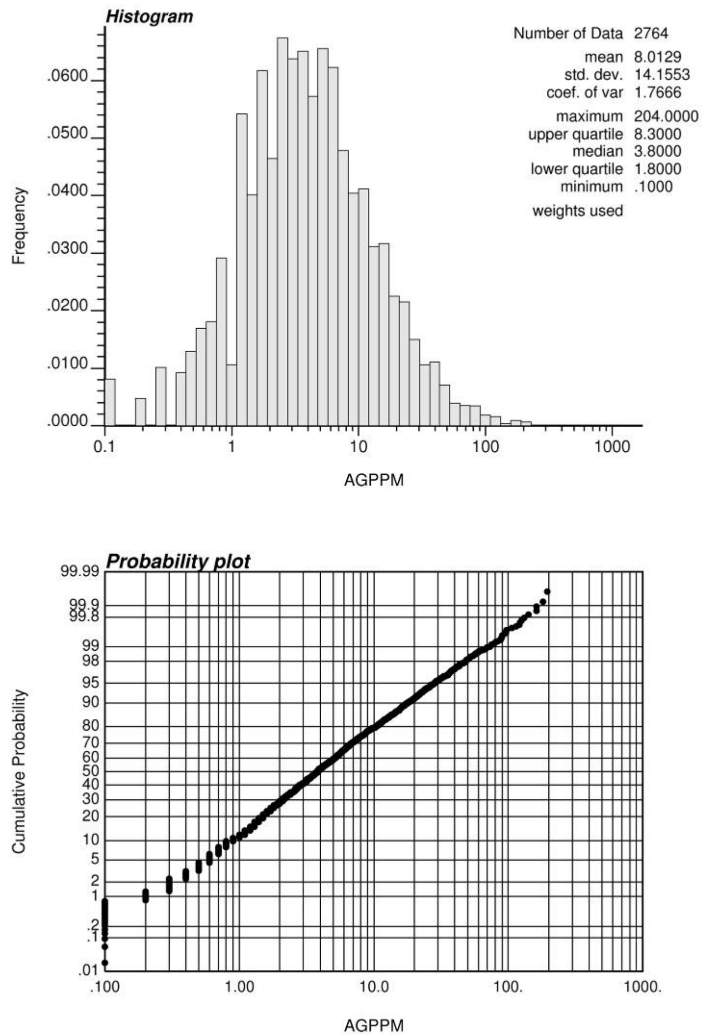



**Figure 17.2.1.4 LCZ-WZ Drill Hole Silver Log10 Histogram and Probability Plot**

In addition to gold and silver, a number of other metals from the multi-element drill database were enriched in the skarn altered zones. The frequency distributions for bismuth and copper have polymodal distributions similar to gold (Figures 17.2.1.5 and 17.1.2.6). Most conspicuously, there are strong linear correlations between gold-bismuth and gold-copper (Figures 17.2.1.7 and 17.1.2.8). The log-log Pearson correlation coefficients are remarkably high, and report as:

- ♦ R = 0.75 for Au versus Bi
- ♦ R = 0.66 for Au versus Cu

These multi-element relationships are useful for independently confirming grade envelopes that were based upon gold and silver assays.

**Figure 17.2.1.5 Bismuth Histogram**

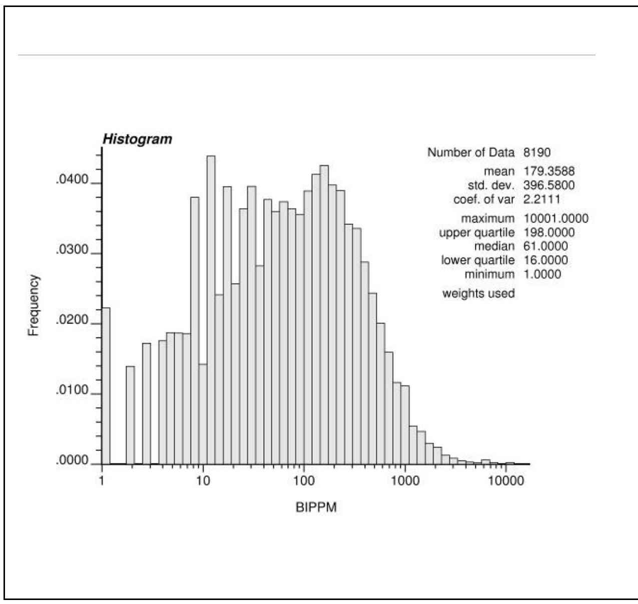



**Figure 17.2.1.6 Copper Histogram**

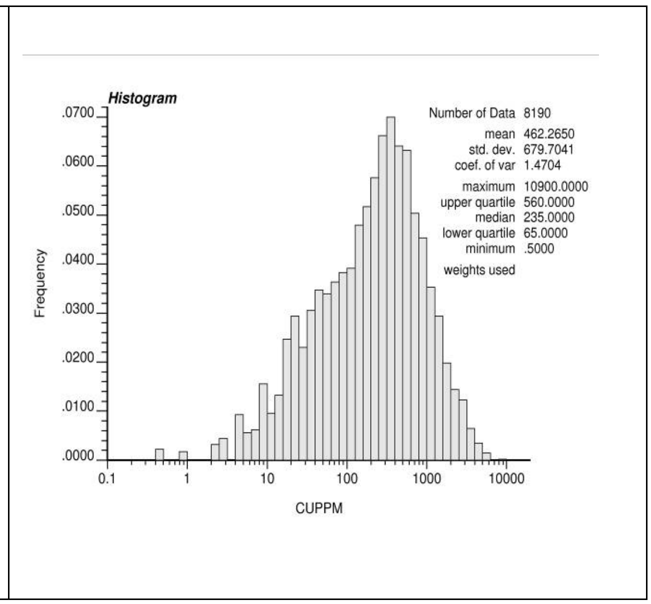


**Figure 17.2.1.7 Au vs Bi Scatter Plot**

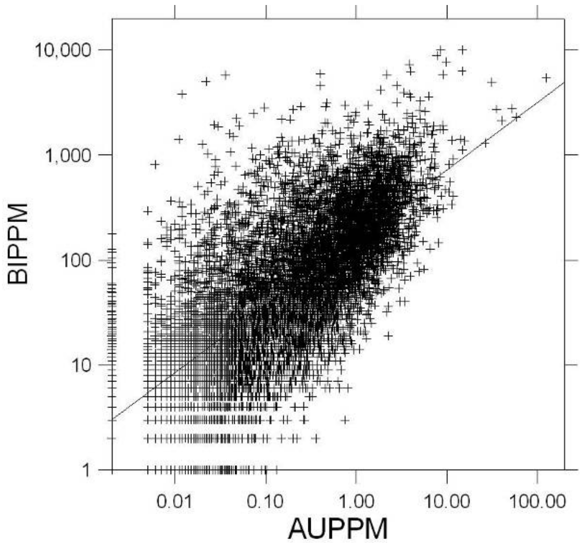
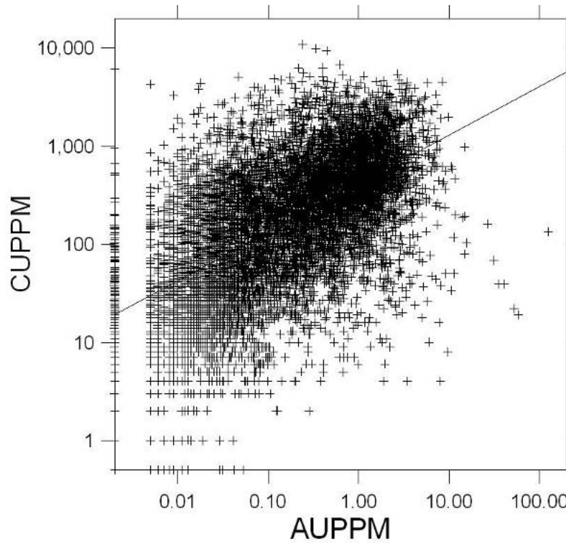



**Figure 17.2.1.8 Au vs Cu Scatter Plot**




### 17.2.2 Interpretation of Geologic Model

The Cerro Jumil geologic model update particularly impacted the interpretations for the LCZ, and its 'hinge zone' transition with the SEZ. The WZ had no new drilling. Originally, the drill data for logged geology, and gold, silver, bismuth, and copper assays were reviewed as dynamic three-dimensional displays and on 1:500 scale cross-sections. The orientation of the cross sections was defined as N35ºW with a 90º dip, looking N55ºE. This cross-sectional orientation approximates a view along the average strike of the Cerro Jumil deposit. The sections were spaced at 25 meters, and designed to approximately follow the lines of the prevailing drill grid pattern.

The relatively simple dipping stratigraphy of the Cerro Jumil deposit resulted in interpretations that defined consistent and correlatable mineralization and rock type solid models. Of note is that the LCZ interpretations from 2008, which were based upon limited drilling, occurred more or less as originally projected when drilled on a regular grid pattern. On the other hand, the 'hinge zone', formed at the antiformal crest between the SEZ and LCZ zones, was thinner and lower grade than expected. Regardless, on balance, expected volumes and tonnages based upon geologic projection and limited drill data 'proved-out" with the follow-up, in-fill drill programs of 2009-2101.

Gold mineralization domains were interpreted as envelopes at the low grade 0.1 g/t and high grade 1.0 g/t thresholds for the SEZ, LCZ, and WZ. Silver mineralization was interpreted within the 10 g/t silver envelope for the LCZ and WZ areas. Other interpreted units included a post-mineralization quartz porphyry that often cross-cut mineralization, as well as internal limestone-marble waste blocks.

The first pass geologic interpretations were used to construct solid models of the gold and silver mineralized zones, the quartz porphyry unit, and internal waste zones. These solids were reconciled with the drill data to ensure that there was no miscoding of drill intervals relative to the model (i.e., a quartz porphyry interval coded as mineralized skarn, etc.). This reconciliation was conducted by slicing the solid model at 5 meters, stepping through the deposit on screen, and making updates and adjustments as necessary. This detailed approach was required since many of holes were not drilled on a regular pattern, but instead from surface accessible drill pads, resulting in holes projecting into, and out of, the plane of section. For areas that did not receive new drilling, such as the WZ and northeast extension of the SEZ, the original 2.5 meter sectional interpretations from 2008 were retained, with the occasional minor adjustment. The model was sliced as long sections at a N55°E orientation, and as bench plans, to further check the consistency of the interpretations. The reconciled and adjusted interpretations were used to build the final solid models, that in turn were utilized to code drill composites and the block model for geostatistical analysis and grade interpolation.

The gold-silver mineralized zone geologic models reflect the antiformal flexure of the skarn-altered stratigraphy away from a feldspar porphyry core, with the SEZ dipping to the southeast, and the LCZ and WZ dipping to the northwest (Figures 17.2.2.1 and 17.2.2.2). In addition to being consistent with the interpreted geology for Cerro Jumil, the mineralized envelopes constrain their respective grade populations as symmetric log distributions. The interpreted model is continuous on section, as well as between adjacent sections (Figures 17.2.2.3, 17.2.2.4, and 17.2.2.5).

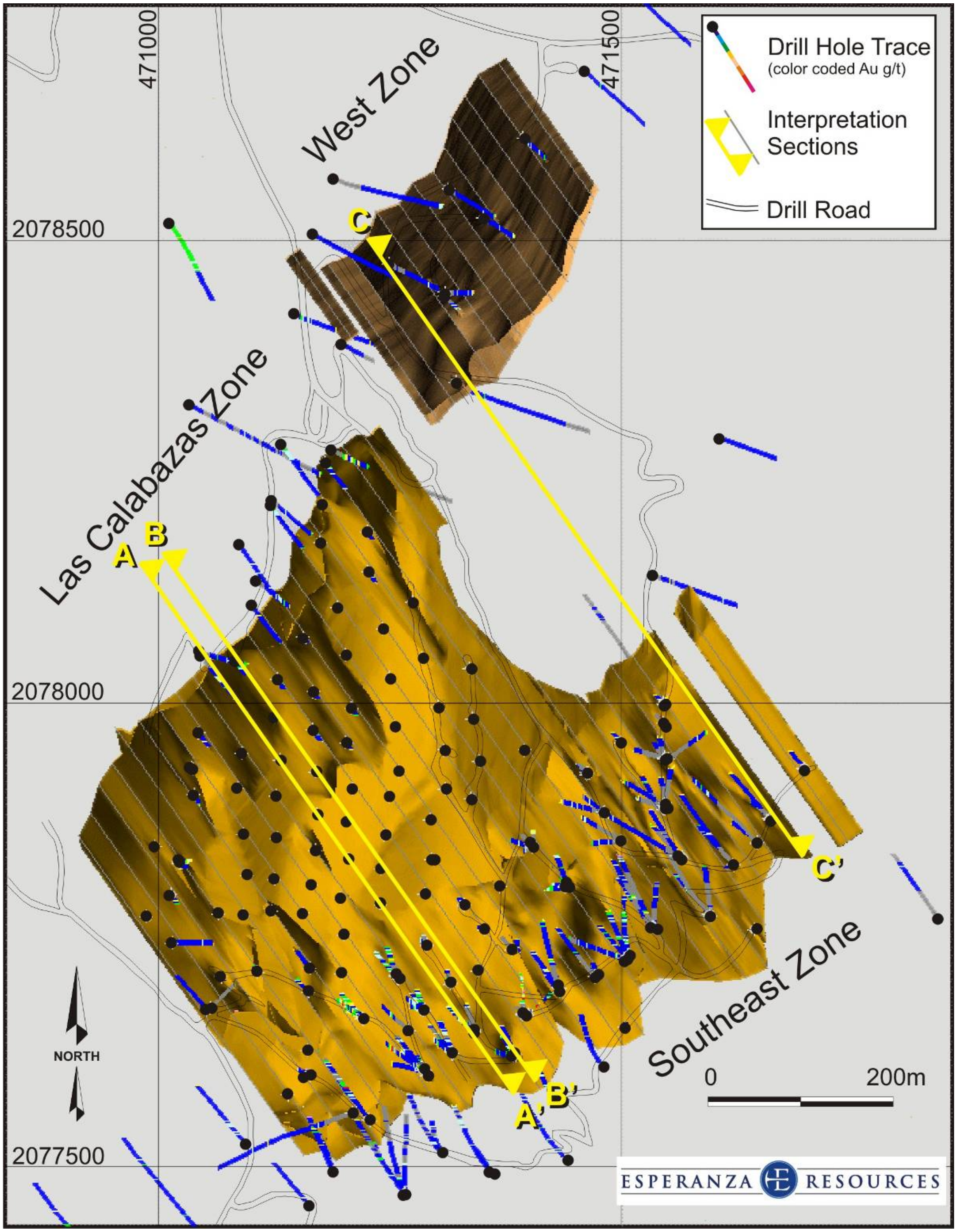
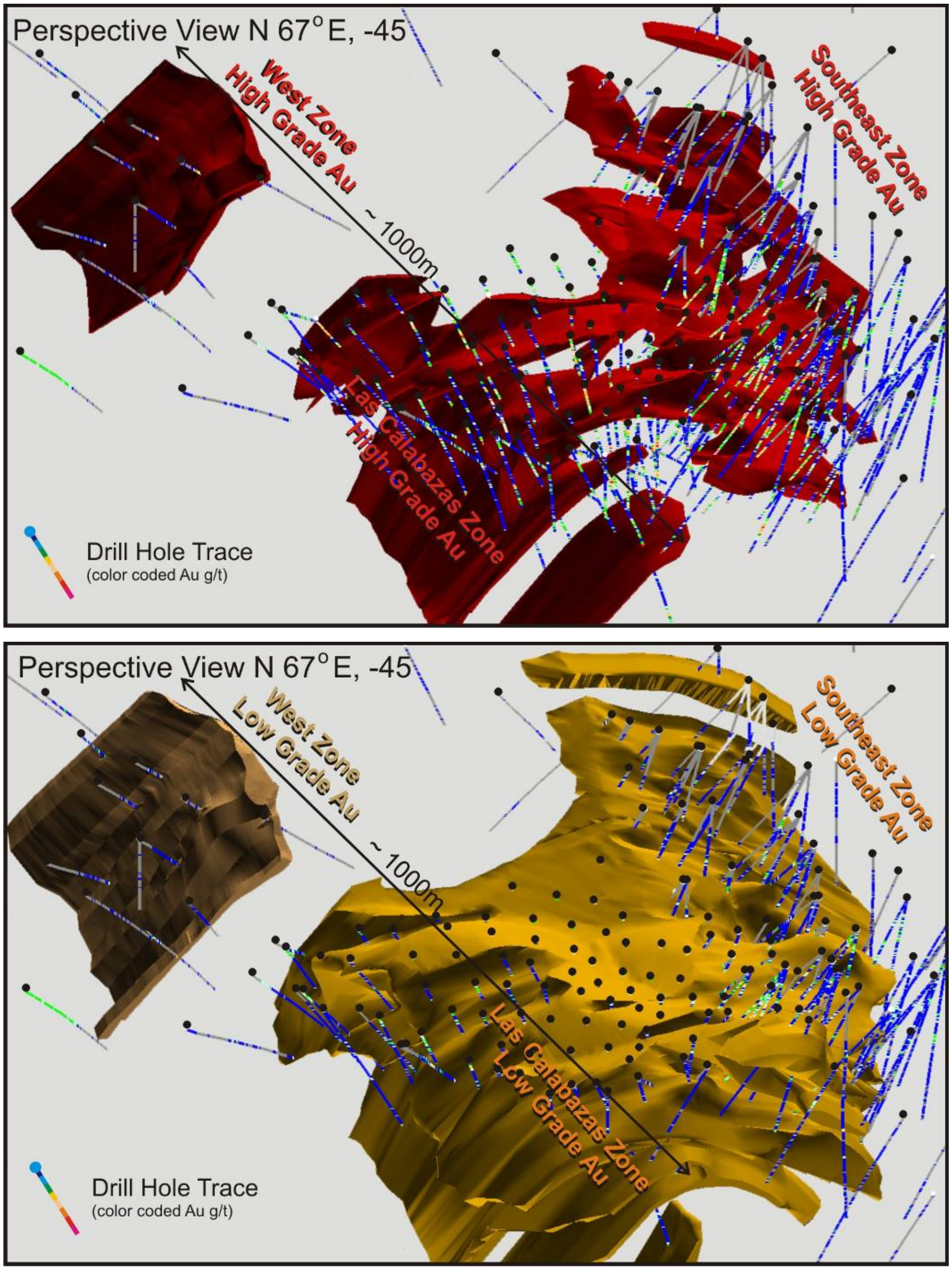



**Figure 17.2.2.1 Plan Map with Interpreted Gold Mineralization Solid Models**




**Figures 17.2.2.2 Perspective Views of Gold Mineralization Solid Models**

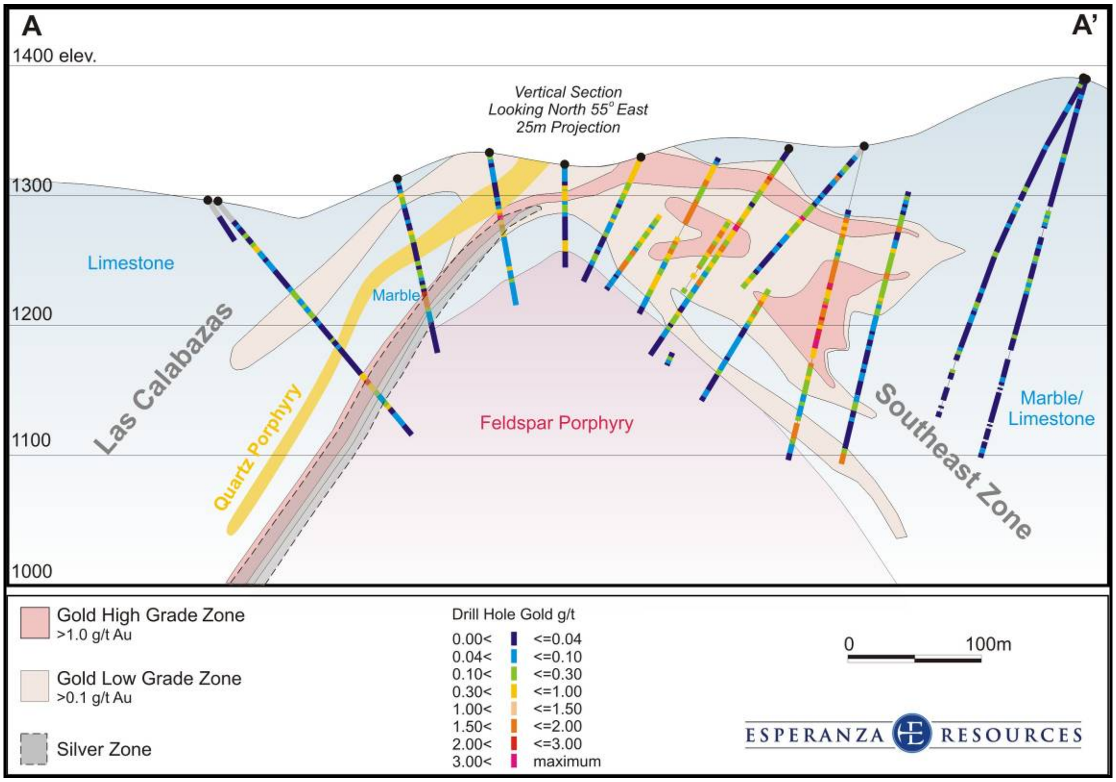



**Figure 17.2.2.3 Section A-A' Geologic Model and Drill Hole Gold**

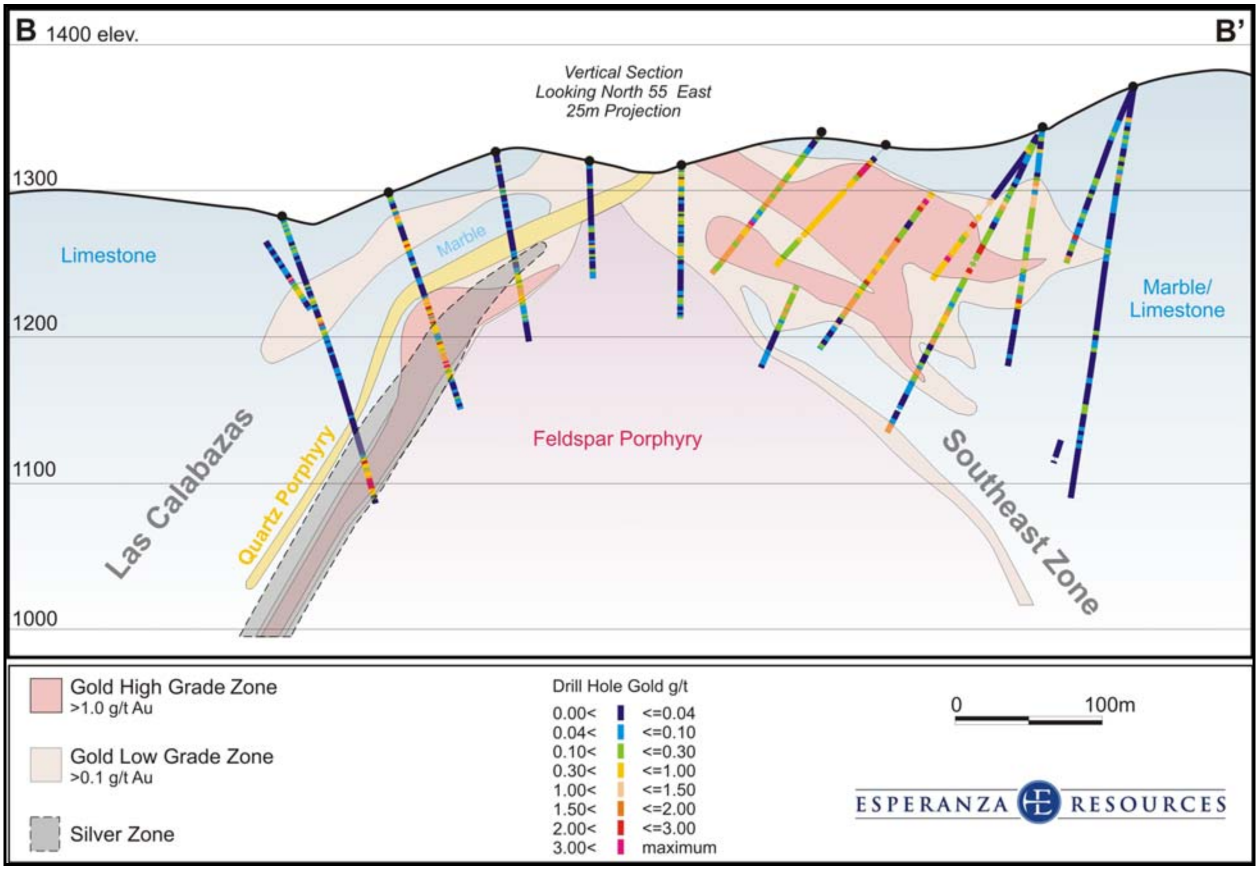



**Figure 17.2.2.4 Section B-B' Geologic Model and Drill Hole Gold**

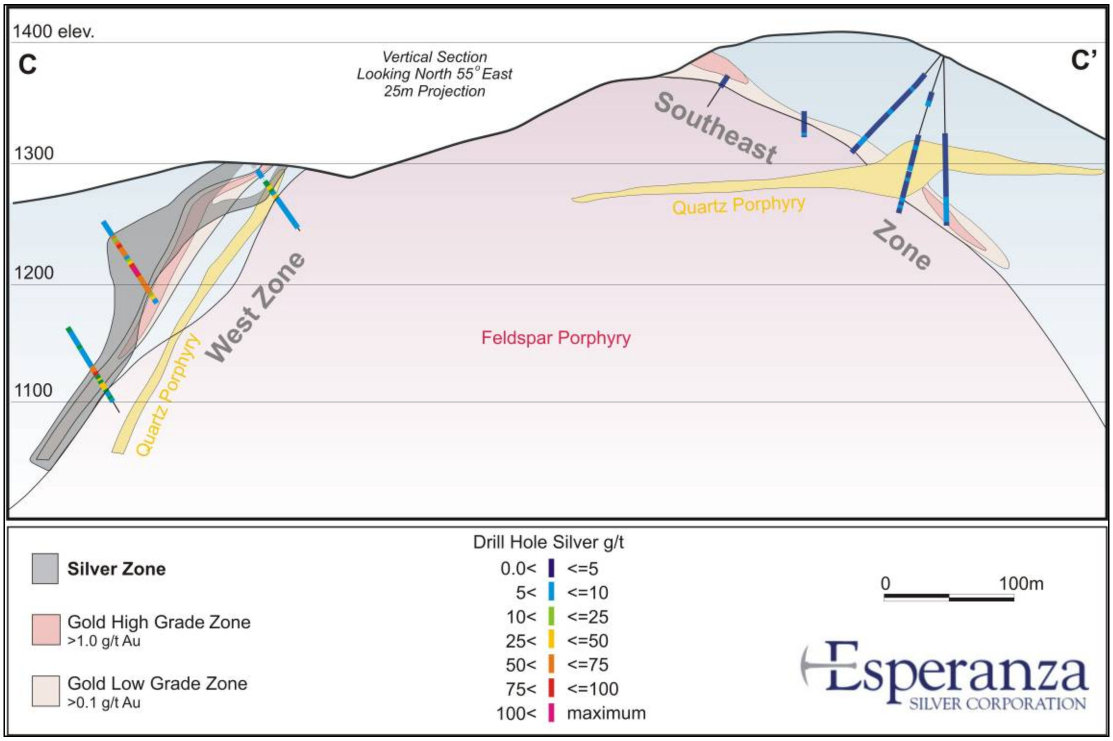



**Figure 17.2.2.5 Section C-C' Geologic Model and Drill Hole Silver**

From a resource modeling perspective, it is important to note from the extensive drilling conducted at Cerro Jumil to date, that virtually entire deposit has been oxidized (see Section 8 of this report). The depth of oxidation, as currently understood, spans over 250 vertical meters. As a result, it was not necessary to model zones of oxidation state for resource estimation or reporting purposes.

## *17.3 Assay Cap Grades and Composites*

### 17.3.1 Gold and Silver Cap Grades

As a step before compositing, gold and silver cap grades were interpreted for the drill hole interval assay data. The cap grades were determined in order to reduce the influence of high grade outliers during grade estimation. The Log10 histograms, Log10 probability plots, and rank order distributions (i.e., sorted by grade) for the gold and silver populations identified statistical outliers at high grade population breaks of the frequency distributions. These statistically derived thresholds were used to cap the outlier drill assays for the mineralized zones as summarized below:

- SEZ low grade gold 5 g/t Au
- SEZ high grade gold 10 g/t Au
- LCZ low grade gold 5 g/t Au
- LCZ high grade gold 10 g/t Au
- WZ low grade gold No cap (max=1.44 g/t Au)
- WZ high grade gold 5 g/t Au
- LCZ-WZ silver 125 g/t Ag

### 17.3.2 Compositing and Rock Code Assignments

Run length composites were calculated from the capped drill database at a three meter interval length. This length represents one-half of an assumed six meter bench height. Review of the drill data established that the average interval length was 1.47 meters. A negligible 0.41% of the intervals lengths were greater than or equal to three meters, with virtually all of these longer intervals coming from early-stage Teck drill holes. The three meter composite length includes two sample intervals on average, thereby retaining down-hole grade variability with minimal smoothing. Non-representative composites with less than 50% of the three meter interval represented by assay data, or less than 1.5 meters in combined length, were discarded; these cases most commonly took place at the end of a drill hole or in zones of poor recovery. The geologic solid models were used to code the assay composites in preparation for geostatistical analysis and block modeling. Composites were determined to be within a modeling domain based upon the location of the composite center. For boundary cases where a composite was incorrectly assigned, the interpreted model was adjusted, and valid assignments made.

### 17.3.3 Composite Summary Statistics

The drill composite frequency distributions for the gold and silver mineralized zones were characterized with univariate statistical analysis. The descriptive statistics for the gold mineralized zones are summarized in Table 17.3.3.1, and the silver mineralized zone in Table 17.3.3.2.

The SEZ mineralized envelopes form the largest population of gold composites, reflecting approximately 8,700 meters of drilling. The LCZ also has a substantial population of drilling, representing around 4,200 meters. The relatively thin WZ has been sparsely drilled, with less than 200 meters of drill composites in the mineralized envelopes. The minimum grades for all of the zones include composites below the nominal envelope cutoff, reflecting geologic grade variability within the broader mineralized envelopes. Similarly, there are high grade composites in the low grade zones; these are frequently isolated cases that may reflect high angle structural controls on gold mineralization. Overall, the low grade gold zones have a consistent average grade in the 0.332 to 0.374 g/t range. The high grade zones on average range from the 1.494 to 1.867 g/t gold; increased variability is expected with higher grade gold domains. Importantly, the coefficients of variation for all gold zones are relatively low (i.e., 0.40-1.26), supporting the use of ordinary kriging as a linear interpolation technique for block estimation.

**TABLE 17.3.3.1 GOLD DESCRIPTIVE STATISTICS BY ZONE**

| Zone | Pop | Min | Max | Average | Median | StdDev | CV |
|---|---|---|---|---|---|---|---|
| SEZ low grade | 1961 | 0.004 | 4.320 | 0.374 | 0.238 | 0.431 | 1.153 |
| SEZ high grade | 949 | 0.030 | 10.000 | 1.494 | 1.202 | 1.145 | 0.766 |
| LCZ low grade | 1086 | 0.003 | 4.500 | 0.374 | 0.206 | 0.473 | 1.263 |
| LCZ high grade | 323 | 0.019 | 7.740 | 1.628 | 1.322 | 1.140 | 0.700 |
| WZ low grade | 35 | 0.032 | 1.440 | 0.332 | 0.267 | 0.294 | 0.887 |
| WZ high grade | 29 | 0.485 | 3.908 | 1.867 | 1.775 | 0.757 | 0.405 |

Significant silver mineralization, as currently understood, is hosted exclusively adjacent to, and within the WZ and LCZ. The number of silver mineralized envelope composites for the WZ and LCZ is relatively limited, representing approximately 1200 meters of drill intercepts. In spite of limited drill definition, the silver zone is geologically continuous from section to section. Silver mineralization increases in average grade along strike to the northeast from the LCZ (avg. = 17.76 g/t Ag) to the WZ (avg. = 31.69 g/t Ag). The coefficients of variation for both zones are low, confirming that the silver zone envelope has characterized a statistically constrained population for interpolation.

**TABLE 17.3.3.2 SILVER DESCRIPTIVE STATISTICS BY ZONE**

| Zone | Pop | Min | Max | Average | Median | StdDev | CV |
|---|---|---|---|---|---|---|---|
| WZ | 100 | 2.15 | 125.00 | 31.69 | 22.38 | 27.44 | 0.87 |
| LCZ | 306 | 0.95 | 99.65 | 17.76 | 13.92 | 14.35 | 0.81 |

## *17.4 Variography*

### 17.4.1 General Methodology

Variography was conducted on the three meter composites for the SEZ, LCZ and WZ gold mineralized domains. As opposed to the pair-wise relative variogram analysis used in 2008, correlograms were employed for the 2010 modeling. By way of explanation in simplified terms, there is a direct relationship between the semivariogram and covariance, as well as the autocorrelation coefficient as represented by the correlogram. Correlograms take the form of the semivariogram, and can be fitted with a semivariogram model. The typical advantage of the correlogram over the variogram is that it frequently renders a more coherent structure for fitting a variogram model. Correlogram (autocorrelation) studies are often referred to as *variography*, due to the traditional emphasis on the variogram; this use of terminology is hereby adopted for subsequent discussion in this report.

The calculated correlograms yielded superior results for modeling the LCZ-WZ gold zones, and were also used for the SEZ for the sake of consistency. However, it is important to note that the variogram models for the SEZ correlograms are nearly identical to the 2008 pair-wise variograms, since there was limited new drill data in this zone.

Initially, down-hole correlograms were calculated for the gold zones. The down-hole correlograms provided the best information for defining the nugget effect, as well as the shape of the variogram model at distances closer than the average drill hole spacing (i.e., down-hole composite pair distances start at three meters as opposed to the drill grid spacing of 25 to 35 meters). The definition of the down-hole variogram model parameters provided a basis for proceeding with directional correlogram analysis. Directional correlograms stepping at 15 degree increments of azimuth, and 10 degree increments of plunge were calculated for the mineralized zones to determine the maximum, secondary, and tertiary directions of spatial continuity. The resulting directions and ranges very closely match, or are identical to those determined in 2008.

### 17.4.2 Southeast Zone Variography

Correlograms for the SEZ (refer to Figure 17.4.2.1) gold composites were calculated on the combined high and low grade populations, as the high grade composites alone did not define coherent variogram model structures. The combination of these two SEZ modeling domains provided a population of composites that yielded robust correlograms, with clearly definable model parameters. The skarn gold mineralization at Cerro Jumil is interpreted to have a significant degree of stratigraphic, bedding parallel control within the carbonate host sequence. Therefore, the high and low grade gold zones have similar spatial orientations, and as a result the modeling of the combined zones has geological justification.

The SEZ down-hole correlogram was modeled to determine the nugget and sill parameters. The double spherical variogram model yielded a nugget C0 of 0.22, a primary sill C1 of 0.57 at a range of 15 meters, and a secondary sill C2 of 0.23 at 50 meters, for a total sill (C1+C2) of 1.02. This yields a nugget to sill ratio of 22%, suggesting that 78% of the gold variance in the SEZ has a spatial component, with the balance of the spatial variance due to 'nugget effect'.

The SEZ gold directional correlograms were modeled as double spherical, with the primary and secondary directions oriented along the average strike and dip, respectively. The tertiary direction is across the zone thickness (i.e., perpendicular to bedding). The SEZ anisotropies and ranges are summarized in Table 17.4.2.1. The nugget was similar to the down-hole definition at C0 = 0.20. The sill parameters were also similar to the down-hole model, but not identical, as given by C1 = 0.65 and C2 = 0.15, for a nugget to sill ratio of 20%. Of the total 80% spatial variance along the strike and dip directions, 65% is defined in the first 28-30 meters, with the 15% balance of spatial variance within the 75 meter secondary range. Importantly, this implies that there is significant gold grade continuity in the SEZ within the drill grid spacing along strike, and up and down dip. This continuity extends, albeit with a weaker spatially defined component of variance, to approximately 2.5 times the nominal drill spacing.

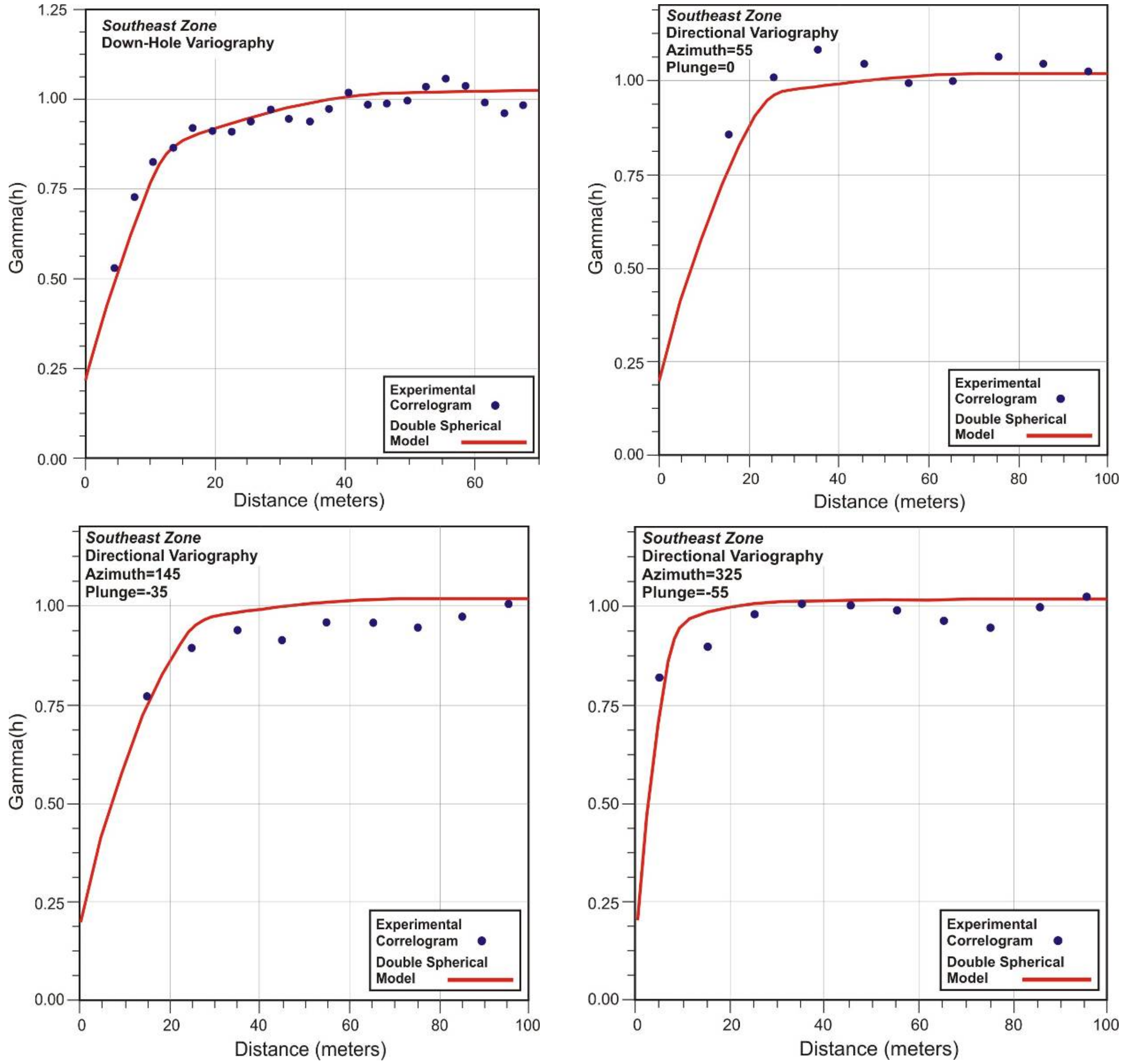



**Figure 17.4.2.1 SEZ Down-hole and Directional Gold Variogram Models.**

## TABLE 17.4.2.1 SEZ GOLD DIRECTIONAL VARIOGRAM MODEL PARAMETERS

| Direction | Azimuth | Inclination | Range 1 (m) | Range 2 (m) |
|---|---|---|---|---|
| Primary | 55 | 0 | 28 | 75 |
| Secondary | 145 | -35 | 30 | 75 |
| Tertiary | 325 | -55 | 10 | 35 |

### 17.4.3 Las Calabazas and West Zone Variography

The LCZ mineralized zone was systematically drilled on a '5-spot' drill pattern in 2009-2010, yielding an effective drill hole spacing of around 35 meters. The WZ remains sparsely drilled, with few drill hole pairs for variogram modeling. The LCZ is transitional along strike into the WZ, and both zones have similar northeasterly strikes and dips to the northwest. Accordingly, the LCZ and WZ were combined for correlogram calculation and variogram modeling. As with the SEZ, the high and low grade gold composites were combined for variography.

The LCZ-WZ down-hole correlogram yielded a well-defined, double spherical variogram model with a nugget C0 of 0.22, and a total (C1 + C2) variance of 1.02. This gives a nugget to sill ratio of 22%, suggesting that 78% of the variance in the LCZ-WZ has a spatial component, with the balance due to nugget effect (Figure 17.4.3.1).

The LCZ-WZ gold directional correlograms were fit with a double spherical model (also Figure 17.4.3.1). The primary, secondary, and tertiary directions were along strike, down dip, and across zone thickness, respectively. The anisotropies and ranges are summarized in Table 17.4.3.1.

The nugget was very similar to the down-hole definition as C0 = 0.23, with the primary sill C1 = 0.69 and the secondary sill C2 = 0.10, for a total sill variance of 1.02. Of the total 78% spatial variance along strike and down dip, 68% is defined in the first 30 to 35 meters, with the 10% balance within the 75 meter secondary range. It is notable that the LCZ-WZ correlograms have similar nugget to sill ratios and ranges as the SEZ, with the primary difference being the anisotropic orientations parallel to stratigraphy.

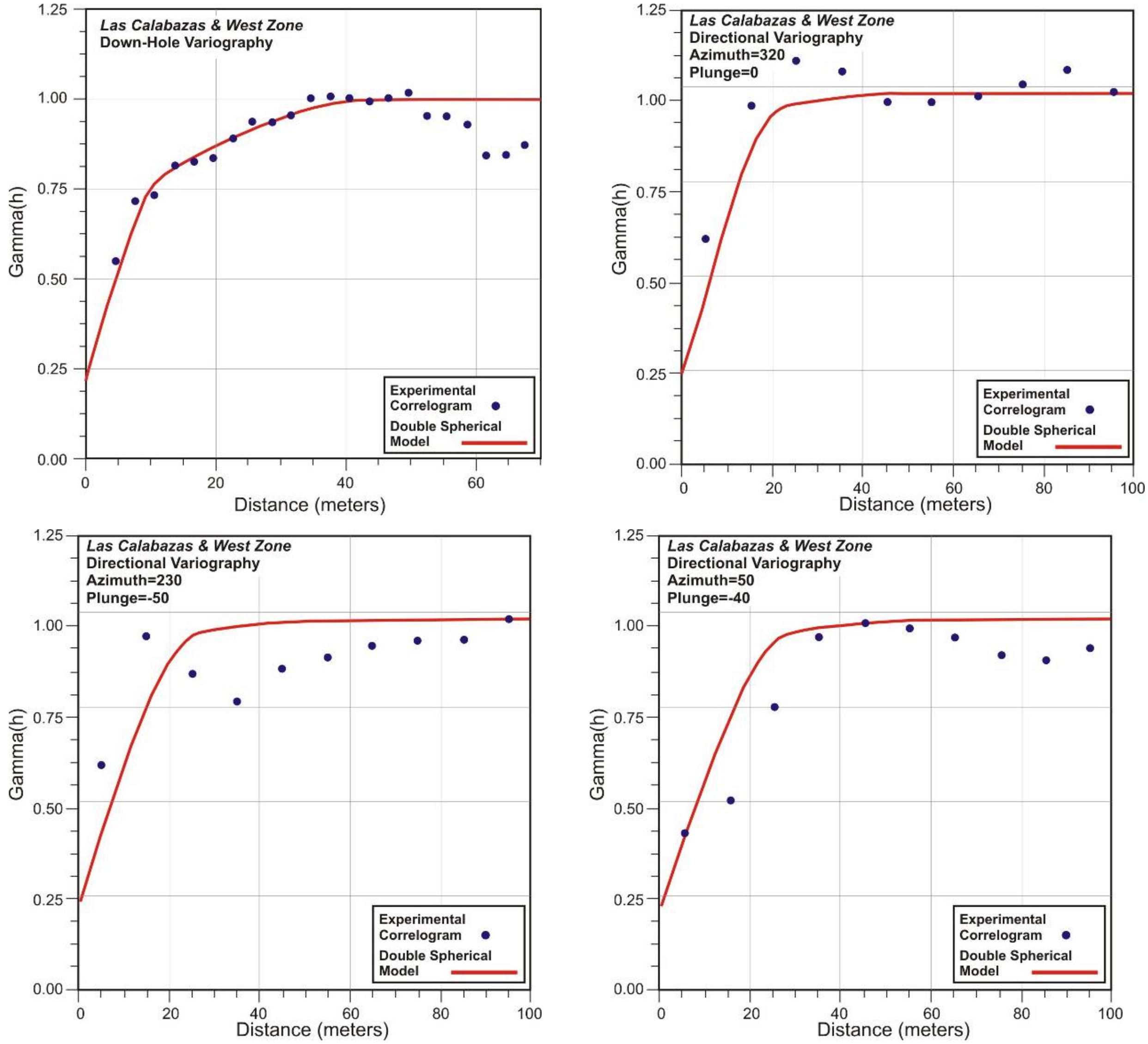



**Figure 17.4.3.1 Combined LCZ and WZ Gold Correlograms**

## TABLE 17.4.3.1 LCZ-WZ GOLD DIRECTIONAL VARIOGRAM MODEL PARAMETERS

| Direction | Azimuth | Inclination | Range 1 (m) | Range 2 (m) |
|---|---|---|---|---|
| Primary | 320 | 0 | 35 | 75 |
| Secondary | 230 | -50 | 30 | 65 |
| Tertiary | 50 | -40 | 20 | 40 |

Although silver mineralized envelopes were defined partially within, and proximal to the LCZ and WZ gold envelopes, there were fewer composites for variogram modeling than for gold. The LCZ-WZ silver correlograms were ill-defined, with no well defined structure due to a lack of sample pairs. Although there is interpreted geological continuity to the silver mineralization, as evident on cross-section, correlogram analysis did not yield readily useable results.

## *17.5 Block Model Definition*

### 17.5.1 Block Model Definition, Geologic Model, and Density Assignments

The Cerro Jumil block model was constructed to cover the extent of all three primary gold mineralized zones (i.e., SEZ, LCZ, and WZ), as well as the silver zones. The block model was oriented parallel to the axes of the project's UTM coordinate grid. The following parameters were used for the definition:

- Origin: 470,800 east, 2,077,300 north, 1000 elev.
- Maximum Extent: 471,900 east, 2,078,800 north, 1510 elev.
- Number of blocks: 220 in X, 300 in Y, and 170 in elev.
- Parent Block size: 5 x 5 x 3 meters (x by y by z)
- Minimum Sub-block size: 1 x 1 x 1.5 meters (x by y by z)

Block codes were assigned according to the geologic model gold and silver mineralized zones, and rock type solid model triangulations. The sub-blocking scheme allowed a high degree of precision in assigning the geologic codes to blocks along the contact between solids. The geologic model assignments included:

- SEZ, LCZ, & WZ high grade gold zones (> 1 g/t Au)
- SEZ, LCZ, & WZ low grade gold zones (> 0.1 and < 1 g/t Au)
- Waste (< 0.1 g/t Au)-coherent blocks internal to mineralized zones
- LCZ and WZ silver zones (> 10 g/t Ag)
- Quartz porphyry cross-cutting, post-mineralization sill-like bodies (SEZ) or bedding parallel dike-like bodies (LCZ and WZ)
- Limestone/marble/feldspar porphyry outside of the zones described above

### 17.5.2 Density Assignments

ESM's database of 3615 specific gravity (SG) measurements was coded by the solid models in order to determine average densities by mineralized zone and rock type. This is the same SG data used for the 2008 model, and has not been updated since the 2009-2010 reverse circulation drilling, by its nature, did not yield samples that could be used for density determinations. Although this is a substantial dataset, review of the data revealed that there was not an absolutely uniform spatial coverage of the SG samples since they came from core holes only. It followed that an interpolated model of SGs would not be representative in some areas of the deposit. As a result, average density values were calculated for the SEZ, LCZ, and WZ by high grade, low grade, quartz porphyry, and internal waste zones. These calculations were finalized after outlier SG measurements were trimmed. The final SG assignments are summarized as:

- 2.50 for SEZ, LCZ, & WZ high grade
- 2.64 for SEZ , LCZ, & WZ low grade
- 2.68 for internal waste
- 2.40 for SEZ , LCZ, & WZ quartz porphyry
- 2.64 for units outside of defined zones (i.e., limestone, etc.)

These densities were assigned to the block model according to their geologic model codes.

## *17.6 Grade Estimation and Resource Classification*

### 17.6.1 Search Strategy

Gold grades were interpolated with search ellipsoids oriented according to the anisotropic variogram model directions, and search distances based upon the variogram model ranges. For gold, two estimation passes were conducted, with the first pass restricted to within a maximum variogram range, and the second pass extended to approximately 1.5 times the variogram range. This approach resulted in block estimations from the first pass using only samples within the range of spatial correlation defined by the variogram model. The second pass estimation filled in unestimated blocks within zones that were interpreted as geologically continuous.

The number of composites for estimation was set to a minimum of three and a maximum of twenty. A maximum of five composites were allowed from a single drill hole. An octant based search scheme was used, with a maximum of five samples from a given octant. These search parameters ensured that composites representing multiple drill holes from multiple search directions were used for estimation of a given block.

The search strategy for silver interpolation in the LCZ and WZ areas was more simplistic than for gold, due to a lack of defined variogram models. For the search ellipsoid, the orientation was taken from the directions of anisotropy for the gold variograms. A two pass interpolation strategy was used, with the first and second pass distances the same as used for gold. These assumptions are based upon the observation that the silver zones are either generally coincident or spatially associated with the LCZ and WZ gold mineralized zones along strike and dip.

### 17.6.2 Grade Estimation

Ordinary Kriging (OK) was used for the estimation of gold for the SEZ, LCZ, and WZ block model domains. The primary estimation inputs included the three meter composite database, the variogram models, and the search ellipsoid configurations. Separate OK estimations were generated for the high and low grade envelopes within each of the zones. These envelopes were used as hard boundaries, with only composites coded within the envelopes used to estimate the corresponding blocks. The resulting gold grade block model is not “smoothed” across the grade boundaries, and as a result, the high and low grade gold domains honor the surrounding composites used for estimation.

In addition to estimating blocks within the mineralized zones, block grades were also interpolated for the internal waste, quartz porphyry, and hanging and footwall marble, limestone and quartz porphyry units. The blocks in the 'waste' and quartz porphyry domains were not included for reporting the Cerro Jumil resources, but were estimated in order to characterize adjacent boundary sub-blocks in preparation for converting from small sub-blocks to larger regularized blocks for floating cone or Lerchs-Grossman analysis. Inverse distance to the fifth power (ID**5) was used to estimate these other domains, with the search ellipsoids oriented according to the general strike and dip of these units.

The silver zone was block modeled with two-pass inverse distance to the third power (ID**3) interpolation. The ID**3 parameter reflects the continuous grade distribution of silver observed on cross sections, while not allowing more distant composites to have undue influence for a given block estimate.

Comparison of the gold and silver composites to the block model in cross section, long section, and plan illustrate that the geologic modeling zones, variogram ranges and anisotropies, and the spatially constrained search schemes yielded block grade estimates that accurately characterize the deposit's gold and silver mineralization (see Figure 17.6.2.1 and refer to Figure 17.1.1). Note that on the block model sections drill hole composites are projected up to 12.5 meters to a corresponding block, and influences from composites along preferred directions of anisotropy may fall off section, but significantly influence the block grades. In addition to the visual check on the block model grades, a nearest neighbor bias check at a zero cutoff came within 0.5% (i.e., 0.669 vs 0.672 g/t Au) of the kriged block model grade.

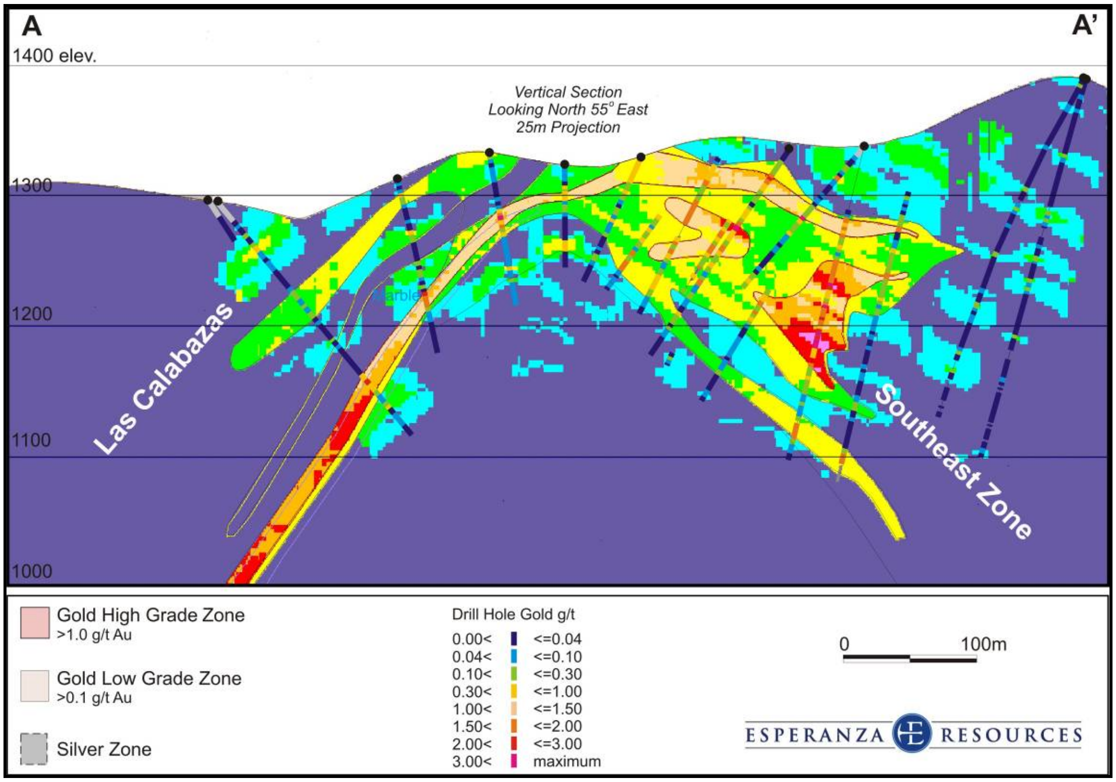



**Figure 17.6.2.1 Section A-A' Block Model and Drill Hole Gold**

### 17.6.3 Gold Equivalent Calculation

A gold equivalent value was calculated from the gold and silver block model grades for resource reporting purposes. The 2008 metal price ratio was adopted at 56:1 (Ag:Au). The 2008 ratio was based upon assumed metal prices of $700 per troy ounce gold and $12.50 per troy ounce silver. At the time of this report, the 56:1 ratio holds consistent with prevailing, round number spot prices of $1200-$1350 per troy ounce gold and $21.50-$24 per troy ounce silver. The Ag:Au metal recovery ratio was kept at 0.62 as determined from the preliminary metallurgical test work cited in 2008. Figure 17.6.3.1 is gold equivalent section A-A' of the SEZ and LCZ; note the subtle impact of the thin silver zone on the Las Calabazas lower limb.

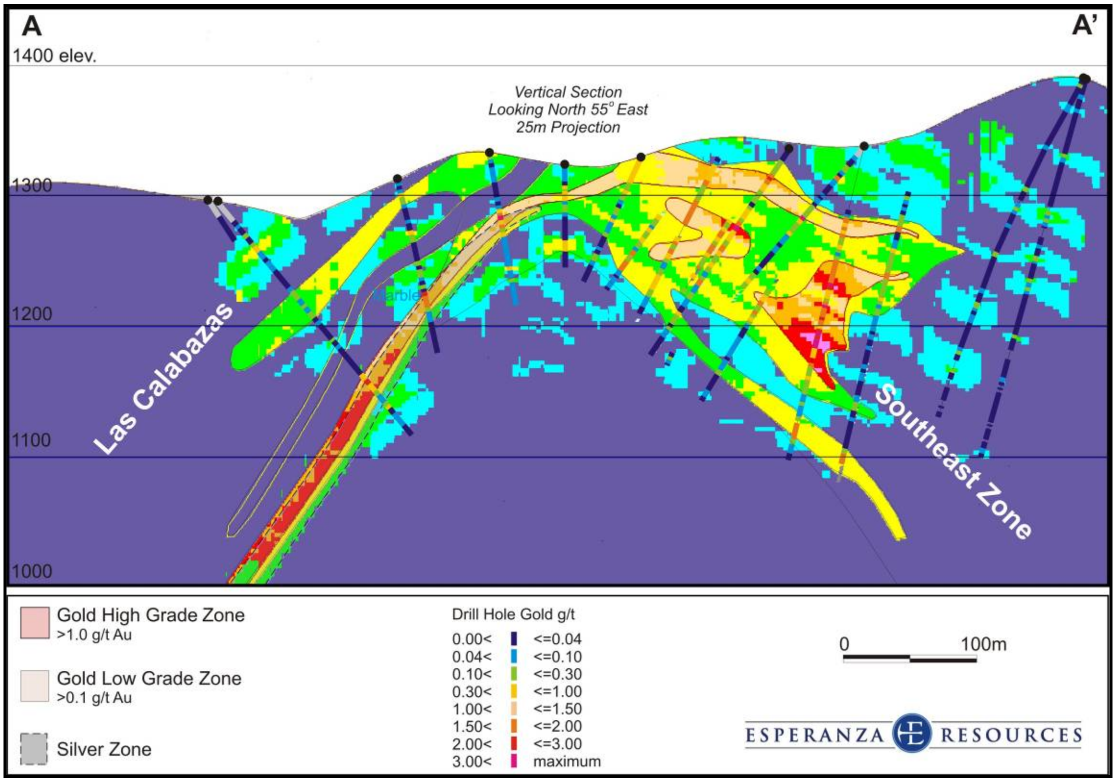



**Figure 17.6.3.1 Section A-A' Block Model Gold Equivalent and Drill Hole Gold**

### 17.6.4 Resource Classification

The geologic and geostatistical controls on grade interpolation yielded varying degrees of confidence depending on the spatial configuration of drill composites used for a block estimate. For each individual block, a number of parameters were stored with respect to the samples used for the estimate, including: 1) the number of drill holes contributing composites, 2) the total number of composites, 3) the cartesian distance to the nearest composite, and 4) the weighted average distance (i.e., by kriging weights) for the input composites. These values were used in various combinations to assign codes for measured, indicated, and inferred resource blocks as summarized in Table 17.6.4.1.

### TABLE 17.6.4.1 GENERALIZED RESOURCE CLASSIFICATION CRITERIA

| | Measured | Indicated | Inferred |
|---|---|---|---|
| Min number of drill holes | 3 - 4 | 2 - 6 | 1 |
| Max dist to nearest comp (m) | 7.1 - 17.5 | 17.5 - 49.5 | 65 |
| Wtd. Avg dist of comps (m) | 17.5 - 24.75 | 35 - 65 | N/A |

Composites at 65 to 75 meters or less from an estimated block are within the variogram ranges for gold in the primary and secondary directions; the tertiary direction is frequently constrained by zone thickness. All of the distance criteria for resource classification were within the more conservative 65 meter variogram range either along the strike or down dip direction.

- Ideally, the measured category required 4 bracketing holes within ½ a 35 meter drill spacing on average (17.5 m orthogonal distance, 24.75 m diagonal distance). Alternatively, 3 holes, with 1 of the holes within 7.1 meters (diagonal distance of a 5 meter block) and the other two within 17.5 meters led to measured classification.
- Overall, the indicated category ranged from at least two bracketing holes within ½ the drill hole grid spacing, up to 6 surrounding holes at an average distance within the variogram range.
- The inferred category required at minimum a single drill hole, and at least 3 composites within the variogram range. All hanging and footwall blocks outside of the gold mineralized zones were classified as inferred.

The combination of rules yielded a logical and intuitively consistent gold resource classification as verified from review on cross section (Figure 17.6.4.1). Blocks with estimated silver grades assumed the classification of an overlapping gold zone, or if not within a gold zone, the estimated silver blocks were classified as inferred.

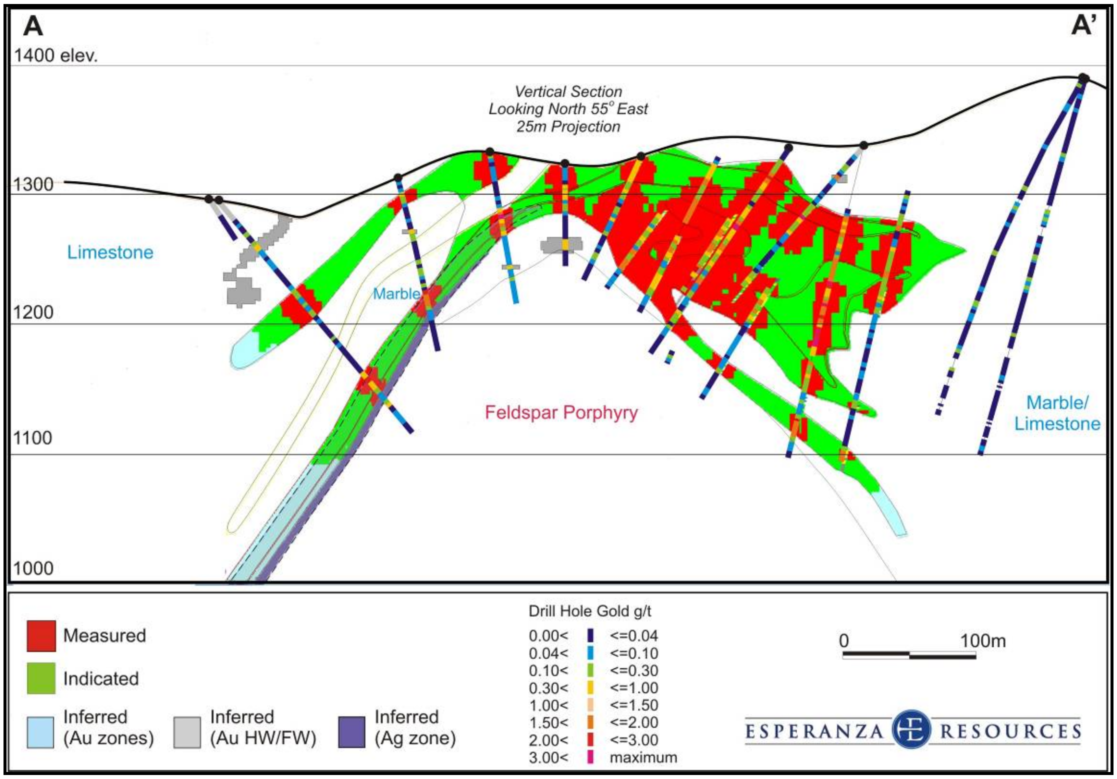



**Figure 17.6.4.1 Section A-A' Block Model Resource Classification**

## *17.7 Resource Reporting*

The Cerro Jumil resources were tabulated for the block model within the defined gold-silver mineralized zones at a 0.3 g/t gold equivalent cutoff (Table 17.7.1). The 0.3 g/t cutoff is taken as the minimum grade that would potentially be considered for an oxide open pit operation. The primary variables used for reporting within the SEZ, LCZ, and WZ include: ordinary kriged gold in g/t, inverse distance estimated silver in g/t, gold equivalent g/t directly calculated from estimated gold and silver grades, tonnage reported as metric tonnes, and resource category. Additional unit conversions for reporting include gold, silver, and gold equivalent troy ounces.

### TABLE 17.7.1 CERRO JUMIL RESOURCES REPORTED AT 0.3 G/T GOLD EQUIVALENT CUTOFF

| Category | Zone | Tonnes (000) | Au g/t | Ag g/t | Au Equiv g/t | Au oz (000) | Ag oz (000) | Au Equiv oz (000) |
|---|---|---|---|---|---|---|---|---|
| **Measured** | SEZ | 7,389 | 0.92 | - | 0.92 | 218 | - | 218 |
| | LCZ & WZ | 2722 | 0.73 | 3.4 | 0.77 | 64 | 296 | 67 |
| | Subtotal | 10,111 | 0.87 | 0.9 | 0.88 | 282 | 296 | 285 |
| **Indicated** | SEZ | 13,799 | 0.78 | nil | 0.78 | 347 | 2 | 347 |
| | LCZ & WZ | 10,496 | 0.84 | 4.9 | 0.90 | 284 | 1,653 | 302 |
| | Subtotal | 24,295 | 0.81 | 2.1 | 0.83 | 630 | 1,655 | 649 |
| **M & I** | **Total** | **34,406** | **0.83** | **1.8** | **0.85** | **913** | **1,951** | **935** |
| | | | | | | | | |
| **Inferred** | SEZ | 2,230 | 0.80 | - | 0.80 | 57 | - | 57 |
| | LCZ & WZ | 5,319 | 0.90 | 11.1 | 1.03 | 154 | 1,904 | 175 |
| | HW/FW | 1,048 | 0.55 | - | 0.55 | 19 | - | 19 |
| | **Total** | **8,596** | **0.83** | **6.9** | **0.91** | **230** | **1,904** | **252** |

Totals may not sum to 100% due to rounding.

The majority of the SEZ and LCZ has now been systematically drilled by ESM. This has resulted in a 46% increase in the measured and indicated (MI) gold equivalent ounces as compared to the 2008 resource. Similarly, the MI resource tonnes increased 48%, reflecting an average gold equivalent grade (0.85 g/t) within 1.2% of the 2008 MI estimate (0.86 g/t). The MI silver ounces increased by over 4 times (1,951 vs 479 Kounces Ag) from 2008, reflecting the added contribution of the relatively silver-enriched LCZ area to the MI total. Notwithstanding, the MI resource is substantially gold dominant, with silver contributing only 22,000 gold equivalent ounces (2.4%) to the 935,000 ounce gold equivalent total.

The SEZ accounts for 62% of the MI resource tonnes, with the 38% balance primarily accounted for by the LCZ. In 2008, the LCZ-WZ represented only 13% of the MI resource. The three fold proportional increase in LCZ-WZ MI resources resulted from new LCZ-focused drilling that shifted tonnes into the measured and indicated classification categories. In net effect, much of the 2008 LCZ inferred tonnages and grades were confirmed with a MI degree of confidence by the 2009-2010 drilling.

Measured and indicated resource estimate results based on a range of gold equivalent cutoff grades are shown in Table 17.7.2. A continuation or increase of the currently high prices for gold and silver may in part eventually justify the lowering of the nominal cutoff grade for Cerro Jumil resource reporting. This table highlights the upside measured and indicated gold equivalent ounces at lower cutoffs.

**Table 17.7.2 MEASURED AND INDICATED RESOURCE COMPARISON BY A RANGE OF GOLD EQUIVALENT CUTOFFS**

| Cutoff Au Equiv | Tonnes (000) | Au g/t | Ag g/t | Au Equiv g/t | Au oz (000) | Ag oz (000) | Au Equiv oz (000) |
|---|---|---|---|---|---|---|---|
| 0.10 | 47,390 | 0.66 | 1.3 | 0.68 | 1,007 | 1,961 | 1,030 |
| 0.20 | 43,746 | 0.70 | 1.4 | 0.72 | 989 | 1,959 | 1,010 |
| 0.25 | 39,404 | 0.76 | 1.5 | 0.77 | 956 | 1,957 | 978 |
| **0.30** | **34,406** | **0.83** | **1.8** | **0.85** | **913** | **1,951** | **935** |
| 0.50 | 18,248 | 1.22 | 2.9 | 1.25 | 715 | 1,693 | 734 |
| 1.0 | 11,240 | 1.59 | 3.0 | 1.62 | 573 | 1,071 | 585 |
| Totals may not sum to 100% due to rounding. | | | | | | | |

The inferred resource tonnes decreased 46% from 2008 (from 15,810 to 8,596 Ktonnes), for the most part reflecting their before-mentioned re-classification into the measured and indicated categories. The overall inferred gold equivalent grade remained relatively constant at 0.91 g/t, increasing by 4.6% from the 0.87 g/t grade reported in 2008. The inferred resource tonnes still primarily occur in the LCZ and

WZ, accounting for 62% of the total. Within the LCZ and WZ, silver contributed 12% to the gold equivalent inferred ounces. Further to gold mineralization within the defined gold zones (i.e., SEZ, LCZ, WZ), the 2010 inferred resources also include 19,000 gold ounces from pods of mineralization hosted in the hanging and footwalls of the main zones. Although this inferred material is relatively minor in its contribution to the overall resource, reporting it does recognize the potential to add marginal resource tonnes outside of the main gold zones in an open pit configuration.

In addition to the gold dominant resources in the main mineralized zones, there is an inferred silver dominant resource outside of these zones that contains a further 2,392,000 tonnes averaging 43.2 g/t silver (3,322,000 contained silver ounces) at a silver cutoff grade of 25 g/t. This silver zone is generally adjacent to, or in the hanging wall of, the LCZ and WZ gold zones.

The 2010 Cerro Jumil resource model defines a low grade, oxide gold-silver deposit. Approximately 80% of the gold equivalent resource tonnes are now in the measured and indicated categories. Importantly, the 2008 inferred resources that transitioned into measured and indicated closely matched the previously estimated tonnes, grade, and contained gold equivalent ounces, on average. This provides a firm basis for confidence in ESM's geologic interpretations, as well as the assumptions and parameters used for resource modeling. Most of the Cerro Jumil deposit, as currently outlined, has now been drilled with adequate density to move from exploration to the next levels of evaluation. The 2010 resource model update further establishes the Cerro Jumil gold-silver skarn deposit as a candidate with significant merit for an open pit mining operation.

## 18.0 OTHER RELEVANT DATA AND INFORMATION

**Author's note from 2010 report:** This Section 18 remains as originally given in the December 23, 2009 technical report, and is included for general information and reference.

The preliminary economic assessment (PEA) evaluated Cerro Jumil as an open pit – heap leach (OPHL) operation. Esperanza Silver has requested that a base case and three options be assessed as a part of this PEA. The options to be examined include:

1. Base Case – Company owned mining fleet with crushed ore delivered to the leach pad;
2. Option 1 – Company owned mining fleet with ROM delivered to the leach pad;
3. Option 2 – Contractor mining fleet with crushed ore delivered to the leach pad;
4. Option 3 - Contractor mining fleet with ROM delivered to the leach pad.

### *18.1 Mine Operations*

The production assumption for Cerro Jumil is a nominal 8000 Tpd or 2,800,000 Tpy. The following assumptions were made by Dyer (2009) in developing the mine design and cost data for the PEA:

- Measured, indicated, and inferred resources were available for processing in the pit optimization;
- Potential revenues for the pit optimization included both gold and silver revenues
- All estimates used a 350 day year;
- The pit slopes are assumed to be 45$^{o}$ in all directions in both ore and waste;
- Bench heights are assumed to be three meters;
- In-pit ramps were designed with a 25 meter overall width and a maximum gradient of 10%;

- The mining operations will use a conventional drill, blast, load, haul cycle;
  - Drilling will use a 165 mm (6.5”) rotary drill;
  - Blasting will use ANFO;
  - Loading will be by a 12 cubic meter hydraulic shovel and a 9 cubic meter front end loader;
  - Hauling of both ore and waste will be with 90 tonne trucks. Depending on the option trucks will haul ore directly to the leach pad or to a crusher.

Assumptions for both mine owned mining fleet and contractor mining will be the same.

Based on the above assumptions, Dyer (2009) ran a series of Whittle pits for various gold prices for each of the mining/processing scenarios.
Table 18.1.1 shows the scenario results for the pits designed at an $800 gold price.

**TABLE 18.1.1 SCENARIO RESULTS FOR $800 WHITTLE PITS**

| | | Mineralized Material Above COG | | | | | Waste Tonnes | Total Tonnes | Strip Ratio |
|---|---|---|---|---|---|---|---|---|---|
| | Au Price | Tonnes | g Au/t | Au Ozs | g Ag/t | Ag Ozs | | | |
| Run | US$/oz | 000's | | 000's | | 000's | 000's | 000's | w/o |
| Owner - ROM | $800.00 | 21,376 | 0.88 | 606 | 2.36 | 1,623 | 47,948 | 69,324 | 2.24 |
| Owner - Crushed Leach | $800.00 | 23,970 | 0.86 | 661 | 2.3 | 1,774 | 60,289 | 84,259 | 2.52 |
| Contract - ROM | $800.00 | 15,955 | 0.92 | 472 | 1.59 | 813 | 24,183 | 40,138 | 1.52 |
| Contract - Crushed Leach | $800.00 | 18,480 | 0.89 | 526 | 1.67 | 993 | 31,491 | 49,972 | 1.7 |

The Whittle analysis showed there was a greater difference between the pits due to mining cost differential than processing cost/recovery differential. Thus two pit designs were developed. They are:

1. Exploit material minable under the owner-mining scenario
2. Exploit material minable under the contract-mining scenario.

Figure 18.1.1 shows the pit configurations for the various scenarios and the locations of the typical cross sections in Figure 18.1.2.

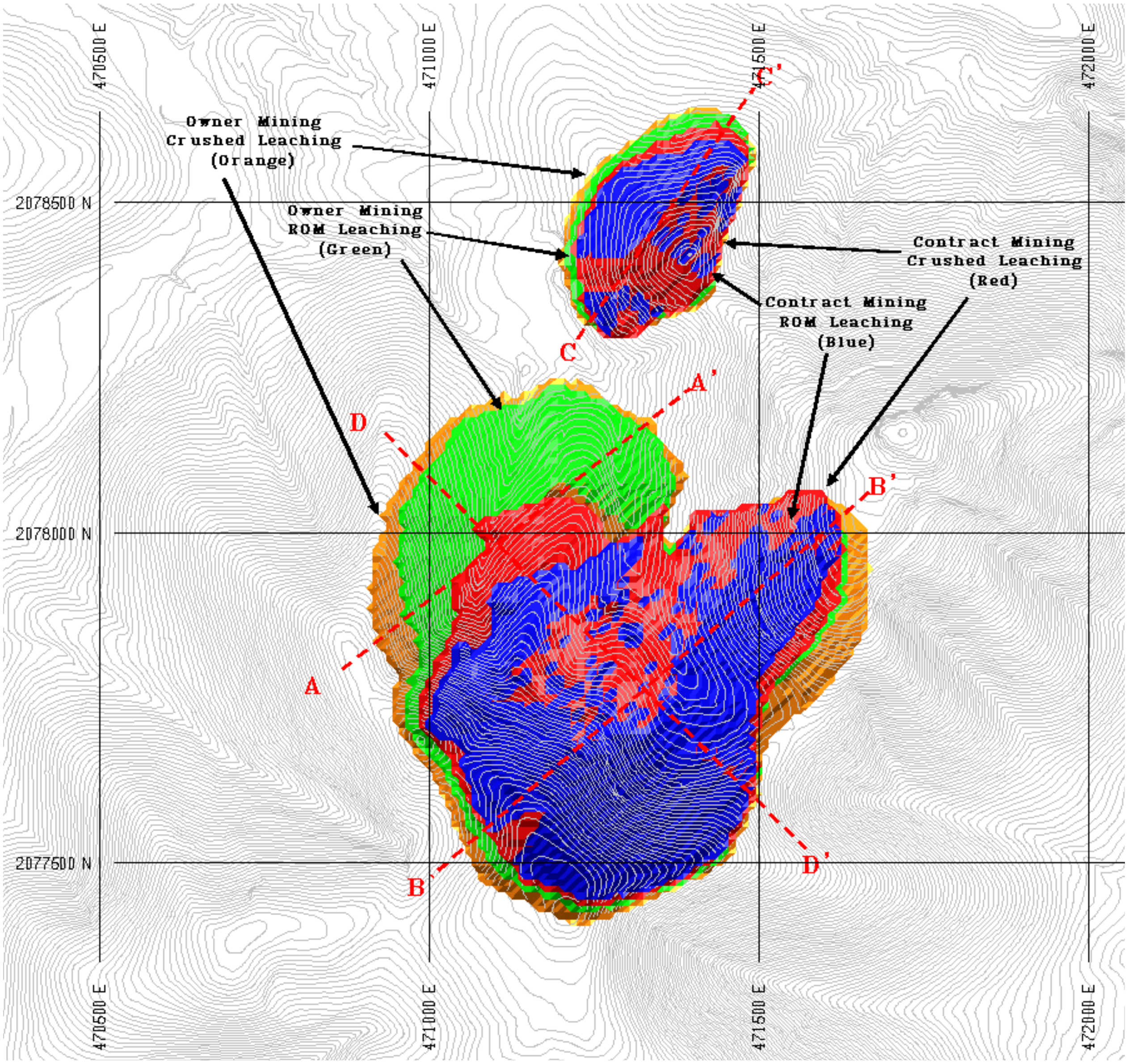



**Figure 18.1.1 Configurations of the Whittle Pit Shells**

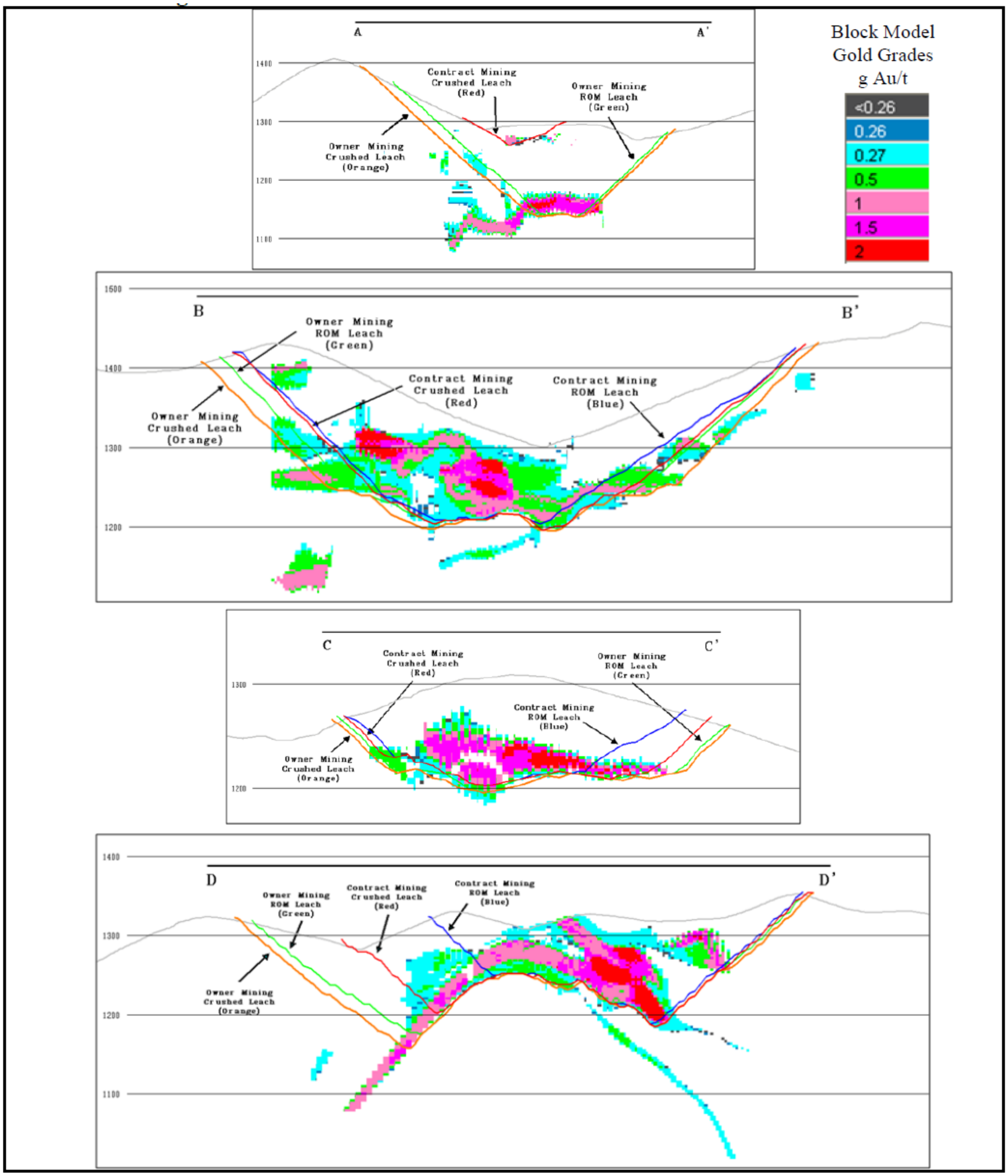



**Figure 18.1.2 Typical Cross Sections of the Whittle Pits and Block Model Grades**

Once the pits were designed and phased, resources inside the pit shells were estimated and a mine production schedule was developed for each of the pit designs.

Tables 18.1.2 and 18.1.3 show the resources estimated by Dyer (2009) for each of the mining scenarios.

## TABLE 18.1.2 RESOURCES INSIDE PIT DESIGNS – CONTRACT-MINING SCENARIO

| | Resources Above COG | | | | | Waste K Tonnes | Total K Tonnes | Strip Ratio |
|---|---|---|---|---|---|---|---|---|
| Phase | K Tonnes | g Au/T | K Au Ozs | g Ag/T | K Ag Ozs | | | |
| Np 1 | 1,407 | 1.14 | 51 | 16.27 | 736 | 5,407 | 6,814 | 3.84 |
| Sp 1 | 16,322 | 0.86 | 454 | - | - | 26,836 | 43,158 | 1.64 |
| Total | 17,729 | 0.89 | 505 | 1.29 | 736 | 32,243 | 49,972 | 1.82 |

Np 1 –North Pit (Red and Blue on Figure 18.1.1)
Sp 1- South Pit (Red and Blue on Figure 18.1.1)

## TABLE 18.1.3 RESOURCES INSIDE PIT DESIGNS – OWNER-MINING SCENARIO

| | Resources Above COG | | | | | Waste K Tonnes | Total K Tonnes | Strip Ratio |
|---|---|---|---|---|---|---|---|---|
| Phase | K Tonnes | g Au/T | K Au Ozs | g Ag/T | K Ag Ozs | | | |
| Np 1 | 1,526 | 1.13 | 55 | 16.42 | 805 | 7,216 | 8,741 | 4.73 |
| Sp 1 | 16,322 | 0.86 | 454 | - | - | 26,836 | 43,159 | 1.54 |
| Sp 2 | 2,691 | 0.84 | 73 | 6.29 | 544 | 20,139 | 22,830 | 7.48 |
| Total | 20,539 | 0.88 | 582 | 2.04 | 1,350 | 54,191 | 74,730 | 2.64 |

Np 1 –North Pit (Orange and Green on Figure 18.1.1)
Sp 1- South Pit (Orange and Green on Figure 18.1.1)
Sp 2 – South Pit Phase 2 (Green and Orange on Figure 18.1.1)

Figures 18.1.3 and 18.1.4 show the ultimate pit designs for the various mining scenarios and phases

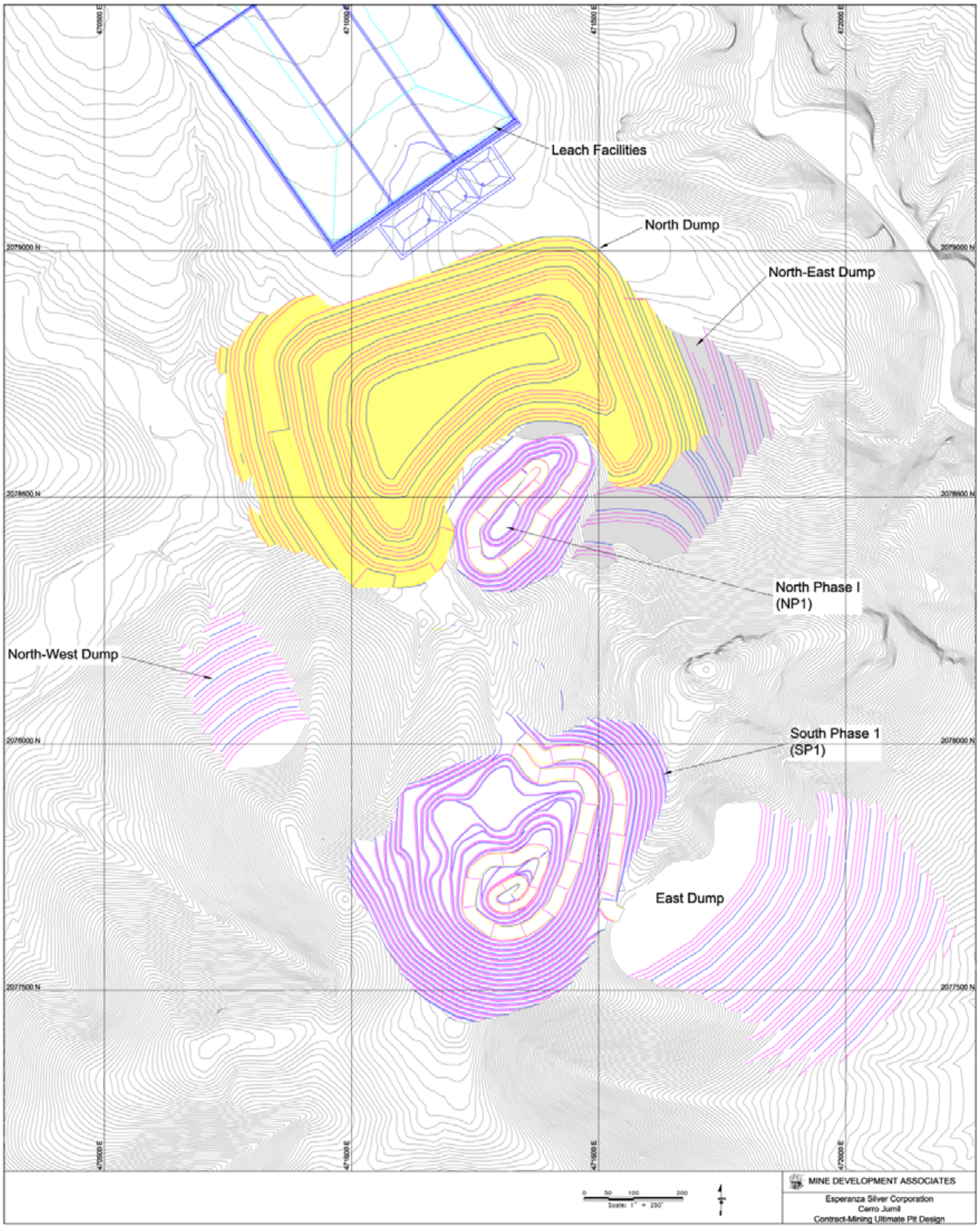



**Figure 18.1.3 Contract Mining Ultimate Pit Design**

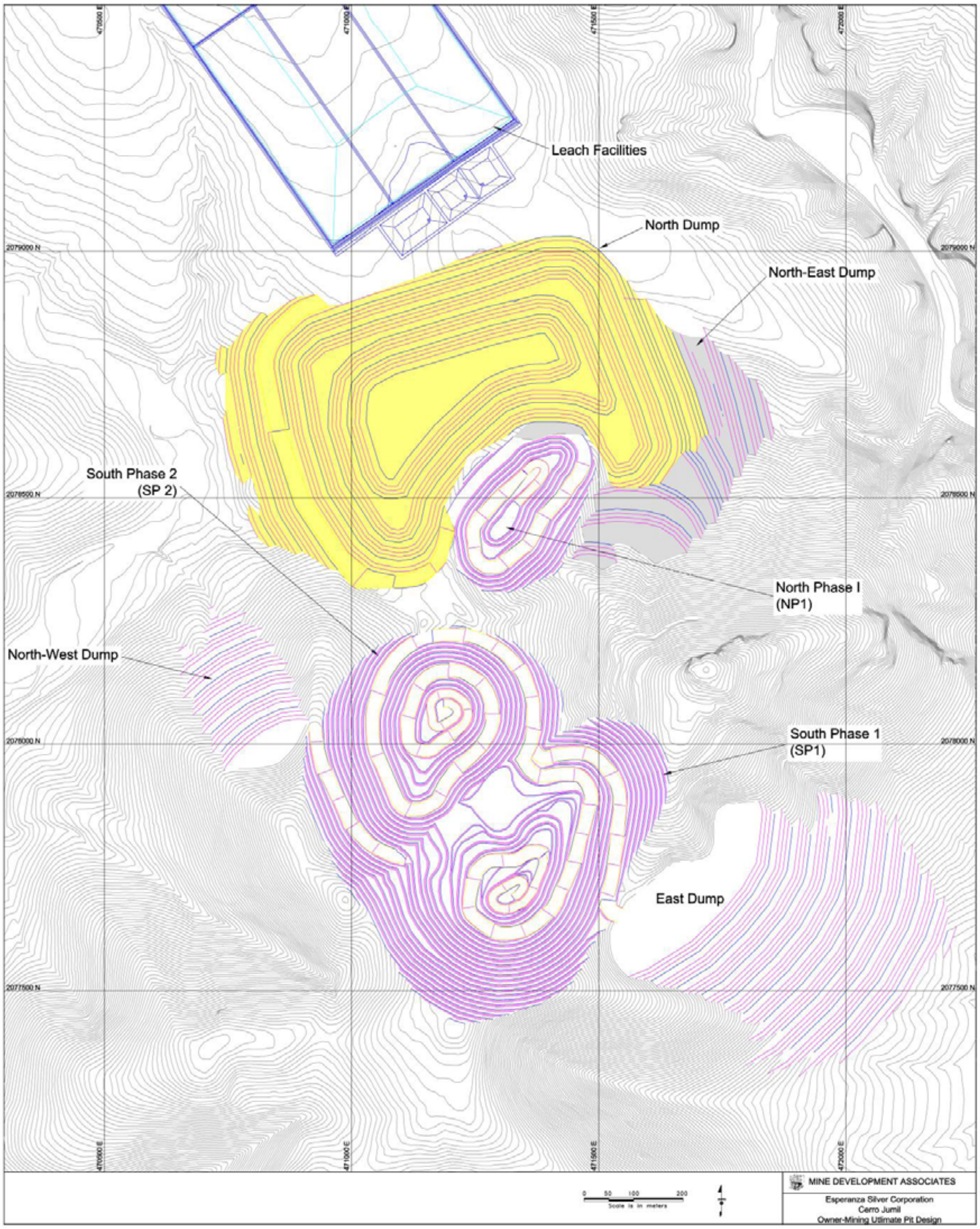



**Figure 18.1.4 Owner – Mining Ultimate Pit Design**

From the schedule a mining fleet was sized and mining costs determined.

Mine production for the owner-mining scenario was estimated using productivity parameters for one hydraulic shovel and one wheeled loader along with conventional 90 tonne haul trucks. Mechanical availability for both the shovel and loader was assumed to be 85%. The hydraulic shovel used is assumed to have a 13 cubic meter bucket with a maximum productive capacity of 1,750 tonnes per hour, or approximately 9.3M tonnes per year based on a 350-day year. For scheduling, the loader was primarily used for loading mineralized material. The loader was assumed have an 11.5 cubic meter bucket with a maximum productive capacity of 1,250 tonnes per operating hour, or approximately 6.7M tonnes per year based on a 350-day year.

A peak requirement of 6 haul trucks was estimated for waste and ore haulage during the first 2 years (year -1 and year 1) of mining. The required number of 90 tonne haul trucks drops to 5 during year 2 and then to 4 in year 6.

The number of mine personnel and personnel costs were estimated for both scenarios. For the contract scenario MDA estimates an average of 24 Esperanza-paid mine staff and operators will be required. The life-of-mine mine personnel cost is estimated at $6.3M and averages $0.9M per year during active mining operations for the contract scenario.  For the owner-mined scenario an estimated peak of 104 staff and operating personnel will be required for owner-mining operations in year 1. The average number of mining personnel was estimated to be 90 in years 2 through 7. The life-of-mine mine personnel cost was estimated at $19.8M with a peak of $2.7M in year 1 and an average of $2.4M in years 2 to 7.

MDA has identified the following risks for the project:

- High road-building costs and increased operational safety risks exist due to the steep terrain.

- The south phase 2 portion of the deposit is economically marginal. Additional drilling and metallurgical studies may upgrade this portion of the deposit.

MDA has identified the following opportunities for the project:

- Gold leaching studies to date have not optimized crush size versus recovery and cost. Once completed, this will increase the confidence in economic parameters used in pit optimization and design, providing a better overall return for the project.
- The negative impact of the initial high stripping may be minimized by contract-mining followed by owner mining.
- Mining costs in this study might be reduced by negotiations with equipment vendors and contract mining companies.

### *18.2 Process Design*

Lyntek Incorporated developed the conceptual process design based on the metallurgical testing completed by SGS and CAMP and their experience with heap leach process design. Lyntek completed their review and submitted a report titled Cerro Jumil Preliminary Economic Assessment in August 2009 that details process design and CAPEX and OPEX costs.

The basic process recommended for this project is heap leaching using a dilute cyanide solution to dissolve the precious metals followed by activated carbon adsorption in columns for primary recovery of the gold and silver from the leaching solutions.

Pregnant solution from the leach pads is pumped to the Carbon Adsorption plant where it is sampled for Au/Ag content. Pregnant solution directed to the Carbon Adsorption Circuit is split equally between Column 1 in each of the two, parallel, 5-column banks of carbon adsorption columns. The solution flows through each of the five carbon columns in each bank in series where the adsorption process takes place. The barren solution that exits Column 5 is then routed back to the Barren Solution Pond for return to the leach pad.

The precious metals will be stripped from the carbon and removed from the stripping solution by "Zadra" process electro-winning cells. The precious metal sludge from the electro-winning cells will be melted and refined into doré bars for sale. The stripped carbon will be screened for size, regenerated as necessary, and returned to the adsorption column.

The objectives of this study were to compare two alternative processes for heap leaching Cerro Jumil ore based on metallurgical performance and cost estimates. The two options are as follows:

1. Run-of-Mine (ROM) ore is treated through a crushing plant to produce a top size of 2 inches (51 mm) that is then fed to the leach pile and stacked via a conveyor system;
2. ROM ore with an assumed top size of 24 inches (610 mm) is directly fed to heap leaching via mine haul trucks and distributed on the pad using a dozer.

In both options, pregnant solutions are piped from the heap leach pad into the carbon recovery plant where gold is adsorbed onto activated carbon from the cyanide solutions and the barren solutions are returned to the barren pond for reconstitution and distribution back onto the heap.

For the crushing option, the crushing circuit is designed to process 8000 tonnes per day. It will reduce the ROM ore to 100% passing 51 mm (two inches). Two options were considered for the crushing plant design. They were:

1. All ROM ore passes through the crusher and is delivered to the heap leach pad by conveyor.

2. The ROM is screened prior to going the crusher and the -2 mm material is treated in a fines circuit that includes gravity separation of the gold.

It was determined that option 2 did not recover sufficient gold to justify the additional expense and this option was abandoned.

Based on Lyntek's review of the available metallurgical test data the following conclusions were made:

- SGS Laboratory column leach test results (2008) showed an Au and Ag recovery of 72.02% and 67.55% respectively for 1" Cerro Jumil material
- For Option 1 and assuming feed grades of 0.91 g/t Au and 2.04 g/t Ag and recoveries of 70% for Au and 65% for Ag, the annual production of Au and Ag is expected to be 50,281 and 104,667 troy oz respectively
- For Option 2 and assuming feed grades of 0.91 g/t Au and 2.04 g/t Ag and recoveries of 50% for Au and 50% for Ag, the annual production of Au and Ag is expected to be 35,915 and 80,513 troy oz respectively
- The capital costs for Option 2 (ROM) is $9 million US dollars, which is about 50% less than Option 1 (crushing) whose capital cost is $19 million US dollars
- The operating costs for Option 1 (crushing) are estimated at $3.08 US dollars per tonne. Option 2 (ROM) operating costs are lower at $2.55 US dollars per tonne.

For the crushing option the crushing circuit basic design consists of:

1. Rock Box - 250 metric tons. Mining trucks up to 150 tons can be dumped directly into the rock box
2. Apron Feeder - 48 inch x 40 feet with a variable speed drive
3. Static Inclined Grizzly with Hydraulic Clear – 127mm Closed Side Setting
4. Cedarapids 3648 Jaw Crusher – 36 inch x 48 inch feed opening – 152.4 mm Closed Side Setting
5. Pedestal Mounted Rock Breaker near jaw crusher
6. Conveyor –48 inch x 40 foot conveyor to collect ore from the grizzly and jaw crusher discharge
7. Magnet – stationary magnet at discharge to remove tramp iron from ore
8. Conveyor – 48 inch x 100 foot conveyor to take the ore on the under jaw conveyor and deliver it to the primary screen feed box.
9. Cedarapids 7203 Screen – 7 foot x 20 foot 3 deck screen
10. Conveyor – 36 inch x 60 foot conveyor ore discharge under the screen for delivery to the heap leach

11. Cedarapids MVP 550 Cone Crusher – 44.5 mm Closed Side Setting
12. Conveyor – 36 inch x 70 foot conveyor to take the ore on the cone crusher discharge and deliver it to the primary screen feed conveyor.
13. Conveyors to deliver the crushed ore to the heap leach pads.

The ROM option delivers ore directly to the leach pad in mining trucks and the ore is placed on the pad and moved with dozers as necessary.

Lyntek (2009) reviewed the following reports provided by Esperanza Silver:

1. Determination of the gold and silver recovery by cyanidation of one ore composite, SGS Minerals Services/Durango, Final report SGS-37-07, May 2008
2. Cerro Jumil Metallurgical Report, The Center for Advanced Mineral Metallurgical Processing, Montana Tech of the University of Montana Butte, Montana, June 1, 2009
3. The recovery of gold by cyanide leaching of two composites, SGS Lakefield Research Ltd., Project 10996-002 Report 1, Sept 2006
4. Cerro Jumil Cyanide Soluble Au Assay Review, D. Turner, May 31, 2009
5. EXCEL File: CN_Pulps_Sample Data Final

Reports 1, 2 and 3 describe bottle roll tests conducted on crushed Cerro Jumil ore to determine its suitability to cyanide leaching whereas Reports 4 and 5 present assay tests. In addition, column leach tests were also described in Report 1 and these results were used to determine the precious metal recoveries for the plant design. The bottle roll test conditions that produced the highest Au recoveries in each report are summarized in Table 18.2.1.

## TABLE 18.2.1: SUMMARY OF BOTTLE ROLL TEST-WORK REPORTED

| REPORT NUMBER | 2 | 3 | | 1 |
|---|---|---|---|---|
| | | Comp. 1 | Comp. 2 | |
| test ID from report | 7 | CN-10 | CN-18 | 2 |
| Au head grade (g/t) | 2.06 | 0.84 | 2.28 | 1.59 |
| Ag head grade (g/t) | 64.46 | | | 2.17 |
| Top size (mm) | 12.7 | ~0.05 | ~0.05 | 12.7 |
| NaCN conc. (g/L) | 1.5 | 1 | 1 | 1 |
| NaCN consumption (kg/t) | | **0.30** | **0.16** | **3.34** |
| CaO consumption (kg/t) | | 3.02 | 1.61 | 2.25 |
| Leach time (h) | 168 | 48 | 48 | 96 |
| Au Recovery % | **78.7** | **91.3** | **96.1** | **79.14** |
| Ag Recovery % | 48.9 | | | 47.15 |
| Residue Au (g/t) | 0.44 | 0.07 | 0.10 | 0.34 |
| Residue Ag (g/t) | 33 | | | 1.16 |

Report 4 is a memo from D. Turner, which presents a CN/FA ratio (cyanide solubility / fire assay Au) for various samples, and the conclusions reported are as follows:

- The intervals selected for CN re-assay cover the typical grade ranges of the Cerro Jumil mineralized zones
- The distribution of the holes provides representative coverage along strike and dip of the SEZ, LCZ, and WZ mineralized domains. CN/FA ratios > 0.75 occur consistently across all three zones
- Low (< 0.75) CN/FA ratios in three SEZ holes appear to preferentially occur within the low grade mineralized envelope. This may indicate a difference in the nature of the occurrence of gold in those areas, because apparent gold does not leach easily. However, the amount of ore and the low grade values should be evaluated to ensure a potential return before much effort is expended on determining the source of the difference in behavior
- The CN extraction average for all combined lithologies is high at 0.89. Key host rocks for Au mineralization (skarn, marble, ls/mbl) exhibit minimal deviation above and below the 0.90 CN/FA line
- The average skarn recoveries deviate from 0.85-0.95 around the 0.90 CN/FA ratio line, implying high CN solubility within all the skarn alteration types. There is a cluster of ratios at 0.85 (gr-tre, jasp, wo-gr) and around 0.90 (gr-

wo, mbl, pyx-gr). The relationship of skarn alteration type versus CN solubility deserves further review

- There does not appear to be grade dependent CN solubility behavior from the data reviewed.

Information from the various reports and Lyntek's experience in heap leach operations provided the basis for the process design for Cerro Jumil. Figure 18.2.1 is a schematic of the ADR building.

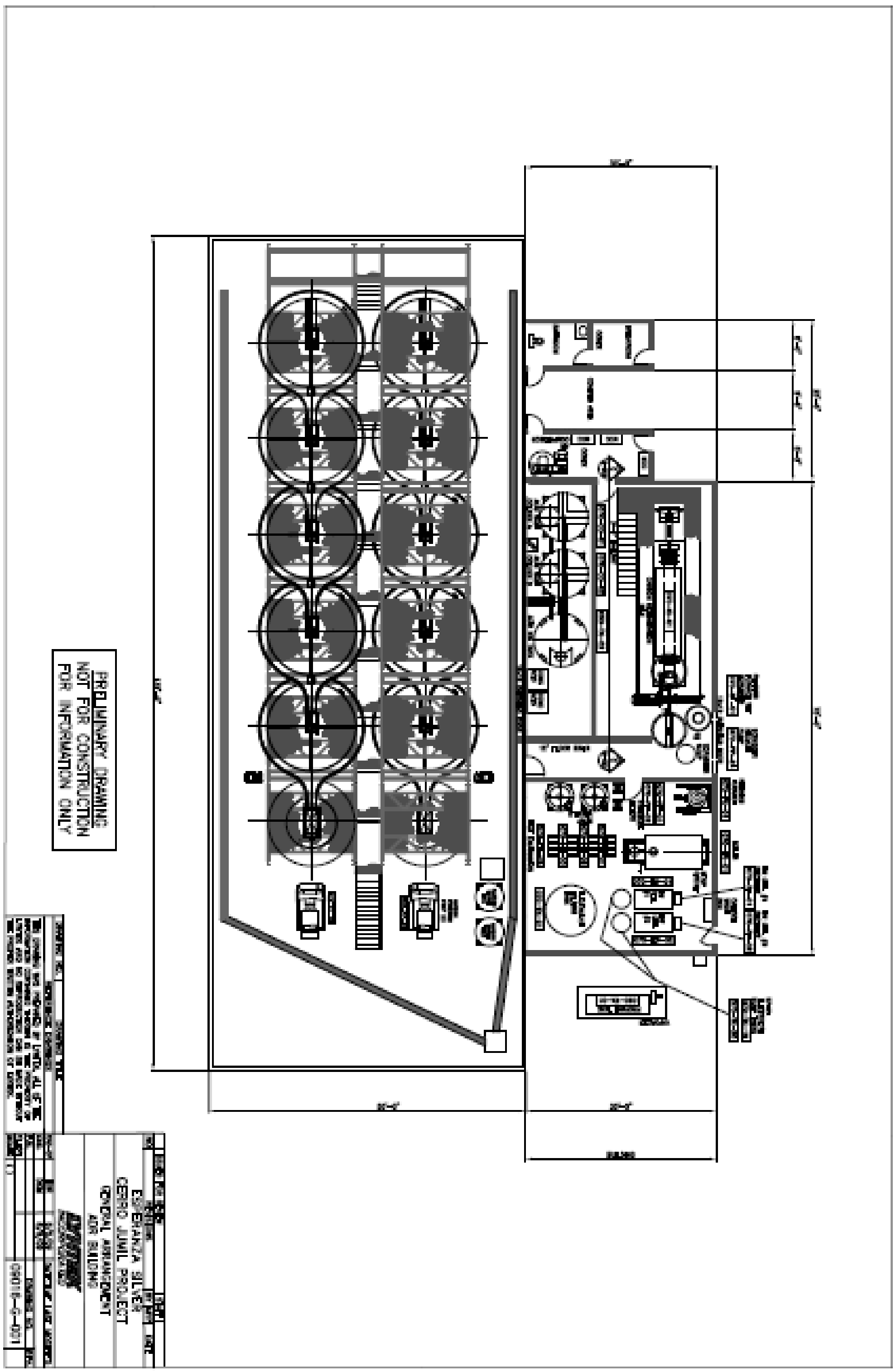



**Figure 18.2.1 Schematic of the General Arrangement of the ADR Building**

### *18.3 Heap Leach Design*

The details of the heap design, construction, and cost were presented in a Technical Memo dated July 31, 2009 from Charles Khoury, P.E. and Allan Breitenbach, P.E. of Vector Engineering. The heap will be constructed in two phases designed ultimately to hold 20 million tonnes of heap leach ore. The design is conceptual based on the anticipated total ore tonnage. No site engineering or testing has been completed. The location and design of the heap used existing topographic maps to select a reasonable site for the pad. Engineers utilized existing topography to calculate the volumes of cut and fill required to construct the pad. The conceptual design discusses the following:

- Foundation preparation
- Leach Pad Characteristics
- Pad Liner System
- Pad Solution Drainage System
- Collection Ditches
- Ore Heap Construction
- Solution Flow
- Collection Ponds
- Diversion System

The technical memo on the leach pads makes recommendations for field and laboratory testing of the materials at the surface and into the subsurface with a series of bore holes and test pits.

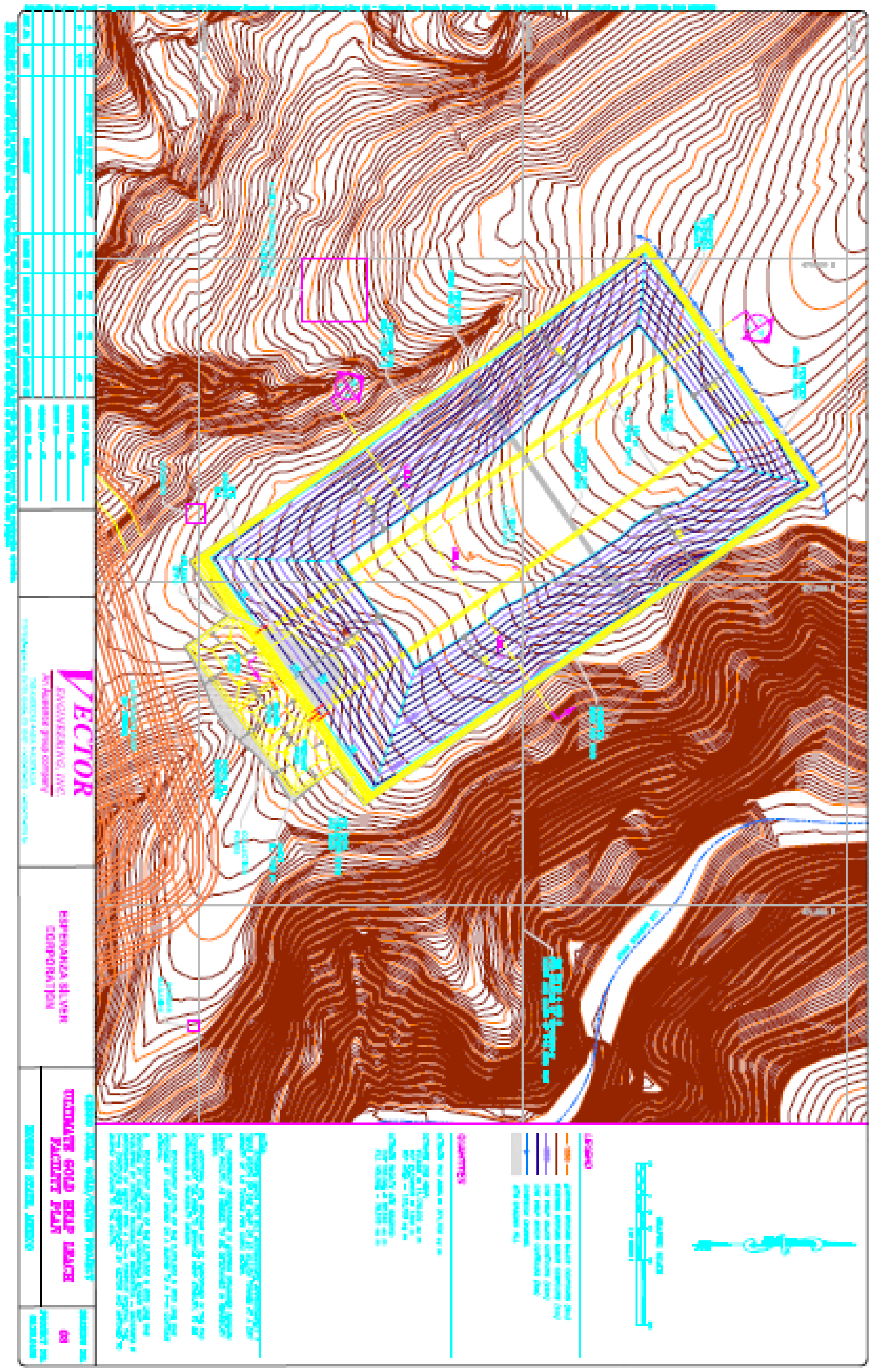



**Figure 18.3.1 Ultimate Heap Leach Facility Plan**

### *18.4 Environmental Considerations*

The author is not an expert in the regulatory aspect of mining within Mexico and the discussion presented here is based on information available in public documents, review of documents prepared for Esperanza Silver (Ramos et. al., 2008), and discussions with Esperanza Silver personnel. The following discussion is a summary of public information from these various sources.

The Mining Act regulates all mining activities in Mexico including the granting of concessions. The Act states that all mining concession owners must carry out their activities according to environmental regulations but does not give the mining authorities the power to enforce the regulations.

The General Law of Ecological Equilibrium and Environmental Protection (LGEEPA) regulates all environmental impacts. All activities that may significantly affect the environment are required to submit to the Dirección General de Impacto Ambiental (DGRIA) an Environmental Impact Manifest (MIA). Mining projects must prepare an MIA according to the LGEEPA Environmental Impact Assessment Regulations.

A second major regulation that impacts mining is the General Law of Sustainable Forestry Development (LDFS). This law classifies all lands other than urban areas in Mexico as forest lands. In order to conduct activities such as mining on these lands, it is necessary to apply for a permit to change the use status of the land. Once the land use status is changed to allow mining, the mining concession holder must pay compensation to the Mexican Forestry Fund based on the productivity classification of the land.

Esperanza Silver has contracted with Consultores Ambientales Asociados (CAA), an environmental and remediation consulting company to carry out certain environmental studies. The primary study has been a fauna baseline study in support of changing the land status to mining. Esperanza recognized that this study must be expanded and updated before the MIA and the land status change permit applications can be filed with the appropriate authorities.

### *18.5 Capital Cost Estimates*

Capital cost estimates for mining, processing, heap construction, owner costs, and closure costs have been estimated for all four options. Table 18.5.1 is a summary of the capital costs for the base case and the three options.

**TABLE 18.5.1 SUMMARY OF CERRO JUMIL CAPITAL COST ESTIMATES**

| | Base Case | Option 1 | Option 2 | Option 3 |
|---|---|---|---|---|
| **CATEGORY** | US$ | US$ | US$ | US$ |
| **PREPRODUCTION CAPITAL** | | | | |
| Mine Development (Prestrip) | $9,247,975 | $9,247,975 | $14,680,546 | $14,680,546 |
| Mining Equipment/Infrastructure | $22,456,521 | $22,456,521 | $6,809,847 | $6,809,847 |
| Plant/Infrastructure | $19,133,626 | $8,956,467 | $19,133,626 | $8,956,467 |
| Leach Pad | $5,524,600 | $5,524,600 | $5,524,600 | $5,524,600 |
| Owner Costs | $1,633,000 | $1,633,000 | $1,633,000 | $1,633,000 |
| Contingency (10% of total Capital) | $7,469,530 | $5,482,257 | $6,474,130 | $5,622,690 |
| **Subtotal** | $65,465,252 | $53,300,820 | $54,255,749 | $43,227,150 |
| **SUSTAINING CAPITAL** | | | | |
| Mining Equipment/Infrastructure | $1,828,110 | $1,828,110 | $1,778,602 | $1,778,602 |
| Leach Pad | $2,975,900 | $2,975,900 | $2,975,900 | $2,975,900 |
| Owner Costs | $200,000 | $200,000 | $200,000 | $200,000 |
| Working Capital (6 mo) | $9,695,566 | $8,819,368 | $10,030,182 | $9,292,938 |
| Closure Cost | $2,000,000 | $2,000,000 | $2,000,000 | $2,000,000 |
| **Subtotal** | $16,699,576 | $15,823,378 | $16,984,684 | $16,247,440 |
| **TOTAL CAPITAL** | $82,164,828 | $69,124,198 | $71,240,433 | $59,474,590 |

### 18.5.1 Mining

Mining costs have been estimated for two options:

- Mining using a company owned mining fleet;
- Mining using a contractor owned mining fleet.

Capital costs for the first option include drilling and blasting equipment, loaders and haul trucks and support equipment, shop and maintenance, equipment, and miscellaneous equipment.

Table 18.5.1.1 shows the break down for mining capital costs by year for mine-owned mining fleet.

**TABLE 18.5.1.1 MINING CAPITAL COSTS IN $USX1000 FOR MINE OPTION 1**

| | Yr -1 | Yr 1 | Yr 2 | Yr 3 | Yr 4 | Total |
|---|---|---|---|---|---|---|
| **Mine Capital** | | | | | | |
| ***Drilling*** | | | | | | |
| Rotary Drill - 165 mm | 1,650 | | | | | 1,650 |
| ***Loading*** | | | | | | |
| 12 Cubic Meter Hydraulic Shovel | 2,745 | | | | | 2,745 |
| 9 Cubic Meter Front End Loader | 855 | | | | | 855 |
| ***Trucks*** | | | | | | |
| 90 Metric Tonne Truck Fleet | 7,377 | | | | | 7,377 |
| ***Support Equipment*** | | | | | | |
| 400-450 Kw Dozer | 1,087 | | | | | 1,087 |
| 300-350 Kw Dozer | 930 | | | | | 930 |
| 4.8-4.9 m Motor Grader | 683 | | | | | 683 |
| Water Truck - 20,000 Liter | 818 | | | | | 818 |
| 30Kw Integrated Tool Carrier | 855 | | | | | 855 |
| Rock Breaker - Impact Hammer | 7 | | | 7 | | 14 |
| Backhoe/Loader | 108 | | | | | 108 |
| Pit Pumps | 12 | | | 12 | | 24 |
| ***Blasting*** | | | | | | |
| Sanding/Stemming Truck | 94 | | | | | 94 |
| Explosives Truck | 79 | | | | | 79 |
| Skid Loader | 30 | | | 30 | | 61 |
| ***Mine Maintenance*** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Lube Truck | 158 | | | | | 158 |
| Fuel Truck | 158 | | | | | 158 |
| Mechanics Truck | 231 | | | - | | 231 |
| ***Mine General Services*** | | | | | | |
| Light Plant | 64 | | 32 | | 32 | 127 |
| ***Other Mine Capital*** | | | | | | |
| ANFO Storage Bins | 39 | | | | | 39 |
| Powder Magazines | 8 | | | | | 8 |
| Cap Magazine | 5 | | | | | 5 |
| Mobile Radios | 19 | | | | | 19 |
| Shop Equipment | 263 | | | | | 263 |
| Engineering & Office Equipment | 150 | | | | | 150 |
| Water Storage (Dust Suppression) | 98 | | | | | 98 |
| Base Radio & GPS Stations | 105 | | | | | 105 |
| Unspecified Miscellaneous Equipment | 105 | | | | | 105 |
| **Total Mine Capital** | 18,730 | | 32 | 50 | 32 | 18,843 |
| | | | | | | |
| **Infrastructure & Buildings** | | | | | | |
| Buildings & Structures | 1,210 | | | | | 1,210 |
| Access Roads - Haul Roads - Site Work | 2,046 | | 1,539 | | | 3,584 |
| Total Infrastructure & Building Capital | 3,256 | - | 1,539 | - | - | 4,794 |
| | | | | | | |
| **Miscellaneous** | | | | | | |
| Light Vehicles | 480 | | | | 240 | 720 |
| | | | | | | |
| **Total Capital** | 22,465 | | 1,570 | 50 | 271 | 24,357 |

Table 18.5.1.2 shows the break down for mining capital costs by year for the contract mining option.

### TABLE 18.5.1.2 MINING CAPITAL COSTS IN $USX1000 FOR MINE OPTION 2

| | Yr -1 | Yr 2 | Yr 4 | Yr 8 | Total |
|---|---|---|---|---|---|
| **Mine Capital** | | | | | |
| ***Drilling*** | Contractor Supplied | | | | |
| ***Loading*** | Contractor Supplied | | | | |
| ***Trucks*** | Contractor Supplied | | | | |
| ***Support Equipment*** | | | | | |
| 300-350 Kw Dozer | 930 | | | | 930 |
| Backhoe/Loader | 107 | | | | 107 |
| ***Blasting*** | Contractor Supplied | | | | |
| ***Mine Maintenance*** | | | | | |
| Mechanics Truck | 116 | | | | 116 |
| ***Mine General Services*** | | | | | |
| Light Plant | Contractor Supplied | | | | |
| Mobile Radios | 2 | | | | 2 |
| Shop Equipment | 263 | | | | 263 |
| Engineering & Office Equipment | 150 | | | | 150 |
| Water Storage (Dust Suppression) | 98 | | | | 98 |
| Base Radio & GPS Stations | 105 | | | | 105 |
| Unspecified Miscellaneous Equipment | 105 | | | | 105 |
| Contractor Mobilization | 1,200 | | | | 1,200 |
| Contractor De-Mobilization | | | | 1,200 | 1,200 |
| Total Mine Capital | 3,074 | | | 1,200 | 4,274 |

### 18.5.2 Processing

The processing capital costs (Lyntek, 2009) are for two options of ore handling and the process plant itself including the carbon columns, the carbon stripping circuit, the electro-winning circuit, the smelting and refining circuit, and the carbon regeneration circuit along with all the ancillary equipment. The two options for ore handling are:

- Crushed ore delivered to the leach pad by conveyers. Table 18.5.2.1 shows the costs for this option as estimated by Lyntek.
- ROM ore delivered to the leach pad by haul trucks and spread by dozer. Table 18.5.2.2 shows the costs for this option.

Table 18.5.2.1 shows a summary of the capital costs for the crushing option.

**TABLE 18.5.2.1 CAPITAL PROCESS COSTS (US$) – CRUSHING OPTION**

| Category | Units | Total Capital |
|---|---|---|
| **Direct Costs** | | |
| Equipment and Installation | | |
| Crushing System | $ | $3,397,960 |
| Overland Conveyors | $ | $503,020 |
| Conveyor Stacker | $ | $1,180,140 |
| Reagent System | $ | $116,848 |
| Flume | $ | $42,194 |
| ADR Plant (Adsorption) and Barren Pumps | $ | $1,187,704 |
| Acid Wash and Carbon Strip | $ | $316,117 |
| Gold Refinery | $ | $181,391 |
| Piping | $ | $76,492 |
| Ancillaries and Miscellaneous | $ | $550,700 |
| Water System | $ | $447,422 |
| Laboratory | $ | $185,490 |
| Administrative/Office Building | $ | $420,000 |
| Laboratory | $ | $330,000 |
| Warehouse | $ | $420,000 |
| ADR Plant | $ | $750,000 |
| Plant Electrical | $ | $642,151 |
| Instrumentation and Programming | $ | $437,830 |
| Plant Piping | $ | $350,264 |
| Concrete | $ | $1,167,547 |
| Structural Steel | $ | $408,641 |
| **Subtotal Direct Costs** | $ | $13,111,910 |
| **Indirect Costs** | | |
| Engineering (% Direct Cost) | 10%$ | $1,311,191 |
| Construction Management (% Direct Cost) | 4%$ | $524,476 |
| Freight (% EQ Cost) | 12%$ | $822,231 |
| Man camp (% Direct Cost) | 3%$ | $393,357 |

| | | |
|---|---|---|
| Contractor Profit (% Direct Cost) | 10%$ | $1,311,191 |
| Construction Equipment Rental (% EQ cost) | 10%$ | $685,192 |
| Contractor Small Tools and Consumables (% EQ Cost) | 4%$ | $274,077 |
| Mobilization and De-Mobilization | -$ | $300,000 |
| Startup and Commissioning | -$ | $150,000 |
| Project Insurances | -$ | $250,000 |
| **Subtotal Indirect Costs** | $ | $6,021,716 |
| **Subtotal Direct and Indirect Costs** | $ | $19,133,626 |

## TABLE 18.5.2.2 CAPITAL PROCESS COSTS (US$) – ROM OPTION

| Category | Item | Total Capital |
|---|---|---|
| **Direct Costs** | | |
| Equipment and Installation | | |
| Reagent System | $ | $116,608 |
| Flume | $ | $42,144 |
| ADR Plant (Adsorption) and Barren Pumps | $ | $1,170,704 |
| Acid Wash and Carbon Strip | $ | $314,177 |
| Gold Refinery | $ | $179,639 |
| Piping | $ | $76,092 |
| Ancillaries and Miscellaneous | $ | $257,348 |
| Water System | $ | $209,085 |
| Laboratory | $ | $185,490 |
| Administrative/Office Building | $ | $420,000 |
| Laboratory | $ | $330,000 |
| Warehouse | $ | $420,000 |
| ADR Plant | $ | $750,000 |
| Plant Electrical | $ | $425,843 |
| Instrumentation and Programming | $ | $283,896 |
| Plant Piping | $ | $283,896 |
| Concrete | $ | $473,159 |
| Structural Steel | $ | $189,264 |
| **Total Direct Costs** | $ | $6,127,344 |
| **Indirect Costs** | | |

| | | |
|---|---|---|
| Engineering (% Direct Cost) | 10%$ | $612,734 |
| Construction Management (% Direct Cost) | 4%$ | $245,094 |
| Freight (% EQ Cost) | 12%$ | $219,111 |
| Man camp (% Direct Cost) | 3%$ | $183,820 |
| Contractor Profit (% Direct Cost) | 10%$ | $612,734 |
| Construction Equipment Rental (% EQ Cost) | 10%$ | $182,592 |
| Contractor Small Tools and Consumables (% EQ Cost) | 4%$ | $73,037 |
| Mobilization and De-Mobilization | -$ | $300,000 |
| Startup and Commissioning | -$ | $150,000 |
| Project Insurances | -$ | $250,000 |
| **Subtotal Indirect Costs** | -$ | $2,829,123 |
| **Subtotal Direct and Indirect Costs** | -$ | $8,956,467 |

### 18.5.3 Heap Construction

The summary of the capital cost for construction of the heap leach pad (Khoury e al, 2009) is shown in Table 18.5.3.1. It includes costs for grading the site, purchase and installation cost of the geosynthetics, purchase and installation costs of the piping system and various miscellaneous costs.

**TABLE 18.5.3.1 CAPITAL COST (US$) FOR HEAP LEACH PAD CONSTRUCTION BY PHASE**

| CONSTRUCTION COST SUMMARY BY PHASE | | | |
|---|---|---|---|
| | Phase I | Phase II | Totals |
| Subtotals - Earthwork Cost | $3,156,060 | $1,754,647 | $4,910,707 |
| Subtotals - Geosynthetics Cost | $2,029,303 | $1,100,389 | $3,129,692 |
| Subtotals - Pipework Cost | $253,559 | $120,868 | $374,427 |
| Subtotals - Miscellaneous Cost | $85,700 | $0 | $85,700 |
| | | | |
| ESTIMATED CONSTRUCTION COSTS OF FACILITY PHASES | $5,524,623 | $2,975,903 | |
| | | | |
| FACILITY ESTIMATED TOTAL CONSTRUCTION COST | | | $8,500,527 |

### 18.5.4 Owner Costs

The owner costs include permitting costs, land acquisition costs, drilling of production water wells, infrastructure costs, prestripping costs, and social and community relations costs. Costs of these are shown in Table 18.5.4.1

All permitting costs for exploration permits are considered sunk costs. This includes the various permit applications, flora and fauna studies, and hydrological studies that have already been conducted. All exploration and land and lease payment costs are also considered sunk costs and are not included in any of the cash flow calculations. Once operations commence, it is possible these costs can be recovered as a tax credit against revenue.

Additional permits are required to allow mining. This includes the Environmental Impact Manifest (MIA) and the Request of land Status Change. Both will require an updated flora and fauna survey. Once the survey is completed the MIA will have to be assembled along with the Request of land Status Change.

The land on which the pit, waste piles, heap leach pad and other infrastructure will sit is the property of an Ejido. An "ejido" is a uniquely Mexican institution set up by the government during a period of land reform. It is a rural agricultural cooperative having well-defined property rights. These rights allow them to control what activities take place on the community lands. The law allows for a mining company to negotiate with the Ejido for a “Temporary Occupancy” permit that grants easement for mining and related activities. This “Temporary Occupancy” easement is good for 50 years. Esperanza will have to negotiate with the Ejido to acquire the “Temporary Occupancy” easement for exploitation of the resource.

Hydrological studies have been carried out. The conclusions of these studies are that sufficient ground water is available to support production (Estudio Hidrológico, 2008). Production from these wells is estimated to be between 10 and 30 Lps. The wells are expected to average 200 meters deep. It has been estimated in the Lyntek study that approximately 10L/hr /m$^2$ will be applied to the heaps. Heap sizes will vary between 220,000m$^2$ and 371,700 m$^2$. Evaporation rates of 8 to 10% have been estimated. If 10% of the solutions are lost to evaporate make up water required will vary between 60 and 100 Lps. Assuming the wells produce an average of 20 Lps, 3 to 5 wells will be required to sustain production. In addition, the Ejido needs water well and as part of its community outreach program, Esperanza expects to drill a water well for the Ejido. The hydrological study recommends four sites for drilling to test the groundwater. It is assumed these four wells will be finished as production wells for the operations.

Esperanza has determined certain social and community relations programs will be on-going during the life of the mine. As these programs are not yet defined, the costs estimated for them by Esperanza are considered very rough and an order of magnitude estimate.

**TABLE 18.5.4.1 OWNER CAPITAL COSTS (US$)**

| | |
|---|---|
| Permitting | |
| MIA | $50,000 |
| Land Status | $25,000 |
| Land Acquisition | $1,500,000 |
| Water Wells | |
| Production | $48,000 |
| Ejido | $10,000 |
| Total Owner Costs | $1,633,000 |
| Ongoing Owner Costs /yr | $25,000 |

### 18.5.5 Closing Costs

As a part of the MIA, Esperanza will have to detail the plans for mine closure. Typical mine closure activities include:

- Flushing and neutralizing the dumps by removing and destroying any remaining cyanide;
- Re-contouring mine waste dumps and leach pads as necessary to create stable slopes;
- Topping waste dumps and leach pads with top soil and re-vegetation of same;

- Removing all buildings and equipment.

As the plan is not yet developed, costs can only be estimated as a lump sum figure based on costs reported by similar sized operations.

## *18.6 Operating Cost Estimates*

### 18.6.1 Mining

Operating mining costs have been estimated by Dyer (2009) for two mining options, company owned mining fleet and contractor mining fleet. Table 18.6.1.1 shows the operating cost summary for the company owned mining fleet.

## TABLE 18.6.1.1 COMPANY OWNED MINING FLEET OPERATING COSTS (US$)

| Mine Cost Summary | | |
|---|---|---|
| Total Mining Cost LOM | | |
| | Units | Total |
| Drill | US$ | $ 10,542,165 |
| Blast | US$ | $ 13,946,834 |
| Load | US$ | $ 8,037,937 |
| Haul | US$ | $ 27,632,673 |
| Mine Support | US$ | $ 11,333,295 |
| Mine Maintenance | US$ | $ 3,274,782 |
| Mine General Services | US$ | $ 8,631,104 |
| Total | US$ | $ 83,398,789 |
| Mine Cost per Tonne Mined | | |
| Drill | US$/t | $ 0.14 |
| Blast | US$/t | $ 0.19 |
| Load | US$/t | $ 0.12 |
| Haul | US$/t | $ 0.37 |
| Mine Support | US$/t | $ 0.15 |
| Mine Maintenance | US$/t | $ 0.04 |
| Mine General Services | US$/t | $ 0.15 |
| Total | US$/t | $ 1.16 |
| | | |
| Less Pre-stripping | US$ | $ 10,068,000 |
| Net Life-of-Mine Cost | US$ | $ 76,159,000 |
| Net Life-of-Mine Cost | US$/t | $ 1.18 |

### TABLE 18.6.1.2 CONTRACT MINING OPERATING COSTS (US$)

| Mine Cost Summary | | |
|---|---|---|
| Total Mining Cost LOM | | |
| | Units | Total |
| Contract Mine | US$ | $ 75,482,000 |
| Mine Support | US$ | $ 2,300,000 |
| Mine Maintenance | US$ | $ 2.292.000 |
| Mine General Services | US$ | $ 6,174,000 |
| Total | US$ | $ 83,398,789 |
| Mine Cost per Tonne Mined | | |
| Contract Mine | US$/t | $ 1.51 |
| Mine Support | US$/t | $ 0.05 |
| Mine Maintenance | US$/t | $ 0.05 |
| Mine General Services | US$/t | $ 0.12 |
| Total | US$/t | $ 1.73 |
| | | |
| Less Pre-stripping | US$ | $ 15,984,000 |
| Net Life-of-Mine Cost | US$ | $ 70,263,000 |
| Net Life-of-Mine Cost | US$/t | $ 1.75 |

### 18.6.2 Processing

Lyntek Inc. as a part of their process development have estimated operating costs (Lyntek, 2009) for two options, crushing with heap leach and Run-of-Mine with heap leach. For each option the solutions are treated in an ADR plant. Table 18.6.2.1 shows the operating costs for each option.

**TABLE 18.6.2.1 PROCESS OPERATING COSTS**

| Option 1 Crushing and Leaching | | |
|---|---|---|
| **Operation** | Cost per tonne (US$) | Notes |
| Crushing & Stacking | $0.67 | Crusher, stacking conveyors, dozer |
| Process Plant | $2.41 | Includes Carbon Plant, Solution Pumping, Laboratory, and power for Office and Warehouse |
| Total for Crushing/Stacking | $3.08 | |
| **Option 2 ROM and Leaching** | | |
| **Operation** | Cost per tonne (US$) | Notes |
| Spreading ore on Heap | $0.14 | Dozer for spreading only, trucks in mining cost |
| Process Plant | $2.41 | Includes Carbon Plant, Solution Pumping, Laboratory, and power for Office and Warehouse |
| Total for ROM Option | $2.55 | |

### 18.6.3 Refining and Transportation

Refining costs vary widely in part because of the competitive nature of the precious metals refining industry. Precious metal producers are not limited to geography or smelter types as are base metal producers. There are several very reputable refiners in North America. Typical refinery terms include:

- Treatment charges (dollars per troy ounce on net weight received)
- Assay charge generally per lot for each metal
- Accountability (the percentage of the assay the refiner will credit)
- Other special charges
- Outturn (the time to complete the refining)

Treatment charges vary from about $0.60 to $1.30 per troy ounce for gold and about $0.30 per troy ounce of silver. The amount of the treatment charge is generally a negotiated amount depending on the amount expected to be shipped and various other factors.

Assay charges generally vary from $25 to $30 per lot for gold and silver.

Accountability covers the refiner's losses and often includes a part of the profit margin. Accountability for gold ranges from 98% to 99.9% depending on the volume of doré delivered to the refiner and the ability of the producer to negotiate terms. Silver accountabilities range from 93% to 99%. Small lots or low grade doré may reduce these to 90% for gold and 85% for silver. Other special charges generally are related to the levels of impurities.

Transportation of doré is a difficult number to determine but a review of numerous operations showed that transportation generally only adds a few cents per ton to operating costs.

Below are the assumptions made in estimating a refining and transportation cost for Cerro Jumil.

- Treatment charges per ounce of $1.30 for Au and $0.30 for Ag.
- Accountability 98% for Au and 93% for Ag
- Transportation $0.02/ tonne of ore mined or $0.97/ Oz of Au shipped if operation is a crush operation or $1.15 /Oz of Au shipped if operation is ROM.

Detailed calculations are shown in APPENDIX B.

### 18.6.4 G&A

G&A costs for the project include salary and benefits for the General Manager, the Administrative Department (accounting, purchasing and warehousing), the Environmental Department, the Human Relations Department, and the Safety and Security Department. In addition there are administrative assistants, one assigned to the General Manager and one to the Safety and Security Department. The salaries are based on information from a PEA 43-101 Technical Report on the San

Javier copper project in Mexico (Hester et. al., 2007) and a Feasibility Study 43-101 Technical Report on Paradones Amarillos (Kuestermeyer, et al 2008). The numbers shown in Table 18.6.4.1 include salary plus a 40% burden. Table 18.6.4.2 shows a typical organizational chart for a mining operation of the size anticipated for Cerro Jumil.

### TABLE 18.6.4.1 STAFF ESTIMATE AND G&A CALCULATION

| Expat | Position | # | Salary | Total Annual Cost |
|---|---|---|---|---|
| Yes | General Manager | 1 | $200,000 | $200,000 |
| No | Administrative Assistant | 1 | $21,000 | $21,000 |
| No | Administrative Superintendent | 1 | $63,500 | $63,500 |
| No | Chief Accountant | 1 | $47,500 | $47,500 |
| No | Accounting Staff | 2 | $37,000 | $74,000 |
| No | Purchasing Manager | 1 | $47,500 | $47,500 |
| No | Purchasing staff | 1 | $26,500 | $26,500 |
| No | Warehouse Manager | 1 | $47,500 | $47,500 |
| No | Warehouse Staff | 2 | $26,500 | $53,000 |
| No | Environmental Manager | 1 | $63,500 | $63,500 |
| No | Environmental Engineer | 1 | $45,000 | $45,000 |
| No | Environmental Technician | 2 | $47,500 | $95,000 |
| No | HR Manager | 1 | $47,500 | $47,500 |
| No | HR Staff | 2 | $37,000 | $74,000 |
| No | Janitorial Staff | 6 | $5,000 | $30,000 |
| No | Safety and Security Manager | 1 | $63,500 | $63,500 |
| No | Safety Specialist | 1 | $37,000 | $37,000 |
| No | Receptionist/Safety Secretary | 1 | $21,000 | $21,000 |
| No | Security Chief | 1 | $45,000 | $45,000 |
| No | Security Guards | 8 | $18,000 | $144,000 |
| | TOTAL | 36 | | $1,246,000.00 |
| | | G&A Supplies @50% | | $623,000.00 |
| | | | | $1,869,000.00 |
| | | LoM $/Tonne | | $0.67 |

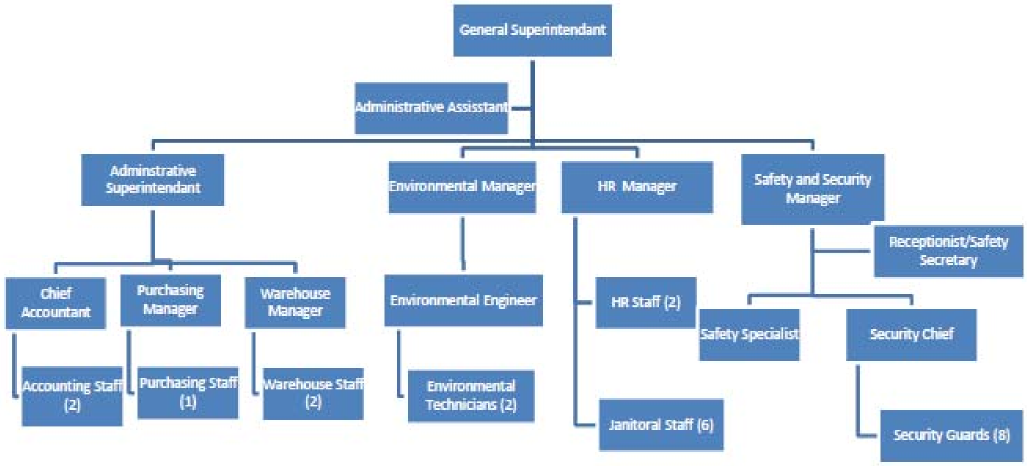



**Figure 18.6.4.1 Typical Organization Chart of a Heap Leach Gold Operation**

## *18.7 Economic Analysis and Sensitivities*

Cash flow models were developed for four cases. Those four cases were:

1. Base Case – Company owned mining fleet with crushed ore delivered to the leach pad;
2. Option 1 – Company owned mining fleet with run-of-mine delivered to the leach pad;
3. Option 2 – Contractor owned mining fleet with crushed ore delivered to the leach pad;
4. Option 3 - Contractor owned mining fleet with run-of-mine delivered to the leach pad.

Shown in Table 18.7.1 is a summary of the findings for each case.

**TABLE 18.7.1 SUMMARY OF PRETAX CASH FLOW MODELS FOR CERRO JUMIL**

| Case | Pretax Cash flow (US$ X $10^6$) | NPV at 5% Discount Rate (US$ X $10^6$) | Internal Rate of Return (IRR) | Payback Period (Years) |
|---|---|---|---|---|
| Base Case | 79.43 | 46.74 | 19.47% | 4.4 |
| Option 1 | 14.67 | -1.53 | 4.42% | 7.0 |
| Option 2 | 56.98 | 32.88 | 17.39% | 4.05 |
| Option 3 | -0.18 | -11.15 | -0.07 | NA |

The following assumptions were made to develop the cash flows. They are:

- The mine production was based on the production schedules developed by Dyer (2009)
- OPEX and CAPEX costs for mining were based on studies done by Dyer (2009)
- Recoveries for the crushed option is 70% for Au and 65% for Ag as indicated by the process study (Lyntek, 2009)
- Recoveries for the ROM option is 50% for Au and 50% for Ag as indicated by the process study (Lyntek, 2009)
- Processing CAPEX and OPEX costs were estimated by Lyntek for the two processing options (Lyntek, 2009)
- Construction and materials costs were estimated by Vector Engineering for the Heap Leach pads (Khoury et al, 2009)
- G&A costs and refining and transportation costs were estimated by Vector engineering based on costs reported by similar operations.

The Base Case utilizes a Company owned mining fleet with crushing as the processing method is the most favorable option. The cash flow models for each case are in Appendix C.

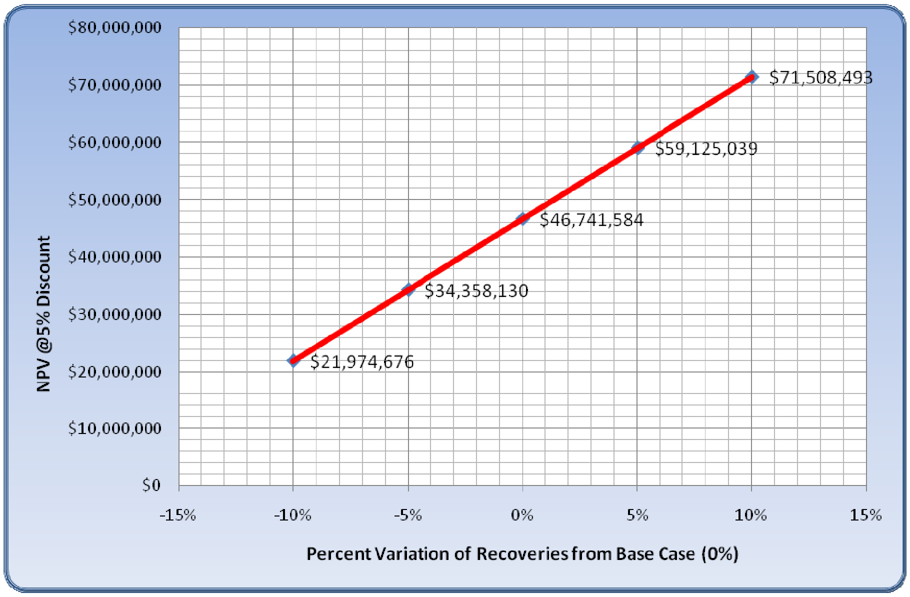
Using the Base Case, sensitivities to changes in recovery, capital costs, operating costs and gold price were examined using the NPV at a 5% discount rate as the basis for comparison. Each of these factors was looked at in a range of ± 10% of the base case values in increments of 5%. Figures 18.7.1 to 18.7.4 summarize the results of the sensitivity analysis.

The base case values are:

- Recoveries for Au is 70 %, Ag is 65%;
- Total LOM Capital Costs are US$ 82,164,828;
- Total LOM Operating Costs excluding royalties are US$165,281,454

- The gold price is US$800

### Figure 18.7.1 Variation in NPV with Changes in Recovery




### Figure 18.7.2 Variation in NPV with Changes in Capital Costs

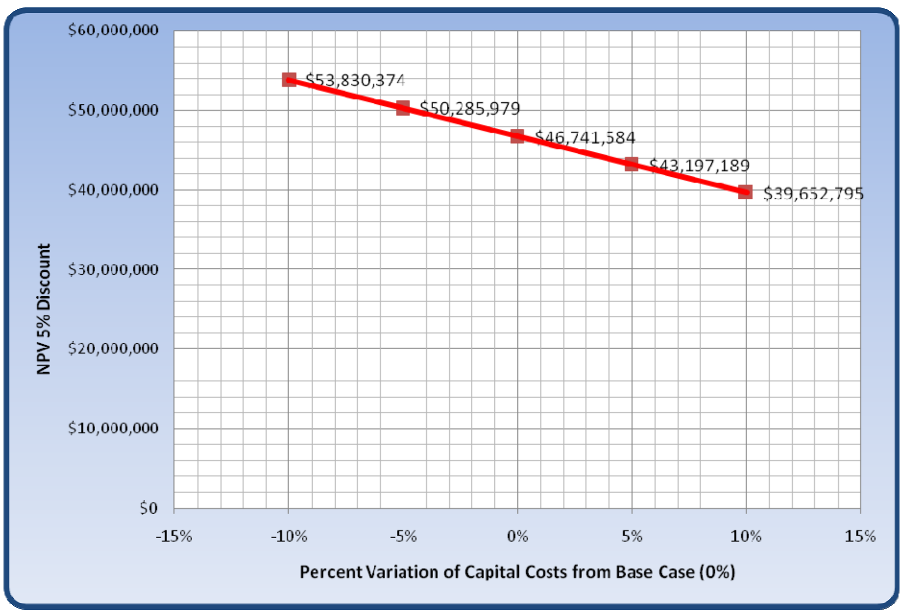


**Figure 18.7.3 Variation in NPV with Changes in Operating Costs**

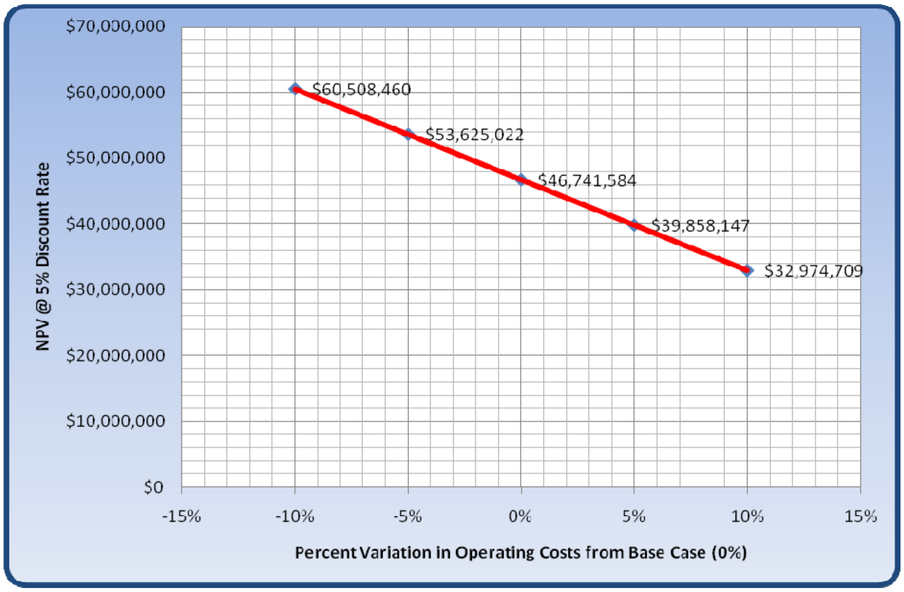
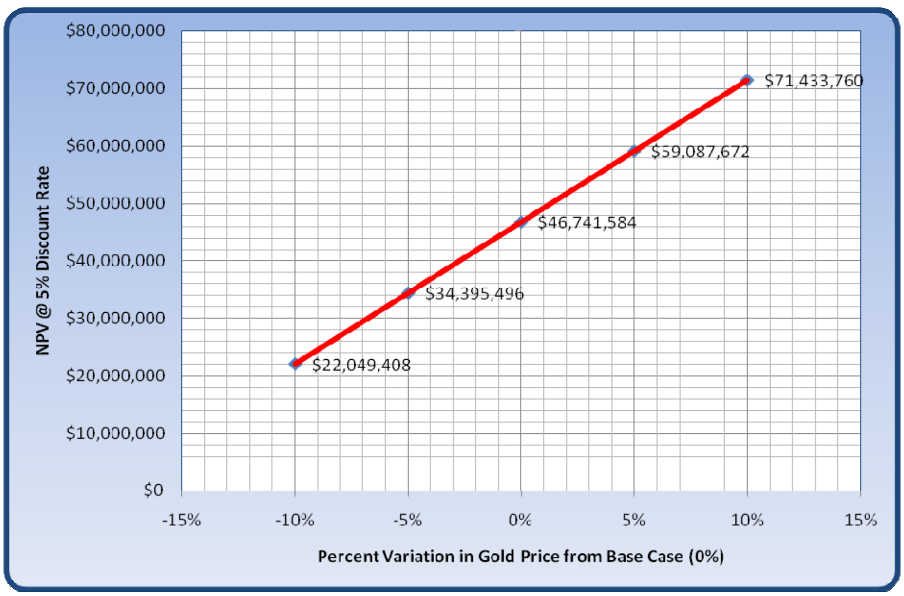



**Figure 18.7.4 Variation in NPV with Changes in Gold Price**




The following conclusions can be reached about the sensitivities based the graphs in Figures 18.7.1 to 18.7.4. They are:

- The project is most sensitive to changes in recovery and gold price;
- The project is least sensitive to changes in CAPEX costs;
- A decrease in the gold price from $800 to about $650 per ounce produces a zero NPV at a 5% discount rate in the base case;
- An increase of about 34% in operating costs produces an NPV equal to zero at a discount rate of 5%;
- A decrease in recovery of about 14% to a recovery of 56% of Au will produce an NPV of zero at a 5% discount rate.

Reviewing the sensitivities and the other cases, recovery appears to be the critical aspect of the economics. This emphasizes the need for significant metallurgical testing at an early stage in the upcoming drilling program. It also emphasizes the need for a plan to obtain relatively large volumes of representative material for this testing. The details of the recommended testing are discussed in Section 20.2.

## *19.0 INTERPRETATION AND CONCLUSIONS*

The Cerro Jumil project, located in the State of Morelos, México, is at an advanced stage of exploration. Drilling as September 2008 defined a resource that formed the basis for the preliminary economic analysis completed in December 2009. The economic analysis showed that the probability of Cerro Jumil developing into a viable orebody is good, and work should begin to proceed toward a final feasibility study.

Significant in-fill drilling was completed on the Cerro Jumil project from December 2009 thru June 2010. This report updates the previous resources used for the preliminary economic assessment report based upon this new drilling. There is a 46% increase in the measured and indicated (MI) gold equivalent ounces as compared to the 2008 resource. As reported at a 0.3 g/t gold equivalent cutoff, measured and indicated gold equivalent ounces now total 935,000 ounces, and there are a further 252,000 gold equivalent ounces in the inferred category. In addition to the gold dominant resources, there is a silver dominant resource that contains a further 3,322,000 inferred silver ounces at a silver cutoff grade of 25 g/t. The 2010 resource model update further strengthens the 2009 preliminary economic assessement of Cerro Jumil gold-silver skarn deposit as a candidate with significant merit for an open pit mining operation.

## 20.0 RECOMMENDATIONS AND BUDGETS

A primary objective of this report, derived from the 2009 preliminary economic assessment report, was to develop recommendations and budgets for the scope of work necessary to proceed toward a feasibility study. Sections 20.1 to 20.5 detail these recommendations and the estimated budgets required to complete the recommended work. It is recommended Esperanza Resources proceed with exploration work, metallurgical test work and process testing, mine design work, geotechnical engineering field work to characterize the site, environmental permitting work, and land acquisition to develop the framework to develop a final feasibility study. Esperanza has completed or is in the process of completing some of these recommendations. Appendix D is the Table of Contents for a typical final or bankable feasibility study. This provides a framework for the ongoing studies. The recommendations focus on exploration, mine design including geotechnical work, process and metallurgical testing and geotechnical testing for site characterization. Table 20.0.1 summarizes the estimated budgets required to complete the recommendations discussed in Sections 20.1 to 20.5 and has been modified from the original to acknowledge some of the work completed since the preliminary assessment report was written.

**TABLE 20.0.1 ESTIMATED BUDGETS FOR THE RECOMMENDED WORK**

| | |
|---|---|
| Exploration Drilling and Support | $1,600,000 |
| Metallurgical Testing | $60,000 |
| Geotechnical Testing Pit Design | $20,000 |
| Geotechnical Heap and foundations | $128,500 |
| Permitting for Production | $75,000 |
| Land Acquisition | $1,500,000 |
| Totals | $3,383,500 |

## 20.1 Exploration Recommendations

It is recommended that continued exploration drilling be undertaken to delineate the extent and grade of gold-silver mineralization in the West Zone at Cerro Jumil. Drilling should focus on upgrading inferred resources to the measured and indicated categories and evaluating additional nearby exploration targets that could add significant resources. It is recommended that a combination of core and RC drilling be implemented to further define these areas. The recommended drilling would include approximately 11,000 meters, of which 8,000 would be dedicated to upgrading the resources classified as inferred, and the balance used to explore new targets and complete condemnation drilling in the areas of the heap leach pad and the waste dumps. The following, Table 20.1.1, gives a cost estimate to complete the recommended exploration program.

**TABLE 20.1.1 RECOMMENDED CERRO JUMIL EXPLORATION BUDGET (US $)**

| | |
|---|---|
| Geological and Logistical Support | $325,000 |
| Road and Drill Site Construction | $50,000 |
| Drilling (11,000 mts @ 110/mt) | $1,210,000 |
| Geochemical Analysis (Drill Samples) | $200,000 |
| Exploration Permitting and Related Costs | $15,000 |
| Total | $1,600,000 |

### *20.2 Metallurgical and Process Testing*

Lyntek (2009) made the following recommendations for additional metallurgical testing: 1) Further test work is required to adequately characterize the leaching behavior of both the crushed and ROM ore. 2) Additionally, crushing tests are needed to optimize the crushing plant design in the crushing option.

The testing to date has shown that ore from most of the deposit can be leached at finer sizes in bottle roll tests. For more detailed feasibility evaluations, tests that are more representative of heap leaching conditions are recommended. These can include some mix of static (or Bucket) leach tests, column leach test and possibly pilot heap leach tests.

The primary recommendation for additional metallurgical testing at this time is for additional column tests. These tests should include:

1. Assays for gold and silver of the feed to each test and the residue from each test by size fraction
2. Assay for gold and silver content of the activated carbon in each test (for closed circuit tests)
3. Proper measurement of lime consumption in all column tests
4. Proper measurement of cyanide consumption in all column tests
5. Monitoring of any settlement of the charge to the column
6. Monitoring of the recovery of gold and silver to ensure that test is run to completion (or run all tests to at least 90 days)
7. Analysis of the final leach liquor for a suite of elements to check for build-up of detrimental constituents. Most analytical laboratories offer economical ICP scans covering many elements. Mercury should always be included in these analyses.

While much useful information can be gained from running additional column tests on minus 1” or finer samples, Lyntek recommended that some tests be run on minus 2” samples and uncrushed samples in large diameter columns as early in the project as possible. These tests will give the best indication of the relative recovery of ROM versus crushed ore on the heap. At the feasibility level of assessment, bulk samples from test pits are recommended.

Column Leach tests can be run in open or closed circuit for the lixiviant. In open circuit tests the lixiviant (leach solution) passes through the column once and is sampled, the sample is assayed for precious metals, cyanide and lime (alkalinity) then the excess is discarded. In a typical closed circuit test column leach, a portion of the leach solution is passed through the leaching column, and collected underneath. Samples are taken for assay, and then the main portion is passed through a carbon column to absorb the precious metals. Make up water, cyanide and lime are added as necessary to the barren solution, and then that portion is ready to pass through the leach column again. The total leach solution will be divided into at least two portions so the column always has leach solution passing through.

Careful technique and management of solutions is critical to get useable results from closed circuit tests. Note that the carbon will need to be sampled and the sample assayed periodically to ensure that it is not saturated with gold and silver. Also, the carbon should be blended, sampled and assayed at the end of the test for total mass balance measurements.

Open circuit tests are easier to analyze and have fewer problems with interferences. However, more solution will be required which can become prohibitive for large columns. If interferences are found in closed circuit column leach tests, that is an indication that the same problems may occur in full-scale operation. Multi-element analyses of the final leach solutions from closed circuit tests will also more easily demonstrate the concentration build-up of any detrimental elements.

Small pilot leach pads can be constructed to test larger bulk samples, if desired for advanced feasibility or design evaluation. These tests would be operated in closed circuit and would require a small carbon adsorption plant. Other than the volume of material, basic operation would be very similar to closed circuit column leach tests. This type of leach testing would be very expensive.

There are several tests to characterize the crushing behavior of an ore. Common tests include the Bond Crushing Index test and the Abrasion Index test. The Crushing Index test gives an indication of the power that a crushing plant would draw, given the feed and product sizes and the throughput required. The Abrasion Index test results will allow prediction of the wear on crusher parts, which is a significant factor in operating costs. Crushing tests will also produce product size distribution predictions. These are needed for the evaluation of the bucket tests, and the preparation of feed samples for the column tests. Crushed ore size distribution data is also needed to evaluate the necessity or advantage of separate fines treatment. Some crushed ore size distribution data can be gathered while preparing composite samples from core.

The total cost of the recommended basic feasibility level metallurgical testing program is estimated to be on the order of $130,000 exclusive of sample acquisition costs (drilling, channel sampling, etc.) and the feasibility study. Approximately $100,000 of this estimate is for the laboratory tests alone. The remaining $30,000 is for site and laboratory visits by the process engineer and a data analysis and evaluation report by the process engineer.

The estimated laboratory charges are based on rates from McClelland Laboratories in Reno, Nevada and RDI in Wheat Ridge, Colorado. These laboratories have reputations for doing the type of work recommended and will need little supervision. The test work may be less expensive at laboratories in Mexico, but it is recommended in that case a representative of the process engineer visit the laboratory to ensure that the recommended test procedures are understood and will be properly executed. The estimate of costs for the process engineering support does include the site visit and the laboratory visit. It also includes a data analysis report, which may become a portion of the process evaluation for the feasibility study. Table 20.2.1 details the costs associated with this type of recommended metallurgical testing.

### TABLE 20.2.1 RECOMMENDED METALLURGICAL TESTING BUDGET

| Test Type | Number of Tests | Estimated Cost per Test | Extended Cost |
|---|---|---|---|
| **Crushing Tests** | | | |
| Crushing Work Index[1] | 2 | $ 750 | $ 1,500 |
| Abrasion Index[1] | 2 | $ 750 | $ 1,500 |
| **Leach Tests** | | | |
| Static "Bucket" | | | |
| By Size Fraction | | | |
| -2"[1] | 3 | $ 1,500 | $ 4,500 |
| 2" x 4"[1] | 3 | $ 1,500 | $ 4,500 |
| 4" x 6"[1] | 3 | $ 1,500 | $ 4,500 |
| 6" x 12"[1] | 3 | $ 1,500 | $ 4,500 |
| +12"[1] | 3 | $ 1,500 | $ 4,500 |
| | | | |
| Column Leach Tests | | | |
| -2" Feed - 12" Column[2] | 2 | $ 8,000 | $ 16,000 |
| ROM up to 48" Column[2] | 2 | $ 16,000 | $ 32,000 |
| Bottle Roll Tests | | | |
| Column Feed Splits[1] | 4 | $ 750 | $ 3,000 |
| **Expected Miscellaneous Additional Laboratory Costs** | | | |
| Misc. Solution & Residue | | 10% | $ 7,650 |
| Data Analysis & Report (lab) | | 20% | $ 15,300 |
| **Site and Laboratory Supervision** | | | $ 30,000 |
| **Total Program Estimate** | | | **$ 129,450** |

*Items with Superscript [1] quoted by RDI*

*Items with Superscript [2] quoted by McClelland Laboratories*

## *20.3 Mine Design and Pit Stability Geotechnical Studies*

The conceptual design will require new pit shells based on the new 2010 resources given in this report. The pit design should incorporate geotechnical information about rock strength or fracture and bedding directions. To design a pit for feasibility study additional geotechnical information needs to be gathered. Recommendations for geotechnical studies resulted from recommendations by Dyer (2009) and discussions with geotechnical engineers from Vector experienced in rock mechanics and geotechnical testing.

With the commencement of the next phase of drilling, it is recommended that geotechnical data be collected as a part of the logging process. Geotechnical studies of structure and testing of rock strength should begin with the drilling to characterize the site parameters for pit design. Esperanza Silver's geologists have collected RQD (Rock Quality Date) during the previous drill campaigns. The recommended activities for the collection of geotechnical data for pit design include:

- Surficial geologic/structure mapping
- Geotechnical logging of exploration drill core and development of a geotechnical database on core drill holes completed within the proposed open pit area. Rock Quality Designation (RQD), rock hardness, alteration/weathering, number of primary joints and relative angle of joint sets to the core should all be determined to establish the preliminary Rock Mass Rating (RMR).
- Selection of rock core samples for uniaxial compressive strength testing. Additional strength information will be developed from a series of point load tests completed in the field.
- Geotechnical/structural domain determination based on preliminary geotechnical database and surficial mapping.
- Incorporation of hydrogeologic model into the geotechnical model
- Global slope stability analysis.
- Development of oriented core drilling program based on the preliminary geotechnical database.
- Reevaluate structural domains, slope stability and provide final pit slope geometry based on results of oriented core drilling program.

It is recommended a geotechnical engineer visit the site when core drilling starts to train the geologists in the proper recovery of geotechnical data from the core. Additional visits will be required to select core for strength testing and to conduct the field point load testing. As much of this information will be collected by the geologists logging the core the costs will be in the visits by the geotechnical engineer and the lab testing. It is estimated this may cost US$ 20,000. Once preliminary work has been completed, the pit design can be reviewed and modified as necessary.

### *20.4 Heap Leach and Foundation Geotechnical Testing*

Khoury et. al (2009) recommended geotechnical field and laboratory testing programs be conducted as a part of the work for the feasibility study to generate sufficient site-specific data to complete the feasibility design of the heap leach facility. The investigation would consist of boreholes to be drilled with a drill rig and test pits to be excavated with a backhoe, and may also include evaluation of potential onsite and offsite sources of borrow materials.

**Boreholes:** Up to 12 boreholes will be drilled at the proposed locations of the ultimate leach pad and ponds. The boreholes will vary in depth depending on their locations however; they are expected to be less than 30 m deep. The objective of the boreholes will be to identify the subsurface materials including the overburden soil, the weathered bedrock and the competent bedrock. The holes will be drilled with a coring rig using specialized core barrel recovery systems to ensure that the material is recovered without disturbance.

**Test Pits:** Up to 30 test pits will be excavated at the proposed locations of the ultimate leach pad and ponds to complement the boreholes. The test pits will be excavated with a backhoe large enough to reach a depth of 6 m. Bulk samples of materials from the test pits will be collected for laboratory testing. After completion of sampling and testing, the test pits will be backfilled with the excavated materials.

Samples of the subsurface materials collected from the boreholes and test pits will be subjected to a laboratory testing program developed by Vector to assess material characteristics and parameters for use in the engineering analyses and designs of the leach facility and the development of construction specifications. The following are the types of tests anticipated to be performed:

- Natural moisture content and density
- Gradation
- Atterberg limits plasticity
- Proctor moisture-density relationship
- Remolded permeability
- Consolidation
- Direct shear
- Triaxial shear

The cost of the geotechnical testing for heap leach pad and foundation design is estimated to be approximately US$ 128,500. The budget is shown in Table 19.3.1.

**TABLE 20.3.1 ESTIMATED BUDGET FOR GEOTECHNICAL TESTING FOR LEACH PAD AND FOUNDATIONS**

| Activity | Units | Cost (US$) /Unit | Total Units | Cost (US$) | Supervision US$ | Total |
|---|---|---|---|---|---|---|
| Drilling | Meters | $120 | 500 | $60,000 | $21,000 | $81,000 |
| Test Pitting | Hrs | $80 | 120 | $9600 | $13,000 | $22,600 |
| Lab Testing | Lump Sum | | | $20,000 | $4900 | $24,900 |
| Total | | | | $89,600 | $38,900 | $128,500 |

Once the geotechnical work is completed and a reserve number estimated, engineering design of the heap leach pad can proceed at a feasibility study level. Khoury et al (2009) further recommended a seismic assessment be completed for Cerro Jumil and the results incorporated into the feasibility study engineering design.

### *20.5 Permitting and Land Acquisition*

Esperanza has, through Consultores Ambientales Asociados (CAA), an environmental and remediation consulting company, permitted exploration programs but has done only preparatory work toward the applications for the MIA and land status change permits. The first recommended step in the permitting process is the development of a Permit Handbook that would define the permits required and the timeframes necessary to obtain these permits. Often obtaining permits can prove to be the critical path issue in proceeding with production. Defining the potential critical path issues in the permitting process will allow planning to account for the time necessary to proceed with the work for final feasibility. The permit Handbook will include:

- Identification of required permits
- Identification of requirements for each permit
- Identification of timelines for each permit
- Identification of permit sequencing

Developing the Handbook will provide a road map for the permitting process and identify those permits with long lead times that will require initiation early in the process. The budget estimated for the permitting process is US$75,000.

Esperanza will have to acquire the surface rights to lands belonging to the Ejido. Esperanza estimates that negotiating a "right to occupy" these lands will cost about US$1,500,000. This cost is included in the owner's costs for the capital budget in the cash flow models.

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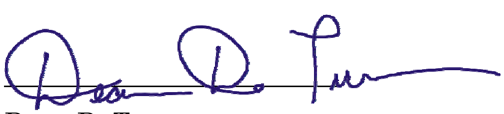
## *22.0 CERTIFICATES OF QUALIFIED PERSONS*

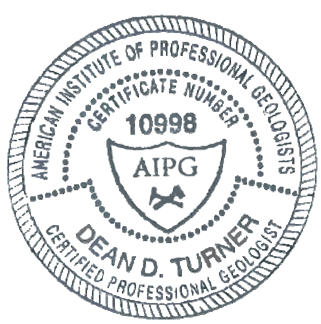
### *22.1 Dean D. Turner*

CERTIFICATE OF THE AUTHOR:

- I, Dean D. Turner, am a Certified Professional Geologist, with an office at 10607 Brown Fox Trail, Littleton, Colorado, USA 80125.
- I am an American Institute of Professional Geologists (AIPG) Certified Professional Geologist, in good standing, and my certificate number is 10998.
- I am a graduate of the University of Arizona with a Bachelors degree in Geosciences, and of the Colorado School of Mines with a Masters degree in Mineral Exploration and Mining Geosciences.
- I have practiced my profession continuously for over 30 years since graduation from the University of Arizona in 1980, and have held both exploration and production geological positions.
- Due to my academic qualifications, experience and certification, I am a Qualified Person as defined in Companion Policy 43-101CP, National Instrument 43-101, Standards of Disclosure for Mineral Projects.
- I visited the Cerro Jumil property January 16-17, 2008.
- I am responsible for the preparation of sections 14.1 and 17.0 in the technical report titled "Cerro Jumil Project, Mexico, NI 43-101 Technical Report" dated 16th September 2010.
- I am not aware of any material fact or material change with respect to the subject property of this technical report not reflected in this report, the omission of which would make this report misleading.
- I am independent of Esperanza Resource Corporation and all subsidiaries in accordance with the application of Section 3.5 of the Companion Policy 43-101CP of National Instrument 43-101, Standards of Disclosure for Mineral Properties.
- I have read National Instrument 43-101, Standards of Disclosure for Mineral Properties and Form 43-101F1, Technical Report and this report has been prepared in compliance with National Instrument (NI) 43-101 and Form 43-101F1.
- That, as of the date of the certificate, to the best of the qualified person's knowledge, information and belief, this report contains all scientific and technical information required to be disclosed to make the technical report not misleading.

Signed and dated in Littleton, Colorado on the 28th day of October, 2010.






Dean D. Turner
10607 Brown Fox Trail
Littleton, Colorado USA 80125

## 22.2 *William D. Bond*

CERTIFICATE OF THE AUTHOR:

- I, William D. Bond, am a Registered Professional Geologist, with an office at 10244 N. West Newman Lake Drive Newman Lake, Washington USA 99025
- I am a Registered Professional Geologist in the State of Oregon, in good standing and my registration number is G885.
- I am a graduate of Winona State University with a (B.A.) degree in Geology, 1974 and a graduate of the South Dakota School of Mines and Technology with a (M.S.) degree in Geology, 1982.
- I have practiced my profession continuously since graduation for the past 30 years and have held both exploration and production geological positions.
- Due to my academic qualifications, experience and certification, I am a Qualified Person as defined in Companion Policy 43-101CP, National Instrument 43-101, Standards of Disclosure for Mineral Projects.
- I have spent more than 400 days at the Cerro Jumil project between October 2003 and present with site visits lasting from 5 to 10 days duration.
- I am responsible for the preparation of all sections of this report, except for sections 14.1 and 17.0, whose contents are updated from the same sections in the technical report titled "Cerro Jumil Project, Mexico, Preliminary Economic Assessment, NI 43-101 Technical Report" dated 23rd December 2009.
- I am not aware of any material fact or material change with respect to the subject property of this technical report not reflected in this report, the omission of which would make this report misleading.
- I am an officer of Esperanza Resources Corporation that owns the majority of shares of the Méxican company Esperanza Silver de México, S.A. de C.V. which controls the property that is the subject of this report and therefore am not independent as Section 3.5 of the Companion Policy 43-101CP of National Instrument 43-101, Standards of Disclosure for Mineral Properties.
- I have read National Instrument 43-101, Standards of Disclosure for Mineral Properties and Form 43-101F1, Technical Report and this report has been prepared in compliance with National Instrument (NI) 43-101 and Form 43-101F1.
- That, as of the date of the certificate, to the best of the qualified person's knowledge, information and belief, this report contains all scientific and technical information required to be disclosed to make the technical report not misleading.

Signed and dated in Newman Lake, Washington on the 28th day of October, 2010.

Signed: "*William Bond*"
William D. Bond
10244 N. West Newman Lake Drive
Newman Lake, Washington USA 99025

# APPENDIX A
# SIGNIFICANT DRILL HOLE INTERVALS

# SIGNIFICANT DRILL HOLE INTERVALS

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| **West Zone** | | | | |
| DHE-05-01 | 48.9 | 85.2 | 36.3 | 2.20 |
| DHE-05-02 | 27.9 | 43.7 | 15.8 | 0.82 |
| DHE-05-03 | 63.5 | 71.5 | 8.0 | 2.68 |
| DHE-05-04 | 94.6 | 101.5 | 6.9 | 1.28 |
| DHE-05-05 | 99.7 | 120.2 | 20.5 | 1.91 |
| includes | 99.7 | 110 | 10.3 | 2.69 |
| DHE-05-07 | 7 | 10.75 | 3.75 | 2.76 |
| DHE-05-08 | 49.25 | 52.5 | 3.25 | 0.60 |
| DHE-05-08 | 66.35 | 101.3 | 34.95 | 0.24 |
| includes | 66.35 | 74.9 | 8.55 | 0.31 |
| includes | 80.5 | 87.6 | 7.1 | 0.37 |
| includes | 96.75 | 101.3 | 4.55 | 0.56 |
| DHE–05-09 | 179.22 | 182.22 | 3 | 0.96 |
| DHE-06-34 | 165.0 | 173.0 | 8.0 | 0.33 |
| RCHE-08-88 | 63.0 | 67.5 | 4.5 | 1.97 |
| **Las Calabazas** | | | | |
| DHE-06-33 | 127.0 | 134.0 | 7.0 | 1.44 |
| DHE-07-54 | 96.5 | 106.5 | 7.0 | 2.41 |
| DHE-07-54 | 159.0 | 187.5 | 28.5 | 1.87 |
| DHE-07-55 | 178.0 | 193.0 | 15.0 | 1.52 |
| DHE-08-57 | 95.5 | 127.0 | 31.5 | 1.42 |
| DHE-08-59 | 69.0 | 88.5 | 19.5 | 1.46 |
| DHE-08-61 | 168.1 | 192.5 | 24.4 | 2.12 |
| includes | 176.0 | 185.0 | 9.0 | 3.11 |
| DHE-08-62 | 59.5 | 76.0 | 16.5 | 0.68 |
| DHE-08-62 | 134.5 | 140.5 | 6.0 | 1.22 |
| DHE-08-62 | 182.5 | 205.0 | 22.5 | 2.17 |
| DHE-08-63 | 134.0 | 195.5 | 61.5 | 0.67 |
| includes | 170.0 | 186.5 | 16.5 | 1.40 |
| DHE-08-64 | 153.5 | 167.0 | 13.5 | 2.39 |
| DHE-08-65 | 17.5 | 38.5 | 21.0 | 0.74 |
| DHE-08-65 | 74.5 | 86.5 | 12.0 | 1.47 |
| DHE-08-66 | 126.0 | 133.5 | 7.5 | 0.51 |
| RCHE-09-105 | 12.0 | 15.0 | 3.0 | 1.120 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-09-106 | 4.5 | 10.5 | 6.0 | 1.982 |
| RCHE-09-107 | 6.0 | 15.0 | 9.0 | 1.659 |
| RCHE-09-111 | 1.5 | 27.0 | 25.5 | 1.344 |
| RCHE-09-112 | 46.5 | 69.0 | 22.5 | 1.092 |
| RCHE-09-112 | 172.5 | 189.0 | 16.5 | 1.658 |
| RCHE-09-112 | 204.0 | 214.5 | 10.5 | 1.127 |
| RCHE-09-112 | 286.5 | 295.5 | 9.0 | 1.424 |
| RCHE-09-112 | 306.0 | 324.0 | 18.0 | 1.358 |
| RCHE-09-113 | 6.0 | 15.0 | 9.0 | 0.801 |
| RCHE-09-113 | 96.0 | 129.0 | 33.0 | 0.528 |
| includes | 96.0 | 106.5 | 10.5 | 0.964 |
| RCHE-09-114 | 54.0 | 78.0 | 24.0 | 1.090 |
| RCHE-09-114 | 94.5 | 108.0 | 13.5 | 0.539 |
| RCHE-09-114 | 132.0 | 153.0 | 16.5 | 1.274 |
| RCHE-09-115 | 15.0 | 30.0 | 15.0 | 1.373 |
| RCHE-09-115 | 121.5 | 133.5 | 12.0 | 0.967 |
| RCHE-09-116 | 91.5 | 109.5 | 18.0 | 1.595 |
| RCHE-10-117 | 40.5 | 88.5 | 48.0 | 0.971 |
| includes | 51.0 | 57.0 | 6.0 | 2.348 |
| RCHE-10-118 | 0.0 | 9.0 | 9.0 | 0.781 |
| RCHE-10-118 | 16.5 | 33.0 | 16.5 | 0.725 |
| RCHE-10-118 | 45.0 | 55.5 | 10.5 | 1.087 |
| RCHE-10-118 | 63.0 | 70.5 | 7.5 | 1.566 |
| RCHE-10-118 | 124.5 | 139.5 | 15.0 | 1.170 |
| RCHE-10-119 | 42.0 | 87.0 | 45.0 | 0.475 |
| RCHE-10-120 | 4.5 | 12.0 | 7.5 | 1.202 |
| RCHE-10-120 | 54.0 | 81.0 | 27.0 | 0.741 |
| RCHE-10-120 | 87.0 | 123.0 | 36.0 | 0.660 |
| includes | 96.0 | 105.0 | 9.0 | 1.265 |
| RCHE-10-120 | 141.0 | 148.5 | 7.5 | 0.678 |
| RCHE-10-121 | 1.5 | 30.0 | 27.0 | 0.832 |
| includes | 7.5 | 19.5 | 10.5 | 1.125 |
| RCHE-10-121 | 69.0 | 81.0 | 12.0 | 0.678 |
| RCHE-10-122 | 46.5 | 66.0 | 19.5 | 1.245 |
| RCHE-10-123 | 30.0 | 46.5 | 16.5 | 1.374 |
| RCHE-10-124 | 27.0 | 51.0 | 24.0 | 0.95 |
| includes | 31.5 | 40.5 | 9.0 | 1.44 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-10-125 | 1.5 | 22.5 | 21.0 | 0.665 |
| RCHE-10-126 | 0.0 | 75.0 | 75.0 | 0.718 |
| includes | 30.0 | 43.5 | 13.5 | 1.428 |
| RCHE-10-127 | 36.0 | 51.0 | 15.0 | 0.860 |
| RCHE-10-127 | 85.5 | 118.5 | 33.0 | 2.053 |
| includes | 100.5 | 117.0 | 16.5 | 2.924 |
| RCHE-10-128 | 120.0 | 144.0 | 24.0 | 0.917 |
| includes | 121.5 | 130.5 | 9.0 | 1.703 |
| RCHE-10-129 | 43.5 | 51.0 | 7.5 | 1.127 |
| RCHE-10-129 | 60.0 | 93.0 | 33.0 | 1.069 |
| RCHE-10-130 | 85.5 | 105.0 | 19.5 | 0.765 |
| includes | 94.5 | 102.0 | 7.5 | 1.118 |
| RCHE-10-131 | 28.5 | 54.0 | 25.5 | 0.343 |
| RCHE-10-132 | 90.0 | 102.0 | 12.0 | 1.543 |
| RCHE-10-133 | 73.5 | 88.5 | 15.0 | 1.348 |
| RCHE-10-134 | 40.5 | 61.5 | 21.0 | 1.060 |
| includes | 49.5 | 61.5 | 12.0 | 1.453 |
| RCHE-10-135 | 10.5 | 43.5 | 33.0 | 0.535 |
| RCHE-10-135 | 63.0 | 81.0 | 18.0 | 1.045 |
| RCHE-10-137 | 16.5 | 25.5 | 7.5 | 0.540 |
| RCHE-10-137 | 58.5 | 66.0 | 7.5 | 0.654 |
| RCHE-10-138 | 12.0 | 16.5 | 4.5 | 0.605 |
| RCHE-10-138 | 58.5 | 64.5 | 6.0 | 0.645 |
| RCHE-10-139 | 15.0 | 48.0 | 28.5 | 0.872 |
| RCHE-10-141 | 10.5 | 37.5 | 27.0 | 1.172 |
| RCHE-10-142 | 0.0 | 16.5 | 16.5 | 0.879 |
| RCHE-10-142 | 39.0 | 63.0 | 24.0 | 2.036 |
| RCHE-10-143 | 0.0 | 6.0 | 6.0 | 1.136 |
| RCHE-10-143 | 15.0 | 22.5 | 7.5 | 3.258 |
| RCHE-10-144 | 24.0 | 30.0 | 6.0 | 0.736 |
| RCHE-10-145 | 0.0 | 28.5 | 28.5 | 1.522 |
| includes | 15.0 | 25.5 | 10.5 | 2.493 |
| RCHE-10-146 | 118.5 | 144.0 | 25.5 | 1.636 |
| includes | 120.0 | 129.0 | 9.0 | 2.020 |
| includes | 136.5 | 144.0 | 7.5 | 2.272 |
| RCHE-10-147 | 27.0 | 33.0 | 6.0 | 1.782 |
| RCHE-10-147 | 94.5 | 123.0 | 28.5 | 1.844 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-10-148 | 34.5 | 48.0 | 13.5 | 2.076 |
| RCHE-10-149 | 67.5 | 76.5 | 9.0 | 0.950 |
| RCHE-10-149 | 88.5 | 97.5 | 9.0 | 1.017 |
| RCHE-10-150 | 51.0 | 66.0 | 15.0 | 1.740 |
| RCHE-10-151 | 15.0 | 25.5 | 10.5 | 3.794 |
| RCHE-10-151 | 55.5 | 148.5 | 93.0 | 1.813 |
| includes | 63.0 | 73.5 | 10.5 | 3.198 |
| includes | 121.5 | 132.0 | 10.5 | 4.243 |
| RCHE-10-152 | 34.5 | 42.0 | 7.5 | 0.911 |
| RCHE-10-152 | 75.0 | 133.5 | 58.5 | 1.233 |
| includes | 115.5 | 126.0 | 10.5 | 2.118 |
| RCHE-10-153 | 25.5 | 51.0 | 25.5 | 1.965 |
| RCHE-10-153 | 94.5 | 114.0 | 19.5 | 1.591 |
| includes | 97.5 | 103.5 | 6.0 | 3.613 |
| RCHE-10-154 | 16.5 | 42.0 | 25.5 | 0.867 |
| RCHE-10-154 | 49.5 | 60.0 | 10.5 | 1.980 |
| includes | 54.0 | 60.0 | 6.0 | 3.049 |
| RCHE-10-154 | 73.5 | 93.0 | 19.5 | 1.192 |
| RCHE-10-155 | 1.5 | 18.0 | 16.5 | 0.702 |
| RCHE-10-156 | 132 | 148.5 | 16.5 | 1.515 |
| RCHE-10-157 | 27 | 43.5 | 16.5 | 1.589 |
| includes | 28.5 | 34.5 | 6.0 | 2.983 |
| RCHE-10-158 | 4.5 | 36.0 | 30.0 | 1.126 |
| RCHE-10-158 | 52.5 | 75.0 | 22.5 | 0.963 |
| RCHE-10-158 | 100.5 | 123.0 | 22.5 | 1.347 |
| RCHE-10-159 | 99 | 114.0 | 15.0 | 2.721 |
| RCHE-10-159 | 181.5 | 195.0 | 13.5 | 0.680 |
| RCHE-10-160 | 192 | 217.5 | 25.5 | 2.467 |
| includes | 195.0 | 208.5 | 13.5 | 3.682 |
| RCHE-10-161 | 178.5 | 204.0 | 25.5 | 1.646 |
| includes | 192.0 | 199.5 | 7.5 | 3.042 |
| RCHE-10-162 | 193.5 | 220.5 | 27.0 | 2.176 |
| RCHE-10-164 | 51.0 | 61.5 | 10.5 | 0.636 |
| RCHE-10-164 | 168 | 177.0 | 9.0 | 0.458 |
| RCHE-10-165 | 19.5 | 39.0 | 19.5 | 0.622 |
| RCHE-10-165 | 49.5 | 102.0 | 52.5 | 1.436 |
| RCHE-10-165 | 130.5 | 157.5 | 27.0 | 1.704 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-10-167 | 48.0 | 75.0 | 25.5 | 0.528 |
| RCHE-10-168 | 64.5 | 72.0 | 7.5 | 0.617 |
| RCHE-10-169 | 49.5 | 73.5 | 24.0 | 1.130 |
| RCHE-10-170 | 13.5 | 96.0 | 82.5 | 0.961 |
| RCHE-10-139A | 1.5 | 42.0 | 40.5 | 1.726 |
| includes | 10.5 | 19.5 | 9.0 | 4.495 |
| RCHE-10-171 | 0.0 | 28.5 | 28.5 | 1.467 |
| RCHE-10-172 | 229.5 | 243.0 | 13.5 | 0.913 |
| RCHE-10-173 | 135.0 | 144.0 | 9.0 | 0.475 |
| RCHE-10-174 | 81.0 | 118.5 | 37.5 | 0.983 |
| **Southeast Zone** | | | | |
| DHE-05-10 | 15.15 | 23 | 7.85 | 2.04 |
| DHE-05-11 | 14 | 35.1 | 21.1 | 1.48 |
| DHE-05-12 | 59.2 | 72.4 | 13.2 | 0.78 |
| DHE-05-13 | 43.8 | 70.3 | 26.5 | 1.04 |
| includes | 50.6 | 70.3 | 19.7 | 1.21 |
| DHE-05-14 | 27.4 | 35 | 7.6 | 0.54 |
| DHE-05-15 | 79.8 | 92.4 | 12.6 | 0.75 |
| includes | 86.4 | 90.4 | 4 | 1.46 |
| DHE-05-16 | 83 | 110 | 27 | 0.78 |
| includes | 83 | 98.1 | 15.1 | 1.11 |
| DHE-05-17 | 123.9 | 151 | 27.1 | 1.10 |
| includes | 123.9 | 133 | 9.1 | 1.49 |
| includes | 123.9 | 128.5 | 4.6 | 2.36 |
| includes | 140.5 | 151 | 10.5 | 1.47 |
| DHE-06-18 | 45 | 74.6 | 29.6 | 2.08 |
| includes | 60.25 | 74.6 | 14.35 | 2.90 |
| DHE-06-19 | 83.2 | 92.2 | 9 | 1.11 |
| DHE-06-20 | 67 | 121 | 54 | 0.74 |
| includes | 67 | 73 | 6 | 0.80 |
| includes | 78 | 92 | 14 | 1.01 |
| includes | 97 | 102 | 5 | 1.30 |
| includes | 107 | 121 | 14 | 0.87 |
| DHE-06-21 | 59 | 108 | 49 | 1.11 |
| includes | 63 | 68 | 5 | 2.08 |
| includes | 84 | 87 | 3 | 2.84 |
| includes | 97 | 102 | 5 | 2.19 |
| DHE-06-22 | 19 | 51 | 32 | 1.57 |
| includes | 25 | 37 | 12 | 2.64 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| DHE-06-23 | 130 | 147 | 17 | 1.04 |
| includes | 139 | 147 | 8 | 1.66 |
| DHE-06-23 | 168 | 174 | 6 | 1.25 |
| DHE-06-24 | 163 | 172 | 9 | 1.28 |
| DHE-06-25 | 42 | 66 | 24 | 1.01 |
| DHE-06-25 | 78 | 114 | 36 | 1.40 |
| DHE-06-25 | 121 | 132 | 11 | 1.31 |
| DHE-06-26 | 46 | 63 | 17 | 1.91 |
| DHE-06-26 | 87 | 152 | 65 | 0.98 |
| includes | 87 | 102 | 15 | 1.53 |
| includes | 115 | 124 | 9 | 1.44 |
| DHE-06-26 | 192 | 202 | 10 | 0.98 |
| DHE-06-27 | 62 | 97 | 35 | 0.99 |
| includes | 68 | 91 | 23 | 1.21 |
| DHE-06-27 | 130 | 149 | 19 | 0.79 |
| DHE-06-28 | 66 | 81 | 15 | 3.34 |
| DHE-06-28 | 88 | 91 | 3 | 9.93 |
| DHE-06-28 | 123 | 155 | 32 | 1.28 |
| DHE-06-29 | 33 | 65 | 32 | 1.62 |
| DHE-06-29 | 85 | 101 | 16 | 3.60 |
| DHE-06-29 | 148 | 168 | 20 | 1.41 |
| DHE-06-30A | 129 | 134 | 5 | 0.86 |
| DHE-06-31 | 162 | 169 | 7 | 1.43 |
| DHE-06-31 | 271 | 289 | 18 | 1.78 |
| includes | 277 | 289 | 12 | 2.10 |
| DHE-06-35 | 84.0 | 88.0 | 4.0 | 1.64 |
| DHE-06-35 | 101.0 | 105.0 | 4.0 | 1.26 |
| DHE-06-35 | 127.0 | 151.0 | 24.0 | 0.48 |
| DHE-07-36 | 125.0 | 141.0 | 16.0 | 1.52 |
| DHE-07-38 | 20.0 | 31.0 | 11.0 | 2.50 |
| DHE-07-38 | 84.0 | 93.0 | 9.0 | 1.74 |
| DHE-07-38 | 105.0 | 118.0 | 13.0 | 1.27 |
| DHE-07-38 | 146.0 | 155.0 | 9.0 | 2.28 |
| DHE-07-52 | 169.5 | 195 | 25.5 | 1.49 |
| DHE-07-52 | 269.5 | 292 | 22.5 | 1.24 |
| DHE-07-52 | 317.5 | 321.35 | 3.85 | 1.67 |
| RCHE-07-01 | 24.0 | 51.0 | 27.0 | 1.28 |
| RCHE-07-02 | 40.5 | 75.0 | 34.5 | 1.89 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-07-03 | 37.5 | 55.5 | 18.0 | 1.02 |
| RCHE-07-04 | 42.0 | 54.0 | 12.0 | 1.42 |
| RCHE-07-05 | 94.5 | 102.0 | 7.5 | 0.70 |
| RCHE-07-06 | 124.5 | 142.5 | 18.0 | 1.48 |
| RCHE-07-07 | 148.5 | 153.0 | 4.5 | 1.48 |
| RCHE-07-09 | 135.0 | 148.5 | 13.5 | 1.69 |
| RCHE-07-10 | 169.5 | 180.0 | 10.5 | 1.15 |
| RCHE-07-12 | 120.0 | 141.0 | 21.0 | 1.53 |
| RCHE-07-13 | 88.5 | 105.0 | 16.5 | 0.63 |
| RCHE-07-13 | 127.5 | 135.0 | 7.5 | 0.89 |
| RCHE-07-14 | 135.0 | 166.5 | 31.5 | 1.08 |
| RCHE-07-15 | 130.5 | 145.5 | 15.0 | 0.76 |
| RCHE-07-16 | 183.0 | 201.0 | 13.5 | 1.56 |
| RCHE-07-18 | 136.5 | 162.0 | 25.5 | 1.30 |
| RCHE-07-19 | 157.5 | 163.5 | 6.0 | 1.28 |
| RCHE-07-20A | 28.5 | 63.0 | 33.0 | 1.38 |
| RCHE-07-21A | 75.0 | 99.0 | 24.0 | 0.76 |
| includes | 75.0 | 84.0 | 9.0 | 1.25 |
| includes | 90.0 | 99.0 | 9.0 | 0.74 |
| RCHE-07-22 | 27.0 | 57.0 | 30.0 | 1.94 |
| RCHE-07-24 | 67.5 | 81.0 | 13.5 | 1.23 |
| RCHE-07-25 | 70.5 | 94.5 | 24.0 | 1.00 |
| RCHE-07-26 | 94.5 | 100.5 | 6.0 | 1.12 |
| RCHE-07-27 | 136.5 | 150.0 | 13.5 | 1.16 |
| RCHE-07-28 | 126.0 | 138.0 | 12.0 | 2.74 |
| RCHE-07-30 | 37.5 | 51.0 | 13.5 | 0.49 |
| RCHE-07-30 | 69.0 | 105.0 | 30.0 | 0.78 |
| RCHE-07-30 | 117.0 | 133.5 | 16.5 | 1.54 |
| RCHE-07-31 | 82.5 | 118.5 | 34.5 | 0.79 |
| includes | 82.5 | 97.5 | 13.5 | 1.51 |
| RCHE-07-33 | 99.0 | 106.5 | 7.5 | 1.04 |
| RCHE-07-33 | 126.0 | 139.5 | 13.5 | 0.99 |
| RCHE-07-35 | 142.50 | 148.50 | 4.50 | 1.46 |
| RCHE-07-37 | 64.5 | 72.0 | 7.5 | 1.02 |
| RCHE-07-37 | 81.0 | 105.0 | 22.5 | 0.65 |
| includes | 91.5 | 102.0 | 9.0 | 0.98 |
| RCHE-07-38 | 88.5 | 120.0 | 31.5 | 0.76 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| includes | 114.0 | 120.0 | 6.0 | 1.62 |
| RCHE-07-39 | 100.5 | 108.0 | 7.5 | 0.69 |
| RCHE-07-40 | 115.5 | 147.0 | 31.5 | 0.92 |
| RCHE-07-41 | 136.5 | 165.0 | 28.5 | 0.31 |
| RCHE-07-42 | 109.5 | 159.0 | 49.5 | 0.62 |
| RCHE-07-42 | 208.5 | 225.0 | 16.5 | 1.19 |
| RCHE-07-43 | 36.0 | 60.0 | 24.0 | 0.57 |
| RCHE-07-43 | 88.5 | 156.0 | 67.5 | 1.37 |
| includes | 129.0 | 142.5 | 13.5 | 4.63 |
| RCHE-07-44 | 19.5 | 81.0 | 61.5 | 0.95 |
| RCHE-07-45 | 22.5 | 67.5 | 45.0 | 1.09 |
| RCHE-07-45 | 129.0 | 156.0 | 27.0 | 1.11 |
| RCHE-07-46 | 19.5 | 69.0 | 49.5 | 1.63 |
| includes | 42.0 | 69.0 | 27.0 | 2.27 |
| RCHE-07-46 | 208.5 | 238.5 | 30.0 | 1.04 |
| RCHE-07-47 | 34.5 | 123.0 | 88.5 | 2.20 |
| includes | 66.0 | 78.0 | 12.0 | 7.03 |
| RCHE-07-48 | 13.5 | 132.0 | 118.5 | 1.47 |
| RCHE-07-49 | 22.5 | 97.5 | 75.0 | 1.05 |
| includes | 66.0 | 78.0 | 12.0 | 2.49 |
| RCHE-07-50 | 21.0 | 96.0 | 70.5 | 1.34 |
| includes | 21.0 | 34.5 | 13.5 | 2.90 |
| RCHE-07-50 | 114.0 | 135.0 | 21.0 | 1.63 |
| RCHE-07-51 | 87.0 | 174.0 | 79.5 | 1.89 |
| includes | 124.5 | 159.0 | 33.0 | 2.80 |
| RCHE-07-52 | 88.5 | 114.0 | 21.0 | 1.45 |
| RCHE-07-52 | 139.5 | 165.0 | 25.5 | 0.62 |
| RCHE-07-52 | 226.5 | 237.0 | 10.5 | 1.05 |
| RCHE-07-53 | 37.5 | 52.5 | 15.0 | 0.81 |
| RCHE-07-53 | 90.0 | 97.5 | 7.5 | 0.79 |
| RCHE-07-53 | 117.0 | 123.0 | 6.0 | 1.60 |
| RCHE-07-54 | 58.5 | 127.5 | 69.0 | 1.09 |
| includes | 76.5 | 88.5 | 12.0 | 2.03 |
| includes | 108.0 | 126.0 | 18.0 | 1.62 |
| RCHE-07-54 | 139.5 | 196.5 | 49.5 | 1.57 |
| includes | 154.5 | 189.0 | 31.5 | 2.17 |
| RCHE-07-55 | 61.5 | 150.0 | 85.5 | 1.17 |
| RCHE-07-56 | 64.5 | 94.5 | 30.0 | 1.34 |
| RCHE-07-57 | 78.0 | 126.0 | 48.0 | 1.16 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-07-57 | 177.0 | 243.0 | 55.5 | 1.71 |
| includes | 180.0 | 195.0 | 15.0 | 3.18 |
| RCHE-07-58 | 64.5 | 123.0 | 39.0 | 0.93 |
| RCHE-07-59 | 73.5 | 103.5 | 30.0 | 0.88 |
| RCHE-07-60 | 40.5 | 126.0 | 85.5 | 1.05 |
| RCHE-07-61 | 52.5 | 127.5 | 75.0 | 1.08 |
| RCHE-07-62 | 48.0 | 87.0 | 36.0 | 0.77 |
| RCHE-07-63 | 37.5 | 124.5 | 87.0 | 0.80 |
| includes | 58.5 | 78.0 | 19.5 | 1.36 |
| RCHE-07-64A | 69.0 | 120.0 | 51.0 | 1.44 |
| RCHE-07-65 | 45.0 | 85.5 | 33.0 | 1.61 |
| RCHE-07-65 | 127.5 | 141.0 | 13.5 | 0.77 |
| RCHE-07-66 | 78.0 | 159.0 | 78.0 | 0.84 |
| includes | 78.0 | 124.5 | 43.5 | 1.14 |
| RCHE-07-67 | 88.5 | 268.5 | 163.5 | 0.87 |
| includes | 180.0 | 213.0 | 33.0 | 1.58 |
| RCHE-07-68 | 166.5 | 184.5 | 16.5 | 1.46 |
| RCHE-07-69 | 145.5 | 174.0 | 25.5 | 0.79 |
| RCHE-07-70 | 183.0 | 204.0 | 21.0 | 0.59 |
| RCHE-07-71 | 118.5 | 135.0 | 16.5 | 0.80 |
| RCHE-07-72 | 18.0 | 69.0 | 51.0 | 0.69 |
| includes | 24.0 | 39.0 | 15.0 | 1.13 |
| RCHE-07-73 | 19.5 | 102.0 | 67.5 | 0.92 |
| RCHE-07-74 | 106.5 | 112.5 | 6.0 | 0.99 |
| RCHE-07-74 | 247.5 | 258.0 | 9.0 | 0.59 |
| RCHE-07-75 | 60.0 | 76.5 | 16.5 | 0.84 |
| RCHE-07-76 | 82.5 | 163.5 | 79.5 | 1.04 |
| includes | 87.0 | 127.5 | 40.5 | 1.48 |
| RCHE-07-78 | 162.0 | 180.0 | 18.0 | 0.78 |
| RCHE-08-79 | 31.5 | 70.5 | 39.0 | 1.73 |
| includes | 54.0 | 69.0 | 15.0 | 3.74 |
| RCHE-08-79 | 100.5 | 145.5 | 45.0 | 0.72 |
| includes | 106.5 | 124.5 | 18.0 | 1.21 |
| RCHE-08-80 | 57.0 | 93.0 | 36.0 | 2.53 |
| RCHE-08-80 | 123.0 | 177.0 | 54.0 | 0.73 |
| RCHE-08-81 | 76.5 | 117.0 | 40.5 | 1.15 |
| RCHE-08-82 | 37.5 | 91.5 | 33.0 | 0.38 |

| Hole | From (meters) | To (meters) | Interval Length | Grade (Au ppm) |
|---|---|---|---|---|
| RCHE-08-83 | 168.0 | 187.5 | 19.5 | 0.42 |
| RCHE-08-93 | 262.5 | 300.0 | 34.5 | 1.40 |
| includes | 283.5 | 297.0 | 13.5 | 2.06 |
| RCHE-08-94 | 249.0 | 300.0 | 51.0 | 1.13 |
| RCHE-08-96 | 163.5 | 225.0 | 61.5 | 0.69 |
| includes | 205.4 | 219.0 | 13.5 | 1.28 |
| RCHE-08-97 | 172.5 | 235.5 | 55.5 | 0.35 |
| RCHE-08-98 | 240.0 | 255.0 | 15.0 | 1.21 |

# APPENDIX B
# REFINING COST CALCULATIONS

## Refer to:

Cerro Jumil Project, Mexico
Preliminary Economic Assessment
NI 43-101 Technical Report
Prepared by: Vector Engineering, Inc
September 01, 2009

# APPENDIX C
# CASH FLOW MODELS

**Refer to:**

Cerro Jumil Project, Mexico

Preliminary Economic Assessment

NI 43-101 Technical Report

Prepared by: Vector Engineering, Inc

September 01, 2009

# APPENDIX D

# FINAL FEASIBILITY STUDY TYPICAL TABLE OF CONTENT

## Refer to:

Cerro Jumil Project, Mexico

Preliminary Economic Assessment

NI 43-101 Technical Report

Prepared by: Vector Engineering, Inc

September, 01, 2009