NI 43-101 TECHNICAL REPORT ON THE YAURICOCHA MINE
Yauyos Province, Peru

PREPARED FOR

SIERRA METALS

Sierra Metals, Inc.
595 Burrard Street, Suite 3083
PO Box 49298, Vancouver, BC
Canada V7X 1L3

Effective Date: December 31, 2014
Report Date: May 11, 2015

PREPARED BY

Donald E. Hulse, P.E., SME-RM
Thomas C. Matthews, MMSA-QP
Deepak Malhotra, PhD, SME-RM

GUSTAVSON ASSOCIATES
GEOLOGISTS · ENGINEERS · ECONOMISTS · APPRAISERS

DONALD E. HULSE, P.E.

Principal Mining Engineer
Gustavson Associates, LLC
274 Union Boulevard, Suite 450
Lakewood, Colorado 80228
Telephone: 720-407-4062 Facsimile: 720-407-4067
Email: dhulse@gustavson.com

CERTIFICATE of AUTHOR

I, Donald E. Hulse do hereby certify that:

1. I am currently employed as Vice President and Principal Mining Engineer by Gustavson Associates, LLC at:

   274 Union Boulevard
   Suite 450
   Lakewood, Colorado 80228

2. I am a graduate of the Colorado School of Mines with a Bachelor of Science in Mining Engineering (1982), and have practiced my profession continuously since 1983.
3. I am a registered Professional Engineer in the State of Colorado (35269). I am also a Registered Member of the Society of Mining, Metallurgy and Exploration (1533190RM).
4. I have worked as a mining engineer for a total of 30 years since my graduation from university; as an employee of a major mining company, a major engineering company, and as a consulting engineer. I have performed resource estimation and mine planning on over 30 gold deposits for over 11 mining companies in three countries working as a consultant as well as an engineer or engineering manager for the projects
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for Sections 1 through 6, 15, 16 and 18 through 27 of the technical report entitled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru," dated May 11, 2015, with an effective date of December 31, 2014, (the "Technical Report"), and am also responsible for the overall organization and content of the document. I visited the project site April 10, 2012 for three days, March 21-24, 2011 and most recently September 29 to October 4, 2013.
7. I prepared a previous report on the Yauricocha property, "NI 43-101 Technical Report on the Yauricocha Project, Yauyos Peru" dated May 25, 2011. I was responsible for Sections 1 through 12, 14, 17.1.5, 17.24, 17.23, 20, and 23 through 27 of the technical report entitled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru", dated October 19, 2012, with an effective date of October 10, 2012, and was also responsible for the overall organization and content of the document. I was responsible

for Sections 1 through 6, 15, 16 and 18 through 27 of the technical report entitled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru," dated November 15, 2013, with an effective date of October 1, 2013 and was also responsible for the overall organization and content of the document.

8. I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
9. I have read National Instrument 43-101 and Form 43-101, and the Technical Report has been prepared in compliance with that instrument and form.
10. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.
11. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 11th day of May, 2015

/s/ Donald E. Hulse
Signature of Qualified Person

Donald E. Hulse
Printed Name of Qualified Person

THOMAS C. MATTHEWS

Principal Resource Geologist
Gustavson Associates, LLC
274 Union Boulevard, Suite 450
Lakewood, Colorado 80228
Telephone: 720-407-4062 Facsimile: 720-407-4067
Email: tmatthews@gustavson.com

CERTIFICATE of AUTHOR

I, Thomas C. Matthews, B.Sc. do hereby certify that:

1. I am currently employed as Senior Resource Geologist at:

   Gustavson Associates, LLC
   274 Union Boulevard, Suite 450
   Lakewood, CO, USA, 80228

2. I graduated with a Bachelors of Science degree in Geology from University of Rochester in 1994.

3. I am a Qualified Professional (QP) Member of the Mining and Metallurgical Society of America (01455QP) with special expertise in Geology and Ore Reserves.

4. I have worked as a geologist for a total of 18 years since my graduation from university, as an employee of an exploration company, a mining company, and as a consultant. My relevant experience includes exploration, geologic modeling, and resource estimation, reserves definition in feasibility studies, ore control systems, and mine-model reconciliation, particularly for structurally controlled hydrothermal systems.

5. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

6. I am responsible for Sections 7 through 12, and 14 of the technical report entitled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru," dated May 11, 2015, with an effective date of December 31, 2014, (the "Technical Report"), and am also responsible for the overall organization and content of the document. I visited the project site on September 29 to October 4, 2013.

7. I previously was responsible for Sections 7 through 12, and 14 of the technical report entitled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru," dated November 15, 2013, with an effective date of October 1, 2013 and was also responsible for the overall organization and content of the document.

8. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.

9. I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

10. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.
11. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 11th day of May, 2015

/s/ Thomas C. Matthews
Signature of Qualified Person

Thomas C. Matthews
Printed Name of Qualified Person

DEEPAK MALHOTRA, PhD,
Member AusIMM, SME, CIMM
Resource Development, Inc.
11475 West I-70 Frontage Road North
Wheat Ridge, Colorado 80033
Telephone: (303) 422-1176 Facsimile: (303) 424-8580
Email: dmalhotra@aol.com

CERTIFICATE of AUTHOR

I, Deepak Malhotra do hereby certify that:

1. I am currently employed as President at:

   Resource Development, Inc.
   11475 West I-70 Frontage Road North
   Wheat Ridge, Colorado 80033

2. I am a graduate of Colorado School of Mines with a M.Sc. degree in Metallurgical Engineering (1974), and PhD in Mineral Economics (1978).
3. I am a registered member of the Society of Mining, Metallurgy and Exploration, Inc. (SME), member No. 2006420RM.
4. I have worked as a Metallurgist/Mineral Economist for a total of 40 years since my graduation from university; as an employee of several mining companies, an engineering company, a mine development and mine construction company, an exploration company, and as a consulting engineer.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for the preparation of the technical report titled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru," dated May 11, 2015, with an effective date of December 31, 2014, (the "Technical Report"), with specific responsibility for Section 13 and 17. I visited the project site on September 29 to October 4, 2013.
7. I previously was responsible for Sections 13 and 17 of the technical report entitled "NI 43-101 Technical Report on the Yauricocha Mine, Yauyos Province, Peru," dated November 15, 2013, with an effective date of October 1, 2013I am independent of the issuer applying all of the tests in Section 1.5 of National Instrument 43-101.
8. I have read National Instrument 43-101 and Form 43-101, and the Technical Report has been prepared in compliance with that instrument and form.
9. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic

publication in the public company files on their websites accessible by the public, of the Technical Report.

10. As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 11th day of May, 2015

/s/ Deepak Malhotra

Deepak Malhotra
Print name of Qualified Person

TABLE OF CONTENTS

SECTION **TITLE** **PAGE NO.**

1. SUMMARY 1

1.1 GEOLOGY AND MINERALIZATION 1
1.2 PROPERTY POSITION 2
1.3 EXPLORATION STATUS 2
1.4 MINERAL RESOURCES AND MINERAL RESERVES 3
1.4.1 Mineral Resources 3
1.4.2 Mineral Reserves 4
1.4.3 Adjustment Factors: Resources to Reserves 5
1.4.4 Reserves Reconciliation 6
1.5 RESERVES REPLACEMENT 8
1.6 MINING 8
1.7 METALLURGY AND PROCESSING 9
1.8 INTERPRETATIONS AND CONCLUSIONS 10
1.9 RECOMMENDATIONS 10

2. INTRODUCTION AND TERMS OF REFERENCE 12

2.1 EFFECTIVE DATE 12
2.2 SOURCES OF INFORMATION 13
2.3 PERSONAL INSPECTION 13
2.4 UNITS 14

3. RELIANCE ON OTHER EXPERTS 18

4. PROPERTY DESCRIPTION AND LOCATION 19

4.1 MINING CONCESSIONS 20
4.1.1 Concessions Held by Minera Corona 20
4.2 LAND SURFACE AGREEMENTS 22
4.2.1 Lease agreement: Huacuypacha 22
4.2.2 Lease agreement: Queka and Cachi Cachi 22
4.3 ROYALTIES AND ENCUMBRANCES 23
4.3.1 Debt 23
4.3.2 Royalties and Special Tax 23
4.4 ENVIRONMENT LIABILITIES AND PERMITTING 24

5. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY 25

5.1 ACCESSIBILITY 25
5.2 CLIMATE 25
5.3 LOCAL RESOURCES 25
5.4 INFRASTRUCTURE 25
5.5 PHYSIOGRAPHY 27
5.6 VEGETATION 27
5.7 PROPERTY POSITION 27
5.8 POTENTIAL TAILINGS STORAGE AREA 27

6. HISTORY 28

7. GEOLOGICAL SETTING AND MINERALIZATION 29

7.1 REGIONAL SETTING 31
7.2 LOCAL GEOLOGY 32

7.2.1 Goyllarisquizga Formation *32*
7.2.2 Jumasha Formation *32*
7.2.3 Celendín Formation *32*
7.2.4 Casapalca Red Beds *32*
7.2.5 Intrusions *32*
7.2.6 Metamorphism *33*
7.2.7 Structure *33*
7.2.7.1 Folds 33
7.2.7.2 Fractures 34
7.2.7.3 Contacts 34
7.2.7.4 Breccias 34
7.3 MINERALIZATION 36
7.4 PRINCIPAL SULFIDE MINERALS 38
7.4.1 Pyrite FeS_2 ..... *38*
7.4.2 Marcasite FeS_2 ..... *38*
7.4.3 Enargite Cu_3AsS_4 ..... *38*
7.4.4 Chalcopyrite $CuFeS_2$ *38*
7.4.5 Bornite Cu_5FeS_4 ..... *38*
7.4.6 Covellite and Idaite CuS and Cu_5FeS_6 ..... *38*
7.4.7 Tetrahedrite and Tennantite $(Cu,Fe)_{12}Sb_4S_{13}$ and $Cu_{12}As_4S_{13}$ *38*
7.4.8 Galena PbS *38*
7.4.9 Sphalerite (Zn,Fe)S *38*
7.4.10 Geocronite $(Pb_{14}(Sb, As)_6 S_{23})$ *39*
7.5 GANGUE MINERALS 39
7.5.1 Quartz SiO_2 ..... *39*
7.5.2 Hematite (var. Specularite) and Siderite Fe_2O_3 and $FeCO_3$ *39*
7.5.3 Calcite $CaCO_3$ *39*
7.5.4 Fluorite CaF_2 ..... *39*
7.5.5 Barite $BaSO_4$ *39*
7.5.6 Magnetite Fe_3O_4 ..... *39*
7.6 MINERALIZED BODIES (BRECCIA CHIMNEYS AND PIPES) 39
7.7 VEINS 40
7.8 SUPERGENE ENRICHMENT AND OXIDATION 40
7.9 MINA CENTRAL 41
7.9.1 Cuye mineralized body *41*
7.9.2 Mascota mineralized body *41*
7.9.3 Butz Mineralized Body *42*
7.9.4 Catas Mineralized Body *42*
7.9.5 Pozo Rico Mineralized Body *43*
7.9.6 Contacto Oriental Mineralized Body *43*
7.9.7 Contacto Occidental Mineralized Body *43*
7.9.8 Violeta Mineralized Body *44*
7.9.9 Antacaca Mineralized Body *44*
7.9.10 Sasacasa Mineralized Body *44*
7.9.11 Erika mineralized body *45*
7.9.12 Amoeba Mineralized Body *45*
7.9.13 Contacto Sur Medio Mineralized Body *45*
7.9.14 Violet – 329 Mineralized Body *46*
7.9.15 Cuye Norte Mineralized Body *46*
7.9.16 Juliana Vein *46*
7.9.17 Juliana I Mineralized Body *47*
7.9.18 Juliana II Mineralized Body *47*
7.9.19 Gallito Mineralized Body *47*

7.9.20 Jacqueline Mineralized Body 47
7.9.21 Veins "A" "C" "D" "F" and "G" 48
7.9.22 Katty Mineralized Body 49
7.9.23 Cuye South Vein 49
7.9.24 Mascota Vein 49
7.9.25 Marita Vein 49
7.9.26 Olguita Mineralized Body 50
7.9.27 "A" Mineralized Body 50
7.9.28 Viviana Mineralized Body 50
7.9.29 Cuye Vein 50
7.9.30 Huamanrripa Mineralized Body 50
7.9.31 Milagrosa Mineralized Body 51
7.9.32 Antacaca West Mineralized Body 51
7.9.33 Poderosa - Felicidad – El Norte Mineralized Bodies 51
7.10 Mina Cachi-Cachi 57
7.11 Mina Éxito 58
7.12 Mina Ipillo 59
7.13 Mina Victoria 59
7.14 Controls on Mineralization 60
7.15 Conclusions 61

8. DEPOSIT TYPES 63

9. EXPLORATION 64

9.1 Central Mine mineralized zones 64
9.2 Cachi-Cachi mineralized zone 65
9.3 Yauricocha Sur 65
9.4 San Juan and San Antonio Areas 65
9.5 Area Éxito NE 67
9.6 Kilkaska Area 67
9.7 Kilkaska Sur Area 68
9.8 Yauricocha Fault Area (Cerros Pucacocha, Uchcapri, Leonpitacana and Carhuanisho) 68
9.9 Yauricocha Este 68
9.10 Yauricocha Oeste 69
9.11 Tintircullpa Area 69
9.12 Ipillo Mine 69
9.13 Western Chimneys 70

10. DRILLING 72

10.1 Drilling Procedures 72
10.2 Survey Control 72
10.3 Core Logging and Storage 73
10.4 Recovery 73
10.5 Drillhole Locations 73
10.6 Summary of Drilling information 76

11. SAMPLE PREPARATION, ANALYSIS, AND SECURITY 77

11.1 Core Samples 77
11.2 Channel Samples 77
11.3 Sample Preparation Procedures 77
11.3.1 Equipment and Materials 77
11.3.2 Sample Reception 78
11.3.3 Procedure 78

11.4 CONTROL OF THE SAMPLES 79
11.5 ANALYTICAL PROCEDURES 79
11.6 ASSAY DATABASE 79

12. DATA VERIFICATION 81

12.1 VERIFICATION OF THE QUALITY CONTROL PROGRAM 81
12.2 CHUMPE LAB QUALITY CONTROL 81
12.3 OUTSIDE LABORATORY CHECK ASSAYS 83
12.4 ASSAY DATABASE REVIEW 86
12.5 DATABASE QUALITY 86

13. MINERAL PROCESSING AND METALLURGICAL TESTING 87

13.1 PROCESS DESCRIPTION 87
13.1.1 Crushing, Screening and Fine Ore Storage 90
13.1.2 Polymetallic Circuit 90
13.1.2.1 Polymetallic Circuit Grinding 90
13.1.2.2 Copper-Lead Flotation and Separation 90
13.1.2.3 Zinc Flotation 91
13.1.3 Lead Oxide Circuit 91
13.1.3.1 Sulphide Flotation 91
13.1.3.2 Oxide Flotation 91
13.1.4 Thickening and Filtration 91
13.1.5 Reagents, Grinding Media and Power 92
13.1.5.1 Reagent Data 92
13.1.5.2 Power 93
13.1.6 Concentrates Production 94
13.1.7 Combined Concentrates Grades 99
13.1.8 Gold 99
13.2 CONCLUSIONS 100
13.3 RISKS AND OPPORTUNITIES 100

14. MINERAL RESOURCE ESTIMATE 101

14.1 DATA USED FOR GRADE ESTIMATION 101
14.2 DENSITY 105
14.3 METHOD USED IN MINERAL RESOURCE ESTIMATION 107
14.3.1 Solids Models interpretation, Cuerpos Massivos 107
14.3.2 Solids Models interpretation, Cuerpos Chicos 108
14.3.3 Compositing and sample selection 109
14.3.4 Capping 110
14.3.5 Variography, Cuerpos Massivos 111
14.3.6 Variography, Cuerpos Chicos 113
14.3.7 Block Grade Estimation 113
14.3.8 Estimate Validation 115
14.3.9 Stope Block Models 121
14.3.10 Mined out Volumes. 122
14.4 RESOURCE CUTOFF GRADES 122
14.5 MINERAL RESOURCE CLASSIFICATION 124
14.6 COMPARISON WITH 2012 RESOURCE 124
14.7 MINA IPILLO AND MINA VICTORIA RESOURCES 125
14.8 TABULATION OF RESOURCES 125
14.9 CUTOFF GRADE SENSITIVITY 127

15. MINERAL RESERVE ESTIMATE 128

15.1 RESERVE CLASSIFICATION 128
15.2 CONVERSION: RESOURCES TO RESERVES 128
15.2.1 Mine Recovery Factor 129
15.2.2 Dilution 129
15.2.3 Grade Correction Factors Mine to Mill 130
15.3 CUT-OFF EVALUATION 131
15.4 MINERAL RESERVES ESTIMATION 133
15.5 RECONCILIATION 134
15.6 RESERVES REPLACEMENT 135

16. MINING METHODS 136

16.1 MINING OPERATIONS AT YAURICOCHA 136
16.2 GEOTECHNICAL CHARACTERISTICS 140
16.3 GEOMECHANICAL CHARACTERISTICS 141
16.4 EXCAVATION DESIGN PARAMETERS 142
16.5 PRODUCTION PLAN 143
16.6 DEVELOPMENT SCHEDULE 146

17. RECOVERY METHODS 148

17.1 METALLURGICAL PERFORMANCE 148
17.2 GOLD 150
17.2.1 Impurity Elements 151
17.3 OPERATING COSTS 151
17.4 CONCLUSIONS & RECOMMENDATIONS 152

18. PROJECT INFRASTRUCTURE 153

18.1 MINE ACCESS 153
18.2 ELECTRIC POWER 154
18.3 HOUSING AND OFFICES 154
18.4 TAILINGS STORAGE 155
18.5 CONCENTRATE TRANSPORTATION 155

19. MARKET STUDIES AND CONTRACTS 156

19.1 MARKETS 156
19.2 METAL PRICING 156
19.3 CONTRACTUAL TREATMENT CHARGES AND REFINING CHARGES 156

20. ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT 157

20.1 PERMITS 157
20.2 POTENTIAL ENVIRONMENTAL IMPACTS 158
20.2.1 Protected Natural Areas 158
20.2.2 Air 158
20.2.3 Water 159
20.2.4 Domestic Solid Waste 162
20.2.1 Industrial Solid Waste 162
20.2.2 Mine Waste and Tailings 162
20.2.3 Closure Plan 162
20.2.4 Summary of Environmental Impact 163
20.3 SOCIAL AND COMMUNITY IMPACT 163

21. CAPITAL AND OPERATING COSTS 165

21.1 CAPEX FOR MAJOR INFRASTRUCTURE 165

21.2 WORKING CAPITAL 165
21.3 CAPITAL COST ESTIMATE 165
21.4 OPERATING COST ESTIMATES (OPEX) 166
21.4.1 Mining OPEX 166
21.4.2 Processing Plant and Freight OPEX 168
21.4.3 Freight Costs 169
21.4.4 General and Administration OPEX 169
21.4.5 Worker's Profit Sharing 169
21.4.6 OPEX Summary 169

22. ECONOMIC ANALYSIS 171

22.1 SUMMARY 171

23. ADJACENT PROPERTIES 172

24. OTHER RELEVANT DATA AND INFORMATION 173

25. INTERPRETATION AND CONCLUSIONS 174

26. RECOMMENDATIONS 175

27. REFERENCES 177

LIST OF FIGURES

FIGURE PAGE

FIGURE 1-1 PRODUCTION VS. MINERAL INVENTORY 8
FIGURE 4-1 YAURICOCHA MINE LOCATION MAP 19
FIGURE 4-2 REGIONAL MAP 21
FIGURE 5-1 YAURICOCHA SURFACE INFRASTRUCTURE 26
FIGURE 7-1 YAURICOCHA STRATIGRAPHIC COLUMN 30
FIGURE 7-2 PLAN OF YAURICOCHA AREA SURFACE GEOLOGY 35
FIGURE 7-3 MINERALIZED BODIES 37
FIGURE 7-4 MINERALIZED ZONES IN MINA CENTRAL 53
FIGURE 7-5 NORTHERN SECTOR OF MINA CENTRAL 55
FIGURE 7-6 SOUTHERN SECTOR OF MINA CENTRAL 56
FIGURE 7-7 GEOLOGIC CROSS SECTION 61
FIGURE 10-1 DRILLING MAP FOR YAURICOCHA 74
FIGURE 12-1 YAURICOCHA MINE DAILY QUALITY CONTROL RESULTS COPPER 81
FIGURE 12-2 YAURICOCHA MINE DAILY QUALITY CONTROL RESULTS SILVER 82
FIGURE 12-3 YAURICOCHA MINE DAILY QUALITY CONTROL RESULTS LEAD 82
FIGURE 12-4 YAURICOCHA MINE DAILY QUALITY CONTROL RESULTS ZINC 83
FIGURE 12-5 OUTSIDE LABORATORY CHECK ASSAYS SILVER 84
FIGURE 12-6 OUTSIDE LABORATORY CHECK ASSAYS LEAD 84
FIGURE 12-7 OUTSIDE LABORATORY CHECK ASSAYS COPPER 85
FIGURE 12-8 OUTSIDE LABORATORY CHECK ASSAYS ZINC 85
FIGURE 13-1 YAURICOCHA OXIDE FLOWSHEET 88
FIGURE 13-2 YAURICOCHA POLYMETALLIC FLOWSHEET 89
FIGURE 13-3 MILL TONNAGE TREATED BY ORE TYPE 98
FIGURE 13-4 CONCENTRATES PRODUCED BY ORE TYPE 99
FIGURE 14-1 MINA CENTRAL, 820 LEVEL, SHOWING DEVELOPMENT AND MINERALIZED ZONES 103
FIGURE 14-2 MINA CACHI-CACHI, 770 LEVEL, SHOWING DEVELOPMENT AND MINERALIZED ZONES 104
FIGURE 14-3: MODELED CUERPOS MASSIVOS 107

Figure 14-4: Cuerpos Pequenos Cuerpos Chicos 108
Figure 14-5: Cachi Cachi Cuerpos Chicos, Elissa shown for reference 109
Figure 14-6: Mina Central Pairwise Relative Variogram, Silver, Along Strike 111
Figure 14-7: Mina General Relative Variogram, Silver, Down Dip 112
Figure 14-8: Mina Central Pairwise Relative Variogram, Silver, Down Dip 112
Figure 14-9: Mina Central Validation Section 117
Figure 14-10: Mascota Validation Section 118
Figure 14-11: Cachi Cachi Validation Section 119
Figure 14-12: Elissa Validation Section 120
Figure 14-13: Cuerpos Pequenos Validation Section 121
Figure 15-1 Production vs. Mineral Inventory 135
Figure 16-1 Yauricocha Mine Ventilation Diagram, Mina Central 137
Figure 16-2 Yauricocha Mine Ventilation Diagram, Cachi-Cachi 138
Figure 16-3 Diagram showing actual (green) and proposed (red) Major Development within Mina Central Area 139
Figure 16-4 Yauricocha General Mining Flowsheet 140
Figure 18-1 Location of the Two Shafts 153
Figure 18-2 Plan View of Mining Area 154
Figure 20-1 Water Effluent Monitoring Locations 160
Figure 21-1 Productivity by Mining Method 167
Figure 21-2 Mine Cost Elements 168
Figure 21-3 Processing Cost Elements 169

LIST OF TABLES

TABLE PAGE

Table 1-1 Measured Resources 3
Table 1-2 Indicated Resources 4
Table 1-3 Measured and Indicated Resources 4
Table 1-4 Inferred Resources 4
Table 1-5 Yauricocha Proven Mineral Reserves 6
Table 1-6 Yauricocha Probable Mineral Reserves 6
Table 1-7 Yauricocha Proven and Probable Mineral Reserves 6
Table 1-8 Reserves Reconciliation 8
Table 1-9 Estimated Recommendations Budget 11
Table 2-1 General Mining Terms 14
Table 2-2 Abbreviations 15
Table 4-1 EBIT Margin Rates 23
Table 6-1 Exploration Advance, Mineral Inventory and Mine Production 28
Table 7-1 Yauricocha Stratigraphic Column 29
Table 7-2 Mina Central Bodies 54
Table 7-3 Cachi-Cachi Mina Mineralized Bodies 58
Table 7-4 Exito Mina Concessions 59
Table 7-5 Ipillo Mina Concessions 59
Table 7-6 Victoria Mina Concessions 60
Table 10-1 Yauricocha Exploration and Development Drilling 72
Table 10-2 Description of Core Drilling 2009-2014 75
Table 11-1 Mineralized Bodies with Drill Data 80
Table 12-1 Drillhole Assay Comparison Sheet: Lab vs. Database, Non-Capping Error Rates 86
Table 13-1 Reagent Usage 2014 92
Table 13-2 Power Consumption 93
Table 13-3 Power Usage 2011 - 2014 93
Table 13-4 Polymetallic Circuit Products, PM Ore 95

Table 13-5 Polymetallic Circuit Products, Copper Ore 96
Table 13-6 Lead Oxide Circuit Products, PbOx Ore 97
Table 13-7 Copper Oxide Circuit Products, CuOx Ore 98
Table 14-1 Mineral Resource Data List 102
Table 14-2 Sample Statistics by Area 105
Table 14-3 Specific Gravity by Body 106
Table 14-4 Composite Statistics by Area 110
Table 14-5 Capping Values used for Estimation 110
Table 14-6 Variogram Ranges By Area (in meters) 113
Table 14-7 Block Model Parameters 113
Table 14-8 Estimation Parameters 114
Table 14-9 Dip Direction and Dip of Structures 115
Table 14-10 Block Model Versus Composite Statistics 116
Table 14-11 Metal Prices and recoveries used to calculate block value for cutoff grades 122
Table 14-12 Silver Equivalent Calculation Values 123
Table 14-13 Measured Resources 125
Table 14-14 Indicated Resources 126
Table 14-15 Measured and Indicated Resources 126
Table 14-16 Inferred Resources 126
Table 14-17 Mineral Resources at various cutoffs 127
Table 15-1 Mine Recovery Factor 129
Table 15-2 Dilution Correction 130
Table 15-3 Grade Adjustment for Mine-Mill Reconciliation 131
Table 15-4 Cost Cut-off Evaluation by Body 132
Table 15-5 Yauricocha Proven Mineral Reserves 133
Table 15-6 Yauricocha Probable Mineral Reserves 133
Table 15-7 Yauricocha Proven and Probable Mineral Reserves 133
Table 15-8 Reserves Reconciliation 135
Table 16-1 Major Mine Equipment 136
Table 16-2 Geomechanical Units 141
Table 16-3 Excavation Design Parameters by Geomechanical Units 142
Table 16-4 Monthly Production by Mining Method 2014 144
Table 16-5 Mine Production Plan by Ore Type 145
Table 16-6 Mine Development Schedule for Production Preparation and Exploration 147
Table 17-1 Polymetallic Circuit Products, PM Ore 149
Table 17-2 Polymetallic Circuit Products, Copper SulfideOre 149
Table 17-3 Lead Oxide Circuit Products, PbOx Ore 150
Table 17-4 Copper Oxide Circuit Products, CuOx Ore 150
Table 17-5 Impurity Elements in Concentrates, 2014 Averages 151
Table 17-6 Mill Operating Costs 151
Table 19-1 Metals Price Assumptions 156
Table 20-1 List of Permits for Yauricocha Project 157
Table 20-2 Summary of Air Monitoring Results from 2014 158
Table 20-3 Summary of Water Monitoring in Location 705 in 2014 160
Table 20-4 Summary of Water Monitoring in Location 707 in 2014 161
Table 20-5 Summary of Water Monitoring in Location 708 in 2014 161
Table 21-1 Annual Capital Costs (Thousands of US Dollars) 165
Table 21-2 Mining Methods at Yauricocha 166
Table 21-3 Mining Cost by Mining Method 167
Table 21-4 Annual Operating Costs 170
Table 26-1 Estimated Recommendations Budget 176

1. SUMMARY

Gustavson Associates, LLC (Gustavson) was commissioned by Sierra Metals Inc. (Sierra Metals, previously known as Dia Bras Exploration, Inc.) to prepare a National Instrument 43-101 Technical Report (NI 43-101) Technical Report to report the advancement of the Yauricocha Mine (or the Mine), which is located in the eastern part of the Department of Lima, Peru. The purpose of this report is to present the mineral resource and reserve estimates, and economic evaluation for the Mine.

The Mine has been in continuous commercial production since 1948, first under the direction of Cerro de Pasco. In 2002, the Yauricocha unit was privatized and purchased by Sociedad Minera Corona S.A. The production decision was not based on a feasibility study of Mineral Reserves demonstrating economic viability. There is an increased uncertainty and economic and technical risks of failure associated with this production decision. Production and economic variables may vary considerably, due to the absence of a complete and detailed site analysis according to and in compliance with NI 43-101 Standards of Disclosure specific risk analysis.

This report was prepared to comply with public reporting obligations according to and in compliance with NI 43-101 Standards of Disclosure for Mineral Projects, and Definition Standards for Mineral Resources and Mineral Reserves according to the Canadian Institute of Mining, Metallurgy and Petroleum (CIM). The interpretations and conclusions reported here are based on technical data available prior to the effective date of this report, December 31, 2014.

1.1 Geology and Mineralization

Most of the stratigraphy, structure, magmatism, volcanism and mineralization in Peru are spatially- and genetically-related to the tectonic evolution of the Andean Cordillera that is situated along a major convergent subduction zone where a segment of the oceanic crust, the Nazca Plate, slips beneath the overriding South American continental plate. The Western Andean Cordillera is recognized for its world-class base- and precious-metal deposits, many of which have been intermittently mined since Incan time. Most of the metal deposits in Peru are spatially and genetically associated with metal-rich hydrothermal fluids generated along magmatic belts that were emplaced along convergent plate tectonic lineaments.

Mineralization at the Yauricocha Mine is represented by variably oxidized portions of a multiple-phase polymetallic system with at least two stages of mineralization, demonstrated by sulfide veins cutting brecciated bodies. Mineralized bodies and quartz-sulfide veins appear to be intimately related and form a very important structural-mineralogical assemblage in the Yauricocha mineral deposit. Minera Corona has developed local classifications describing milling and metallurgical characteristics of mineralization at Yauricocha: polymetallic, oxide, and copper.

In plan view, these deposits are lenses with major axes parallel to the general strike of the strata (NW-SE) that dip steeply to the NE or are approximately vertical. Their vertical dimensions are almost always much greater than their horizontal. There are instances where these deposits extend more than 650 m down from the surface and whose widths are 10 to 40 m, tending to be spindle-shaped at depth. The bodies are emplaced in the Jumasha limestone and form groupings within the limestone as well as along the contact with the Celendín lutites and in contact with intrusive masses.

1.2 Property Position

The Yauricocha Mine is located in the Alis district, Yauyos province, department of Lima. The active mining area within the mineral concessions is located at coordinates 421,500 m east by 8,638,300 m north on UTM Zone 18L on the South American 1969 Datum, or latitude and longitude of 12.3105° S and 75.7219° W.

The mining concession Accumulation Yauricocha includes the mineral rights on 19,204.5715 Ha. Dia Bras purchased 82% of Sociedad Minera Corona S.A. (Minera Corona) in May 2011. On December 5th, 2012, Dia Bras Exploration changed its name to Sierra Metals Inc. According to information provided by Sierra Metals, the mineral concessions are not subject to an expiration date. This mineral concession is in good standing (PMJHR, 2013 and INGEMMET, 2012).

As part of the mineral concessions transfer with Empresa Minera del Centro del Peru in 2002 (see Section 4.1), Minera Corona acquired approximately 677 hectares of land and associated surface rights. A portion of the San Lorenzo Alis community is located within the 677 hectares. In 2007, Minera Corona has extended this agreement with the San Lorenzo Alis community (Villaran, 2009).

1.3 Exploration Status

The Yauricocha mining district contains multiple polymetallic deposits represented by skarn and replacement bodies and intrusion-hosted veins related to Miocene-era magmatism. Mineralization is strongly structurally-controlled with the dominant features being the Yauricocha Fault and the contact between the Jumasha limestones and the Celendín Formation.

Exploration for extensions of these bodies and other nearby satellites has continued to replace mined reserves on an annual basis since Minera Corona has been operating the mine. 107 and 58 diamond core holes were completed in 2012 and 2013 respectively totaling over 21.3 and 11.7 thousand meters. During 2014, 29,160.6 meters of diamond drilling were completed in 102 holes for exploration and mineral resource expansion.

Exploration in other areas of the Yauricocha property has been conducted over the past several years. Areas include Yauricocha Sur, San Juan & San Antonio, Exito NE, Kilkaska, Ipillo, Falla

Yauricocha, Cerros Uchcapri, Leonpitacana, and Carhuanisho, Yauricocha Este, Yauricocha Oeste, Tintircullpa Yauricocha, and the Western Chimneys.

1.4 Mineral Resources and Mineral Reserves

The 2014 Resource Estimation for Yauricocha mine is based on a standard domained block modelling approach. This is a change from previous resource estimations, which used a traditional section and plan interpretation with grade estimation by length-weighted mean determination.

1.4.1 Mineral Resources

The effective date of this resource estimate is December 31, 2014. Thomas Matthews, MMSA QP, Principal Resource Geologist with Gustavson Associates LLC, is the Qualified Person responsible for this resource estimate. Gustavson Associates validated the database used for resource estimation, created domain wireframes corresponding to the main mineralized bodies, interpolated grade into block models within these mineralized bodies, aggregated these block models into stope blocks for resource evaluation, and reviewed the mine-mill reconciliation results. Gustavson considers the resource to meet industry standard practices, and to be CIM and NI 43-101 compliant.

For all mineralization types, resources are presented at a cut-off which corresponds to the value of recoverable metal of $37 per tonne; this value being the approximate value of direct mining and processing costs at Yauricocha. Metal prices used in this determination were $18.10/oz silver, $0.95/lb lead, $3.02/lb copper, $0.91/lb zinc and $1,241/oz gold. Metal recovery was set at historical performance for each mineralization type.

Mineral Resources are not Mineral Reserves and do not demonstrate economic viability. There is no certainty that all or any part of the Mineral Resource will be converted to Mineral Reserves. The quantity and grade or quality is an estimate and is rounded to reflect the fact that it is an approximation. Quantities may not sum due to rounding.

Table 1-1 Measured Resources

		Grades						Contained Metal				
Mineralization Type	**Tonnes (t)**	**AgEq (g/t)**	**Ag (g/t)**	**Pb (%)**	**Cu (%)**	**Zn (%)**	**Au (g/t)**	**Ag koz**	**Pb (T)**	**Cu (T)**	**Zn (T)**	**Au oz**
Polymetallic	1,675,000	330.9	62.2	1.02	0.73	2.77	0.81	3,350	17,037	12,211	46,347	43,550
Copper	10,000	567.5	102.6	0.70	3.50	1.61	0.73	31	67	334	154	224
Copper Oxides	16,000	614.5	108.6	2.40	4.99	5.00	0.48	56	385	800	802	247
Oxides	67,000	962.7	344.1	10.43	0.67	2.69	2.37	745	7,020	453	1,808	5,135
Mina Ipillo (Polymetallic)	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,767,000**	**359.0**	**73.6**	**1.39**	**0.78**	**2.78**	**0.87**	**4,182**	**24,509**	**13,798**	**49,110**	**49,156**

Table 1-2 Indicated Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	9,056,000	222.1	36.0	0.31	0.82	1.46	0.69	10,489	28,246	74,248	132,268	200,236
Copper	8,000	571.0	118.3	0.83	3.40	1.80	0.83	30	66	272	144	214
Copper Oxides	26,000	1,368.7	693.4	8.39	5.53	1.36	0.26	584	2,199	1,449	356	219
Oxides	553,000	731.6	283.9	7.62	0.87	2.76	1.67	5,050	42,164	4,828	15,272	29,639
Mina Ipillo (Polymetallic)	168,900	662.2	140.8	1.33	1.32	6.34	1.30	765	2,246	2,229	10,708	7,059
Total	**9,812,000**	**261.7**	**53.6**	**0.75**	**0.84**	**1.54**	**0.74**	**16,153**	74,922	83,027	158,750	**230,308**

Table 1-3 Measured and Indicated Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	10,731,000	239.1	40.1	0.42	0.81	1.66	0.71	13,838	45,284	86,459	178,615	243,786
Copper	18,000	569.1	109.7	0.76	3.45	1.70	0.78	62	133	606	298	438
Copper Oxides	42,000	1,082.4	471.4	6.12	5.33	2.74	0.34	640	2,584	2,249	1,158	467
Oxides	621,000	756.7	290.4	7.93	0.85	2.75	1.74	5,795	49,184	5,281	17,080	34,774
Mina Ipillo (Polymetallic)	168,900	662.2	140.8	1.33	1.32	6.34	1.30	765	2,246	2,229	10,708	7,059
Total	**11,411,000**	**280.7**	**57.5**	**0.85**	**0.83**	**1.73**	**0.76**	**20,335**	99,431	96,825	207,860	**279,464**

Table 1-4 Inferred Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	1,871,000	1,209.2	203.0	1.52	4.33	8.48	3.26	12,214	28,357	81,022	158,644	196,206
Copper	30	470.0	135.5	0.74	2.46	2.95	1.41	0	0	1	1	1
Copper Oxides	4,500	1,353.8	649.7	10.96	5.10	0.94	1.31	93	489	228	42	188
Oxides	278,000	774.8	339.5	7.48	0.92	2.46	1.57	3,030	20,765	2,554	6,829	14,013
Mina Ipillo (Polymetallic)	-	-	-	-	-	-	-	-	-	-	-	-
Total	**2,153,000**	**1,153.7**	**221.5**	**2.30**	**3.89**	**7.69**	**3.04**	**15,337**	**49,611**	**83,804**	**165,516**	**210,407**

1.4.2 Mineral Reserves

The effective date of this reserves estimate is December 31, 2014. The mineral reserves estimate was completed by applying modifying factors to the stope blocks of the mineral resource. Stope

blocks were modified by applying ore loss, dilution, and grade adjustment factors derived from reconciliation with prior production. Block NSR values for the diluted blocks were estimated by considering metal grades, recoveries, and treatment and refining charges. Blocks which are included within the Yauricocha mine plan, and which have an estimated NSR above the cutoff grade for the applicable zone are considered ore. (Zone cutoff grades vary due to differences in mining methodology and zone geometry.) Cutoffs vary by zone, include all operating costs and G&A, and reflect mining cost assumptions for each zone. Cutoffs vary from $42 to $87 per tonne depending on mining method. However due to bulk mining methods employed, some marginal value blocks inside of stope shapes are included as reserves. Gustavson considers the reserves to meet industry standard practices, and to be CIM and NI 43-101 compliant.

The Proven Reserve is that portion of the Measured resource for which the diluted NSR value is above the economic cutoff, and where mining access has been defined.

The Probable Reserve is defined as that portion of the Indicated resource for which the diluted NSR value is above the economic cutoff, and where mining access has been defined.

1.4.3 Adjustment Factors: Resources to Reserves

Resource grades and tonnages are adjusted using factors in considering classification of resources as reserves.

- Mine recovery (Ore loss factor, reduction in tonnes), dependent on mining technique and specific ore body. These factors are based on reconciliation between the resource model and actual 2013-2014 production.
- Dilution (Increase in tonnes and decrease in grades for all metals, dependent on mining technique and specific ore body. These factors are based on reconciliation between the resource model and actual 2013-2014 production.
- Grade Adjustment factors: Adjustment to grades (generally decrease in grades) according to type of mineralization, derived from mine-mill reconciliation data from the prior 2 years.
- Reserves tonnages for each resource volume is defined as:
    - $T_{reserve} = T_{resource} * M_{rec}\% * (1+Dilution\%)$
- Reserves grade is defined as
    - $G_{reserve} = G_{resource} * (1-Dilution\%) * (1+Adjustment\%)$
- (Where dilution is expressed as a positive percentage, and grade adjustment is expressed as a negative percentage.)

Table 1-5 Yauricocha Proven Mineral Reserves

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	1,108,000	348.5	65.2	1.17	0.68	3.07	0.81	2,320	13,014	7,493	33,963	28,749
Copper	10,000	444.5	80.3	0.58	2.74	1.34	0.57	27	60	283	138	189
Copper Oxides	18,000	523.1	88.8	1.96	4.31	4.32	0.39	50	346	760	762	221
Oxides	72,000	775.1	276.1	8.41	0.59	2.30	1.91	638	6,047	422	1,655	4,427
Total	**1,207,000**	**377.6**	**78.2**	**1.61**	**0.74**	**3.02**	**0.87**	**3,036**	**19,467**	**8,958**	**36,518**	**33,586**

Table 1-6 Yauricocha Probable Mineral Reserves

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	3,607,000	270.4	43.3	0.48	0.78	2.24	0.86	5,017	17,465	28,093	80,871	99,942
Copper	9,000	447.3	92.6	0.69	2.66	1.50	0.65	26	60	230	130	181
Copper Oxides	32,000	1,111.3	538.3	6.97	4.69	1.12	0.46	559	2,250	1,514	362	478
Oxides	522,000	671.0	263.5	7.00	0.76	1.55	1.47	4,422	36,516	3,982	8,089	24,731
Total	**4,170,000**	**327.4**	**74.8**	**1.35**	**0.81**	**2.15**	**0.93**	**10,024**	**56,291**	**33,819**	**89,452**	**125,332**

Table 1-7 Yauricocha Proven and Probable Mineral Reserves

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	4,714,000	288.7	48.4	0.65	0.75	2.44	0.85	7,338	30,479	35,586	114,834	128,691
Copper	19,000	445.8	86.0	0.63	2.71	1.41	0.61	52	119	513	268	370
Copper Oxides	50,000	903.5	379.5	5.20	4.56	2.25	0.44	609	2,596	2,274	1,124	699
Oxides	594,000	683.6	265.0	7.17	0.74	1.64	1.53	5,060	42,564	4,404	9,744	29,158
Total	**5,377,000**	**338.6**	**75.5**	**1.41**	**0.80**	**2.34**	**0.92**	**13,059**	**75,758**	**42,778**	**125,970**	**158,918**

The quantity and grade or quality is an estimate and is rounded to reflect the fact that it is an approximation. Quantities may not sum due to rounding.

1.4.4 Reserves Reconciliation

Gustavson has reviewed the reconciliation data for 2013 and 2014 to evaluate the predictive value of this reserves estimation as compared to production at the Yauricocha Mine. While there are local variations, the stated reserves appear to be a reliable predictor of monthly and annual actual production statistics. Gustavson believes that the reconciliation meets industry standards and provides strong support for the methodologies and assumptions used for definition of reserves.

In order to test the performance of the updated block resource modelling methodology, as well as to tune recovery and dilution factors, Gustavson reconciled the Cuerpos Massivos models against actual production from levels recently mined. Table 1-8 shows the bodies and levels that can be reconciled using this new model.

There are six instances where ore zones were completely mined out on specific levels during 2013-2014. The table shows the relationship between the 2014 modeled reserves (with dilution, ore loss, and metal factors applied) as compared with actual production from these mining levels.

Gustavson recommends that Yauricocha Mine continue to monitor model performance against actual production on at least a quarterly basis, to determine whether additional adjustments are warranted to the dilution factors.

Table 1-8 Reserves Reconciliation

		Planned Production (2014 Model Reserves)					Plant Head Grades & Tonnages				
Body	Level	Tonnes	Ag-g/t	Pb%	Cu%	Zn%	Tonnes	Ag-g/t	Pb%	Cu%	Zn%
Antacaca	820	151,504	73.1	1.343	0.560	3.621	155,809	77.7	1.218	0.790	3.400
Antacaca	870	151,524	61.4	1.114	0.480	2.992	150,325	67.3	1.218	0.730	3.204
Antacaca Sur	820	142,153	67.2	1.115	0.671	3.760	138,837	68.3	1.169	0.916	3.811
Catas	820	262,491	71.5	0.792	0.965	2.282	271,568	72.8	0.818	0.995	2.525
Catas	870	277,563	61.9	0.576	0.895	2.245	266,954	62.7	0.743	0.882	2.477
Rosaura	820	150,798	78.0	1.43	1.66	3.39	155,523	74.4	1.688	1.019	4.289

1.5 Reserves replacement

There is no guarantee that resources will be converted to reserves through further exploration, nor is it possible to determine whether historical reserves replacement rates can be maintained into the future. However, it is useful to note that Yauricocha mine has demonstrated a history of reserves replacement as shown in Figure 1-1, above.

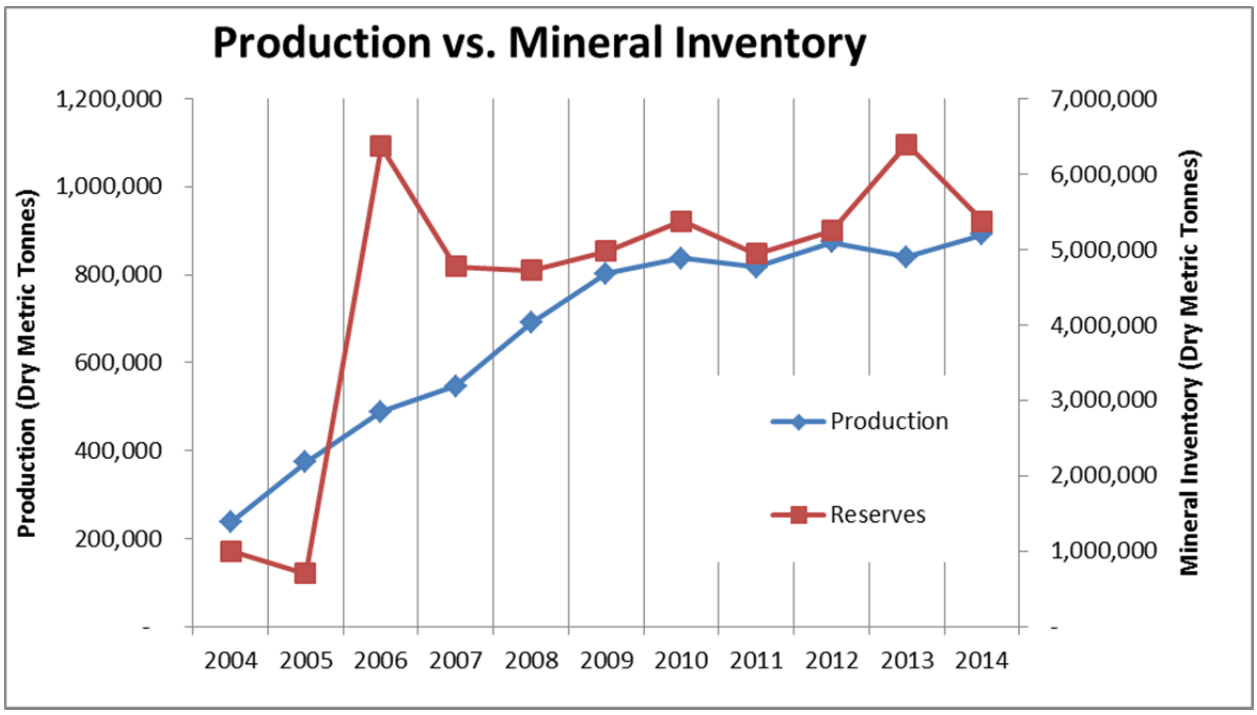


Figure 1-1 Production vs. Mineral Inventory

1.6 Mining

Mining at Yauricocha is accomplished by various extraction methods, principally sublevel caving and overhand cut and fill stoping. The larger mineralized bodies are both thicker (10-60 m) and longer along strike and down dip and the ore minerals are held in semi consolidated rocks which ravel easily with minor provocation by blasting. The smaller bodies are also in poor rock,

however can be of quite high metal grades, averaging over 10 oz/tonne silver and 10% lead. During cut and fill stoping the mine uses timber in square sets to maintain the level open for safe access (mostly through breasting) and then fills the lower level after mining the upper level.

In 2014, 81% of the ore was mined by Mechanized Sub Level Caving and 19% by other methods including manual caving and cut and fill. In the sub-level caving method, approximately 70% of the production results from self-caving, the remaining 30% has to be drilled and blasted.

Approximately 93% of the ore and waste material is extracted through the Klepetko Tunnel located at Level 720. The tunnel has a section of 3 m x 3 m, is 4 km long and is equipped with 20 tonne trolley locomotive hauling ore cars of 110 to 160 ft^3 capacity.

Because of the potential of the orebodies at depth, the company is planning the sinking of a hoist raise to hoist ore from deeper levels of the lead oxide, copper and polymetallic orebodies to the 720 haulage level. The new access will serve the Mascota, Cuye, Catas, Antacaca, Rosaura and Antacaca Sur orebodies in the Mina Central. Given the depth of current production below the surface, development drilling to convert the mineral resource to a mineable reserve is performed on an ongoing basis from underground workings.

1.7 Metallurgy and Processing

The Chumpe Mill treats ore produced by the Yauricocha Mine using crushing, grinding and flotation. The ores are complex, carrying zinc, lead, copper, silver and gold values. Three types of ore have been historically treated: polymetallic (PM), containing payable silver, lead, copper and zinc; copper ore, containing payable copper and silver; and lead oxide (PbOx), containing payable silver and lead. Gold occurs in the ores and is partially recovered, until recently it has not been tracked in the mill. Impurity elements such as arsenic and antimony are not routinely monitored. Currently the mine is producing limited quantities of copper ore. The Chumpe mill is operating two milling circuits only, one treating polymetallic ore and one treating lead oxide ores. Current production of copper ore is being processed through the PM circuit.

The plant produces five concentrates; lead concentrate, copper concentrate and zinc concentrate in the polymetallic plant, copper concentrate (Campaña) and lead oxide concentrate in the lead oxide circuit. The sulfide lead concentrate from the oxide plant is combined with the sulfide lead in the polymetallic circuit. Copper ore is reported through 2014.

The annual metallurgical data for the two milling circuits are given in Tables 17-1 to 17-3. Figures in boldface refer to payable metals. There was no copper sulfide ore processed in 2014.

The PM plant processed approximately 10% more tonnage in 2014 as compared to 2013;

- The metals recovery appears to be consistent between the two years.
- The silver losses to the tailings are less than an ounce/tonne;

- The silver losses in the lead oxide tailings is significant but are improving;
  There appears to be steady improvement in metal recoveries in the PM circuit despite the decrease in the feed grade to the PM circuit.

1.8 Interpretations and Conclusions

This study shows a production of 5.7 million oz of silver, 51.7 thousand tonnes of lead, 58.2 thousand tonnes of zinc, 11.4 thousand tonnes of copper, and about 20.7 thousand ounces of gold from 2.8 million tonnes of ore during the next three years. The mine plan for the next three years does not fully consume the proven and probable reserves. There are an additional three years of operation at expected mining rates before the current reserves are depleted.

1.9 Recommendations

- Gustavson recommends that downhole surveys be done for all exploration drilling going forward, that the database be updated to include any existing downhole survey data which have not been included, and that Minera Corona consider surveying open, accessible drillholes which have not previously been surveyed.

- Gustavson recommends that Minera Corona continue to monitor Chumpe Laboratory performance by sending 5% of coarse reject samples and /or pulp duplicates to a certified outside lab for analysis, with particular attention paid to understanding the source of erratic outlier values, and possible sources of bias for zinc and lead assay.

- Gustavson recommends that Minera Corona geology department submit standards and blanks with the sample stream to Chumpe Lab, to independently monitor and verify sample preparation and laboratory performance.

- Gustavson recommends that Minera Corona should continue to update database methodologies for the project, including consideration of handling underground channel samples as traverse databases, maintaining capped and uncapped assay values as auditable records within a database rather than in separate databases, and similar database modernization efforts.

- Gustavson recommends that Minera Corona should continue the process of updating the resource estimation methodology for the project for the future to leverage the data management and modeling capabilities of modern resource estimation software, particularly for Cuerpos Chicos. Such methodology Should improve the ability to audit data, improve the reporting of resources and reserves estimates, improve infomraiton flow between geology and mine planning, and allow for petter understanding of potential exploration targets in the vicinity of existing operations.

- Gustavson recommends that Minera Corona should consider exploration drilling along trend to the small mineralized bodies currently being developed, rather than only

exploring these bodies through underground development. These small mineralized bodies are relatively low tonnage, but can contain significant grades and are important to the resources and reserves. Such drilling should be focused on understanding the periodicity of these small structural zones, so that similar zones might be delineated in advance of mine development.

- Gustavson recommends that Sierra should undertake an exploration program to prioritize additional exploration targets based on resource potential, proximity to current operations, and land and surface rights status. The objective should be to identify drilling targets and to identify additional resources within the project area for future development.

- Gustavson recommends continued metallurgical testing to identify process improvements or alternative processes to improve precious metals recoveries.

- Gustavson recommends a study to consider mining methods or mine dewatering improvements to reduce dilution and improve safety for mechanized sublevel caving in mine areas where water is present.

The budget for this work is shown in Table 1-9. This work can be completed in one phase.

Table 1-9 Estimated Recommendations Budget

Task	Cost
DownHole Surveys	$100,000
Outside Lab Check Assays	$15,000
Standards and Blanks	$50,000
In Situ Bulk Density Sampling	$5,000
Database Methodologies	$10,000
Resource Methodology Update, Including Software Licenses & Training	$200,000
Underground Exploration Drilling	$3,000,000
Surface Exploration Programs (2015-2016)	$3,000,000
Metallurgical Testwork	$80,000
Mining Methods – Dewatering	$100,000
Total	**$6,560,000**

2. INTRODUCTION AND TERMS OF REFERENCE

Gustavson Associates, LLC (Gustavson) was commissioned by Sierra Metals Inc. (Sierra Metals, previously known as Dia Bras Exploration, Inc.) to prepare a National Instrument 43-101 (NI 43-101)Technical Report to report the advancement of the Yauricocha Mine (or the Mine), which is located in the eastern part of the Department of Lima, Peru. The purpose of this report is to present the mineral resource and reserve estimates, and economic evaluation for the Mine.

The Mine has been in continuous commercial production since 1948, first under the direction of Cerro de Pasco. In 2002, the Yauricocha unit was privatized and purchased by Sociedad Minera Corona S.A. (Minera Corona). 88% of Minera Corona was purchased by Sierra Metals, Inc. in 2011. Minera Corona operates the Yauricocha Mine as a subsidiary of Sierra Metals, Inc.

This report was prepared to comply with public reporting obligations according to and in compliance with NI 43-101 Standards of Disclosure for Mineral Projects, and Definition Standards for Mineral Resources and Mineral Reserves according to the Canadian Institute of Mining, Metallurgy and Petroleum (CIM). The interpretations and conclusions reported here are based on technical data available prior to the effective date of this report, December 31, 2014.

The production decision was not based on a feasibility study of Mineral Reserves demonstrating economic viability. There is an increased uncertainty and economic and technical risks of failure associated with this production decision. Production and economic variables may vary considerably, due to the absence of a complete and detailed site analysis according to and in compliance with NI 43-101 Standards of Disclosure specific risk analysis.

The Qualified Persons (QP's) responsible for this report are:

- Mr. Donald Hulse, P.E., SME-RM, V.P. and Principal Mining Engineer for Gustavson, is a QP as defined by NI 43-101. Mr. Hulse acted as project manager during preparation of this report and is specifically responsible for Sections 1 through 6, 15, 16 and 18 through 27.
- Mr. Thomas C. Matthews, B.Sc, MMSA-QP, Principal Resource Geologist for Gustavson, is a QP as defined by NI 43-101. Mr. Matthews is specifically responsible Sections 7 through 12, and 14.
- Deepak Malhotra, PhD., SME-RM, President, RDi is a QP as defined by NI 43-101 and is responsible for Sections 13 and 17.

2.1 Effective Date

The effective date for this report is December 31, 2014. The effective date of the Mineral Resources and Mineral Reserves is December 31, 2014.

2.2 Sources of Information

The information, opinions, conclusions, and estimates presented in this report are based on the following:

- Information and technical data provided by Minera Corona;
- Review and assessment of previous investigations;
- Assumptions, conditions, and qualifications as set forth in the report; and
- Review and assessment of data, reports, and conclusions from other consulting organizations.

In addition to the above, Carlos Villanueva – General Manager – Yauricocha Mine – Minera Corona, provided capital and operating costs, along with concentrate sales information for the Yauricocha Mine.

These sources of information are presented throughout this report and in Section 27 – References. The qualified persons are unaware of any material technical data other than that presented by Minera Corona and Sierra Metals.

2.3 Personal Inspection

Mr. Donald E. Hulse P.E. visited the site on March 22, 23 and 24, 2011 in the company of Mr. Carlos Villanueva of Minera Corona and Dr. Thomas Robyn, SVP, Exploration of Sierra Metals. Mr. Hulse inspected the core stored on site and performed an extensive tour of the existing underground workings. Mr. Hulse visited again on April 9-13, 2012 and reviewed production records, mine plans and core from new drilling.

Mr. Hulse accompanied Thomas Matthews of Gustavson and Deepak Malhotra to the site from September 29 to October 4, 2013. Mr. Hulse and Mr. Malhotra visited the process plant and reviewed metallurgical data and operating practices for the plant. Mr. Matthews reviewed sampling practices, viewed drill core, reviewed data handling and database, and resource estimation practices. Mr. Hulse and Mr. Matthews performed a tour of the underground workings to review operating methods for overhand cut and fill and sub-level caving and to view mineralization as it outcrops in the Mine.

Gustavson understands that current operating practices at the mine are consistent with those observed during the site visits, and notes that data formats and internal reporting standards for 2014 data are consistent with those received at site during the visits.

2.4 Units

All measurements used in the Yauricocha Mine are in metric units and all references to dollars are United States dollars.

The following general mining terms may be used in this report.

Table 2-1 General Mining Terms

Term	Definition
Assay:	The chemical analysis of mineral samples to determine the metal content.
Capital Expenditure:	All other expenditures not classified as operating costs.
Composite:	Combining more than one sample assay to give a length weighted average..
Concentrate:	A metal-rich product resulting from a mineral enrichment process such as gravity concentration or flotation, in which most of the desired mineral has been separated from the waste material in the ore.
Crushing:	Initial process of reducing ore particle size to render it more amenable for further processing.
Cut-off Grade (CoG):	The grade of mineralized rock, which determines whether it is economic to recover its metal content by further processing.
Dilution:	Waste, which is unavoidably mined with ore.
Dip:	Angle of inclination of a geological feature/rock from the horizontal.
Fault:	The surface of a fracture along which movement has occurred. .
Footwall:	The underlying side of a fault, orebody, or stope.
Grade:	The measure of concentration of metal within mineralized rock.
Hangingwall:	The overlying side of a fault, orebody, or slope.
Haulage:	A horizontal underground excavation which is used to transport mined ore or waste.
Igneous:	Primary crystalline rock formed by the solidification of magma or lava.
Kriging:	An interpolation method of assigning values from samples to blocks which utilizes geostatistical analysis and is intended to minimize the estimation error.
Level:	Horizontal tunnel primarily for the transportation of personnel and materials.
Lithological:	Geological description pertaining to different rock types.
LoM Plans:	Life-of-Mine plans.
Mafic:	A rock type that is composed predominantly of magnesian rock-forming silicate minerals; subsilicic. Contrasted with felsic.
Milling:	A general term used to describe the process in which the ore is crushed and ground and subjected to physical or chemical treatment to extract the valuable metals to a concentrate or finished product.
Mineral/Mining Lease:	A lease area for which mineral rights are held.
Mining Assets:	The Material Properties and Significant Exploration Properties.
Ongoing Capital:	Capital estimates of a routine nature, which is necessary for sustaining operations.
RoM:	Run-of-Mine.
Sedimentary:	Pertaining to rocks formed by the accumulation of sediments, formed by the erosion of other rocks.
Shaft:	An opening cut downwards from the surface for transporting personnel, equipment, supplies, ore and waste.
Sill:	An intrusive body of relatively thin and tabular igneous rock which has been emplaced parallel to the bedding or schistosity of the intruded unit
Smelting:	A high temperature pyrometallurgical operation conducted in a furnace, in which the valuable metal is collected to a molten matte or doré phase and separated from the gangue components that accumulate in a less dense molten slag phase.

Term	Definition
Stope:	Underground void created by mining.
Stratigraphy:	The study of stratified rocks in terms of time and space.
Strike:	Direction of line formed by the intersection of strata surfaces with the horizontal plane, always perpendicular to the dip direction.
Sulfide:	A metallic, sulfur bearing mineral.
Tailings:	Finely ground waste rock from which valuable minerals or metals have been extracted.
Thickening:	The process of concentrating solid particles in suspension.
Total Expenditure:	All expenditures including those of an operating and capital nature.
Variogram:	A statistical representation of the characteristics (usually grade).

The following abbreviations may be used in this report.

Table 2-2 Abbreviations

Abbreviation	Unit or Term
A	ampere
AA	atomic absorption
A/m^2	amperes per square meter
Ag	silver
Au	gold
°C	degrees Centigrade
CCD	counter-current decantation
CIL	carbon-in-leach
CoG	cut-off grade
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
cfm	cubic feet per minute
ConfC	confidence code
CRec	core recovery
CSS	closed-side setting
CTW	calculated true width
Cu	copper
°	degree (degrees)
dia.	Diameter
EDX	energy dispersive x-ray
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
FA	fire assay
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
g	gram
gal	gallon
g/L	gram per liter
g-mol	gram-mole

Abbreviation	Unit or Term
gpm	gallons per minute
g/t	grams per tonne
ha	hectares
Hp	Horsepower
HQ	drill core diameter of ~63.5 mm
HTW	horizontal true width
ICP-MS	inductively coupled plasma mass spectrometry
ID2	inverse-distance squared
ID3	inverse-distance cubed
kA	kiloamperes
kg	kilograms
km	kilometer
km^2	square kilometer
koz	thousand troy ounce
kt	thousand tonnes
kt/d	thousand tonnes per day
kt/y	thousand tonnes per year
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
kWh/t	kilowatt-hour per metric tonne
L	liter
L/sec	liters per second
L/sec/m	liters per second per meter
lb	pound
LHD	Long-Haul Dump truck
LOI	Loss On Ignition
LoM	Life-of-Mine
m	meter
m^2	square meter
m^3	cubic meter
masl	meters above sea level
Ma	millions of years before present
mg/L	milligrams/liter
MLA	mineral liberation analysis
mm	millimeter
mm^2	square millimeter
mm^3	cubic millimeter
MME	Mine & Mill Engineering
Moz	million troy ounces
Mt	million tonnes
MTW	measured true width
MW	million watts
m.y.	million years
NGO	non-governmental organization
NI 43-101	Canadian National Instrument 43-101
NQ	drill core diameter of ~47.5 mm
opt	troy ounce per ton

Abbreviation	Unit or Term
OSC	Ontario Securities Commission
oz	troy ounce
%	Percent
Pb	lead
PGM	Pilot Gold Mill
PLC	Programmable Logic Controller
PLS	Pregnant Leach Solution
PMF	probable maximum flood
ppb	parts per billion
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RC	rotary circulation drilling
RoM	Run-of-Mine
RQD	Rock Quality Description
Sb	antimony
sec	second
SEM	Scanning Electron Microscope
SG	specific gravity
SPT	standard penetration testing
st	short ton (2,000 pounds)
t	tonne (metric ton) (2,204.6 pounds)
t/h	tonnes per hour
t/d	tonnes per day
t/y	tonnes per year
TSF	tailings storage facility
TSP	total suspended particulates
µm	micron or microns
V	volts
VFD	variable frequency drive
W	Tungsten or watts
XRD	x-ray diffraction
XRF	x-ray fluorescence
Y	Year
Zn	zinc

3. RELIANCE ON OTHER EXPERTS

During preparation of this report, Gustavson relied in good faith on information provided by Carlos Villanueva, General Manager of Minera Corona, for the information concerning mining concessions and permit status for the Mine, (Sections 4.2 through 4.5).

Ed Guimaraes, Chief Financial Officer and Claudio Cubillas, Corporate Financial Planning Manager of Sierra Metals, Inc. provided information regarding the calculation of Peruvian Royalties and Special Taxes (Section 19).

Gustavson has reviewed the documentation concerning the surface rights and mineral tenure, and these documents appear to be in order and agree with the representation of Sierra personnel. Gustavson is unaware of any material technical data other than that provided by Sierra Metals and Minera Corona.

4. PROPERTY DESCRIPTION AND LOCATION

The Yauricocha Mine is located in the Alis district, Yauyos province, department of Lima approximately 12 km west of the Continental Divide and 60 km south of the Pachacayo railway station. The active mining area within the mineral concessions is located at coordinates 421,500 m east by 8,638,300 m north on UTM Zone 18L on the South American 1969 Datum, or latitude and longitude of 12.3105° S and 75.7219° W. It is geographically in the high zone of the eastern Andean cordillera, very close to the divide and within one of the major sources of the River Cañete, which discharges into the Pacific Ocean. The mine is at an average altitude of 4,600 masl Figure 4-1 shows the project location.

Figure 4-1 Yauricocha Mine Location Map

4.1 Mining Concessions

4.1.1 Concessions Held by Minera Corona

The mining concession Acumulación Yauricocha (Figure 4-2) was transferred from Empresa Minera del Centro del Peru, the Peruvian state-owned mining entity, to Minera Corona in 2002 (Empresa Minera, 2002) for the sum of $US 4,010,000.00, plus an agreement to invest $US 3,000,000.00 to project development or to the community, which agreement has been completed. The Accumulation Yauricocha includes the mineral rights on 19,204.5715 Ha. Dia Bras purchased 82% of Minera Corona in May 2011. On December 5th, 2012, Dia Bras Exploration changed its name to Sierra Metals Inc. According to information provided by Dia Bras, the mineral concessions are not subject to an expiration date and remain in effect as long as these two conditions are met: (1) renewal payment is made to the Peruvian federal government in the amount of $ 3 per hectare, and (2) annual minimum production amount of $100 per year and per hectare. The payment subject to Condition (1) was made to the Peruvian federal government on June 20, 2012. This mineral concession is in good standing (PMJHR, 2013 and INGEMMET, 2012).

No royalties are associated with the Yauricocha mineral concession.

Included within the above area is a processing site concession with an area of 148.5000 ha with a permitted capacity of 2,500 dry tonnes/day. This has been authorized by Resolution No. 279-2010-MEM-DGM/V on July 14, 2010. The payment for rights to the processing site concession was paid on June 20, 2012 (INGEMMET, 2012). This mineral concession is in good standing.

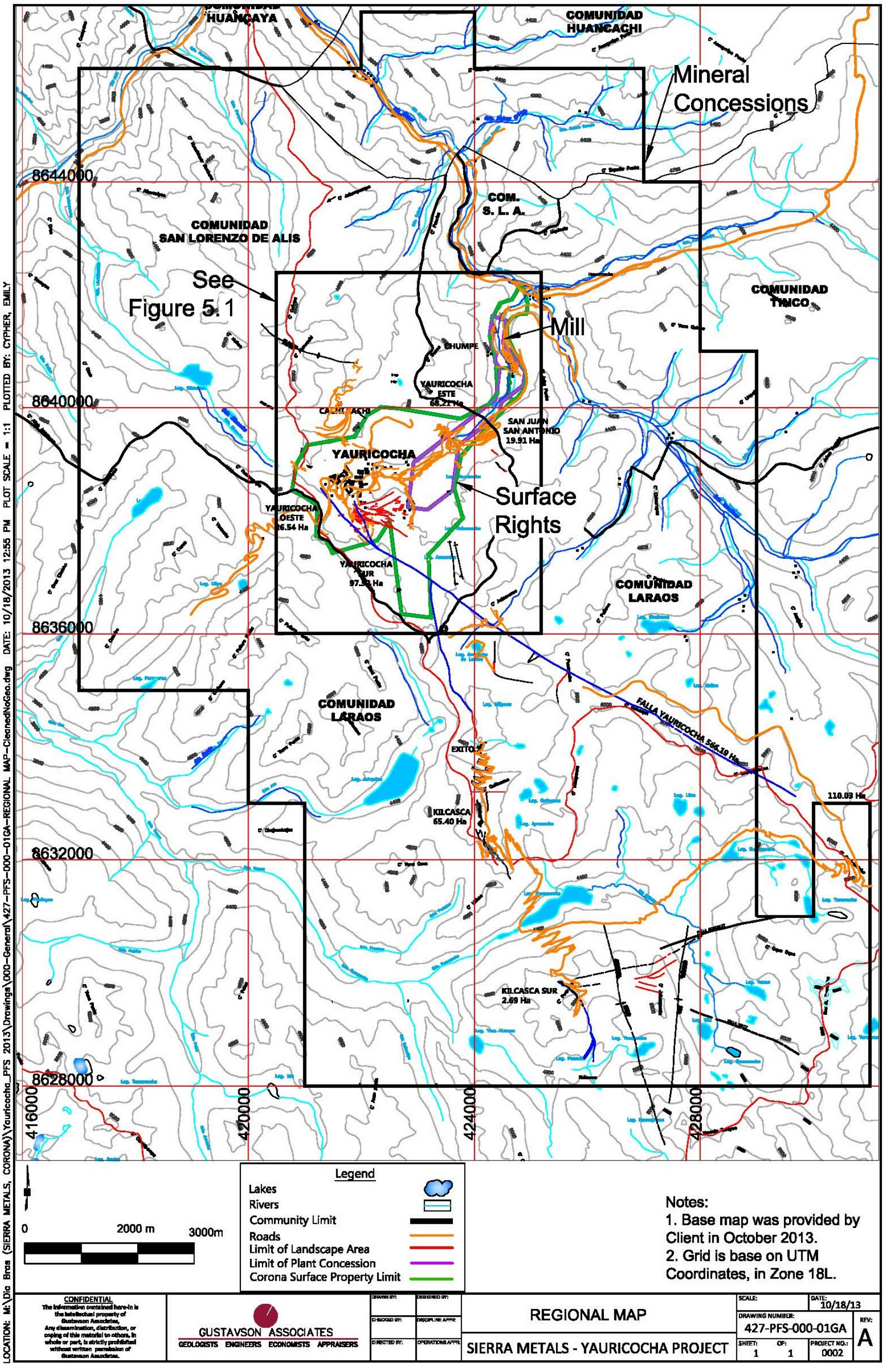


Figure 4-2 Regional Map

4.2 Land Surface Agreements

As part of the mineral concessions transfer with Empresa Minera del Centro del Peru in 2002 (see Section 4.1), Minera Corona acquired approximately 677 hectares of land and associated surface rights. A portion of the San Lorenzo Alis community is located within the 677 hectares. In 2007, Minera Corona entered into an additional agreement with the San Lorenzo Alis community (Villaran, 2009). Under this agreement, Minera Corona owns the surface rights and may conduct mining operations in the subject 677 hectares through August 2, 2037, or until mine closure, whichever comes first. In exchange, Minera Corona is obligated to pay the San Lorenzo Alis community an annual fee. This fee is paid by Minera Corona every two years beginning on January 1, 2009, and surface rights remain in good standing. However, in February 2013 an addendum was signed which establishes that the payments must be made every year. This right of usufruct (beneficial use) has been registered before the Public Registry of Lima, Office of Cañete (Public Registry of Lima et al, 2013).

The Company has in place several land surface agreements by means of which the title holders of the land surfaces within the area of the Acumulación Yauricocha mining concession, grants the Company the right to use the superficial surface and execute mining activities. The agreements entered by the Company in this regard, are the following:

4.2.1 Lease agreement: Huacuypacha

The Company has entered into a lease agreement with Mr. Abdon Vilchez Melo, regarding the surface land within the real property named Huacuypacha, located in Tinco, district of Alis, province of Yauyos, Department of Lima. This land is not registered in the Public Registry. By means of this agreement, the Company acquired the right to use said land, including access to water boreholes.

This agreement has been renewed in four opportunities. The term of the agreement expires on December 31, 2021.

4.2.2 Lease agreement: Queka and Cachi Cachi

The Company has entered into a lease agreement with the Family Varillas, in relation to land containing 56 ha located in district of Alis, province of Yauyos, Department of Lima. This land is not registered in the Public Registry.

By means of this agreement, the landowner granted the use of the referred land in favor of the Company for a total payment of S/.31,500. In addition to the payment obligation, the Company has assumed the obligation to take care of all the environmental liabilities that its activities could generate.

This agreement has been amended in two opportunities. The term of the agreement expired on March 7, 2012. However, the company has signed a new agreement extending the term of the lease until March 7, 2022 in exchange for a one-time payment of S/.210,000.

4.3 Royalties and Encumbrances

4.3.1 Debt

For the purchase of Minera Corona, Dia Bras Peru S.A.C. borrowed US$150 million in an agreement with Banco de Credito de Peru on May 24, 2011. All current obligations of debt service have been met and this Technical Report supports the cash flows and reporting requirements that are necessary to continue meeting these obligations.

In October 2013, Minera Corona has signed a new loan agreement with Banco de Credito de Peru for US$60 million. This loan has a period of 5 years and is to support expansion and infrastructure costs.

4.3.2 Royalties and Special Tax

In 2011, the Peruvian Congress passed a new Mining Law effective in 2012. Under this law, a Special Tax and Royalty is introduced which applies to the operating margin of producing mining companies. The margin rates for a given interval of Earnings Before Interest and Tax (EBIT) are as follows:

Table 4-1 EBIT Margin Rates

EBIT Margin		Special Mining Tax	Mining Royalty
		Margin Rate	Margin Rate
0.00%	5.00%	0.00%	0.00%
5.00%	10.00%	2.00%	1.00%
10.00%	15.00%	2.40%	1.75%
15.00%	20.00%	2.80%	2.50%
20.00%	25.00%	3.20%	3.25%
25.00%	30.00%	3.60%	4.00%
30.00%	35.00%	4.00%	4.75%
35.00%	40.00%	4.40%	5.50%
40.00%	45.00%	4.80%	6.25%
45.00%	50.00%	5.20%	7.00%
50.00%	55.00%	5.60%	7.75%
55.00%	60.00%	6.00%	8.50%
60.00%	65.00%	6.40%	9.25%
65.00%	70.00%	6.80%	10.00%
70.00%	75.00%	7.20%	10.75%
75.00%	80.00%	7.60%	11.50%
80.00%	85.00%	8.00%	12.00%
85.00%	90.00%	8.40%	

The total royalty is the summation of the special mining tax and the mining royalty.

4.4 Environment Liabilities and Permitting

Environmental liabilities and permitting are discussed in Section 20. Based on information reviewed by Gustavson, potential environmental impacts from onsite mining and processing activities are managed by existing permits and requirements with the proper regulatory agencies. As a result, Gustavson knows of no significant factors or risks that may affect access, title, right or the ability to perform work on the property.

5. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The principal access to the Mine is the main Lima – Huancayo – Yauricocha highway. The highway is paved (asphalt) for the first 420 km, along the Lima – Huancayo – Chupaca interval. From Chupaca to the Mine the road is unpaved.

Another important access route is along the southern Pan-American Highway from Lima through Cañete to Yauricocha, through the valley of the Rio Cañete, for a distance of 370 km. The road is paved (asphalt) from Lima to Pacarán, and from Pacarán to the mine it is unpaved.

5.2 Climate

The climate in the region is cool, with two well-demarcated seasons with daytime temperatures above 20 ºC, the nights are cool with temperatures below 10 ºC. Operations are carried out year round. The wet season extends from November to April, and during April and May there is broad vegetative cover. The dry season covers the remainder of the year.

During the wet season, snow and hail feed the glaciers, which subsequently feed streams that descend the mountainsides and feed the lakes below.

5.3 Local Resources

Though there are closer pueblos the closest population center is Huancayo, approximately 60 km east or 90 km by paved 2 lane road. It is served by paved roads but has limited supply capability. Supplies and material for the mine are sourced out of Lima, Peru. All personnel and materials are supplied to the mine via normal highway transport. On site personnel live in camps at the mine.

5.4 Infrastructure

Grid power is available at the site, and water wells are on the property. Paved roads extend to the property boundary, and internal travel is on improved gravel roads. Worker camp facilities are provided on site, with internal worker transport and transport to and from the camp provided by contractors. Site layout is shown on Figure 5-1. Infrastructure is further discussed in Section 18.

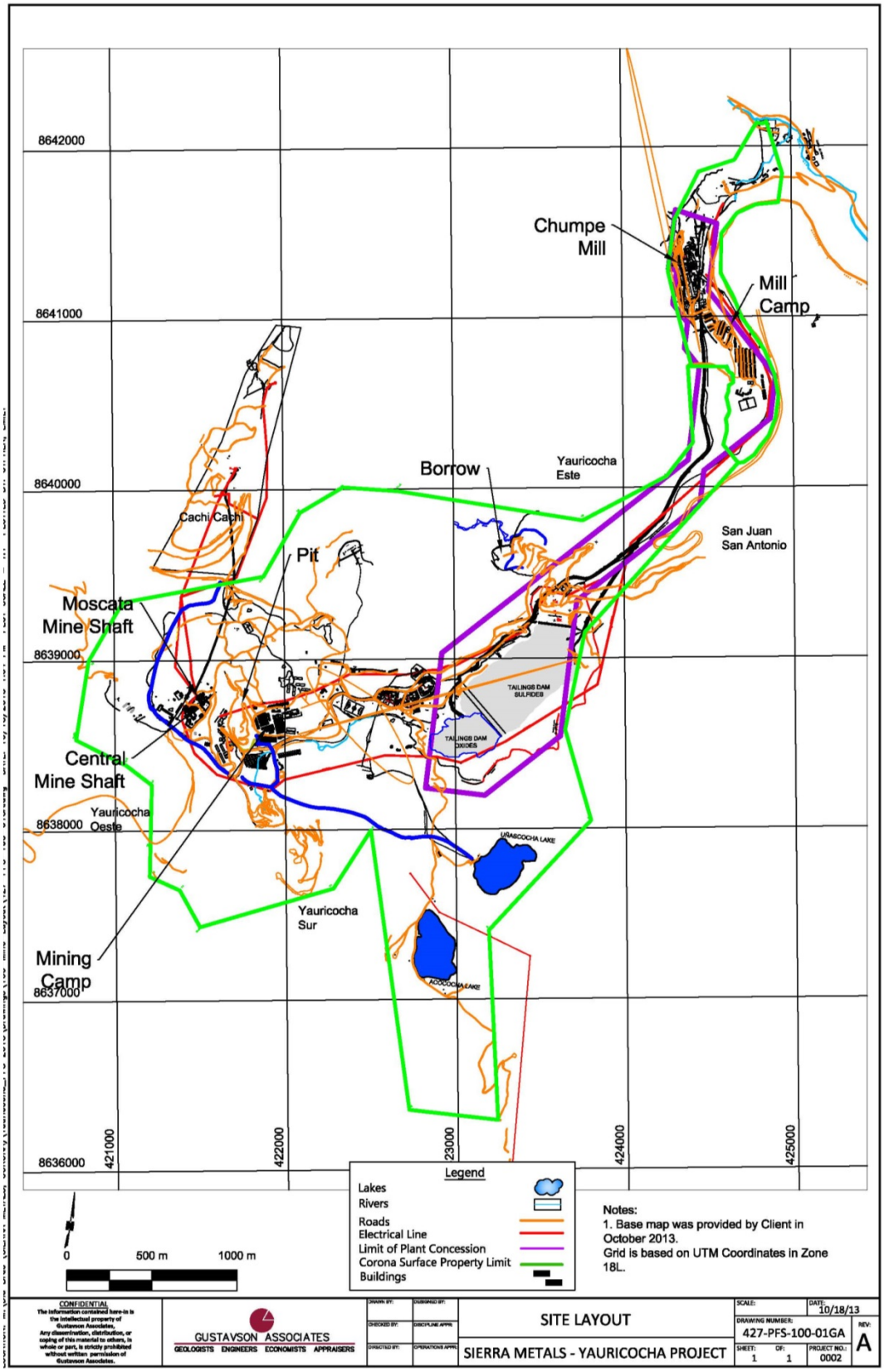


Figure 5-1 Yauricocha Surface Infrastructure

5.5 Physiography

The topography of the Yauricocha mining district is abrupt, typical alpine terrain. Pliocene erosion is clearly recognizable in the undulating, open fields to the northeast of the Continental Divide while to the southeast the terrain is cut by deep valleys and canyons. The extent of this erosion is evidenced by mountain peaks with an average elevation of 5,000 masl.

To the southeast of the Continental Divide the high valleys are related to the Chacra Uplift. Below 3,400 m elevation, this grand period of uplift is clearly illustrated by deep canyons that in some cases are thousands of meters deep.

Valleys above 4,000 masl clearly demonstrate the effects of Pliocene glaciations, with well-developed lateral and terminal moraines, U-shaped valleys, hanging valleys and glacial lakes.

5.6 Vegetation

Vegetation in the Yauricocha area is principally tropical alpine – rain tundra. The flora is varied with species of grasses, bushes, and some trees. The biological diversity is typical of Andean alpine communities.

5.7 Property Position

Overall, the property position including mineral concessions and surface rights are expected to be sufficient for foreseeable mine activities. As shown on Figure 5-1, the project infrastructure is located within the area where Sierra Metals has surface rights. The Cachi Cachi mine is located within the area of mineral rights, but outside of the area of surface rights. Cachi Cachi is an underground mine, and surface access to Cachi Cachi is located within the area of surface rights. Of the 20 km length of the property along strike approximately 4 km have been developed near the center of the property.

5.8 Potential Tailings Storage Area

The Yauricocha project expanded its existing tailings dam in H2 2013: this expansion is within the area where surface rights are held. Gustavson is of the opinion that the area for the expanded tailings dam to be sufficient for foreseeable mining activities. Within the expansion, there is an internal impoundment to segregate tailing from the lead oxide circuit of the mill. These tailings contain elevated values of gold and silver and may be reprocessed when the metallurgical work and plant modifications allow.

6. HISTORY

The silver of Yauricocha was initially documented by Alexander von Humboldt in the early 1800s. In 1905, the Valladares family filed the claims of what is today the Yauricocha Mine. The Valladares family mined high grade silver ore for 22 years and in 1927, Cerro de Pasco Corporation acquired the Yauricocha claims. In 1948, Cerro de Pasco commenced mining operations at Yauricocha until the Peruvian Military Government nationalized Cerro de Pasco Corporation and Yauricocha became a production unit of State-owned Centromin Peru S.A. for 30 years. In 2002, the Yauricocha unit was privatized and purchased by Minera Corona. Dia Bras acquired 82% of the total equity of Corona in May, 2011.

Prior to the 1970s detailed production records are unavailable. Since 1973, Company records indicate thatYauricocha has produced 13.6 million tonnes of mineralized material containing 63 million ounces of silver as well as 378 thousand tonnes of lead, 117 thousand tonnes of copper and nearly 618 thousand tonnes of zinc. Since 1979 Yauricocha has averaged 413,000 tonnes of production per year. The historical estimates presented below predate CIM and NI 43-101 reporting standards and therefore cannot be relied upon. These estimates were not used as a basis for the current resource and/or reserve estimates, as the material has already been mined and processed.

Table 6-1 Summarizes exploration and mining statistics under Corona ownership (2002). Mineral inventory is derived from Company reports to Peruvian regulatory Authorities and are not CIM compliant. Mine production is derived from actual mine production records.

Table 6-1 Exploration Advance, Mineral Inventory and Mine Production

YEAR	Exploration (Meters)	Development and Infill (Meters)	Exploration and Development (Meters)	Drilling (DDH) by Company (Meters)	Drilling (DDH) by Contractor (Meters)	Mine Production (Tonnes)	Mineral * Inventory (Tonnes)
2002	2,726	1,160	3,886	1,887		124,377	344,630
2003	3,307	1,648	4,955	3,415		212,677	571,520
2004	1,778	2,245	4,023	2,970		233,486	1,001,350
2005	2,004	2,030	4,034	3,160	8,043	373,546	702,524
2006	788	1,998	2,786	2,999	10,195	487,909	6,371,845
2007	826	1,640	2,466	4,751	6,196	546,652	4,773,198
2008	796	1,584	2,380	5,379	13,445	690,222	4,720,606
2009	872	1,040	1,912	4,955	13,579	802,737	4,974,593
2010	454	632	1,086	4,615	3,527	837,389	5,379,526
2011	684	927	1,611	5,195	9,071	816,289	4,943,770
2012	921	609	1,530	11,532	31,257	872,869	5,246,000
2013	1730	839	2,569	10,653	16,781	840,711	6,394,000
2014	680	331	1,011	9,357	30,455	890,910	

*** Beginning of Year Balances. Mineral Inventory includes Proven and Probable Reserves and Indicated Resources as reported to the Peruvian Exchange, and is not CIM compliant. These numbers are for historic information purposes only.**

7. GEOLOGICAL SETTING AND MINERALIZATION

Table 7-1 and Figure 7-1 show a simplified stratigraphic column of the Yauricocha mine area:

Table 7-1 Yauricocha Stratigraphic Column

Period	Unit
Quaternary	Glacial Deposits
Tertiary	Intrusives (monzonitic-granodioritic complexes)
	Casapalca red beds
Upper Cretaceous	Celendín Formation (France Chert)
Middle Cretaceous	Jumasha limestone
Lower Cretaceous	Goyllarisquizga Formation

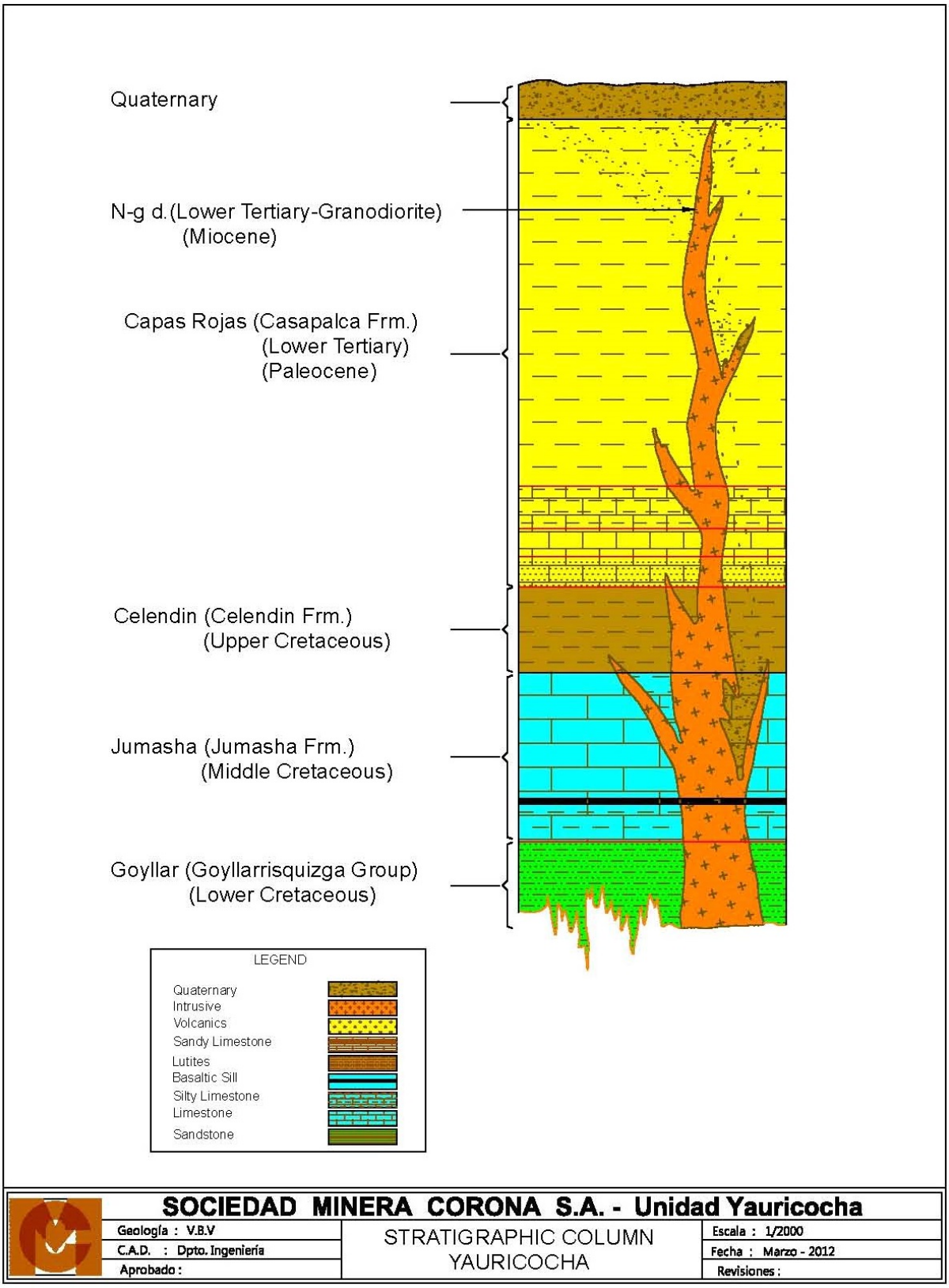


Figure 7-1 Yauricocha Stratigraphic Column

7.1 Regional Setting

Most of the stratigraphy, structure, magmatism, volcanism and mineralization in Peru are spatially- and genetically-related to the tectonic evolution of the Andean Cordillera that is situated along a major convergent subduction zone where a segment of the oceanic crust, the Nazca Plate, slips beneath the overriding South American continental plate. The Andean Cordillera has a metamorphic rock basement of Proterozoic age on which Hercynian Paleozoic sedimentary rocks accumulated and were in turn deformed by plutonism and volcanism to Upper Paleozoic time. Beginning in the Late Triassic time, following Atlantic Ocean rifting, two periods of subduction along the western margins of South America resulted in the formation of the present Andes; the Mariana-type subduction from the Late Triassic to Late Cretaceous and Andean-style subduction from the Late Cretaceous to the present.

Late Triassic to late Cretaceous Mariana-type subduction resulted in an environment of extension and crustal attenuation producing an oceanic trench, island arcs, and back arc basin from west to east. The back arc basin reportedly has two basinal components, the Western Basin and Eastern Basin, which are separated by the Cusco – Puno high, probably part of the Maranon Arch. The basins are largely comprised of marine clastic and minor carbonate lithologies of the Yura and Mara Groups overlain by carbonates of the Ferrobamba Formation. The western back-arc basin, called the 'Arequipa Basin', is the present Western Andean Cordillera of Peru; the site of a Holocene magmatic belt that spans the Andes and was emplaced from Late Oligocene to 25 Ma.

The Western Andean Cordillera is recognized for its world-class base- and precious-metal deposits, many of which have been intermittently mined since Incan time. Most of the metal deposits in Peru are spatially and genetically associated with metal-rich hydrothermal fluids generated along magmatic belts that were emplaced along convergent plate tectonic lineaments. Furthermore, many of these primary base-metal deposits have undergone significant supergene enrichment due to uplift and weathering over the last 30 Ma.

Radiometric studies have correlated the igneous host rocks and attendant hydrothermal alteration for some of the largest and richest porphyry copper deposits in the world along the Western Andean Cordillera from 6 degrees to 32 degrees south, including the Chalcobamba – Tintaya iron-gold-copper skarn and porphyry belt (30-35 Ma) in the main magmatic arc, southward through the Santa Lucia district (25-30 Ma) and into Chile. The Andahuaylas-Yauri Porphyry Copper Belt, a well-known 300 km long porphyry copper belt related to middle Eocene to early Oligocene calc-alkaline plutonism, is situated along the northeastern edge of the Western Andean Cordillera.

7.2 Local Geology

7.2.1 Goyllarisquizga Formation

The oldest rocks exposed in the area are the lower Cretaceous Goyllarisquizga arenites. This formation is approximately 300 m thick and comprises thick gray and white arenites, locally banded with carbonaceous lutites as well as small mantos of low-quality coal beds and clay. In the vicinity of Chaucha, these arenites have near their base interbedded, red lutite. The arenites crop out in the cores of the anticlines southwest of Yauricocha, as beds dispersed along the Chacras uplift, and isolated outcrops in the Éxito zone.

7.2.2 Jumasha Formation

The mid-Cretaceous Jumasha Formation consists of massive gray limestone, averages 700 m thick, and concordantly overlies the Goyllarisquizga Formation. Intercalations of carbonaceous lutites occur at its base near the contact with the arenites. These layers are succeeded by discontinuous lenses of maroon and grey limestone, occasionally with horizons of lutite and chert about 6 m thick. Also present are pseudo-breccias of probable sedimentary origin and a basaltic sill.

7.2.3 Celendín Formation

The Celendín Formation concordantly overlies the Jumasha Formation and contains finely stratified silicic lutites with intercalations of recrystallized limestone of Santoniana age as well as the France Chert. The average thickness in the Yauricocha area is 400 m.

7.2.4 Casapalca Red Beds

The Casapalca red beds lay concordantly on the Celendín Formation with a gradational contact. It has been assigned an age between upper Cretaceous and lower Tertiary, but because of the absence of fossils its age cannot be precisely determined. It is composed primarily of calcareous red lutites, pure limestones, and reddish arenaceous limestone. Lava flows and tuffaceous beds have been occasionally reported.

7.2.5 Intrusions

Major intrusive activity occurred during the Miocene period. Radiometric K-Ar ages derived from biotite samples taken in the Yauricocha and Éxito areas yield an average age of 6.9 Ma.

The intrusives cut the sediments at a steep angle and exhibit sharp contacts, as well as a tendency to follow the regional strike and dip of the structure. The intrusions vary in size from bodies of several hundred square meters to large masses that cover several square kilometers. Small apophyses commonly occur on the margins of larger intrusions.

Intrusive compositions vary from granodiorite to quartz monzonite at margins and are typically porphyritic with phenocrysts of plagioclase, orthoclase, biotite, hornblende and quartz. The plagioclases vary from orthoclase to andesine.

7.2.6 Metamorphism

All of the intrusions have produced metamorphic aureoles in the surrounding rocks. The extent, type, and grade of metamorphism vary greatly with the type of rock intruded. The rocks have been altered to quartzites, hornfelsed lutites, and recrystallized limestones.

Locally, the intrusions have produced narrow zones of skarn of variable width. These skarn zones contain epidote, zoisite, tremolite, wollastonite, phlogopite, garnet, chlorite and diopside.

7.2.7 Structure

The Andean Cordillera uplift has dominated the structural evolution of the Yauricocha area through episodes of folding, fracturing, and brecciation associated with the local structure having a general NW-SE strike principally expressed as follows:

7.2.7.1 Folds

Various folds make up the principal structures of the Yauricocha area. The Purísima Concepcíon anticline and the France Chert syncline occur in the Mina Central area, while the Cachi Cachi anticline and Huamanrripa al Norte syncline and the Quimpara syncline occur immediately to the south of Lake Pumacocha, north of Mina San Valentíne.

The Purísima Concepcíon anticline, located southwest of the Yauricocha Mine in the Mina Central area, is well defined by a tightly folded basaltic sill 17 m thick. The axial trace trends approximately N50W with a gentle SE plunge of 20°. In the axis of this anticline and towards Flanco East, the basaltic sill contains occurrences of disseminated gold in horizontal, silicic breccias.

The France Chert syncline is a tight fold, also in the Mina Central area, but located northeast of the mine. Its axial trace changes trend from N35W in the south to N65W in the north and has a SE40 plunge. The Yauricocha mineral deposit is found in the west flank of this fold and in banded limestones without subsidiary folding.

In the Mina Central area, the NW strike of the folded sediments was rotated about 30° clockwise horizontally. This distortion can be attributed to a basement shear fault that strikes NE-SW.

The axial trace of the Cachi-Cachi-Prometida anticline strikes approximately N80W to N70W and its flanks dip to the north (Prometida) and south (Cachi-Cachi) with a plunge to the east. Mineralization in the vicinity of the major North Intrusive located 2 km north of Mina Central is associated with this fold.

The Quimpara syncline, located 1 km south of the discharge stream of Pumacocha Lake, has an axial trace that strikes N45W. Its east flank is in contact with the intrusive at an angle dipping 70° to 75°W. Its west flank dips about 80°E conformably with beds of dark gray limestone that are recrystallized in the vicinity of the contact. Garnets, magnetite and copper oxides occur in the same contact.

7.2.7.2 Fractures

Diverse systems of fractures were developed during episodes of strong deformation.

Folding occurred before and/or contemporaneous with intrusive emplacement. Primary fractures developed during folding along with longitudinal faults parallel to the regional strike of the stratigraphy. These faults combined to form the Yauricocha Fault along the Jumasha limestone-Celendín lutite contact. The Yauricocha Fault extends a great distance from the SE of the Ipillo mine continuing to the north behind Huamanrripa hill, parallel to and along Silacocha Lake.

After the intrusions were emplaced, the strike of the folds NW of the mine was rotated by strong horizontal forces some 30°. As a result of this rotation, three sets of shears and joints were developed: NW-SE, NE-SW and E-W with dips of 50-80° NE or SW first, then 60-85° SE or NW, and finally N or S with nearly vertical dips. This set of fractures forms fault blocks that cut the dominant lithologies of the area and join with the Yauricocha Fault. The Yauricocha Fault is the most significant fault in the mining district and is a strong control on mineralization.

7.2.7.3 Contacts

The contacts of the Jumasha limestone-Celendín lutite, the Jumasha limestone-intrusions, and Celendín lutite-intrusions had major influence on the development of folds, fractures and ascension of mineralizing fluids.

7.2.7.4 Breccias

The breccias that occur in the Yauricocha area typically follow structural lineaments and occur predominantly in the limestones associated with contacts and intersections of fractures. They form tabular and chimney-like bodies.

Tectonic breccias, forming near intrusions or contacts, constitute some of the principal receptive structures for mineralization.

Figure 7-2 shows the surface geology of the Yauricocha area.

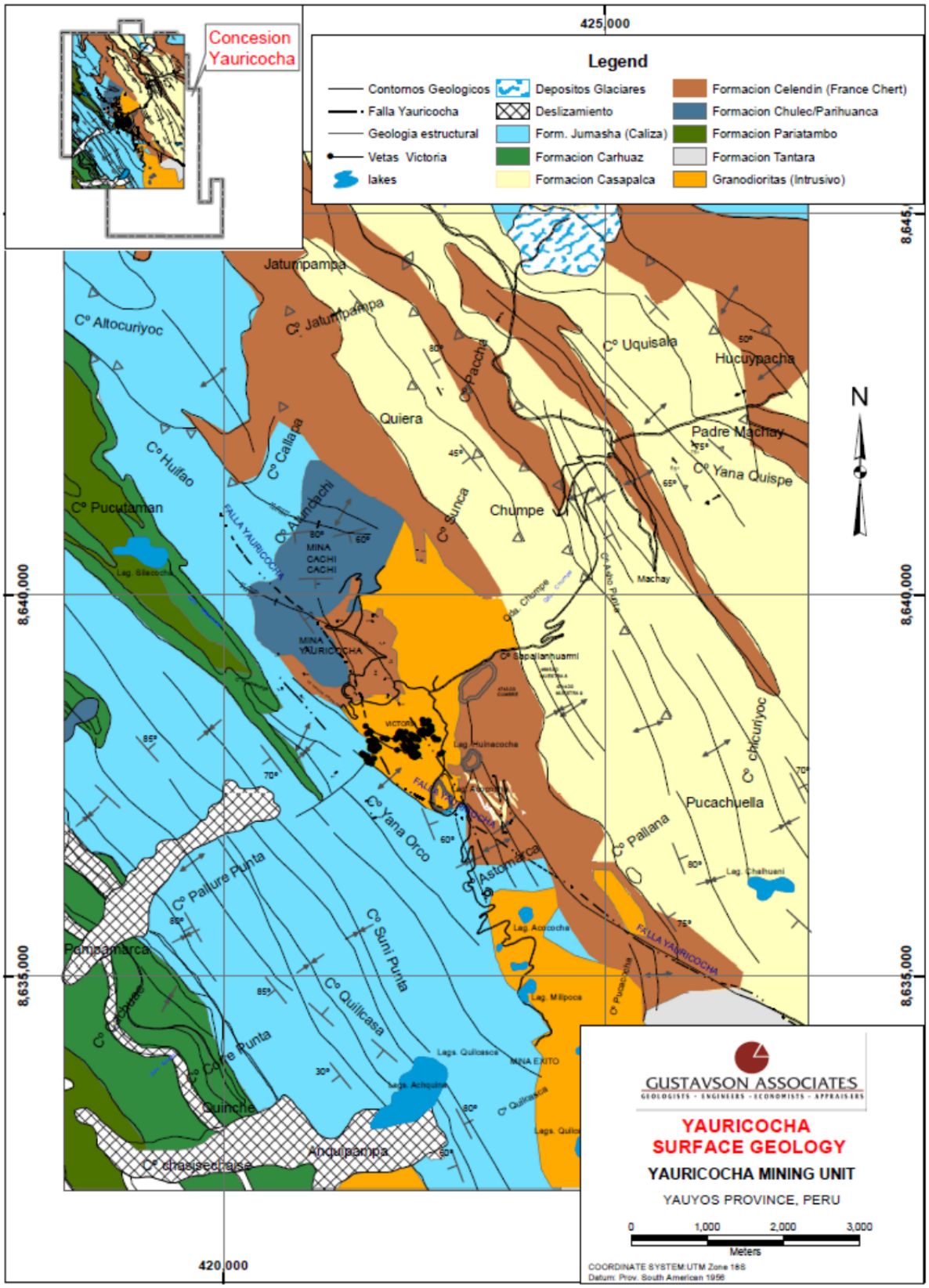


Figure 7-2 Plan of Yauricocha Area Surface Geology

7.3 Mineralization

Mineralization at the Yauricocha Mine is represented by variably oxidized portions of a multiple-phase polymetallic system with at least two stages of mineralization, demonstrated by sulfide veins cutting brecciated polymetallic sulfide mineralized bodies. The mineralized bodies and quartz-sulfide veins appear to be intimately related and form a very important structural-mineralogical assemblage in the Yauricocha mineral deposit. Comments herein made regarding the characteristics of the Yauricocha district apply directly to the Minera Corona Yauricocha Mine.

The mineralized zones defined at Yauricocha are shown within the property boundary in Figure 7-3. All parts of the property with historic exploration or production activity are in the current area of operations. This area is nearly centered within the concession boundary and there is both space and potential to expand the resources and the operation both directions along the strike of the Yauricocha Fault.

Minera Corona has developed local classifications describing milling and metallurgical characteristics of mineralization at Yauricocha: polymetallic, oxide, and copper. “Polymetallic” mineralization is represented by Pb-Zn sulfides, often with significant Ag values, “oxide” refers to mineralization that predominantly comprises oxidized sulfides and resulting supergene oxides, hydroxides and/or carbonates (often with anomalous Au), and the “copper” classification is represented by high values of Cu with little attendant Pb-Zn.

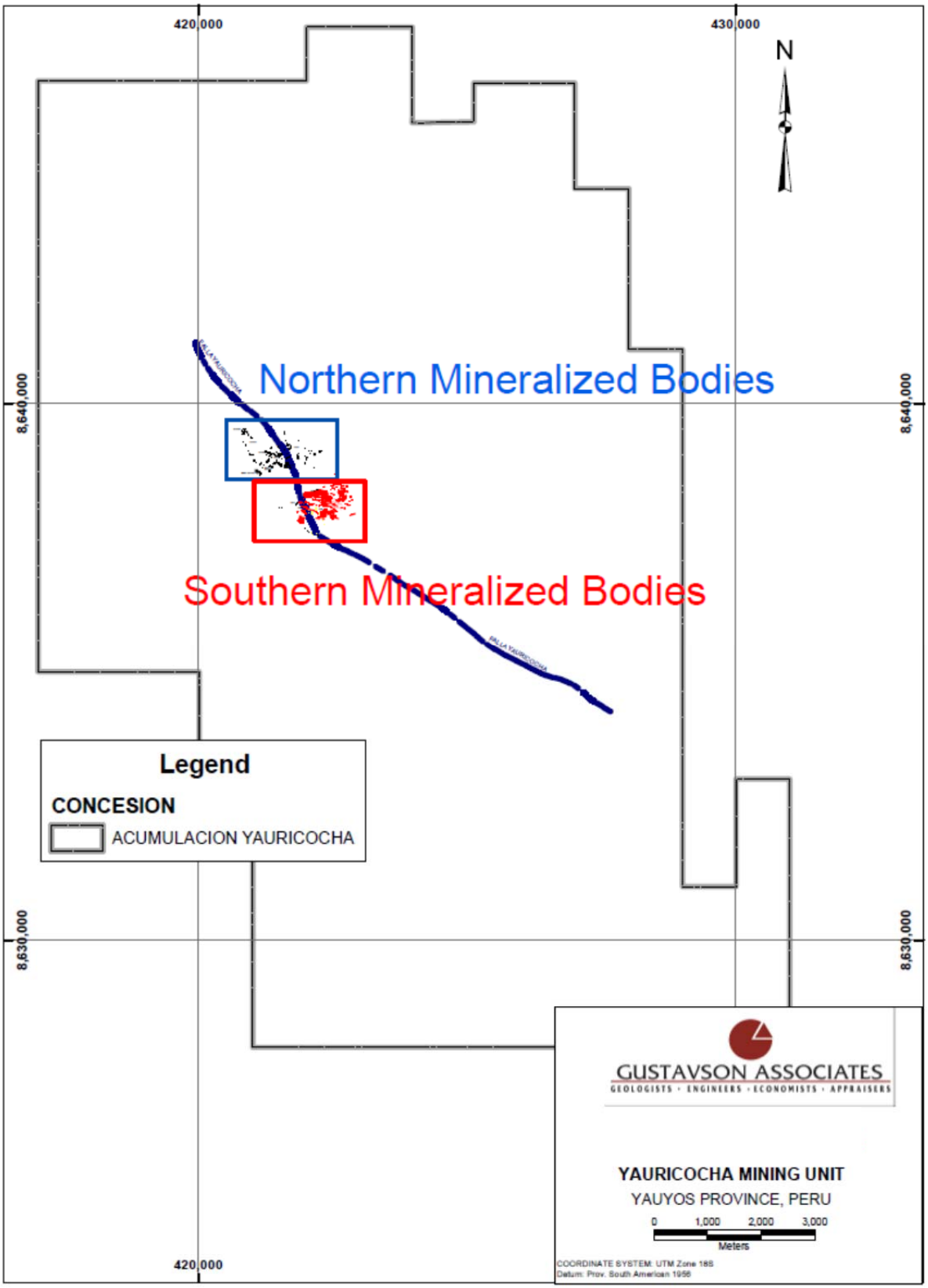


Figure 7-3 Mineralized Bodies

7.4 Principal Sulfide Minerals

7.4.1 Pyrite FeS_2

Generally of friable texture to porous and massive bodies; five types have been distinguished that represent five different stages of formation. Abbreviated Py in Tables 7-2 through 7-6.

7.4.2 Marcasite FeS_2

Three types of marcasite have been identified, which are associated with chalcopyrite, galena and sphalerite.

7.4.3 Enargite Cu_3AsS_4

This is the principal copper mineral in the deposit, which occurs in irregular fragments and large masses together with quartz and pyrite. Abbreviated En in Tables 7-2 through 7-6.

7.4.4 Chalcopyrite $CuFeS_2$

After enargite, chalcopyrite is the most abundant copper mineral. It occurs as replacement fragments of limestone breccia together with friable quartz and pyrite, or filling small cavities. It is associated with native gold and electrum. The amount of this mineral increases in the lower levels of the mine. Abbreviated Cp in Tables 7-2 through 7-6.

7.4.5 Bornite Cu_5FeS_4

Bornite is invariably associated with chalcopyrite and to a lesser degree with enargite. Abbreviated Bn in Tables 7-2 through 7-6.

7.4.6 Covellite and Idaite CuS and Cu_5FeS_6

These two minerals have been observed within bornite, forming as small laminar intergrowths. Abbreviated Cv and Id respectively in Tables 7-2 through 7-6.

7.4.7 Tetrahedrite and Tennantite $(Cu,Fe)_{12}Sb_4S_{13}$ and $Cu_{12}As_4S_{13}$

Small crystals of these minerals are abundant in the periphery of the enargite bodies, as in the mineralized bodies on the outer margins of the Central and Sur Medio intrusions. Abbreviated as Tet and Ten respectively in Tables 7-2 through 7-6.

7.4.8 Galena PbS

This mineral is found disseminated and in skarnified limestone; at Yauricocha it is typically associated with chalcopyrite and sphalerite.

7.4.9 Sphalerite (Zn,Fe)S

Sphalerite is the most abundant mineral in the Yauricocha deposit and is associated with clay, pyrite and galena, mainly in the peripheries of the mineralized bodies. Abbreviated Spl in Tables 7-2 through 7-6.

7.4.10 Geocronite ($Pb_{14}(Sb, As)_6 S_{23}$)

This mineral is found in the upper levels of the mine associated with galena, sphalerite, tetrahedrite and quartz filling fractures and cleavages in sphalerite. Abbreviated Geo in Tables 7-2 through 7-6.

7.5 Gangue Minerals

7.5.1 Quartz SiO_2

Quartz is the most abundant gangue mineral in the mineralized bodies. Abbreviated Qtz in Tables 7-2 through 7-6.

7.5.2 Hematite (var. Specularite) and Siderite Fe_2O_3 and $FeCO_3$

These minerals are associated with limestone and intrusive veins in the Éxito and Ipillo mines. Abbreviated Hem or Sid respectively in Tables 7-2 through 7-6.

7.5.3 Calcite $CaCO_3$

Calcite is found in veinlets associated with quartz and sphalerite. Abbreviated Cal in Tables 7-2 through 7-6.

7.5.4 Fluorite CaF_2

Fluorite was deposited contemporaneously with galena and sphalerite within the lead-zinc mineralized bodies. Abbreviated Fl in Tables 7-2 through 7-6.

7.5.5 Barite $BaSO_4$

Barite occurs in the periphery of the lead-zinc orebodies in zones of lower temperature. Abbreviated Bar in Tables 7-2 through 7-6.

7.5.6 Magnetite Fe_3O_4

This mineral is found primarily in the Cuye and Catas mineralized bodies, and rarely in Antacaca, and in deep levels (Levels 770 to 1020). Abbreviated Mag in Tables 7-2 through 7-6.

7.6 Mineralized Bodies (Breccia Chimneys and Pipes)

In plan view, these deposits are lenses with major axes parallel to the general strike of the strata (NW-SE) which either dip steeply to the NE or are approximately vertical. Their vertical dimensions are almost always much greater than their horizontal. There are instances where these deposits extend more than 650 m down from the surface and whose widths are 10 to 40 m, tending to be spindle-shaped at depth.

The bodies are emplaced in the Jumasha limestone and form groupings within the limestone as well as along the contact with the Celendín lutites and in contact with intrusive masses.

Some bodies are irregularly distributed, though interconnected, forming larger mineralized zones such as in the case of the Catas Cuye, Rosauro, and Antacaca bodies, which are referred to as the large bodies (Cuerpos Massivos). Other bodies occur as solitary units, forming relatively small, discrete mineralized areas, such as with the veins in the area and Sur Medio, Contacto Occidental, Carmencita, Juliana, Pozo Rico, and Gallito bodies. These are collectively referred to as the small bodies (cuerpos pequenos).

The mineralization of these deposits is typically represented by a zoned sequence of pyrite, quartz, enargite, chalcopyrite, bornite and/or covellite in the core or central parts, with an outer portion or halo of soft masses of friable pyrite, galena, sphalerite, tetrahedrite and/or geocronite, plus or minus chalcopyrite in gangue of limestone, clay and quartz.

7.7 Veins

The mineralized veins are well developed in both the intrusive and limestone units with mineralization being more abundant in the intrusive host.

Surface and underground vein exposures at the Cachi Cachi, Victoria, Central, Éxito and Ipillo mines show that veining can be grouped into three principal systems. The first system strikes N70-80W and dips 60-80° SW or NE. The second system strikes N70-80E and dips 65-80° NW, while the third system strikes generally E-W and dips north and south.

Their horizontal and vertical dimensions are relatively short, while their widths vary between 0.5 and 2.5 m.

Limestone-hosted vein mineralization consists primarily of pyrite, sphalerite and galena with some quartz and chalcopyrite. Intrusion-hosted vein mineralization consists of pyrite, quartz, enargite, galena, sphalerite, covellite, fluorite, hematite, pale sphalerite and electrum.

The deposits and veins are described in Sections 7.9 through 7.13 by sectors (Mina Central, Mina Cachi Cachi, Mina Éxito, Mina Ipillo and Mina Victoria).

7.8 Supergene Enrichment and Oxidation

Oxidation of the orebodies in Yauricocha is partial to complete and extends from the surface to below Level 1020. Supergene enrichment is closely related to the distribution of oxidation. Covellite, chalcocite and digenite, of supergene origin, are found where the sulfide minerals are in contact with oxidized areas.

Residual Oxides: “In-situ” oxides (and related sulfates and silicates) include limonite, goethite, jarosite, hematite, quartz, gypsum, anglesite, kaolin, gold and silver. Residual oxides of the Mascota and Pozo Rico deposits extend from the surface to below Level 1120. In non-oxide bodies, oxides generally only extend to depths of 10 to 15 m.

Transported Oxides: These oxides are completely free of quartz and contain cuprite, malachite, azurite, brocanthite, jarosite, cerussite, chrysocolla and manganese oxides. These transported oxides occur along the lower portions of the chimney deposits and are found from the surface down to Level 920 where they fill karst cavities. Native copper also occurs.

7.9 Mina Central

The main portion of Mina Central is shown in Figure 7-4, while the total northern and southern extents of mineralized bodies are showin in Figure 7-5 and Figure 7-6, respectively. The bodies are listed in Table 7-2.

7.9.1 Cuye mineralized body

This body is closely associated with the Mascota intrusive stock at higher levels. Its morphology is a very irregular pipe-like form that tends to expand to the East and West with the orientation of the predominant set of fractures. Dip is not constant but varies from North to South. Mineralization is vertically gradational with Cu-Pb near the surface becoming Zn-enriched at depth. Residual silica contains Au and Ag, and there is slight supergene enrichment until level 360. Sulfide mineralization comprises pyrite and tetrahedrite in the interior and galena, sphalerite, and chalcopyrite (along with hematite and magnetite) near the periphery. This body has been recognized and exploited from the surface until the 870 level. At higher levels, mineralization often keeps a brecciated contact with the Jumasha limestone host.

These concessions are held 100% by Minera Corona.

7.9.2 Mascota mineralized body

The Mascota mineralized body is an elongate structure that trends East-West, parallel to the alignment of the Catas, Pozo Rico, and Adrianna mineralized bodies. Mineralization occurs at the contact between the Mascota intrusive stock and Jumasha limestone, closely following the contact below the 465 Level but becoming somewhat divergent at more shallow levels; above the 360 Level the mineralized body separates into three splays. Mineralization has been recognized from the surface through the 920 Level, and with drill intersections to the 1220 Level.

Residual oxides, enriched in Ag, Pb, Au, and silica, are near-continuous from the 360 Level to the 1220 Level. From the 300 Level to the 575 Level, mineralization largely comprises jarosite, hematite, plumbojarosite, and lesser amounts of cerussite and anglesite which increase from the 575 Level to the 720 Level. Cerussite continues to increase below the 720 Level.

Mineralization occurring in the three divergent, shallower splays comprises native copper, malachite, tenorite, cuprite, argentiferous jarosite, plumbojarosite, and Fe- and Mg oxides and hydroxides. Small, high grade zones of Pb and Zn occur throughout the mineralized contacts.

These concessions are held 100% by Minera Corona.

7.9.3 Butz Mineralized Body

The Butz mineralization is hosted by the Jumasha limestone and its contact with the central intrusive stock; mineralization occurs as large interconnected pods and breccias striking northwest-southeast and dipping to the East. Three separate zones have been identified, the Butz West, Butz Central, and Butz East. Thin, sulfide-bearing veins that strike east-west and dip to the north intercept the Butz mineralized bodies. Normal faulting that strikes east-west seems to control where mineralized areas are found; slight changes in strike and dip exert strong influences on the tenor of mineralization. The Butz mineralized body had been recognized in drilling to the 920 Level.

Butz West is well-defined as vein-like structures on the 520 Level and has been recognized up to the 870 Level as an irregular structure. Mineralogy includes friable pyrite, chalcopyrite, enargite, galena, and sphalerite.

Butz Central has been recognized on the 465 and 575 Levels. It constitutes a body of massive argentiferous galena, sphalerite, friable pyrite, chalcopyrite, quartz, and fluorite surrounded by a breccia containing galena, sphalerite, and pyrite.

Butz East is recognized on the 520 and 870 Levels. It consists of friable, partially oxidized pyrite, galena, sphalerite, enargite, chalcopyrite, and Fe- and Mg-oxides and hydroxides.

The thin, cross-cutting vein mineralogy includes galena, sphalerite, and massive pyrite.

These concessions are held 100% by Minera Corona.

7.9.4 Catas Mineralized Body

The principal mineralized body at Catas is southeast of the Cuye body, located in the fractured and brecciated Jumasha Limestone near its contact with the France Chert where persistent sets of fractures are oriented northwest-southeast and east-west. Catas extends from the surface to below the 1120 Level.

Primary mineralization in the center part of the body extends from the surface to the 410 Level and comprises pyrite, silica, enargite, and gold. This mineralization is covered by residual silica rich with gold and silver. Mineralization toward the eastern edge is limited by the France Chert, while toward the western edge it is cut by the contact with Contacto Oriental; the southern area connects to the Antacaca mineralized body.

Supergene oxidation is shallow in the eastern part of the mineralized area; in the northern part, oxidation extends below the 410 Level. The oxides transported consist of Fe- and Mn-oxides and hydroxides, cuprite, and native copper.

Drilling has intercepted chalcopyrite, pyrite, hematite, magnetite, and, in many sections, sphalerite mineralization to the 1120 Level, demonstrating that the Catas body persists at depth.

Within Catas, limestone lenses and barren pyrite oriented parallel to the strike of the body are common. These concessions are held 100% by Minera Corona.

7.9.5 Pozo Rico Mineralized Body

This body is located in the Jumasha limestone proximal to the intrusive stock Pique Central. Its morphology resembles that of a funnel and its maximum length is 135m on the 360 Level.

The mineralized body comprises mostly oxides of which the central and southeast sections extend from the surface to the 575 Level; this section has been correlated with barren oxides found on the 720 Level. Mineralization includes bornite, azurite, malachite, cuprite, and tenorite; this area is separated from primary sulfide mineralization by a zone of barren Fe- and Mg-oxides and hydroxides above the 410 Level.

The sulfides located in the northwest portion of the body extend from the 360 Level to beneath the 465 Level and consists of auriferous chalcopyrite and enargite. The sulfide zone connects with the Catas mineralized body on the 410 level.

These concessions are held 100% by Minera Corona.

7.9.6 Contacto Oriental Mineralized Body

This body is located in the contact between the intrusive stock "Piqué Central" and the Jumasha limestones. It has been recognized in the 410, 720, and 770 Levels. It consists of several parallel structures striking N 70-80◦ W, dipping steeply to the north. Mineralization is predominantly represented by sphalerite and argentiferous galena with a gangue of pyrite, fluorite, and quartz. High Ag contents distinguish this mineralized body from other known bodies in the area.

These concessions are held 100% by Minera Corona.

7.9.7 Contacto Occidental Mineralized Body

This body is located in the contact between the intrusive stock Pique Central and the Jumasha limestone. This body has been recognized from the 360 Level up to the 770 Level, reaching its greatest extent on the 520 Level; its tenor decreases from the 575 Level to the 670 Level. The Contacto Occidental connects with the mineralized bodies Pozo Rico on the 465 Level, Butz on the 575 and 520 Levels and Catas on the 465 and 520 Levels. Drilling has encountered this mineralized body at 80m beneath the 920 Level. The southern extension of mineralization follows the strike of the limestone rather than contact, terminating in two short branches.

There are two styles of mineralization: massive enargite, chalcopyrite, pyrite, sphalerite, and galena, and sphalerite, galena, and pyrite acting as a pseudomatrix between limestone clasts.

These concessions are held 100% by Minera Corona.

7.9.8 Violeta Mineralized Body

The Violeta was initially recognized as a small structure on the 520 Level and has been correlated with other small, isolated mineralized bodies in the 720, 620, 465, and 410 Levels. Mineralized zones are typically elongate, brecciated, striking N 30◦ W, and connect with Antacaca to the south. Mineralization is represented by sphalerite, argentiferous galena, pyrite, and chalcopyrite as a pseudomatrix with limestone clasts. Its continuity is demonstrated on the 720 Level by an oxidized, vein-like structure with jorsite, cerussite, and Fe- and Mg oxides and hydroxides.

These concessions are held 100% by Minera Corona.

7.9.9 Antacaca Mineralized Body

The Antacaca mineralized body is south of the Catas body, with which it forms a large mineralized zone that strikes subparallel to the contact between the Jumasha Formation and intrusive stock, steeply dipping to the south which, at the 575 Level, changes to a steep northerly dip. The Antacaca and Catas mineralized bodies are divided into discontinuous mineralized sectors by limestone lenses.

Antacaca has been recognized at the surface, the 770 Level, and intersected by drilling down to the 1120 Level. To the west, a disjointed member has been identified between the 520 and 670 Levels which, through an oxidized zone, connects with the Sasacaca mineralized body.

Mineralization in the main body is represented by friable pyrite and massive galena, sphalerite, chalcopyrite, and enargite. A core of pyrite and silica occur in the central part of the body, persistent from the 520 Level to below the 870 Level. Mineralization in the disjointed member is predominantly friable pyrite, chalcopyrite, and enargite with subordinate amounts of galena and sphalerite. Mineralized breccias toward the west edge of both bodies consist of mostly galena and sphalerite.

These concessions are held 100% by Minera Corona.

7.9.10 Sasacasa Mineralized Body

The Sasacasa Body is west of the Antacaca Body, hosted in the northwest-southeast striking contact between the Jumasha limestone and the intrusive Sur stock. There is a zone of skarn 10 to 15m thick between the mineralized body and stock. The Sasacasa Body has been identified on the 465 and 670 Levels; exploration has not located it at lower elevations. Between the 520 and 575 Levels it connects with the Antacaca Body through an oxidized zone.

Mineralization predominantly consists of friable pyrite and/or massive enargite, with chalcopyrite in the core grading to masses of loose, friable pyrite, sphalerite, and galena filling voids in limestone at the margins.

Concessions by percentage of participation, 100% owned by mining company Crown S.A.

7.9.11 Erika mineralized body

The Erika body was initially recognized on the 465 and 410 Levels but was later identified as being a splay off of the Contacto Occidental Mineralized Body, forming a single structure down to the 520 Level.

This body is an elongate brecciated structure striking parallel to the strata. It connects with the Contacto Occidental Mineralized Body toward the north whereas to the south the tenor of mineralization decreases. Mineralization consists of a psuedomatrix of sphalerite, galena, argentiferous galena, pyrite, and fluorite with limestone clasts.

These concessions are held 100% by Minera Corona.

7.9.12 Amoeba Mineralized Body

The Amoeba body occurs in the contact between the Yauricocha intrusion and the Jumasha limestone south of the Central Mine. It is a near-circular lens with an average thickness of between 10 – 16m that strikes N60◦W with a near-vertical dip towards the northeast. It has been identified on the 410 Level but was not encountered in drilling on the 465 Level.

Mineralization consists of galena, sphalerite, and pyrite along with disseminated enargite, chalcopyrite, and covellite. Fe- and Mn-oxides and hydroxides also occur as oxidation products.

These concessions are held 100% by Minera Corona.

7.9.13 Contacto Sur Medio Mineralized Body

The Contacto Sur Medio is located to the northwest of the Sur Medio intrusion and follows, in a general way, the brecciated contact between the intrusion and surrounding Jumasha limestone, striking E-W and dipping 80◦ N. This body has been identified from the surface to below the 770 Level.

The breccia matrix is mineralized for a strike length of approximately 100m with an average width of 4m. Mineralization is complex, including both pale and dark sphalerite, galena, argentiferous galena, geocronite, locally disseminated native silver, tetrahedrite, and (possibly) proustite and/or pyrargite. Gangue mineralization includes pyrite, calcite, rhodocrosite, orpiment, and realgar. Sericite and sporadic Fe- and Mn-oxides and hydroxides occur near the contact.

These concessions are held 100% by Minera Corona.

7.9.14 Violet – 329 Mineralized Body

The Violet 329 is hosted entirely in the Jumasha limestone 20m to the southeast of the Central intrusion. This body consists of a large, tubular form (pipe) that dips approximately 80◦ N. Surrounding this structure is a limestone breccia zone with limestone fragments of variable size ranging up to 1m in diameter. The body is structurally controlled by east-west fracturing and, at depth, may connect with the central intrusion. The Violet 329 has been recognized on the 575 Level up to the 870 Level.

The breccia matrix consists of crushed limestone that's been argillized and shows disseminated pyrite, sphalerite, and argentiferous galena. The mineralized body contains abundant sphalerite, argentiferous galena, pyrite, and rhodocrosite.

These concessions are held 100% by Minera Corona.

7.9.15 Cuye Norte Mineralized Body

This body is located in the contact between the Mascota intrusion and Jumasha limestone and may be the continuation of the Cuye mineralized body though mineralogy differs between the two. Cuye Norte has been identified on the 410, 575, and 620 Levels and has also been intersected by drilling.

Mineralization is represented by galena, argentiferous galena, and sphalerite with the gangue suite comprising pyrite, quartz, calcite, and fluorite. Some sulfide mineralization has been oxidized to hematite, pyrolusite, gypsum, cerussite, jarosite, and Fe- and Mg-oxides and hydroxides, with the intensity of oxidation increasing proximal to the intrusion.

These concessions are held 100% by Minera Corona.

7.9.16 Juliana Vein

The Juliana Vein is northwest of the Cuye North intrusion, hosted in the Jumasha limestone. It has been recognized at the surface (in open pits) and at the 245 and 720 Levels. Mineralization takes three forms: 1) disseminated in a breccia matrix composed of crushed limestone with a significant amount of organic matter; clasts are limestone 2) in east-west striking, north-dipping veinlets and 3) masses along the contact between the Jumasha Limestone and France Chert. Representative mineralogies include pyrite, caramel-colored sphalerite, galena, argentiferous galena, hyaline quartz, green and purple fluorite, marcasite, and Ca- and Mg-carbonates. The brecciated structure strikes east-west with a near-vertical dip to the northeast and ranges from 0.2 m to 5.0m in thickness. Laboratory results have not established the presence of anomalous Au.

These concessions are held 100% by Minera Corona.

7.9.17 Juliana I Mineralized Body

Juliana I is south of the Juliana Vein, hosted in the Jumasha Limestone and has been recognized between the 245 and 770 Levels. The body is irregular, slightly oval, and dips to the northeast between the 245 and 360 Levels with mineralization similar to that of the Juliana Vein. On the 770 level the body is an elongate structure 5.0 to 7.0 meters thick with massive galena, sphalerite, and pyrite.

These concessions are held 100% by Minera Corona.

7.9.18 Juliana II Mineralized Body

The Juliana II body is northwest of the Juliana I body in the contact between the Jumasha limestone and the France Chert of the Celadín Formation. It has been identified from the 245 Level to the 770 Level. where exposed on the 300 Level it is approximately 110m long with a width that averages 2.5m at the southeast contact with the France Chert and increases to an average 6.0m width to the west.

To the south, it is structurally controlled by faulting at the Jumasha limestone-France Chert contact striking N 50◦ W dipping 70◦ NE. To the north, the structural controls are tensional fractures that strike east-west dipping an average of 75° N. Mineralization comprised chalcopyrite, enargite, pyrite, sphalerite, and argentiferous galena.

These concessions are held 100% by Minera Corona.

7.9.19 Gallito Mineralized Body

The Gallito mineralized body is located in the contact between the Jumasha limestone and Celendín Formation at the north end of the Yauricocha reservoir. It has been recognized between the 245 and 870 Levels and identified by drilling through the 820 Level. On the 300 Level, an exposure of the body has a length of 60.0m and an average width of 4.0 m. The structural control is a set of fractures that strike east-west to northwest, and a set of fractures N 50◦ W near the France Chert with a dip of 65-70◦ NE.

The Gallito is a breccia with blackish-gray limestone clasts and a fine-grained matrix containing fine-grained black pyrite, calcite, and disseminated galena and pale sphalerite. The southern end of the body contains a central zone with Cu mineralization (bornite, tetrahedrite, enargite) which is surrounded by Pb-Zn sulfides.

These concessions are held 100% by Minera Corona.

7.9.20 Jacqueline Mineralized Body

The Jacqueline body is located to the west of the Catas Norte, hosted in the Jumasha limestones, and has been recognized from the surface to the 520 Level. It is an oval-shaped brecciated zone

striking N 60° W, 28.0m long and 12.0m wide with a barren core 16.0m long and 4.0m wide. Mineralization consists of sphalerite, argentiferous galena, and pyrite. A drilling program was recommended to see if the mineralized body extends through the 575 Level.

These concessions are held 100% by Minera Corona.

7.9.21 Veins "A" "C" "D" "F" and "G"

This set of veins is part of the first vein system mentioned above. They occur in the extreme north portion of the Yauricocha Mine area and are hosted entirely in the Jumasha limestone. Their horizontal and vertical extents are variable but relatively short, ranging from 0.2 to 2.5 m, similar to veining that characterizes the “Rosario” deposit. Mineralization present in this vein set is mostly Pb, Zn, and Ag sulfides and oxides.

These concessions are held 100% by Minera Corona.

Vein "A" is located to the northwest of the Catas Body, extending for an approximate length of 70.0m and connects the Catas (to the north) and Cuye (to the south) Bodies. It has been recognized in the 520, 575, 620 and 670 Levels, strikes approximately N 70◦ W, dips approximately 78◦ SW, and has a thickness that ranging from 0.2m to 1.5m. It is a well-defined structure with local variations in strike and dip. Mineralization consists of masses of loose friable pyrite and/or massive galena and sphalerite in a gangue of limestone.

Vein "C” is south of Vein "A" and also occurs to the northwest of the Catas Body, extending for an approximate length of 120m, apparently connecting the middle part of the Catas Body and Butz Central Body. It has been recognized on the 465, 520, and 575 Levels with an average strike of N 80◦ W, variable dip of 75◦ S to near-vertical, and variable thickness of 0.2 to 1.5m. It is a well-defined structure with sulfides near the Catas and Butz Bodies and supergene oxides gaining prominence in the central part of the vein. Sulfide mineralization is represented by masses of loose, friable pyrite, galena, and sphalerite with subordinate chalcopyrite in a gangue of limestone, clay, and quartz. Supergene mineralization comprises hematite, quartz, kaolinite, and Fe- and Mn-oxides and hydroxides.

Vein "D" occurs northeast of the Contacto Oriental Body, running for an approximate length of 130m, apparently connecting the Contacto Oriental and Catas Bodies. It has been recognized on parts of the 520, 575, and 620 Levels, striking N 75◦ W, dipping 80◦ SW with a variable width of 0.2 to 2.5m. It is a well-defined structure near the mineralized bodies, but there is an apparent discontinuity in the vein between the bodies. Mineralization comprises masses of loose, friable pyrite and/or massive galena, sphalerite, and chalcopyrite with limestone gangue. The vein is locally brecciated.

Vein “F” occurs northwest of the Catas Body, striking N 60° E, dipping 70◦ SE, is approximately 30m long, and has an average thickness of 3.0m It is observed on parts of the 465 and 520

Levels. Mineralization present is large masses of friable pyrite, massive pyrite, galena, sphalerite, and chalcopyrite in a gangue of limestone.

Vein "G" occurs southwest of the Yauricocha Mine near the Jumasha limestone – intrusive contact and appears to be part of the fault that displaces the Sasacaca Body. This vein is observed on parts of the 520 Level, strikes E-W, dips 70◦ N, and averages 1.5m thick. Mineralization occurs within a breccia and consists mostly of pyrite and sphalerite with subordinate chalcopyrite

These concessions are held 100% by Minera Corona.

7.9.22 Katty Mineralized Body

This body is between the Contacto Sur Body and the "Piqué Central" intrusion at the intrusion's contact with the Jumasha limestone. It has been recognized from the 465 to the 820 Levels. It is genetically related to an apophysis of the Piqué Central and is structurally controlled by the brecciated contact and fractures oriented N 70 - 80º W and dipping 75◦ N.

Mineralization consists mainly of massive and disseminated sphalerite and argentiferous galena with a gangue of pyrite, fluorite, and quartz.

These concessions are held 100% by Minera Corona.

7.9.23 Cuye South Vein

This vein occurs south of the Cuye Body and north of the Catas Body and Vein "A." It has been recognized on the 670 Level and intersected in two drillholes at the 620 Level, including a 40.0m interval. It strikes N 80° E, dips approximately 80° SE, and has a thickness ranging from 0.2to 3.0m. It has a brecciated texture and includes pyrite, enargite, sphalerite, and galena.

These concessions are held 100% by Minera Corona.

7.9.24 Mascota Vein

This vein is northwest of the Mascota Mineralized Body, strikes N 65◦ W, dips 80◦ SW, runs for approximately 60m, and has a thickness varying from 0.8 to 4.5m. Its mineralization comprises sphalerite and galena in a gangue of pyrite, rhodocrosite, and limestone.

These concessions are held 100% by Minera Corona.

7.9.25 Marita Vein

The Marita Vein is north of the Mascota intrusion, strikes N 80◦ W, dips 80◦ NW to near-vertical, runs for a length of approximately 90m, and has a thickness ranging from 0.2 to 3.0m. It was initially recognized on the 620 Level and subsequently intersected by drilling on the 770, 720, 575, 520, and 465 Levels. Mineralogy is represented by argentiferous galena, sphalerite, and pyrite. Delineation drilling at lowers levels was recommended.

These concessions are held 100% by Minera Corona.

7.9.26 Olguita Mineralized Body

This tabular, pipe-like structure is located between the "A" Vein and to the northwest of the Catas Body and seems to be a continuation of the Catas Body but with different mineralogy. Massive mineralization is represented by abundant sphalerite, argentiferous galena, pyrite and specks of chalcopyrite.

These concessions are held 100% by Minera Corona.

7.9.27 "A" Mineralized Body

The “A” body is a copper mineralized zone in the floor of the "A" vein on the 620 Level. The zone consists of grainy, friable pyrite and chalcopyrite in the Jumasha limestone. Exploration starting at the 575 and 670 Levels was recommended.

These concessions are held 100% by Minera Corona.

7.9.28 Viviana Mineralized Body

This body is located on the 670 Level in the Jumasha limestone at the limestone – Occidental Sur Medio intrusion contact. It strikes N 30° E, dips 60° E, has a length of 12.0 m and an average width of 2.5m. It is hosted in fractures and breccias of the Jumasha limestone with mineralization comprising galena, sphalerite, and tetrahedrite with a pyrite, carbonate, and clay gangue.

These concessions are held 100% by Minera Corona.

7.9.29 Cuye Vein

The Cuye Vein is located in the southern part of the Cuye mineralized body. The host is brecciated limestones of the Jumasha formation and has been recognized on the 360 and 410 Levels.

The Cuye Vein has an elongate form with a length of 28.0m on the 410 Level and 40.0m on the 360 Level. It strikes from N 80° W to S 75 °W, dips vertically to 85° NW, and the width ranges from 2.5 to 6.0m

Mineralization consists of mineralized breccia with pyrite, sphalerite, argentiferous galena and, in the central part, a chalcopyrite zone that is being worked on the 360 level.

These concessions are held 100% by Minera Corona.

7.9.30 Huamanrripa Mineralized Body

The Huamanrripa body is located approximately 800 to 1000m northwest of the Central Pïque. The body is a mineralized breccia hosted in the Jumasha Formation, striking NE-SW and dipping

to the SE. It is located in the eastern flank of the anticline of Purísima Concepción; two fault systems, one striking N 60° E and another N 50° W, may have contributed to its ground preparation.

This body was identified through diamond drilling to the 410 Level and was subsequently exploited through workings at that Level. Mineralization consists of a breccia with pyrite, galena, sphalerite, with a clay-like, silty matrix. Observed textures indicate a high level of deposition related to a hydrothermal-magmatic system.

These concessions are held 100% by Minera Corona.

7.9.31 Milagrosa Mineralized Body

The mineralized body Milagrosa is located northeast of the Gallito body, hosted in the marls and interbedded shales of the Celendín Training. The lenticular body strikes N 10° E, dips 55° E, has a length of 30m and an average width of 2.5m. It was identified through drilling and in workings at the 465 Level. The marls and shales are highly fractured with a predominance of fractures striking N 80° W. Rock quality is incompetent and unstable.

Mineralization consists of pyrite with cores of sphalerite, galena and chalcopyrite, and enargite.

These concessions are held 100% by Minera Corona.

7.9.32 Antacaca West Mineralized Body

This body lies to the west of the main body Antacaca, hosted in limestones of the Jumasha Formation. Part of the Antacaca, the Antacaca West strikes N 50° W, dips 70° NE, has a length of 40m with an average width of 6.0m. It has been identified on the 620 Level. Wall rocks are highly fractured with Fe- and Mg-oxide and hydroxide coatings. Within the body are barren limestone lenses with orientations parallel to that of the body.

Mineralization consists of masses of friable pyrite with cores of enargite and disseminated chalcopyrite.

These concessions are held 100% by Minera Corona.

7.9.33 Poderosa - Felicidad – El Norte Mineralized Bodies

This group of bodies is found in the Celendín Formation (France chert) and appears to be related to favorable structures more than favorable stratigraphy. Bodies have a lenticular form and generally strike N 25º W, dipping approximately 60◦ S, and are localized in reverse faults and drag folds caused by mechanical contrasts between the Celendín and Jumasha Formations. The size of lenses is variable and seems to decrease with depth. Open pits have identified some minor structures with narrow, east-west striking lenses that seem to cut lenses striking northeast. An

"en echelon" pattern is evident in both horizontal and vertical extents. Cu, Pb, and Zn mineralization has been identified, and pyrite veinlets connect all bodies.

The Felicidad Body consists of several different lenses with irregular orientations due to a pair of shear zones caused by regional deformation. The primary lens of this body is 300m long with a maximum thickness of 2.5m. Mineralization predominantly comprises friable pyrite, enargite, and quartz.

The El Norte body is known from surface to the 290 Level. This body was exploited by open pit until bench 4 at the 635 Level (20m below the surface). At bench 4, it is 30m long and averages 3.0m thick. Mineralization varies with depth; above the 240 Level mineralization comprises massive pyrite with disseminated chalcopyrite and bornite with supergene covellite. Below the 240 Level mineralization consists of massive pyrite with disseminated chalcopyrite and enargite; hematite and lesser quantities of bornite and covellite fill small fractures. There is small-scale zonation in this body in that Pb-Zn increases in concentration as it approaches the lenses edges, then tapers off.

These concessions are held 100% by Minera Corona.

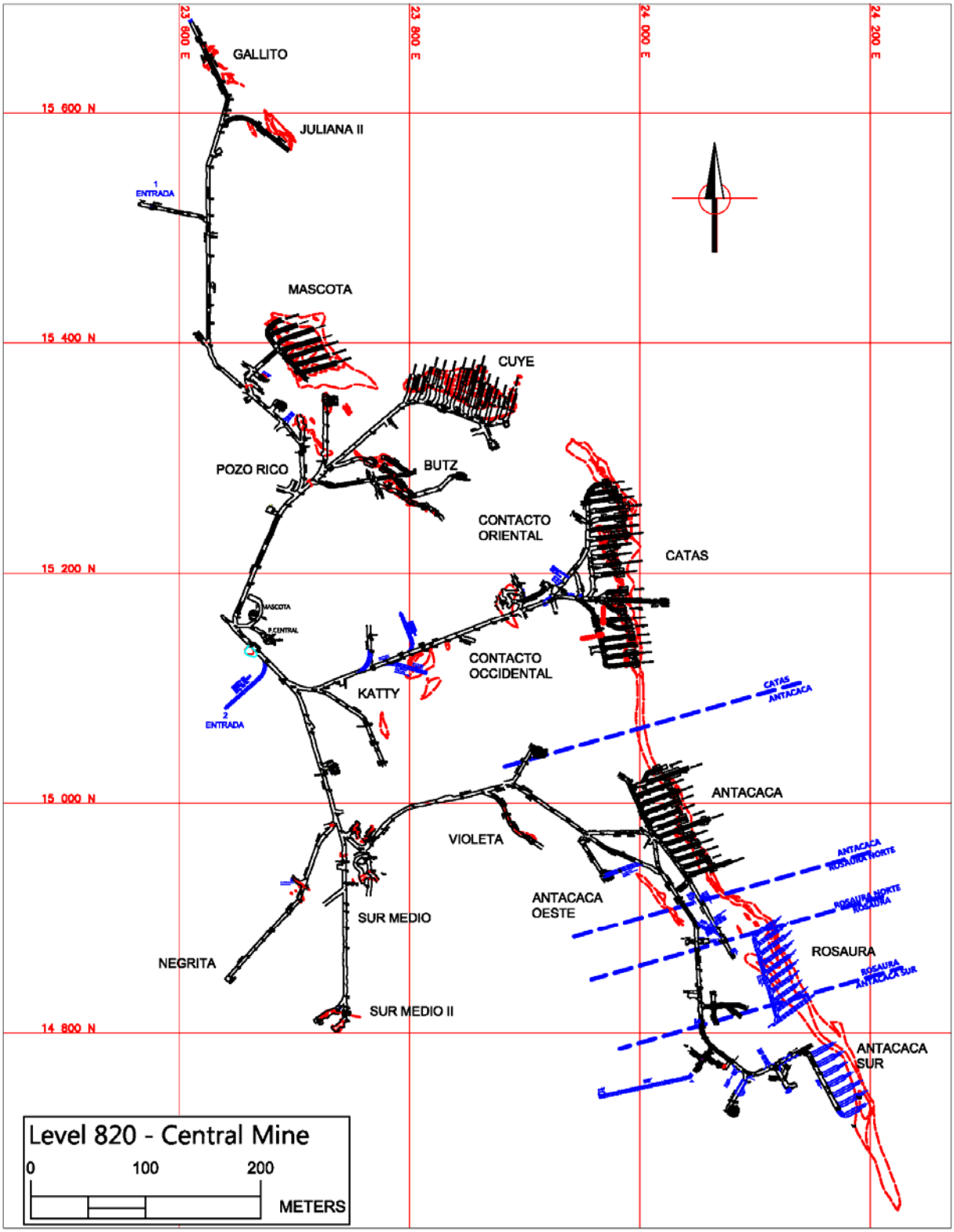


Figure 7-4 Mineralized Zones in Mina Central

Table 7-2 Mina Central Bodies

Name	Type	Mineralogy (Gangue)	Classification	Comment
A Deposit	Deposit - Tabular	Cp-(Py)	Not classified	
Amoeba	Deposit	Spl-Gal-Cp-En-Cv-(Py)	Not classified	
Antacaca	Deposit	Spl-Gal-Cp-En-(Py)	Polymetallic, Copper	
Antacaca West	Deposit	Cp-En-(Py)	Polymetallic	Part of the Antacaca Deposit
Butz	Deposit - Breccia	Spl-Gal-Cp-En-(Py-Qtz-Fl)	Polymetallic	
Catas	Deposit - Breccia	Spl-Gal-Cp-En-Bn-(Mag-Hem-Py)	Polymetallic	Anomalous Au
Contacto Occidental	Deposit	Spl-Gal-(Py-Qtz-Fl)	Oxide	Argentiferous galena
Contacto Oriental	Deposit - Breccia	Spl-Gal-Cp-En-(Py)	Polymetallic	
Contacto Sur Medio	Deposit - Breccia	Spl-Gal-Tet-Geo-(Py-Cal-Rhodochrosite-Real-Orp-Gar-Ser)	Polymetallic	Argentiferous galena
Cuye	Deposit	Spl-Cp-En-Tet-(Py-Mag-Hem)	Copper, Polymetallic	Vertically zoned, possible Au
Cuye Norte	Deposit	Spl-Gal-(Py-Qtz-Fl-Pyro-Gyp-Jaro-Cerr)	Not classified	
El Norte	Deposit	Cp-En-Cv-Bn-(Py-Hem)	Not classified	Zonation
Erika	Deposit - Breccia	Spl-Gal-(Py-Fl)	Not classified	Argentiferous galena
Felicidad	Deposit	En-(Py-Qtz)	Not classified	
Gallito	Deposit - Breccia	Spl-Gal-En-Bn-Tet-(Py-Calcsilicates)	Polymetallic	
Huamanrripa	Deposit - Breccia	Spl-Gal-(Py)	Not classified	
Juliana I	Deposit - Breccia	Spl-Gal-(Py)	Polymetallic	
Juliana II	Deposit - Breccia	Spl-Gal-Cp-En-(Py)	Polymetallic	Argentiferous galena
Jacqueline	Deposit -		Not classified	
Katty	Deposit	Spl-Gal-(Py-Qtz-Fl)	High grade oxide	
Mascota	Deposit	(Hem)	Oxide	Principal oxide body
Milagrosa	Deposit	Spl-Gal-Cp-En-(Py)	Polymetallic	
Olguita	Deposit	Spl-Gal-Cp-(Py)	Not classified	Argentiferous galena, extension of Catas but with different mineralogy
Pozo Rico	Deposit	Cp-En	Polymetallic, High Grade Oxide	Anomalous Au, oxidized portion of the Catas sulfide deposit
Sasacaca	Deposit	Spl-Gal-Cp-En-(Py)	Not classified	
Violeta	Deposit - Breccia	Spl-Gal-Cp-(Py-Cerr-Jaro)	Not classified	
Violeta 329	Deposit - Breccia	Spl-Gal-(Py-Rhodochrosite)	High Grade Oxide	Argentiferous galena
Viviana	Deposit - Breccia	Spl-Gal-Tet-(Py-CO3)	Polymetallic	
Cuye Vein	Vein - Breccia	Spl-Gal-(Py)	Not classified	Argentiferous galena, partially brecciated
Juliana Vein	Vein	Spl-Gal-(Py-Mar-Qtz-Fl-CaMnCO3)	Not classified	Vein-like interior, massive mineralization at contact
Marita	Vein	Spl-Gal-(Py)	Not classified	Argentiferous galena
Vein A	Vein	Spl-Gal-(Py)	Not classified	
Vein C	Vein	“sulfides and oxides”	Not classified	
Vein Cuye Sur	Vein - Breccia	Spl-Gal-En-(Py)	Not classified	
Vein D	Vein	Spl-Gal-Cp-(Py)	Not classified	
Vein F	Vein	Spl-Gal-Cp-(Py)	Not classified	
Vein G	Vein - Breccia	Spl-Gal-(Py)	Not classified	
Vein Mascota	Vein - Breccia	Spl-Gal-(Py-rhodochrosite)	Not classified	

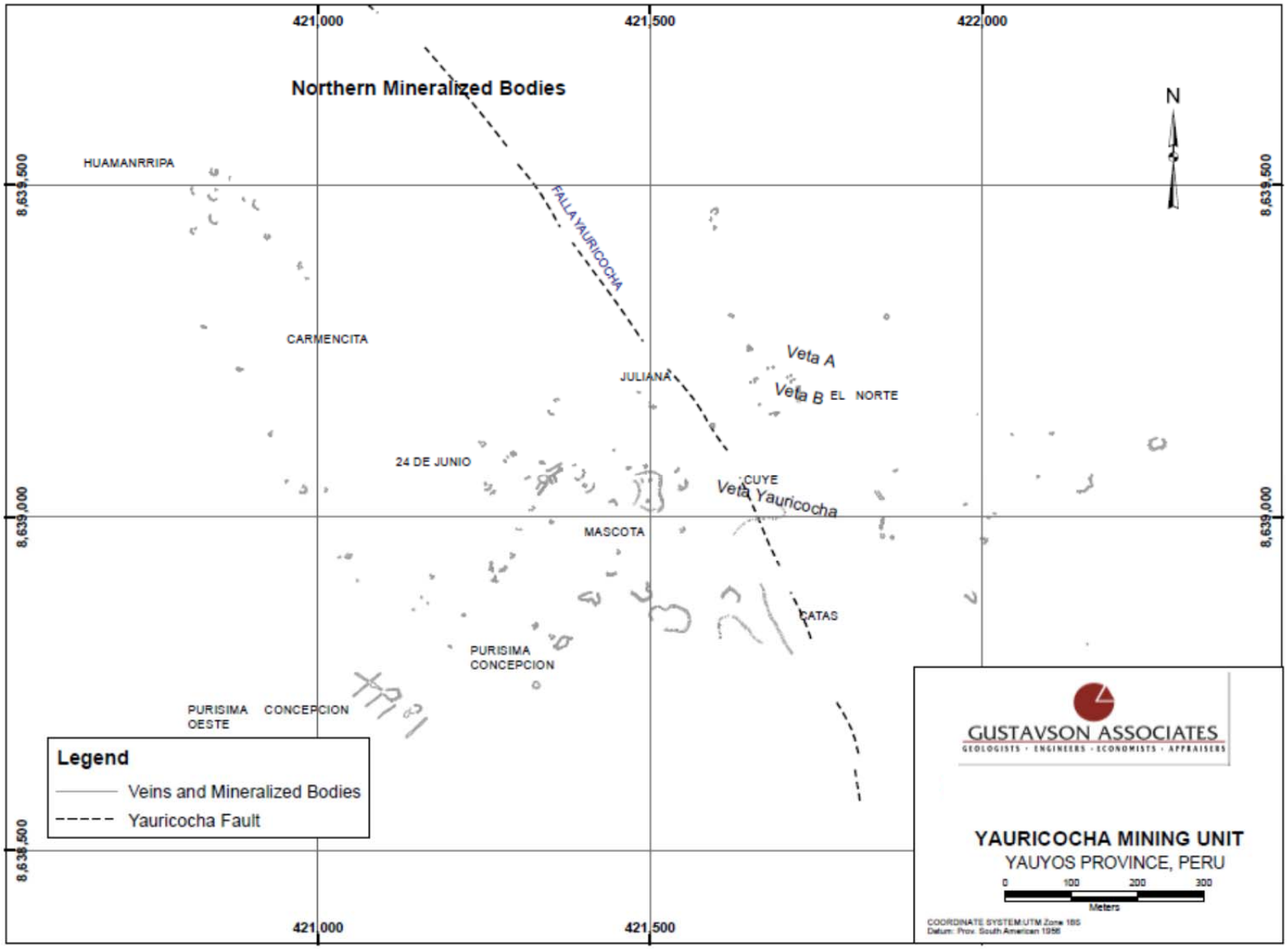


Figure 7-5 Northern Sector of Mina Central

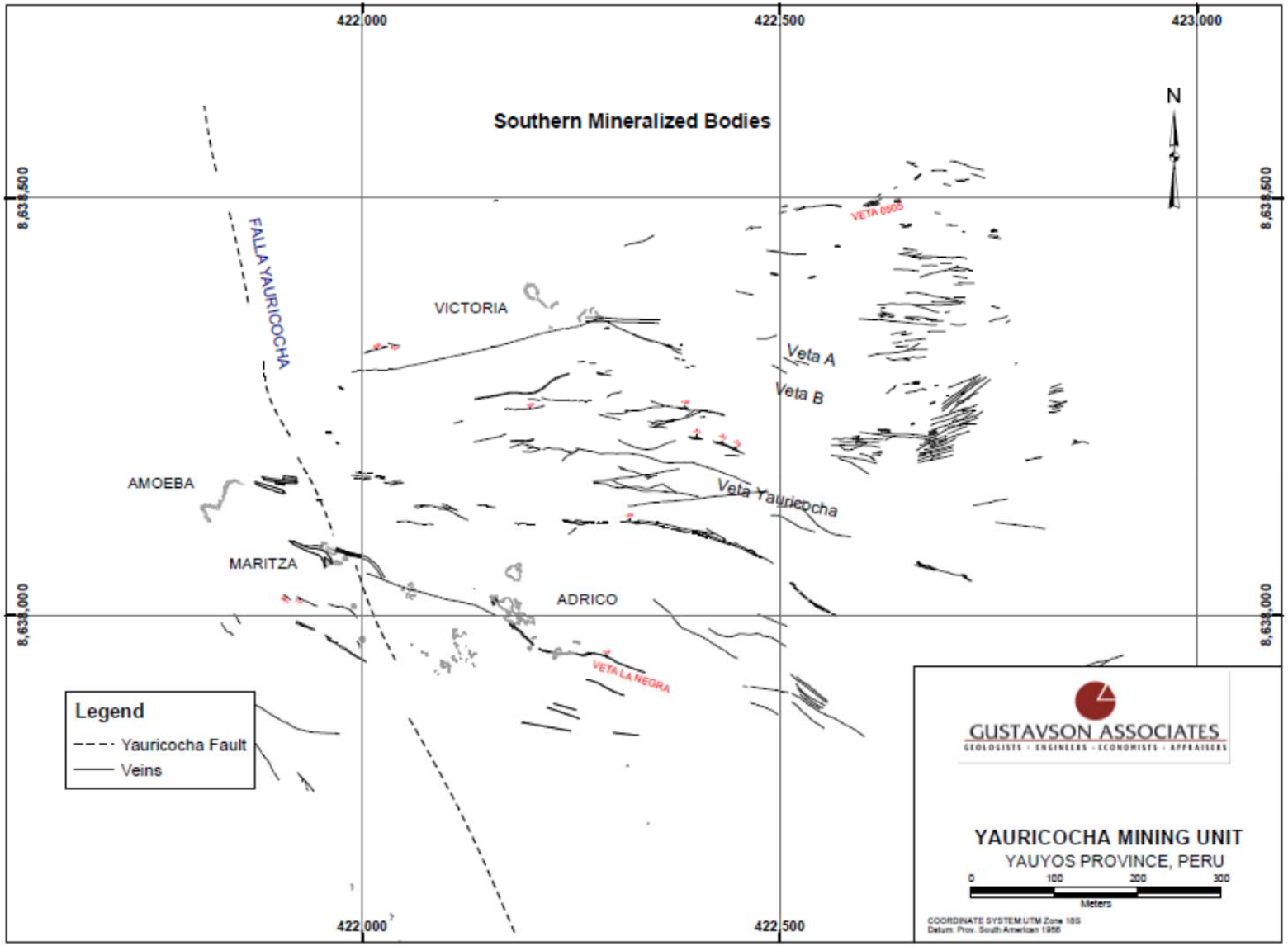


Figure 7-6 Southern Sector of Mina Central

7.10 Mina Cachi-Cachi

Mineral deposits in the Cachi-Cachi area are located 1.5 km north of the Yauricocha Mine at an elevation of 4,600 masl. They are hosted by Jumasha limestone as individual bodies within the limestone along its contact with the Yauricocha intrusive (northwest border). The main deposit was discovered by a diamond drilling program done during the years 1978, 1980 and 1993. This deposit was mined by open pit method until 1986. The Manuelita and Privatizadora deposits were discovered on Level 720 and are currently being mined on Levels 465, 520, 575 and 620, which are connected by a bored raise. Mineralized bodies in Cachi-Cachi are summarized in Table 7-3.

In the Cachi-Cachi area, a Tertiary-Cretaceous stratigraphic sequence is exposed that comprises Jumasha limestone and France Chert lutites. These were intruded by Pliocene granodiorite and quartz monzonite porphyry intrusions. These intrusions produced defined alteration areoles (argillic, potassic and sericitic types) as well as wide skarn zones (andradite-grossularite) in contact with the limestones. The deposits are massive irregular bodies and breccias that occupy an area of 100 by 150 m; they have been identified down to Level 720 and are continuing to be defined in intermediate levels.

On Levels 410, 465, 520, 575 and 620 the deposits are found as lenticular forms within limestone preferentially recrystallized along the limestone-intrusive contact.

Mineralization consists of galena, sphalerite, massive or friable pyrite, chalcopyrite, quartz and tennantite; galena, sphalerite and enargite are the economic minerals. At the extreme southern part of the area, local zones of residual Fe- and Mn-oxides and hydroxides, copper-enriched sulfides, (covellite, bornite) and native copper occur.

Narrow veins, striking E-W and dipping S, occur in the intrusion but to unknown depths or extent. The mineralization is different than in the deposits and contains massive or friable pyrite, enargite and quartz.

Several systems of faulting and fracturing have affected the area of Cachi-Cachi, and the following are the most important:

a) Faulting and fracturing striking N-S and dipping E, and a strike of E-W with dips to the S, possibly pre-mineralization, that have controlled the shape and disposition of the deposits.
b) Two systems of post-mineralization faulting, both with horizontal displacement; the first strikes N 80° E and dips 75° S, and the second strikes N 75° E and dips 80° S.

These concessions are held 100% by Minera Corona.

Table 7-3 Cachi-Cachi Mina Mineralized Bodies

Name	Type	Mineralogy (Gangue)	Classification	Comment
Angelita	Deposit	Spl-Gal-(Py)	Polymetallic	
Caprichosa	Deposit - Breccia	Spl-Gal-(Py)	Not classified	
Fanny	Deposit - Replacement	Gal-(Jaro-Hem-Cerr)	Polymetallic	Remnant galena
Privatizadora	Deposit - Breccia	Spl-Gal-(Py)	Polymetallic	
Raquellita	Deposit - Breccia	Spl-Gal-(Py)	Polymetallic	
Raquellita II	Deposit - Breccia	Spl-Gal-(Py-Bar-Chalcedony)	Polymetallic	
Rossy	Deposit - Breccia	Spl-Gal-(Py-Qtz)	Not classified	
Carmencita Vein	Vein - Breccia	Spl-Gal-Cp-(Py)	Not classified	
Dianita Vein	Vein	Spl-Gal-Cp-(Py)	Not classified	
Esperanza Vein	Vein	Spl-Gal-(Py-Chalcedony)	Not classified	
Tatiana	Vein	Spl-Gal-(Py)	Not classified	
Elissa	Deposit - Replacement	Spl-Gal-(Py-Calcite-Rhodochrosite)	Polymetallic	
Virginia Vein	Vein		Not classified	

7.11 Mina Éxito

This deposit is a mineralized structure (breccia) located within the granodiorite at its east side, within intrusive breccia on its west side, and within Jumasha limestone to the southwest. The mineralization was initially discovered at 100 m depth during a diamond drilling program and later by underground workings, such as a ramp and crosscut with diamond drilling to a depth of 200 m. This deposit was exploited during 2008 to Level 670; it does not continue to depth.

Mineralization is in the form of a breccia that contains clasts of sulfides, fragments of intrusive rock and sub-rounded skarn in a sandy matrix. The breccias exhibit post-mineralization displacement. The “in-situ” mineralization had been formed in a skarn zone (endoskarn). Mineralization comprises massive ruby sphalerite and weakly disseminated galena and chalcopyrite. The predominant gangue minerals are quartz and garnet.

Three principal directions of fracturing are present: N 75◦ E 70-75 ◦ SE (Vizcachita); N 20-30◦ W 70-80◦ SW; and, E-W 70-75◦ S.

The principal deposits of the Éxito mine were mined out in 2008, and the mine was closed in 2009.

These concessions are held 100% by Minera Corona.

Table 7-4 Exito Mina Concessions

Name	Type	Mineralogy (Gangue)	Classification
Evita Deposit	Deposit - Breccia	Spl-Gal-(Py-Qtz-Garnet-Epi-Hem-Chl)	Not classified
Isabel	Deposit - Breccia	Spl-Gal – (Py-Qtz-Garnet)	Not classified
Evita Vein	Vein	Spl-Gal-(Py-Qtz-Garnet-Epi)	Not classified
Santa Isabel Vein	Vein	Spl-Gal-Cp-(Py-Qtz)	Not classified

7.12 Mina Ipillo

The Ipillo mine is located 23 km SE of the Yauricocha production facilities. The structures are mineralized with gold and grade to Pb-Zn towards the contact with the Jumasha limestone. The deposit is located in the central part of the altered and fractured Éxito granodioritic stock. It is identified as a lenticular system of veins that strike N 70-80° W.

Mineralization is typically of filled fractures and replacements in the form of patches and disseminations. The width of the mineralization varies between 0.5 and 2.5m and occurs in shoots 70 to 90m long. The mineralogy consists of sphalerite, galena and chalcopyrite with values of gold. The gangue is constituted by pyrite, quartz, hematite and carbonates.

Table 7-5 Ipillo Mina Concessions

Name	Type	Mineralogy (Gangue)	Classification	Comments
Poggi	Vein	Spl-Gal-Cp-(Py-Qtz-Hem)	Not classified	Hematite as specularite, anomalous Au
Poggi II	Vein	Spl-Gal-Cp-(Py-Qtz-Hem)	Polymetallic	Anomalous Au
Ponderosa Vein	Vein	Spl-Gal-Cp-(Qtz, Hem)	Not classified	Anomalous Au
Ramal Coquelet	Vein	Spl-Gal-Cp-(Py-Hem)	Not classified	

7.13 Mina Victoria

The Victoria area is located in the southeast portion of the district, 450 m from the Yauricocha Mine and at an average elevation of 4,600 masl. All of the area is within the Yauricocha granodioritic intrusive that is elongated parallel to the regional trend. Its contacts with the surrounding rocks are concordant and at a steep angle.

One of the important structural settings that occur in the area is complex faulting. Surface mapping has identified three systems of mineralized structures, either economic or marginal. The first system is formed by veins striking N 70-75◦ E and dipping 65-70◦ NW. The second is formed by veins striking N 60-70◦ W and dipping 65-80◦ SW. The third is formed by a series of E-W structures that dip from NW to S.

In outcrops of these structures, abundant quartz with residual limonite is seen that are products of oxidation and partial leaching of the abundant sulfide minerals pyrite, galena, sphalerite, tennantite and chalcopyrite.

Table 7-6 Victoria Mina Concessions

Name	Type	Mineralogy (Gangue)	Classification
La Grande Vein	Vein	Spl-Gal-En-(Py-Qtz-Rhodochrosite)	Not classified
Victoria 0505 Vein	Vein	Spl-Gal-Cp-En-Cv-Ten-(Py-Qtz-Real-Orp)	Also listed as Veta 0505; Copper
Victoria 8651-E Vein	Vein	Spl-Gal-Cp-En-Tet-(Py-Qtz-Hem-Rhodonite)	Not classified

7.14 Controls on Mineralization

The axial traces of the folds that cross the Yauricocha area have been rotated in a horizontal plane about 30°, and as a result to this rotation three principal systems of shearing and jointing have developed with strikes of E-W, NW-SE and NE-SW. The first system is almost vertical, while the second dips 70° NE due to the influence of the strata in the direction of the shearing, while the third dips 75° SE. The great majority of the mineralized bodies (chimneys, or pipes) occur in the NW-SE set. It is inferred that the bodies indicate the strike direction of the most profound and defined shear set, given that they are the deepest found in the mine. It is very possible that the positions of the bodies at depth may be controlled by the intersection of the persistent NE-SW and E-W shear sets. In plan view, the position of the bodies is parallel to those two directions of shearing and jointing. Furthermore, the two sets interact, as mentioned above, as illustrated by the pyrite banding in the mineralized bodies and the presence of some veins with their respective directions seen within the intrusive as well as the Jumasha limestone and the France Chert.

The contact of the Jumasha limestone and the France Chert is strongly influenced by the orientation and position of the Cuye and Catas bodies. This contact strikes NW to SE and dips between 85 and 70° to the NE. Figure 7-7 is a N-S cross section showing the relationships between the structural controls.

The preference for mineralization of the limestone by the intrusives is well defined, although some discontinuous deposits of the vein type also occur in the limestone and the granodiorite. All the known bodies that contain copper occur within the aureole of recrystallization of the limestone bordering the granodioritic intrusions, and bodies of Pb-Zn are only found in recrystallized limestone. The limestone is more receptive to alteration where there is increased fracturing and calcite crystals are larger. Therefore, it is not surprising that the large mineralized bodies occur within the areole of recrystallized limestone and where the rocks differ in competency, as exemplified by contacts of the limestone-chert-intrusive.

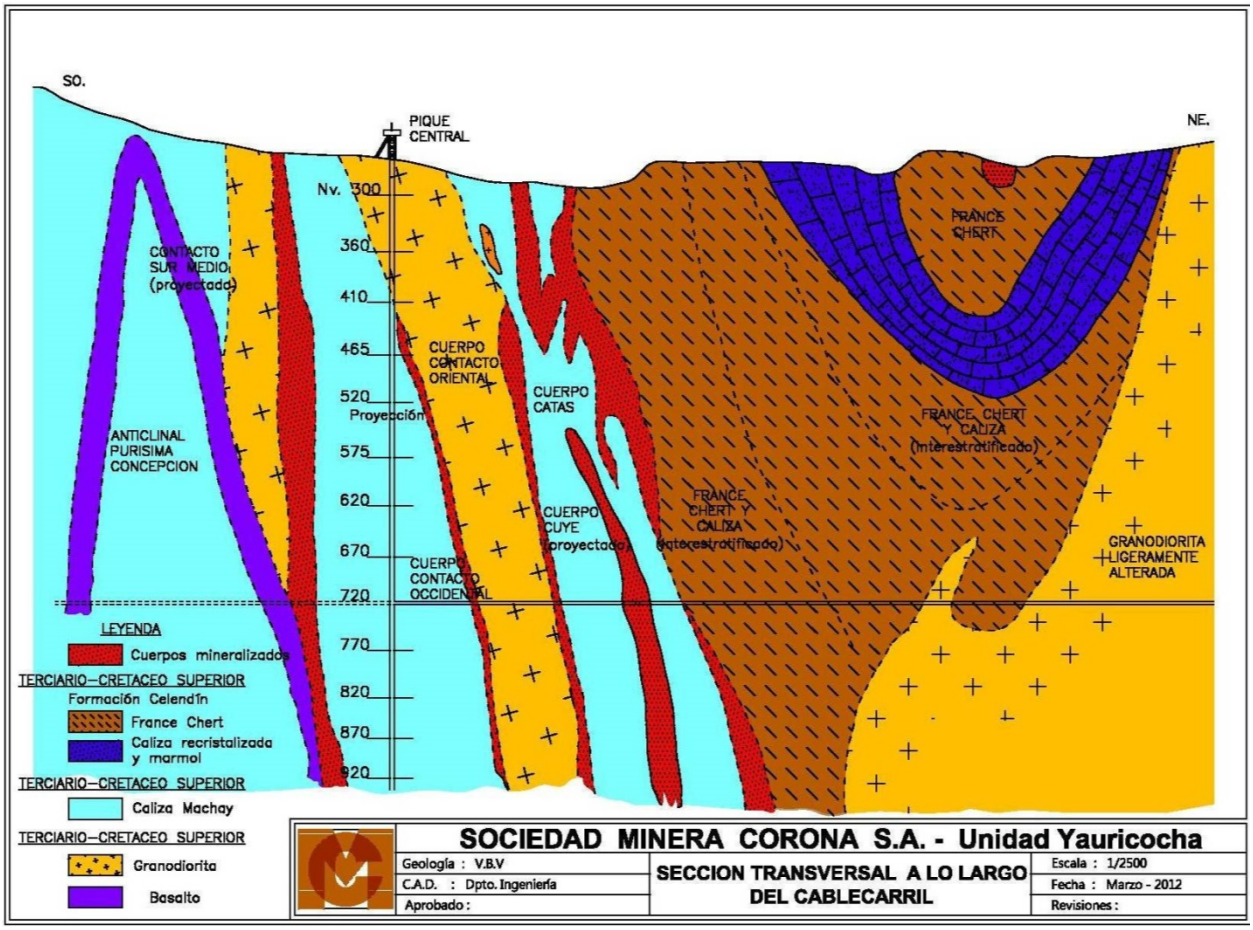


Figure 7-7 Geologic Cross Section

7.15 Conclusions

- In the Yauricocha mining district, at the end of the Miocene, near-vertical intrusions of granodiorite were emplaced in the Middle Cretaceous Jumasha limestone, and in marl and lutite of the Celendín Formation, forming a metamorphic aureole around the intrusions. The red bed lutites were bleached and calc-silicate minerals were formed. The limestones were recrystallized and developed a coarse granular texture.
- Due to a tear fault in the basement, the NW strike of the folded sediments was rotated by strong horizontal forces 20-30° clockwise. As a result of this rotation, three principal systems of shearing and jointing were developed, with strikes of NW-SE, NE-SW, and E-W.
- The systems of shearing and jointing, the areas of tectonic disturbance and recrystallization of limestone to coarse granular texture were the dominant controls on emplacement of mineralized bodies. Therefore, the principal bodies are grouped

along the contacts and demonstrate a net tendency to grow in NW-SE, NE-SW and E-W directions.

- Soft and friable aggregations of quartz and pyrite formed the mineralized bodies due to rapid dissolution of the limestone along fractures and joints. The limestone breccias and intrusions that were produced by the solutions that dissolved the rock show an orientation parallel with the contacts of the mineralized bodies.
- The presence of abundant argillized rock is due to the action of acidic solutions on the limestone and minerals such as phlogopite and sanidine were altered to clay. These were transported to the outer limits of the zones by the ascending mineralizing solutions and were concentrated in the upper limits of the mineralized bodies. This alteration displayed by the granodiorite and the calc-silicates serves as a guide in exploration for mineralized bodies. The economic minerals were deposited by a rapid process of “dissolution and collapse”. These minerals are: enargite, chalcopyrite, bornite, galena and sphalerite with pyrite and quartz.
- Mineralogical zoning of the district is readily marked, with the core of the central part consisting of enargite located within the Jumasha limestone near the contact with the France Chert. Next to the west are rich bodies of bornite and chalcopyrite with predominance also of enargite. Further to the west occur rich bodies of lead, zinc, silver and gold. The same zoning is observed at a smaller scale inside the ore body.
- The mineralization was associated with a porphyry fueling a hydrothermal system and the temperatures of the mineralizing solutions was about 500° C which is classified as a xenothermal deposit, that is, high temperature and low pressure.
- The uplift and erosion of the Andes at the end of the Pliocene exposed some of the deposits and some of them were oxidized. In many cases, oxidation is complete. Oxidation of sulfide minerals by meteoric waters produced the residual and transported oxides. The clays that surround the bodies, especially in their upper parts, have protected many oxidized bodies

8. DEPOSIT TYPES

Mineralization in the Yauricocha district is spatially and genetically related to the Yauricocha stock, a composite intrusive body of granodioritic to quartz monzonitic composition that has been radiometrically dated at late Miocene (approximately 7.5 million years old) (Giletti and Day, 1968). The stock intrudes tightly folded beds of the late Cretaceous Jumasha and Celendín Formations and the overlying Casapalca Formation (latest Cretaceous and Paleocene?).

Mineralized bodies are dominantly high-temperature polymetallic sulfide bodies that replaced limestone. Metal-bearing solutions of the Yauricocha magmatic-hydrothermal system were highly reactive and intensely attacked the carbonate wall rock of the Jumasha and Celendín Formations, producing the channels in which sulfides were deposited. Base and precious metals were largely precipitated within several hundred meters of the stock (Lacy, 1949; Thompson, 1960). Skarn is developed adjacent to the stock but does not host appreciable amounts of economic mineralization (Alverez and Noble, 1988). Mineralization typically exhibits both vertical and radial zoning and there is a pronounced district zoning, with an inner core of enargite (the principal copper mineral) giving way outward to an enargite-chalcopyrite-bornite zone, which in turn is succeeded to the west by zones characterized by sphalerite, galena and silver (Lacy, 1949; Thompson, 1960).

The mineralized zones at Yauricocha are partially to completely oxidized and extend from the surface to below level 1220. Supergene enrichment is closely related to oxidation distribution. Supergene covellite, chalcocite and digenite are found where the sulfide minerals are in contact with oxidized areas.

Mineralization at Yauricocha very closely resembles that typified by polymetallic Ag-Au deposits, which comprise quartz-sulfide-carbonate fissure vein equivalents of quartz-sulfide and carbonate-base metal deposits. These deposits are best developed in Central and South America, where they have been mined since Inca times as important Ag sources. Quartz and pyrite of the quartz-sulfide Au +/- Cu mineralization suite typically occur early in the paragenetic sequence; carbonate-hosted mineralization and some polymetallic Ag-Au veins evolved at a later stage. Predominant controls on mineralization are structural, where dilatational structures, voids resulting from wall rock dissolution, and/or rheologic dissimilarities at contacts between units serve as enhanced fluid pathways for mineralizing solutions.

9. EXPLORATION

The Yauricocha mining district contains multiple polymetallic deposits represented by skarn and replacement bodies and intrusion-hosted veins related to Miocene-era magmatism. Mineralization is strongly structurally-controlled with the dominant features being the Yauricocha Fault and the contact between the Jumasha limestones and the Celendín Formation (especially the France Chert). Exploration is being conducted to expand the mineralized zones currently being exploited as well as on prospects in the vicinity of the operations.

Exploration in or close to the mining operations is of higher priority since it is performed under existing governmental and community permits. Any exploration success can be quickly incorporated into defined resources and reserves and thus the business plan.

Exploration outside of the existing operational footprint has been conducted at Yauricocha Sur, San Juan & San Antonio, Exito NE, Kilkaska, Ipillo, Falla Yauricocha, Cerros Uchcapri, Leonpitacana, and Carhuanisho, Yauricocha Este, Yauricocha Oeste, and Tintircullpa Yauricocha. The advance of exploration in these zones is predicated on near-mine exploration priorities as well as governmental permits and community agreements.

9.1 Central Mine mineralized zones

The mineralized zones of the Central Mine area, which are currently being exploited, are outlined in Section 7 herein. The zone is open along strike and down dip. Exploration drilling of these mineralized zones has historically been conducted several years ahead of production.

During 2014, drilling under the Antacaca and Rosaura ore bodies demonstrated that mineralization continues to the southeast and in-fill drilling demonstrated the continuity of mineralization between drill holes.

A total of 5,043 meters of drilling was completed on the Antacaca and Rosaura orebodies during 2014. Of this program, 10 of 11 holes drilled at Antacaca between Levels 970 and 1320 intersected significant mineralization.

All nine holes drilled at Rosaura between Levels 970 and 1220 intersected significant mineralization.

Drilling under the Antacaca Sur ore body is planned to continue on Level 920 to test for extension of mineralization to the southeast and to depth.

Programs are currently planned for several zones of the Central Mine. 6,060 m in 22 drill holes are planned to explore for extensions along strike of the Yauricocha Fault and to depth in Antacaca Sur. For depth extensions of the Mascota orebodies, 6,740 m in 30 holes are planned. However, these programs have defined breaks to allow for evaluation between phases.

Results from the 2014 drill program for Mina Central are incorporated into the resource estimation.

9.2 Cachi-Cachi mineralized zone

The mineralized zone of Cachi-Cachi, which is currently being exploited, is outlined in Section 7 herein. The zone is open along strike and down dip.

During 2014, drilling has expanded mineralization to depth with a total of 3,057 meters drilled and 9 of 10 holes intersecting significant mineralization.

The next drill program planned for Cachi-Cachi is 1,840 m in 2 holes. Results of these holes will determine the next program.

Results from the 2014 drill program for Cachi-Cachi are incorporated into the resource estimation.

9.3 Yauricocha Sur

Yauricocha Sur is 2 km southeast of the mine offices (3 km by road). Representative lithologies include sedimentary rocks of the upper Cretaceous period, siltstones, marl, and limestone, the Celendín Formation, and the Yauricocha granodiorite intrusive.

At Yauricocha Sur the structures predominantly related to mineralization are a structure that correlates with Yauricocha Fault and contact between the Celendín formation and the eastern flank of the Yauricocha granodiorite intrusion. The Yauricocha South deposit exposes skarn bodies developed at the contact between the intrusion and the Celendín limestone, where a mineralized belt 230m long and up to 9m wide occurs at elevations between 4,610 to 4,675 masl. Channel samples taken from bodies that showed recognizable mineralization reported average values of Ag 23.63 g/t, Pb 0.04 %, 1.06 % Cu, 0.61 % Zn and Au 0.12 g/t over an average width of 5.38m.

The geologic structure that correlates with the Yauricocha Fault in a road cut at the Acococha Reservoir strikes N 50 ° -60 °W and dips 75 °NW. The host rock is intrusive and shows evidence of base metal mineralization, with relict galena, pyrite, and Fe- and Mn oxides and hydroxides. 3 channel samples have reported average assays of Ag 109.59 g/t, Pb 1.10 %, 0.07 % Cu, 0.90 % Zn and Au 0.44 g/t over an average width of 1.15m.

A drill program of 1,380 m in 6 holes in the skarn and 460m in 2 holes in the Yauricocha Fault is planned. Recommendations are in place to sample the ramps of underground workings.

9.4 San Juan and San Antonio Areas

The San Juan and San Antonio prospects are 2 km east of the mine offices (4 km by road) and 600m from the tailings impoundment. The favorable lithology is the calcareous sandstone of the

Casapalca Formation which, in the area, is extensively silicified and, through the presence of epidote, shows a degree of propylitic alteration. Sulfide and apparently supergene iron oxide and hydroxide veins suggest primary polymetallic mineralization.

The San Juan Vein strikes between N 50 ° - 70 ° W, dipping 80 ° -88 ° NE, and exhibits a brecciated texture. Three outcrop samples reported averages of 80.80 g/t Ag, 0.53 % Pb, 0.03 % Cu , 0.08 % Zn and 0.15 g/t Au over an average width of 0.72m.

A 140m long splay of the San Juan Vein occurs to the northwest of the San Juan Vein outcrop with a width that ranges from 0.20m to 0.65m, striking N 60 ° -75 ° W and dipping 80 ° -85 ° S. Two outcrop samples report averages of 19.82 g/t Ag, 0.76% Pb , 0.06 % Cu , 0.50 % Zn and 0.06 g/t Au over an average width of 0.43m.

Near the southeast end of the outcropping San Juan Vein, a 180m long mineralized splay strikes N 90° E and dips 75°-80° S. The splay ranges from 0.20 to 0.30 meters in width and exhibits a brecciated texture with Mn and Fe oxides and hydroxides. Samples have returned average values of 88.54 g/t Ag, 0.71% Pb, 0.03 % Cu, 0.06 % Zn and 0.18 g/t Au over an average width of 0.30 m. An additional mineralized splay crops out 20m north, striking N 64° -80 ° W and dipping 60 ° SW with a width of 0.20 to 0.40 meters. This splay exhibits a brecciated texture, pyrite, galena, and Fe and Mn oxides. Samples from this structure have returned 137.23 g/t Ag, 4.07% Pb, 0.05 % Cu, 0.19 % Zn and 0.10 g/t Au over an average width of 0.40m.

The San Antonio Vein shows a winding, continuous outcrop for 260m that strikes N40-65W with a near-vertical dip. The vein exhibits a brecciated texture with intergrown quartz and iron oxides and hydroxides that are reminiscent of other polymetallic mineralization occurrences at Yauricocha. The vein is narrow to the northwest, becoming better developed to the southeast. 10 samples taken from the northwest sector reported average grades of Ag 151.04 g/t, 0.15 % Pb, 0.03 % Cu , 0.03 % Zn and 0.31 g/t Au with values as high as 769.97 g Ag / TM, though the average is 219.81 g Ag/t) over an average width of 1.44m; 11 samples taken from the southeast sector returned average values 286.05 g/t Ag, 0.40 % Pb , 0.12 % Cu , 0.06 % Zn and 0.50 g/t Au over an average width of 0.41m.

South of the San Antonio Vein, the Toño Vein is exposed near the summit of Cerro Sapallanhuarmi, striking N 70 ° -80 °W, showing a brecciated texture with coatings of malachite and Fe- and Mn-oxides and hydroxides. Historic workings include 2 covered adits and collapsed trenches. Outcrop sampling reported 243.50 g/t Ag, Pb 1.67 %, 0.36 % Cu, 0.56 % Zn and Au 0.56 g/t over an average width of 0.8m. A grab sample taken from old workings reported Ag 121.76 g/t, Pb 1.41 %, 0.22 % Cu, Zn 0.80 %.

The 4500 Level is inferred as being the elevation of primary mineralization; anticipated exploration of the San Juan and San Antonio areas include drilling 2 holes (590 and 410 meters

respectively) from the 4500 Level in order to delineate observed vein mineralization along subsurface projections.

9.5 Area Éxito NE

Éxito NE is located 4 km to the southeast of the Yauricocha offices (8 km by road). The property is located within the surface area of Laraos community. Access is by improved gravel road.

Stratigraphy is represented at Éxito NE by the Jumasha limestones and the intrusive granodiorite of the Éxito Stock. In the project area, the limestone contact with intrusive has general direction N 00 ° and a dip of 80° to 85° W. Primary faults are northwest- striking N 65 ° -90° W, dipping 75 °- 78° N, with some second order faults dipping 82° to 86° S.

Excavation at Éxito NE exposes the contact between granodiorite and limestone at an altitude of 4,700 to 4,800 masl and has revealed oxidized metal sulfides and lesser amounts of brochantite, malachite, pyrite and chalcopyrite; the limestone next to the contact has been recrystallized and resulting endoskarn contains garnet, epidote, and pyrite.

Four channel samples taken from outcrop reported averages of 29.30 g/t Ag, Pb 0.11 %, 0.27 %Cu, Zn 1.76 %, Au 0.17 g/t over an average 0.31m width. 2 grab samples chosen from historic workings reported averages 233.27 g/t Ag, Pb 7.86 %, 0.66 % Cu, 8.15 % Zn and 1.20 g/t Au.

The planned exploration program in the Éxito NE area is 970 total meters of drilling in 4 holes of 180, 240, 250 and 300 meters each.

9.6 Kilkaska Area

Kilkaska is located 7 km southeast of the Yauricocha mine offices (16 km by road).

At the Cerro Kilkaska, mineralized bodies 1,400m long and of variable width up to 70 meters are common at the Jumasha limestone- Éxito granodiorite contact. 750m north on the same contact is the Éxito Body, and the Mina San Valentin and Kilkaska South bodies lie 2.5 km to the south. The mineralized bodies are skarns associated with hydrothermal breccias at the contact. Mineralization is typical to that found in supergene zones: hematite, goethite, Mn oxides, and relict sphalerite and galena.

Previous exploration and historic mining has identified several zones in the area, the Central, Éxito Francolina, and Felicidad zones. Sierra Metals has reviewed and reinterpreted the results of previous exploration programs and mining operations and anticipates 1) rehabilitating the Felicidad mine workings to evaluate local mineralization through drilling and underground development; and 2) additional drilling in the Central and Felicidad sectors to intersect the hypogene zone where sulfide remnants are exposed on the surface in the Central sector.

9.7 Kilkaska Sur Area

Kilkaska Sur is located 10 km southeast of the Yauricocha mine central offices (23 km by road); with relation to the ore bodies of the Cerro Kilkaska is located 2.5 km to the S. The surface rights belong to the rural community of Laraos. Access is by improved road that connects the Pumacocha lagoon and the St. Valentine's Mine.

The Kilkaska Sur mineralized bodies are common at the contact between the Jumasha Limestone and intrusive Éxito Stock at Cerro Puquiocaj. The bodies have a lenticular form with their major axes parallel to the strike of the contact and variable lengths of 5 to 50 meters with widths of up to 6 meters. Barren endoskarn comprises the material between the mineralized bodies. The type of skarn, as defined by mineralogy, seems to change between the northern and southern zones. In the northern zone, mineralogy indicates Cu-rich skarn: chalcopyrite and malachite in addition to pyrite, magnetite, hematite, and epidote. Skarn in the southern zone is represented by traces of galena and sphalerite in addition to malachite, hematite, goethite, magnetite, epidote, and garnet; the lack of chalcopyrite with the addition of galena and sphalerite suggests that these are Zn skarns.

A two-stage drill program of approximately 1,220m has been proposed in order to test the area between Kilkaska and Kilkaska Sur that remain under Quaternary Cover. The results of the first stage (4 drillholes) will establish the design of the second stage.

9.8 Yauricocha Fault Area (Cerros Pucacocha, Uchcapri, Leonpitacana and Carhuanisho)

The Yauricocha Fault is a regional geologic structure that runs along a length of 10 Km, striking N 50°- 63°W, by the summits of the Cerros Pucacocha, Uchcapri, Leonpitacana and Carhuanisho, at altitudes of 4,750 to 5,100 masl. The fault trace can be located through color anomalies and/or the presence of alteration and oxidation minerals. The Yauricocha fault, especially in conjunction with the Jumasha and Casapalca Formations, provide a geologic framework that is very favorable for mineralization. The Jumasha Formation hosts the Antamina, Yauricocha, St. Valentine's, Raura, Uchucchacua and The Heralds Black deposits; the Casapalca Formation hosts the Huaron and Casapalca deposits; and the Yauricocha Fault hosts the Yauricocha deposits.

To date, this area has not been thoroughly explored. Anticipated exploration activities include trenching and drilling a total of 11,850m in 23 holes from 11 platforms. This will require the construction of 7 km of road.

9.9 Yauricocha Este

Yauricocha Este is 2 km from the Yauricocha offices (3 km by road), between the Central Mine and Chumpe Concentrator and adjacent to the tailings impoundment. Representative lithologies include the Yauricocha granodiorite and siltstone and marl of the Celendín Formation. At this

prospect, the granodiorite is medium to coarse-grained and exhibits brecciation plus argillic and propylitic alteration near the contact. In the sedimentary sequence, the siltstone and marl are silicified and show pyrite and epidote. Given the variety and nature of mineralization in the Yauricocha District, it is possible that the Yauricocha Este prospect hosts disseminated mineralization. Anticipated exploration activities include trenching and diamond drilling from underground workings in the San Juan and San Antonio areas.

9.10 Yauricocha Oeste

The Yauricocha Oeste area is located on the Cerro Yauri Tip to 1 km southeast of the Yauricocha Mine offices of the Yauricocha min (2 km by road), on the boundary between the communities of Laraos and San Lorenzo of Alis. The stratigraphy of this area is represented by limestone formations and Pariatambo Jumasha. At the summit of Cerro Yauri Tip there are small, old underground mine workings in stained limestone voids that show evidence of polymetallic mineralization.

The anticipated exploration program at Yauricocha Oeste includes 1,050m of drilling in 3 holes.

9.11 Tintircullpa Area

This area of interest is located in the Tintircullpa Ravine, between the Canchacasa and Acsa Punta hills, 10 km south of the Yauricocha Mine offices (23 km by road) near the community of Laraos. The stratigraphy of this area is formed by the Oyon, Chimu, Santa, Carhuaz, Chulec, Pariatambo and Jumasha Formations which serve as metalotects for polymetallic deposits. The Santa limestone hosts a silicified horizon, defined by nodules of black chert, in which sulfide mineralization occurs. Significant mines that are exploiting these kinds of deposits in the Santa Formation are the Iscay Cruz, Huanzalã, and Yauyinazo Mines; which are mining limestone hosted mineral in the Santa Formation, and skarn at the El Extrano operation. Therefore, this area is prospective to host significant undiscovered polymetallic deposits.

The anticipated exploration program at Tintircullpa includes trenching and drilling 7,180m in 14 holes.

9.12 Ipillo Mine

The Ipillo Mine is located in the extreme southeastern end of the Yauricocha concessions, 7.5 km from mine offices (23 km by road). Surface rights are held by the community of Laraos. Access is via paved road.

Outcrops in the area of Ipillo are intrusive granodiorite, a unit that ranges from the El Paso area, through the Éxito and Kilkaska areas, and continuing to the southeast. A metasomatic event occurred prior to mineralization, developing light to dark green bands where mafic minerals (biotite and hornblende) were replaced by chlorite in zones of strong fracturing and along sub-

parallel faults. Chlorite is the most abundant alteration product, followed in order of abundance by epidote, specular hematite, magnetite, quartz, and calcite.

The Ipillo polymetallic deposits occur mainly as veins, fracture-fill for a joint set oriented to the northeast, and, in some sections of the mine that have sufficient ground preparation, as mineralized stockworks or breccias . Metasomatic haloes can have a width of several meters. Polymetallic (and gangue) mineralization consists of sphalerite, chalcopyrite, galena, hematite, siderite, quartz, pyrite and calcite. The major structures that have been historically exploited include the Poggi, Alis, Coquelet, and Laraos Veins with Ag values ranging from 75.43 to 476.56 g/t; Pb ranging from 1.58 to 10.08 %; Cu ranging from 0.14 to 1.20 %; Zn ranging from 0.57 – 5.97 %; and Au ranging from 0.69 – 4.21 g/t over reported vein widths ranging from 0.46 to 3.00m. By definition, these minimum and maximum values are anomalous and should not be interpreted as representative values but rather as to what extents of mineralization have been historically determined. It is 1.5 km from the Ipillo Mine workings to Kilkaska Sur and 1.45 km to the St. Valentine Mine.

Anticipated exploration activity is to develop mineralized vein extensions through drilling from underground workings.

9.13 Western Chimneys

The Western Chimneys are located within 400 meters southwest of the Central Mine area. Of the five solution breccias discovered, three trend in an E-W direction and are believed to be controlled by a fault, while the other two are aligned parallel to stratigraphy.

All five chimneys have been scraped and sampled in detail and two chimneys, Mascota Noroeste and Mascota Oeste Intermedio, have been tested by drilling, and encountered sufficient mineralization to encourage further exploration.

Mascota Oeste Intermedio is the largest chimney discovered to date and has been exposed at surface over an area of 85 by 25 meters. Drilling has intersected multiple mineralized bodies as well as karst cavities, and with significant silver and zinc grades.

The western chimneys are geologically similar to the high-grade, Ag-Pb-Zn Mascota oxide ore body currently being mined in the Central Mine, which averages 200-300 g/t Ag, 6-10% Pb and 1-3% Zn. Lower silver, lead and zinc grades obtained from surface sampling and shallow drilling of the western chimneys compared to those currently being mined at depth on the Mascota body may be due to near surface secondary leaching.

Follow-up surface and underground drilling of the chimney discoveries is planned for 2015 and is underway at the time of this report.

The discovery of the western chimneys has led to a new structural interpretation that indicates a possible “mirror” pattern to mineralization in the area, such that another major area of mineralization similar to the Central Mine area could occur to the west-southwest of it. Sierra Metals indicates that detailed mapping followed by reconnaissance drilling based on this concept is planned for late 2015.

10. DRILLING

10.1 Drilling Procedures

Minera Corona's Geology Department owns and operates three small hydraulic drills, the reach of which varies between 80 m and 150 m with core diameter is 3.5 cm. A fourth air drill has a reach of 60 m and the core diameter is 2.25 cm.

Additionally, the department owns two jackleg drills fitted with an extension bar reaching up to 25 m. These machines are utilized to delineate mineralization at intervals of 10 m between holes.

The company utilizes the services of a contractor for deeper drillholes reaching up to 474 m in length. Core diameters are HQ and NQ. Exploration (establishing continuity of mineralization) and development (reserve and production definition) drilling conducted by Corona from 2002 to 2011 is detailed in Table 10-1. Exploration drilling is confined to expanding known mineralization, particularly in the massive mineralized bodies, and has not been performed to date for discovery of new bodies.

Table 10-1 Yauricocha Exploration and Development Drilling

YEAR	Exploration (Meters)	Development and Infill (Meters)	Exploration and Development (Meters)	Drilling (DDH) By Company (Meters)	Drilling (DDH) By Contractor (Meters)
2002	2,726	1,160	3,886	1,887	
2003	3,307	1,648	4,955	3,415	
2004	1,778	2,245	4,023	2,970	
2005	2,004	2,030	4,034	3,160	8,043
2006	788	1,998	2,786	2,999	10,195
2007	826	1,640	2,466	4,751	6,196
2008	796	1,584	2,380	5,379	13,445
2009	872	1,040	1,912	4,955	13,579
2010	454	632	1,086	4,615	3,527
2011	684	927	1,611	5,195	9,071
2012	921	609	1,530	11,532	31,257
2013	1730	839	2,569	10,653	16,781
2014	680	331	1,011	9,357	30,455

10.2 Survey Control

Drill collar locations are surveyed underground by the mine survey team by total station. Collar locations are assumed to be accurate to less than 0.1 meters.

Downhole surveys were provided for a total of 27 drillholes, primarily within the Mina Central area. Where they are surveyed, holes are downhole surveyed every 50 meters. Gustavson recommends that downhole surveys be done for all exploration drilling going forward, that the

database be updated to include any existing downhole survey data which have not been included, and that Minera Corona consider surveying open, accessible drillholes which have not previously been surveyed.

Lack of downhole survey control causes local distortions in the geometry of the wireframes used to control resource estimation, particularly where both drillhole and channel sample data are collocated.

10.3 Core Logging and Storage

During the October 2013 site visit, Gustavson personnel visited the core storage and logging facility at Yauricocha mine. The core logging facility is clean, well appointed, and well organized. Core is stored in the unused classrooms of the old Collegio building. Core boxes are well labeled, well organized, and reasonably easy to access.

Sections of several drillholes were examined to review core splitting and sampling methodologies. In areas where competent core exists, core is sawn down the length. In areas of brecciation or broken core, the core is manually split. Sampling in both cases appears to be consistent and representative.

Core is only sampled in areas where there is substantial evidence of mineralization. Given the high grades of sulfide minerals in this deposit, it is reasonable only to sample areas where substantial mineralization can be logged. However, there is a possibility that some areas of gold-silver mineralization might be missed in the sampling, in the database, unsampled intervals are being treated as barren, and those areas are not considered as part of resource volumes.

10.4 Recovery

Sample recovery information is not stored in the drillhole database. Based on visual examination of core, recovery appears to be generally excellent, so this is not considered to be a significant source of error. However, Gustavson recommends that core recovery data be added to the database for future resource estimation efforts.

10.5 Drillhole Locations

All drillholes used for the resource estimation have been drilled from underground, within the Yauricocha mine workings. Figure 10-1 shows a plan view of drillholes relative to the main orebodies within the deposit. Exploration drilling is generally targeted to intersect the main mineralized bodies perpendicular to the strike of the bodies, and should be representative of the deposit. Table 10-2 outlines the breakdown of drill targets and number of holes per area per year.

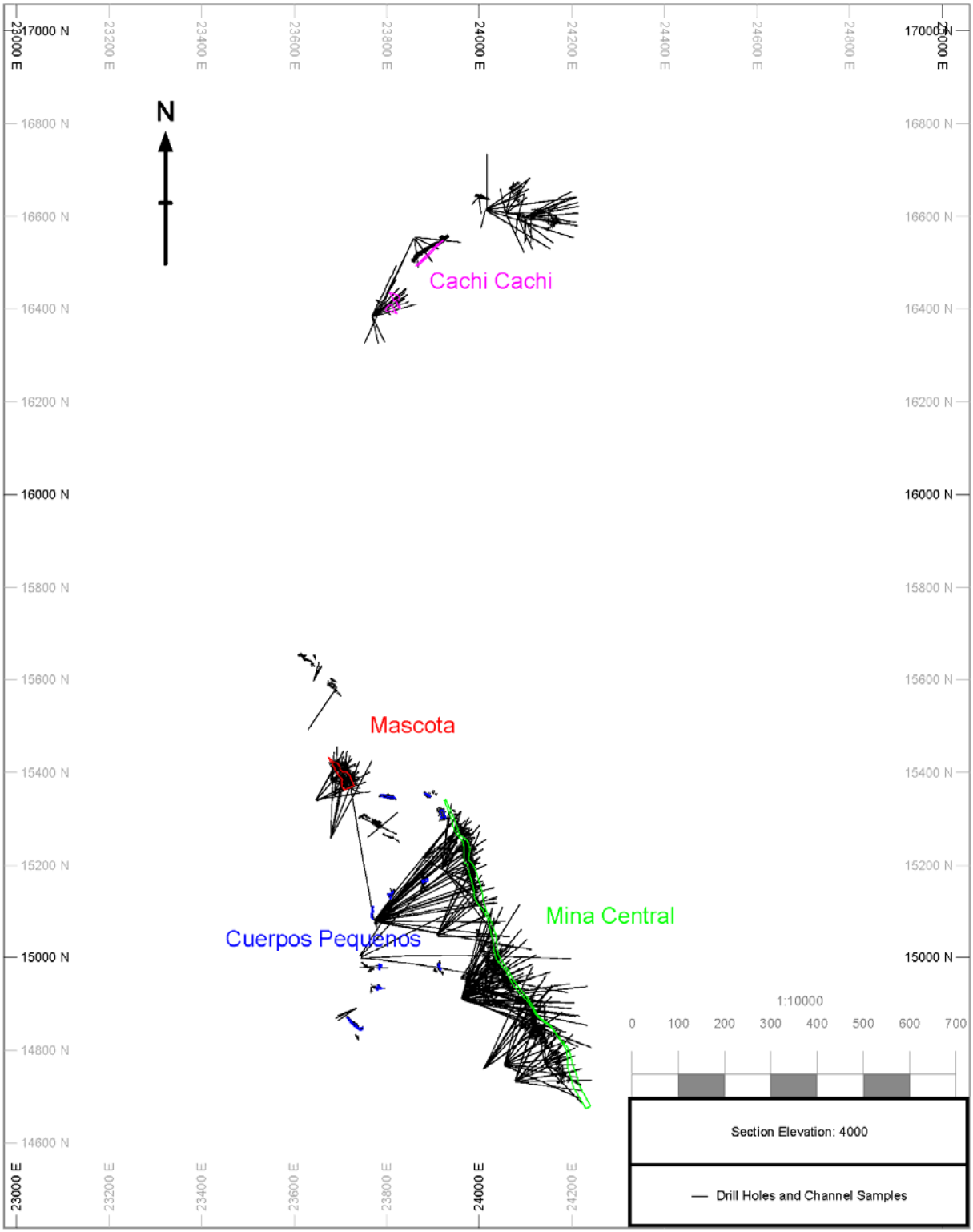


Figure 10-1 Drilling map for Yauricocha

Table 10-2 Description of Core Drilling 2009-2014

Prospect	Year	# Drillholes	Meters Drilled
Antacaca	2008	-	-
	2009	10	1,747
	2010	-	-
	2011	5	911.20
	2012	23	3,565.3
	2013	5	1,454.20
	2014	15	4,832.5
	Total	**58**	**12,510.2**
Antacaca Sur	2008	-	-
	2009	12	1,632.30
	2010	-	-
	2011	-	-
	2012	13	2,226.3
	2013	13	2,301.70
	2014	-	-
	Total	**38**	**6,160.3**
Catas	2008	-	-
	2009	8	1,551.45
	2010	-	-
	2011	11	2,973.65
	2012	46	10,603.8
	2013	3	963.5
	2014	3	1,654.8
	Total	**71**	**17,747.2**
Mascota	2008	7	1,798.70
	2009	-	-
	2010	-	-
	2011	5	510.6
	2012	1	457.3
	2013	16	1,454.20
	2014	3	97.0
	Total	**32**	**4,317.8**
Rosaura	2008	-	-
	2009	5	698.85
	2010	-	-
	2011	-	-
	2012	25	4,520.8
	2013	21	5,522.60
	2014	8	2,370.2
	Total	**59**	**13,112.45**

10.6 Summary of Drilling information

Gustavson considers the drillhole information to be sufficiently complete and representative to be used as the basis for resource estimation.

11. SAMPLE PREPARATION, ANALYSIS, AND SECURITY

11.1 Core Samples

Core samples are collected from the rigs underground by the geology staff and transported to the core logging and storage facility. Core is logged, and sample intervals are marked for splitting by the geology staff. Samples are split under supervision of the logging geologist and samples are placed in numbered plastic bags. A sample ticket displaying the sample number and bar code are inserted into the bag. Bags are tied to prevent contamination during handling and transportation.

11.2 Channel Samples

Channel samples are collected underground by geology staff. Typical sample intervals are 1 meter along the ribs of crosscuts within stopes for the large mineralized zones or across the back of the stopes for the small mineralized zones. The samples are placed in a plastic bag labeled with a permanent marker on the outside. A sample ticket displaying the number and bar code is inserted in the bag. The bags are tied to prevent outside contamination during their handling and transportation to the assay lab.

The samples are processed at the Minera Corona's lab located in the Concentrator Plant under the supervision of company personnel. A summary of the sample preparation procedure follows. The on-site laboratory is not currently independently certified.

Channel sample locations are surveyed in the underground by mine survey staff. Sample start and end point locations are assumed to be accurate to centimeter accuracy.

11.3 Sample Preparation Procedures

The fundamental objective of the preparation of geologic and exploration samples is to obtain a clean and representative sample with adequate size distribution for quantitative analysis. These sampling procedures are applied to samples from the underground mine, from stockpiles of ore and from ore cars all which are under the responsibility of the Geology department, along with samples from exploration.

11.3.1 Equipment and Materials

Equipment used in sample preparation includes:

- 1 – Primary Jaw Crusher, Make – Denver, Jaw capacity – 5" x 6", Output – 70%, minus ¼"
- 1 – Secondary Jaw Crusher, Make – FIMA, Jaw capacity – 5" x 6", Output –80%, minus 10 mesh
- 1 – Pneumatic Pulverizer, Make – Tmandina
- 2 – Sample Dryers, with termocupla and temperature regulator

- 1 – ½" Stainless steel splitter, Make – Jones
- Five point air nozzles
- Stainless steel trays, 225x135x65 mm
- Stainless steel trays, 300x240x60 mm
- Plastic or impermeable cloth
- 2" brushes

11.3.2 Sample Reception

For Core samples, bagged samples are transported by the internal transport service from the core logging facility and are received at the reception counter at the laboratory entrance. A log entry is made to record the sample numbers being received.

Channel samples are collected in the field by the geology staff and transported by the internal transport service from the Yauricocha Mine or Klepetko Adit and are received at the reception counter at the laboratory entrance. A log entry is made to record the number of samples being received. These samples are between 1.5 kg and 3.0 kg, are damp and received in plastic bags.

11.3.3 Procedure

Prior to beginning sample prep, verify that

- The equipment is clean and free from contamination.
- The crushers and pulverizers are functioning correctly.
- Review the numbering of the sample bags that all bags are unique and identifiable.

The procedure to reduce the sample to a pulp of 150 gm, and 85% passing 200 mesh is:

- Transfer the sample to the appropriate tray, depending on the volume of the sample, noting the tray number on the sample ticket.
- Insert a blank sample (silica or quartz) in each batch.
- Place in the Sample Dryer at a temperature of 115º C.
- Code the sample envelopes with the information from the sampling ticket noting the sample code, the tray number, date and the quantity of samples requested on the sample ticket.
- Once dry, remove and place the tray on the work table to cool.
- Pass 100% of the sample through the Primary Jaw Crusher when particle sizes exceed 1", the resulting product 70% passing ¼".
- Pass the sample through the secondary crusher, the resulting product 80% passing 10 mesh.

- Clean all equipment after crushing of each sample.
- Select a random sample to carry out the control of the crushing to 10 mesh, noting the weights in the log along with the sample code for the sample in question.
- Empty the sample into the Jones Splitter and split to obtain an approximate 150 g sample. Clean the splitter after each sample with the air nozzle.
- Put the numbered envelopes in the tray for the corresponding sample.
- Then pass the sample in the ring cavity of the pneumatic pulverizer until achieving a size fraction of 85% minus 200 mesh. This is accomplished by setting the time on the pulverizer's timer. Clean the cavities after each pulverization with the compressed air nozzle.
- Transfer the pulverized sample to the impermeable sample mat, homogenize and pour into the respective coded envelope.
- As a part of this process, pass a random sample through a 200 mesh screen, noting the weights in the control log.
- Clean all materials and the work area thoroughly.

11.4 Control of the Samples

Staff from the Yauricocha geology department collect and transport the samples to the laboratory. Control is personally maintained and both field and laboratory procedures are sound.

11.5 Analytical Procedures

Core and channel samples from the mine are assayed utilizing two procedures. Silver, lead, zinc, and copper are assayed by atomic absorption. Gold is assayed by fire assay with an atomic absorption finish.

The laboratory is clean and well organized. Equipment is well maintained and supplies and reagents are store in well labeled containers. During the site visit, no samples were being processed in the lab and Gustavson did not have an opportunity to independently confirm the use of the procedures. Gustavson is of the opinion that the procedures are adequate for the mineralized bodies currently being analyzed. As exploration on nearby deposits progresses, the analytical procedures merit a detailed review.

11.6 Assay Database

Four drill hole assay databases were provided to Gustavson. One contains data from each area of mineralized bodies intersected by drilling (Mina Central, Mascota, Cachi Cachi, and the Cuerpos Pequenos). These are listed in Table 11-1. The second set of databases contain channel sample data from the development cross cuts that cross the massive bodies, and samples across the back for development workings in the small bodies. Some small bodies were not intersected by drilling and are defined only by channel sampling.

Table 11-1 Mineralized Bodies with Drill Data

Area	Large Deposits	Small Deposits
Mina Central	Antacaca	
	Antacaca Sur	
	Rosaura	
	Catas	
Mascota	Mascota	
Cachi Cachi		Andrea
		Angelita
	Elissa	
		Escondida
		Karlita
		Zulma
Cuerpos Pequenos		Contacto Oriental
		Contacto Sur Medio II
		Contacto Sur Medio I
		Katty
		Juliana
		Gallito
	Butz	

12. DATA VERIFICATION

12.1 Verification of the Quality Control Program

Prior to 2012, Minera Corona did not utilize the services of an independent lab for data verification. The company used an internal QA/QC procedure at its assay lab (Chumpe Lab) located in the Concentration Plant. Historically, the results have compared well with the metal contained in concentrates and further work on a formal external QA/QC procedure had not been pursued. Beginning in 2012, Minera Corona began to use external check assays as part of the validation system for the Chumpe lab data stream, as described in 12.3, below.

12.2 Chumpe Lab Quality Control

The current procedure includes certified standards, blanks, pulp duplicates, and sample preparation size review. These are processed at approximately 1 per 20 samples. External labs receive approximately 1 sample for each 15 processed internally. Gustavson did not have the opportunity to fully observe the laboratory operation; however Gustavson has examined QA/QC records of certified standards for 2011 through 2014. Daily average response to the copper, silver, lead and zinc standard samples are shown in Figure 12-1 through Figure 12-4. Gustavson is of the opinion that the data are adequate for the purposes of the report and show consistently good performance.

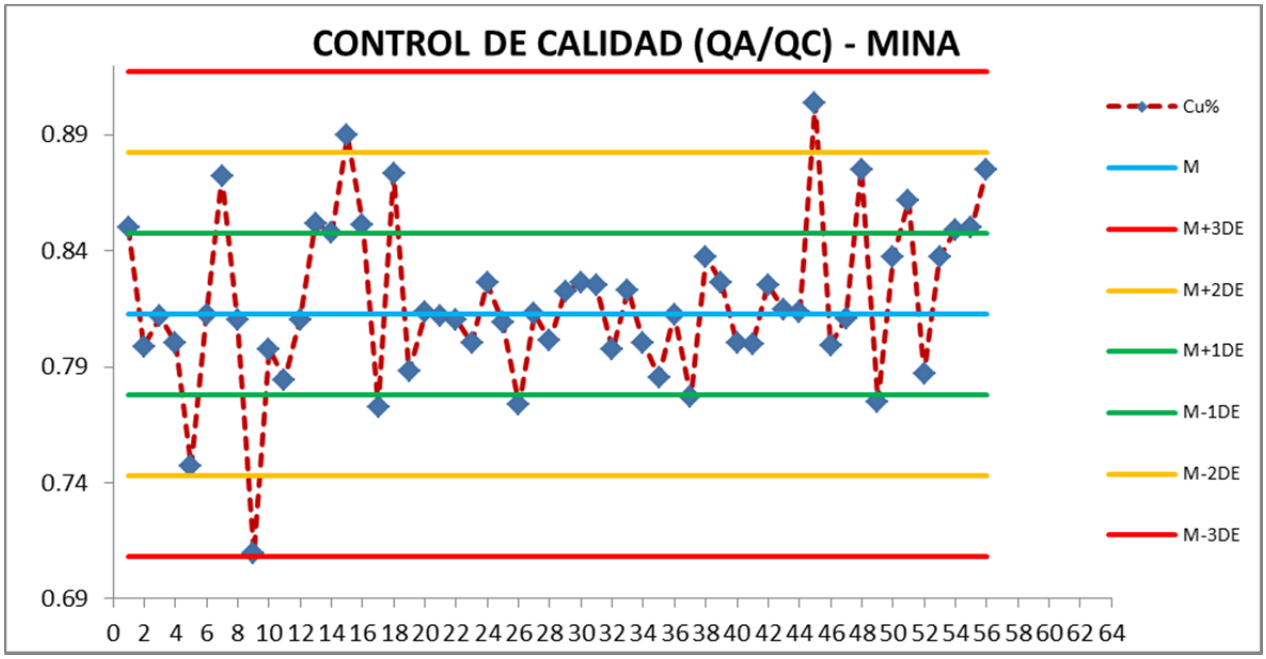


Figure 12-1 Yauricocha Mine Daily Quality Control Results Copper

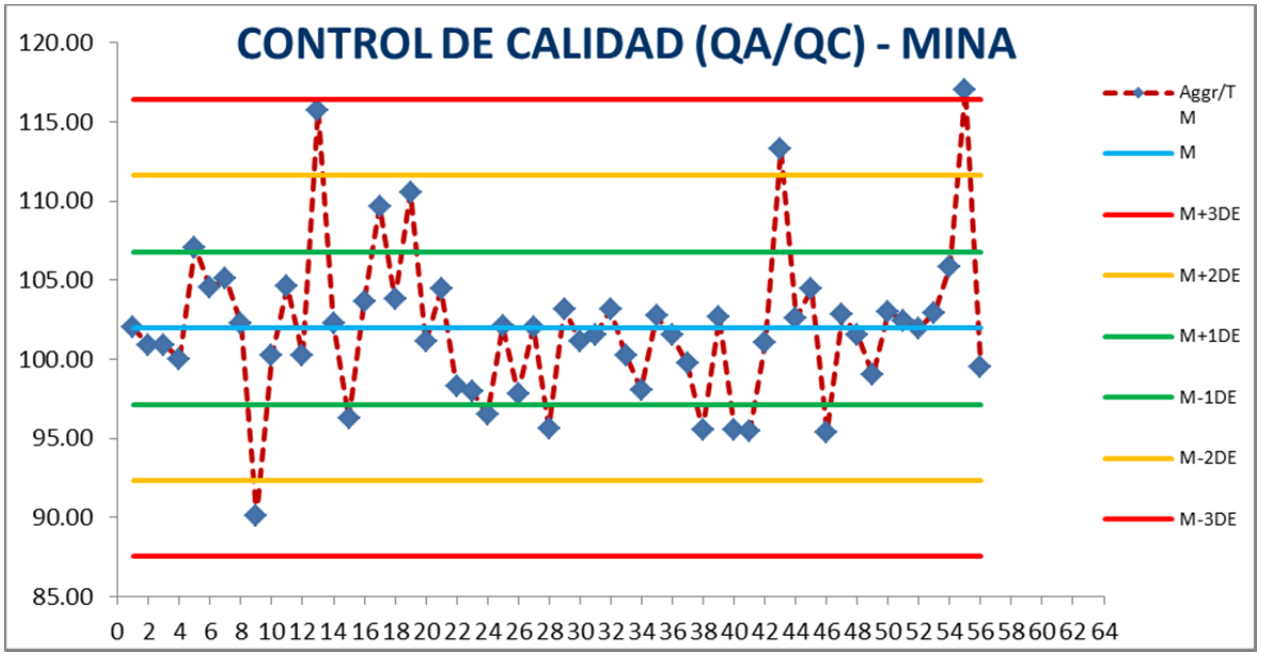


Figure 12-2 Yauricocha Mine Daily Quality Control Results Silver

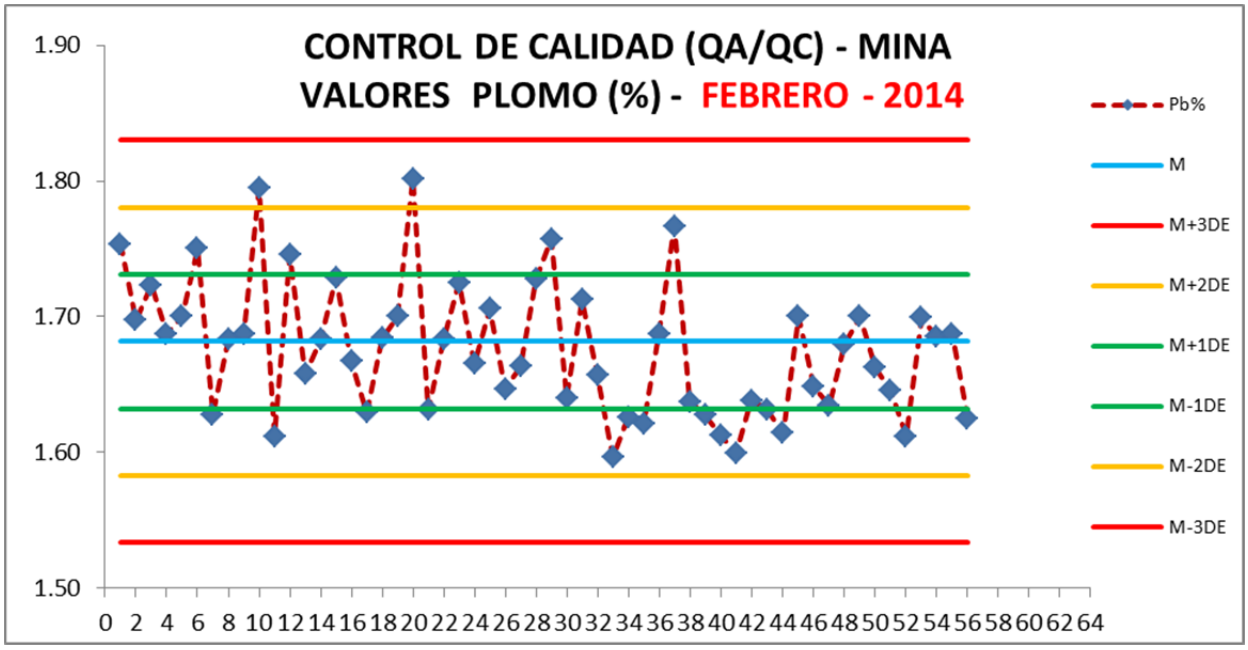


Figure 12-3 Yauricocha Mine Daily Quality Control Results Lead

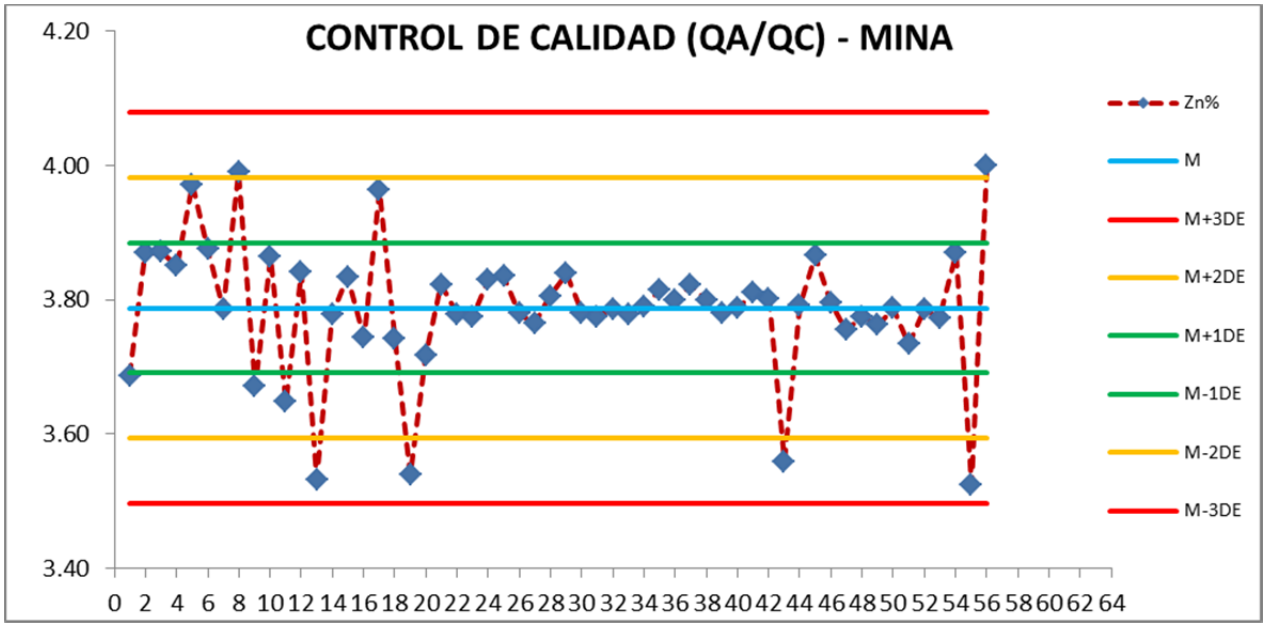


Figure 12-4 Yauricocha Mine Daily Quality Control Results Zinc

12.3 Outside Laboratory Check Assays

Starting in 2012, Minera Corona implemented a QA/QC procedure for coarse reject duplicate analyses by an outside lab to confirm validity of results from the Chumpe Laboratory. During 2014, approximately 120 pulps were submitted to Chemex Labs of Lima Peru per month (approximately 5 percent of samples). Second-lab analyses show good agreement with Chumpe lab.

Gustavson recommends that Minera Corona continue to monitor Chumpe Laboratory performance by sending 5% of coarse reject samples to a certified outside lab for analysis, with particular attention paid to understanding the source of erratic outlier values, and possible sources of bias for zinc and lead assay.

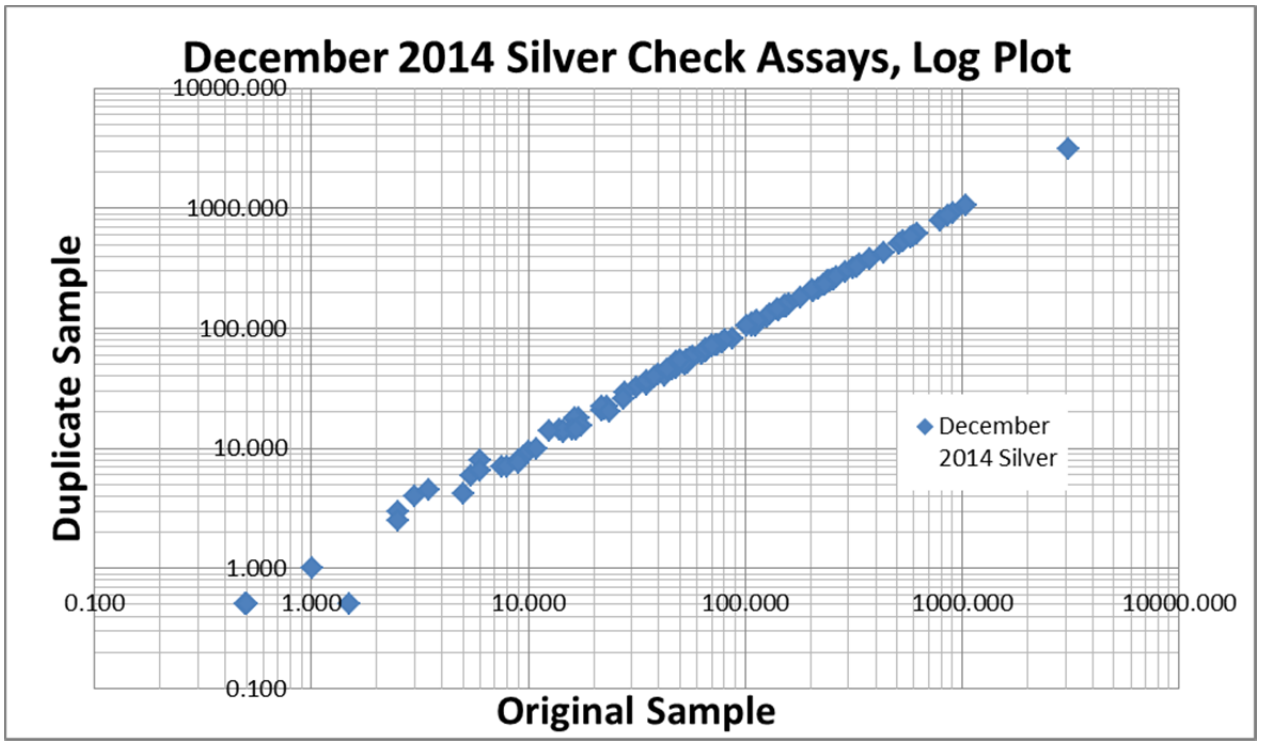


Figure 12-5 Outside Laboratory Check Assays Silver

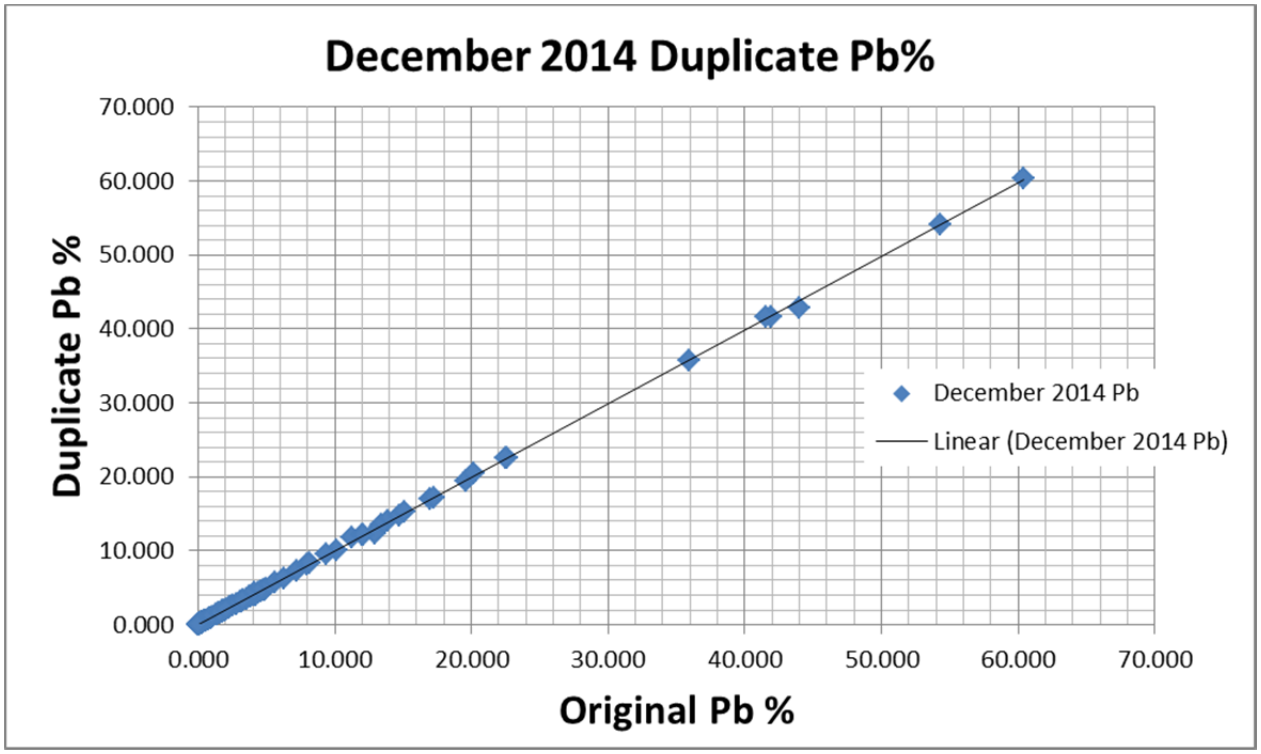


Figure 12-6 Outside Laboratory Check Assays Lead

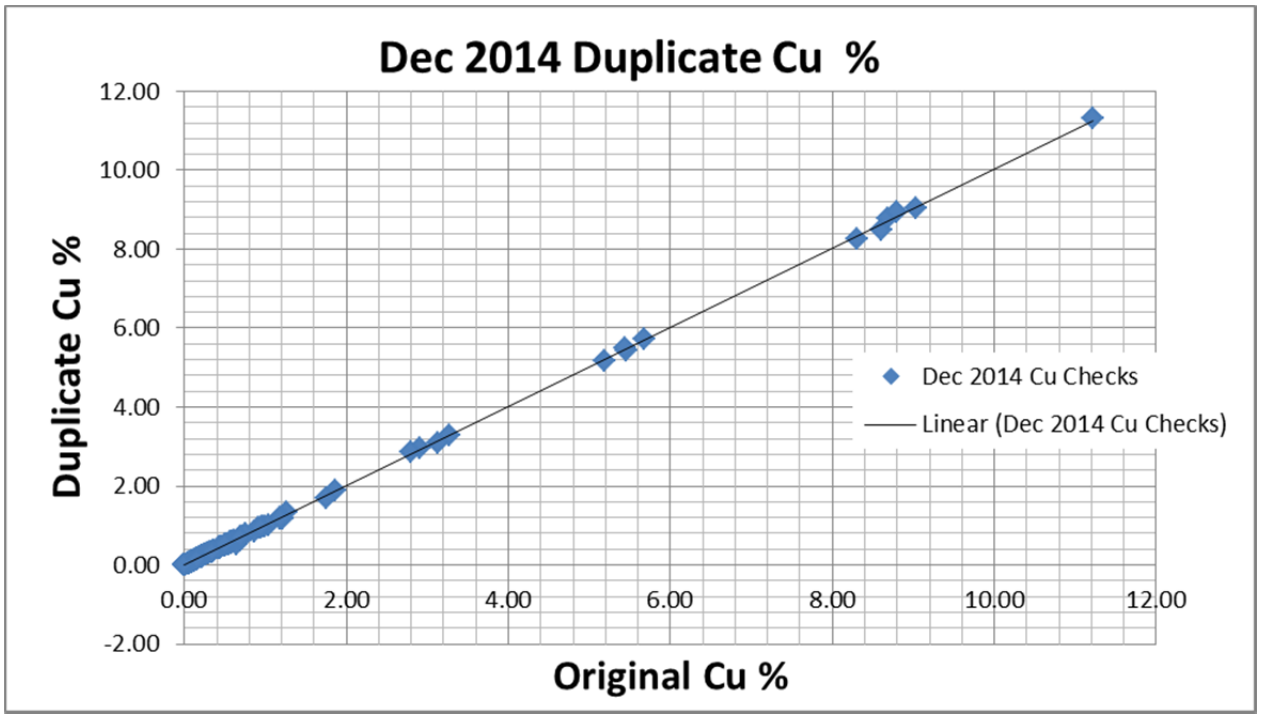


Figure 12-7 Outside Laboratory Check Assays Copper

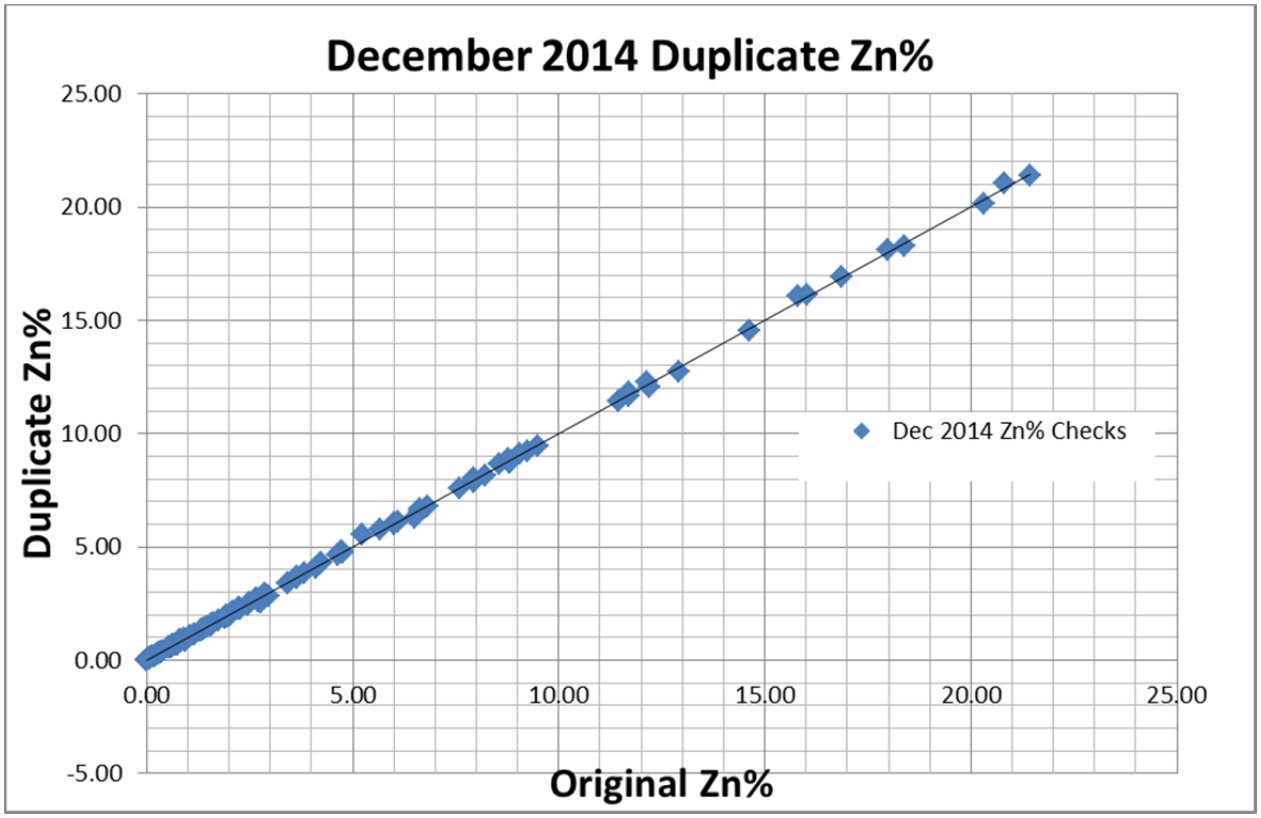


Figure 12-8 Outside Laboratory Check Assays Zinc

12.4 Assay Database Review

Gustavson reviewed the drillhole and underground channel samples databases for the Yauricocha project and compared the assay database with a separately maintained database of assay data which is described as 'laboratory data'. Chumpe lab does not provide a separately maintained database, nor are there assay certificates per se with which to compare the database.

Detailed database comparisons were carried out on drillhole databases from 5 areas of the deposit, which comprise over 80 percent of the resource tonnage.

The overall error rates, as tabulated in Table 12-1, below, are between 0.28 and 0.55%, which is within an acceptable range for this type of database.

Table 12-1 Drillhole Assay Comparison Sheet: Lab vs. Database, Non-Capping Error Rates

Resource Area	Number of Samples	Error Ag	Error Pb	Error Cu	Error Zn	Error Au
Catas	1390	10	0	0	0	0
Antacaca Sur	639	1	1	1	1	1
Antacaca	569	0	0	0	0	0
Rosaura	871	0	0	0	0	12
Mascota	869	11	11	11	11	11
Combined	**4338**	**22**	**12**	**12**	**12**	**24**
Error Rate		**0.51%**	**0.28%**	**0.28%**	**0.28%**	**0.55%**

12.5 Database Quality

Yauricocha mine has been modernizing data handling and database procedures, and is currently maintaining databases of drillhole and channel samples in Datamine software. There are some legacy data structures related to the historical practice of handling data from individual resource zones as separate databases. While there remains room for improvement in the database logic, the information as presented is sound. Gustavson recommends that Minera Corona continue the process of modernizing and integrating the data system into the overall mine planning system, with particular attention being paid to ensuring that all drill and channel sample information is available for modelling efforts.

Overall, Gustavson has determined that the data are of sufficient quality and reliability to be used for resource estimation.

13. MINERAL PROCESSING AND METALLURGICAL TESTING

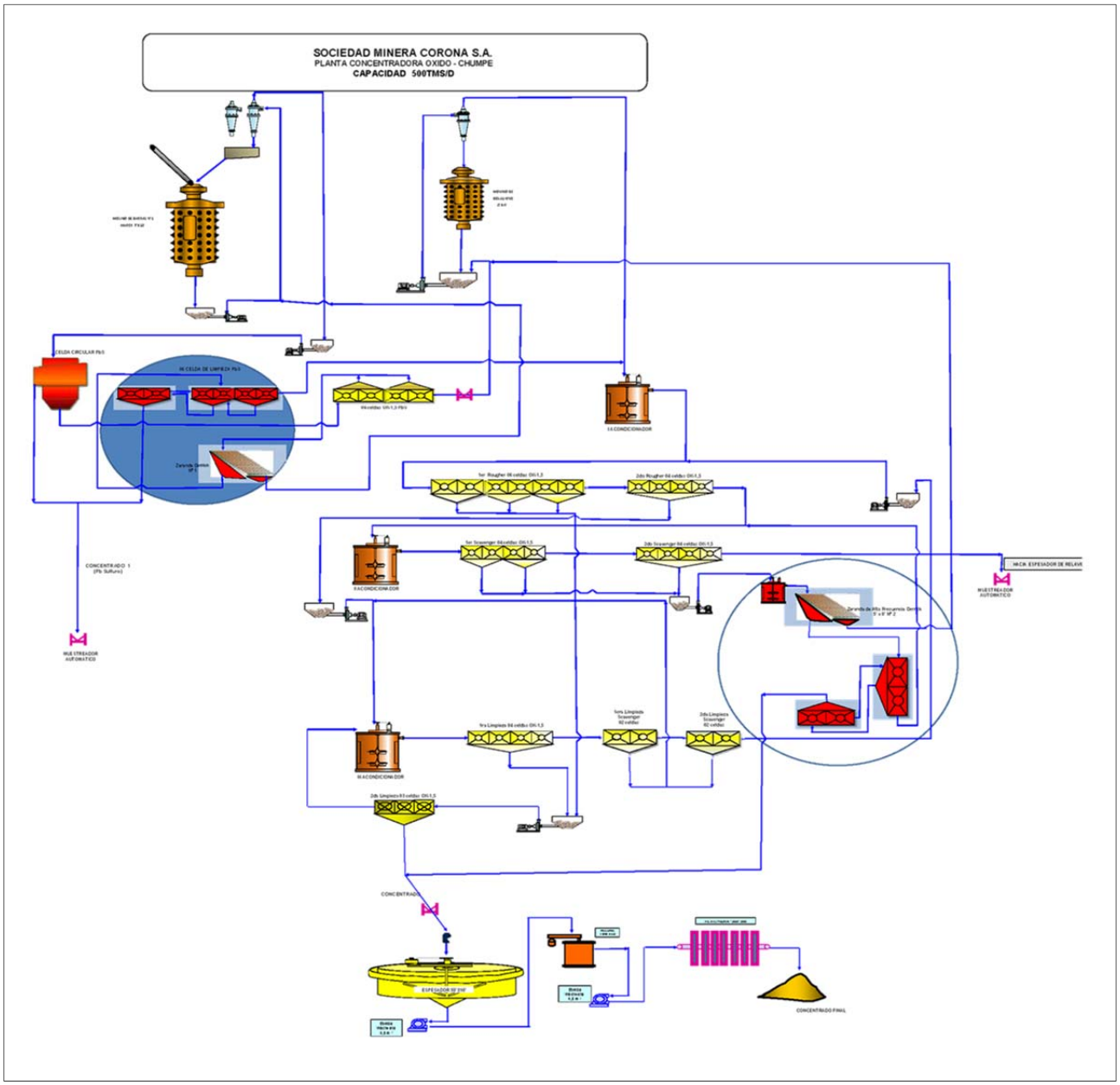
The Chumpe Mill has treated ore from the Yauricocha Mine since 2003. Therefore, this section reviews the current process flowsheet and the metallurgical performance of the mill.

13.1 Process Description

The Chumpe Mill treats ore produced by the Yauricocha Mine using crushing, grinding and flotation. The ores are complex, carrying zinc, lead, copper, silver and gold values. Three types of ore have been historically treated: polymetallic ore (PM), containing payable silver, lead, copper and zinc; copper ore, containing payable copper and silver; and lead oxide (PbOx), ore containing payable silver and lead. Gold occurs in the ores and is partially recovered, until 2012 it had not been tracked in the mill. Impurity elements such as arsenic and antimony are not routinely monitored. Currently the mine is producing limited quantities of copper ore. The Chumpe mill is operating two milling circuits only, one treating polymetallic ore and one treating lead oxide ores. Current production of copper ore is being processed through the PM circuit.

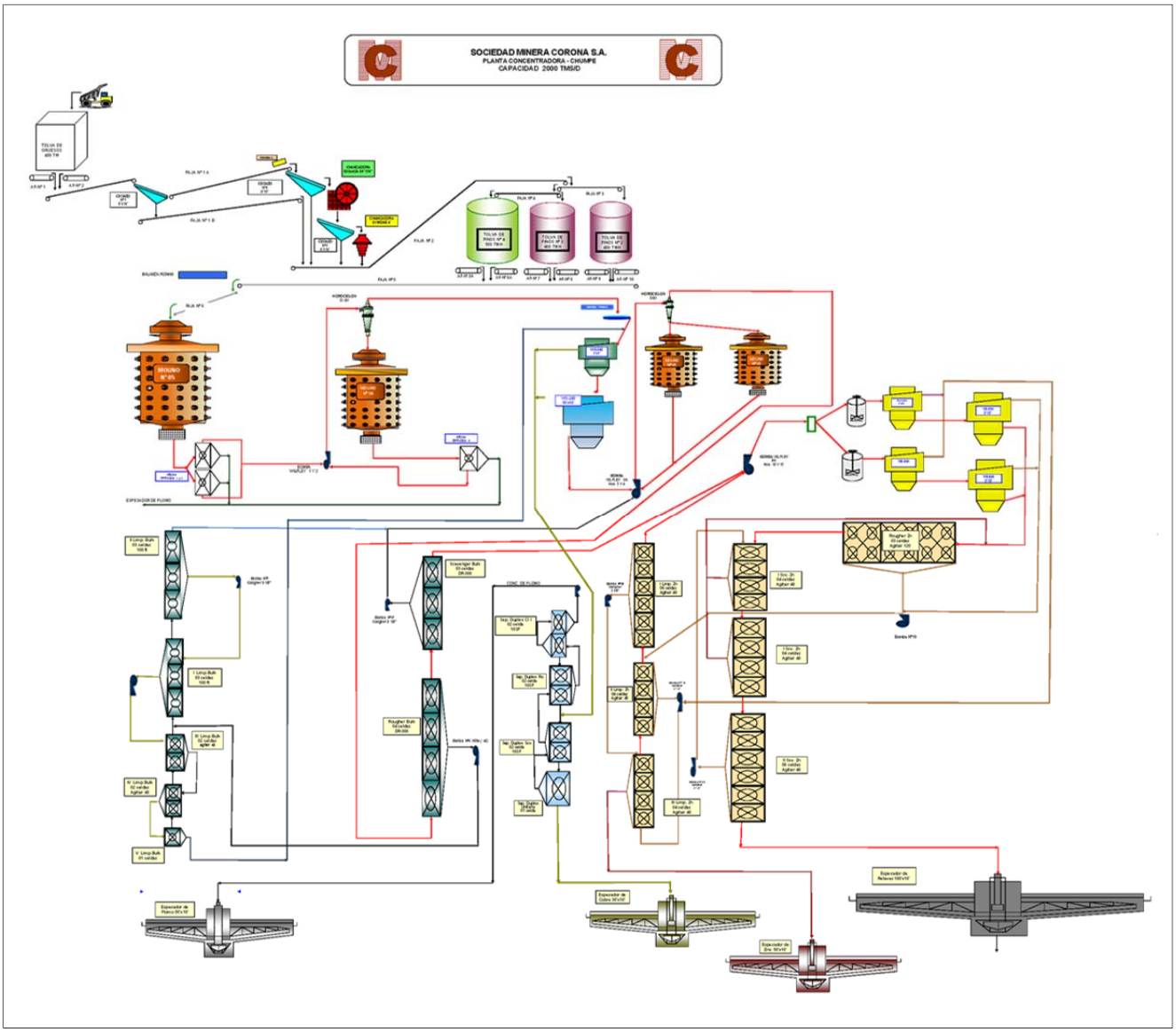
The three ore types are treated in two separate milling circuits which share a common crushing section. PM and copper ores are treated in campaigns through the polymetallic circuit, with PbOx ore treated in the lead oxide circuit.

The process flowsheets are presented in Figure 13-1 and Figure 13-2. The description of the process flowsheet is given in the following sections.



Source Sierra Metals, 2013

Figure 13-1 Yauricocha Oxide Flowsheet



Source Sierra Metals, 2013

Figure 13-2 Yauricocha Polymetallic Flowsheet

13.1.1 Crushing, Screening and Fine Ore Storage

All ore received from the mine is treated in a common crushing-screening circuit. PM and copper ores are received in a 450 tonne bin, with PbOx ore received in a 150 tonne bin. The two ore types are crushed separately in campaigns. The crushing circuit incorporates a 24” by 36” jaw crusher and a 48” standard cone crusher, along with three screens. Fine PM and copper ores are stored in three fine ore bins, while fine PbOx ore is stored in a single dedicated bin.

13.1.2 Polymetallic Circuit

When treating PM ore, the polymetallic circuit produces three final concentrates: copper, lead and zinc. A bulk copper-lead concentrate is produced initially and then separated into lead and copper concentrates. Copper ore treatment is a simplified version of the polymetallic process circuit, wherein the polymetallic circuit produces only a copper concentrate with no lead or zinc concentrates produced. However, during 2014, there was a negligible amount of primary copper ore processed in this plant. The following describes polymetallic ore treatment circuit:

13.1.2.1 Polymetallic Circuit Grinding

Ore from the fine ore bins is sent to a 7 ft by 12 ft rod mill in open circuit. Rod mill discharge passes to a cyclone sump, with cyclone underflow ground in an 8 ft by 10 ft ball mill. Ball mill discharge is treated in three unit flotation cells producing copper-lead bulk concentrate before the tails are returned to the cyclone sump. Cyclone overflow is treated in three circular flotation cells producing copper-lead bulk concentrate. Tailings from these cells are sent to the cyclone sump of a fine grinding circuit consisting of two 8 ft by 6 ft ball mills in closed circuit. This cyclone sump also receives scavenger concentrates and cleaner tails from subsequent operations in the copper-lead circuit.

13.1.2.2 Copper-Lead Flotation and Separation

The cyclone overflow from the fine grinding circuit is treated in a bulk copper-lead rougher-scavenger circuit followed by four stages of cleaning. The final cleaner concentrate is sent to a copper-lead separation circuit, along with copper-lead bulk concentrates from the earlier flotation cells. Scavenger tails are sent to the zinc circuit.

In the copper-lead separation circuit, lead minerals are depressed and copper minerals floated in a rougher-scavenger circuit, so that the scavenger tails (lead concentrate) are sent to the lead concentrate thickener. The copper rougher concentrate is processed through three stages of cleaning, with the cleaner concentrate being sent to a recleaner stage in which copper is depressed and remnant lead floated using four recleaner stages. The recleaner tails form the final copper concentrate and are sent to the copper concentrate thickener. The recleaner lead concentrate is sent to the lead thickener.

13.1.2.3 Zinc Flotation

Scavenger tails from the copper-lead bulk concentrate circuit form the feed to the zinc circuit. The feed is conditioned and floated in an intricate circuit utilizing pre-roughers, roughers, cleaners, rougher-scavengers and cleaner-scavengers. A final zinc concentrate is produced and sent to the zinc thickener. The circuit is currently being expanded to improve zinc recovery.

Tailings from the final zinc scavenger are sent to the PM tailings thickener.

13.1.3 Lead Oxide Circuit

The lead oxide circuit produces two concentrates: a sulphide concentrate which is sent to the lead thickener and combined with concentrates from the polymetallic circuit, as well as a separate lead oxide concentrate. Crushed PbOx ore is fed directly to a 7 ft by 12 ft rod mill. Discharge from this mill is sent to a cyclone, with cyclone underflow sent to a 5 ft by 6 ft ball mill in closed circuit. Cyclone overflow goes to the lead oxide sulphide circuit.

13.1.3.1 Sulphide Flotation

The sulphide circuit consists of six rougher cells, with the first two serving as conditioners. The available flowsheet indicates that a sulphide cleaner circuit is contemplated but not yet installed. The concentrate from the final four cells is sent to the lead concentrate thickener, where it is mixed with lead concentrate from the polymetallic circuit. Sulphide circuit tails become the feed for the lead oxide circuit.

13.1.3.2 Oxide Flotation

The lead oxide circuit utilizes two rougher stages, three rougher-scavenger stages, two cleaner stages and one cleaner-scavenger stage. Conditioners are employed prior to the first rougher, first rougher-scavenger and first cleaner. Third rougher-scavenger tails are sent to the tailings thickener, where they are mixed with tailings from the polymetallic circuit prior to being pumped to tailings disposal. Second cleaner concentrate is pumped to the lead oxide concentrate thickener. Historically the lead oxide circuit had poor recoveries of the precious metals and the tailings contain high values of silver and gold. These tailings were placed into a segregated impoundment for later reprocessing. In 2014, additional sulfidisation reagents (i.e. Na_2S) have added to improve lead and silver recoveries. However, flotation tailings still contain significant precious metals and should be investigated further to improve recoveries.

13.1.4 Thickening and Filtration

The four concentrates (lead sulphide, copper, zinc and lead oxide) as well as the final tailings are sent to separate thickeners. Underflows from the concentrate thickeners are filtered using drum filters and filter presses. Underflow from the tailings thickener is sent through two tailings lines, each with a dedicated pump, to the tails dam. A third standby pump can serve either line.

13.1.5 Reagents, Grinding Media and Power

13.1.5.1 Reagent Data

While the two milling circuits share some reagents and grinding media, most reagents are specific to each of the two circuits. The polymetallic circuit treats both PM and copper ores, which require somewhat different schemes, but their separate consumptions are not available. Reagent consumptions for 2014 are listed in Table 13-1.

Table 13-1 Reagent Usage 2014

Reagent	Annual Usage (kg)				Usage (kg/t)		
	Circuit			Total	Circuit		
	Poly-metallic	Lead Oxide	Copper Oxide		Poly-metallic	Lead Oxide	Copper Oxide
Z-6	16,662		12,200	28,862	0.024		0.820
Z-11	16,662			16,662	0.024		
ZnSO4	574,543	16,501		591,044	0.818	0.096	
CAL	565,063		4,300	569,363	0.803		0.289
NaHSO3	75,979			75,979	0.108		
MIBC	4,067	377		4,444	0.006	0.002	
Frother 70	8,695	23,636	2,893	35,224	0.012	0.138	0.195
NaCN	136,716	10,803		147,519	0.194	0.063	
CuSO4	166,784			166,784	0.237		
DOW FROTH 250			255	255			0.017
Z-14		113,034	8,425	121,459		0.658	0.566
Aero 404		8,162	165	8,327		0.048	0.011
MT-738		20,235	1,622	21,857		0.118	0.109
Na2S		671,453	97,700	769,153		3.908	6.569
Na2 SiO3		321,933	41,560	363,493		1.874	2.794
Petroleo		47,800	5,694	53,494		0.278	0.383
HA-30			7,303	7,303			0.491
H-05			483	483			0.032
Media (Mill #)							
1 ½” balls (4)	93,200			188,670	0.132		
1 ½” balls (3)	95,470				0.136		
2” balls (2)	178,337			178,337	0.253		
1 ½” balls (6)		4,893	50	4,943		0.028	0.003
3” rods (1)	129,378			152,512	0.184		
3” rods (5)		20,174	2,960			0.117	0.199

13.1.5.2 Power

Power consumption by plant section was available for 2011 through 2014. Table 13-2 lists these consumptions.

Table 13-2 Power Consumption

Section	2011		2012		2013		2014	
	Usage (kWh)	% of total	Usage (kWh)	% of Total	Usage (Kwh)	% of Total	Usage (Kwh)	% of Total
Polymetallic								
Crushing	1,059,918.97	4.60%	1,179,542.49	4.70%	1,185,389.78	4.70%	1,330,091.03	4.85%
Grinding	4,264,884.61	18.70%	4,738,765.12	18.90%	4,760,976.01	18.86%	5,350,430.92	19.50%
Pb Flotation	2,285,771.85	10.00%	2,539,529.49	10.10%	2,551,394.70	10.11%	2,867,526.06	10.45%
Zn Flotation	2,730,611.92	12.00%	3,032,991.12	12.10%	3,047,030.71	12.07%	3,425,422.50	12.49%
Cu Flotation	1,314,268.66	5.80%	1,460,446.98	5.80%	1,467,317.48	5.81%	1,648,822.00	6.01%
Pumping	1,028,090.76	4.50%	1,141,845.26	4.60%	1,147,114.83	4.54%	1,289,671.31	4.70%
Laboratory	187,546.35	0.80%	208,347.23	0.80%	209,317.26	0.83%	235,274.81	0.86%
Auxiliary	1,908,055.57	8.40%	2,119,699.79	8.50%	2,129,572.38	8.44%	2,393,638.81	8.73%
Tailings	2,053,556.92	9.00%	2,279,527.62	9.10%	2,289,832.89	9.07%	2,575,787.97	9.39%
Subtotal	**16,832,705.61**	**73.80%**	**18,700,695.08**	**74.60%**	**18,787,946.04**	**74.43%**	**21,116,665.41**	**76.98%**
Oxide								
Crushing	147,209.71	0.60%	156,940.49	0.60%	158,825.67	0.63%	155,301.80	0.57%
Grinding	1,489,171.20	6.50%	1,587,633.86	6.30%	1,606,715.02	6.36%	1,571,027.85	5.73%
Flotation	1,745,362.35	7.60%	1,860,493.15	7.40%	1,882,747.40	7.46%	1,841,330.38	6.71%
Pumping	1,210,334.37	5.30%	1,290,208.38	5.10%	1,305,655.19	5.17%	1,276,880.28	4.65%
Laboratory	114,764.98	0.50%	122,348.42	0.50%	123,817.03	0.49%	121,073.87	0.44%
Tailings	1,278,128.42	5.60%	1,362,720.63	5.40%	1,379,131.39	5.46%	1,348,375.52	4.92%
Subtotal	**5,984,971.03**	**26.20%**	**6,380,344.92**	**25.40%**	**6,456,891.70**	**25.57%**	**6,313,989.70**	**23.02%**

Total power consumption for 2011 through 2014 is listed in Table 13-3.

Table 13-3 Power Usage 2011 - 2014

	2011	2012	2013	2014
Total Power Usage (kWh)	22,817,677	25,081,040	25,244,838	27,430,655

13.1.6 Concentrates Production

Product grades and recoveries for the polymetallic circuit treating PM ore, polymetallic circuit treating copper ore and lead oxide circuit treating PbOx ore are listed in Table 13-4, Table 13-5, and Table 13-6, respectively. Figures in boldface refer to payable metals. Feed and concentrate tonnages are shown in Figure 13-3 and Figure 13-4.

Table 13-4 Polymetallic Circuit Products, PM Ore

Year 2014											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	703,712.87	0.67	83.77	1.79	0.7	3.95	100	100	100	100	100
Cu Conc.	12,781.70	**3.96**	**1115**	2.11	**26.37**	6.82	**8.26**	**24.17**	2.13	**67.96**	3.13
Pb Conc.	18,055.00	**1.5**	**1397.88**	**58.63**	1.45	4.9	**8.13**	**42.81**	**83.89**	5.26	3.18
Zn Conc.	48,656.94	0.77	114.91	0.8	1.35	**50.58**	10.12	9.48	3.07	13.21	**88.45**
Tails	624,219.23	0.56	22.22	0.22	0.11	0.23	72.08	23.53	10.91	13.66	5.23
Year 2013											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	641,268	0.81	83.2	1.48	0.65	4.05	100	100	100	100	100
Cu Conc.	12,728	**3.89**	**1057.78**	2.75	**23.21**	6.38	**7.19**	**25.23**	3.68	**70.6**	3.12
Pb Conc.	14,258	**1.83**	**1299.98**	**53.38**	1.84	5.9	**7.07**	**34.74**	**79.97**	6.27	3.24
Zn Conc.	45,412	1.03	122.12	0.62	1	**50.76**	10.39	10.39	2.95	10.83	**88.66**
Tails	568,869	0.69	27.79	0.22	0.09	0.23	74.22	29.63	13.4	12.35	4.98
Year 2012											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	607558.19	0.75	100.44	1.75	0.75	4.18	100	100	100	100	100
Cu Conc.	13295.09	3.95	**1218.49**	3.35	**23.07**	6.5	**11.5**	**26.55**	4.18	**67.35**	3.4
Pb Conc.	15708.24	1.8	**1305.89**	**55.19**	2	4.7	**6.19**	**33.61**	**81.38**	6.89	2.91
Zn Conc.	44405.82	0.56	140.58	0.71	1.06	**50.99**	5.45	10.23	2.98	10.3	**89.12**
Tails	534149.04	0.65	33.83	0.23	0.13	0.22	75.68	29.61	11.45	15.52	4.57
Year 2011											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	384339.56	0.59	96.2	2.19	0.65	4.59	100	100	100	100	100
Cu Conc.	6,080.96	3.63	**1338**	5.96	**23.71**	6.68	**9.75**	**22.01**	4.3	**58.07**	2.3
Pb Conc.	11,660.12	1.17	**1134.76**	**56.93**	2.36	4.83	**6.02**	**35.79**	**78.81**	11.07	3.2
Zn Conc.	30,574.29	0.56	147.39	1.04	1.08	**51.08**	7.62	12.19	3.77	13.31	**88.61**
Tails	336024.18	0.48	33.03	0.33	0.13	0.31	71.98	30.02	13.12	17.65	5.89
Year 2010											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	432819	0.69	111.08	2.14	0.68	4.75	100	100	100	100	100
Cu Conc.	6833	**3.56**	**1872.67**	5.44	**24.5**	7.42	**8.09**	**26.7**	4	**57**	2.5
Pb Conc.	12849	**1.33**	**1226.39**	**55.82**	2.46	4.68	**5.81**	**32.8**	**77.3**	10.7	2.9
Zn Conc.	35959	0.68	153.6	1.2	0.89	**50.38**	8.11	11.5	4.7	11	88.2
Tails	377178	0.59	37.03	0.35	0.17	0.35	74.13	29	14.1	21.4	6.4

Table 13-5 Polymetallic Circuit Products, Copper Ore

Year 2014											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	0	0	0	0	0	0	0	0	0	0	0
Cu Conc.	0	**0**	**0**	0	**0**	0	**0**	**0**	0	**0**	0
Tails	0	0	0	0	0	0	0	0	0	0	0
Year 2013											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	3,215	1.41	109.07	0.99	3.25	2.21	100	100	100	100	100
Cu Conc.	355	**4.17**	**605.29**	4.3	**20.66**	16.59	**33.2**	**61.27**	48.11	**70.29**	83.01
Tails	2,860	1.04	47.47	0.57	1.08	0.41	65.6	38.72	51.49	29.71	16.46
Year 2012											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	62,166	1.04	91.97	0.73	1.9	1	100	100	100	100	100
Cu Conc.	4,993	4.05	**694.72**	4.95	**21.15**	9.43	**31.4**	**60.7**	54.8	**89.4**	76.1
Tails	57,173	0.74	39.26	0.35	0.22	0.26	66.1	39.3	44.8	10.6	23.7
Year 2011											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	221,972	1.04	88.64	0.61	2.35	1.02	100	100	100	100	100
Cu Conc.	22,332	4.08	**587.59**	3.54	**21**	8.63	**39.3**	**66.7**	58.3	**90.1**	84.7
Tails	199,640	0.7	32.81	0.28	0.26	0.17	60.5	33.3	41.7	9.9	15.3
Year 2010											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	192,501	1.11	83.66	0.55	2.24	1.02	100	100	100	100	100
Cu Conc.	18,425	3.69	**573.94**	3.4	**20.9**	9.05	**31.8**	**65.5**	59.1	**89.4**	84.5
Tails	174,076	0.81	31.89	0.25	0.26	0.18	66.4	34.5	40.9	10.6	15.5

Table 13-6 Lead Oxide Circuit Products, PbOx Ore

Year 2014											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	171,829	2.88	233.61	9	0.53	1.58	100	100	100	100	100
Sul. Conc	2,231	13.42	**2,494.28**	**27.54**	2.13	13.54	**14**	**13.86**	**3.97**	5.25	11.12
Ox. Conc.	20,082	5.99	**737.15**	**49.19**	0.4	0.68	**24.1**	**42.97**	**66.52**	9.48	5.66
Tails	149,515	2.08	131.98	3.33	0.52	1.52	61.7	57.28	33.48	90.2	94.1
Year 2013											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	196,228	2.29	277.81	7.71	0.64	1.69	100	100	100	100	100
Sul. Conc	2,603	14.2	**2,368.51**	**23.81**	2.66	11.57	**5.4**	**11.31**	**4.1**	5.54	9.11
Ox. Conc.	17,152	6.08	**835.85**	**50.01**	0.55	1.3	**30.3**	**29.72**	**59.12**	7.93	7.43
Tails	176,473	1.65	192.73	3.36	0.61	1.57	63.3	70.5	40.88	91.81	92.34
Year 2012											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	203,145	3.03	359.68	7	0.39	1.25	100	100	100	100	100
Sul. Conc	4,255	26.39	**1,578.16**	**16.29**	1.68	5.97	**18.2**	**9.2**	**4.9**	9.1	10
Ox. Conc.	13,495	8.34	**1,002.91**	**48.93**	0.41	0.98	**18.3**	**18.5**	**46.5**	7.1	5.2
Tails	185,395	2.11	284.02	3.73	0.36	1.16	63.5	72.1	48.7	83.8	84.6
Year 2011											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	211,938	3.16	331.87	6.75	0.4	1.64	100	100	100	100	100
Sul. Conc	5,885	19.49	**1,824.90**	**15.26**	2.47	6.47	**17.1**	**15.3**	**6.3**	17	11
Ox. Conc.	15,509	8.15	**950.67**	**46.86**	0.42	0.81	**18.9**	**21**	**50.8**	7.7	3.6
Tails	190,543	2.22	234.83	3.22	0.34	1.55	63.2	63.6	42.9	75.3	85
Year 2010											
Product	Mass (m-tons)	Assays					Recoveries				
		Au (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	211,729	2.51	339.69	8.71	0.31	1.86	100	100	100	100	100
Sul. Conc	6,312	15.99	**2,206.77**	**21.29**	1.74	5.64	**19**	**19.4**	**7.3**	16.5	9
Ox. Conc.	25,214	5.28	**848.19**	**46.03**	0.3	1.16	**25.1**	**29.7**	**62.9**	11.4	7.4
Tails	180,202	1.64	202.98	3.05	0.27	1.81	55.7	50.9	29.8	71.9	82.8

Table 13-7 Copper Oxide Circuit Products, CuOx Ore

Year 2014									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	14,873	91.63	3.04	3.09	1.97	100	100	100	100
Pb. Ox. Conc.	530	**655.80**	**24.21**	6.91	3.95	**25.5**	**28.37**	7.97	7.15
Cu Conc.	970	**340.12**	10.75	**18.57**	1.91	**24.21**	23.05	**39.2**	6.31
Tails	13,373	51.23	1.64	1.82	1.89	50.27	48.57	52.83	86.1

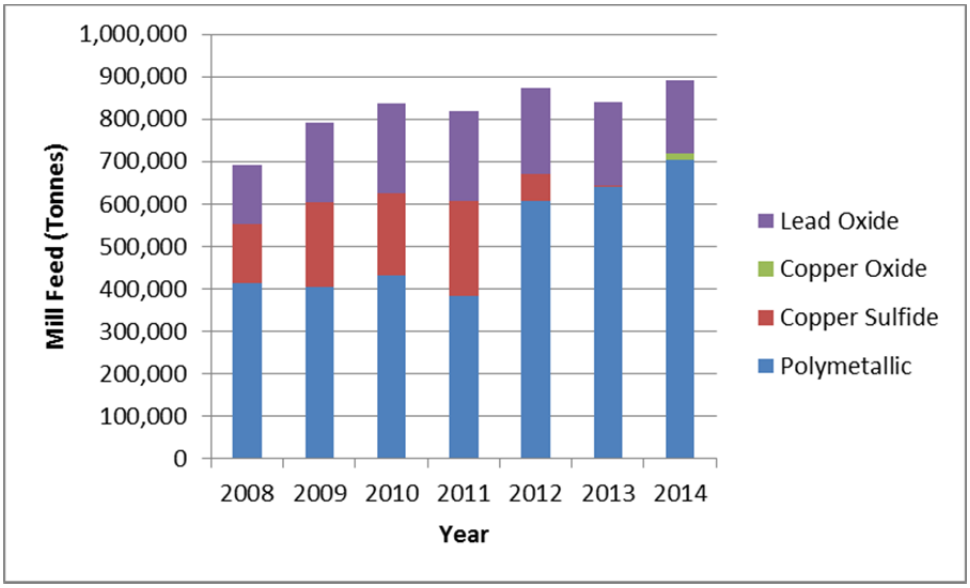


Figure 13-3 Mill Tonnage Treated by Ore Type

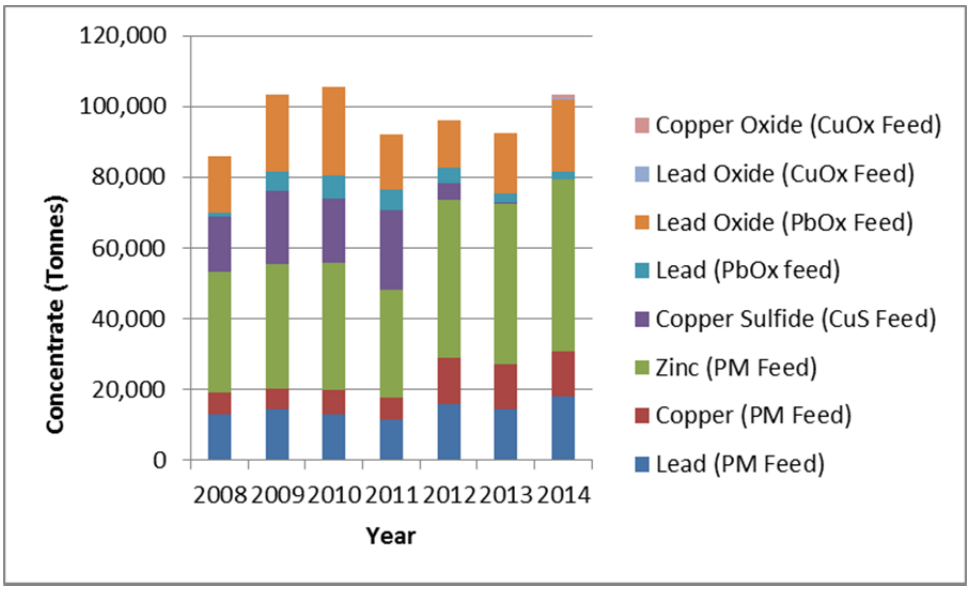


Figure 13-4 Concentrates Produced by Ore Type

13.1.7 Combined Concentrates Grades

Concentrates produced by the two circuits from the three ore types are shipped as five separate products. These concentrates and their sources are:

- Lead sulphide concentrate:
  - Lead concentrate from polymetallic circuit treating PM ore.
  - Sulphide concentrate from lead oxide circuit treating PbOx ore.
- Copper concentrate (polymetallic):
  - Copper concentrate from polymetallic circuit treating PM ore.
- Copper concentrate (campaign):
  - Copper concentrate from polymetallic circuit treating copper ore.
- Zinc concentrate:
  - Zinc concentrate from polymetallic circuit treating PM ore.
- Lead Oxide concentrate:
  - Oxide concentrate from lead oxide circuit treating PbOx ore.

13.1.8 Gold

Gold is present in Yauricocha ores but until recently it has not been routinely analyzed and tracked through the mill circuits. Gold payments are made for the lead sulphide, copper and lead oxide

13.2 Conclusions

The Chumpe Mill is a stable plant which uses conventional methods to produce as many as five separate concentrates for sale. Available data indicates that, with expansions and process modifications taken into account, the mill performance has been stable for several years, with recoveries affected more by relatively minor changes in ore grade than by other factors. Improvements in the Chumpe Mill were achieved in 2012 and 2014 due to changes in the process circuit and reagents.

13.3 Risks and Opportunities

Currently Chumpe Mill is implementing an expansion project in Polymetallic circuit, evaluating the capabilities of grinding and flotation.

Tailings from the lead oxide circuit contain significant values of Ag. In early 2012, silver in the lead oxide tailings was approximately 200 g/t and these tailings were stored separately from that time to allow for the possibility of future retreatment of that material. During the last few years, plant improvements and the reduction of lead oxide head grades have seen the tailings fall to approximately 120 g/t Ag. The lead oxide tails is being investigated to evaluate methods for improving silver and gold recovery.

14. MINERAL RESOURCE ESTIMATE

The effective date of this resource estimate is December 31, 2014. Thomas Matthews, MMSA QP, Principal Resource Geologist with Gustavson Associates LLC, is the Qualified Person responsible for this resource estimate. Gustavson Associates validated the database used for resource estimation, created domain wireframes corresponding to the main mineralized bodies, interpolated grade into block models within these mineralized bodies, aggregated these block models into stope blocks for resource evaluation, and reviewed the mine-mill reconciliation results. Gustavson considers the resource to meet industry standard practices, and to be CIM and NI 43-101 compliant.

14.1 Data Used for Grade Estimation

Assay databases were provided by Minera Corona covering the main mineralized bodies. In general, the databases include:

- Diamond drillholes;
    - Diamond drillholes are typically sampled in mineralized intervals, in intervals where sulfides or significant alteration is observed, and in intervals where skarn bodies are encountered. Sample lengths are typically 1 meter. Where drillholes are not sampled, Gustavson has assumed that no mineralization exists.
- Underground channel samples in development drifts, within the stopes and cross cuts;
    - Channel samples for massive bodies are generally taken every 1 meter along the ribs of crosscuts, approximately 1 meter above the floor of the working.
    - Channel samples for small bodies are generally taken across the back of the stope, with individual samples varying in length depending on the width of the stope.
- The database includes all information generated by the mine through October 31, 2014. Additional drill and channel sample information may have been generated by the mine after October 31, but it has not been compiled and provided to Gustavson. However, because the resource volumes are limited to areas not mined prior to December 31, 2014, Gustavson considers the December 31 date as the appropriate effective date of the resource estimation.

Mineralization at Yauricocha encompasses two main styles, differentiated by scale, continuity, and exploration and development style.

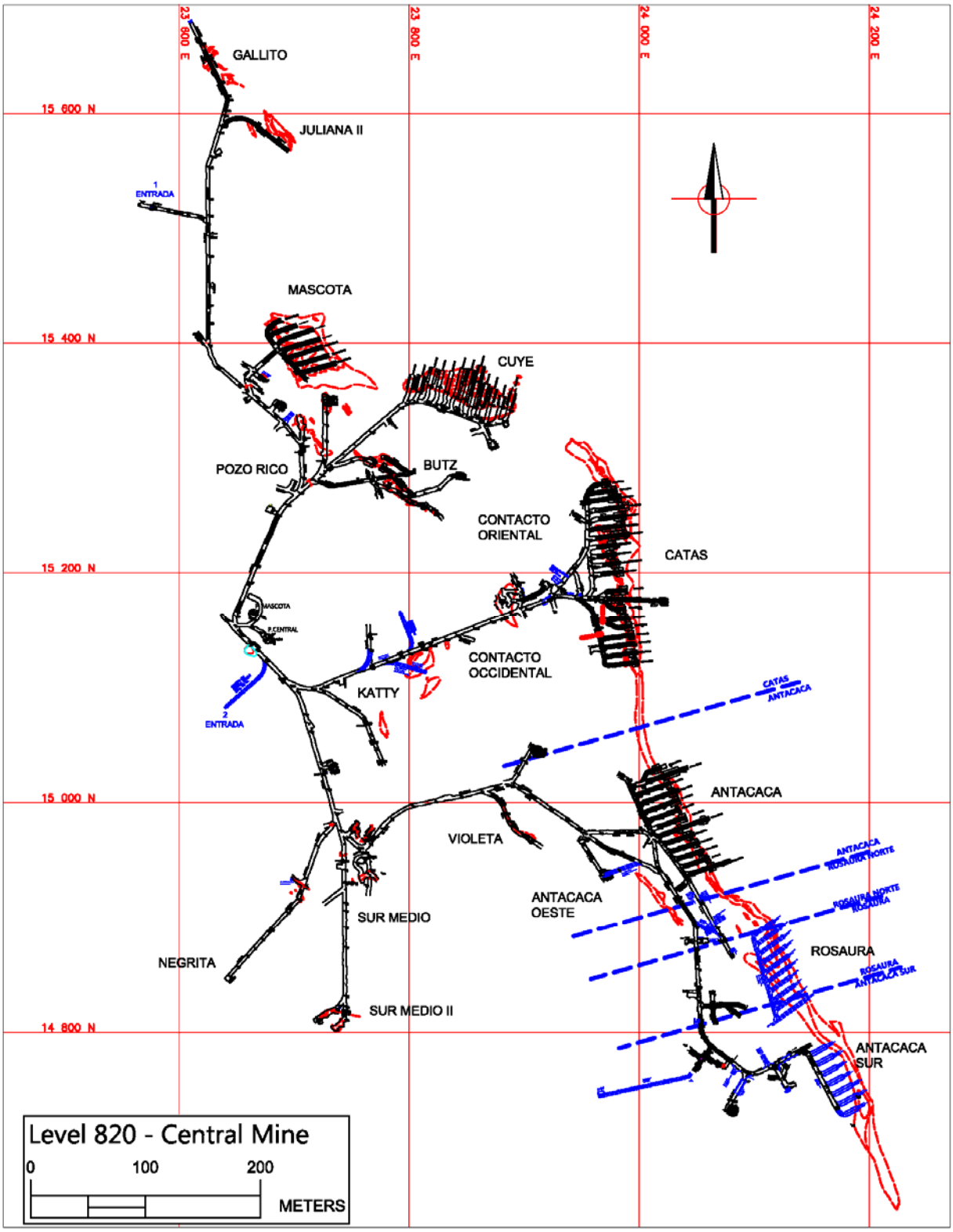
- Cuerpos Massivos (large bodies) are bodies formed along major structures of significant (several hundreds of meters) of vertical extent, consistent geometry, and significant strike length. These bodies constitute the majority of tonnage mined in the operation, are easily intersected by targeted drilling, and are mined by bulk mining methods.
- Cuerpos Chicos (small bodies) are smaller mineralized bodies of high grades. They are often skarn bodies, are less continuous and less regular in form than the Cuerpos

Massivos, and are difficult to intersect except with carefully targeted drilling. They are typically mined by overhand cut and fill or similar high-selectivity mining methods. The mine has historically drifted into these zones and delineated them using localized channel sample data. Recently, additional effort has been made to use targeted drilling to explore the extents of certain of these bodies. Cuerpos Chicos in the Cachi Cachi area are referred to by the area designation "Cachi Cachi" and Cuerpos Chicos occurring in the vicinity of Mina Central are collectively referred to as the "Cuerpos Pequenos".

The bodies for which Gustavson have calculated resources are listed in Table 14-1 and shown in Figure 14-1 and Figure 14-2. Statistics for sample data within the bodies are given in Table 14-2. For statistical purposes, Elissa is considered part of Cachi Cachi.

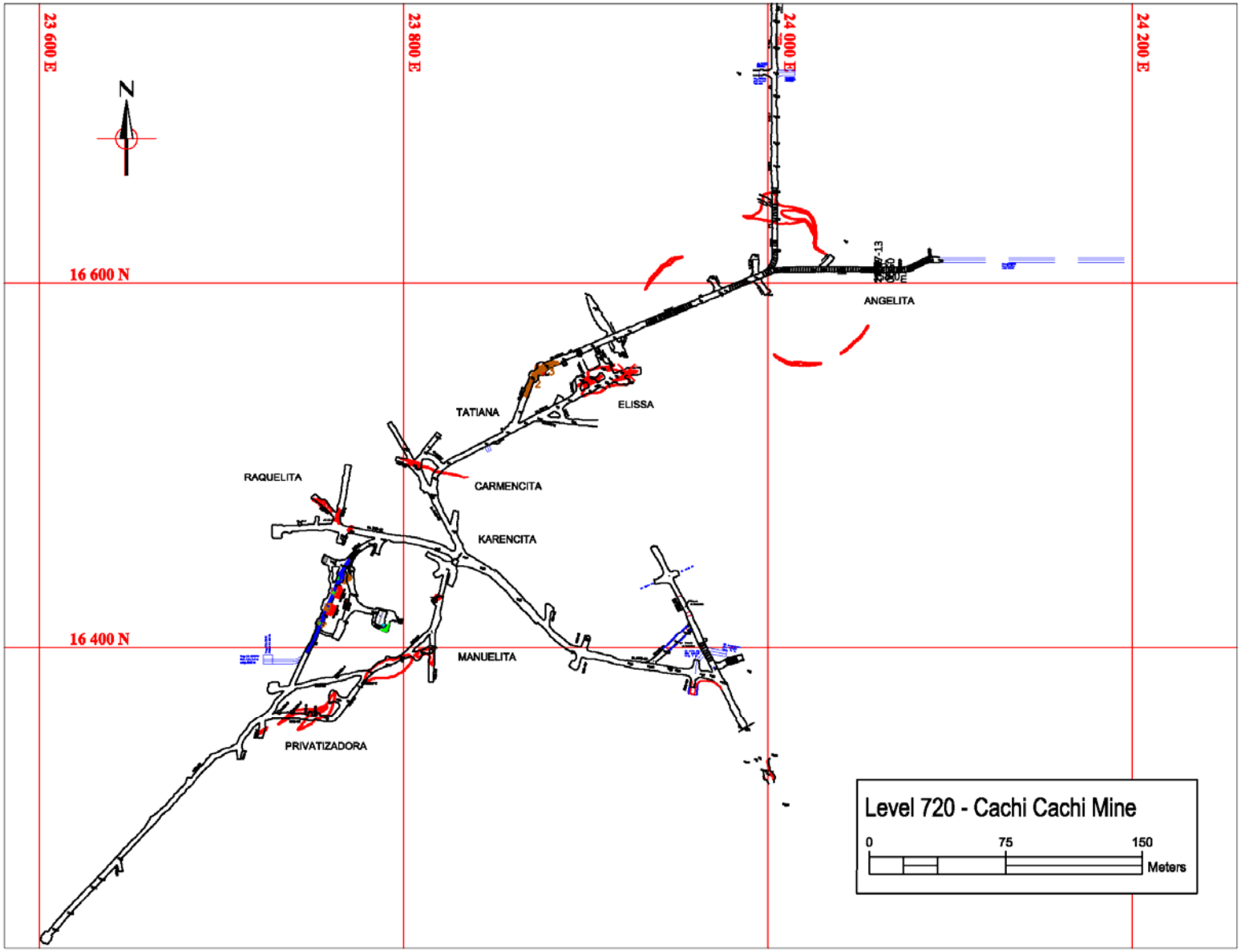
Table 14-1 Mineral Resource Data List

Area	Cuerpos Massivos	Cuerpos Chicos
Mina Central	Antacaca	
	Antacaca Sur	
	Rosaura	
	Catas	
Mascota	Mascota	
Cachi Cachi		Andrea
		Angelita
	Elissa	
		Escondida
		Karlita
		Zulma
Cuerpos Pequenos		Contacto Occidental
		Contacto Oriental
		Contacto Sur Medio II
		Contacto Sur Medio I
		Contacto Sur Medio
		Cuye
		Cuye Sur
		Katty
		Marita
		Violeta
		Juliana
		Gallito
		Butz



Source: Minera Corona, September 2013

Figure 14-1 Mina Central, 820 Level, Showing Development and Mineralized Zones



Source: Minera Corona, September 2013

Figure 14-2 Mina Cachi-Cachi, 770 Level, Showing Development and Mineralized Zones

Table 14-2 Sample Statistics by Area

Area	Metal	#	Min	Max	Mean	Std. Dev.	Var.
Mina Central	Ag (g/t)	7722	0.0	2128.8	65.2	84.3	7110.0
	Pb (%)	7722	0.0	31.5	1.0	2.2	4.8
	Zn (%)	7722	0.0	45.5	3.4	5.6	31.3
	Cu (%)	7722	0.0	24.6	1.0	2.0	3.8
	Au (g/t)	4570	0.0	45.2	0.82	1.4	1.9
Mascota	Ag (g/t)	2987	0.0	2854.4	249.6	269.0	72370
	Pb (%)	2987	0.0	57.6	7.3	9.6	91.5
	Zn (%)	2987	0.0	35.2	1.0	2.5	6.0
	Cu (%)	2987	0.0	20.6	1.0	2.1	4.6
	Au (g/t)	2987	0.0	34.2	1.8	3.2	10.0
Cachi Cachi	Ag (g/t)	1641	0.0	2529.7	78.2	145.7	21240
	Pb (%)	1641	0.0	62.9	1.5	3.1	9.9
	Zn (%)	1641	0.0	44.3	6.2	8.0	64.0
	Cu (%)	1641	0.0	11.4	0.3	0.60	0.36
	Au (g/t)	1359	0.0	38.0	0.48	1.5	2.1
Cuerpos Pequen os	Ag (g/t)	919	0.0	4606.1	373.1	459.6	211300
	Pb (%)	919	0.0	69.2	9.2	12.4	153.3
	Zn (%)	919	0.0	47.2	7.6	8.8	77.6
	Cu (%)	919	0.0	25.3	1.2	2.5	6.1
	Au (g/t)	451	0.0	28.0	1.7	3.0	9.1

14.2 Density

The specific gravity is obtained by collecting representative samples each weighing 5 kg and pertaining to the various types of mineralization and from the various bodies. The specific gravity determinations are made at the onsite laboratory.

Table 14-3 lists the average S.G. by body and type of mineralization where applicable.

Table 14-3 Specific Gravity by Body

Area	Body	Specific Gravity (g/cm^3)
Mina Central	Antacaca	3.68
	Antacaca Sur	3.78
	Rosaura	3.64
	Catas	3.82
Mascota	Mascota (Lead Oxide)	3.48
	Mascota (Copper Oxide)	3.36
Cachi Cachi	Andrea	3.56
	Angelita	3.64
	Elissa	3.68
	Escondida	3.58
	Karlita	3.70
	Zulma	3.58
Cuerpos Pequenos	Contacto Occidental	3.48
	Contacto Oriental	3.49
	Contacto Sur Medio II	3.87
	Contacto Sur Medio I	3.98
	Contacto Sur Medio	3.89
	Cuye	3.65
	Cuye Sur	3.65
	Katty	3.51
	Marita	3.63
	Violeta	3.47
	Juliana	3.52
	Gallito	3.64
	Butz	3.69

Due to relatively high local variability of specific gravity, the geology department collects multiple samples and performs specific gravity determinations within each mineralized zone. These specific gravity determinations are averaged to estimate specific gravity for each mineralized volume.

During 2014, Minera Corona conducted a test regime to refine the specific gravity measurements using in situ bulk density sampling for ore zones to augment the current specific gravity determinations. Minera Corona reports good agreement between in situ bulk density and specific gravity determination methods.

14.3 Method Used in Mineral Resource Estimation

The 2014 Resource Estimation for Yauricocha mine is based on a standard domained block modelling approach. This is a change from previous resource estimations, which used a traditional section and plan interpretation with grade estimation by length-weighted mean determination. The implications of the change in methodology will be discussed later in section 14.

14.3.1 Solids Models interpretation, Cuerpos Massivos

Solids Models for Cuerpos Massivos were constructed using Leapfrog software. Channel sample traverses and drillhole intersections were evaluated to select footwall and hangingwall intersections in the mineralized zone. Because the Cuerpos Massivos are formed within a discrete structural zone, and because of the low rock strength within the ore zone, the mining method tends to extract all material within the zone, from the footwall to the hangingwall. Accordingly, all types of mineralization are considered for this evaluation, without regard to the presence of salable elements.

Once the footwall and hangingwall intersections are selected, Leapfrog is used to create separate footwall and hangingwall surfaces by linking these points into a 3-Dimensional mesh surface. The surfaces are constrained within a bounding box, and the area between the footwall and hangingwall surfaces, within the bounding box, is considered as the domain. The Cuerpos Massivos are shown in Figure 14-3.

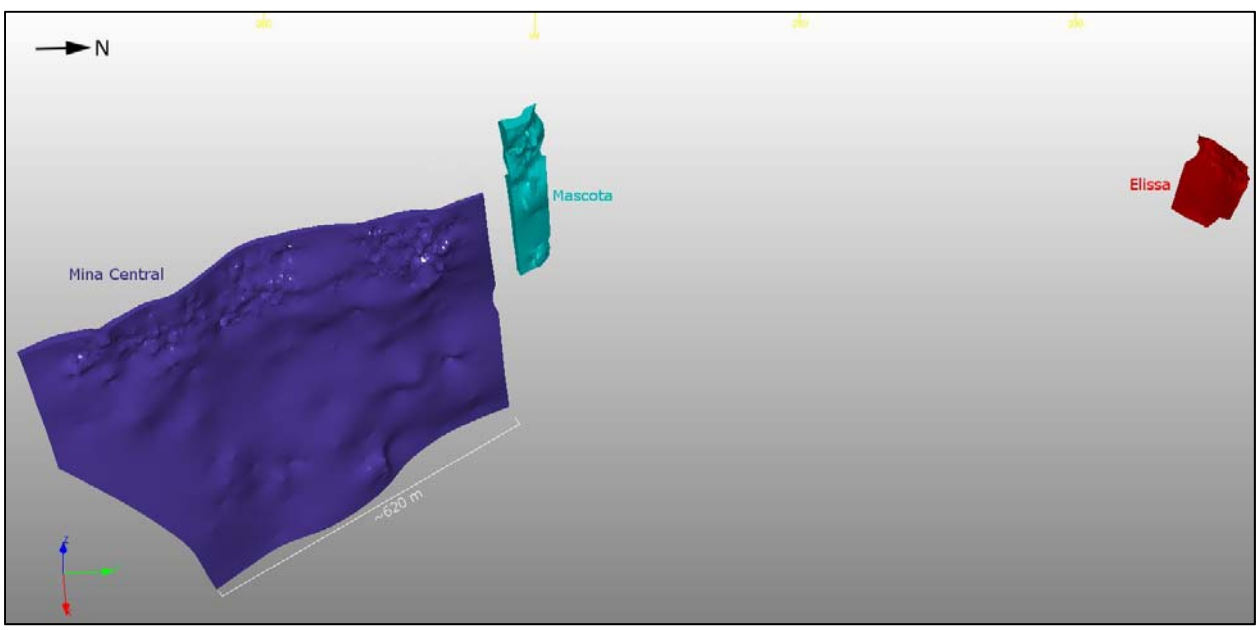


Figure 14-3: Modeled Cuerpos Massivos

14.3.2 Solids Models interpretation, Cuerpos Chicos

For Cuerpos Chicos in the Cachi Cachi area, Minera Corona provided 3D wireframe shapes. Gustavson reviewed the wireframes provided and finds that they correspond to the channel and drillhole sampling within the area, are consistent with the mining geometry within the zones, and include applicable internal and external waste when encountered in the sampling. Accordingly, Gustavson accepted the wireframes as provided for estimation.

For Cuerpos Chicos in the Mina Central area (the Cuerpos Pequenos), Minera Corona provided 2D planar shapes corresponding to the channel sample locations from within the Cuerpos Chicos. Traditionally, Minera Corona had used theses planar geometries to determine the area of the bodies, to be projected vertically to determine the volume of the body for estimation. The planar geometries correspond to the channel sample geometry for the zones. Gustavson linked these bodies vertically to create wireframes for estimation, allowing for an additional 25 meters of projection above and below the final wireframes. The Cuerpos Chicos of the Cuerpos Pequenos and Cachi Cachi areas are shown in Figure 14-4 and Figure 14-5, respectively.

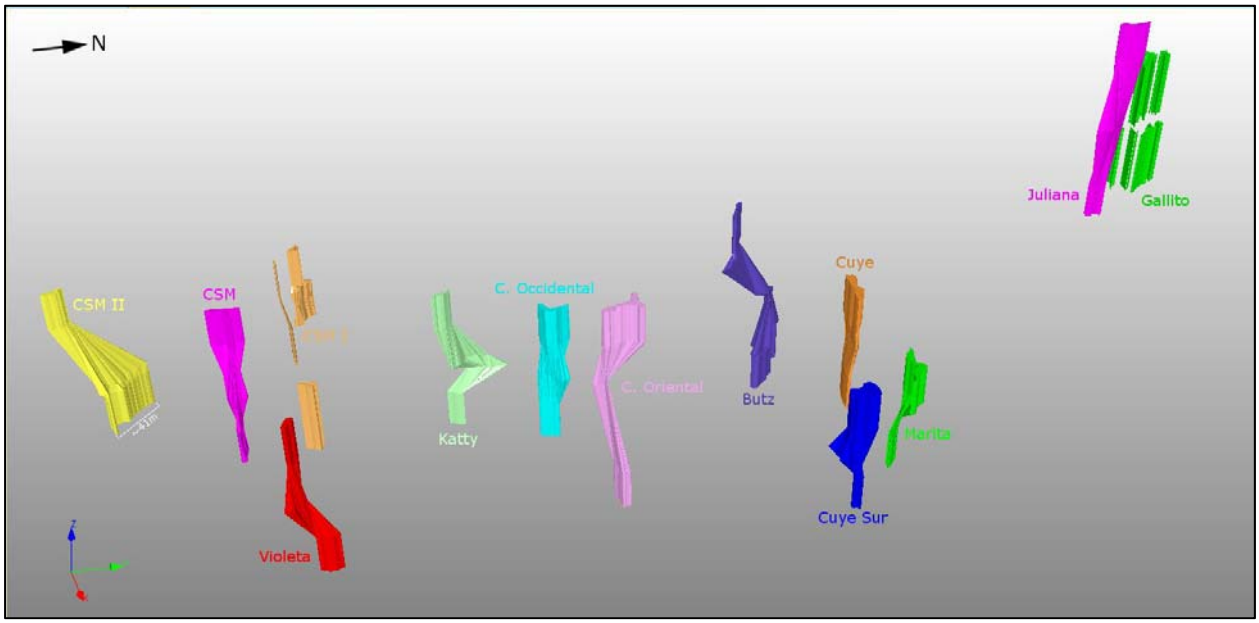


Figure 14-4: Cuerpos Pequenos Cuerpos Chicos

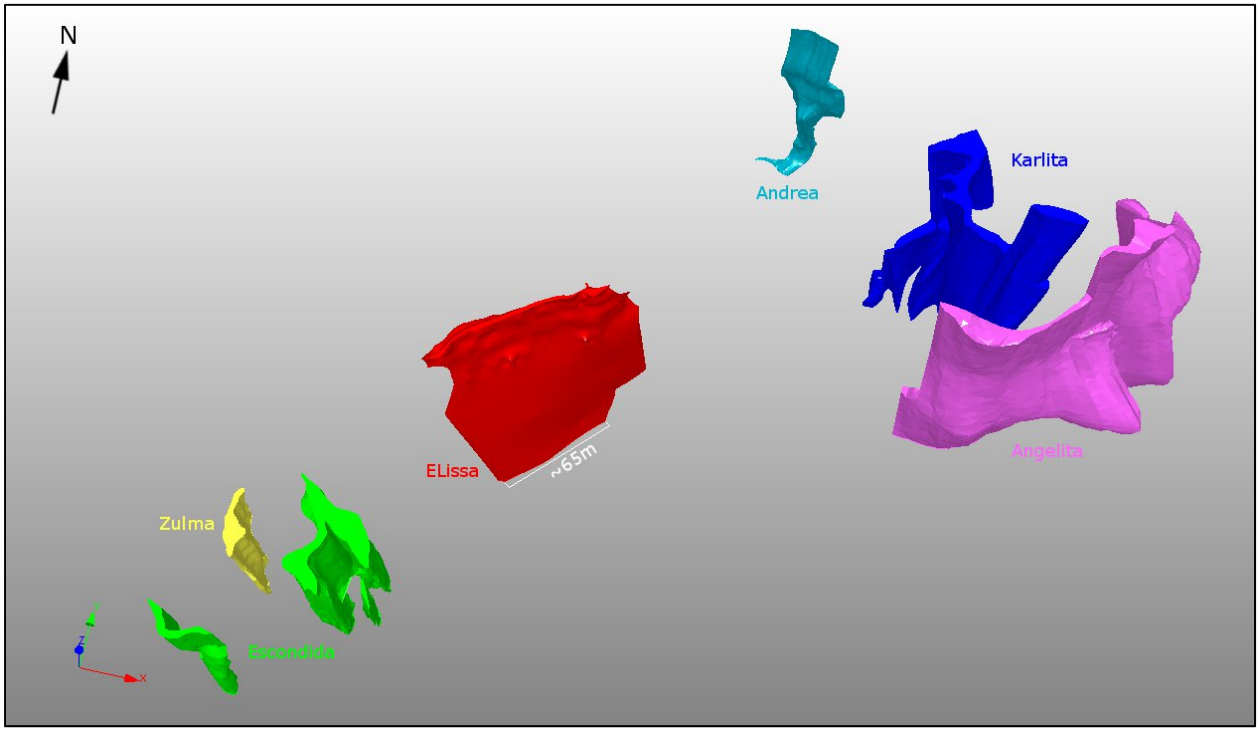


Figure 14-5: Cachi Cachi Cuerpos Chicos, Elissa shown for reference

14.3.3 Compositing and sample selection

Channel and drillhole samples lengths are typically 1.0 meters. Accordingly, 1.0 meter composite intervals are selected for estimation. Compositing was done on samples selected from within the interpreted domains (which generally include composites both with and without salable values). Original sample and composite grades inside selected domains are given in Table 14-4.

Table 14-4 Composite Statistics by Area

Area	Metal	#	Min	Max	Mean	Std. Dev.	Var.
Mina Central	Ag (g/t)	8409	0.0	2128.8	61.48	82.3	6771.0
	Pb (%)	8409	0.0	26.4	0.98	2.1	4.4
	Zn (%)	8409	0.0	45.5	3.2	5.4	29.2
	Cu (%)	8409	0.0	24.6	1.0	1.9	3.5
	Au (g/t)	5258	0.0	37.8	0.75	1.3	1.6
Mascota	Ag (g/t)	2990	0.0	2714.9	253.9	272.9	74490
	Pb (%)	2990	0.0	56.6	7.4	9.6	92.0
	Zn (%)	2990	0.0	35.2	1.1	2.5	6.3
	Cu (%)	2990	0.0	20.2	1.1	2.1	4.5
	Au (g/t)	2990	0.0	33.7	1.8	3.1	9.7
Cachi Cachi	Ag (g/t)	2307	0.0	2052.8	85.0	129.3	16730
	Pb (%)	2307	0.0	31.8	1.7	2.7	7.3
	Zn (%)	2307	0.0	44.3	7.3	8.9	78.8
	Cu (%)	2307	0.0	11.2	0.26	0.49	0.24
	Au (g/t)	1704	0.0	31.0	0.44	1.2	1.4
Cuerpos Pequenos	Ag (g/t)	1316	0.0	4606.1	411.2	461.6	213100
	Pb (%)	1316	0.0	69.2	10.3	11.9	140.9
	Zn (%)	1316	0.0	47.2	8.9	9.1	83.35
	Cu (%)	1316	0.0	24.9	1.0	2.2	4.6
	Au (g/t)	677	0.0	22.4	1.5	2.5	6.5

14.3.4 Capping

Capping was applied to Ag, Au, Zn, Pb and Cu grades to reduce the impact of potential smearing of high grade composites. Capping values were selected by examination of cumulative frequency plots, with capping values selected to limit high grade outliers outside the main grade distribution.

Table 14-5 Capping Values used for Estimation

Domain	Ag (g/t)	Au (g/t)	Cu (%)	Pb (%)	Zn (%)
Mina central	800	10	10.5	6	10
Mascota	3000	13	10	11	2.5
Cuerpos Pequenos	2000	20	15	50	30
Cachi Cachi	1000	5	3	20	30

14.3.5 Variography, Cuerpos Massivos

Variogram Ranges used for Estimation and Classification are based on variography conducted on 1m composites within the Cuerpos Massivos. Variography for Mina Central (Catas, Antacaca, Rosaura, Antacaca Sur) was carried out on samples from all the bodies as a contiguous unit, because they all occupy the same structural domain. Variography for Mascota and Elissa were considered separately.

Both General relative and pairwise variograms were constructed. Both show long ranges of continuity within the domain, in the strike and dip directions, and very poor structure in the across strike direction (consistent with the geometry of the mineralized zones). The variography supports using relatively long ranges for classification and estimation, as tabulated below.

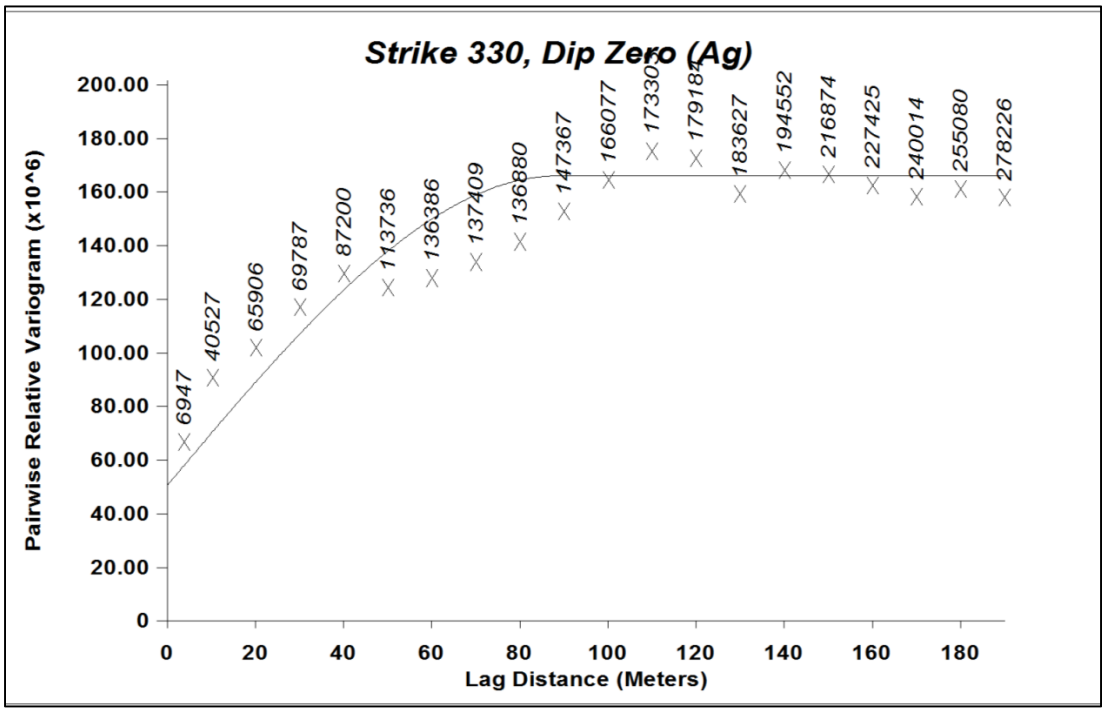


Figure 14-6: Mina Central Pairwise Relative Variogram, Silver, Along Strike

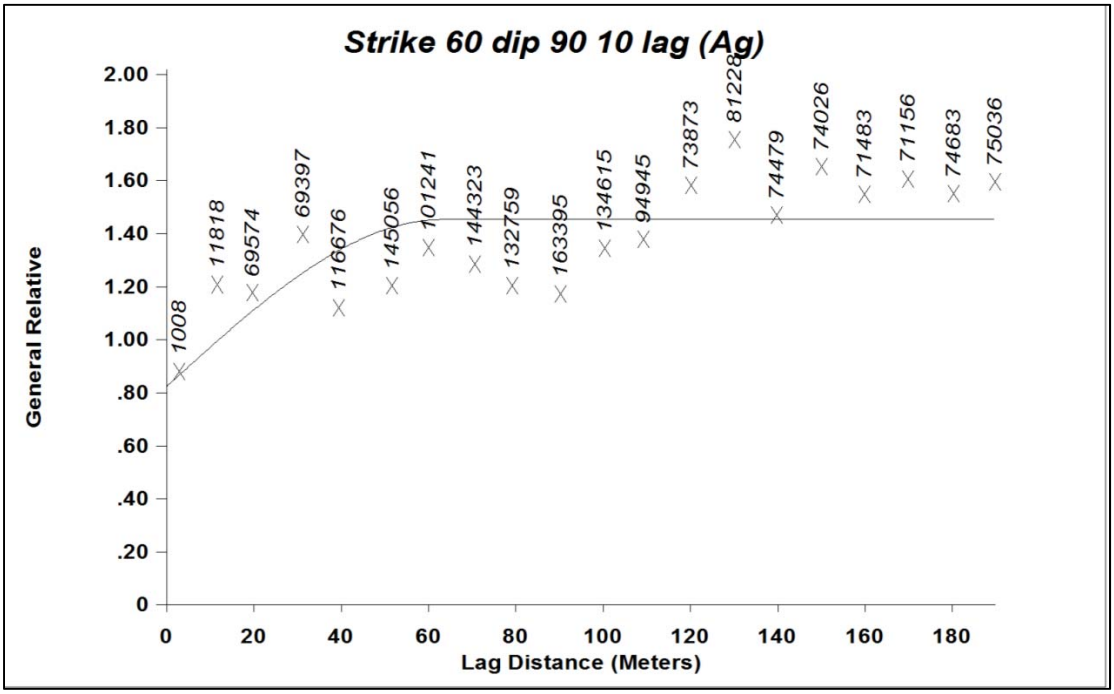


Figure 14-7: Mina General Relative Variogram, Silver, Down Dip

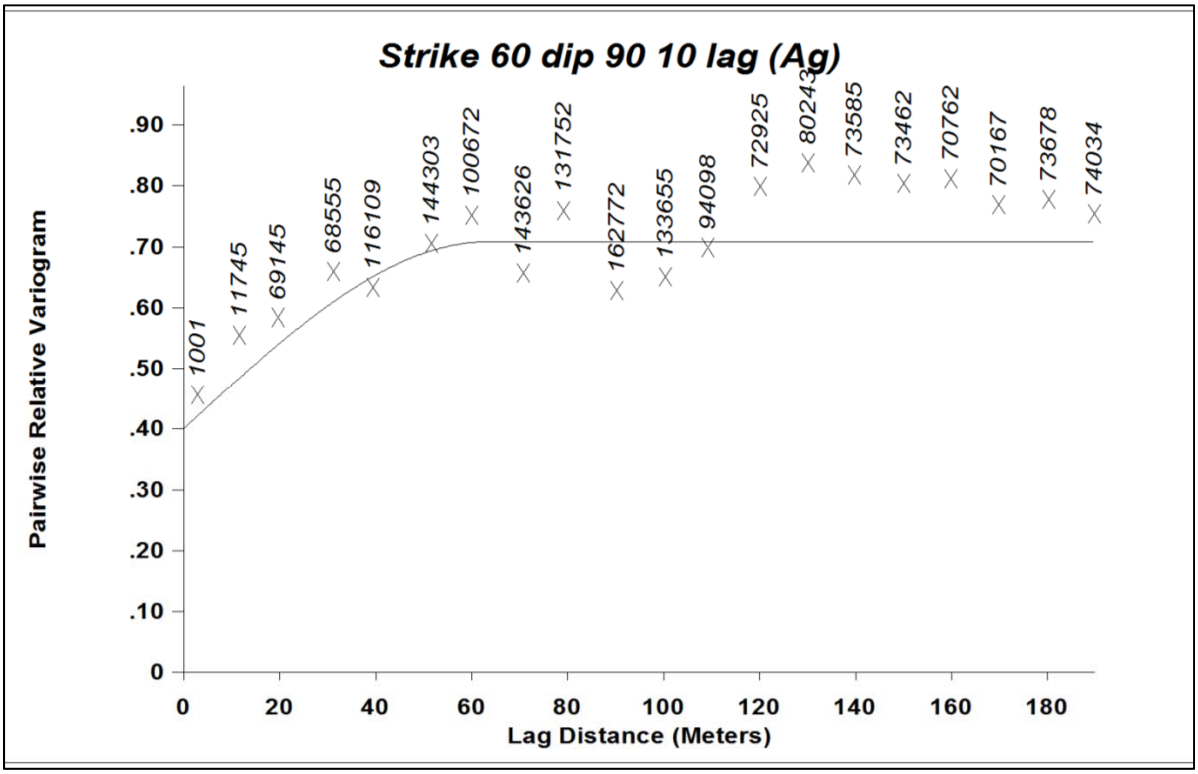


Figure 14-8: Mina Central Pairwise Relative Variogram, Silver, Down Dip

Table 14-6 Variogram Ranges By Area (in meters)

	Along Strike	Down Dip	Across Strike
Mina Central	80	70	10
Mascota	30	80	14
Elissa	40	40	10

14.3.6 Variography, Cuerpos Chicos

The Cuerpos Chicos have complex geometry, variable sampling density, and limited extents. It is difficult to construct variography for these bodies which has recognizable structure. Gustavson chose to duplicate the projection extents traditionally used by Minera Corona to determine the influence of grade estimation for Cuerpos Chicos. Accordingly, a 25 meter range is selected as the range of influence for Cuerpos Chicos samples, consistent with the vertical projection used historically for indicated resources.

Gustavson recommends that in cases where ongoing exploration drilling expands the known extents of certain of the Cuerpos Chicos, more detailed variography be analyzed on a zone by zone basis to ensure that the continuity of mineralization is properly understood.

14.3.7 Block Grade Estimation

Separate block model prototypes were constructed for each of the main resource areas, with the block models rotated horizontally around the Z axis to orient blocks parallel to the main strike of the mineralized zones. Relatively small blocks were used in order to reduce edge effects in the estimation, and to allow division into stope blocks without introducing data artifacts. Block model parameters are shown in Table 14-7.

Table 14-7 Block Model Parameters

Area		Origin (Local Grid m)	# of Blocks	Block Size (m)	Rotation (°)
Mina Central	X	23820	400	2	0
	Y	15300	160	1	0
	Z	3490.413	700	1	60
Mascota	X	23660	52	2	0
	Y	15435	40	2	0
	Z	3490.413	625	1	65
Cachi Cachi (Cuerpos Chicos)	X	23740	238	2	0
	Y	16335	175	2	0
	Z	3950	150	2	0
Elissa	X	23925	58	2	0
	Y	16580	45	1	0
	Z	3960	90	2	140
Cuerpos Pequenos	X	23560	220	2	0
	Y	14800	445	2	0
	Z	3490.413	350	2	0

Gustavson utilized Ordinary Kriging (OK) in all resource areas. This estimation type was chosen to help decluster the variable channel and drill data densities in the resource areas. Composites from within one body were not allowed to be used to estimate any other body. Search ellipse distances were determined through analysis of variograms. Individual search distances correspond to resource classification categories. Blocks outside modeled bodies were not estimated. All bodies were estimated using channel and drill hole sampling. The resource was estimated in 3 passes for all blocks. All passes utilized ordinary kriging. The estimation parameters are listed in Table 14-8.

Table 14-8 Estimation Parameters

Area		1st Pass	2nd Pass	3rd Pass
Mina Central	Primary Axis (meters)	40	80	120
	Secondary Axis (meters)	35	70	105
	Tertiary Axis (meters)	5	10	15
	Min # Composites	3	3	3
	Max # Composites	9	9	9
	Max Composites per Drillhole	2	2	2
Mascota	Primary Axis (meters)	15	30	60
	Secondary Axis (meters)	40	80	160
	Tertiary Axis (meters)	7	14	28
	Min # Composites	3	3	3
	Max # Composites	9	9	9
	Max Composites per Drillhole	2	2	2
Cachi Cachi (Cuerpos Chicos)	Primary Axis (meters)	13	26	52
	Secondary Axis (meters)	13	26	52
	Tertiary Axis (meters)	13	26	52
	Min # Composites	3	3	3
	Max # Composites	9	9	9
	Max Composites per Drillhole	2	2	2
Elissa	Primary Axis (meters)	20	40	80
	Secondary Axis (meters)	20	40	80
	Tertiary Axis (meters)	5	10	20
	Min # Composites	3	3	3
	Max # Composites	9	9	9
	Max Composites per Drillhole	2	2	2

Area		1st Pass	2nd Pass	3rd Pass
Cuerpos Pequenos	Primary Axis (meters)	13	26	52
	Secondary Axis (meters)	13	26	52
	Tertiary Axis (meters)	13	26	52
	Min # Composites	3	3	3
	Max # Composites	9	9	9
	Max Composites per Drillhole	2	2	2

Gustavson utilized oriented anisotropic search ellipses based on structural trends within each Cuerpos Massivo. Gustavson utilized dynamic anisotropy in the Mina Central block model to account for changing structural orientation throughout the mineralized zone. A trend surface for the centerline was used to estimate a dip and dip direction for each block, and these parameters were used to adjust the search ellipse dynamically. Cuerpos Chicos were estimated with a restricted isotropic search. The Cuerpos Chicos search ranges were designed to mimic the projection distances historically used for classification of Cuerpos Chicos. The average dip direction and dip for each explicit structure and implicit domain is shown in Table 14-9.

Table 14-9 Dip Direction and Dip of Structures

Area	Dip Direction	Dip
Mina Central	Dynamic	Dynamic
Mascota	45	89
Cachi Cachi (Cuerpos Chicos)	0	0
Elissa	140	89
Cuerpos Pequenos	0	0

14.3.8 Estimate Validation

The model was first evaluated by comparing the capped composite statistics to the block model statistics for each resource area. Results are shown inTable 14-10.

Table 14-10 Block Model Versus Composite Statistics

Area	Metal	Capped Composite Sample Statistics				Model Statistics			
		Min	Max	Mean	Standard Deviation	Min	Max	Mean	Standard Deviation
Mina Central	Ag (g/t)	0.0	800.0	60.0	76.7	0.0	219.0	40.1	32.5
	Pb (%)	0.0	6.0	0.83	1.4	0.0	3.4	0.4	0.59
	Zn (%)	0.0	10.0	2.5	3.3	0.0	8.7	1.4	1.5
	Cu (%)	0.0	10.5	0.90	1.6	0.0	5.0	0.75	0.50
	Au (g/t)	0.0	10.0	0.72	1.0	0.0	4.0	0.60	0.54
Mascota	Ag (g/t)	0.0	2714.9	253.9	272.9	38.9	817.2	306.8	166.9
	Pb (%)	0.0	11.0	4.8	4.3	0.94	11.0	4.7	2.5
	Zn (%)	0.0	2.5	0.68	0.77	0.15	2.3	0.80	0.57
	Cu (%)	0.0	10.0	1.0	1.9	0.08	3.2	0.91	0.59
	Au (g/t)	0.0	13.0	1.8	2.8	0.32	6.0	1.8	0.92
Cachi Cachi	Ag (g/t)	0.0	1000.0	83.9	117.1	0.0	762.1	47.0	68.0
	Pb (%)	0.0	20.0	1.7	2.6	0.0	14.9	0.89	1.4
	Zn (%)	0.0	30.0	7.1	7.8	0.0	27.2	4.2	4.7
	Cu (%)	0.0	3.0	0.25	0.38	0.0	2.2	0.38	0.27
	Au (g/t)	0.0	5.0	0.41	0.56	0.0	3.7	0.37	0.30
Cuerpos Pequenos	Ag (g/t)	0.0	2000.0	405.9	434.5	0.0	1459.9	285.0	302.3
	Pb (%)	0.0	50.0	10.2	11.5	0.0	46.6	7.5	8.1
	Zn (%)	0.0	30.0	8.8	8.7	0.0	30.0	8.2	6.9
	Cu (%)	0.0	15.0	1.0	2.1	0.0	13.0	0.95	1.5
	Au (g/t)	0.0	20.0	1.5	2.5	0.0	10.0	1.0	1.4

The model was validated by evaluating the blocks against drill hole assay data to determine if the estimated blocks fit the grade and parameters of the deposit. Cross sections for each area displaying the block model silver content for blocks with the drill hole silver data are presented in Figure 14-9 through Figure 14-13. Note that block and sample color coding uses legend shown.

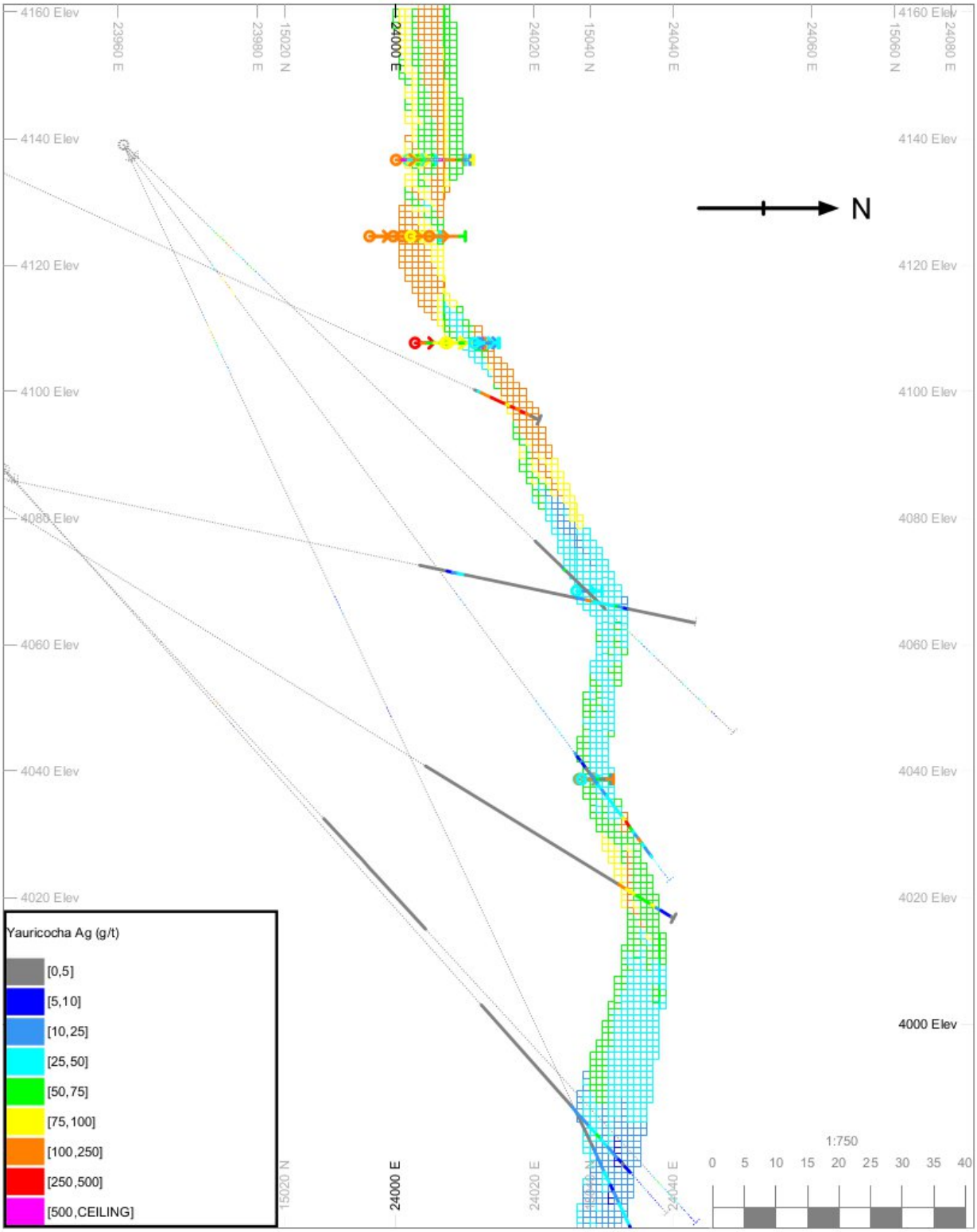


Figure 14-9: Mina Central Validation Section

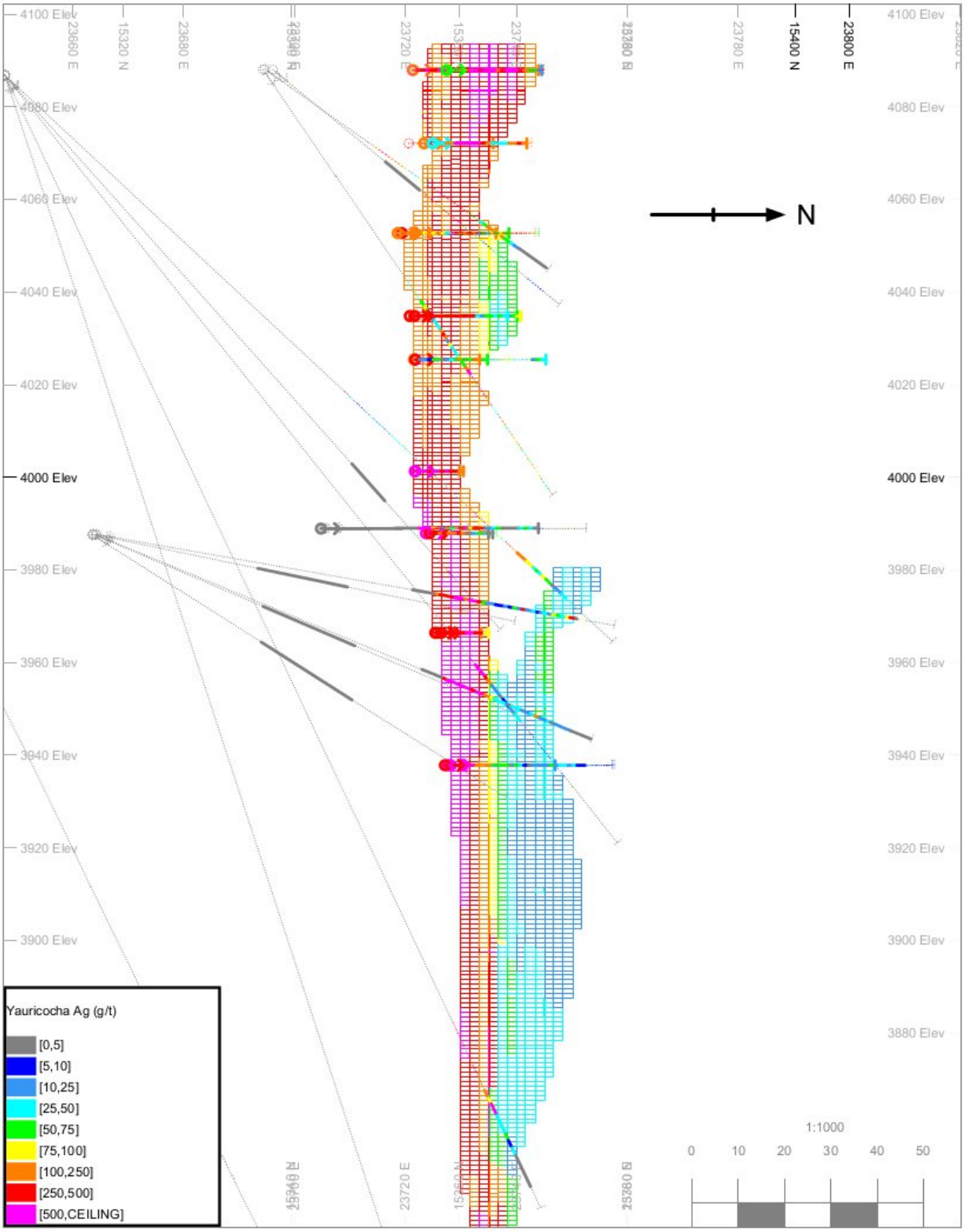


Figure 14-10: Mascota Validation Section

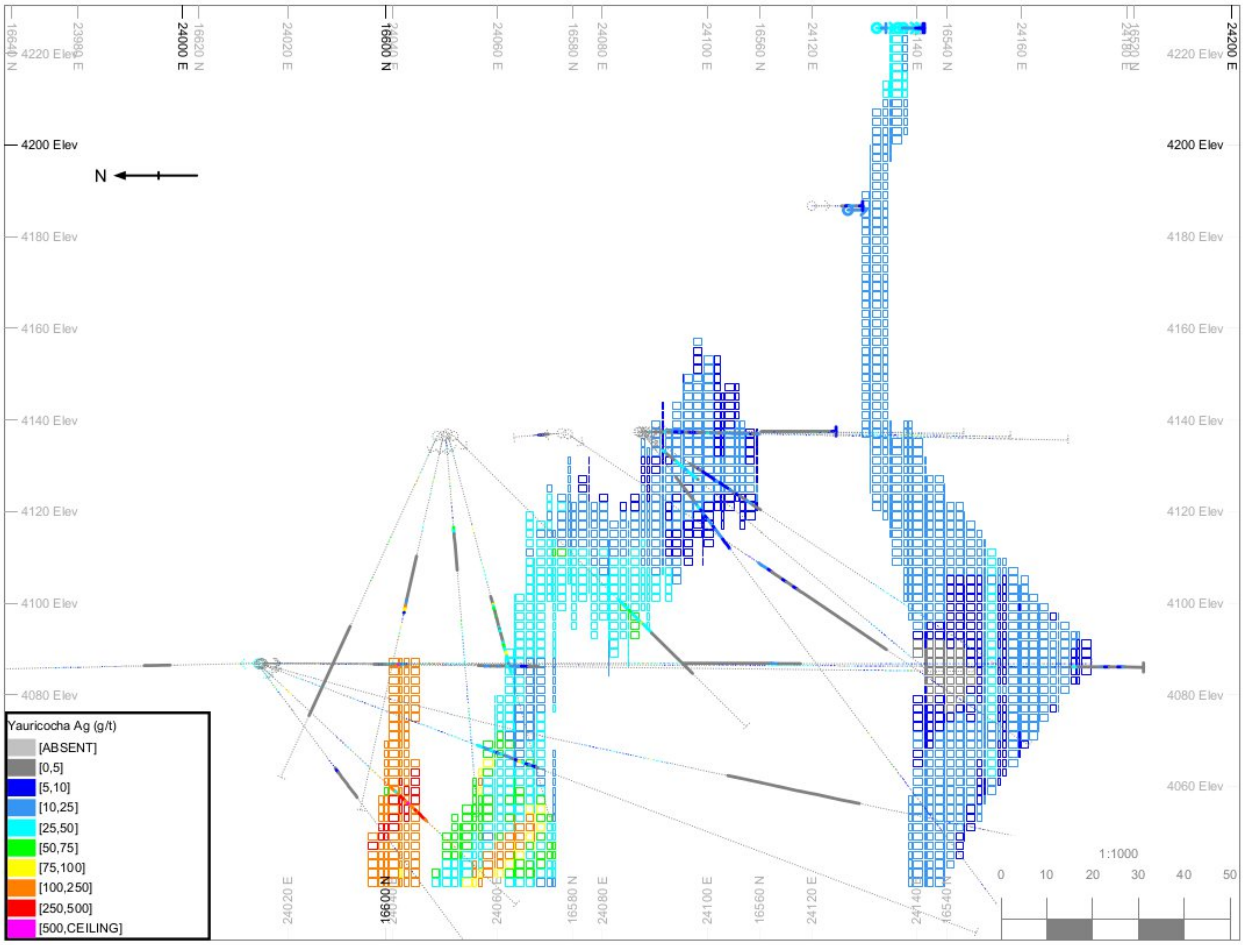


Figure 14-11: Cachi Cachi Validation Section

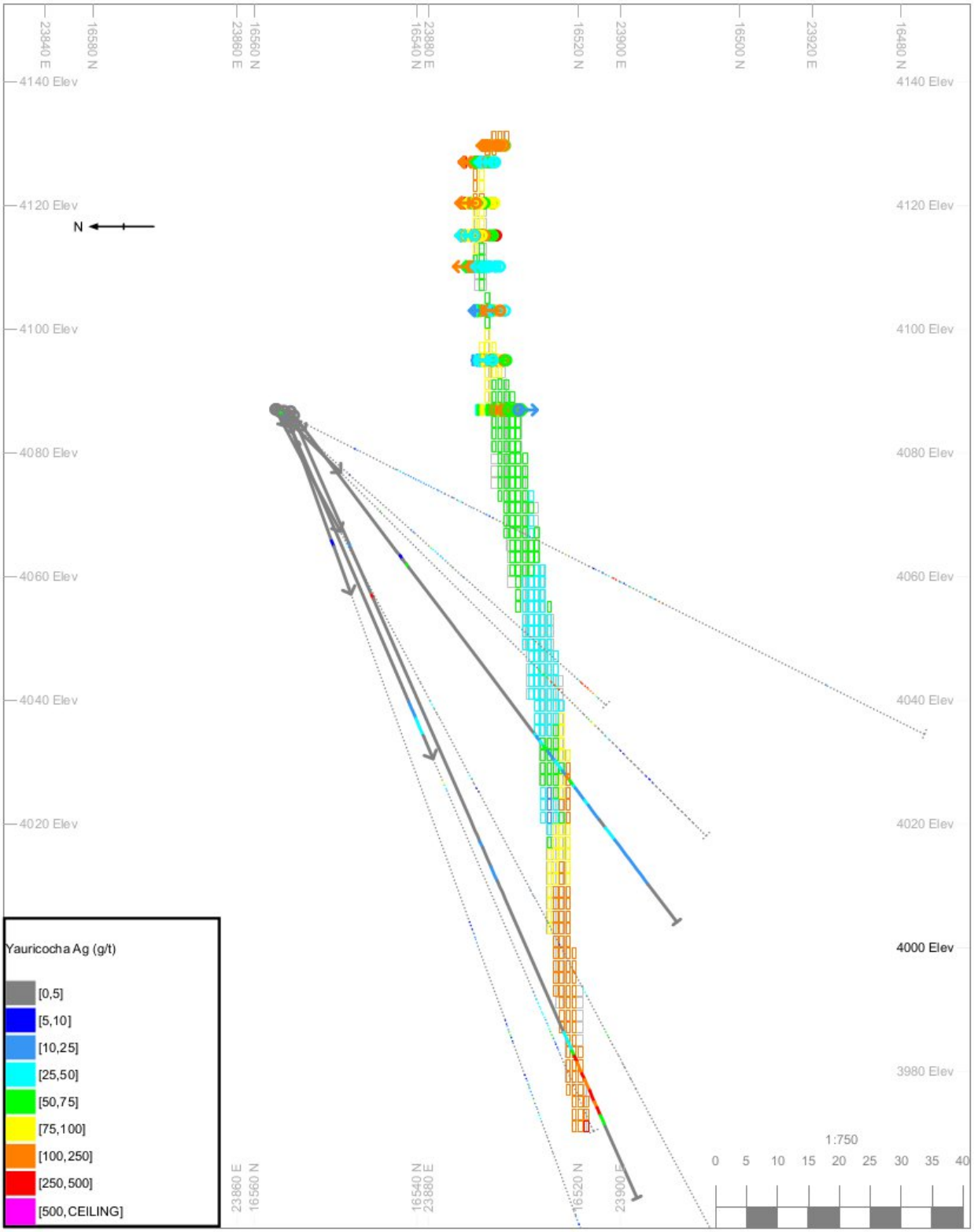


Figure 14-12: Elissa Validation Section

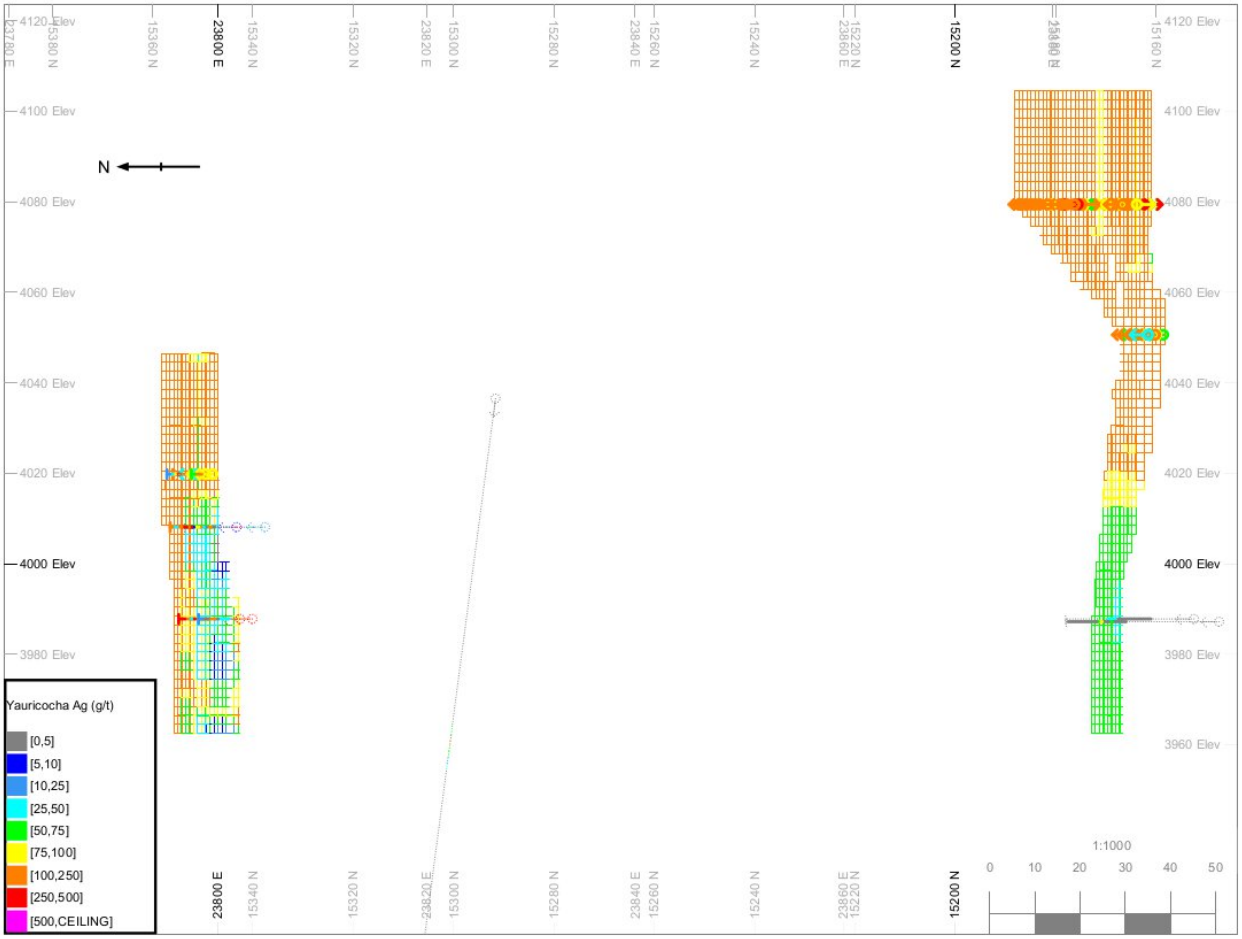


Figure 14-13: Cuerpos Pequenos Validation Section

14.3.9 Stope Block Models

For the Cuerpos Massivos, the mining method employed at Yauricocha employs access tunnels or draw points (ventanas) across the bodies on 8 meter centers. Material from 25 meters above the draw point is caved into the ventanas and hauled away for processing. There is minimal selectivity of mining of material from within individual ventanas, so reporting grades and tonnages based on cutoffs applied to small block grades is a poor representation of the grade distribution expected to be encountered in mining. Accordingly, it is useful to consider the bodies as a series of 8 meter by 25 meter stope blocks, with each block corresponding to 1 drawpoint.Gustavson created a stope block model which combines all the estimated blocks within each 8x25 meter (on long section) cell, across the full thickness of the body. These stope blocks were tagged by level, piso, and area and exported with averaged grade data to Excel for processing.

For the Cuerpos Chicos, the bodies are generally limited in extent, and because most of the data is derived from channel sampling at 25 meter level intervals, the grades estimated within the bodies is quite consistent through the volume. The Cuerpos Chicos are separated vertically

into two sublevels per 50 meter level (25 meters vertically) and reported with averaged tonnes and grade.

For both Cuerpos Chicos and Cuerpos Massivos stope blocks, grades and tonnages are aggregated on a zero cutoff basis, so that all internal dilution is captured into the grade assigned to the volume. Cutoff values are applied the entire stope block volume at its average grade, as this is considered the selective mining unit. This results in a much lower average grade (and higher tonnage) reported than would be seen for directly reporting tonnes and grade at cutoff from the small blocks models, but Gustavson is of the opinion that it is the most accurate representation of the grades encountered using the current mining methods.

14.3.10 Mined out Volumes.

Minera Corona provided information as to the levels from each body which are mined out as of December 31, 2014. Mined out levels are excluded from the resource tabulation. For this reason, the effective date of the resource report is December 31, 2014.

14.4 Resource Cutoff Grades

Each 8 x 25 meter stope block or Cuerpos Chicos sublevel volume is evaluated relative to cutoff grade.

Cutoff grade for resources is estimated on a recoverable metal value basis, incorporating metals prices, metal recovery, and without regard to external dilution, ore loss, or other factors. The pricing assumptions and recovery factors used for estimating recoverable metal value are as follows:

Table 14-11 Metal Prices and recoveries used to calculate block value for cutoff grades

Metal	Symbol	Grade Units	Price	Price Symbol	Recovery Symbol
Silver	Ag	g/t	18.10 $/ozt	P_{ag}	R_{ag}
Lead	Pb	%	0.95 $/lb	P_{pb}	R_{pb}
Copper	Cu	%	3.02 $/lb	P_{cu}	R_{cu}
Zinc	Zn	%	0.91 $/lb	P_{zn}	R_{zn}
Gold	Au	g/t	1241 $/lb	P_{au}	R_{au}

Recovery	Polymetallics	Copper	Oxides	Cu Oxides
R_{ag}	59.76%	63.90%	54.20%	49.71%
R_{pb}	80.32%	0.00%	67.85%	0%
R_{cu}	69.65%	89.86%	0.00%	39.20%
R_{zn}	88.65%	0.00%	0.00%	0%
R_{au}	13.90%	7.50%	52.57%	10.01%

Resources are evaluated by comparing calculated average grades for each superblock with a $37 cutoff value. This value represents the average marginal cutoff grade for the deposit (i.e., the value which covers direct mining, processing, and G&A costs for the material under current mining and processing methodology. Gustavson is of the opinion that this cutoff value represents reasonable prospects for economic extraction. Resources are also summarized at $56, $70 and $85 cutoff values to show the sensitivity of the resource at a stope block scale to various cutoffs.

Note: The 2012 resource reported cutoff grades on a silver-equivalent basis, rather than dollar value. The NSR value assumptions used for cutoff grade are similar, with the exception of the metals pricing assumption changes. For sake of comparison between resource tabulations, average silver-equivalent resource grades have been calculated and are included in the resource tables. The reader is cautioned that because of changes in pricing assumptions between the reports, direct comparison of silver-equivalent grades between the models is not advisable.

The formula for AgEq is:

$$\mathbf{AgEq} = \frac{(Ag * P_{ag*} R_{ag}/31.1035)+(Pb*P_{pb}*R_{pb}*22.05)+(Cu*P_{cu}*R_{cu}*22.05)+(Zn*P_{zn}*R_{zn}*22.05)}{(P_{ag*} R_{ag})}$$

Where the symbols represent

Table 14-12 Silver Equivalent Calculation Values

Metal	Symbol	Grade Units	Price	Price Symbol	Recovery Symbol
Silver	Ag	g/t	18.10 $/ozt	P_{ag}	R_{ag}
Lead	Pb	%	0.95 $/lb	P_{pb}	R_{pb}
Copper	Cu	%	3.02 $/lb	P_{cu}	R_{cu}
Zinc	Zn	%	0.91 $/lb	P_{zn}	R_{zn}
Gold	Au	g/t	1241 $/lb	P_{au}	R_{au}

Recovery	Polymetallics	Copper	Oxides	Cu Oxides
R_{ag}	59.76%	63.90%	54.20%	49.71%
R_{pb}	80.32%	0.00%	67.85%	0%
R_{cu}	69.65%	89.86%	0.00%	39.20%
R_{zn}	88.65%	0.00%	0.00%	0%
R_{au}	13.90%	7.50%	52.57%	10.01%

Metals price assumptions are based on 6-month trailing averages, as discussed under market studies in section 19, below. Recovery assumptions are based on 2-year trailing average production recoveries for the Chumpe Mill.

Mineral resources are not mineral reserves and do not demonstrate economic viability. There is no certainty that all or any part of the mineral resource will be converted to mineral reserves.

14.5 Mineral Resource Classification

For the December 31, 2014 resource model, resources are classified according to distance from data. In the Cuerpos Massivos, small blocks are classified as measured (Svol=1_ if at least 2 drillholes or sample channels used for estimation are located within 50% of the variogram range of the block. Small blocks are classified as Indicated (Svol=2) if at least 2 drillholes or sample channels used for estimation are located within 100% of the variogram range of the block. Small blocks are inferred (Svol=3) if at least two drillholes or channel samples are within 150% of the variogram range for Mina Central, 200% of the variogram range for other zones. The specific ranges and ellipse geometries used are shown in table Table 14-8.

When the blocks are combined into stope blocks, the Svol codes are averaged. Stope Blocks which have an Svol average of 1 (100% measured) are considered measured resource. Blocks with an Svol of up to 2.2 (up to 20% inferred material) are considered indicated resource. Blocks with an Svol above 2.2 (over 20% inferred) are considered inferred resource.

14.6 Comparison with 2012 Resource

Based on recommendations in prior Technical Reports, there is a significant change in the estimation basis for resource model referenced herein as compared to previous resource models for the Yauricocha project. As such, it can be difficult to compare the two estimations.

The historical resource estimation methodology used a capped, length weighted average of local channel samples to estimate stope blocks. The method tended to minimize the effect of dilution and estimate grades significantly higher than the mine production grades. This was countered by the use of dilution factors which had been carefully vetted over the years to buffer these effects.

In the current estimate for Mina Central, Gustavson is estimating metal grades into small blocks (1x1x2m). This allows the block distribution to precisely follow the shape of the mineralized zones as modeled by site geologists and reviewed and approved by Gustavson. Because these blocks are much smaller than the selective mining unit for the mine, the small blocks have been aggregated into larger “stope blocks” which are 8m on strike, 25m down dip, and from footwall to hanging wall, the unit defined by spacing of “ventanas” or drawpoints during mining.

This method allows the use of hanging wall to footwall variations in the grade of the material to be projected up and down dip, potentially resulting in a better estimate of the mineral

distribution. The aggregation into the stope blocks mimics the blending which happens during mining. Gustavson's confirmation of the benefit of this method comes with the reconciliation of this estimate with production data for prior years. This results in smaller correction factors for dilution and ore loss which are supported by the reconciliation analysis in Section 15.5.

14.7 Mina Ipillo and Mina Victoria Resources

There is a small resource tonnage estimated for the Mina Ipillo area of the project. This resource was estimated using traditional polygonal methods, and was audited by Gustavson as part of the November 2013 resource report. The Ipillo resource has been carried forward into the current resource statement. There is no new data available for this zone, and the resource estimation methodology has not been updated for this zone. Based on the previous audit, this material is still considered resource and is included in the resource tabulation.

An additional small resource tonnage was historically estimated for Mina Victoria. Minera Corona Staff have determined that additional exploration is required in this area to confirm the extents and continuity of mineralization. Accordingly, it has been removed from the estimation.

14.8 Tabulation of Resources

The effective date of this resource estimate is December 31, 2014. Tables 14-13 through 14-16 are a tabulation of the resources for the Yauricocha deposit, separated by material type. Resources are presented at a $37 per tonne NSR Cutoff grade, which constitutes reasonable prospects for economic extraction of the material. Mineral Resources are not Mineral Reserves and do not demonstrate economic viability. There is no certainty that all or any part of the Mineral Resource will be converted to Mineral Reserves. The quantity and grade or quality is an estimate and is rounded to reflect the fact that it is an approximation. Quantities may not sum due to rounding.

Table 14-13 Measured Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	1,675,000	330.9	62.2	1.02	0.73	2.77	0.81	3,350	17,037	12,211	46,347	43,550
Copper	10,000	567.5	102.6	0.70	3.50	1.61	0.73	31	67	334	154	224
Copper Oxides	16,000	614.5	108.6	2.40	4.99	5.00	0.48	56	385	800	802	247
Oxides	67,000	962.7	344.1	10.43	0.67	2.69	2.37	745	7,020	453	1,808	5,135
Mina Ipillo (Polymetallic)	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,767,000**	**359.0**	**73.6**	**1.39**	**0.78**	**2.78**	**0.87**	**4,182**	**24,509**	**13,798**	**49,110**	**49,156**

Table 14-14 Indicated Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	9,056,000	222.1	36.0	0.31	0.82	1.46	0.69	10,489	28,246	74,248	132,268	200,236
Copper	8,000	571.0	118.3	0.83	3.40	1.80	0.83	30	66	272	144	214
Copper Oxides	26,000	1,368.7	693.4	8.39	5.53	1.36	0.26	584	2,199	1,449	356	219
Oxides	553,000	731.6	283.9	7.62	0.87	2.76	1.67	5,050	42,164	4,828	15,272	29,639
Mina Ipillo (Polymetallic)	168,900	662.2	140.8	1.33	1.32	6.34	1.30	765	2,246	2,229	10,708	7,059
Total	**9,812,000**	**261.7**	**53.6**	**0.75**	**0.84**	**1.54**	**0.74**	**16,153**	74,922	83,027	158,750	**230,308**

Table 14-15 Measured and Indicated Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	10,731,000	239.1	40.1	0.42	0.81	1.66	0.71	13,838	45,284	86,459	178,615	243,786
Copper	18,000	569.1	109.7	0.76	3.45	1.70	0.78	62	133	606	298	438
Copper Oxides	42,000	1,082.4	471.4	6.12	5.33	2.74	0.34	640	2,584	2,249	1,158	467
Oxides	621,000	756.7	290.4	7.93	0.85	2.75	1.74	5,795	49,184	5,281	17,080	34,774
Mina Ipillo (Polymetallic)	168,900	662.2	140.8	1.33	1.32	6.34	1.30	765	2,246	2,229	10,708	7,059
Total	**11,411,000**	**280.7**	**57.5**	**0.85**	**0.83**	**1.73**	**0.76**	**20,335**	99,431	96,825	207,860	**279,464**

Table 14-16 Inferred Resources

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	1,871,000	1,209.2	203.0	1.52	4.33	8.48	3.26	12,214	28,357	81,022	158,644	196,206
Copper	30	470.0	135.5	0.74	2.46	2.95	1.41	0	0	1	1	1
Copper Oxides	4,500	1,353.8	649.7	10.96	5.10	0.94	1.31	93	489	228	42	188
Oxides	278,000	774.8	339.5	7.48	0.92	2.46	1.57	3,030	20,765	2,554	6,829	14,013
Mina Ipillo (Polymetallic)	-	-	-	-	-	-	-	-	-	-	-	-
Total	**2,153,000**	**1,153.7**	**221.5**	**2.30**	**3.89**	**7.69**	**3.04**	**15,337**	**49,611**	**83,804**	**165,516**	**210,407**

Mineral resources from the Ipillo Mine are conditional to negotiations with the local community and permit from the authority. Other than that, Gustavson knows of no other existing environmental, permitting, legal, socio-economic, marketing, political, or other factors that might materially affect the mineral resource estimate.

14.9 Cutoff Grade Sensitivity

Table 14-17 shows the sensitivity of the mineral resource to changing cutoff grades, specifically Measured, Indicated, and Inferred resources at various NSR cutoff values. The $37 g/t cutoff is considered the base case for reporting mineral resources, as discussed in 14.4, Above.

Table 14-17 Mineral Resources at various cutoffs

Measured Mineral Resources							Measured Resources Contained Metal				
NSR Cut-off	Tonnes	Ag g/t	Pb%	Cu%	Zn%	Au g/t	Ag Oz	Pb T	Cu T	Zn T	Au Oz
$37/t	**1,767,000**	**73.6**	**1.39**	**0.78**	**2.78**	**0.87**	**4,182,000**	**24,500**	**13,800**	**49,100**	**49,200**
$56/t	1,552,000	80.9	1.56	0.81	3.11	0.94	4,038,000	24,300	12,600	48,200	47,100
$70/t	1,335,000	86.7	1.74	0.83	3.26	0.98	3,719,000	23,200	11,100	43,600	41,900
$85/t	1,139,000	94.9	1.99	0.86	3.56	0.96	3,474,000	22,700	9,800	40,600	35,000

Indicated Mineral Resources							Indicated Resources Contained Metal				
NSR Cut-off	Tonnes	Ag g/t	Pb%	Cu%	Zn%	Au g/t	Ag Oz	Pb T	Cu T	Zn T	Au Oz
$37/t	**9,644,000**	**52.1**	**0.75**	**0.84**	**1.54**	**0.74**	**16,153,000**	**72,700**	**80,800**	**148,000**	**230,300**
$56/t	7,702,000	60.5	0.91	0.89	1.73	0.84	14,981,000	70,100	68,900	133,300	207,400
$70/t	6,133,000	69.8	1.11	0.92	1.97	0.91	13,770,000	68,100	56,700	121,000	179,000
$85/t	4,157,000	86.9	1.54	0.94	2.37	1.03	11,611,000	63,900	38,900	98,300	137,600

Measured and Indicated Mineral Resources							Measured and Indicated Resources Contained Metal				
NSR Cut-off	Tonnes	Ag g/t	Pb%	Cu%	Zn%	Au g/t	Ag Oz	Pb T	Cu T	Zn T	Au Oz
$37/t	**11,411,000**	**55.4**	**0.85**	**0.83**	**1.73**	**0.76**	**20,335,000**	**97,200**	**94,600**	**197,200**	**279,500**
$56/t	9,255,000	63.9	1.02	0.88	1.96	0.86	19,019,000	94,400	81,500	181,500	254,500
$70/t	7,467,000	72.9	1.22	0.91	2.20	0.92	17,489,000	91,300	67,800	164,500	220,900
$85/t	5,296,000	88.6	1.63	0.92	2.62	1.01	15,086,000	86,600	48,800	138,900	172,600

Inferred Mineral Resources							Inferred Resources Contained Metal				
NSR Cut-off	Tonnes	Ag g/t	Pb%	Cu%	Zn%	Au g/t	Ag Oz	Pb T	Cu T	Zn T	Au Oz
$37/t	**2,153,000**	**221.5**	**2.30**	**3.89**	**7.69**	**3.04**	**15,337,000**	**49,600**	**83,800**	**165,500**	**210,400**
$56/t	1,616,000	279.6	3.10	4.44	9.77	3.90	14,526,000	50,100	71,700	157,800	202,500
$70/t	1,236,000	332.8	4.16	3.97	11.46	4.53	13,222,000	51,500	49,100	141,600	180,200
$85/t	948,000	363.5	5.11	3.45	13.71	5.00	11,075,000	48,400	32,700	129,900	152,500

15. MINERAL RESERVE ESTIMATE

The effective date of this reserves estimate is December 31, 2014. The mineral reserve was estimated by applying modifying factors to the resources described in Section 14, Mineral resources. Yauricocha is an operating mine, with significant production history. Because of this, the primary basis for the modifying factors applied for reserves definition is actual historic cost, recovery, and mine planning data. Gustavson considers the reserves to meet industry standard practices, and to be CIM and NI 43-101 compliant.

15.1 Reserve Classification

The mineral reserve is the economically demonstrated minable portion of the measured and indicated mineral resource, limited by mine recovery as determined by mining method and a recoverable metal value cutoff determined by the sum of the recoverable value of the contained metals.

The Proven Reserve is defined as that portion of the Measured resource for which the diluted recoverable metal value is above the economic cutoff, except that resources for which mining accessibility has not been defined are not converted to reserves.

The Probable Reserve is defined as that portion of the Indicated resource for which the diluted recoverable metal value is above the economic cutoff, except that resources which may be inaccessible are not converted to reserves.

15.2 Conversion: Resources to Reserves

Resource grades and tonnages are adjusted using three factors in considering conversion of resources to reserves.

- Mine recovery (Ore loss factor, reduction in tonnes), dependent on mining technique and body.
- Dilution (Increase in tonnes and decrease in grades for all metals), dependent on mining technique and body.
- Grade Adjustment factors: Adjustment to grades (generally decrease in grades) according to type of mineralization, derived from mine-mill reconciliation data from the prior 2 years.
- Reserves tonnages for each resource volume is defined as:
    - $T_{reserve} = T_{resource} * M_{rec}\% * (1+Dilution\%)$

- Reserves grade is defined as
  - $G_{reserve} = G_{resource} * (1+Adjustment\%) /(1+Dilution\%)$
  - Dilution is expressed as a positive percentage, and grade adjustment is expressed as a negative percentage.

15.2.1 Mine Recovery Factor

Mine recovery factor (ore loss) is a function of the mining method and ore body. Mine recovery factor takes into account the historical recovery factor for each zone as per the following table.

Table 15-1 Mine Recovery Factor

Body	Method	% Rec.	Description
Antacaca	SLCM2	90	Mechanized Sub Level Caving – Some Water Present
Antacaca Sur	SLCM3	75	Mechanized Sub Level Caving –Water present
Catas	SLCM2	90	Mechanized Sub Level Caving – Some Water Present
Rosaura	SLCM3	90	Mechanized Sub Level Caving –Water present
Mascota	SLCM1	100	Mechanized Sub Level Caving – No Water Present
C. Occidental	SQ	90	Square Set
Katty	SQ	95	Square Set
Violetta	SQ	95	Square Set
Cuye	SLCM1	90	Mechanized Sub Level Caving – No Water Present
Marita	SLCM1	90	Mechanized Sub Level Caving – No Water Present
Elissa	CRAM1	100	Mechanized Ascending Cut and Fill – No Pillars
Andrea	CRAC	90	Conventional Ascending Cut and Fill
Zulma	CRAC	96	Conventional Ascending Cut and Fill
Angelita	SLCC	80	Conventional Sub Level Caving
Karlita	SLCM1	80	Mechanized Sub Level Caving – No Water Present
Gallito	SQ	94	Square Set
Julianna	SQ	90	Square Set
C. Oriental	CRAC	94	Conventional Ascending Cut and Fill
C.S. Medio	CRAC	90	Conventional Ascending Cut and Fill
C.S. Medio I	CRAM1	94	Mechanized Ascending Cut and Fill – No Pillars
C.S. Medio II	CRAM1	95	Mechanized Ascending Cut and Fill – No Pillars

15.2.2 Dilution

From historical information, the dilution correction depends on the mining method, presence of water and geomechanical factors which are summarized in Table 15-2. Dilution corrections used for Antacaca, Antacaca Sur, Catas, Rosaura, and Mascota were determined by reconciliation between the superblock model and actual production from 2013 and 2014. Dilution corrections for the small bodies were determined by reconciliation of historic Cuerpos ChicosCuerpos Chicos models with actual production. However, given the similarity in tonnes and grade

estimated between the historic and current Cuerpos Chicos models, the factors are accepted as reasonable for this report. Gustavson recommends that reconciliation results be monitored for all resource areas so that dilution and recovery factors may be tuned to ensure reliable grade and tonnage predictions going forward.

Table 15-2 Dilution Correction

Body	Method	% Dil.	Description
Antacaca	SLCM2	0	Mechanized Sub Level Caving – Some Water Present
Antacaca Sur	SLCM3	25	Mechanized Sub Level Caving –Water present
Catas	SLCM2	0	Mechanized Sub Level Caving – Some Water Present
Rosaura	SLCM3	0	Mechanized Sub Level Caving –Water present
Mascota	SLCM1	10	Mechanized Sub Level Caving – No Water Present
C. Occidental	SQ	10	Square Set
Katty	SQ	10	Square Set
Violetta	SQ	10	Square Set
Cuye	SLCM1	20	Mechanized Sub Level Caving – No Water Present
Marita	SLCM1	20	Mechanized Sub Level Caving – No Water Present
Elissa	CRAM1	10	Mechanized Ascending Cut and Fill – No Pillars
Andrea	CRAC	10	Conventional Ascending Cut and Fill
Zulma	CRAC	10	Conventional Ascending Cut and Fill
Angelita	SLCC	20	Conventional Sub Level Caving
Karlita	SLCM1	20	Mechanized Sub Level Caving – No Water Present
Gallito	SQ	10	Square Set
Julianna	SQ	10	Square Set
C. Oriental	CRAC	10	Conventional Ascending Cut and Fill
C.S. Medio	CRAC	10	Conventional Ascending Cut and Fill
C.S. Medio I	CRAM1	10	Mechanized Ascending Cut and Fill – No Pillars
C.S. Medio II	CRAM1	10	Mechanized Ascending Cut and Fill – No Pillars

15.2.3 Grade Correction Factors Mine to Mill

In addition to the penalty for dilution, there is a second reduction factor for each metal based on a statistical evaluation of mine production grades versus grades at the concentrator for the past two years. These factors are presented in Table 15-3. Again, factors for the Cuerpos Massivos

are determined by reconciliation of the current resource model against actual 2013 and 2014 production. Factors for Cuerpos ChicosCuerpos Chicos are determined by the mine from reconciliation of historic models.

Table 15-3 Grade Adjustment for Mine-Mill Reconciliation

Body	Ag	Pb	Cu	Zn	AU
Antacaca	0	-15	0	-15	0
Antacaca Sur	-20	-20	0	-10	0
Catas	-5	0	-15	0	0
Rosaura	0	0	-20	0	0
Mascota	-10	-10	-5	-5	-10
C. Occidental	-10	-10	-5	-5	-10
Katty	-10	-10	-5	-5	-10
Violetta	-10	-10	-5	-5	-10
Cuye	-6	0	-6	**0**	-6
Marita	-8	-6	-10	**-8**	-8
Elissa	-8	-6	-10	**-8**	-8
Andrea	-8	-6	-10	**-8**	-8
Zulma	-8	-6	-10	**-8**	-8
Angelita	-8	-6	-10	**-8**	-8
Karlita	-8	-6	-10	**-8**	-8
Gallito	-8	-6	-10	**-8**	-8
Julianna	-8	-6	-10	**-8**	-8
C. Oriental	-8	-6	-10	**-8**	-8
C.S. Medio	-8	-6	-10	**-8**	-8
C.S. Medio I	-8	-6	-10	**-8**	-8
C.S. Medio II	-8	-6	-10	**-8**	-8

15.3 Cut-off Evaluation

Cut-Off is the limit where it is possible to mine a mineral deposit economically. The reserves value calculation done for this report calculates a net smelter return based upon the diluted and adjusted grade, metal recovery, price of the metals and payable metal, including concentration

and sales costs, based on the ore type. Evaluation is carried out on a stope block basis, including the internal dilution for the block. The cut-off value varies by mining area, and considers the mining cost (including development), processing costs, administration costs, and average refining costs on a per tonne basis.

Reserves are classified by dollar value cutoff as Economic, Marginal, or Waste according to the following. Stope blocks with an average value per tonne above the economic cutoff (Table 15-4) are considered reserves, as long as they are not isolated (isolated being defined as a stope block with no adjacent economic blocks.) Marginal blocks are those bocks with an average value per tonne less than the economic cutoff, but more than the direct mining and processing costs (marginal cutoff). In certain cases (specifically within the Catas, Antacaca, Antacaca Sur, and Rosaura bodies) there are blocks of marginal material tabulated as reserves, where such material occurs within a mining level which carries grades above economic cutoff. (IE, the marginal material is accepted as internal dilution within a volume which carries economic grade in aggregate.) Sequences of marginal blocks isolated from economic blocks are classified as waste. In all other areas, average values for reserve volumes are well in excess of the economic cutoff.

For this report each zone has a different economic and marginal cut off value as shown in Table 15-4. Variation between the zones is largely a result of variation in mining costs related to geometries and mining technique.

Table 15-4 Cost Cut-off Evaluation by Body

Zone	Economic Cut off Value for Reserves	Marginal Cut Off Value For Reserves
Antacaca	42.28	34.00
Antacaca Sur	50.96	39.00
Catas	42.28	34.00
Rosaura	50.96	39.00
Mascota	50.00	34.00
C. Occidental	87.00	59.00
Katty	87.00	59.00
Violetta	87.00	59.00
Cuye	50.00	34.00
Marita	50.00	34.00
Elissa	56.00	38.00
Andrea	75.00	51.00
Zulma	75.00	51.00
Angelita	49.00	34.00
Karlita	49.00	34.00
Gallito	87.00	59.00
Julianna	87.00	59.00
C. Oriental	75.00	51.00
C.S. Medio	75.00	51.00
C.S. Medio I	75.00	51.00
C.S. Medio II	56.00	38.00

The cut-off is applied to each zone individually to account for variation in mining cost.

15.4 Mineral Reserves Estimation

The mineral reserve estimates for the December 31, 2014 Effective Date are presented in Table 15-5, through Table 15-7. Quantities may not sum due to rounding.

Table 15-5 Yauricocha Proven Mineral Reserves

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	1,108,000	348.5	65.2	1.17	0.68	3.07	0.81	2,320	13,014	7,493	33,963	28,749
Copper	10,000	444.5	80.3	0.58	2.74	1.34	0.57	27	60	283	138	189
Copper Oxides	18,000	523.1	88.8	1.96	4.31	4.32	0.39	50	346	760	762	221
Oxides	72,000	775.1	276.1	8.41	0.59	2.30	1.91	638	6,047	422	1,655	4,427
Total	**1,207,000**	**377.6**	**78.2**	**1.61**	**0.74**	**3.02**	**0.87**	**3,036**	**19,467**	**8,958**	**36,518**	**33,586**

Table 15-6 Yauricocha Probable Mineral Reserves

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	3,607,000	270.4	43.3	0.48	0.78	2.24	0.86	5,017	17,465	28,093	80,871	99,942
Copper	9,000	447.3	92.6	0.69	2.66	1.50	0.65	26	60	230	130	181
Copper Oxides	32,000	1,111.3	538.3	6.97	4.69	1.12	0.46	559	2,250	1,514	362	478
Oxides	522,000	671.0	263.5	7.00	0.76	1.55	1.47	4,422	36,516	3,982	8,089	24,731
Total	**4,170,000**	**327.4**	**74.8**	**1.35**	**0.81**	**2.15**	**0.93**	**10,024**	**56,291**	**33,819**	**89,452**	**125,332**

Table 15-7 Yauricocha Proven and Probable Mineral Reserves

		Grades						Contained Metal				
Mineralization Type	Tonnes (t)	AgEq (g/t)	Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Au (g/t)	Ag koz	Pb (T)	Cu (T)	Zn (T)	Au oz
Polymetallic	4,714,000	288.7	48.4	0.65	0.75	2.44	0.85	7,338	30,479	35,586	114,834	128,691
Copper	19,000	445.8	86.0	0.63	2.71	1.41	0.61	52	119	513	268	370
Copper Oxides	50,000	903.5	379.5	5.20	4.56	2.25	0.44	609	2,596	2,274	1,124	699
Oxides	594,000	683.6	265.0	7.17	0.74	1.64	1.53	5,060	42,564	4,404	9,744	29,158
Total	**5,377,000**	**338.6**	**75.5**	**1.41**	**0.80**	**2.34**	**0.92**	**13,059**	**75,758**	**42,778**	**125,970**	**158,918**

Gustavson knows of no existing environmental, permitting, legal, socio-economic, marketing, political, or other factors that might materially affect the mineral reserve estimate.

15.5 Reconciliation

In order to test the performance of the updated block resource modelling methodology, as well as to tune recovery and dilution factors, Gustavson reconciled the Cuerpos Massivos models against actual production from levels recently mined. Table 15-8 shows the bodies and levels that can be reconciled using this new model.

There are six instances where ore zones were comptletely mined out on specific levels during 2013-2014. The table shows the relationship between the 2014 modeled reserves (with dilution, ore loss, and metal factors applied) as compared with actual production from these mining levels.

Gustavson recommends that Yauricocha Mine continue to monitor model performance against actual production on at least a quarterly basis, to determine whether additional adjustments are warranted to the dilution factors.

Table 15-8 Reserves Reconciliation

Planned Production (2014 Model Reserves)							Plant Head Grades & Tonnages				
Body	Level	Tonnes	Ag-g/t	Pb%	Cu%	Zn%	Tonnes	Ag-g/t	Pb%	Cu%	Zn%
Antacaca	820	151,504	73.1	1.343	0.560	3.621	155,809	77.7	1.218	0.790	3.400
Antacaca	870	151,524	61.4	1.114	0.480	2.992	150,325	67.3	1.218	0.730	3.204
Antacaca Sur	820	142,153	67.2	1.115	0.671	3.760	138,837	68.3	1.169	0.916	3.811
Catas	820	262,491	71.5	0.792	0.965	2.282	271,568	72.8	0.818	0.995	2.525
Catas	870	277,563	61.9	0.576	0.895	2.245	266,954	62.7	0.743	0.882	2.477
Rosaura	820	150,798	78.0	1.43	1.66	3.39	155,523	74.4	1.688	1.019	4.289

15.6 Reserves Replacement

There is no guarantee that resources will be converted to reserves through further exploration, nor is it possible to determine whether historical reserves replacement rates can be maintained into the future. However, it is useful to note that Yauricocha mine has demonstrated a history of reserves replacement as shown in **Error! Reference source not found.**.

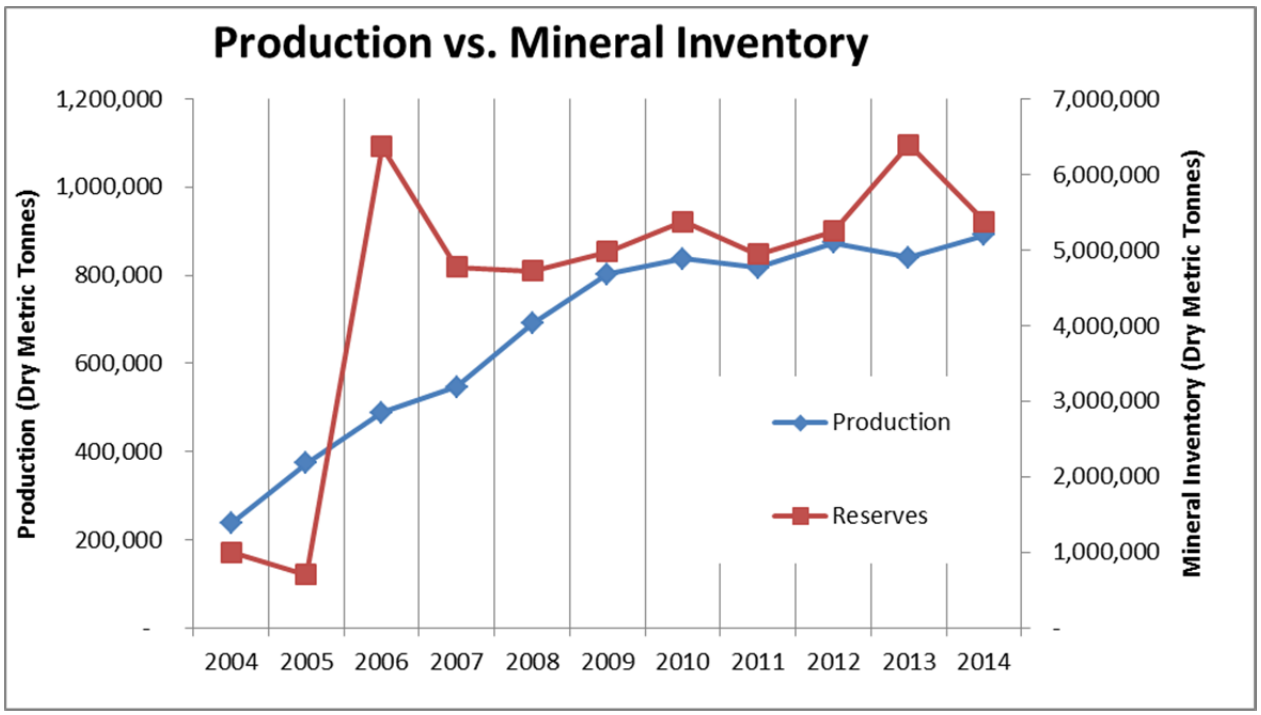


Figure 15-1 Production vs. Mineral Inventory

16. MINING METHODS

16.1 Mining Operations at Yauricocha

Mining at Yauricocha is accomplished by various extraction methods, principally sublevel caving and overhand cut and fill stoping. The larger mineralized areas are both thicker (10-60 m) and longer along strike and down dip and the ore minerals are held in semi consolidated rocks which ravel easily with minor provocation by blasting. The limestone footwall is competent and all development workings are located in the footwall. The smaller areas are also in poor rock, however can be of quite high metal grades, averaging over 10 oz/tonne silver and 10% lead. During cut and fill stoping the mine uses timber in square sets to maintain the level open for safe access (mostly through breasting) and then fills the lower level after mining the upper level.

In 2014, 81% of the ore was mined by Mechanized Sub Level Caving and 19% by other methods including manual caving and cut and fill. In the sub-level caving method, approximately 70% of the production results from self-caving, the remaining 30% has to be drilled and blasted.

Major items of mining equipment are shown in Table 16-1.

Table 16-1 Major Mine Equipment

Mining Equipment	Units
Jumbos	6
Scoop Trams	26
Mine Trucks	2
Locomotives	26
Mine Cars	26
Skips	6
Compressors	6
Front End Loaders	5
Backhoe	1
Total Mining Equipment	**102**

Approximately 93% of the ore and waste material is extracted through the Klepetko Tunnel located at Level 720. The tunnel has a section of 3 m x 3 m, is 4 km long and is equipped with 20 tonne trolley locomotive hauling ore cars of 110 to 160 ft^3 capacity.

Mine ventilation flows through Level 300, the Klepetko Tunnel and the Central and Mascota shafts. Ground support is accomplished by rock bolts, mesh, square sets and steel arch support.

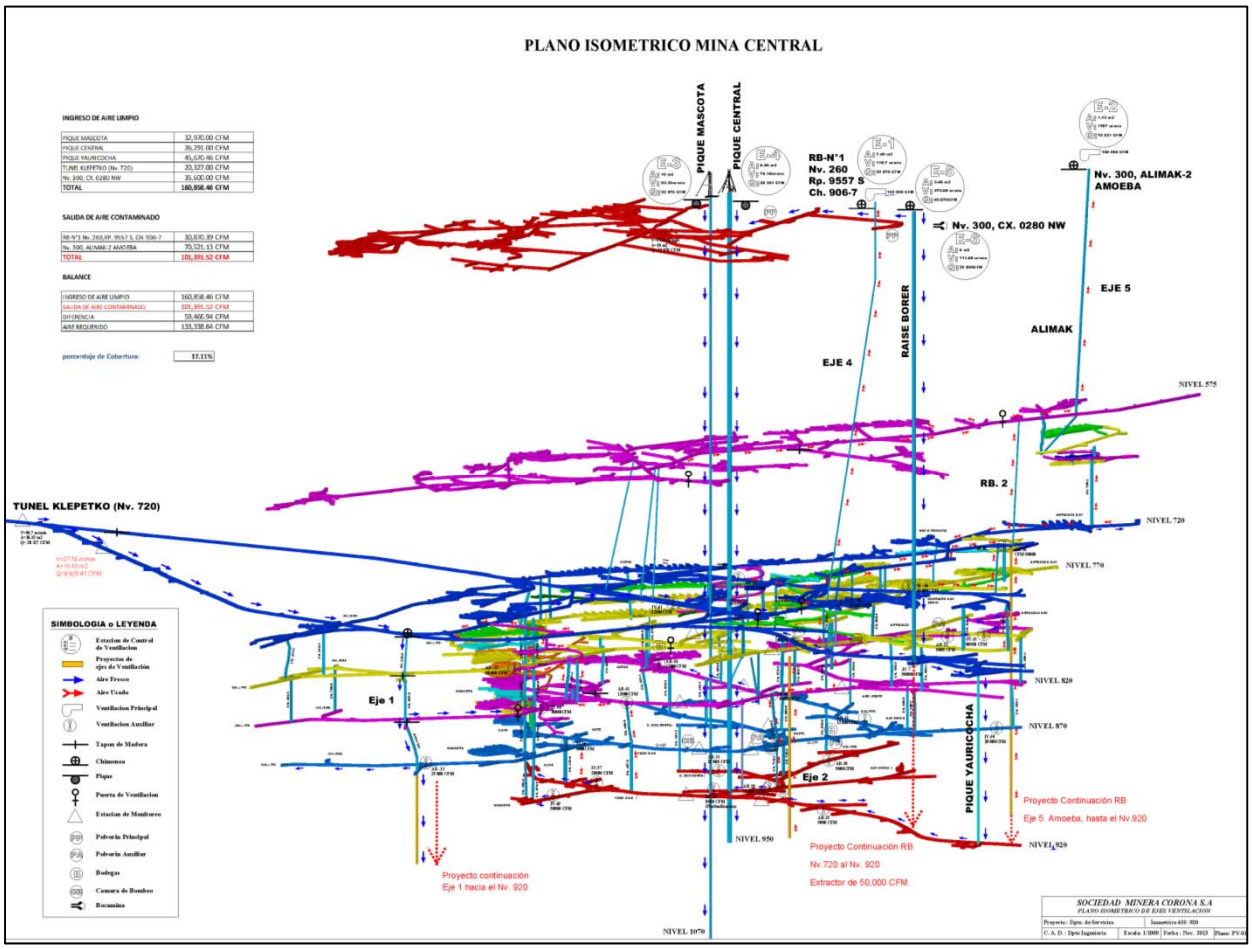


Figure 16-1 Yauricocha Mine Ventilation Diagram, Mina Central

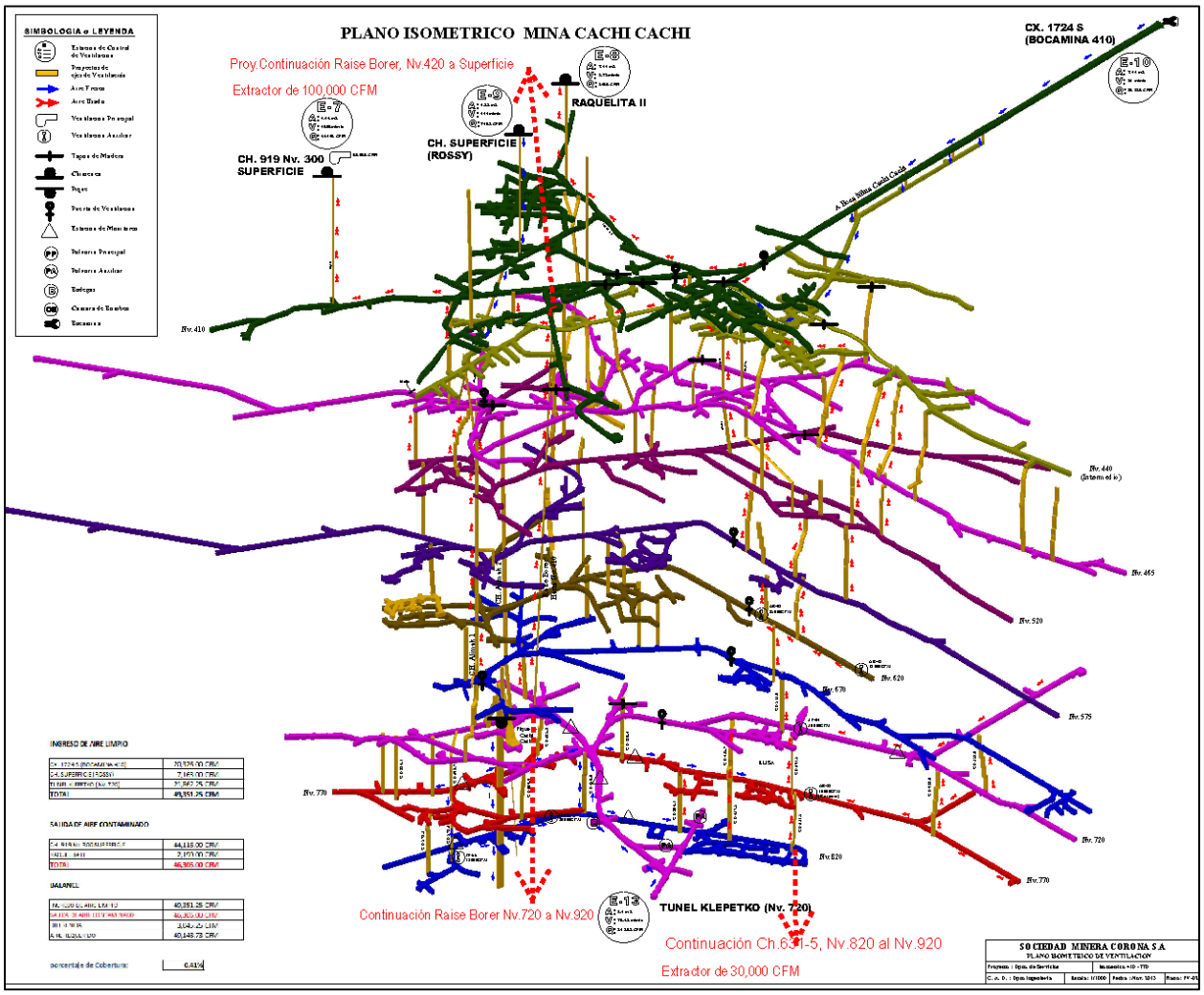


Figure 16-2 Yauricocha Mine Ventilation Diagram, Cachi-Cachi

Two shafts are in service at the Yauricocha Mine, namely Pique Central and Pique Mascota. The Pique Central services Levels 970 to 690, has a depth of 810 m and a hoisting capacity of 74 tonnes/hr for ore and 67 tonnes/hr for waste. The Mascota shaft services Levels 1100 to 680, its depth is 920 m and has a hoisting capacity of 135 tonnes/hr for ore and 110 tonnes/hr for waste. The average hoisting cost is $0.77/tonne.

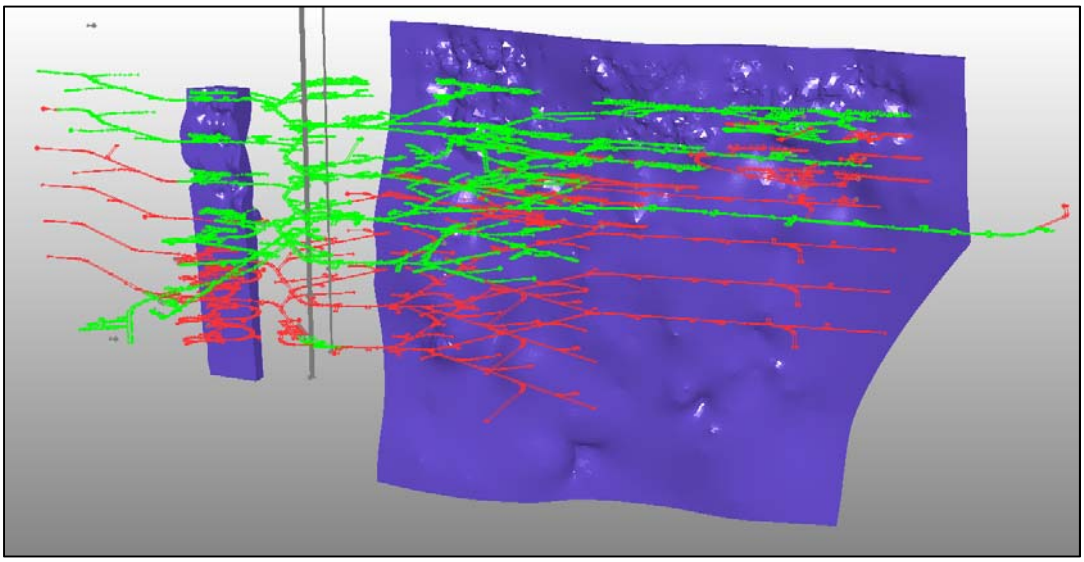


Figure 16-3 Diagram showing actual (green) and proposed (red) Major Development within Mina Central Area

New access is currently being built for the deeper lead oxide, copper and polymetallic orebodies. The new access will serve the Mascota, Catas, Antacaca, Rosaura and Antacaca Sur orebodies in the Mina Central.

Given the depth of current production below the surface, development drilling to convert the mineral resource to a mineable reserve is performed on an ongoing basis from underground workings.

Due to the ore body becoming deeper, the company is currently sinking a new shaft in order to hoist ore from deeper levels to the 720 haulage level.

The Mining Unit at Yauricocha is organized in the following departments: Operations, General Mine Services, Maintenance and Safety. The Engineering Department provides technical support to the operation.

Figure 16-4 shows the general mining process.

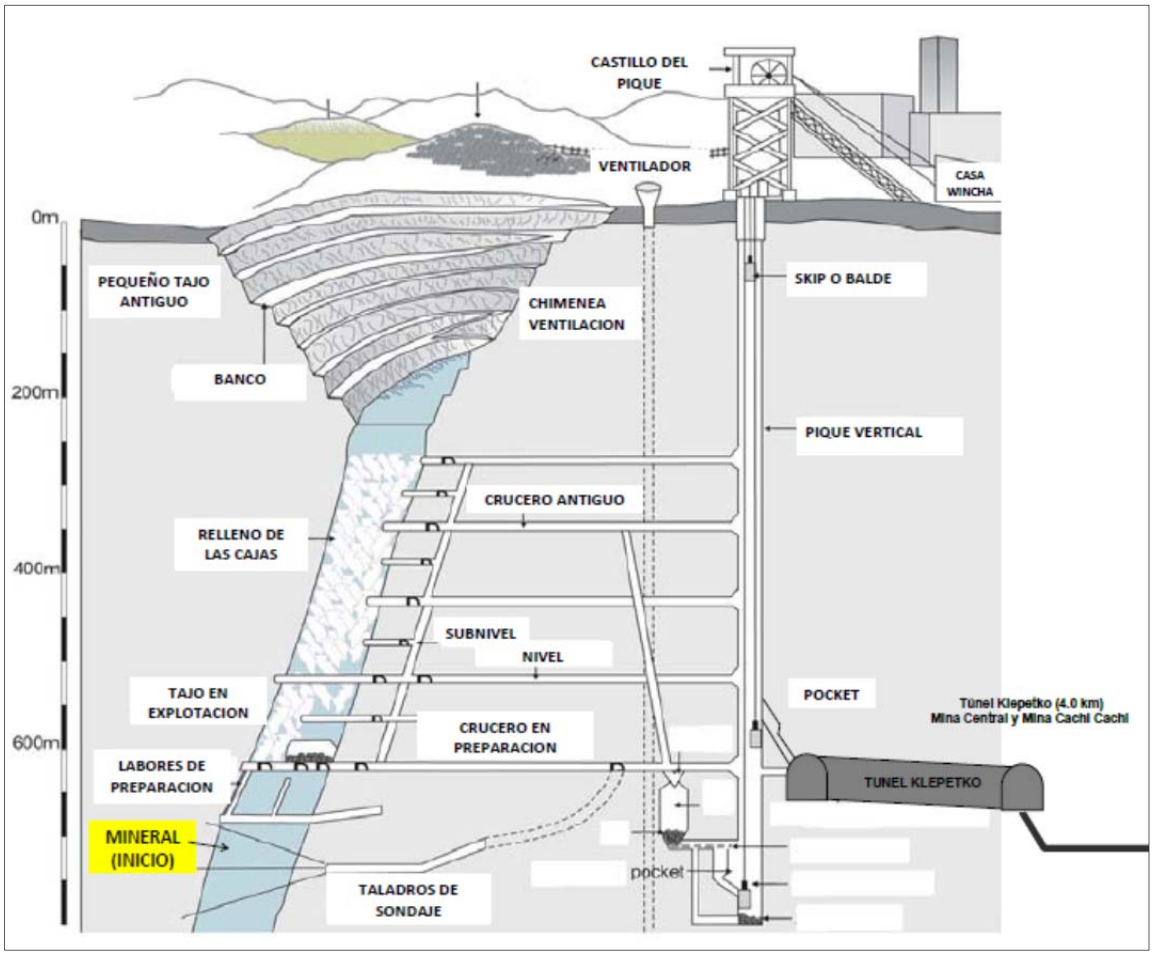


Figure 16-4 Yauricocha General Mining Flowsheet

16.2 Geotechnical Characteristics

The Catas, Antacaca, Rosaura and Antacaca Sur mineralized structures are controlled by a shear zone running NW-SE, parallel to the alignment of the Yauricocha Regional Fault, which is the predominant structure running along the contact between the limestone pertaining to the Jumasha formation and the shale pertaining to the Celendín (France Chert) Formation.

There are a number of folds in the vicinity of the Mina Central, among them the Purísima Concepcion Anticline and the France Chert Syncline, both trending N-W and with a plunge varying from 20° to 40° SE.

These folds produced longitudinal faults parallel to the predominant trend of the regional structure. Horizontal stresses following the placement of the intrusive body resulted in a shift of approximately 30° in the orientation of the sediments. As a result shear zones and fractures developed along the NW-SE trend but with a steeper plunge of 80°. This set of fractures forms a

stockwork across the different lithologic domains and controls the position of the mineralized structures.

The lithologic contacts between the limestones of the Jumasha Formation, the shale of the Celendín Formation and intrusive bodies are the most important and consistent feature in the ensuing folding, fracturing and placement of the mineralized solutions.

The breccias also follow the predominant orientation, are tabular in geometry and are present mostly in the limestones. These breccias constitute the main repository of the mineralized solutions at the Yauricocha Mine.

The Yauricocha Mine consists of four mineralized structures hosting massive sulphides and oxidized minerals.

The Catas deposit is a lenticular body deposited between the shale of the Celendín Formation (hangingwall) and limestone of the Jumasha Formation (footwall). Its largest dimensions occur when its elongated axis is vertical. It has been identified from surface down to Level 1320.

The Antacaca deposit is bound by the intrusive (hangingwall) and the limestone of the Jumasha (footwall). This structure presents the largest concentration of groundwater seepage. It has been identified from surface down to Level1270.

The Mascota orebody occurs mostly in the Jumasha limestones; in some exploration levels the contact with intrusive represents the hangingwall. The Mascota deposit has an E-W orientation; its length is approximately 90 m and its average thickness is 20 m. It has been identified from surface down to Level 1220.

16.3 Geomechanical Characteristics

A geomechanical characterization of the country and mineralized rocks following the Rock Mass Rating (RMR) resulted in 5 classes. The evaluation of different rock types and deposits was based on observations made at the surface and at the excavations located in the mine Levels 670, 720 and 770. The observations on the country rock were limited to the areas not affected by the sublevel caving method in order to rank its condition relative to its proximity to the mineralized structures. The results are summarized below:

Table 16-2 Geomechanical Units

Stratigraphic Unit	Lithologic Unit	RMR Values	Rock Type
Intrusive Stock	Monzonite	65	Rock Type II - GOOD
Jumasha Formation	Limestone	55	Rock Type III - AVERAGE
Celendín Formation	Silicified Shale	28	Rock Type IV - POOR
Orebody	Sulphides- Oxides	8 - 12	Rock Type V – VERY POOR

16.4 Excavation Design Parameters

The results of the geomechanical characterization process were utilized to derive the following parameters to be utilized in the design of underground excavations:

Table 16-3 Excavation Design Parameters by Geomechanical Units

Geotechnical Unit	RMR Avg	Time Self Support	Maximum Permissible Excavation	Comments
Unit I Intrusive	65	1 Month	4m x 4m x 4m (H)	Excavation dimensions not to be exceeded due to brittleness in the intrusive, shear zones and rockbursts in the vicinity of the Yauricocha fault
Unit II Limestone	55	5 Days	10m x 10m x 6m (H)	Considered the best unit for permanent workings, major excavations, tunnel and civil structures, at least 100 meters away from orebodies.
Unit III Breccia - Shale	28	1 Hour	3m (a) x 3m (h)	Recommended only for temporary workings as part of Sublevel Caving Method; Mechanical support is required for permanent structures
Unit IV Sulphides and Oxides	8	Immediate Collapse	3m (a) x 3m (h)	Recommended only for temporary workings as part of Sublevel Caving Method; not recommended for permanent or civil structures due to high stress concentrations

In an effort to put the results of the geomechanical characterization into practice at the Yauricocha Mine, a modified version of the RMR analysis was conducted in 2007 this time utilizing the Geological Strength Index (GSI), which is defined in the following equation:

$$GSI = RMR'89 - 5$$

The geomechanical units listed in Table 16-3 were related to ground conditions to facilitate the identification of potential hazards as well as to provide design and ground support guidelines for the production crews.

Two field conditions were defined to correlate the geomechanical units to actual field observations:

- Structure condition determined by the number of fractures per linear meter
- Strength of the rock as measured by a scaling bar or rock pick
- The modified geotechnical units are as follows:
- Geomechanical Unit I; Lightly Fractured Rock; 2-6 fractures per meter
- Geomechanical Unit II: Moderately Fractured Rock; 6 to 12 fractures per meter
- Geomechanical Unit III: Very Fractured Rock; 12 to 20 fractures per meter
- Geomechanical Unit IV: Highly Fractured or Crushed Rock; more than 20 fractures per meter

16.5 Production Plan

The mine production plan was developed by Yauricocha engineers and checked by Gustavson. As stated in the previous section, the production plan for mineable material covers 5 years of production of Proven and Probable Reserves, and Gustavson is of the opinion that this is appropriate for an underground mine with significant operating history. In the current mine production plan, there will be 857,000 tonnes of Proven and Probable Reserve remaining after 2019.

As an ongoing producer, Yauricocha has maintained good records especially during the tenure of Minera Corona.

In 2014, the total ore production at the Yauricocha Mining Unit was 929,316 tonnes, averaging 77,443, tonnes per month and 2,546 tonnes per day.

Of the total ore production, 81% was mined utilizing the mechanized sub-level caving method, 6% utilizing the conventional sub-level caving, 10% by means of ascending cut and fill with waste rock backfill and 3% with conventional square sets. This is summarized in Table 16-4.

Table 16-4 Monthly Production by Mining Method 2014

Mining Method	Mechanization	Production Tonnes/Month	Subtotal %	Total %
Overhand Cut and Fill	Conventional	6,118	7.9	10
	Mechanized	1,626	2.1	
Sub Level Caving	Conventional	4,879	6.3	86.8
	Mechanized	62,342	80.5	
Square Set	Conventional	2,478	3.2	3.2
Total		77,443	100	100

The mine plan includes 934,835 tonnes/yr of total ore divided between polymetallic, copper and oxide ores in the first year with annual tonnages staying consistent and moving more towards the polymetallic ores.

Table 16-5 details the production plan by mining zone, ore type and deposit type.

Table 16-5 Mine Production Plan by Ore Type

	2015	2016	2017	2018	2019	Total
Polymetallic Ores (tonnes)	722,723	565,418	606,052	696,762	714,012	3,304,967
Ag(oz/t)	2.83	1.92	1.60	1.40	1.33	1.82
Ag(g/t)	88.11	59.64	49.92	43.52	41.39	56.74
Pb(%)	1.79%	1.90%	0.79%	0.38%	0.27%	1.00%
Cu(%)	0.56%	0.50%	0.67%	0.58%	0.70%	0.60%
Zn(%)	4.20%	3.48%	2.60%	2.14%	2.54%	2.99%
Au(g/t)	0.78	0.75	0.77	1.36	0.93	0.93
Copper Sulfide Ores (tonnes)	9,000	219,957	125,327	110,187	112,863	577,334
Ag(oz/t)	2.76	1.12	1.04	0.86	1.06	1.07
Ag(g/t)	85.95	34.89	32.33	26.85	32.94	33.21
Pb(%)	0.63%	0.13%	0.12%	0.07%	0.04%	0.11%
Cu(%)	2.71%	1.39%	1.24%	1.87%	1.57%	1.50%
Zn(%)	1.41%	0.53%	0.47%	0.33%	0.54%	0.49%
Au(g/t)	0.61	1.05	0.84	0.62	0.69	0.85
Lead Oxide Ores (tonnes)	181,320	198,000	180,831	28,048	0	588,199
Ag(oz/t)	5.17	6.38	13.19	14.37	-	8.48
Ag(g/t)	160.85	198.4	410.29	446.87	-	263.81
Pb(%)	5.43%	6.46%	10.04%	3.30%	-	7.09%
Cu(%)	0.69%	0.49%	0.91%	1.86%	-	0.75%
Zn(%)	2.80%	1.69%	0.61%	0.65%	-	1.65%
Au(g/t)	1.16	1.73	1.87	0.18	-	1.52
Copper Oxide Ores (tonnes)	21,792	0	3,459	24,674	0	49,925
Ag(oz/t)	0.85	-	9.51	22.6	-	12.20
Ag(g/t)	26.54	-	295.92	702.92	-	379.49
Pb(%)	0.61%	-	7.81%	8.88%	-	5.20%
Cu(%)	4.85%	-	3.99%	4.37%	-	4.55%
Zn(%)	4.77%	-	0.66%	0.25%	-	2.25%
Au(g/t)	0.24	-	2.53	0.31	-	0.43
Grand Total (tonnes):	**934,835**	**983,375**	**915,669**	**859,671**	**826,875**	**4,479,870**
Ag(oz/t)	3.24	2.64	3.85	2.36	1.29	2.73
Ag(g/t)	100.76	82.04	119.61	73.47	40.24	85.01
Pb(%)	2.46%	2.42%	2.55%	0.68%	0.24%	1.74%
Cu(%)	0.71%	0.70%	0.81%	0.90%	0.82%	0.79%
Zn(%)	3.92%	2.46%	1.91%	1.81%	2.27%	2.51%
Au(g/t)	0.84	1.02	1.00	1.20	0.90	1.00
Metal Content						
Ag(oz)	3,028,474	2,593,912	3,521,214	2,030,619	1,069,677	12,243,896
Pb(tonne)	22,982	23,828	23,357	5,843	1,973	77,983
Cu(tonne)	6,597	6,854	7,393	7,702	6,770	35,316
Zn(tonne)	36,603	24,195	17,479	15,519	18,745	112,541
Au(oz)	25,223	32,094	29,547	33,073	23,853	143,790

16.6 Development Schedule

Table 16-6 shows the schedule for mine development work during 2015 through 2019. This will allow preparation for mining as well as underground access for development and infill drilling. Year 2015 and 2016 projected advances were done in detail with the final three years based on the average between 2014-2016. All costs are grouped into mine operating cost.

Table 16-6 Mine Development Schedule for Production Preparation and Exploration

		Programmed			Projected			Projected			Projected			Projected			Projected		
Advance		2014			2015			2016			2017			2018			2019		
Workings	Section	Exploration	Preparation	Total	Exploration	Preparation	Total	Exploration	Preparation	Total	Exploration	Preparation	Total	Exploration	Preparation	Total	Exploration	Preparation	Total
Raise	1.20 x 2.40	0	1,990	1,990	0	1,836	1,836	0	214	214	0	1,347	1,347	0	1,347	1,347	0	1,347	1,347
Raise	1.50 x 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raise	2.00 x 2.00	0	183	183	0	183	183	0	0	0	0	122	122	0	122	122	0	122	122
Crosscut	1.50 x 1.80	0	833	833	0	20	20	0	4	4	0	286	286	0	286	286	0	286	286
Raise	2.4 x 2.4	0	175	175	0	94	94	0	21	21	0	97	97	0	97	97	0	97	97
Cross Cut	2.80 x 2.80	0	158	158	0	0	0	0	0	0	0	53	53	0	53	53	0	53	53
Ramp	2.50 x 2.50	0	320	320	0	693	693	0	45	45	0	353	353	0	353	353	0	353	353
ramp	3.00 x 3.00	2,521	8,663	11,184	2,248	11,927	14,175	446	3,631	4,077	1,738	8,074	9,812	1,738	8,074	9,812	1,738	8,074	9,812
Cross Cut	2.40 x 2.40	560	1,196	1,756	0	0	0	0	0	0	187	399	585	187	399	585	187	399	585
Cross Cut	2.50 x 2.50	320	0	320	0	0	0	0	0	0	107	0	107	107	0	107	107	0	107
Crosscut	3.50 x 3.50	0	934	934	0	659	659	0	298	298	0	630	630	0	630	630	0	630	630
Chamber	3.80 x 4.00	0	38	38	0	71	71	0	14	14	0	41	41	0	41	41	0	41	41
Chamber	4.00 x 4.00	0	51	51	0	12	12	0	0	0	0	21	21	0	21	21	0	21	21
Chamber	5.00 x 5.00	0	4	4	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1
Total		**3,401**	**14,545**	**17,946**	**2,248**	**15,495**	**17,743**	**446**	**4,227**	**4,673**	**2,032**	**11,422**	**13,454**	**2,032**	**11,422**	**13,454**	**2,032**	**11,422**	**13,454**

17. RECOVERY METHODS

The process description of the two processing circuits is provided in Section 13. The PM circuit processes polymetallic ore and copper sulfide ore in campaigns, whereas, the lead oxide ore and copper oxide ore is treated in the oxide circuit.

17.1 Metallurgical Performance

The plant produces five concentrates; lead concentrate, copper concentrate and zinc concentrate in the polymetallic plant, copper concentrate (Campaña) and lead oxide concentrate in the lead oxide circuit. The sulfide lead concentrate from the oxide plant is combined with the sulfide lead in the polymetallic circuit. The copper oxide concentrate produced from the copper oxide ore is combined with the copper concentrate and the lead oxide concentrate produced from the copper oxide ore is combined with the lead oxide concentrate from the lead oxide circuit. The Chumpe mill is operating two milling circuits only, one treating polymetallic ore and one treating lead oxide ores. Current production of copper sulfide ore is being processed through the PM circuit. Copper ore is reported through the end of 2014.

The annual metallurgical data for the two milling circuits are given in Table 17-1 to

Table 17-4. Figures in boldface refer to payable metals. There was no copper sulfide ore processed in 2014.

The PM plant processed approximately 10% more tonnage in 2014 as compared to 2013;

- The metals recovery appears to be consistent between the two years.
- The silver losses to the tailings are less than an ounce/tonne;
- The silver losses in the lead oxide tailings is significant but are improving;

Table 17-1 Polymetallic Circuit Products, PM Ore

Year 2014									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	703,712	83.77	1.79	0.70	3.95	100	100	100	100
Cu Conc.	12,781	1115.00	2.11	26.37	6.82	24.17	2.13	67.96	3.13
Pb Conc.	18,055	1397.88	58.63	1.45	4.90	42.81	83.89	5.26	3.18
Zn Conc.	48,657	114.91	0.80	1.35	50.58	9.48	3.07	13.21	88.45
Tails	624,219	22.22	0.22	0.11	0.23	23.53	10.91	13.66	5.23
Ratio			3898	55.06	14.46	0.00	0.00	0.09	0.00
Year 2013									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	641,268	83.20	1.48	0.65	4.05	100	100	100	100
Cu Conc.	1,2728	**1057.78**	2.75	**23.21**	6.38	**25.23**	3.68	**70.60**	3.12
Pb Conc.	14,258	**1299.98**	**53.38**	1.84	5.90	**34.74**	**79.97**	6.27	3.24
Zn Conc.	45,412	**122.12**	0.62	1.00	**50.76**	**10.39**	2.95	10.83	**88.66**
Tails	568,869	27.79	0.22	0.09	0.23	29.63	13.40	12.35	4.98
Ratio			44.97	50.38	14.12	0.00	0.00	0.04	0.00

Table 17-2 Polymetallic Circuit Products, Copper SulfideOre

Year 2013									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	3,215	109.07	0.99	3.25	2.21	100.00	100.00	100.00	100.00
Cu Conc.	355	**605.29**	4.30	**20.66**	16.59	**61.27**	48.11	**70.29**	83.01
Tails	2,860	47.47	0.57	1.08	0.41	38.72	51.49	29.71	16.46
Ratio				9.06		-0.01	0.40	0.00	-0.52

Table 17-3 Lead Oxide Circuit Products, PbOx Ore

Year 2014									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	171,829	233.61	9.00	0.53	1.58	100.00	100.00	100.00	100.00
Sul. Conc	2,231	**2,494.28**	**27.54**	2.13	13.54	**13.86**	**3.97**	5.25	11.12
Ox. Conc.	20,082	**737.15**	**49.19**	0.40	0.68	**42.97**	**66.52**	9.48	5.66
Tails	149,515	131.98	3.33	0.52	1.52	57.28	33.48	90.20	94.10
Ratio			11.45			0.26	0.00	-0.32	-0.24
Year 2013									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	196,228	277.81	7.71	0.64	1.69	100.00	100.00	100.00	100.00
Sul. Conc	2,603	**2368.51**	**23.81**	2.66	11.57	**11.31**	**4.10**	5.54	9.11
Ox. Conc.	17,152	**835.85**	**50.01**	0.55	1.30	**29.72**	**59.12**	7.93	7.43
Tails	176,473	192.73	3.36	0.61	1.57	70.50	40.88	91.81	92.34
Ratio			9.93			0.22	0.00	-0.25	-0.23

Table 17-4 Copper Oxide Circuit Products, CuOx Ore

Year 2014									
Product	Mass (m-tons)	Assays				Recoveries			
		Ag (g/t)	Pb (%)	Cu (%)	Zn (%)	Ag (%)	Pb (%)	Cu (%)	Zn (%)
Head	14,873	91.63	3.04	3.09	1.97	100.00	100.00	100.00	100.00
Pb Ox. Con	530	**655.80**	**24.21**	6.91	3.95	**25.50**	**28.37**	7.97	7.15
Cu. Conc.	970	**340.12**	10.75	**18.57**	1.91	**24.21**	23.05	**39.20**	6.31
Tails	13,373	51.23	1.64	1.82	1.89	50.27	48.57	52.83	86.10
Ratio			28.06	15.33		-0.02	0.00	0.00	-0.44

17.2 Gold

Gold is present in Yauricocha ores but until recently it has not been routinely analyzed and tracked through the mill circuits. Gold payments are made for all of the concentrates except for the zinc. Gold assays are not reported for 2013 and 2014. Based on conversations with the process plant, and on head grade and payable metal determinations from 2013-2014, the following gold recovery assumptions are used:

17.2.1 Impurity Elements

Impurity elements are not routinely analyzed and tracked through the mill circuits but are assayed for in final concentrates. Average values for 2014 materials are listed in Table 17-5. There is minor variability in the levels of impurity elements from year to year, depending on the mix of ore presented to the mill.

Table 17-5 Impurity Elements in Concentrates, 2014 Averages

Concentrate	As(%)	Sb(%)	Bi(%)	Pb+Zn(%)	As+Sb(%)	Fe(%)	Mn(%)
Lead Sulphide	0.30	0.12	0.18	---	---	---	---
Copper (polimetalico)	**1.80**	**0.18**	**0.15**	**9.548**	---	---	---
Zinc	---	---	---	---	0.11	8.13	**0.35**
Lead Oxide	0..22	0.06	0..05	---	---	---	---

Figures in **Bold** exceed penalty minimums.

17.3 Operating Costs

Chumpe Mill operating costs summaries were provided for 2012 through 2014. Costs are incurred in Peruvian soles, which have been converted to US dollars. Table 17-6 lists operating costs for the Chumpe mill for 2012, 2013, and 2014.

Reported operating costs, not including equipment depreciation charges, amounted to $9.3 million or $10.68/tonne treated in 2012, $9.6 million or $11.44/tonne treated in 2013, and $9.3 million or $10.47/tonne treated in 2014.

Table 17-6 Mill Operating Costs

Item	2012		2013		2014	
Tonnes Treated	872869		840711		890910	
Soles/$	2.64		2.7		2.84	
	2012		2013		2014	
Item	Cost($)	Unit Cost ($/t)	Cost($)	Unit Cost ($/t)	Cost($)	Unit Cost ($/t)
Wages & Burden	$ 1,764,550	$ 2.02	$ 1,849,858	$ 2.20	$ 1,773,299	$ 1.99
Grinding Media	$ 860,729	$ 0.99	$ 1,192,750	$ 1.42	$ 1,049,340	$ 1.18
Reagents & Consumables	$ 3,418,981	$ 3.92	$ 3,166,161	$ 3.77	$ 2,915,231	$ 3.27
Power	$ 1,593,915	$ 1.83	$ 1,740,196	$ 2.07	$ 2,065,357	$ 2.32
Maintenance Supplies	$ 1,304,448	$ 1.49	$ 290,980	$ 0.35	$ 236,691	$ 0.27
Laboratory Charges	$ 95,978	$ 0.11	$ 138,937	$ 0.17	$ 117,482	$ 0.13
General Costs	$ 284,215	$ 0.33	$ 1,238,384	$ 1.47	$ 1,170,417	$ 1.31
Total	**$ 9,322,816**	**$ 10.68**	**$ 9,617,266**	**$ 11.44**	**$ 9,327,818**	**$ 10.47**

17.4 Conclusions & Recommendations

The Chumpe Mill is a stable plant that uses conventional methods to produce as many as five separate concentrates for sale. Available data indicate that, with expansions and process modifications taken into account, the mill performance has been stable for several years, and steadily improving despite drop in feed grade. As long as process inputs such as mill tonnages, tenors and mineralogical characteristics remain constant, metallurgical recoveries and performance are not expected to change significantly.

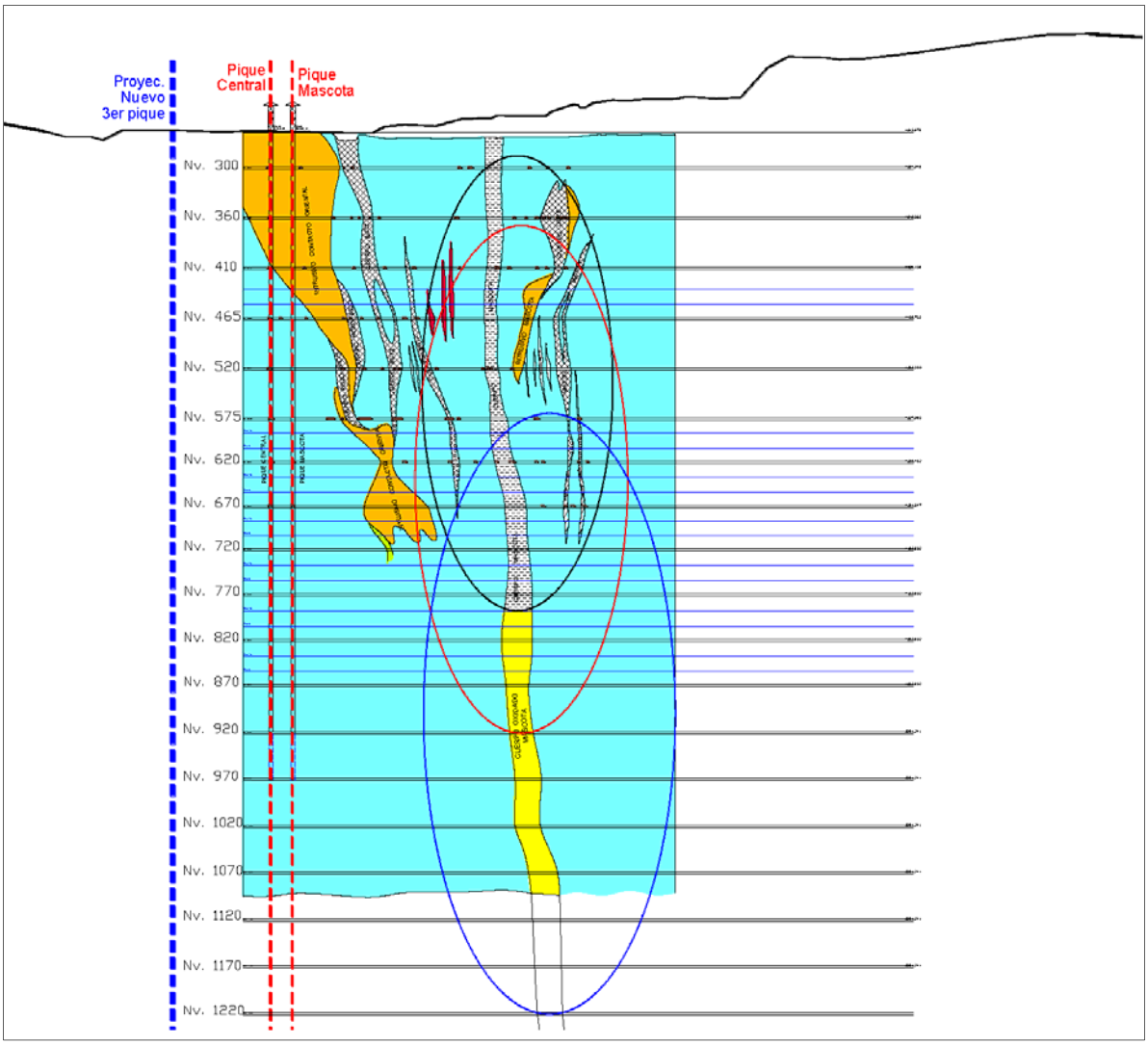
- Automatic samplers are in use at the Chumpe Mill but no on-stream analyzers, grinding circuit particle size monitors or other real-time instrumentation is in use. The applicability of such instrumentation, coupled with computerized controls of the various mill circuits, such as grinding mill feed speeds and feed rates, pump sump levels and reagent feed rates should be investigated. Possible benefits would include cost savings and process improvements.
- Periodic audits should be undertaken to ensure improved performance in the milling circuit;
- Laboratory testing should be undertaken to investigate reagents, process parameters, etc., to improve gold and silver recoveries in the two circuits.

18. PROJECT INFRASTRUCTURE

18.1 Mine Access

Two shafts are currently in service at the Yauricocha Mine, Pique Central and Pique Mascota. The Pique Central services Levels 970 to 690, has a depth of 810 m and a hoisting capacity of 74 tonnes/hr for ore and 67 tonnes/hr for waste. The Mascota shaft services Levels 1100 to 680, its depth is 920 m and has a hoisting capacity of 135 tonnes/hr for ore and 110 tonnes/hr for waste.

The sub-level caving is causing some subsidence that is already lightly affecting the Central and Mascota shafts and this will continue in the future. New access to the lower orebodies is being constructed. The new Yauricocha tunnel is expected to be completed by the end of 2015 and the Yauricocha shaft will be completed by 2017.



Source: Sierra Metals - 2013

Figure 18-1 Location of the Two Shafts

Currently primary haulage is conducted via railway through the Klepetko Tunnel located at Level 720. The tunnel has a section of 3 m x 3 m, is 4 km long and is equipped with 20 tonne trolley locomotive hauling ore cars of 110 to 160 ft^3 capacity.

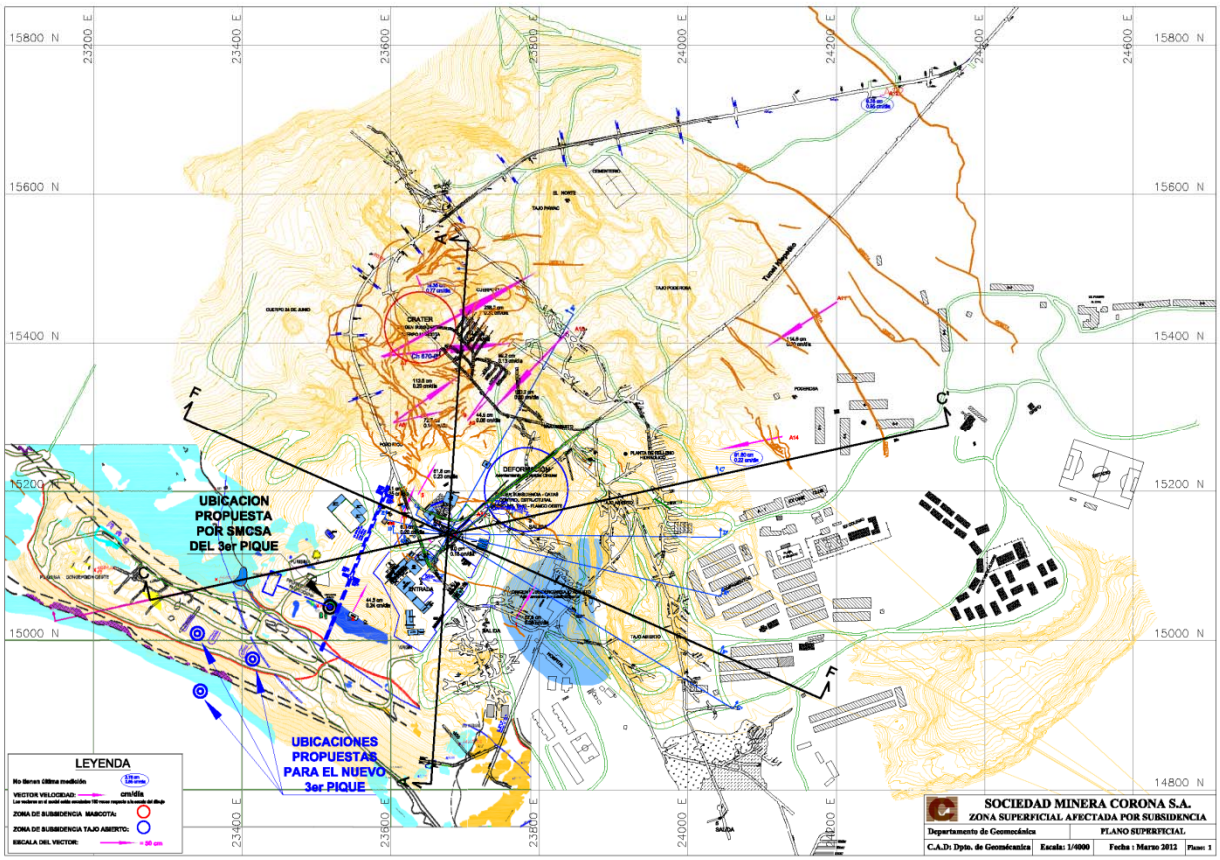


Figure 18-2 Plan View of Mining Area

18.2 Electric Power

The electric energy is supplied from the National Interconnected System (SINAC, by its Spanish acronym), in a voltage level of 69 kV. It is received in the substation at Chumpe. The physical electric line 601 comes from the city of La Oroya, from the substation administered by the company SN Power S.A., through its subsidiary, Electroandes S.A.. The total power installed is 12.75 mVA for mine and plant.

18.3 Housing and Offices

Workers live at three onsite camps with facilities for 2,000 people. One camp houses supervisory personnel, one houses process employees and one houses miners and mining contractors. Approximately 1,600 workers are currently employed at the Yauricocha project.

There is adequate constructed space for engineering and administration needs on site including project management, mine and plant management, engineering and geology, safety, and environmental groups. A health clinic is manned by a doctor assigned each year from the National Health Service.

18.4 Tailings Storage

The phase 4 tailings dam was expansion was completed in 2014 which provides tailings capacity through 2019.

The project infrastructure has been gradually modified based on project needs during the mine life, and Gustavson is of the opinion that it will be adaptable to current and future infrastructure needs.

18.5 Concentrate Transportation

Concentrates produced by the mine are transported overland by truck to the refinery. Costs for transportation, insurance, and related charges are included in the treatment costs for concentrates.

19. MARKET STUDIES AND CONTRACTS

19.1 Markets

The commodities produced by Yauricocha, gold, silver, lead, zinc, and copper, are all traded on various metals exchanges around the world. These markets are highly liquid and not dependent on long-term contract pricing for producers. Accordingly, historic market prices have been used to estimate future pricing. Current contracts include adjustment factors for these prices and no further consideration of market or sales limits has been considered within this report.

19.2 Metal Pricing

Gustavson generally uses 3 year trailing average pricing for economics analysis for metals mining projects. However, with recent changes in the metals markets, it is noted that these averages are significantly higher than current market prices, particularly for silver, gold, and copper. Accordingly, we have used a 6-month trailing average price as a proxy for spot. (As of the effective date of the report, metals pricing in US dollars is experiencing significant volatility, so a 6-month average is considered more indicative of spot prices over a reasonable timeframe.)

No escalation of metals prices is considered for this report.

Table 19-1 Metals Price Assumptions

Metal	Units	Price	3 Yr. Trailing
Silver	$/OzT	18.10	24.70
Lead	$/lb	0.95	0.95
Copper	$/lb	3.02	3.35
Zinc	$/lb	0.91	0.91
Gold	$/OzT	1241.00	1340.00

19.3 Contractual Treatment Charges and Refining Charges

Yauricocha produces metal concentrates rather than refined metals. These concentrates are processed by a smelter in Peru with treatment and refining charges agreed to in advance under annual contracts. Gustavson has reviewed these contracts and confirms that the contracts for shipping and refining these concentrates are typical of similar operations. Current contracts include adjustment factors for metal prices and concentrate quality on a shipment by shipment basis.

Each concentrate produced by Minera Corona is subject to processing charges for the treatment of the concentrate and the final refinement of the metals contained therein. These costs were estimated from the current contracts and from the projected qualities of the concentrates estimated to be produced. These contracts are renewed on at least an annual basis; their terms are

assumed to continue and no escalation of their provisions was included. These contracts have been renewed previously and no material changes are expected with renewal.

Disclosure of specific charges and rates is limited by the contract language.

20. ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 Permits

A list of permits for the Yauricocha project is provided in Table 20-1.

Table 20-1 List of Permits for Yauricocha Project

Agency	Permit No.	Status	Rights Granted
General Direction of Security Control Services, Arms, Ammunitions and Explosives Control for Civil Use – DICSCAMEC	Directorial Resolution N° 3134/2009-IN-1703-2	Current	License for operation of one (01) Type A (Subterranean) powder keg for the storage of explosives, located in the District of Alis, in the Yauyos Province, in the Department of Lima
General Direction of Security Control Services, Arms, Ammunitions and Explosives Control for Civil Use – DICSCAMEC	Directorial Resolution N° 4673/2009-IN-1703-2	Current	License for operation of one (01) Type A (subterranean) Powder magazine for the storage of Blasting Accessories, located in the District of Alis, in the Yauyos Province, in the Department of Lima
General Direction of Security Control Services, Arms, Ammunitions and Explosives Control for Civil Use – DICSCAMEC	Directorial Resolution N° 755-2011-IN-1703-2	Current	Global Authorization for the acquisition and use of the following items: (i) Fleet of safety fuse, (ii) Detonating Cord, (iii) Non electric Cord, (iv) Dynamite, (v) Quickmatch
Technical Office of the National Authority of the Peruvian Nuclear Energy Institute - IPEN	License N° 4319.C2	Current	License for the use of fixed nuclear gauges with Cesium 137 in the Yauricocha unit
Peru National Authority of Water and Management of Water Resources	Directorial Resolution No. 017-2013-ANA-DGCRH	Current	Discharge of treated wastewater
Ministry of Agriculture	Administrative Resolution No. 042-2004-AG-DRA-LC/ATDR-MOC	Current	Use of water extracted from the Klepetko Tunnel at a rate of 40 l/s

20.2 Potential Environmental Impacts

20.2.1 Protected Natural Areas

Acumulación Yauricocha is located within the buffer zone of a Protected Natural Area ("PNA") called "Reserva Paisajística Nor Yauyos Cochas". The PNA is the mainland and/or marine spaces of the national territory expressly recognized and declared as such, including its categories and zonings, for the conservation of biological diversity and other associated values of cultural, scenic and scientific interest, as well as for their contribution to the sustainable development of the country.

The areas adjacent to the PNA are considered buffer zones which comprise the National System for Protected Natural Areas for the State ("SINANPE"), which due to their nature and location require a special treatment in order to ensure the conservation of the protected area.

The activities conducted in the buffer zones shall not endanger the achievement of the PNA goals. As a general rule, the approval of environmental studies of mining exploration activities required within a PNA or within its buffer zone, is subject to approval by the National Natural Resources Institute ("INRENA"). However, since this PNA "Reserva Paisajística Nor Yauyos Cochas" has been created after the approval of the PAMA for the Yauricocha unit, the Company does not have the obligation to require the aforementioned favorable opinion

20.2.2 Air

Sierra Metals conducts quarterly air monitoring at a location south and west of the onsite Chumpe Mill (Equas, 2012a, 2012b, 2012c, and 2012d). This monitoring location is identified as "704" and is located at the UTM coordinates of 8,641,350 meters North, 424,300 meters East. Air monitoring parameters, along with the maximum detected concentration in 2014, are shown in Table 20-1. As shown in Table 20-1, all air monitoring results were below the reporting standards. The results are reported on a quarterly basis to the Peruvian environmental regulation agency (Programa de Adecuacion y Manejo Ambiental).

Table 20-2 Summary of Air Monitoring Results from 2014

Parameter	Most Stringent Standard	Maximum Detection in 2014
Particulate Matter (10 micron) ($\mu g/m^3$)	70	27
Lead ($\mu g/m^3$)	1.5	<0.005
Arsenic (ug/m3)	6	<0.005
Cadmium ($\mu g/m^3$)	0.002	<0.02
Copper ($\mu g/m^3$)	None	0.107
Zinc ($\mu g/m^3$)	None	0.269

20.2.3 Water

At Yauricocha project, domestic water is drawn from the Uñascocha Lake and Ococha Lake. Domestic wastewater is collected from the mining camp and mill camp. Domestic wastewater is treated at one of two wastewater treatment plant by activated sludge.

Industrial water is used primarily at the Chumpe Mill, and small quantities of water are used for dust control at the mine operations. Water for industrial use is drawn from groundwater extracted from the Cachi Cachi Underground Mine and conveyed via the Klepetko Tunnel, overflow water collected from the tailings dam, and additional make up water from Uñascocha Lake and Ococha Lake. Wastewater from the Chumpe Mill is treated at the Klepetko wastewater treatment plant.

The Klepetko industrial wastewater treatment plant has a capacity of 4,500 gallons per minute. Treated effluent is reused in the Chumpe Mill, with any excess water discharged to the Chumpe River, a tributary to the Tinco River. Sludge generated from the Klepetko wastewater treatment plant is disposed of at the tailings pile. Per federal requirements, Minera Corona reports the quantity of generated sludge to the Peru Ministry of Energy and Mines. Released water is limited annually to a total of 10,091,520m^3 at a quality at least equal to the basin of the Rio Tinco. Measurements are required for pH, oxygen, hexavalent chromium, WAD cyanide, and free cyanide as well as total concentration of arsenic, cadmium, copper, mercury, lead, selenium, and zinc.

Under its permit with the Peruvian federal government, Minera Corona is required to conduct monthly water sampling for effluent water quality, to be reported on a quarterly basis. These three sample locations are shown on Figure 20-1. These three locations are:

- Location 705 is located at UTM 8,641,900 meters North and 424,850 meters east. This location is to monitor treated wastewater effluent quality from the Klepetko industrial wastewater treatment plant.
- Location 707 is located at UTM 8,642,250 meters North and 424,650 meters east. This location is located downstream of the 705 sampling location, and is intended to monitor water quality at Tinco River.
- Location 708 is located at UTM 8,638,500 meters North and 421,400 meters east. This monitoring location is the water supply tank to the mine.

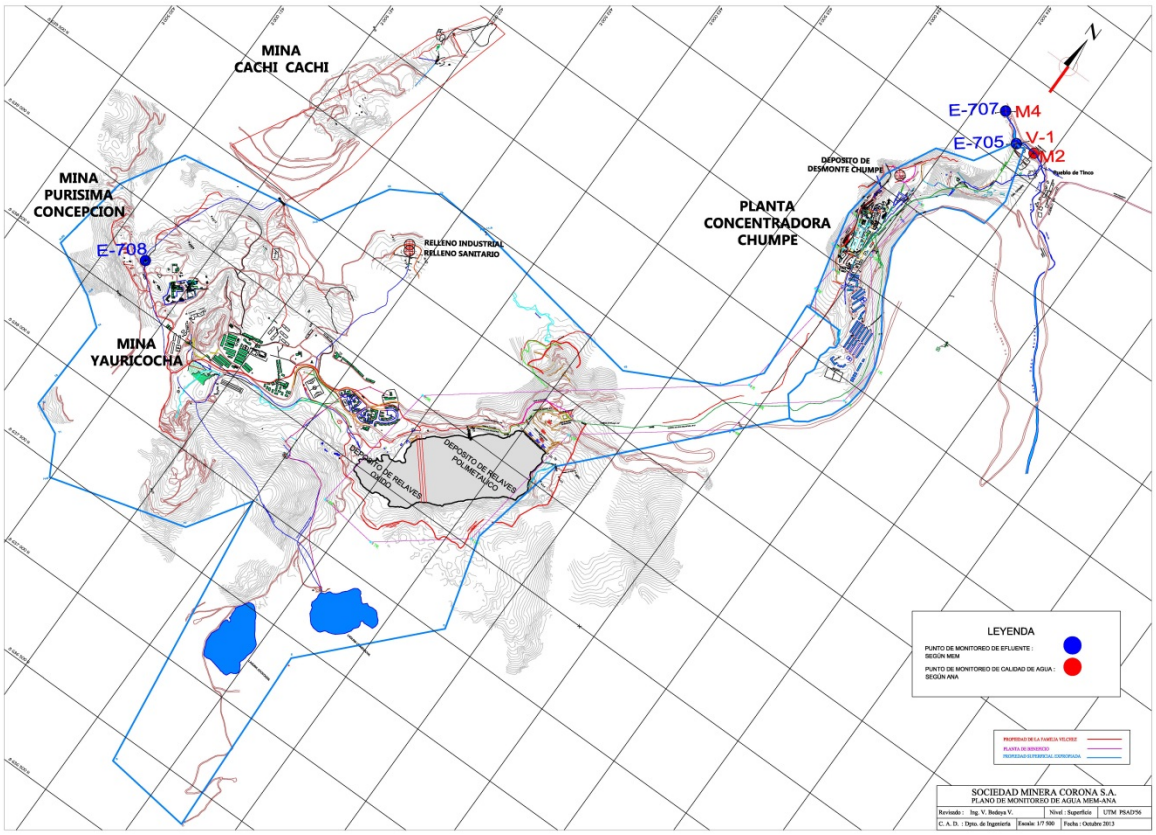


Figure 20-1 Water Effluent Monitoring Locations

Results from the 705 and 707 were evaluated together, as these samples represent water quality impact from the Klepetko wastewater treatment plant. Analytical results from the 705 location were compared to the federally set maximum permissible limits for discharge from mining and metallurgical activities: as shown in Table 20-2, no exceedances of limits were noted.

Table 20-3 Summary of Water Monitoring in Location 705 in 2014

Parameter	D.S. N° 010-2010-MINAM	705 - Maximum Detection in 2014	No. Exceedances in 2014	Expreseed in:
pH	6-9	8.90	0	Unid. de pH
Total suspended solids	50	5	0	mg/l
Oil and grease	20	<0.5	0	mg/l
Lead	0.2	0.03	0	mg/l
Zinc	1.5	0.547	0	mg/l
Dissolved iron	2	0.11	0	mg/l
Arsenic	0.1	0.081	0	mg/l
Mercury	0.002	0.0009	0	mg/l
Cadmium	0.05	<0.002	0	mg/l
Copper	0.5	0.120	0	mg/l
Hexavalent chromium	0.1	<0.01	0	mg/l
Total cyanide	1	0.085	0	mg/l

Analytical results from Location 707 are compared to risk-based exposures based on vegetable irrigation and animal consumption pathway. As shown in Table 20-3, of the 12 monthly samples that were reported in 2014, pH was detected above the standards for surface water consumption, but below the mine standards upper limit of pH at 9. Dissolved oxygen was also detected outside of the acceptable standards.

Table 20-4 Summary of Water Monitoring in Location 707 in 2014

Parameter	ECA's Categoría 3* D.S. N° 002-2008-MINAM	707 - Maximum Detection in 2014	No. Exceedances in 2014	Expreseed in:
pH	6.5-8.4	8.4	0	Unid. pH
Conductivity (uS/cm)	≤5,000	420	0	uS/cm
Total suspended solids	No standard	5	Not applicable	mg/l
Reactive cyanide	0.1	<0.005	0	mg/l
Dissolved oxygen	>5	7.8	0	mg/l
Biological oxygen demand	≤15	3	0	mg/l
Arsenic	0.1	0.018	0	mg/l
Cadmium	0.005	<0.002	0	mg/l
Copper	0.5	0.026	0	mg/l
Hexavalent chromium	0.1	<0.01	0	mg/l
Mercury	0.001	0.0007	0	mg/l
Lead	0.05	0.01	0	mg/l
Selenium	0.05	0.002	0	mg/l
Zinc	24	0.120	0	mg/l

All detections in the 708 sample were below the maximum permissible limits for discharge from mining and metallurgical activities: as shown in Table 20-5, no exceedances of limits were noted.

Table 20-5 Summary of Water Monitoring in Location 708 in 2014

Parameter	D.S. N° 010-2010-MINAM	708 - Maximum Detection in 2014	No. Exceedances in 2014	Expreseed in:
pH	6-9	8.5	0	Unid. de pH
Total suspended solids	50	<3	0	mg/l
Oil and grease	20	<0.5	0	mg/l
Lead	0.2	<0.01	0	mg/l
Zinc	1.5	0.110	0	mg/l
Dissolved iron	2	<0.01	0	mg/l
Arsenic	0.1	0.008	0	mg/l
Mercury	0.0020	0.0016	0	mg/l
Cadmium	0.05	<0.002	0	mg/l
Copper	0.5	0.017	0	mg/l
Hexavalent chromium	0.1	<0.01	0	mg/l
Total cyanide	1	0.044	0	mg/l

The water discharge permit was revised by the Peruvian National Water Authority (Autoridad Nacional del Agua) in January 2013 (CNA, 2013). The number of metals required for analysis was increased, including manganese. In a report completed by Ego-Aguirre & Smuda (2012), manganese is reported to be present in the effluent at levels above discharge limits.

20.2.4 Domestic Solid Waste

According to SMC (2011), solid waste generated from the Yauricocha project includes domestic waste from the camps. Domestic solid waste is disposed of at the onsite municipal landfill. This landfill was constructed in 1997 by the Peruvian central government (Centromin Peru S.A.) and operated under a permit approved by the Peru Ministry of Energy and Mines, Environmental Compliance and Management Production. This landfill has an expected lifespan of 20 years.

20.2.1 Industrial Solid Waste

Industrial solid waste, including waste oil, scrap metal, plastic, and paper are collected and taken offsite for recycling by a licensed solid waste processing unit. Per federal requirements, Minera Corona reports the quantity of generated waste oil, and scrap metal to the Peru Ministry of Energy and Mines.

20.2.2 Mine Waste and Tailings

Mine waste rock is utilized for backfill in the underground mine workings, and as such, waste rock piles are not being generated during Minera Corona's mining activities.

Tailings are generated from the Chumpe Mill. In accordance with Peru's Ministry of Energy and Mines, Sierra Metals is required to report the quantity of tailings generated on an annual basis. In 2014, Sierra Metals generated approximately 787,000 dry metric tons, or approximately 65,600 dry metric tons of tailings per month. The tailings undergo flocculation and settling, then settled in a thickener and piped in a southwesterly direction to the existing tailings dam. Per federal requirements, Minera Corona reports the quantity of generated tailings to the Peru Ministry of Energy and Mines.

Operation of the existing tailings dam is permitted by the Peru Ministerio de Energía y Minas. The permitted tailings dam has a total capacity of 10 million tons, based on 4 expansion phases. The fourth expansion was completed in 2014.

20.2.3 Closure Plan

Sierra Metals commissioned Cesel S.A. to prepare a Mine Closure Plan in 2006. Following subsequent correspondence with the Peru Ministry of Energy and Mines, the Mine Closure Plan to and approved by the Peru Ministry of Energy and Mines in August 2009. Under requirements by the Peru Ministry of Energy and Mines, Sierra Metals is required to restore disturbed areas to

pre-mining conditions, treat acid mine drainage, and conduct post-closure maintenance and monitoring.

The approved closure plan contained a closure budget of approximately $10 million, and an annual assurance of mine closure obligation of $1.4 million. This obligation is recalculated each year and a bond is posted annually with the Ministry of Mining to maintain closure funding up to date.

Additionally, since 2010, Sierra Metals spent approximately $820,000 towards progressive mine closure activities.

20.2.4 Summary of Environmental Impact

Based on information reviewed by Gustavson, potential environmental impacts from onsite mining and processing activities are managed by existing permits and requirements with the proper regulatory agencies.

20.3 Social and Community Impact

Several communities are located within or near the area of the Yauricocha project (as defined by the extent of the project mineral concessions) – these towns include Tinco, Huancachi, Tomas, Alis, and Laraos.

Sierra Metals has developed a Community Relations Plan describing the principles of responsibilities to the community. Assistance is given to develop sustainable economic activities, support community institutions and establish programs of health and education. Additionally, donations are made to support direct requests, Christmas celebrations, Mothers' Day celebrations and sporting events.

Projects implemented during 2014 included:

- Construction of steel bridges at Lloclla, Cantuchaca and Piscigranja;
- Improvements to irrigation systems at Chupurume and Sinhua;
- Provided small quantity of livestock for Tomas and breeding services for Alis;
- Provided material for fencing of pastures;
- Assisted sowing of pastures; and,
- Provided office equipment and farming equipment for Laraos.

Sierra Metals has provided Gustavson with a summary of community investment in 2015. Over $250,000 will be distributed among the local communities in line with the Community Relations Plan.

Gustavson is aware of ongoing discussions with the Huancachi community following concerns of contamination, pending investment support and the behavior of previous community leaders.

The Company has strenuously denied these complaints and argues that the bases for these complaints are false statements from third parties. Notwithstanding this, the Company is proactively utilizing the Ministry of Energy and Mines to mediate a formal resolution expeditiously. This situation does not affect mine operations.

21. CAPITAL AND OPERATING COSTS

21.1 CAPEX for Major Infrastructure

There are several capital expenditures that are expected within the next 5 years. Of the capital projects that are scheduled between now and 2019 most will be completed by the end of 2015. These projects include completing the new Yauricocha tunnel, updating the Mascota lifting chamber, extending the Cachi Cachi shaft, and completing the Mascota loading pocket at level 1100. The new Yauricocha shaft is scheduled to be completed in 2017.

21.2 Working Capital

Working capital has been included in the estimate in order to replace and rebuild existing equipment.

21.3 Capital Cost Estimate

The capital cost estimates for Yauricocha mining unit were provided by SMC personnel based upon expectations of capital needed to maintain current operating levels and efficiencies.

The following table summarizes these capital items:

Table 21-1 Annual Capital Costs (Thousands of US Dollars)

	2015	2016	2017
Yauricocha Tunnel	$ (2,700)	$ -	$ -
Yauricocha Shaft	(3,723)	(3,773)	(6,109)
Mascota Hoist Chamber	(1,117)	-	-
Cachi Cachi Shaft	(132)	-	-
Mascota Loading Pocket	(165)	-	-
Sustaining Capital	(2,713)	(2,500)	(2,500)
Environmental & Closure Costs	(120)	(120)	-
Total Capital Costs	$ (10,669)	$ (6,393)	$ (8,609)

21.4 Operating Cost Estimates (OPEX)

21.4.1 Mining OPEX

Mine operating costs are estimated based on the results of operations from 2014, since the projected operations are similar in size and operating parameters to those of 2014.

In 2014, the total ore production at the Yauricocha Mining Unit was 929,316 tonnes, averaging 77,443 tonnes per month and 2,546 tonnes per day. Of the total ore production, 81% was mined utilizing the mechanized sub-level caving method, 6% utilizing the conventional sub-level caving, 10% by means of ascending cut and fill with waste rock backfill and 3% with conventional square sets.

Table 21-2 Mining Methods at Yauricocha

Mining Method	Mechanization	Production Tonnes/Month	Subtotal %	Total %
Overhand Cut and Fill	Conventional	6,118	7.9	10
	Mechanized	1,626	2.1	
Sub Level Caving	Conventional	4,879	6.3	86.8
	Mechanized	62,342	80.5	
Square Set	Conventional	2,478	3.2	3.2
Total		77,443	100	100

The productivity of the mechanized sub-level caving method averages 20 tonne/man-shift and far exceeds the other mining methods as illustrated in Figure 21-1. The mining cost of the mechanized sub-level caving averages $10.81/tonne, significantly below the unit cost for the other mining methods (Table 21-3). An additional $5.89 per tonne of ore is assigned equally to all mining methods to cover mining indirect costs and ore haulage.

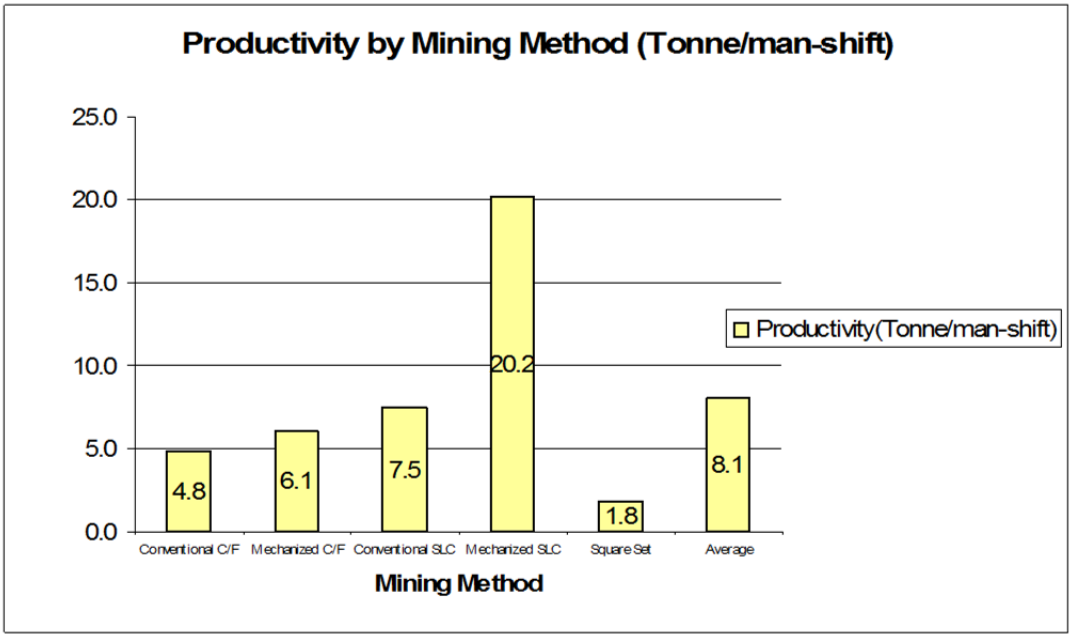


Figure 21-1 Productivity by Mining Method

Table 21-3 Mining Cost by Mining Method

Description	Conventional Cut and Fill	Mechanized Cut and Fill	Conventional Sub Level Caving	Mechanized Sub Level Caving (no water)	Mechanized Sub Level Caving (little water)	Mechanized Sub Level Caving (with water)	Square Set
Productivity Tonne/man-shift	4.8	6.1	7.4	20.1	20.1	20.1	1.8
Preparation Cost $/Tonne	11.7	4.25	13.15	10.57	10.19	17.8	7.81
Exploitation Cost $/Tonne	21.05	18.56	12.13	11.07	10.59	10.77	37.72
Services Cost $/Tonne	15.13	6.05	4.25	1.31	1.29	2.17	15.16
Total Cost $/Tonne	47.88	28.86	29.53	22.95	22.07	30.74	60.69

Minera Corona employs a total of 388 workers at the mine and plant. However, the vast majority of the work force (1,244 workers) is hired by four contractors. The transportation of concentrate and exploration work is contracted to two firms. Likewise, the security, transportation of personnel, civil and environmental work is carried out by contractors. The total work force at Yauricocha consists of 1,632 workers. The company is union-free.

The mine operates two shifts of approximately 10 hours per shift 7 days a week with workers working 14 days on and 7 days off, to mine and transport ore material. No significant variation from the operating areas, operating efficiencies and work flow are projected.

No escalation of costs of the Mine Department has been projected.

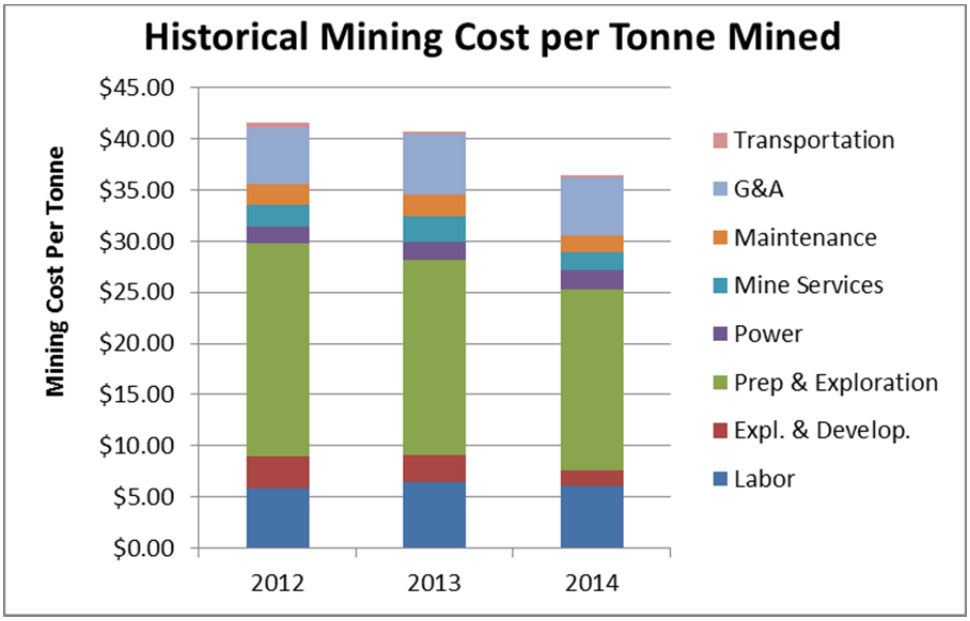


Figure 21-2 Mine Cost Elements

21.4.2 Processing Plant and Freight OPEX

Plant operating costs are estimated based on the results of operations from 2014, since the projected operations are similar in size, design and operating parameters to those of 2014. The plant operates three 8 hour shifts 7 days a week, with workers normally working 14 days on and 2 days off per rotation, to process ore material and ship the resulting concentrates. No significant variation from the operating areas, operating efficiencies and work flow are projected.

No escalation of costs of the Process Plant Department has been projected.

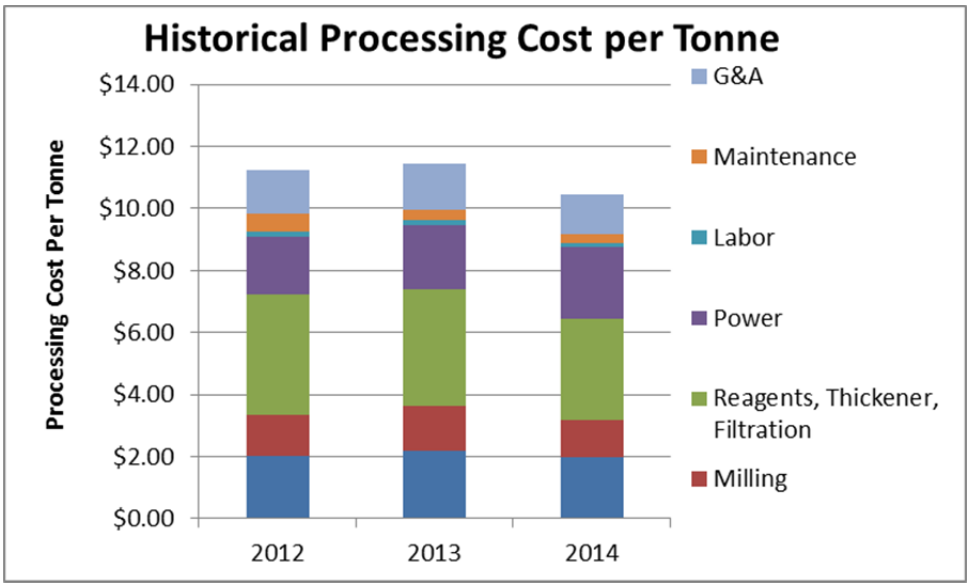


Figure 21-3 Processing Cost Elements

21.4.3 Freight Costs

Freight operating costs are estimated based upon the current freight rates for 2014 and upon the projected tonnes of concentrate to be shipped.

No escalation of costs of Freight has been projected.

21.4.4 General and Administration OPEX

Administrative operating costs are estimated based on the results of operations from 2014, since the projected operations are similar in size and operating parameters to those of 2014. Administrative staff work 10 days on and 5 days off, one shift per day of approximately 10 hours. No significant variation from the administrative responsibilities, operating efficiencies and work flow are projected.

No escalation of costs of the Administrative Department has been projected. Administrative scope and cost have been historically stable and no contingency has been included in the current projections.

21.4.5 Worker's Profit Sharing

Peruvian law mandates an 8% share of taxable income be set aside and paid to the operation's employees, which amount has been projected and included as a part of operating costs.

21.4.6 OPEX Summary

The following table shows the estimated typical annual operating costs for the Yauricocha Operations.

Table 21-4 Annual Operating Costs

Operating Cost Summary	2015	2016	2017	2018	2019
Tonnes of Ore	934,835	983,375	915,669	859,671	826,875
Direct Mining Costs	$27,022,207	$27,537,825	$24,615,546	$23,377,073	$23,010,890
G&A Mining Costs	$5,216,374	$5,487,233	$5,109,433	$4,796,970	$4,613,963
Surface Ore Haulage (to Mill)	$289,799	$304,846	$283,857	$266,498	$256,331
Direct Processing Costs	$8,675,260	$9,125,720	$8,497,408	$7,977,756	$7,673,400
G&A Processing Costs	$1,233,981	$1,298,055	$1,208,683	$1,134,767	$1,091,475
General & Administration (includes technical)	$3,486,931	$3,667,989	$3,415,445	$3,206,577	$3,084,244
Freight	$3,492,205	$3,033,700	$2,653,293	$1,825,918	$1,841,878
Workers Profit Sharing	$2,932,943	$2,171,123	$2,284,267	$745,003	$15,573
Total Operating Costs	**$52,349,700**	**$52,626,491**	**$48,067,932**	**$43,330,562**	**$41,587,754**
Operating Cost/Tonne Ore					
Direct Mining Costs	$28.91	$28.00	$26.88	$27.19	$27.83
G&A Mining Costs	$5.58	$5.58	$5.58	$5.58	$5.58
Surface Ore Haulage (to Mill)	$0.31	$0.31	$0.31	$0.31	$0.31
Direct Processing Costs	$9.28	$9.28	$9.28	$9.28	$9.28
G&A Processing Costs	$1.32	$1.32	$1.32	$1.32	$1.32
General & Administration (includes technical)	$3.73	$3.73	$3.73	$3.73	$3.73
Freight	$3.74	$3.08	$2.90	$2.12	$2.23
Workers Profit Sharing	$3.14	$2.21	$2.49	$0.87	$0.02
Total Operating Costs/Tonne Ore	**$56.00**	**$53.52**	**$52.49**	**$50.40**	**$50.30**

22. ECONOMIC ANALYSIS

22.1 Summary

Sierra Metals is a producing issuer as defined by Section 1.1 of N.I. 43-101 and Yauricocha is an operating mine with stable production and significant production history. As such, section 22 is not required to be included under N.I. 43-101.

23. ADJACENT PROPERTIES

There are no adjacent properties to the Yauricocha mine as defined under 43-101.

24. OTHER RELEVANT DATA AND INFORMATION

Gustavson judges that there is no other relevant data at this time.

25. INTERPRETATION AND CONCLUSIONS

The Yauricocha Mine is a mature operation with a successful history. The mineralized bodies have been and continue to be consistent in grade and size, though deeper drilling shows some potential changes in the mix of metals produced and the geometries of the bodies. Careful resource modeling and planning will insure that these issues are resolved proactively. The annual rate of reserve replacement is robust and the property continues to show adequate economic returns.

The mine is transitioning from hand calculated to geostatistical methods for resource and grade control models. Care should be taken in the coming months to monitor reconciliation results for both Cuerpos MassivosCuerpos Massivos and Cuerpos Chicos to tune dilution, ore loss, and grade adjustment factors.

The mine is a stable operating mine. Current investment in improved underground access, hoisting and haulage will contribute to improved long term operating efficiencies and cost control.

The Chumpe Mill is a stable plant that uses conventional methods to produce as many as five separate concentrates for sale. Available data indicate that, with expansions and process modifications taken into account, the mill performance has been stable for several years and steadily improving despite drop in feed grade. As long as process inputs such as mill tonnages, tenors and mineralogical characteristics remain consistent, metallurgical recoveries and performance are not expected to change significantly.

26. RECOMMENDATIONS

- Gustavson recommends that downhole surveys be done for all exploration drilling going forward, that the database be updated to include any existing downhole survey data which have not been included, and that Minera Corona consider surveying open, accessible drillholes which have not previously been surveyed.

- Gustavson recommends that Minera Corona continue to monitor Chumpe Laboratory performance by sending 5% of coarse reject samples and /or pulp duplicates to a certified outside lab for analysis, with particular attention paid to understanding the source of erratic outlier values, and possible sources of bias for zinc and lead assay.

- Gustavson recommends that Minera Corona geology department submit standards and blanks with the sample stream to Chumpe Lab, to independently monitor and verify sample preparation and laboratory performance.

- Gustavson recommends that Minera Corona should continue to update database methodologies for the project, including consideration of handling underground channel samples as traverse databases, maintaining capped and uncapped assay values as auditable records within a database rather than in separate databases, and similar database modernization efforts.

- Gustavson recommends that Minera Corona should continue the process of updating the resource estimation methodology for the project for the future to leverage the data management and modeling capabilities of modern resource estimation software, particularly for Cuerpos Chicos. Such methodology Should improve the ability to audit data, improve the reporting of resources and reserves estimates, improve infomraiton flow between geology and mine planning, and allow for petter understanding of potential exploration targets in the vicinity of existing operations.

- Gustavson recommends that Minera Corona should consider exploration drilling along trend to the small mineralized bodies currently being developed, rather than only exploring these bodies through underground development. These small mineralized bodies are relatively low tonnage, but can contain significant grades and are important to the resources and reserves. Such drilling should be focused on understanding the periodicity of these small structural zones, so that similar zones might be delineated in advance of mine development.

- Gustavson recommends that Sierra should undertake an exploration program to prioritize additional exploration targets based on resource potential, proximity to current operations, and land and surface rights status. The objective should be to identify drilling targets and to identify additional resources within the project area for future development.

- Gustavson recommends continued metallurgical testing to identify process improvements or alternative processes to improve precious metals recoveries.
- Gustavson recommends a study to consider mining methods or mine dewatering improvements to reduce dilution and improve safety for mechanized sublevel caving in mine areas where water is present.

The budget for this work is shown in Table 26-1. This work can be completed in one phase.

Table 26-1 Estimated Recommendations Budget

Task	Cost
DownHole Surveys	$100,000
Outside Lab Check Assays	$15,000
Standards and Blanks	$50,000
In Situ Bulk Density Sampling	$5,000
Database Methodologies	$10,000
Resource Methodology Update, Including Software Licenses & Training	$200,000
Underground Exploration Drilling	$3,000,000
Surface Exploration Programs 2105-2016	$3,000,000
Metallurgical Testwork	$80,000
Mining Methods – Dewatering	$100,000
Total	**$6,560,000**

27. REFERENCES[1]

Alverez, A.A., and Noble, D.C., 1988, Sedimentary Rock-Hosted Disseminated Precious Metal Mineralization at Purisima Concepcion, Yauricocha District, Central Peru: Economic Geology, v. 83, no. 7, pp. 1368-1378

Corbett, G.J., 2008, Influence of magmatic arc geothermal systems on porphyry-epithermal Au-Cu-Ag exploration models: Terry Leach Symposium: Australian Institute of Geoscientists, Bulletin 48, p. 25-43

CNA, 2013. Directorial Resolution No. 017-2013-ANA-DGCRH (Resolucion Directoal No. 017-2013-ANA-DGCRH) for Wastewater Discharge. Prepared by Management of Water Resources and Management (Direccion de Gestion de Calidad de los Recursos Hidricos) and National Water Authority (Autoridad Nacional del Agua), dated January 18, 2013.

Ego-Aguirre & Smuda, 2012. Evaluation of Water, Sediment, and Mining Effluent Quality at Yauricocha (Evaluacion de Calidad de Aguas, Sedimentos, y Efluentes Mineros de la UM Yauricocha – SMCC). Prepared by Ego-Aguirre & Smuda, dated July 2012.

Equas, 2012a. First Quarter 2012 Environmental Monitoring – Ministry of Energy nd Mines (Monitoreo Ambiental I Trimestre 2012 – Ministerio de Energia y Minas). Prepared by Equas for Mineral Corona, report is not dated.

Equas, 2012b. Second Quarter 2012 Environmental Monitoring – Ministry of Energy nd Mines (Monitoreo Ambiental II Trimestre 2012 – Ministerio de Energia y Minas). Prepared by Equas for Mineral Corona, report is not dated.

Equas, 2012c. Third Quarter 2012 Environmental Monitoring – Ministry of Energy nd Mines (Monitoreo Ambiental III Trimestre 2012 – Ministerio de Energia y Minas). Prepared by Equas for Mineral Corona, report is not dated.

Equas, 2012d. Fourth Quarter 2012 Environmental Monitoring – Ministry of Energy nd Mines (Monitoreo Ambiental IV Trimestre 2012 – Ministerio de Energia y Minas). Prepared by Equas for Mineral Corona, report is not dated.

KPMG, 2015: Publican Ley que realiza modificaciones a la Ley del Impuesto a la Renta, Impuesto General a las Ventas, el Código Tributario y Ley General de Minería para promover la reactivación de la economía Ley No. 30296.

[1] For those documents that were provided in Spanish, the title of the document is provided, along with the original Spanish title in parentheses, immediately following the translated English title.

Giletti, B.J. and Day, H.W., 1968, Potassium-argon ages of igneous intrusive rocks of Peru: Nature, v. 220, pp. 570-572

INGEMMET, 2012. Report from the Peru Institute of Geology, Mining, and Metallurgy (INGEMMET) dated June 20, 2012.

Lacy, W.C., 1949, Oxidation Processes and Formation of Oxide Ore at Yauricocha: Soc. Geol. Peru, v. 25th Anniversary Jubilar, pt. 2, fasc. 12, 15 pp.

PMEM, 2009a. Report No. 999-2009 regarding the Final Closure Plan Feasibility Evaluation for the Yauricocha Mine of MInera Corona (Informe No. 999-2009 sobre Informe Final de la Evaluacion del Plan de Cierre de Minas a Nivel de Factibilidad de la Unidad Minera Yauricocha de Minera Corona). Prepared by Peru Ministry of Energy and Mines (PMEM), dated August 11, 2009.

PMEM, 2009b. Directorial Resolution No. 258 2009-MEM/AAM regarding approval of the Final Closure Plan Feasibility Evaluation for the Yauricocha Mine of Minera Corona (Resolucion Directoral No. 258 2009-MEM/AAM). Prepared by PMEM, dated August 24, 2009.Empresa Minera, et al, 2002. Mineral Concessions Transfer Contract between Empresa Minera del Centro del Peru S.A. and Minera Corona, dated March 7, 2002.

PMJHR, 2013. Book of Mineral Certificates (Libro de Derechos Mineros Certificado de Vigencia). Prepared by Peru Ministry of Justice and Human Rights (Ministerio de Justicia y Derechos Humanos del Perú), dated September 23, 2013.

Public Registry of Lima et al, 2013. Property Description, Oquisala and Yauyos Sectors (Inscription de Propiedad Inmueble, Sector Principal – Oquisala, Yauyos). Prepared by the Public Registries of Lima, Callao, and Canete, dated March 7, 2013.

SCM, 2011. Waste Management Plan (Plan de Manejo de Residuos Solidos). Prepared by Minera Corona, dated 2011.

SCM, 2011. Sludge Management Plan (Plan de Manejo de Lodos). Prepared by Minera Corona, dated 2011.

SCM, 2011. Tailings Management Plan (Plan de Manejo de Relaves). Prepared by Minera Corona, dated 2011.

SCM, 2010. Community Relations Plan (Plan de Relaciones Comunitarias). Prepared by Minera Corona, dated 2010.

Thompson, D.S.R., 1960, The Yauricocha Sulphide Deposits, Central Peru: Unpublished PhD dissertation, Imperial College, London, 154 pp.

Villaran, 2009. Land Use Contract between San Lorenzo de Alis and Minera Corona, S.A. (Transaccion Extrajudicial y Contrato de Usufructo que Celebran de una Parte la Comunidad Campesian San Lorenzo de Alis y de la Otra Parte Minera Corona, S.A.) Prepared by Ricardo Ortiz de Zevallos Villaran, Notary of Lima, dated November 16, 2007.

The following documents were provided by Sierra Metals staff and reviewed by Gustavson:

1. RESUMEN GENERAL YAURICOCHA-2012.xls
2. Planeamiento 2012-2016 rev. por trimestres (t).xls
3. RESUMEN PROGRAMA DE AVANCES 2012 - 2016 (t).xlsx
4. COSTO MINADO POR METODOS (t).xlsx
5. COSTOS DE LABORES POR METRO DE AVANCE.xlsx
6. COSTOS CONTABLES 2011 - ENERO 2012.xls
7. Criterios de Estimación de Reservas y Recursos-2012.doc
8. Geologia Yauricocha-2012.doc
9. Exploratión Advance-Mineral Inventry.xls
10. Planeamiento 2012-2016 rev..xls
11. Cuadro resumen - Recursos-Reservas Yauricocha 2012-2016 planning.xls
12. Informacion Adicional - Tony Hammond.xlsx
13. Reservas Probadas-Probables-Recursos Minerales-Por Cuerpos-Ycha-2012.xls
14. Reservas Probadas-Probables-Recursos Minerales-Por Zonas-Ycha-2012.xls
15. INFORME LABORATORIO 2012.docx
16. GEOYAU-032-12 (Informe Ipillo).doc
17. GEOYAU-178(INFORME DE EXPLORACION EN VICTORIA).doc
18. Recursos Ipillo.xls
19. Recursos Victoria-.xls
20. Royalties Explained.xlsx
21. Daniel Tellechea memo 2012 7 20.docx
22. Resumen_Tratamiento_ENE_A_Dic 2013_2014.xls
23. Plan de Minando 2015-2019_Rev.Final.xls
24. Relacion de Equipos Actuaizados.xls
25. Relacion de Ventiladores_Yauricocha
26. Copia de COSTO_SMC_Dic14.xls

27. Planeamiento 2015-2016 (detailed mine plans)
28. Programa de Avances 2015-2016
29. Costo de principals labors + sostenimiento 102014.xls
30. Costo Minado Por Metodo – Plan 2015.xls