U.S. Department of the Interior

Bureau of Land Management

Environmental Assessment

DOI-BLM-NV-B020-2015-0030-EA

March 2015

Mineral Ridge Mine Mary LC and Satellite Deposits Environmental Assessment

Location:

Esmeralda County

Applicant/Address:

Mineral Ridge Gold, LLC

1515 7th Street

Elko, NV 89801

U.S. Department of the Interior

Bureau of Land Management

Tonopah Field Office

Phone: 775-482-7800

Fax: 775-482-7810

BLM Tonopah

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 PURPOSE AND NEED FOR ACTION AND DECISION TO BE MADE 2
1.2 SCOPING AND ISSUES 2
1.3 LAND USE PLAN CONFORMANCE STATEMENT 3
1.4 RELATIONSHIP TO OTHER STATUTES, REGULATIONS, AND PLANS 3
1.4.1 Esmeralda County Public Lands and Policy Plan 5

2.0 PROPOSED ACTION AND ALTERNATIVES 6

2.1 LOCATION OF THE PROPOSED ACTION 6
2.2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES 6
2.2.1 History 6
2.2.2 Existing Operations 6
2.2.3 Summary of Proposed Action 7
2.2.4 Proposed Action 7
2.2.4.1 Project Boundary 8
2.2.4.2 Project Schedule and Workforce 11
2.2.4.3 Open Pits 11
2.2.4.4 Waste Rock Disposal Areas 13
2.2.4.5 Haul Roads 15
2.2.4.6 Growth Media 15
2.2.4.7 Exploration and Condemnation Drilling 15
2.2.4.8 Realignment of Water Lines 17
2.2.4.9 Realignment of Power Lines 17
2.2.4.10 Air Quality Barrier 17
2.2.4.11 General Disturbance 18
2.2.4.12 Changes to Mobile Equipment 18
2.2.4.13 Reclamation 18
2.2.5 Applicant Committed Environmental Protection Measures 24
2.2.6 Alternatives to the Proposed Action 30
2.2.6.1 Crusher Area Physical Barrier Alternative 31
2.2.6.2 Alternatives Considered but Eliminated from Further Analysis 31
2.2.6.3 No Action Alternative 31

3.0 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND PROPOSED MITIGATION OR AVOIDANCE MEASURES 32

3.1 AIR QUALITY 35
3.1.1 Affected Environment 35
3.1.1.1 Climate and Meteorology 37
3.1.1.2 Current Conditions 37
3.1.1.3 Greenhouse Gas Emissions and Climate Change 38
3.1.2 Environmental Consequences of the Proposed Action 39
3.1.2.1 Air Quality Impact Assessment 40
3.1.2.2 Criteria Pollutant Model Results 40
3.1.2.3 Greenhouse Gas Emissions 41
3.1.2.4 Hazardous Air Pollutant Emissions 41
3.1.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 42
3.1.4 Environmental Consequences of the No Action Alternative 42
3.2 CULTURAL RESOURCES 42
3.2.1 Affected Environment 42
3.2.2 Environmental Consequences of the Proposed Action 42
3.2.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 42
3.2.4 Environmental Consequences of the No Action Alternative 42
3.3 NOXIOUS WEEDS, INVASIVE AND NON-NATIVE SPECIES 43
3.3.1 Affected Environment 43

3.3.2 Environmental Consequences of the Proposed Action 44
3.3.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 44
3.3.4 Environmental Consequences of the No Action Alternative 44
3.4 NATIVE AMERICAN CULTURAL CONCERNS 45
3.4.1 Affected Environment 45
3.4.2 Environmental Consequences of the Proposed Action 46
3.4.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 47
3.4.4 Environmental Consequences of the No Action Alternative 47
3.5 MIGRATORY BIRDS 47
3.5.1 Affected Environment 47
3.5.2 Environmental Consequences of the Proposed Action 48
3.5.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 49
3.5.4 Environmental Consequences of the No Action Alternative 49
3.6 WASTE, HAZARDOUS OR SOLID 50
3.6.1 Affected Environment 50
3.6.2 Environmental Consequences of the Proposed Action 50
3.6.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 50
3.6.4 Environmental Consequences of the No Action Alternative 50
3.7 WATER (SURFACE AND GROUND) 50
3.7.1 Affected Environment 50
3.7.1.1 Surface Hydrology 52
3.7.1.2 Surface Water Quality 52
3.7.2 Environmental Consequences of the Proposed Action 53
3.7.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 55
3.7.4 Environmental Consequences of the No Action Alternative 55
3.8 GRAZING MANAGEMENT 55
3.8.1 Affected Environment 55
3.8.2 Environmental Consequences of the Proposed Action 55
3.8.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 56
3.8.4 Environmental Consequences of the No Action Alternative 56
3.9 LAND USE AUTHORIZATIONS 56
3.9.1 Affected Environment 56
3.9.2 Environmental Consequences of the Proposed Action 56
3.9.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 57
3.9.4 Environmental Consequences of the No Action Alternative 57
3.10 FOREST AND WOODLAND RESOURCES 57
3.10.1 Affected Environment 57
3.10.2 Environmental Consequences of the Proposed Action 58
3.10.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 58
3.10.4 Environmental Consequences of the No Action Alternative 59
3.11 GEOLOGY AND MINERAL RESOURCES 59
3.11.1 Affected Environment 59
3.11.2 Environmental Consequences of the Proposed Action 60
3.11.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 61
3.11.4 Environmental Consequences of the No Action Alternative 61
3.12 PALEONTOLOGICAL RESOURCES 61
3.12.1 Affected Environment 61
3.12.2 Environmental Consequences of the Proposed Action 61
3.12.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 61
3.12.4 Environmental Consequences of the No Action Alternative 62
3.13 RECREATION 62
3.13.1 Affected Environment 62
3.13.2 Environmental Consequences of the Proposed Action 62
3.13.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative 62
3.13.4 Environmental Consequences of the No Action Alternative 63
3.14 SOCIO-ECONOMIC VALUES 63

3.14.1 Affected Environment ... 63
3.14.2 Environmental Consequences of the Proposed Action ... 63
3.14.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 64
3.14.4 Environmental Consequences of the No Action Alternative ... 64
3.15 SOILS ... 64
3.15.1 Affected Environment ... 64
3.15.2 Environmental Consequences of the Proposed Action ... 65
3.15.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 66
3.15.4 Environmental Consequences of the No Action Alternative ... 66
3.16 SPECIAL STATUS SPECIES (PLANTS AND ANIMALS) ... 66
3.16.1 Affected Environment ... 66
3.16.2 Environmental Consequences of the Proposed Action ... 68
3.16.2.1 Plants ... 68
3.16.2.2 Animals ... 68
3.16.3 Mitigation ... 70
3.16.4 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 71
3.16.5 Environmental Consequences of the No Action Alternative ... 71
3.17 VEGETATION ... 71
3.17.1 Affected Environment ... 71
3.17.2 Environmental Consequences of the Proposed Action ... 71
3.17.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 72
3.17.4 Environmental Consequences of the No Action Alternative ... 72
3.18 VISUAL RESOURCES ... 72
3.18.1 Affected Environment ... 72
3.18.2 Environmental Consequences of the Proposed Action ... 73
3.18.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 74
3.18.4 Environmental Consequences of the No Action Alternative ... 74
3.19 WILD HORSES AND BURROS ... 74
3.19.1 Affected Environment ... 74
3.19.2 Environmental Consequences of the Proposed Action ... 74
3.19.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 75
3.19.4 Environmental Consequences of the No Action Alternative ... 75
3.20 WILDLIFE ... 75
3.20.1 Affected Environment ... 75
3.20.2 Environmental Consequences of the Proposed Action ... 77
3.20.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative ... 78
3.20.4 Environmental Consequences of the No Action Alternative ... 78

4.0 CUMULATIVE IMPACTS ... 79

4.1 DESCRIPTION OF CUMULATIVE EFFECTS STUDY AREA BOUNDARIES ... 80
4.2 PAST AND PRESENT ACTIONS ... 81
4.2.1 Exploration and Mining ... 81
4.2.2 Land Sales, Acquisitions, and Land Exchanges ... 83
4.2.4 Livestock Grazing ... 84
4.2.3 Wildlife Habitat Improvements ... 84
4.2.4 Transportation Networks and Rights-of-Way (ROWs) ... 84
4.2.5 Recreation ... 85
4.2.6 Wild Horse and Burros Gathers ... 86
4.3 REASONABLY FORESEEABLE FUTURE ACTIONS (RFFAS) ... 86
4.4 CUMULATIVE IMPACTS ASSOCIATED WITH PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS, INCLUDING THE PROPOSED ACTION ... 87
4.4.1 Air Quality ... 87
4.4.1.1 Proposed Action ... 88
4.4.1.2 Crusher Area Physical Barrier Alternative ... 88
4.4.1.3 No Action Alternative ... 88
4.4.2 Cultural Resources ... 89

4.4.2.1 Proposed Action ... 89
4.4.2.2 Crusher Area Physical Barrier Alternative ... 89
4.4.2.3 No Action Alternative ... 89
4.4.3 Noxious Weeds, Invasive and Non-native Species ... 89
4.4.3.1 Proposed Action ... 90
4.4.3.2 Crusher Area Physical Barrier Alternative ... 90
4.4.3.3 No Action Alternative ... 91
4.4.4 Migratory Birds ... 91
4.4.4.1 Proposed Action ... 91
4.4.4.2 Crusher Area Physical Barrier Alternative ... 92
4.4.4.3 No Action Alternative ... 92
4.4.5 Wastes, Hazardous and Solid ... 92
4.4.5.1 Proposed Action ... 92
4.4.5.2 Crusher Area Physical Barrier Alternative ... 93
4.4.5.3 No Action Alternative ... 93
4.4.6 Forest and Woodland Resources ... 93
4.4.6.1 Proposed Action ... 93
4.4.6.2 Crusher Area Physical Barrier Alternative ... 94
4.4.6.3 No Action Alternative ... 94
4.4.7 Geology and Mineral Resources ... 94
4.4.7.1 Proposed Action ... 94
4.4.7.2 Crusher Area Physical Barrier Alternative ... 95
4.4.7.3 No Action Alternative ... 95
4.4.8 Water (Surface and Ground) ... 95
4.4.8.1 Proposed Action ... 95
4.4.8.2 Crusher Area Physical Barrier Alternative ... 96
4.4.8.3 No Action Alternative ... 96
4.4.9 Socio-Economic Values ... 96
4.4.9.1 Proposed Action ... 96
4.4.9.2 Crusher Area Physical Barrier Alternative ... 97
4.4.9.3 No Action Alternative ... 97
4.4.10 Soils ... 98
4.4.10.1 Proposed Action ... 98
4.4.10.2 Crusher Area Physical Barrier Alternative ... 98
4.4.10.3 No Action Alternative ... 99
4.4.11 Special Status Species ... 99
4.4.11.1 Proposed Action ... 99
4.4.11.2 Crusher Area Physical Barrier Alternative ... 100
4.4.11.3 No Action Alternative ... 100
4.4.12 Vegetation ... 100
4.4.12.1 Proposed Action ... 101
4.4.12.2 Crusher Area Physical Barrier Alternative ... 101
4.4.12.3 No Action Alternative ... 101
4.4.13 Visual Resources ... 101
4.4.13.1 Proposed Action ... 102
4.4.13.2 Crusher Area Physical Barrier Alternative ... 102
4.4.13.3 No Action Alternative ... 102
4.4.14 Wild Horses and Burros ... 102
4.4.14.1 Proposed Action ... 103
4.4.14.2 Crusher Area Physical Barrier Alternative ... 103
4.4.14.3 No Action Alternative ... 103
4.4.15 Wildlife (Plants and Animals) ... 103
4.4.15.1 Proposed Action ... 104
4.4.15.2 Crusher Area Physical Barrier Alternative ... 105
4.4.15.3 No Action Alternative ... 105

5.0 CONSULTATION AND COORDINATION ... 106

5.1 LIST OF PREPARERS ... 106
5.1.1 BLM – Tonopah Field Office ... 106
5.1.2 BLM – Mount Lewis Field Office ... 106

5.1.3 BLM – National Operations Center 106
5.1.4 SRK Consulting (U.S.), Inc. 106
5.1.5 Stantec 106

6.0 REFERENCES 107

LIST OF TABLES

TABLE 2-1: ASSOCIATED NEPA AND 43 C.F.R. 3809 ACTIONS 7
TABLE 2-2: DISTURBANCE SUMMARY 9
TABLE 2-3: SUMMARY OF ORE AND WASTE ROCK QUANTITIES 12
TABLE 2-4: PIT DESIGN PARAMETERS AND DIMENSIONS SUMMARY 13
TABLE 2-5: WASTE ROCK DESTINATION SUMMARY 14
TABLE 2-6: PHASE I EXPLORATION WORK PLAN AREAS 16
TABLE 2-7: BLM RECOMMENDED RECLAMATION SEED MIXTURE 19
TABLE 3-1: ELEMENTS ASSOCIATED WITH SUPPLEMENTAL AUTHORITIES AND RATIONALE FOR DETAILED ANALYSIS FOR THE PROPOSED ACTION 32
TABLE 3-2: ADDITIONAL ELEMENTS REVIEWED 34
TABLE 3-3: SUMMARY OF CRITERIA POLLUTANTS 36
TABLE 3-4: DISPERSION MODELLING CRITERIA POLLUTANT RESULTS 40
TABLE 3-5: MIGRATORY BIRD SPECIES POTENTIALLY OCCURRING WITHIN THE PROJECT AREA 47
TABLE 3-6: SPRING WATER QUALITY 52
TABLE 3-7: EXISTING RIGHTS-OF-WAY WITHIN PROJECT AREA 56
TABLE 3-8: GREAT BASIN PINION JUNIPER WOODLAND SPECIES 57
TABLE 3-9: POPULATION INFORMATION FOR SELECT TOWNS 63
TABLE 3-10: SOIL UNITS WITHIN THE PROJECT AREA 64
TABLE 3-11: SUMMARY OF POTENTIAL UNDERGROUND BAT HABITAT 69
TABLE 4-1: CUMULATIVE EFFECTS STUDY AREAS 80
TABLE 4-2: PAST AND PRESENT MINING AND EXPLORATION ACTIVITIES 81
TABLE 4-3: AUTHORIZED GEOTHERMAL EXPLORATION PROJECTS 82
TABLE 4-4: AUTHORIZED GEOTHERMAL LEASES 83
TABLE 4-5: LAND SALES AND EXCHANGES 83
TABLE 4-6: PAST AND PRESENT ROW ACTIONS 85
TABLE 4-7: PENDING ACTIONS WHOLLY OR PARTIALLY WITHIN CESA BOUNDARIES 86
TABLE 4-8: REVENUE SUMMARY FOR 2014 96

LIST OF FIGURES

(Figures located at end of document)

Figure 1: General Location

Figure 2: Authorized Facilities

Figure 3: Proposed Facilities

Figure 4: Phase I Exploration

Figure 5: Crusher Area Physical Barrier Alternative

Figure 6: Hydrographic Area Boundaries

Figure 7: Water Resources

Figure 8: Grazing

Figure 9: Land Use

Figure 10: Surficial Geology Including Wells and Springs

Figure 11: Soils

Figure 12: Wildlife

Figure 13: Visual Resources

Figure 14: Silver Peak HMA

Figure 15: Cumulative Effects Study Areas

LIST OF APPENDICES

Appendix A: Public Comments and Responses

Appendix B-1: 1995 Open Pit Geotechnical Report

Appendix B-2: 2011 Open Pit Geotechnical Report

Appendix C: Waste Rock Characterization Memo

Appendix D: Waste Rock Slope Stability Memo

Appendix E: Air Modelling Results

Appendix F: Mineral Ridge Water Development Evaluation

Appendix G: Visual Assessment

LIST OF ACRONYMS AND ABBREVIATIONS

§	Character *signum sectionis*, used to refer to a particular section of a document
afy	acre feet per year
amsl	above mean sea level
APLIC	Avian Power Line Interaction Committee
AQIA	Air Quality Impact Assessment
ARDML	acid rock drainage and metals leaching
BAPC	Bureau of Air Pollution Control
bgs	below ground surface
BLM	Bureau of Land Management
BMP	Best Management Practice
BMRR	Bureau of Mining Regulation and Reclamation
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CESA	Cumulative Effects Study Area
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DOI	Department of the Interior
EA	Environmental Assessment
E.O.	Executive Order
EPA	Environmental Protection Agency
E-T cell	evapo-transpiration cell
FOS	Factor of Safety
FLPMA	Federal Land and Policy Management Act
g	fractions of standard gravity

GHG	greenhouse gas
gpd	gallons per day
gpm	gallons per minute
GPS	global positioning system
HAP	hazardous air pollutant
HMA	Herd Management Area
H_2S	hydrogen sulfide
IM	Instruction Memorandum
KOP	Key Observation Point
$kWh/m^2/day$	kilowatt hours per square meter per day
MBTA	Migratory Bird Treaty Act
MMPA	Mining and Mineral Policy Act of 1970
MRG	Mineral Ridge Gold, LLC
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Repatriation Act
NDEP	Nevada Division of Environmental Protection
NDWR	Nevada Division of Water Resources
NDOA	Nevada Department of Agriculture
NDOW	Nevada Department of Wildlife
NHPA	National Historic Preservation Act
NEPA	National Environmental Policy Act
NH_4	methane
N_2O	nitrous oxide
NOx	nitrogen oxides
NO_2	nitrogen dioxide
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NSAAQS	Nevada State Ambient air quality Standards
NV	Nevada
PA	Programmatic Agreement
PAG	potentially acid generating
PGA	peak ground acceleration
$PM_{2.5}$	particulate matter smaller than 2.5 microns in aerodynamic diameter
PM_{10}	particulate matter smaller than 10 microns in aerodynamic diameter
ppb	parts per billion
ppm	parts per million
PSD	prevention of significant deterioration
RC	reverse circulation
REA	Rapid Ecoregional Assessment
RFFA	Reasonably Foreseeable Future Actions
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
SHPO	State Historic Preservation Office

SIP	State Implementing Plan
SO_2	sulfur dioxide
SRK	SRK Consulting, (U.S.), Inc.
T1S, R39E	Township 1 South, Range 39 East
TCP	Traditional Cultural Properties
U.S.	United States
U.S.C.	United States Code
VRM	visual resource management
W/m^2	watts per square meter
Wh/m^2	watt hours per square meter
WPCP	Water Pollution Control Permit
$\mu g/m^3$	micrograms per cubic meter

1.0 INTRODUCTION

Mineral Ridge Gold, LLC (MRG) is the operator of the Mineral Ridge Mine authorized under NVN-73109. The mine is located approximately five air miles northwest of the town of Silver Peak in Esmeralda County, Nevada (NV). This area is approximately equidistant from Reno to the north and Las Vegas to the south and is approximately 30 air miles southwest of Tonopah and 20 air miles from the California border. The general location is portrayed in Figure 1. The proposed project is located on public lands, administered by the United States (U.S.) Department of the Interior (DOI), Bureau of Land Management (BLM), Tonopah Field Office and on private lands controlled by MRG. The proposed Plan Boundary would encompass approximately 2,700 acres including approximately 2,044 acres of public lands administered by the BLM and 656 acres of private land.

MRG submitted to the BLM and the Nevada Division of Environmental Protection (NDEP) Bureau of Mining Regulation and Reclamation (BMRR) an Amended Plan of Operations and Nevada Reclamation Permit (Record Number NVN-73109/Reclamation Permit No. 0103) entitled the *Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Mary LC Expansion and Satellite Deposits Plan of Operations Amendment* (Plan Amendment). The proposed modifications include:

- Expansion of the Plan of Operations boundary (Plan Boundary);
- Addition of haul roads on the western side of the Plan Boundary;
- Addition of the Bluelite and Solberry pits;
- Increase the size of and production from the Mary LC, Wedge B, and Brodie pits;
- Addition of two new waste rock disposal areas, Solberry and Bluelite;
- Partial backfilling of the Brodie Pit with about 900,000 tons of material;
- Backfilling of the Wedge B Pit with about 200,000 tons of material;
- Increase the capacity of waste rock disposal areas WD-2, WD-4, WD-6, WD-9, WD-10, and WD-11 with area changes also occurring for WD-1, WD-5, and WD-7;
- Salvaging growth media and expansion of the growth media stockpile;
- Changes to the "General Disturbance" category which includes disturbance areas such as interpit spaces, yard edges, and other uncategorized spaces between facilities;
- Re-alignment of water and power lines;
- Addition of a physical barrier to public access near the crusher to comply with the NDEP – Bureau of Air Pollution Control (BAPC) requirements;
- Reallocation and increase of exploration disturbance areas, development of the "Phase I Exploration Work Plan", and focus of future exploration tracking on surface disturbance;
- Changes to mobile equipment; and
- Changes to employment.

The proposed expanded Plan Boundary is referred to in this Environmental Assessment (EA) as the Project Area.

The BLM has prepared this EA in conformance with the Council on Environmental Quality (CEQ) (CEQ 1997) regulations for implementing the National Environmental Policy Act (NEPA) (40 C.F.R. §1500-1508) and the BLM NEPA Handbook H-1790-1. The EA describes a Proposed Action and No Action alternative, and evaluates the impacts to the affected environment associated with their implementation. The document further describes environmental protection measures specifically designed to eliminate or reduce potential environmental impacts.

1.1 Purpose and Need for Action and Decision to Be Made

The purpose of the action is to provide MRG the opportunity to explore, locate, and delineate gold deposits, and to extract additional economically recoverable gold and other metals determined to exist in the Project Area as provided by the General Mining Law of 1872 as amended and in compliance with the Federal Land and Policy Management Act of 1976 (FLPMA) and other applicable federal and state laws.

The need for the action is established by the BLM's responsibility under Section 302 of the FLPMA and the BLM Surface Management Regulations at 43 CFR§3809 to respond to a plan of operations proposal that would allow an operator to prospect, explore, and assess locatable mineral resources on public lands, and to take any action to prevent unnecessary or undue degradation of the public lands.

The decision the BLM would make, based on analysis conducted pursuant to the NEPA, includes the following: 1) approve the Plan Amendment with no modifications; 2) approve the Plan Amendment with additional mitigation measures that are needed to prevent unnecessary or undue degradation of public lands; or 3) deny the approval of the Plan Amendment as currently written and not authorize the Project if it is found that the Proposed Action does not comply with the 3809 regulations and the FLPMA mandate to prevent unnecessary or undue degradation.

1.2 Scoping and Issues

A BLM ID Team meeting was held on October 1, 2014 at the Tonopah Field Office. During this meeting, BLM personnel identified the elements associated with supplemental authorities and other resources and uses to be addressed in this document as outlined in Section 3.0. The following specific issues related to the Proposed Action were identified:

- Would there be impacts to air quality?
- Could the proposed air quality physical barrier location be changed to reduce potential impacts to desert bighorn sheep (*Ovis canadensis nelsoni*)?
- Can exploration be presented using a phased approach, with Phase I presented in this document?
- Would there be changes to process water or exploration water use?
- Are there areas with wilderness characteristics present in the Project Area?
- Would there be impacts to forest and woodland resources?
- Would impacts to the Visual Resource Management Class III-managed area occur?
- How would stormwater be managed for the proposed disturbance?

- Would the proposed disturbance reduce animal unit months (AUMs) for the grazing allotment?
- What is recreational use in the area with consideration for hunting?

On October 22, 2014 a consultation invitation letter was mailed from the BLM to the Timbisha Shoshone Tribe. To this point in time, the Tribe has not expressed concerns with regard to the Proposed Action. However, the BLM continues to provide opportunities for participation and input.

1.3 Land Use Plan Conformance Statement

The BLM has the responsibility and authority to manage the surface and subsurface resources on public lands located within the jurisdiction of the BLM Tonopah Field Office, and it has designated lands within the Project Area as open for mineral exploration and development. In its Record of Decision (ROD) for the Tonopah Resource Management Plan (RMP) (BLM 1997), the BLM objective for locatable minerals is:

- To provide opportunity for exploration and development of locatable minerals, such as gold, silver, copper, lead, molybdenum, etc., consistent with the preservation of fragile and unique resources in areas identified as open to the operations of the mining laws.

A Plan of Operations and a Reclamation Plan are required in situations in which there will be more than five acres of cumulative unreclaimed surface disturbance in a Plan of Operations area.

The Proposed Action and the No Action Alternative are in conformance with the Tonopah RMP and ROD, approved on October 6, 1997 (BLM 1997). "A total of 6,028,948 acres (99 percent of the Tonopah Planning Area) would be open to the operation of the mining laws," (page 23). The "BLM provides for mineral entry, exploration, location and operations pursuant to the mining laws in a manner that 1) would not unduly hinder the mining activities, and 2) assures that these activities are conducted in a manner which would prevent undue or unnecessary degradation of the public land," (page 35). “All operations shall comply with all federal and state laws, including those relating to air quality, water quality, solid waste, fisheries, wildlife and plant habitat, and archeological and paleontological resources," (page 36).

1.4 Relationship to Other Statutes, Regulations, and Plans

MRG proposes to undertake activities as part of the Plan Amendment under the authority of the FLPMA (43 United States Code [U.S.C.] §302(b)). Other federal statutes, regulations, executive orders (E.O.), and plans that must be complied with include:

- American Indian Religious Freedom Act 1978 (42 U.S.C. 1996);
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa to 47011);
- Clean Air Act, as amended (42 U.S.C. 7401 et seq.);
- Clean Water Act of 1977 (33 U.S.C. 1251 et seq.);
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 U.S.C. 9615);

- Council on Environmental Quality (40 Code of Federal Regulations [C.F.R.] §1500);
- Eagle Protection Act (16 U.S.C. §668-668d);
- E.O. 11988, as amended, Floodplain Management, May 24, 1977;
- E.O. 11990, Protection of Wetlands, May 24, 1977;
- E.O. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994;
- E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001;
- Endangered Species Act of 1973, as amended (16 U.S.C. 1531);
- Magnuson-Stevens Act Provision: Essential Fish Habitat: Final Rule (50 C.F.R. Part 600; 67 FR 2376, January 17, 2002)
- Migratory Bird Treaty Act of 1918, as amended (16 U.S.C 703 et seq.);
- National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.);
- National Historic Preservation Act (NHPA), as amended (16 U.S.C. 470);
- Omnibus Public Lands Act of 2009-Paleontological Resources Preservation (OPLA-PRP); P.L. 111-11, Title VI, Subtitle D, Sections 6301-6312, 123 Stat. 1172, 16 U.S. C. 470aaa;
- Public Rangelands Improvement Act of 1978;
- Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.);
- Safe Drinking Water Act, as amended (42 U.S.C. 300f et seq.);
- Surface Management (43 C.F.R. §3809 et seq.);
- Wild and Scenic Rivers Act as amended (16 U.S.C. 1271); and
- Wilderness Act of 1964 (16 U.S.C. 1131 et seq.).

The BLM regulations for surface management of public lands mined under the General Mining Law of 1872, as amended (43 CFR 3809) recognize the statutory right of mineral claim holders, such as MRG, to explore for and develop federal mineral resources and encourage such development. These federal regulations require the BLM to review proposed operations to ensure that the following items are included: a) adequate provisions to prevent unnecessary or undue degradation of public lands; b) measures to provide for reclamation; and c) operations comply with other applicable federal, state, and local laws and regulations.

MRG submitted the Plan Amendment to the BLM in August, 2014 as required under the regulations. The Plan Amendment is on file and available for review during normal business hours at the BLM Tonopah Field Office.

The Mining and Mineral Policy Act of 1970 (MMPA) mandates federal agencies to ensure that closure and reclamation of mine operations are completed in an environmentally responsible manner. The MMPA states that the federal government should promote the following: "...development of methods for the disposal, control, and reclamation of mineral waste products, and the reclamation of mined lands, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities."

The BLM's long-term reclamation goals are to shape, stabilize, revegetate, or otherwise treat disturbed areas in order to provide a self-sustaining, safe, and stable condition providing productive use of the land, which conforms to the approved land use plan for the area. The

BLM’s long-term goals also include management of discharges from process components. The short-term reclamation goals are to stabilize disturbed areas and to protect both disturbed and adjacent undisturbed areas from unnecessary or undue degradation. Relevant BLM policy and standards for reclamation are set forth in the BLM Solid Minerals Reclamation Handbook which provides consistent reclamation guidelines for all solid non-coal mineral activities conducted under the authority of the BLM Minerals Regulations in Title 43 CFR 3809 (BLM 1992a). The BLM has reviewed the site reclamation portions of the Plan Amendment to ensure that the project would meet BLM reclamation standards and goals.

1.4.1 Esmeralda County Public Lands and Policy Plan

On April 3, 1985, the Esmeralda County Board of Commissioners adopted a county policy plan for public lands under the Nevada Statewide Policy Plan for Public Lands authorized by Senate Bill 40. Senate Bill 40 directs the State Land Use Planning Agency to work together with local planning entities to prepare local plans and policy statements regarding the use of federal land in Nevada. The Esmeralda County Public Lands Policy Plan was finalized in 2013 (Esmeralda County 2013). The Proposed Action may be consistent with relevant policies found in the plan (policies 7-1, 7-3, 7-4, 7-5, and 7-6).

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Location of the Proposed Action

The Project Area is accessed by traveling south on State Highway 265 to Silver Peak, NV as shown on figures 1 and 2, then to the site using either the Eagle Canyon Road or the Coyote Road. The road going through the mine site is referred to as the Mineral Ridge Road.

Activities presented under the Proposed Action would take place within the proposed Plan Boundary (Project Area) portrayed in Figure 2 and located within portions of the following townships and ranges within the Mount Diablo Base and Meridian:

- Township 1 South, Range 39 East (T1S, R39E), Section 31;
- T1S, R38E, Section 36;
- T2S, R38E, sections 1, 2, 11, and 12; and
- T2S, R39E, sections 5, 6, and 7.

2.2 Description of Proposed Action and Alternatives

2.2.1 History

Mining began in the Mineral Ridge area in 1865 and has since experienced periods of exploration, mining, and inactivity. MRG started crushing oversized ore left on the pad by previous operators in February 2011, and began leaching and operation of carbon columns adsorption/desorption and recovery process in March 2011. The site was considered to be out of temporary closure and back in operation as of March 29, 2011. Mining of new ore from the Drinkwater Pit began in May, 2011.

2.2.2 Existing Operations

The authorized Plan Boundary consists of about 995 acres of which 509 acres are owned by MRG and 486 acres are public land administered by the BLM. Existing and authorized facilities are shown on Figure 2 and include:

- Crushing facilities;
- Stormwater control features (i.e. diversion ditches);
- Growth media stockpiles;
- Haul roads and other constructed roads;
- Laydown areas;
- Heap leach and related process facilities;
- Borrow areas;
- Pits;
- Waste rock disposal areas;
- Plant site;
- Security areas;
- Production wells;
- Exploration activities; and

- Ancillary facilities.

The 43 CFR§3809 actions associated with the authorized Plan Boundary are summarized in Table 2-1.

Table 2-1: Associated NEPA and 43 C.F.R. 3809 Actions

43 CFR 3809 / NEPA Action	Date	No.
Plan of Operations / Reclamation Permit	February 2001	NVN -73109 / 0103
Plan of Operations / Reclamation Permit Amendment	July 2002	NVN -73109 / 0103
Plan of Operations / Reclamation Permit Amendment	February 2003	NVN -73109 / 0103
Plan of Operations / Reclamation Permit Amendment	April 2003	NVN -73109 / 0103
Plan of Operations / Reclamation Permit Amendment	December 2010	NVN -73109 / 0103
Mineral Ridge Mine (NVN 73109/Reclamation Permit 01030 and Mary Drinkwater (Reclamation Permit 0034): Plan of Operations Amendment	October 2011	NVN -73109 / 0103
Mineral Ridge Mine (NVN-73109/Reclamation Permit 103): Plan of Operations Water Well Amendment	December 2011	NVN -73109 / 0103
Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103): Pit Expansion Plan of Operations Amendment	November 2013	NVN -73109 / 0103

2.2.3 Summary of Proposed Action

MRG has identified additional economically viable reserves in the western portion of the Project Area which they propose to mine as the Bluelite and Solberry pits. Additional economic reserves have also been located near the Mary LC, Wedge B, and Brodie pits, leading to their proposed expansions. Additional waste rock disposal areas and existing waste rock disposal areas expansions are proposed to handle the anticipated waste rock. These changes would result in the need to realign some of the utilities and roads, and to add additional haul roads to the new pits.

2.2.4 Proposed Action

MRG is proposing to undertake the following activities as part of the Proposed Action as shown on Figure 3

- Expansion of the Plan Boundary;
- Addition of haul roads on the western side of the Plan Boundary;
- Addition of the Bluelite and Solberry pits;
- Increase the size of and production from the Mary LC, Wedge B, and Brodie pits;
- Addition of two new waste rock disposal areas, Solberry and Bluelite;
- Partial backfilling of the Brodie Pit with about 900,000 tons of material;
- Backfilling of the Wedge B Pit with about 200,000 tons of material;

- Increase the capacity of waste rock disposal areas WD-2, WD-4, WD-6, WD-9, WD-10, and WD-11 with area changes also occurring for WD-1, WD-5, and WD-7;
- Salvaging growth media and expansion of the growth media stockpile;
- Changes to the "General Disturbance" category which includes disturbance areas such as interpit spaces, yard edges, and other uncategorized spaces between facilities;
- Re-alignment of water and power lines;
- Addition of a physical barrier to public access near the crusher to comply with the NDEP – BAPC requirements;
- Reallocation and increase of exploration disturbance areas, development of the "Phase I Exploration Work Plan", and focus of future exploration tracking on surface disturbance;
- Changes to mobile equipment; and
- Changes to employment.

The proposed changes would increase the Project disturbance area from approximately 621 acres to 906 acres. Authorized and proposed surface disturbances within the Project Area are summarized in Table 2-2.

2.2.4.1 Project Boundary

MRG is proposing to increase the authorized Plan Boundary by 1,197 acres from the existing 1,503 acres to approximately 2,700 acres. The proposed Plan Boundary (Project Area) would include approximately 2,044 acres of public lands administered by the BLM and 656 acres of private land. No U.S. Forest Service-administered land or state lands are located within the Project Area.

The proposed Project Area is shown on Figure 3 and is located in all or portions of the following:

- T1S, R39E, sections 31 and 32;
- T1S, R38E, sections 35 and 36;
- T2S, R38E, sections 1, 2, 3, 10, 11, and 12; and
- T2S, R39E, sections 5, 6, and 7.

Table 2-2: Disturbance Summary

Description	Authorized Disturbance (total acres)			Proposed Developments (acres of change)			Proposed Disturbance (total acres)		
	Public (BLM)	Private	Total	Public (BLM)	Private	Total	Public (BLM)	Private	Total
Crusher/Conveyor	0.1	0.3	0.4	0.0	0.0	0.0	0.1	0.3	0.4
General Disturbance	30.3	39.5	69.8	22.1	9.8	31.9	52.4	49.3	101.7
Growth Med. Stockpiles	0.0	0.9	0.9	0.0	1.9	1.9	0.0	2.8	2.8
Roads[1]	26.9	22.0	48.9	9.2	-4.8	4.4	36.1	17.2	53.3
Leach Pad	23.9	14.4	38.3	0.1	0.0	0.1	24.0	14.4	38.4
Borrow Pit	3.0	0.5	3.5	-3	-0.5	-3.5	removed		
Buildings	0.2	0.3	0.5	0.0	0.0	0.0	0.2	0.3	0.5
Pits[2]	0.5	115.6	116.1	22.9	41.5	64.4	23.4	157.8	181.2
Ponds	2.5	0.2	2.7	0.0	0.0	0.0	2.5	0.2	2.7
Sediment Traps	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.1	0.2
Stockpile (existing)	3.3	0.0	3.3	0.0	0.0	0.0	3.3	0.0	3.3
WD-1	32.5	10.8	43.3	1.4	4.5	5.9	33.9	15.3	49.2
WD-2	6.9	33.4	40.3	-0.8	-4.5	-5.3	6.1	28.9	35.0
WD-4	6.0	7.5	13.5	9.2	1.5	10.7	15.2	9.0	24.2
WD-5	0.0	22.1	22.1	0.0	-3.8	-3.8	0.0	18.3	18.3
WD-6	0.0	18.4	18.4	0.7	1.2	1.9	0.7	19.6	20.3
WD-7	6.7	5.4	12.1	0.2	-2.1	-1.9	6.9	3.3	10.2
WD-8	0.0	4.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0
WD-9	4.1	12.9	17.0	0.2	0.0	0.2	4.3	12.9	17.2
WD-10	28.7	13.9	42.6	11.6	6.7	18.3	40.3	20.6	60.9
WD-11	10.2	13.6	23.8	-4.6	-4.1	-8.7	5.6	9.5	15.1
Bluelite waste rock disposal area	0.0	0.0	0.0	19.6	12.4	32.0	19.6	12.4	32.0

Description	Authorized Disturbance (total acres)			Proposed Developments (acres of change)			Proposed Disturbance (total acres)		
	Public (BLM)	Private	Total	Public (BLM)	Private	Total	Public (BLM)	Private	Total
Solberry waste rock disposal area	0.0	0.0	0.0	10.1	5.4	15.5	10.1	5.4	15.5
Yards	5.7	13.8	19.5	0.0	0.0	0.0	5.7	13.8	19.5
Subtotal	***191.6***	***349.6***	***541.2***	***98.9***	***65.1***	***164.0***	***290.5***	***415.4***	***705.9***
Exploration[3, 4, 5]	37.0	42.5	79.5	120.5	0.0	120.5	157.5	42.5	200.0
Total	**228.6**	**392.1**	**620.7**	**219.4**	**65.1**	**284.5**	**448.0**	**457.9**	**905.9**

[1] Haul roads are calculated to be 13,200 feet long by 80 feet wide, and light duty roads are calculated to be 21,000 feet long by 60 feet wide for reclamation cost calculations associated with the Plan Amendment.

[2] The pit disturbance area includes the following: 10.6 acres for the Bluelite Pit; 32.0 acres for the Brodie Pit; 65.0 acres for the Drinkwater Pit; 59.4 acres for the Mary LC Pit; and 7.1 acres for the Solberry Pit; 7.0 acres for the Wedge B Pit. Approximately 10 acres of the pit backfill area will be reclaimed. The total unreclaimed pit area would be approximately 171.2 acres.

[3]The State Bank Notice area disturbance of 3.3 acres would be incorporated into the exploration disturbance area upon approval of the Plan Amendment.

[4]Approximately 29.5 acres of exploration disturbance are proposed under the Phase I Exploration Work Plan.

[5]Approximately two-thirds of the 209 pads were calculated as measuring 50 by 80 feet and one-third of the pads as measuring 50 by 100 feet. Exploration roads are calculated with a width of 15 feet.

2.2.4.2 Project Schedule and Workforce

No changes to processing rates are proposed at this time. However, MRG may add a night shift to their operations, increasing the schedule from five 12-hour days per week to five 24-hour days per week. This increase in work time, if required, would be used to mine the Bluelite and Solberry pits. The proposed mine plan involves active mining for an additional year until 2017, while various reclamation monitoring activities could require an additional three to five years. Reclamation activities could last for approximately ten years.

The addition of a night shift may temporarily add approximately five contractor employees. However, employee numbers for MRG may decrease slightly over time due to more efficient operations at the site resulting from better ore delivery procedures and the permanent crusher circuit. The permanent crushing circuit was installed to the north of the heap leach facility at the location of the previous permanent crusher which has been in operation since June, 2013.

2.2.4.3 Open Pits

MRG is authorized to mine from the Mary LC and the Drinkwater pits. Under this Proposed Action MRG proposes to expand the Mary LC Pit and to expand mining operations within the Brodie (referred to in two sections as the Brodie NW and the Brodie SE) and Wedge B pits. In addition, MRG proposes to begin mining from two new pits named the Bluelite Pit and the Solberry Pit. The proposed pit footprints are shown on Figure 3.

The proposed pit areas would be mined in the same manner as the authorized pit areas. Mineral Ridge open pits are mined using conventional open pit techniques including drilling, blasting, and loading the ore and waste rock into mine haul trucks with front-end loaders and hydraulic excavators. The mine waste rock would be truck-hauled to waste rock disposal areas, road fill areas, and other construction facilities.

Wheel loaders such as Caterpillar 988 or 992 -type machines or excavators would be used for loading ore and cleaning bench faces. The pit wall configurations would be controlled by several parameters including bench height, catch bench width, and slope height. Preliminary design parameters based on geotechnical studies indicate final bench heights may range from ten to 60 feet with inter-ramp slope angles ranging from 45 to 49 degrees, and bench face angles of up to 70 degrees. Local variations in geological conditions may require some modifications to the recommended bench configurations. Bench configurations and drilling and blasting practices would ultimately be optimized based on site conditions, field trials, and documented slope performance.

The geologic strength index of pit wall rock is estimated to be between 65 and 75 indicating good rock quality. A feasibility–level stability analysis carried out in 1995 (included as Appendix B-2) indicates that slope stability would be controlled by structural conditions and operating procedures rather than intact rock strength or rock mass strength. Structural orientations demonstrate a strong similarity with the orientation of the Drinkwater fault with some modifications. The analysis examined potential failure modes with the use of stereonets. With some limited exceptions, the study did not identify structures or combinations of structures which would limit bench face angles to less than 70 degrees.

Another pit slope stability report completed in 2011 (included as Appendix B-2) indicated slightly more conservative inter-ramp angles (43 to 45 degrees) but stated that surface mapping may allow for steeper slopes if the pit slopes and benches perform better than expected.

MRG is implementing stacked benching per the 1995 report which states that it is preferable to have fewer but effective permanent catch benches than to have more catch benches too narrow to be effective. MRG has implemented use of a 25-foot catch bench width with a 60-foot bench height in the Drinkwater Pit. The Drinkwater Pit was completed in September of 2014. The pit walls were stable throughout the mining process and have remained stable (i.e. no signs of sloughing or failure have been observed) since completion. In addition, several high walls in the pit have been stable since the late 1990's when they were created. The maximum bench height has been reduced to a 50-foot bench height in the other pits, resulting in a maximum inter-ramp slope angle of 47 degrees.

The risk of slope stability problems would be reduced by minimizing rock disturbance through use of industry-accepted drilling and blasting practices. These practices include controlled blasting and careful cleaning of final bench faces. Final blast rows would be modified as necessary to minimize over-breakage and disturbance, considering rock quality and proximity to the design line.

When drill holes penetrate underground workings, modifications in the blast design would be required for operating safety, to prevent loss of explosives into the workings, and to ensure effective blasting. Crown pillar thickness would be observed and maintained for operating safety. Hole plugs would be used when breakthrough occurs. Blasthole drilling would be conducted by either rotary or percussion blasthole drills. Ammonium nitrate/fuel oil or other standard emulsions would be used as the primary blasting agent.

Authorized and proposed total ore and waste rock tons from the proposed and existing pits are summarized in Table 2-3. The approximate pit dimensions are summarized in Table 2-4. No changes in ore or waste tons are proposed for the Drinkwater Pit.

Table 2-3: Summary of Ore and Waste Rock Quantities

Open Pit	Authorized		Proposed	
	Ore Tons	Waste Tons	Ore Tons	Waste Tons
Drinkwater	2,117,000	7,674,000	2,117,000	7,674,000
Mary LC	1,788,300	13,537,900	2,678,000	18,878,900
Bluelite	0	0	300,000	1,400,000
Solberry	0	0	175,000	850,000
Brodie NW	0	0	540,000	6,100,000
Brodie SE	0	0	35,000	300,000
Wedge	0	0	105,000	500,000
Total	**3,905,300**	**21,211,900**	**5,950,000**	**35,702,900**

Table 2-4: Pit Design Parameters and Dimensions Summary

Open Pit	Authorized				Proposed			
	Length (ft)	Width (ft)	Depth (ft)	Pit Bottom Elevation (ft amsl[1])	Length (ft)	Width (ft)	Depth (ft)	Pit Bottom Elevation (ft amsl[1])
Drinkwater	2,380	1,674	680	6,470	2,380	1,674	680	No change
Mary LC	2,470	1502	515	6,350	2,470	1,670	625	6,240
Bluelite	-	-	-	-	775	750	220	7,130
Solberry	-	-	-	-	620	475	140	7,260
Brodie NW	-	-	-	-	1,600	680	250	7,000
Brodie SE	-	-	-	-	575	285	110	7,040
Wedge	500	420	105	7,150	705	675	185	7,070

[1] Above mean sea level

The Brodie Pit would be backfilled with approximately 900,000 tons once the Brodie NW and Brodie SE extensions have been mined which is projected to occur in 2016. The Brodie backfill would generally be placed in 40-foot lifts, where practical, with reclaimed slopes of about 2.5H:1.0V.

Approximately 300,000 tons of waste rock from the upper portion of the expanded Wedge B Pit would be hauled to WD-9. The remaining 200,000 tons would be temporarily placed in the laydown area north of the process pond and then used to backfill the Wedge B Pit in order to reestablish access to the crusher. No regrading is anticipated to be necessary for the relatively flat backfilled area. Approximately ten acres of pit backfill would be reclaimed. Backfilling is projected to occur near the end of 2014 or the beginning of 2015.

The proposed pit bottoms are anticipated to be located at a minimum 125 feet above the water table as discussed in Section 3.7. The formation of pit lakes is not anticipated due to their location above the water table. Pit walls would be exposed during operations and closure. Potentially acid generating (PAG) rock is not anticipated to be exposed in the pit walls as discussed in Section 3.7.

In preparation for the Pit Expansion Plan Amendment MRG contracted with SRK Consulting (U.S.), Inc. (SRK) to prepare a waste rock and ore geochemical characterization report to analyze the potential for acid rock drainage and metals leaching (ARDML). The geochemical characterization report concluded that the geology and types of mineralization found in the expanded pit areas are similar to the geology and mineralization encountered in the authorized pits. No changes to the waste rock handling plan are proposed (SRK 2013c and Appendix C).

Following completion of mining, each pit would remain in its final configuration. Soil/rock berms and warning signs would be placed around each pit. Although the pit walls would remain relatively stable following closure, some sloughing would occur over time. The berms would be placed so that any sloughing would not affect their integrity. Unconsolidated materials used for pit berms would be placed at slopes not steeper than 2.0H:1.0V.

2.2.4.4 Waste Rock Disposal Areas

The waste rock disposal areas currently utilized are WD-2, WD-6, WD-10, and WD-11. MRG proposes to increase the capacity of waste rock disposal areas WD-2, WD-4, WD-6, WD-9, WD-10, and WD-11 and alter the footprints of WD-1, WD-5, and WD-7. MRG also proposes to add two new waste rock disposal area, the Bluelite and the Solberry, as shown on Figure 3.

The Bluelite and WD-4 waste rock disposal areas would generally be constructed in 40-foot lifts where practical. The remaining waste rock disposal areas would generally be constructed by end dumping over the face with a maximum face height of about 390 feet. The proposed waste rock disposal areas would have maximum reclaimed slopes of 2.5H:1.0V.

The proposed waste rock tonnages by source and disposal area are summarized in Table 2-5. Movement of waste rock material from existing waste rock disposal areas may occur in small amounts to make room for adjacent facilities with appropriate buffer areas for access and safety. Under these circumstances the material would be moved to adjacent waste rock disposal area lifts using front-end loaders and mine haul trucks.

Table 2-5: Waste Rock Destination Summary

WRD	Authorized	Existing as of December 2012	Proposed Additions by Source Pit (Life-of-Mine)						Total (tons)
			Drinkwater (tons)	Mary LC (tons)	Bluelite (tons)	Solberry (tons)	Brodie Pits (tons)	Wedge B[2] (tons)	
WD-1	5,870,400	5,870,400	0	0	0	0	0	0	5,870,400
WD-2	9,760,600	9,251,000	700,000	0	0	0	0	0	9,951,000
WD-4[1]	510,400	510,400	0	0	0	0	3,300,000	0	3,810,400
WD-5	3,133,400	3,133,400	0	0	0	0	0	0	3,133,400
WD-6	1,921,000	0	0	2,900,000	0	0	0	0	2,900,000
WD-7	805,300	805,300	0	0	0	0	0	0	805,300
WD-8	286,600	286,600	0	0	0	0	0	0	286,600
WD-9	1,480,100	1,480,100	0	0	0	0	0	300,000	1,780,100
WD10	7,858,900	0	0	12,400,000	0	0	0	0	12,400,000
WD11	2,721,000	2,190,000	0	1,100,000	0	0	0	0	3,290,000
Bluelite	0	0	0	0	1,400,000	0	2,200,000	0	3,600,000
Solberry	0	0	0	0	0	1,310,000	0	0	1,310,000
Brodie Pit Backfill	0	0	900,000	0	0	0	900,000	0	0
Total	**34,347,700**	**23,527,200**	**1,600,000**	**16,400,000**	**1,400,000**	**1,310,000**	**6,400,000**	**300,000**	**49,137,200**

[1] In 2012, 69,100 tons of ROM material was hauled from the leach pad to WD-4.

[2] The additional 200,000 tons of waste from the Wedge B pit would be used to backfill the pit to re-establish access to crusher.

The waste rock disposal areas (WD-1, WD-2, WD-4, WD-5, WD-7, WD-8, WD-9, WD-10, WD-11, Bluelite, and Solberry) would be completed such that the final graded slopes are 2.5H:1.0V or less. The upper portion of WD-5 built by former operators has an as-built slope of between 1.3H and 1.5H:1.0V. The natural slope the rock disposal area was built on has a slope of 2.0H:1.0V which makes it impracticable to reclaim this portion of the area since the heavy equipment used for contouring cannot operate on slopes greater than 2.0H:1.0V and the underlying natural slope is primarily solid rock. The lower portion would be reclaimed to a final slope of 2.5H:1.0V.

The waste rock stability analysis completed by the former operator has been updated and is included as Appendix D. The stability analysis results are summarized below.

2.5H:1.0V Rock Disposal Area Slopes

- Static conditions, block failure factor of safety (FOS) = 2.05;
- Seismic loading, block failure FOS = 1.48;
- Static conditions, circular failure FOS = 1.90; and
- Seismic loading, circular failure FOS = 1.36.

2.0H:1.0V Rock Disposal Area Slopes

- Static conditions, block failure FOS = 1.73;
- Seismic loading, block failure FOS = 1.31;
- Static conditions, circular failure FOS = 1.52; and
- Seismic loading, circular failure FOS = 1.13.

During reclamation, the lift crests of each rock disposal area would be rounded off by a bulldozer to slightly shallower final slopes. This regrading would contribute to the long-term stability of the reclaimed rock disposal area slopes.

2.2.4.5 Haul Roads

MRG is proposing the construction of new haul roads on the west side of the proposed Project Area as shown on Figure 3. The haul roads would link the proposed Bluelite and Solberry facilities with the process area. The new haul roads would have a nominal running width of between 50 and 55 feet. Safety berms would be constructed as required to a height of about four feet, adding approximately 12 feet to the overall width of the road. The haul roads would be constructed out of waste rock or by contouring and reshaping the existing topography. Best Management Practices (i.e. *Nevada Contractors Field Guide for Construction Site Best Management Practices*) including but not limited to ditches, straw bales, and/or silt fences, would be used to minimize erosion, manage stormwater, and control sediment.

2.2.4.6 Growth Media

Growth media salvage is anticipated from the Bluelite Pit, Bluelite waste rock disposal area, WD-4, and Brodie Pit footprints. The anticipated volume would be estimated for use in the reclamation plan. Salvaged growth media would be placed in an extension to the existing growth media stockpile shown on Figure 3. Growth media stockpiles would continue to be managed as described in Section 2.2.5 to prevent the loss of growth media through wind or water erosion and to prevent its disturbance or burial.

2.2.4.7 Exploration and Condemnation Drilling

MRG proposes to continue exploration within the expanded Project Area. MRG is authorized to drill up to 469 drill holes and disturb up to 79.5 acres for exploration roads and pads. MRG proposes to modify the permit condition to allow a maximum of 200 acres of exploration disturbance without a limit to the number of drill holes. Existing exploration roads located outside of the proposed disturbance areas are shown on Figure 4.

Proposed exploration activities would include overland access, new road construction, construction of exploration drill pads and sumps, and reclamation. These activities would be tracked using global positioning system (GPS) technology.

MRG would follow standard drilling procedures and require a geologist to be available throughout drilling activities. The duties of the geologist may include sitting the drill rig, logging each hole according to the geologic features encountered, determining the maximum depth of each hole, and advising the drill operator, as needed. The geologist would travel to and from the drill site in a separate truck. Standard drill rig crews would consist of a drill operator and one or two helpers. The helpers normally remove and box the recovered core samples and the cuttings from RC rigs, mix drilling fluids in the portable mud tank, operate the water truck, assist with drilling operations, and conduct maintenance as necessary. The crew would be transported to and from the drill site in a light vehicle or one of the support vehicles.

MRG holds a notice for exploration within the State Bank area (NVN-93044). The State Bank Notice includes the drilling of 32 exploration holes and covers a disturbance area of 4.1 acres. The 32 holes have been drilled and 3.3 acres have been disturbed as shown on Figure 4. Upon approval, the State Bank Notice would be incorporated into the Plan Amendment as exploration disturbance.

Because exploration is an iterative endeavor, the exact number of drill sites and the precise locations of the drill roads and drill pads are not known for the entire exploration process. MRG has prepared a "Phase I Exploration Work Plan" describing exploration disturbance associated with the first 209 drill holes. The planned drill hole and road locations are shown on Figure 4 and are summarized in Table 2-6.

Table 2-6: Phase I Exploration Work Plan Areas

Exploration Feature	Disturbance (acres)
Drill pads[1]	20.8
Drill roads[2]	8.7
Total	**29.5**

[1]Approximately two-thirds of the 209 pads were calculated as measuring 50 by 80 feet and one-third of the pads as measuring 50 by 100 feet.

[2]Disturbance is estimated for 25,350 feet of 15-foot wide exploration road

Additional work phase plans would be submitted to the BLM for review approximately two months prior to their implementation. Exploration holes and roads would also be located with regards to the applicant committed environmental protection measures described in Section 2.2.5. Completed exploration roads and pads would be mapped using GPS technology. Upon completion of each exploration phase, a report would be submitted to the BLM summarizing the work completed.

Exploration operations would utilize reverse circulation (RC) drill rig and diamond core drill rigs. Drill rigs may be track-mounted, truck mounted, or buggy-mounted depending on rig availability and site conditions. Drill holes would be advanced to an average of 390 feet below ground surface (bgs). Most holes are not anticipated to intersect groundwater. Groundwater elevations are discussed in Section 3.7

Three exploration drill rigs may be operated at any one time. The drill rigs would be supported by a 2,000-gallon water truck, a dozer, a service truck, a skidder, and a light vehicle. Other equipment may be used as it is necessary. Water would be supplied from the Mineral Ridge production wells. An average of 1,375 gallons of water per shift would be used to drill the exploration holes. RC rigs would normally operate one shift per day and core rigs would normally operate two shifts per day. Exploration water use would range from approximately 6,875 to 8,250 gallons per day (gpd). Water would be supplied by the permitted production wells.

The RC drilling would occur on pads measuring 50 feet by 80 feet. The diamond core drilling would occur on pads measuring 50 feet by 100 feet. Sumps would be excavated within the limit of the drill pad and would generally measure ten feet by four feet wide and five feet deep. Final sump dimensions would be designed to meet the estimated required capacity of drill fluids and cuttings with one foot of freeboard. Drill mud from the pre-collar RC drilling would be collected in sumps and reused where practicable for the subsequent core drilling.

Panels, wire fencing, snow fencing, electric fencing, and other types of barriers would be installed and maintained around each sump to prevent access by larger wildlife, wild horses, and livestock. Fencing around sumps may be removed once the sump is dry.

Condemnation drilling would occur within the proposed facility footprints and the associated disturbance would be categorized under the given facility's acreage. Drilling would be carried out in the pit footprints to better define ore location and characteristics prior to pit development, and drilling would take place in the waste rock footprints prior to the placement of waste rock to ensure that viable resources are not covered. Condemnation drilling would be carried out using the same fleet and procedures as used for exploration drilling.

2.2.4.8 Realignment of Water Lines

The existing water lines from production wells PW-1 and PW-2 are located within the proposed Bluelite Pit and Brodie Pit footprints. MRG proposes to move the PW-2 water line to the south of the proposed Bluelite Pit footprint and the PW-1 water line to the west and south of the proposed Brodie Pit footprint. The proposed water line locations are shown on Figure 3.

2.2.4.9 Realignment of Power Lines

No changes to the existing 69-kilovolt power line route are proposed at this time. However, MRG proposes to alter the power conveyance lines to PW-1 and PW-2 to generally follow the proposed water line route as shown on Figure 3 and avoid conflicts with the proposed Bluelite and Brodie pits. A majority of the realignment would occur on interpit areas categorized as "General Disturbance". The realignment would be completed prior to excavation of the Bluelite Pit or expansion of the Brodie Pit.

MRG employees and contractors would perform the power line realignment work. Standard raptor protection designs as outlined in *Suggested Practice for Avian Protection on Power Lines* (Avian Power Line Interaction Committee [APLIC] 2006) would be incorporated.

2.2.4.10 Air Quality Barrier

MRG has been required to install a physical barrier to public access per their Class II Air Quality Operating Permit (Permit No. AP1041-2733) schedule of compliance. As required by the NDEP-BAPC, the physical barrier must include at a minimum, a three-strand wire field fence, geographic feature, or berms which cannot reasonably be traversed by a person on foot. MRG submitted an AERMOD model based on a physical barrier around the crusher area created by existing berms, existing highwalls, and an additional three-strand wire fence. The barrier location was approved by the NDEP-BAPC in December, 2013 (BAPC 2013). The proposed barrier location is shown on Figure 3.

Biological surveys have indicated that desert bighorn sheep inhabit the operations area and surroundings, and use the truck shop filling station overflow as a water source. The truck shop filling station overflow is located within the proposed physical barrier perimeter. Representatives from the Nevada Department of Wildlife (NDOW) and BLM concurred that the barrier used should be wildlife-friendly with the use of fencing being discouraged.

2.2.4.11 General Disturbance

MRG proposes to increase the "General Disturbance" disturbance category. Much of this increase results from filling in areas between proposed and existing facilities to cover their potential disturbance under the reclamation bond. The proposed General Disturbance areas are shown on Figure 3.

2.2.4.12 Changes to Mobile Equipment

MRG proposes to increase the mobile mining equipment fleet by four haul trucks, one loader, and one blast hole drill rig. The fleet, including the proposed additions, would consist of the following:

- Eleven haul trucks;
- Four loaders;
- Three excavators;
- Four blast hole drill rigs;
- Two dozers;
- One grader; and
- One water truck.

Exploration equipment would consist of the following:

- Three drill rigs;
- Three water trucks;
- One support truck;
- One dozer; and
- One skidder.

2.2.4.13 Reclamation

Reclamation would be completed to the standards described in 43 CFR 3809.420 and NAC 519A. Reclamation would meet the reclamation objectives outlined in the BLM Solid Minerals Reclamation Handbook (BLM 1992a), revegetation success standards per BLM/NDEP guidelines for successful revegetation (BLM 1999), and the Surface Management Handbook (BLM 2012a). Overland travel and existing roads would be utilized as much as possible, minimizing the need for road construction. MRG drill sites, sumps, overland travel, and road construction would be recontoured and reseeded.

Reclamation would be designed to achieve post-mining/exploration land uses consistent with the BLM's land use management plans for the area, which are outlined in the Tonopah RMP (BLM 1997). Reclamation is intended to return disturbed land to a level of productivity comparable to pre-mining/exploration levels. Post-exploration land use includes wildlife habitat, livestock grazing, hunting, dispersed recreation, and mineral exploration and development. The post-mining/exploration land use is not expected to differ from the pre-mining/exploration land use.

During periods of inactivity between exploration drilling phases, reclamation would involve filling sumps, cleaning sites, and maintaining the overall safety of the Project Area. The BLM and NDEP would be notified prior to periods of inactivity greater than 120 days.

Revegetation, Seeding, and Planting

Reclaimed surfaces would be revegetated to reduce runoff and erosion, provide forage for wildlife and livestock, control invasive weeds, and reduce visual impacts. Seed would be applied with either a rangeland drill, hydroseeder, or a mechanical broadcaster and harrow, depending upon accessibility. Seedbed preparation and seeding would typically take place between the BLM-recommended dates of October 1 and March 15 of each year after grading and growth media placement activities are complete. Seeding outside these dates may occur depending on weather conditions.

A reclamation seed mixture has been approved by the BLM and is shown in Table 2-7. The proposed seed mixture and application rates are subject to modification based upon the actual results of concurrent reclamation in the Project Area, revegetation test plots, or changes by the BLM in the seed mix recommendations. Modifications may be undertaken after consultation with the BLM.

Table 2-7: BLM Recommended Reclamation Seed Mixture

Common Name	Scientific Name	Broadcast Application Rate[1]
Indian rice grass	*Oryzopsis hymenoides*	2.00
Streamband wheatgrass	*Agropyron riparium*	2.25
Sandberg bluegrass	*Poa secunda*	2.00
Palmer penstemon	*Penstemon palmeri*	0.25
Basin sagebrush	*Atemisia tridentata*	1.50
Mormon Tea	*Ephedra viridis Coville*	1.00
Globemallow	*Sphaeralcea ambigua*	0.50
Galleta grass	*Hilaria jamesii*	2.00
Total		**11.5**

[1] Pure live seed

Post-Mining Contours and Topography

Large constructed topographic features, such as rock disposal areas and the spent heap, would have rounded tops to prevent water ponding on flat surfaces and to promote surface water run-off from the top of the rock disposal areas. When feasible, large constructed topographic features would have variable slope angles to resemble natural landforms as well as interspersed rock piles or rock features. The final reclamation configuration would provide a stable post-mining landform as determined by both seismic and erosion performance. Slopes would generally be regraded to 2.5H:1.0V. To limit erosion, growth media would be placed and seeded on the regraded surfaces with priority given to the heap leach facility. The open pits would remain as post-mining features. Safety berms would be constructed around their edges to preclude vehicular access.

Reclamation of Rock Disposal Areas

The rock disposal areas would be reclaimed to meet general objectives including reduced slope erosion, mass stability, rounded edges, revegetated surfaces, and rates of soil loss consistent with the surrounding topographic features. The final slopes of the reclaimed rock disposal areas would vary, with slopes of 2.5H:1.0V or shallower and slight benches remaining at practical intervals to reduce surface water flow velocities and erosion. The upper portion of WD-5, built by former operators, has an as-built slope of between 1.3H and 1.5H:1.0V. The natural slope the rock disposal area was built on has a slope of 2.0H:1.0V. Heavy equipment used for rock disposal area contouring cannot operate on slopes steeper than 2.0H:1.0V. In order to contour WD-5 to a 2.5H:1.0V slope, it would be necessary to cut into the natural underlying ground, which for the most part is solid rock. The lower portion would be reclaimed to a final slope of 2.5H:1.0V.

The rock disposal areas would be revegetated with the recommended seed mix to reduce their erosion potential and assist in establishing post-mining land use goals. Growth media would not be applied to the waste rock disposal area surface, so that use of salvaged growth media can be prioritized for reclamation of the heap leach facility.

The tops of the rock disposal areas would be ripped/scarified to a depth of 12 to 18 inches to alleviate surface compaction. The surface would be left in a rough condition to facilitate plant growth. Seed would be applied to the rock disposal areas by broadcast methods and set in place by dragging a wire mesh or other acceptable implement over the seeded surface. Depending on seasonal conditions, seeding would be completed between October 1 and March 15 to optimize germination and vegetative success.

No additional material would be added to WD-8, which has been filled to planned capacity and is currently being used for the truck shop facilities.

Revegetation goals for the rock disposal areas would be determined from the existing baseline vegetation sampling program (CCA 1995) and from the results of ongoing revegetation test programs. Vegetation research sites would include exploration drill sites, roads already reclaimed, and areas suitable for concurrent reclamation. The lower slopes of other rock disposal areas would become available for concurrent reclamation as they are converted to rock disposal areas constructed with lifts rather than the existing free-fall structures. Data from these programs would be incorporated into final closure plans, and revegetation standards for the rock disposal areas would be in accordance with the guidelines contained in the Nevada Standards for Successful Revegetation issued by the BLM and the BMRR.

The seed mix shown in Table 2-7, developed by the BLM, is based on known soil and climatic conditions and was selected to establish a plant community which would support post-mining land use. The seed mix provides plant species that can: exist in the environment of west-central Nevada; species approved for revegetation; and/or are native species found in the plant communities prior to disturbance. Modifications in the seed mix, application rates, and cultivation methods and techniques could occur based on monitoring and concurrent reclamation. Changes and/or adjustments to the seed mixtures and application rates would be developed in consultation with and approval by the BLM and the BMRR. The seed mix selected in consultation with the BLM and the BMRR would represent a reclaimed desired plant community and would be appropriate for each ecological site description identified by the BLM in the Project Area.

Reclamation of Heap Leach Facility

A final plan for permanent closure would be completed and submitted to the NDEP at least two years prior to heap leach facility closure. The sections below describe the basic closure procedures.

Regrading

The heap leach facility would be completed in lifts to an overall stable slope configuration of 2.5H:1.0V and is expected to contain up to 7.6 million tons. At the conclusion of leaching, solution neutralization, and evaporation, the lift crests would be rounded off to produce slope breaks and a slightly shallower overall final slope configuration, which would maintain or increase the designed slope stability. The heap top would be rounded and contoured to prevent ponding. Reshaping would be completed within the leach pad containment.

The final surface of the reshaped heap leach facility compacted by equipment during reshaping would be ripped or scarified and covered with approximately 24 inches of growth media prior to seeding. The growth media layer depth would be approved by state and federal authorities prior to final reclamation. The resulting growth media is generally considered adequate to capture rainfall for evaporation or uptake by vegetation.

The heap would be revegetated with the seed mix listed in Table 2-7 to reduce wind and water erosion, and infiltration of meteoric waters into the spent heap, and to establish the post-mining land use. Seed would be applied by broadcast methods or by hydro-seeding and set in place by dragging a wire mesh or other acceptable implement over the seeded surface between October 1 and March 15.

Revegetation goals for the heap would be determined from the completed baseline vegetation studies (CCA 1995) and from the results of ongoing revegetation test programs. Data from these programs would be provided to the BLM and the NDEP. Revegetation standards for the spent heap would be consistent with the existing guidelines contained in the Nevada Interim Standards for Successful Revegetation issued by the BLM and the BMRR (BLM 1999).

Stabilization of the spent heap would be accomplished by regrading and revegetating the surface according to the guidelines issued by the BLM and the BMRR.

Treatment of Outflows, Residual Chemicals, or Fluids in the Heaps

After operations cease, solution in the heap leach facility would be allowed to drain down until the rate of flow from these facilities can be passively managed through evaporation from the ponds. The time required to reach a residual flow rate sufficiently low to be passively managed in the ponds is mainly a function of the final reclamation strategy rather than drain down rate and depends upon the fluid management measures taken to reduce solution inventory.

Fluid management would include an active and passive phase. During the active phase, solution would be recirculated and evaporated through a forced spray evaporation system located on the heap leach facility not closer than 500 feet from the edge. Heap solution may also be re-applied to the heap leach facility using the existing drip and/or sprinkler system.

The purpose of the active phase would be to rapidly reduce solution inventory in the heap leach facility and associated ponds to allow transition to the passive management phase. The evaporation program would be continued until drain down from the heap leach facility has reached levels that can be handled through a passive management system.

Evaporation on the heap surfaces may extend up to one year after closure begins. Until active evaporation on the facility surfaces ceases, growth media would not be placed on those portions of the facility's surfaces that are being used for evaporation, but may be staged nearby.

Management of drain down solution during the passive phase would include converting the process ponds into an evapo-transpiration cell (E-T cell). These cells would be created by backfilling the ponds and seeding them with the reclamation seed mix or a seed mix designed to be effective in moist conditions.

The bond cost calculation assumes that the pond would be converted to an E-T cell in order to shorten the active management period and allow passive management to begin sooner.

The closure of the heap would be consistent with the requirements of the facility's water pollution control permit (WPCP). The detailed design for the final closure are required to be presented in a final closure plan for review and approval by the BMRR and the BLM two years prior to closure.

Detoxification would occur through natural degradation. The present criteria for considering spent heaps successfully stabilized include the following:

- A pH between six and nine;
- A weak acid dissociable cyanide concentration below 0.2 milligrams per liter; and
- Concentration levels of other potential contaminants below levels as determined by the NDEP, at which degradation of surface and ground water is not likely to occur.

Reclamation of Process Pond

Solutions in the process pond would be managed during the residual gold recovery operation and treated as described for reclamation of the heap leach facility.

Solids in the pond would be present in some quantity at the time of closure. Representative samples would be obtained to determine the chemical characteristics of the pond solids. Depending on the results of the characterization testing, the solids would either be left in the pond with the pond liners folded over and buried in place, removed and placed on the heap prior to regrading and cover, or removed and placed in an approved landfill.

Solution transfer channels would be reclaimed in the same manner as the process ponds; therefore, solutions draining from the reclaimed leach facility would be directed into the E-T cell. Residues would be tested and either removed to an appropriate disposal area or buried in the channels. The channels would be backfilled with the original excavated material stockpiled in the channel berms. This soil would provide suitable growth media for final vegetation.

The channels would be revegetated with the seed mix listed in Table 2-7. MRG would determine revegetation goals for the channels based on baseline vegetation sampling information already collected and the results of ongoing revegetation test programs. Data from these programs would be coordinated with the BLM and the NDEP. The revegetation standards for ditches would be in accordance with the existing guidelines contained in the Nevada Interim Standards for Successful Revegetation issued by the BLM and the BMRR (BLM 1999). Reclamation of all surfaces would be in accordance with the requirements of Nevada Administrative code (NAC) 519A.

Reclamation of Roads

The main access roads and certain haul roads crossing the Project Area would not be reclaimed in order to maintain access through the Project Area for post-reclamation monitoring and long-term use by Esmeralda County. Esmeralda County holds the right-of-way (N-89441) for the access road from State Route 265 to the Mineral Ridge Mine and west to Coyote Road. Maintenance of this road would return to Esmeralda County when operations cease.

Roads specified for reclamation would have surfaces ripped to depths ranging between 12 to 18 inches in order to reduce compaction. Road surfaces and adjacent ditches at grade would be regraded to approximate pre-mining contours. Roads and ditches with significant cut would be recontoured to blend with surrounding areas. Culverts not needed in the post-mining landscape would be removed. These sites would be reclaimed to a stable, free-draining configuration.

Reclaimed roads and adjacent ditches would be revegetated with the seed mix listed in Table 2-7. MRG would determine revegetation goals for the roads based on the preliminary vegetation information program and the results of revegetation test programs. Data from these programs would be provided to the BLM and the NDEP. Revegetation standards for reclaimed roads and ditches would be in accordance with the existing guidelines contained in the Nevada Interim Standards for Successful Revegetation issued by the BLM and the BMRR (BLM 1999).

Drainage sites affected by road construction would be restored to a stable free-draining configuration to the extent possible. These sites would be stabilized to prevent erosion using techniques that include revegetation or the placement of riprap in erosion-prone areas of the drainages.

Drainages crossed by access and haul roads would remain open during regrading. The resulting channels would contain the same capacity as upstream and downstream reaches. Erosion would be controlled by using surface stabilization techniques and ultimately, revegetation. Sediment control measures would be followed during construction, operation, and reclamation to minimize sedimentation from the disturbed areas. MRG would be responsible for maintenance and removal of sediment control structures utilized during operations.

Reclamation of Open Pits

Reclamation of open pits would include construction of a physical perimeter barricade to prevent vehicular access and to deter livestock. Access to the open pits would be controlled by a four-foot high safety rock berm and a catch bench. Select pit access and haul roads would be bermed and left in place to allow for wildlife ingress and egress.

The Brodie Pit would be backfilled with approximately 900,000 tons once the Brodie NW and Brodie SE extensions have been mined. The Brodie backfill would generally be placed in 40-foot lifts, where practical, with reclaimed slopes of about 2.5H:1.0V.

Approximately 300,000 tons of waste rock from the upper portion of the expanded Wedge B Pit would be hauled to WD-9. The remaining 200,000 tons would be temporarily placed in the laydown area north of the process pond and then used to backfill the Wedge B Pit in order to reestablish access to the crusher. No regrading is anticipated to be necessary for the relatively flat backfilled area. Approximately ten acres of pit backfill material would be revegetated with the recommended seed mix to reduce their erosion potential and assist in establishing post-mining land use goals. The material would be ripped/scarified to a depth of 12 to 18 inches to alleviate surface compaction. The surface would be left in a rough condition to facilitate growth. Seed would be applied to the material using broadcast methods and set in place by dragging a wire mesh or other acceptable implement over the seeded surface. Depending on seasonal conditions, seeding would be completed between October 1 and March 15 to optimize germination and vegetative success.

The backfill material would have the same geochemical characteristics as material placed in the waste rock disposal areas (discussed in detail in Section 2.2.5) with a net neutralizing effect and presenting a low risk for ARDML. The backfill material would not come into contact with groundwater since the pit floors would be located above the groundwater elevation.

Concurrent Reclamation

MRG would conduct concurrent reclamation of facilities no longer required for operational purposes or which will no longer be altered for waste rock movement. This reclaimed acreage and the status of growth media storage would be reported annually to the regulatory agencies.

2.2.5 Applicant Committed Environmental Protection Measures

Applicant committed environmental protection measures and best management practices (BMPs) have been developed as a means of minimizing or avoiding environmental impacts. They are discussed below by subject.

Air Quality

Air emissions, including point and fugitive sources, would continue to be controlled in accordance with the Class II Air Quality Operating Permit (Permit No. AP1041-2733) and the Fugitive Dust Control Plan. BMPs implemented include but are not limited to dust control on roads through water or a binder application (primarily near the administrative building and process area), vehicle maintenance, pre-watering of areas prior to disturbance, gravelling, and adherence to speed limits. The amount of water for fugitive dust control is expected to be 750 gpd. Water would be supplied by the permitted production wells.

Backfilling Operations

MRG would perform pit backfilling using the same dust suppression techniques as are used for waste rock material placement and would manage potential impacts to wildlife in accordance with the measures listed below. The pit slope stability factors such as rock strength and structural factors (Appendix B-1 and B-2) would be taken into consideration for the designation of safe backfill operations. Industry accepted drilling and blasting practices would also be followed during the mining of areas to be backfilled to minimize rock damage and destabilization from blasting.

Cultural Resources

Avoidance is the MRG-preferred treatment for preventing effects to historic properties (an historic property is any prehistoric or historic site eligible to the National Register of Historic Places (NRHP) or unevaluated cultural resources. If cultural properties, items, or artifacts (i.e., stone tools, projectile points, etc.) are encountered during operations, the activity would be halted immediately and the relevant persons notified. Site area borders would be staked and/or flagged with buffer areas as needed. If avoidance is not possible or is not adequate to prevent adverse effects, MRG would undertake data recovery at the affected historic properties in accordance with the *Programmatic Agreement between the Bureau of Land Management, Tonopah Field Office, and the Nevada State Historic Preservation Office, Regarding the Treatment of Historic Properties During Scorpio Gold Corporation's Mineral Ridge Mine Expansion in the Mineral Ridge Mining District, Esmeralda County, Nevada* (PA).

Development of a treatment plan, data recovery, archaeological documentation, and report preparation would be based on stipulations delineated in the PA. If an unevaluated site cannot be avoided, additional information would be gathered, and the site would be evaluated. If the site does not meet eligibility criteria as defined by the State Historic Preservation Office (SHPO), no further cultural work would be performed. If the site meets eligibility criteria, a data recovery plan or appropriate mitigation would be completed and approved. Once data recovery has been completed at a historic property, the BLM would issue a Notice to Proceed for work at that location.

Public Safety

Locked gates have been installed near the active mine area entrances on the Coyote Road and the Eagle Canyon Road. Active exploration sumps would be flagged for visibility until they are backfilled. Existing roads would not be blocked by drilling equipment.

Following completion of mining, soil/rock berms would be placed around each pit. Although the pit walls would remain relatively stable following closure, some sloughing would occur over time. The berms would be placed so that sloughing would not affect their integrity. Unconsolidated materials used for pit berms would be placed at slopes not steeper than 2.0H:1.0V.

Water Quality

Monitoring the facility fluid management systems through leak detection systems and vadoze zone wells would continue as stipulated under WPCP NEV0096106.

Roads would be designed to the minimum standards needed to accommodate intended safe use and to maintain surface resource protection; exploration roads would generally be constructed along existing contours. Exploration road construction would be conducted in such a manner as to minimize cuts and fills, including limiting road construction on steep slopes, where possible. Access across drainages would be avoided where possible.

No springs or seeps are located within the Project Area, and only ephemeral drainages are present. Surface water features are discussed further in Section 3.7. The Mineral Ridge Mine

General National Pollutant Discharge Elimination System permit was terminated by the NDEP effective June 4, 2012 as the U.S. Army Corps of Engineers concurred that all drainages within the mine area are considered isolated waters and not navigable waters of the U.S.

The Coyote and Tarantula springs (both located outside of the Project Area) are monitored every other week for flow and wildlife observations and yearly for water quality. This monitoring plan was adopted as part of the *Mineral Ridge Mine (N-73109/Reclamation Permit 0103): Plan of Operations Water Well Amendment II* (BLM 2012b). Results are submitted to the BLM and NDOW.

Diversion structures and BMPs are used to control surface water runoff. Sediment and surface control structures are constructed alongside roads and yards to direct stormwater flows away from facilities as part of operational management. Where possible, upgradient flows are diverted around disturbed areas and returned to natural drainages. Sediment and surface water control structures are also constructed at the waste rock disposal areas to manage flow, control erosion, and to control sedimentation.

Diversion structures are located near the east and west toes of the heap leach facility. The v-shaped structures have been designed, constructed, and are maintained to divert runoff resulting from the 100-year, 24-hour storm event away from the facility.

Accepted engineering practices and BMPs for sediment control would be employed during construction, operation, and reclamation to minimize sedimentation of disturbed areas. Sediment control structures may include, but are not be limited to, fabric and/or certified weed-free straw bale filter fences, siltation or filter berms, mud sumps, and down gradient drainage channels in order to prevent unnecessary or undue degradation to the environment. Sediment traps (sumps), constructed as necessary adjacent to drill sites, would be used to settle drill cuttings and prevent release. In order to control erosion from roads and drill sites, and from the unlikely event of drill cuttings being released, certified weed-free straw bales and silt fences would be placed in drainages to capture sediment, where required.

Drainage structures would be constructed or installed where necessary to prevent or minimize erosion and sedimentation. Drainage structures may consist of, but not be limited to, water bars, borrow ditches, contour furrows, and culverts sized to handle maximum seasonal water flows.

Spills would be managed according to the spill contingency plan described in the *Spill Prevention, Control, Containment, and Countermeasure Plan* included as Appendix D of the Plan Amendment. Materials and equipment necessary for spill cleanup would be kept on-site at appropriate locations. Notifications to appropriate agencies would be undertaken.

Exploration drilling sumps for drill water, fluids, and cuttings would be excavated within the limit of the drill site. Anticipated sump dimensions would be about ten feet by four feet by five feet deep or smaller. Final sump dimensions would be designed to meet the estimated required capacity of drill fluids and cuttings with one foot of freeboard.

Mineral exploration and development drill holes subject to Nevada Division of Water Resources (NDWR) regulations would be abandoned in accordance with Nevada Revised Statutes (NRS) 534.425 through 428.

Wildlife and Vegetation

To minimize impacts to wildlife and plant resources within the Project Area, MRG would utilize existing access and exploration roads to the maximum extent possible. In addition, new surface disturbance would be kept to the minimum required to provide safe equipment access and crew working areas. Disturbed areas would be reclaimed by recontouring and revegetating at the earliest practical time upon the completion of operations. If necessary, MRG, in coordination with the BLM, would implement measures to avoid or protect special status plant or wildlife species that could potentially be impacted.

MRG would make efforts to avoid cutting trees where possible. Trees which are removed would be cut up with a chain saw, with the larger diameter pieces placed in berms near the disturbance area and near areas accessible to the public and MRG employees. They would be left for collection. Slash, tree trimmings, and smaller pieces of wood would be incorporated into the growth media stockpile.

Land clearing and surface disturbance would be timed to prevent destruction of active bird nests or of young birds during the avian breeding season (March 15 through July 31) in accordance with Tonopah Field Office policies and with the Migratory Bird Treaty Act (MBTA). If surface-disturbing activities are unavoidable, MRG would have a qualified biologist survey areas proposed for disturbance for the presence of active nests within two weeks prior to the disturbance. The survey results would be valid for two weeks.

If active nests are located in an area which would be disturbed, or if other evidence of nesting are observed (mating pairs, territorial defense, carrying nesting material, transporting of food), the area would be avoided to prevent destruction or disturbance of nests until the birds are no longer present. Avian surveys would be performed only during the avian breeding season and immediately prior to MRG conducting activities that would result in disturbance. After such surveys are performed, and disturbance has been created, MRG would not conduct any additional disturbance during the avian breeding season without first conducting another avian survey. After July 31, in compliance with the Tonopah Field Office guidelines, no further avian surveys would be required until the next avian breeding season.

Bald and Golden Eagles are protected under the *Bald and Golden Eagle Protection Act* (16 U.S.C. 668-688d). The *Bald and Golden Eagle Protection Act* prohibits the taking or possession of and commerce in Bald and Golden Eagles, parts, feathers, nests, or eggs with limited exceptions. The definition of “take” includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. “Disturb“ means to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available:

- Injury to an eagle;
- A decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or
- Nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior.

This definition also applies to impacts that may result due to human activities to or around a nesting site during times when eagles are not present if, when the eagles return, the alterations or activities interrupt their normal breeding, feeding, sheltering, or cause death, or nest abandonment (USFWS 2010).

MRG's existing and proposed construction, operation, and reclamation procedures incorporate measures to protect eagles. Surveys would be conducted prior to ground disturbance in the breeding and nesting seasons to determine the presence or absence of eagles as well as other migratory avian species protected under the MBTA. If nesting or brooding eagles are determined to be present, MRG would avoid the area using a buffer zone developed in coordination with the BLM and NDOW.

Standard raptor protection designs as outlined in *Suggested Practice for Avian Protection on Power Lines* (APLIC 2006) would be incorporated into the design and construction of power lines.

Project-related traffic would observe prudent speed limits, 25 miles per hour or less, to protect wildlife. The solution pond is fenced with an eight-foot high chain-link fence to limit terrestrial wildlife access and the pond water is covered by bird balls. An eight-foot high chain-link fence has also been installed around the electrical sub-station.

For exploration activities, one end of each sump would be sloped to provide an escape route in the event an animal enters the sump. Sumps would be backfilled after completion of drilling. Select pit access and haul roads would be bermed and left in place to allow for wildlife ingress and egress.

Livestock and Range Allotments

Project-related traffic would observe prudent speed limits, 25 miles per hour or less, to protect livestock.

Survey Monuments

Survey monuments, witness corners, or reference monuments would be protected to the extent economically and technically feasible. Should moving such a feature be required, MRG would ensure that a licensed Professional Land Surveyor oversees and executes the relocation in a manner consistent with applicable laws. The BLM would be notified in writing prior to the moving of any such survey monuments.

Solid Wastes

Non-hazardous Project-related refuse would be collected in approved trash bins or containers and removed from the site for disposal in accordance with county, state, and federal regulations, or disposed in the on-site permitted landfill. The bins and/or containers would be equipped with lids. Debris that may have hazardous characteristics, residues, or fluids would not be disposed of in these trash bins.

Two Class III-waivered landfills have been permitted for the site. The original landfill is located on WD-4 and has been covered with waste rock material and is no longer in use. The currently used Class III-waivered landfill is located on WD-5. These landfills have been designed, permitted, and constructed in accordance with applicable local, state, and federal regulations.

Hazardous Substances

Hazardous substances employed for the Project would be transported in accordance with applicable regulatory guidelines. Upon request, MRG would provide the BLM with MSDS or equivalent safety information. Spill prevention and spill reporting measures are outlined in the site *Spill Prevention, Control, and Countermeasures Plan and Spill Contingency and Emergency Response Plan* submitted with the Plan Amendment.

Hazardous wastes would be stored and disposed of in accordance with federal, state, and local regulations and MRG's hazardous waste management plan. Petroleum-contaminated soils would be shipped off-site to a licensed disposal facility. A petroleum-contaminated soils plan is not required at the Mineral Ridge Mine.

Petroleum Contaminated Soils

Petroleum contaminated soils are currently shipped off-site to a licensed disposal facility. A petroleum contaminated soils plan is not required at this site.

Fire Prevention and Control

MRG will comply with all applicable state and federal fire laws and regulations , and reasonable measures would be taken to prevent and suppress fires in the Project Area. Smoking would only be permitted in areas that are free of flammable materials and only if allowed by state law or federal regulations. If smoking is allowed, smokers would position themselves in such a manner that burning material would fall within cleared areas. Smoking materials would be extinguished by pressing said materials into mineral soils. When completely extinguished, debris associated with smoking would then be put into containers designed solely for this purpose and properly disposed.

The mine buildings are equipped with fire extinguishers and fire hydrants as described in the site Emergency Response Plan. Mobile equipment on the mine site would be equipped with fire extinguishers as required by the Mine Safety and Health Administration.

In the event the proposed activities start or cause a wildland fire, MRG would be responsible for all the costs associated with suppression. The following precautionary measures would be taken to prevent and report wildland fires:

- All vehicles would carry fire extinguishers;
- Adequate fire-fighting equipment (i.e., shovel, Pulaski, extinguishers), and a minimum ten gallons of water would be kept at each drill site;
- Vehicle catalytic converters would be inspected often and cleaned of brush and grass debris;
- Welding operations would be conducted in an area free from or mostly free from vegetation. A minimum of ten gallons of water and a shovel would be on hand to extinguish any fires created from the sparks. Extra personnel would be at the welding site to watch for fires created by welding sparks. Welding aprons would be used when conditions warrant (i.e., during red flag warnings);
- Wildland fires would immediately be reported to the BLM Central Nevada Interagency Dispatch Center at (775) 623-3444. Information reported would include the location (latitude and longitude if possible), fuels involved, time started, who or what is near the fire, and the direction of fire spread; and

- When conducting operations during the months of May through September, the BLM Battle Mountain District Office, Division of Fire and Aviation would be contacted at (775) 635-4000 to determine if any fire restrictions are in place for the Project and to provide approximate beginning and ending dates for Project activities.

Growth Media

Growth media stockpiles would continue to be managed so as to prevent the loss of growth media through wind or water erosion and to prevent its disturbance or burial. Approximately 121,850 cubic yards are currently stored in the on-site growth media stockpile constructed with angle of repose slopes. MRG would attempt to salvage additional material that could be used as growth media. If new stockpiles are created that would remain in place throughout a growing season they would be seeded with an interim seed mixture to help stabilize the material and minimize non-native species establishment. New stockpiles would be strategically located to reduce reclamation costs associated with reuse.

Noxious Weed / Undesirable Plant Control

As of 2013, no listed noxious weeds were identified within the Project Area (Knight & Leavitt 2012a, 2013a, 2014a and SRK 2013a, 2013b, 2014a, and 2014b). Since no listed noxious weeds have been identified within the Project Area to date, the current priorities for weed management are controlling the introduction of weeds along access routes and preventing infestations on planned disturbances.

Employees and contractors would be educated to identify noxious weeds that could occur in the proposed disturbance areas. MRG would report the occurrence of noxious weeds to the BLM authorized officer and take appropriate measures to prevent the spread of noxious weeds. BMPs include the following:

- Flagging areas of concern to prevent employees and contractors from driving through a stand of listed noxious weeds;
- Using certified weed-free hay and straw;
- Using an approved seed mix to reduce invasive species over time by developing and maintaining desired plant communities; and
- Washing down construction equipment in accordance with the BLM standard operating procedures to prevent the transfer of noxious and undesirable weed seed from other areas.

Employee Training

MRG would train employees, contractors, and other related personnel as to the environmental and cultural resources responsibilities required under the Plan Amendment as well as state and federal law.

2.2.6 Alternatives to the Proposed Action

In accordance with BLM NEPA Handbook H-1790-1, Chapter 6 (BLM 2008), this EA evaluates a No Action Alternative which is a reasonable alternative to the Proposed Action. The objective of the No Action Alternative is to describe the environmental consequences that would result if the Proposed Action were not implemented. The No Action alternative forms the baseline from which the impacts of all other alternatives can be measured.

2.2.6.1 Crusher Area Physical Barrier Alternative

MRG is required to install a physical barrier to public access per their Class II Air Quality Operating Permit (Permit No. AP1041-2733) schedule of compliance. As required by the NDEP-BAPC, the physical barrier must include at a minimum, a three-strand wire field fence, geographic feature, or berms which cannot reasonably be traversed by a person on foot.

Under the Proposed Action, this barrier would consist of existing berms, fences, and a highwall linked by a proposed fence as shown on Figure 3. Under the Crusher Area Physical Barrier Alternative, the barrier would be configured more locally to contain, at a minimum, the area around the crusher where NAAQS exceedances occur as shown on Figure 5 but would not surround the truck shop filling station overflow area used as a water source by desert bighorn sheep. The barrier would be constructed using a combination of three-strand wire field fence, geographic features, berms, or other feature as approved by the NDEP-BAPC.

2.2.6.2 Alternatives Considered but Eliminated from Further Analysis

The proposed pit locations are based on ore grade data and modelling and are considered fixed. The location of the rock disposal areas is based on economic considerations such as haul distance, grade of the haul, and volume of material to be placed. Other facility configurations, including additional pit backfill, were considered to be cost-prohibitive or not practically feasible.

2.2.6.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be approved by the BLM. MRG would continue mining operations in accordance with previously authorized actions.

3.0 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND PROPOSED MITIGATION OR AVOIDANCE MEASURES

This section describes the status of supplemental authorities and resources that may be affected by either the Proposed Action or No Action Alternative.

The purpose of this section of the EA is to describe the existing environment of the Project Area. Supplemental authorities that are subject to requirements specified by statute or E.O. must be considered in all BLM environmental documents. The elements associated with the supplemental authorities listed in Appendix 1 of the NEPA Handbook (BLM 2008) and in the Nevada Instruction Memorandum (IM) NV-2009-030, Change 1, are listed in Table 3-1. The table lists the elements and the determination of whether the element is present in the Project Area and, if present, if the element would be affected by the Proposed Action. Those elements listed under the supplemental authorities that do not occur in the Project Area and would not be affected are not discussed further in the EA based on the rationale provided in the following table. The elimination of non-relevant issues follows CEQ regulations, as stated in 40 CFR §1500.4. The potential effects of the No Action Alternative are also discussed.

Table 3-1: Elements Associated with Supplemental Authorities and Rationale for Detailed Analysis for the Proposed Action

Supplemental Authority[1]	Not Present[2]	Present/Not Affected	Present/May be Affected[3]	Rationale
Air Quality			●	Air quality would be affected by combustion emissions and fugitive emissions related to land disturbance; carried forward for further analysis. See discussion in Section 3.1.
Area of Critical Environmental Concern (ACEC)	●			No ACECs are located within the Project Area.
Cultural/ Historical			●	Land clearing and disturbance would occur, potentially affecting cultural resources; carried forward for further analysis. See discussion in Section 3.2.
Environmental Justice	●			No minority or low-income populations would be disproportionately affected by the Proposed Action.
Farmlands Prime or Unique	●			No prime or unique farmlands are located within the Project Area.
Noxious Weeds/Invasive Non-native			●	Potential for invasive and nonnative species in the area exists; carried forward for analysis. See

Supplemental Authority[1]	Not Present[2]	Present/Not Affected	Present/May be Affected[3]	Rationale
Species				discussion in Section 3.3.
Native American Cultural Concerns			●	Information sharing with tribal representatives is ongoing; carried forward for analysis. See discussion in Section 3.4.
Floodplains	●			No flood zones have been identified by the Federal Emergency Management Agency for the Project Area.
Riparian/Wetlands	●			No riparian or wetland areas have been identified in the Project Area.
Threatened and Endangered Species	●			No threatened or endangered species are found within the Project Area. Although potential habitat may occur for threatened and endangered species, no individuals or sign were observed during baseline biological surveys.
Migratory Birds			●	The Project Area provides habitat for migratory birds; carried forward for analysis. See discussion in Section 3.5.
Waste – Hazardous/Solid			●	Hazardous materials use would not change under the Proposed Action but could be accidentally spilled; carried forward for analysis. See discussion in Section 3.6.
Water Quality			●	Activities under the Proposed Action have the potential to affect water resources; carried forward for analysis. See discussion in Section 3.7.
Wild & Scenic Rivers	●			No wild and scenic rivers are located within the Project Area.
Wilderness	●			No designated wilderness or wilderness study areas are located within the Project Area. A "Lands with Wilderness Characteristics" inventory was completed in October of 2014 and none were found to be present within the Project Area.
Forests and Rangelands (Healthy Forest Restoration Act projects only)	●			This Project does not meet the requirements to qualify as a Healthy Forest Restoration Act project.

Supplemental Authority[1]	Not Present[2]	Present/Not Affected	Present/May be Affected[3]	Rationale
Human Health and Safety	•			The Proposed Action does not involve herbicide treatment. The resource has not been carried forward for analysis. Public safety provisions are described in Section 2.2.5.

[1] See H-1790-1 (January 2008) Appendix 1 Supplemental Authorities to be Considered.
[2] Supplemental authorities determined to be Not Present or Present/Not Affected need not be carried forward for analysis or discussed further in the document.
[3] Supplemental authorities determined to be Present/May Be Affected *must* be carried forward for analysis in the document.

Other elements that may be affected are further described in the EA. Rationale for those elements that would not be affected by the Proposed Action and alternative is listed in Table 3-2 below.

Table 3-2: Additional Elements Reviewed

Other Resources	Not Present[1]	Present/Not Affected	Present/May be Affected	Rationale
Grazing Management			•	The Project is located within the Silver Peak grazing allotment and some loss of vegetation is anticipated; carried forward for analysis. See discussion in Section 3.8.
Land Use Authorization			•	Rights-of-way exist within the Project Area; carried forward for analysis. See discussion in Section 3.9.
Forest and Woodland Resources			•	Forest and woodland species exist within the Project Area; carried forward for analysis. See discussion in Section 3.10.
Geology and Mineral Resources			•	The Project Area is located on patented and unpatented mining claims; carried forward for analysis. See discussion in Section 3.11.
Paleontological Resources			•	The Proposed Action has the potential to affect paleontological resources within the Project Area; carried forward for analysis. See discussion in Section 3.12.
Recreation			•	Dispersed recreation is present in the area; carried forward for analysis. See discussion in Section 3.13.
Socio-Economic Values			•	Some changes in employment may occur and the mine life would be extended by approximately one year; carried forward for analysis. See discussion in Section 3.14.

Other Resources	Not Present[1]	Present/Not Affected	Present/May be Affected	Rationale
Soils			•	Soils in the Project Area would be affected by the proposed activities; carried forward for analysis. See discussion in Section 3.15.
Special Status Species			•	There is the potential for various special status species to occur within the Project Area; carried forward for analysis. See discussion in Section 3.16.
Vegetation			•	Vegetation would be removed under the Proposed Action; carried forward for analysis. See discussion in Section 3.17.
Visual Resources			•	Modifications to the landscape would occur under the Proposed Action; carried forward for analysis. See discussion in Section 3.18.
Wild Horses and Burros			•	The Proposed Action is located within the Silver Peak Herd Management Area; carried forward for analysis. See discussion in Section 3.19.
Wildlife			•	Wildlife habitat would be removed or altered under the Proposed Action; carried forward for analysis. See discussion in Section 3.20.

[1] Other resources determined to be Not Present or Present/Not Affected need not be carried forward for analysis or discussed further in the document based on the rationale provided. For the analysis carried out in this EA, "short-term" is defined as lasting for the duration of the Proposed Action including the mining, reclamation, and revegetation phases. "Long-term" is defined as lasting beyond the duration of the Proposed Action and beyond the time it would take for native plants to colonize revegetated areas, returning the reclaimed areas to pre-mining vegetation communities.

3.1 Air Quality

3.1.1 Affected Environment

The Federal Clean Air Act is the primary controlling legislation over air quality. Ambient air quality and the emission of air pollutants are regulated under both federal and state laws and regulations. Regulatory air standards that are potentially applicable to the Proposed Action include the National Ambient Air Quality Standards (NAAQS) and the Nevada State Ambient Air Quality Standards (NSAAQS).

The BAPC is the agency in the State of Nevada delegated with the responsibility for implementing a State Implementation Plan (SIP) (excluding Washoe and Clark Counties, which have their own SIP). Included in a SIP are the State of Nevada air quality permit programs (NAC 445B.001 through 445B.3791, inclusive). Also part of a SIP is the

NSAAQS. The NSAAQS are generally identical to the NAAQS with the exception of the following:

- An additional standard for carbon monoxide (CO) in areas with an elevation in excess of 5,000 feet amsl;
- A hydrogen sulfide (H_2S)standard;
- The revised NAAQS for particulate matter of aerodynamic diameter less than 2.5 microns ($PM_{2.5}$);
- The revised NAAQS for particulate matter of aerodynamic diameter less than ten microns (PM_{10});
- The revised NAAQS for sulfur dioxide (SO_2) and nitrogen dioxide (NO_2);
- Ozone (Nevada has yet to adopt the new and revised federal standards); and
- A violation of state standards occurring with the first annual exceedance of an ambient standard, while federal standards are generally not violated until the second annual exceedance.

In addition to establishing the NSAAQS, the BAPC is responsible for the Prevention of Significant Deterioration (PSD) program, enforcing the New Source Performance Standards, and implementing the Federal Operating Permit Program (Title V) throughout the State of Nevada.

The attainment status relative to the NSAAQS within the Project Area is determined by monitoring ambient levels of criteria pollutants. An attainment or unclassified designation means that no violations of NSAAQS or NAAQS have been documented in the region. The Project Area is located in the Clayton Valley hydrographic basin, which is considered in attainment relative to the NAAQS and is not a PSD-triggered basin for any pollutant. The existing air quality is typical of largely undeveloped regions of the western U.S. with limited sources of pollutants. Table 3-3 presents a summary of the criteria pollutants for Nevada.

Table 3-3: Summary of Criteria Pollutants

Pollutant		Averaging Time	Level[1]
Carbon Monoxide (CO)		1-hour	4,000 $\mu g/m^3$
		8-hour	1,000 $\mu g/m^3$
Lead		Rolling 3 month average	0.15 $\mu g/m^3$
Nitrogen Dioxide (NO_2)		1-hour	188 $\mu g/m^3$
		Annual	100 $\mu g/m^3$
Ozone (O_3)		8-hour	150 $\mu g/m^3$
Particle Pollution	$PM_{2.5}$	24-hour	35 $\mu g/m^3$
		Annual	15 $\mu g/m^3$
	PM_{10}	24-hour	150 $\mu g/m^3$
		Annual	50 $\mu g/m^3$
Sulfur Dioxide (SO_2)		1-hour	196 $\mu g/m^3$
		3-hour	1,300 $\mu g/m^3$
		24-hour	365 $\mu g/m^3$
		Annual	80 $\mu g/m^3$

Pollutant	Averaging Time	Level[1]
Hydrogen Sulfide (H_2S)	1-hour	120 μg/m^3

Source: EPA 2013a

[1] Levels include: parts per million (ppm); micrograms per cubic meter (μg/m^3); and parts per billion (ppb).

3.1.1.1 Climate and Meteorology

The climate in the Project Area is classified as semi-arid to arid. An arid climate is characterized by hot to very hot summers, and mild or cold winters, depending if the area is located within a subtropical or mid-latitude region. Mid-latitude deserts are found at the interior of continents and have hot summers with scarce precipitation. The winters are cold with erratic precipitation, sometimes in the form of light snow. Semiarid climates are more moderate, experiencing less of the extreme high to low temperatures. These areas typically surround desert areas, with rainfall totals slightly higher than in the arid climates (NOAA 2013).

The average annual precipitation is 4.43 inches as measured at the Silver Peak Meteorological Station between 1967 and 2013 (WRCC 2014). Winters are generally cool with very cold periods while the summers are hot and dry. The Silver Peak Meteorological Station average minimum temperature in January is 18.8 degrees (°) Fahrenheit (F) while the highest average monthly temperature in July is 97.5°F (WRCC 2014). Elevation in the Project Area is approximately 7,150, feet amsl, approximately 2,850 feet higher than the Silver Peak Meteorological Station. Therefore, lower average temperatures can be expected at the site.

3.1.1.2 Current Conditions

The BLM published the final Rapid Ecoregional Assessment (REA) for the Central Basin and Range in June 2013 (Comer et al. 2013). REAs examine climate change and other widespread environmental influences that are affecting western landscapes. REAs look across an ecoregion to more fully understand ecological conditions and trends, natural and human influences, and opportunities for resource conservation, restoration, and development. The REAs provide regional information that can inform local management efforts.

Over the past 100 years, the weather, vegetation cover, and wildfire regimes of the Central Basin and Range ecoregion have changed, suggesting a change in the ecoregion's climate regime. Changes in temperature and precipitation have resulted in changes to vegetation cover and wildfire regimes. Changes are expressed in species composition, changes in vegetation communities, and increasing quantities of invasive species. Many areas once dominated by sagebrush have pinion-juniper encroachment as well as cheatgrass (Comer et al. 2013).

Air quality in the Project Area is governed by pollutant emissions and meteorological conditions. Wind speeds, mixing heights, and stability affect the circulation, distribution, and dilution of emissions in the area. Esmeralda County and hydrographic area 143 (Clayton Valley) shown on Figure 6 is considered "unclassifiable/attainment" (40 C.F.R. § 81.329 Nevada).

3.1.1.3 Greenhouse Gas Emissions and Climate Change

Greenhouse gases (GHGs) are those that allow short-wave solar radiation to enter the earth's atmosphere but absorb long-wave infrared radiation reemitted from the earth's surface. Greenhouse gases can affect climate patterns, which in turn can affect resource management.

Gases exhibiting greenhouse properties come from both natural and human sources. Water vapor, carbon dioxide, methane, and nitrous oxide (NO_x) are examples of greenhouse gases that have both natural and man-made sources, while other greenhouse gases, such as chlorofluorocarbons, are exclusively man-made. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused carbon dioxide equivalent concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change recently concluded that "human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes….it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century" (IPCC 2013).

Sources of greenhouse gas emissions in the vicinity of the Project Area are primarily vehicles and mobile equipment, construction and operation for mineral and energy development, and grazing livestock, wild horses, and burros. To the extent that these activities increase, greenhouse gas emissions are also likely to increase.

Climate represents the long-term statistical characterization of daily, seasonal, and annual weather conditions such as temperature, relative humidity, precipitation, cloud cover, solar radiation, and wind speed and direction. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. A region's climate is affected by latitude, terrain, and altitude, as well as nearby water bodies and their currents.

Warmer and more arid conditions, coupled with a shorter snow season, have led to limited water supplies and severe drought in parts of the state. By 2100, the average temperature in Nevada is predicted to increase by three to four degrees Fahrenheit in the spring and fall and by five to six degree Fahrenheit in the summer and winter. El Niño events are predicted to increase in frequency and duration as a result of global climate change. These temperature changes would affect evaporation and precipitation in the state, likely resulting in the decreased availability of water (National Conference of State Legislatures 2008).

In the Central Basin and Range ecoregion, climate models suggest there is no strong trend toward either wetter or drier conditions either in the near future (through the 2020s) or in the long term (through the 2050s; Comer et al. 2013). However, models show significant increases in maximum monthly temperatures by 2020, primarily in the summer months (July, August, and September). The highest maximum temperature increase projected is six °F. These increases are predicted to occur mostly in the southern and northeastern edges of the ecoregion. Forecasts for 2060 predict substantial increases in maximum temperature for all months. Similar to forecasts for 2020, the greatest increases are predicted during the summer months and along the southern and northeastern edges of the ecoregion (Comer et al. 2013). Model forecasts for minimum temperatures show a considerable change in both rate and magnitude over most of the study area. July through September showed the greatest degree of change over most of the region.

Data for precipitation suggest no strong trend toward either wetter or drier conditions in any month for the ecoregion. With the exception of a slight increase in summer monsoon rains toward the south and east, there were no significant forecasted trends in precipitation for any other months in either the near-term (2020s) or midcentury (2050s) projections (Comer et al. 2013).

Potential effects of these forecasts on the landscape could include increased fuel loads in higher elevations, increased frequency and duration of droughts, expansion of invasive species in higher elevations, increased wind erosion, and changes in wildfire regimes (Comer et al. 2013). However, the potential effects of the Project on climate change are beyond the scope of this EA and are not further analyzed in this EA.

The Final Mandatory Reporting of Greenhouse Gases Rule issued by the EPA, as signed on September 22, 2009, requires suppliers of fossil fuels or industrial GHG, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to the EPA. MRG is not required to submit GHG annual reports.

3.1.2 Environmental Consequences of the Proposed Action

The Proposed Action would result in impacts to air quality related to increased land disturbance, extended life of the mine and use of equipment, and increased rates of ore processing. Surface disturbance would increase by approximately 285 acres. Surface disturbances would increase fugitive particulate dust entrainment in the vicinity of the Project Area for the duration of the Project. The construction of pits, waste rock disposal areas, and other disturbance areas would create fugitive dust emissions in the form of PM_{10} and $PM_{2.5}$ that would have a potential impact on air quality. These impacts would be short term, lasting until reclamation and revegetation success has been established. Approximately 54 acres of the proposed pit disturbance would remain unreclaimed as open pit features, for a total of 171 unreclaimed acres of open pit within the Project Area. The unreclaimed open pit features would not be revegetated and would present a long-term fugitive dust source.

Approximately one additional year of combustion-related emissions would result from operation of internal combustion engines that power mobile equipment and vehicles used under the Proposed Action. Vehicle emissions in the form of $PM_{2.5}$, PM_{10}, NO_x, SO_2, CO, and hydrocarbons (HC) would occur any time the internal combustion engines are operating. However, vehicle emissions are regulated by the EPA and are controlled by specific design requirements when the vehicle is manufactured.

Air emissions from stationary sources are within the existing Class II Air Quality Operating Permit (AP1041-2733) limitations for stationary source throughput. Emissions addressed under the Class II Air Quality Operating Permit include PM_{10}, SO_2, NOx, CO, volatile organic compounds, and fugitive emissions. Opacity is also addressed as a qualitative standard.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. The border of the guzzler installations may remain unvegetated due to use by desert bighorn sheep and other wildlife.

3.1.2.1 Air Quality Impact Assessment

Stantec Consulting Services Inc. (Stantec) was retained by MRG to carry out an Air Quality Impact Assessment (AQIA) to estimate impacts to ambient air quality which may result from the Proposed Action. The modelling protocol was approved by the BLM in November, 2014. Emission sources modelled include pits, mobile equipment, milling, generators, other sources (such as light plants, fuel storage tanks, and lab equipment), heap leach facilities, waste rock disposal facilities, backfill areas, wind erosion, and roads.

The EPA's approved air dispersion model AERMOD-ISC 7.9 (Version 14134) was used to model criteria pollutants. The conservative approach was taken in choosing the assessment period; one year was used for the model during which mining was assumed to occur from three pits, with five waste rock disposal facilities and one backfill area being used. Mining operations may occur from three pits during a one-year time frame; however, only three waste rock facilities would be used at once.

Detailed information about terrain, land classification, receptors, downwash, and meteorological factors used in the model can be found in the AQIA included as Appendix E. The modelling report also discusses background concentrations and emission source factors in detail.

Emissions related to the desert bighorn sheep guzzler installation have not been included in the air quality impact assessment conducted by Stantec. Impacts to air quality would include dust from disturbed areas and earthworks as well as mobile equipment combustion engine emissions during road improvements, road maintenance, and guzzler construction. With consideration for the guzzler disturbance area size and MRG's adherence to environmental protection measures during road improvement and maintenance, the contribution to air quality impacts are considered to be minor and would not cause the exceedance of air quality standards.

3.1.2.2 Criteria Pollutant Model Results

Air dispersion modelling was performed for relevant criteria pollutants and their regulated averaging periods. They are listed in Table 3-4 with the modelled impact listed with total concentrations when added to background concentrations, where present. The total concentrations' percent of the lowest applicable standard is also listed, showing that none of the criteria pollutants are anticipated to exceed the NAAQS or Nevada ambient air quality standards (Stantec 2014).

Table 3-4: Dispersion Modelling Criteria Pollutant Results

Criteria Pollutant	Modelled Averaging Period	Modelled Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Lowest Standard ($\mu g/m^3$) [1]	Percent of Standard
CO	1-hour	2,159.66	-	2,159.66	4,000	5.40
	8-hour	351.04	-	351.04	1000	3.51
NO_2	1-hour	134.38	-	134.38	188	71.48

Criteria Pollutant	Modelled Averaging Period	Modelled Impact (µg/m^3)	Background Concentration (µg/m^3)	Total Concentration (µg/m^3)	Lowest Standard (µg/m^3) [1]	Percent of Standard
	Annual	4.25	-	4.25	100	4.25
$PM_{2.5}$	24-hour	7.61	7	14.61	35	41.75
	Annual	1.86	2.4	4.26	12	35.50
PM_{10}	24-hour	138.05	10.2	148.25	150	98.83
	Annual	18.55	9	27.55	50	55.10
SO_2	1-hour	14.68	-	14.68	196	7.49
	3-hour	6.69	-	6.69	1300	0.51
	24-hour	0.64	-	0.64	365	0.18
	Annual	0.08	-	0.08	80	0.01

Source: Stantec 2014 included as Appendix E

[1]The lowest standard is either the NAAQS or Nevada ambient air quality standard converted to µg/m^3

Emissions of the criteria pollutants lead and ozone have not been included in this analysis. Lead emissions are most commonly related to lead smelters, processing, and the use of leaded aviation gasoline. Ground-level ozone is created by the chemical reaction between NO_x and volatile organic compounds (EPA 2013a). In addition, hydrogen sulfide is the result of the breakdown of organic matter in the absence of oxygen and is not applicable as a combustion-related emission.

3.1.2.3 Greenhouse Gas Emissions

The model also calculated GHG emissions for the Proposed Action. The primary constituents of GHG emissions are CO_2, CH_4, and N_2O. GHG emissions are reported in CO_2 equivalent (CO_2e) using CO_2 as a reference gas with a global warming potential of one. CH_4 has a global warming potential of 21 and N_2O has a global warming potential of 310. GHG emissions were calculated using the yearly estimated emissions from diesel and gasoline combustion with the global warming potential as stated above. Annual GHG emissions were calculated as 9,300,000 metric tons per year (Stantec 2014).

The most recent data analysis from the NDEP-BAPC showed that the statewide gross GHG emissions from 2010 totaled 45 million metric tons of CO_2e and the gross GHG emissions for the United States totaled 6,822 million metric tons (Stantec 2014). In comparison, the modelled emissions from the MRG mine are negligible.

3.1.2.4 Hazardous Air Pollutant Emissions

The total HAP emissions were assessed using the same approach as the GHG emission calculations. The primary source of HAP emissions come from diesel combustion sources. A small quantity of HAP emissions are derived from fugitive dust containing trace elements. The fugitive HAP emissions are typically negligible when compared to combustion source emissions. The NDEP-BAPC regulates HAP emissions for stationary sources based on a threshold of 10 tons per year for any single HAP and 25 tons per year for any combination of HAPs. HAP emissions from the MRG mine are calculated using a conservative approach with total fuel usage estimates and EPA emission factors for large internal combustion engines. Calculated HAP emissions for the Proposed Action are 0.927 tons per year, well below the NDEP-BAPC thresholds for stationary sources, with mobile sources included.

3.1.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to air quality under this alternative would be the same as for the Proposed Action. Only the location of the physical barrier required by the NDEP-BAPC would be changed; the barrier would still keep the public out of the area where NAAQS standards are exceeded.

3.1.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative no change to air quality in the area would occur beyond impacts related to authorized activities.

3.2 Cultural Resources

3.2.1 Affected Environment

Multiple cultural resource investigations have been conducted within the Project Area and along access roads. A total of 13 prior cultural resources investigations have been conducted, which included the Project Area, the Coyote Road to the west, and the Eagle Canyon Road to the east. These include ten Class III inventories, six treatment plans for eligible sites, and two eligible site mitigation reports (Kautz 2014). The entire Project Area has been covered by Class III cultural resource surveys.

3.2.2 Environmental Consequences of the Proposed Action

Adverse effects to cultural resources are anticipated under the Proposed Action, as some facilities and activities cannot be designed to avoid NRHP-eligible cultural sites in the NRHP-eligible Mineral Ridge Historic Mining District. Development of a treatment plan, data recovery, archaeological documentation, and report preparation in accordance with stipulations in the PA, and as described in Section 2.2.5, would be undertaken to mitigate adverse effects.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. The guzzler installation would be carried out by the NDOW with cooperation from the BLM and would only occur after the proposed areas have been cleared for cultural resources. No impacts to cultural resources are anticipated.

3.2.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The physical barrier proposed under this alternative would be constructed on previously disturbed ground. Impacts to cultural resources would be the same as for the Proposed Action.

3.2.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed Project would not be developed, and impacts to cultural resources related to the Proposed Action would not occur.

3.3 Noxious Weeds, Invasive and Non-native Species

3.3.1 Affected Environment

Noxious weeds, invasive, and non-native species are species that are highly competitive, aggressive and spread easily. They typically establish and infest disturbed sites, along roadsides, and along waterways. Changes in plant community composition from native species to non-native species can change fire regimes, negatively affect habitat quality, biodiversity, and ecosystem structure and function.

Noxious weeds and invasive plant species have been defined as pests by law or regulation. The BLM defines a noxious weed as "a plant that interferes with management objectives for a given area of land at a given point in time." The BLM Battle Mountain District recognizes the current noxious weed list designated by the State of Nevada Department of Agriculture (NDOA) statute, found in NAC 555.010. Currently the list contains 47 noxious weed species. When considering whether to add a species to the list, the NDOA makes a recommendation after consulting with outside experts and a panel comprising Nevada Weed Action Committee members. Per NAC 555.005, if a species is found probable to be "detrimental or destructive and difficult to control or eradicate", the NDOA, with approval of the Board of Agriculture, designates the species as a noxious weed. The species is then added to the noxious weed list in NAC 555.010. Upon listing, the NDOA will also assign a rating of "A", "B", or "C" to the species. The rating reflects the NDOA view of the statewide importance of the noxious weed, the likelihood that eradication or control efforts would be successful, and the present distribution of noxious weeds within the state. An "invasive species" is defined as a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (E.O. 1999).

The BLM's policy relating to the management and coordination of noxious weed and invasive plant species is set forth in the BLM Manual 9015 – Integrated Weed Management (BLM 1992b). The BLM's primary focus is providing adequate capability to detect and treat smaller weed infestations before they have a chance to spread. Noxious weed control is based on a program of prevention, early detection, and rapid response.

Information for noxious weeds, invasive, and non-native species has been accessed from baseline biological survey reports and memos referenced under previously approved EAs (BLM 2011a, 2013, and 2014b) as well as from more recent biological baseline reports which collectively cover the Project Area (SRK 2013a, 2013b, 2014a, and 2014b). Annual noxious weed survey reports were also accessed (Knight & Leavitt 2012a, 2013a, and 2014a).

No noxious weeds have been observed within the Project Area. Non-native species have been observed alongside and within disturbed areas (SRK 2013a, 2013b, 2014a, and 2014b and Knight & Leavitt 2013a and 2014a). Three non-native species are particularly wide-spread in the Project Area, mainly in areas experiencing long-term disturbance: cheatgrass (*Bromus tectorum*); halogeton (*Halogeton glomeratus*); and Russian thistle (*Salsola tragus*). Halogeton is the most abundant weed species, occurring in all of the disturbed sites surveyed and showing dominance in many of the disturbed areas as sprouts, young plants, and large stands of dead plants from previous years. Russian thistle and cheatgrass also occur throughout the area, but mainly as scattered individual plants or small clusters (Knight & Leavitt 2014a).

Other non-native species observed in the Project Area include burning bush (*Kochia scoparia*), red brome (*Bromus rubens*), herb sophia (*Descurainia sophia*), lambsquarters (*Chenopodium album*), red stem stork's bill (*Erodium cicutarium*), tansy mustard (*D. pinnata*), and tall tumblemustard (*Sisymbrium altissimum*) (Knight & Leavitt 2013a and 2014a).

3.3.2 Environmental Consequences of the Proposed Action

Under the Proposed Action, approximately 285 acres of land would be disturbed, creating favorable conditions for the establishment of invasive and non-native plant species. The establishment of invasive and non-native species could change the plant community from complex to more simple over time, competing with native plants for pollinators, nutrients, water, and space. The invasive and non-native plant species' establishment opportunity would remain until disturbed areas have been reclaimed and vegetation has established. The potential for these species to compete with reclamation and native vegetation would remain as long as these species are present in the area.

Approximately 54 acres of open pit features would remain unreclaimed under the Proposed Action. Invasive and non-native species may colonize within these unreclaimed acres, although establishment on the steep slopes and pit walls would be difficult.

Considering the size of the additional disturbance proposed, the absence of noxious weeds, and the environmental protection measures proposed by MRG in Section 2.2.5, impacts related to noxious weeds would be negligible.

Impacts related to other invasive and non-native weeds would be temporary at best, lasting until reclamation and revegetation. However, non-native and invasive plant presence may continue for the long-term if revegetation and/or the establishment of native species is not successful enough to dominate the plant community.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvement/maintenance to the access roads including grading and boulder removal. The border of the guzzler installations may remain unvegetated due to use by desert bighorn sheep and other wildlife. Noxious weeds, invasive, and non-native species may become established on disturbed areas. MRG would adhere to their applicant committed environmental protection measures to reduce the spread of these species. Impacts to noxious weeds, invasive, and non-native species would be negligible.

3.3.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The physical barrier proposed under this alternative would be constructed on previously disturbed ground. Impacts to noxious weeds, invasive, and non-native species would be the same as for the Proposed Action.

3.3.4 Environmental Consequences of the No Action Alternative

No further impacts are projected from noxious weeds, invasive, and non-native species under the No Action Alternative beyond those impacts related to the authorized activities.

3.4 Native American Cultural Concerns

3.4.1 Affected Environment

Located within the traditional territory of the Western Shoshone, the BLM Tonopah Field Office administrative boundary contains spiritual, traditional, and cultural resources, and sites to engage in social practices that aid in maintaining and strengthening the social, cultural, and spiritual integrity of the Tribes. The BLM conducted Native American consultation on October 22, 2014, by contacting the Timbisha Tribe of the Western Shoshone. The Tribe has not expressed concerns about the Proposed Action at this point in time.

Social activities of Native Americans continue to define places of cultural importance across lands administered by the BLM. Some Western Shoshone maintain cultural, spiritual, and traditional activities, visit their sacred sites, hunt game, and gather available medicinal and edible plants. Through oral history (the practice of handing down knowledge from the elders to the younger generations), some Western Shoshone continue to maintain a world view similar to that of their ancestors.

Cultural, traditional, and spiritual sites and activities of importance to Tribes include, but are not limited to the following:

- Existing animal traps;
- Certain mountain tops used for vision questing and prayer;
- Medicinal and edible plant gathering locations;
- Prehistoric and historic village sites and gravesites;
- Sites associated with creation stories;
- Hot and cold springs;
- Collection of materials used for basketry and cradle board making;
- Locations of stone tools such as points and grinding stones (mano and matate);
- Chert and obsidian quarries;
- Hunting sites;
- Sweat lodge locations;
- Locations of pine nut ceremonies, traditional gathering, and camping;
- Rock collecting for use in offerings and medicine gathering;
- Tribally identified Traditional Cultural Properties (TCPs);
- TCPs found eligible to the NRHP;
- Rock shelters;
- Rock art locations;
- Lands or resources that are near, within, or bordering current reservation boundaries; and
- Actions that conflict with tribal land acquisition efforts.

In accordance with the NHPA of 1966 (P.L. 89-665), the NEPA, the FLPMA (P.L. 94-579), the American Indian Religious Freedom Act of 1978 (P.L. 95-341), the Native American Graves Repatriation Act (NAGPRA) (P.L. 101-601) and E.O. 13007, the BLM must provide affected Tribes an opportunity to comment and consult on the proposed Project. The BLM must attempt to limit, reduce, or possibly eliminate any negative impacts to Native American traditional/cultural/spiritual sites, activities, and resources.

3.4.2 Environmental Consequences of the Proposed Action

Various Tribes and Bands of the Western Shoshone have stated that federal projects and land actions can have widespread effects to their culture and religion as they consider the landscape as sacred and as a provider. Various locations throughout the BLM Tonopah Field Office and Battle Mountain District administrative area host certain traditional, spiritual, and cultural use activities today, as in the past. TCPs, designated by the Tribes, are not known to exist in or within the vicinity of the Project Area. The BLM continues to solicit input from local tribal entities. The BLM is continuing to coordinate with the Tribes to identify any other sites or artifacts, or cultural, traditional, and spiritual use resources and activities that might experience an impact.

If any TCPs, tribal resources, sacred sites, etc. are identified within or in close proximity to the Project boundary, a protective “buffer zone” may be acceptable, if doing so satisfies the needs of the BLM, the proponent, and affected Tribe. The size of any “buffer zone” would be determined through coordination and communication between all participating entities.

The BLM Cultural Resource Specialist, accompanied by designated tribal observers, may periodically visit identified cultural resources sites within or near the mineral exploration activity boundary. Native American Consultation and monitoring by the BLM and Tribal Representatives may occur throughout the life of a project to ensure that identified TCPs are not deteriorating.

If a subsequent development plan or plan amendment is submitted to the BLM as a result of an approval of this specific mineral exploration proposal, the BLM would again initiate consultation with the local Tribes and utilize any data collected during this mineral exploration proposal.

During the Project's activities, if cultural properties, items, or artifacts (i.e., stone tools, projectile points, etc.) are encountered, it must be stressed to those involved that such items are not to be collected. The environmental protection measures in Section 2.2.5 state that all activities would be halted immediately in the event of a discovery of a cultural resource. Cultural and archaeological resources are protected under the Archaeological Resources Protection Act (16 United States Code 470ii) and the FLPMA.

Though the possibility of disturbing Native American gravesites within most project areas is extremely low, inadvertent discovery procedures must be noted. Under the NAGPRA, Section (3)(d)(1), the discovering individual must notify the authorized officer in writing of such a discovery. If the discovery occurs in connection with an authorized use, the activity, which caused the discovery, is to cease and the materials are to be protected until the land manager can respond to the situation.

At this time, no impacts related to Native American Cultural Concerns have been identified and are not anticipated from the Proposed Action. Tribal relations and coordination does not terminate with the land use decision itself, but rather continues to engage Tribes regarding treatments, mitigation, reclamation, and disposition of artifacts and deports.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. The guzzler installation would be carried out by the NDOW with cooperation from the BLM and would only occur after the proposed areas have been cleared for cultural resources. Installation of the guzzlers would not have a measurable impact on Native American Cultural Concerns.

3.4.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to Native American Cultural Concerns would be the same as for the Proposed Action.

3.4.4 Environmental Consequences of the No Action Alternative

Native American Cultural Concerns would not be affected under the No Action Alternative as the Project Area's expansion and changes in mining activities would not occur.

3.5 Migratory Birds

Migratory birds are protected by the MBTA which prohibits the taking of migratory birds, their parts, nests, eggs, and nestlings. Information pertaining to the use of the Project Area by migratory birds has been collected from baseline biological reports referenced in previously approved EAs (BLM 2011a and 2013) as well as more recent migratory bird surveys and biological surveys conducted during 2011, 2012, 2013, and 2014. These surveys collectively cover the Project Area. Recently performed surveys and reports include the following:

- 2011a, 2011b, 2012b, 2012c, 2012d, 2013b, and 2014b migratory bird surveys conducted by Knight & Leavitt Associates (Knight & Leavitt);
- SRK. 2014a. *Mineral Ridge Gold 2014 State Bank Expansion Biological Baseline.* August 2014;
- SRK. 2014b. *Mineral Ridge Gold 2014 Expansion Baseline*. June 2014;
- SRK. 2013a. *Mineral Ridge Gold Biological Baseline Survey.* June 2013; and
- SRK. 2013b. *Mineral Ridge Gold Missouri Claim Biological Baseline Survey.* August 2013.

3.5.1 Affected Environment

Migratory birds may be found in the Project Area as either seasonal residents or as migrants. Table 3-5 provides an inventory of migratory birds which may occur in the Project Area or which have been observed within the Project Area or the vicinity. Some of these birds are also listed as special status species and are further discussed in Section 3.16.

Table 3-5: Migratory Bird Species Potentially Occurring Within the Project Area

Common Name	Scientific Name		Common Name	Scientific Name
American Crow	*Corvus brachyrhynchos*		Loggerhead Shrike	*Lanius ludovicianus*
American Kestrel	*Falco sparverius*		Long-eared Owl	*Asio otus*
American Robin	*Turdus migratorius*		Merlin	*Falco columbarius*
Anna's Hummingbird	*Calypte anna*		Mountain Bluebird	*Sialia currucoides*
Ash-throated Flycatcher	*Myiarchus cinerascens*		Mountain Chickadee	*Poecile gambeli*
Bald Eagle	*Haliaeetus leucocephalus*		Mourning Dove	*Zenaida macroura*
Barn Swallow	*Hirundo rustica*		Northern Flicker	*Colaptes auratus*
Black Rosy Finch	*Leucosticte atrata*		Northern Harrier	*Circus cyaneus*
Black-billed Magpie	*Pica hudsonia*		Northern Mockingbird	*Mimus polyglottos*
Black-chinned Hummingbird	*Archilochus alexandri*		Northern Shrike	*Lanius excubitor*

Common Name	Scientific Name		Common Name	Scientific Name
Black-headed Grosbeak	*Pheucticus melanocephalus*		Peregrine Falcon	*Falco peregrinus*
Black-throated Gray Warbler	*Dendroica nigrescens*		Pinion Jay	*Gymnorthinus cyanocephalus*
Black-throated Sparrow	*Amphispiza bilineata*		Plumbeous Vireo	*Vireo plumbeus*
Blue-gray Gnatcatcher	*Polioptila caerulea*		Prairie Falcon	*Falco mexicanus*
Brewer's Blackbird	*Euphagus cyanocephalus*		Red-tailed Hawk	*Buteo jamaicensis*
Brewer's Sparrow	*Spizella breweri*		Red-winged Blackbird	*Agelaius phoeniceus*
Broad-tailed Hummingbird	*Selasphorus platycercus*		Rock Wren	*Salpinctes obsoletus*
Brown-headed Cowbird	*Molothrus ater*		Rose-breasted Nuthatch	*Sitta canadensis*
Cassin's Finch	*Carpodacus cassinii*		Rough-legged Hawk	*Buteo lagopus*
Chipping Sparrow	*Spizella passerina*		Sage Sparrow	*Amphispiza belli*
Cliff Swallow	*Petrochelidon pyrrhonota*		Sage Thrasher	*Oreoscoptes montanus*
Common Nighthawk	*Chordeiles minor*		Say's Phoebe	*Sayornis saya*
Common Poorwill	*Phalaenoptilus nuttallii*		Short-eared Owl	*Asio flammeus*
Common Raven	*Corvus corax*		Solitary Vireo	*Vireo solitarius*
Costa's Hummingbird	*Calypte costae*		Spotted Towhee	*Pipilo maculatues*
Ferruginous Hawk	*Buteo regalis*		Swainson's Hawk	*Buteo swainsoni*
Golden Eagle	*Aquila chrysaetos*		Swallow sp.	-
Gray Flycatcher	*Empidonax wrightii*		Turkey Vulture	*Cathartes aura*
Gray Vireo	*Vireo vicinior*		Vesper Sparrow	*Pooecetes gramineus*
Gray-crowned Rosy Finch	*Leucosticte tephrocotis*		Violet Green Swallow	*Tachycineta thalassina*
Great Horned Owl	*Bubo virginianus*		Western Kingbird	*Tyrannus verticalis*
Hermit Thrush	*Catharus guttatus*		Western Meadowlark	*Sturnella neglecta*
Horned Lark	*Eremophila alpestris*		Western Tanager	*Piranga Ludoviciana*
House Finch	*Carpodacus mexicanus*		Western Wood Peewee	*Contopus sordidulus*
House Wren	*Troglodytes aedon*		White-crowned Sparrow	*Zonotrichia leucophrys)*
Lapland Longspur	*Calcarius lapponicus*		Burrowing Owl	*Athene cunicularia*
Lark Sparrow	*Chondestes grammacus*		Wilson's Warbler	*Wilsonia pusilla*
			Yellow-rumped Warbler	*Dendroica coronata*

Migratory bird nests observed within or near the Project Area during 2011, 2012, 2013, and 2014 surveys include nests for the following species:

- Black-throated Sparrow;
- Blue-gray Gnatcatcher;
- Common Raven;
- House Finch; and
- Red-tailed Hawk.

The Red-tailed Hawk nest is located to the north of the Project Area in New York Canyon. It was found to be active during both the 2013 and 2014 baseline surveys. No other raptor nests were observed within the Project Area or the one-mile buffer (SRK 2013a and 2014b).

3.5.2 Environmental Consequences of the Proposed Action

Under the Proposed Action up to 285 acres of potential migratory bird habitat would be removed or altered due to land clearing and facility developments. Impacts to migratory bird habitat would persist until reclamation activities are complete, and revegetation has been achieved. Migratory bird individuals would likely move into adjacent areas due to habitat disturbance, potentially competing with other individuals or individuals of other species for foraging and nesting habitat.

Approximately 54 acres of proposed open pit disturbance would not be reclaimed or revegetated and would represent a long-term loss of migratory bird habitat.

The post-reclamation vegetation community resulting from reclamation and revegetation efforts would be altered from the existing community but is expected to slowly return to a pre-mining community type in the long-term as natural seed dispersal from undisturbed areas occurs. The interim post-reclamation vegetation community may benefit some migratory bird species more than others.

The extended mine life and increased mine site activity would result in impacts to migratory birds related to human presence and noise for one year longer than previously assessed. Human presence and noise may further push migratory birds away from areas of disturbance and activity and into adjacent undisturbed (quieter) areas.

The taking of migratory bird individuals, nests, or young could occur during earth-clearing activities. As described in Section 2.2.5, MRG would conduct breeding bird surveys to reduce this occurrence. In addition, prudent speed limits would be observed to limit the potential for vehicular collisions.

Considering the size of the proposed disturbance, environmental protection measures, the presence of existing disturbance, and the presence of largely undisturbed migratory bird habitat surrounding the Project Area, impacts to migratory birds are considered to be negligible. Impacts to migratory birds are also considered to be largely short-term, lasting until revegetation success.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. This disturbance would relate to a loss of migratory bird habitat, and migratory birds may be disturbed by human activity and equipment use during road improvements, the guzzler construction, and occasional road maintenance activities. Construction and road improvement activities would occur outside of the migratory bird nesting season. Impacts to migratory birds resulting from the guzzlers would be negligible.

3.5.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The physical barrier proposed under this alternative would be constructed on previously disturbed ground. Impacts to migratory birds would be the same as for the Proposed Action.

3.5.4 Environmental Consequences of the No Action Alternative

No adverse consequences associated with the No Action Alternative are anticipated beyond the impacts related to the approved activities.

3.6 Waste, Hazardous or Solid

3.6.1 Affected Environment

A Class III-waivered landfill is located within WD-5 as shown on Figure 2. A Class III-waivered landfill no longer in use is located on WD-4. Process solutions are either contained within the fluid management system or are evaporated. Diesel, gasoline, and oil storage tanks are above ground with secondary containment to reduce the potential for releases into the environment. Sodium cyanide and sodium hydroxide are kept in a storage location with secondary containment adjacent to the processing plant. Cyanide solutions from the laboratory are conveyed to the heap leach facility process pond, and acid solutions are neutralized prior to disposal.

3.6.2 Environmental Consequences of the Proposed Action

Hazardous and solid waste associated with the Proposed Action would be managed in the same manner as currently managed. Pursuant to 43 C.F.R. § 8365.1-1(b)(3), no sewage, petroleum products, or refuse would be dumped in the area of the Proposed Action. Spills of hazardous materials including petroleum products would be cleaned and reported according to state and federal regulations within the required timeframes.

The only change in potential impacts related to hazardous and solid waste would be the extension of the mine life by approximately one year. With consideration for the management of solid and hazardous wastes on site, the potential for a release to occur into the environment is low. If a release should occur, adherence to the site *Spill Contingency and Emergency Response Plan* would mitigate potential impacts. Furthermore, the lack of water ways and other sensitive receptors within or near the Project Area would make potential impacts minimal.

Solid or hazardous wastes created as part of the guzzler installation tasks performed by MRG (discussed as mitigation under Section 3.16) would be managed in the same way as solid or hazardous wastes from the site. Minimal impacts are anticipated.

3.6.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to hazardous and solid wastes would be the same as for the Proposed Action.

3.6.4 Environmental Consequences of the No Action Alternative

No additional impacts related to hazardous or solid waste under the No Action Alternative are projected beyond those related to previously authorized activities.

3.7 Water (Surface and Ground)

3.7.1 Affected Environment

The Project Area is located within NDWR Central Region (Hydrographic Basin 10), within the Clayton Valley Hydrographic Area (area number 143). The western side of the Project Area overlaps slightly into the Big Smoky Valley (area 137A). Fish Lake Valley (area 117) is located about four miles to the north of the Project Area. The Project Area falls completely within the more recently mapped and more accurate Hydrologic Unit Code (HUC) level 12 Angel Island – Clayton Valley area which encompasses approximately 287,230 acres. The Project Area, hydrographic sub-basins, and HUC 12 area are shown on Figure 6.

The majority of the groundwater recharge within the Project Area and the adjacent valleys occurs as precipitation, mainly snow in the mountains. Groundwater discharge occurs as flow from springs and evapotranspiration. The regional groundwater flow consists of interbasin flow directed from north to south and northeast to southwest. The regional flow systems occur within fractured bedrock and volcanic units, and unconsolidated to consolidated basin-fill sediments and alluvium. The localized flow system underlying the Project Area is characterized by groundwater movement eastward from the Silver Peak Range to the alluvial basin of Clayton Valley (Hydro-Search 1996). In Clayton Valley, production wells, evaporation ponds, and evapotranspiration consume the shallow groundwater.

The perennial yield of the Clayton Valley hydrographic area has been estimated at 20,000 acre feet per year (afy). Water rights within the Clayton Valley Hydrographic Area exist for mining, municipal, and stockwater (NDWR 2014). Underground water right allocations include: 23,050 afy for mining and milling; 589 afy for municipal use, and 39 afy for stockwater. Other groundwater water right allocations include 181 afy for mining and milling. This calculates as an over-allocation of approximately 3,858 afy. Actual pumping/usage rates may differ from the permitted (NDWR 2015). Most of the water diversion occurs on the western end of Clayton Valley near the town of Silver Peak and nearby lithium mining operations.

During previous mineral exploration conducted by Mineral Ridge Resources, Inc., a temporary groundwater flow of 20 gallons per minute (gpm) from a perched water zone was encountered in borehole MR95385 at a depth of 540 to 565 feet bgs. This site became production well PW-1 (permit number 60036) and has a collar elevation of approximately 7,065 feet above mean sea level (amsl). As drilling continued, the water production dropped off until significant water was encountered at a depth of approximately 900 feet bgs (GPMI 2002). Measurements taken during the first quarters of 2010, 2011, and 2012 as part of the site WPCP monitoring requirements have indicated a static water level of approximately 1,025 feet bgs. Well locations are shown on Figure 6.

The deepest drill hole in the leach pad area was drill hole GW-19-86, drilled to depth of 545 feet; no groundwater was encountered (WESTEC 1995). Two monitoring wells WW94001 and WW94003 (permit number 60034 for both), located approximately 1.2 miles from the mine area, had static water levels of 720 feet bgs and 818 feet bgs respectively as measured after drilling in 1994. The wells have collar elevations of approximately 5,270 feet amsl. Test borehole WW-98A (also referred to as DH-98001 and now abandoned) located to the west of the heap leach facility, had a static water level of approximately 1,059 feet bgs as measured after drilling in 1998.

Test borehole and monitoring well WW12-001 was drilled and installed as part of site investigations for the installation of a second production well. The test borehole targeted the high angle Coyote Fault system which dips to the west and is exposed on the southwestern section of the Project Area. The test borehole was drilled to a depth of 2,181 feet bgs. Water was first encountered at a depth of 1,638 feet bgs, and a flow rate test was performed at 1,661 feet bgs resulting in a constant flow of 25 gpm. A peak flow greater than 90 gpm was achieved at 2,121 feet bgs which stabilized to 85 gpm below this depth. The monitoring well was drilled to a total of 2,075 feet bgs with the screen interval from 1,655 to 2,075 feet bgs. The static water level was consistently measured at approximately 820 feet bgs (Lumos 2011).

Production well PW-2 (WW12-003) was drilled to a total depth of 2,150 feet bgs and constructed with a perforated section from approximately 1,859 to 2,119 feet bgs. The static water level was measured at 833 feet bgs. An airlift test resulted in a production rate of approximately 65 gpm and a draw down below the static water level of 700 feet over a two-hour time period

Exploration holes in the vicinity of the proposed Solberry Pit have been drilled up to 700 feet bgs. Water was encountered in hole MR14808 at 340 feet bgs (7,020 feet amsl). Exploration holes in the vicinity of the Brodie pit have been drilled up to a depth of 800 feet. Data indicate a depth to water of between 375 and 535 feet bgs as illustrated by exploration holes MR11149, MR 12354, and MR12381 which had depths to water of 434 (7,183 feet amsl), 535 7,205 feet amsl), and 375 feet bgs (7,112 feet amsl) respectively.

3.7.1.1 Surface Hydrology

Fifteen drainages are located within one mile of the Project. Nine are unnamed minor drainages and six have been named: Great Gulch; Custer Gulch; Echo Canyon; Eagle Canyon; Eagle Nest Canyon; and New York Canyon. Each of these drainages is ephemeral, flowing east into Clayton Valley. The drainages are shown on Figure 7. Evapotranspiration exceeds precipitation during most of the year near the Project Area, so stream flows are of short duration. New York, Echo, and Eagle canyons flow only during significant storm events (Hydro-Search 1996).

Two springs are located within a one-mile radius of the Project Area: Tarantula Springs (SP-5) and Borgo Springs (SP-4), shown on Figure 7. The measured flow rate at Tarantula Spring in 1995 was approximately 0.1 gpm (Hydro-Search, 1996), and in September 2011 SRK measured the flow rate at 0.2 gpm (SRK 2011). In 1995, Borgo Spring was not flowing (Hydro-Search 1996), and in 2011 only a damp spot was located at the Borgo Spring site (SRK 2011).

3.7.1.2 Surface Water Quality

A baseline hydrological study was carried out in 1996 by Hydro-Search (Hydro-Search 1996) within a five-mile radius study area centered on the Mineral Ridge Mine area. Of the 18 identified springs in the study area, 15 were inspected, and samples were collected from ten. Additional samples have been collected from Coyote Spring (SP-9) in 2014 and from Tarantula Spring (SP-5) in 2011, 2012, 2013, and 2014 (SRK 2011 and MRG 2014).The findings are summarized in Table 3-6 and spring locations are shown on Figure 7.

Table 3-6: Spring Water Quality

Spring Name	Standard - Met or exceeded state and federal standards established for drinking water, irrigation, and livestock or the NDEP form 0190 reference values.
Minnesota Spring (SP-1), Macaroni Spring (SP-2), Valcalda Spring (SP-8)	Met these standards

Spring Name	**Standard - Met or exceeded state and federal standards established for drinking water, irrigation, and livestock or the NDEP form 0190 reference values.**
North Spring (SP-3), SP-7, and SP-14	Met these standards with the exceptions of iron and aluminum.
Coyote Spring (SP-9)	Met these standards with the exceptions of iron, aluminum, nitrogen, sulfate, and total dissolved solids
Tarantula Spring (SP-5)	Met these standards with the exceptions of boron, magnesium, sulfate, and total dissolved solids

Sources: Hydro-Search 1996, SRK 2011, and MRG 2014

3.7.2 Environmental Consequences of the Proposed Action

No changes to process water usage or exploration water usage rates would occur under the Proposed Action. Water would be used for an additional year.

The proposed pits and new pit depths are not anticipated to intercept groundwater. The interception of perched water zones are not anticipated during pit development. The deepest pit is the Drinkwater Pit with a depth of 680 feet. No groundwater has been encountered in this pit, and no changes are proposed to the depth of this pit. The depth of the Mary LC Pit is proposed to increase by 110 feet to a total depth of 625 feet; the Mary LC Pit is not expected to encounter groundwater since the nearby Drinkwater Pit has reached similar depths and has remained dry. Likewise, the proposed changes to the nearby Wedge Pit, with a total proposed depth of 185 feet bgs, is not expected to encounter groundwater.

Exploration holes near the proposed Solberry Pit have been drilled up to a depth of 700 feet bgs without encountering water. Water was encountered in hole MR14808 at a depth of 340 feet bgs. The proposed Solberry Pit would have a depth of 140 feet bgs and is thus not anticipated to encounter groundwater.

Groundwater was encountered in an exploration hole in the vicinity of the Bluelite and Brodie pits at a depths ranging between 375 and 535 feet bgs. The Bluelite Pit with a proposed depth of 220 feet bgs and the Brodie Pit with a proposed depth of 250 feet are not expected to encounter groundwater.

The proposed expanded pit footprints and new pits would remove mineral resources from an area not previously analyzed for geochemical characteristics. Exposure to previously buried rocks and formation types to meteoric water and atmospheric conditions can cause the release of constituents and the creation of compounds and acids. MRG contracted with SRK Consulting (U.S.), Inc. (SRK) to prepare a waste rock and ore geochemical characterization report to analyze the potential for this to occur and thus the potential for waste rock and ore from the proposed pits to affect water resources.

The geochemical characterization report concluded that the geology and types of mineralization found in the proposed existing pit expansion areas as well as the proposed Bluelite and Solberry pits are similar to the geology and mineralization encountered in the existing pits (Appendix C).

The results of the static and kinetic geochemical test work demonstrate that the Mineral Ridge waste rock material anticipated to be generated under the Proposed Action would be the same as the waste rock material generated from the authorized mining, with a net neutralizing effect and presenting a low risk for ARDML. PAG waste rock is not anticipated to be exposed in the pit walls. No special handling or changes to waste rock management practices are proposed. Furthermore, based on the acid base accounting and net acid generating results from previous investigations, kinetic testing was determined not to be necessary to demonstrate the Mineral Ridge waste rock material’s low ARDML potential (SRK 2013c and Appendix C).

Results of the study indicate the stockpiled ore geochemistry is similar to the waste rock material and presents a low risk for ARDML. The spent ore collected from the active heap also has a low potential for acid generation; however, several constituents are likely to be mobile under the neutral to alkaline pH conditions and would likely be present in the long-term heap draindown, including arsenic, mercury, sulfate, nitrate, and weak acid dissociable cyanide (SRK 2013c). Management of the heap solution and draindown would continue within containment as authorized.

Based on these geochemical results, impacts to surface or ground water related to ARDML generated by stockpiled ore or waste rock material would be unlikely to occur under the Proposed Action.

Proper drilling methods would be used to prevent contamination of groundwater. Bentonite would be used to drill and plug holes. The drill holes would be cased and plugged, as specified in NAC 534.4371 and as described under Section 2.2.5. Given adherence to these environmental protection measures, impacts to groundwater related to drilling are not anticipated to occur.

Up to 285 additional acres of land would be disturbed under the Proposed Action increasing erosional potential within these disturbed areas; wind and water erosion of disturbed lands could impact ephemeral surface water features through increased sedimentation and nutrient loading. These impacts would last until reclamation efforts are completed and revegetation success attained. Approximately 54 acres of open pit features would not be reclaimed as long-term sediment sources. Erosion from these sources, however, would be unlikely to impact surface waters as meteoric water would drain to the pit bottoms where the water would quickly infiltrate or evaporate. Puddles which may accumulate in the pit bottoms are typically dried up within a matter of days.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. Impacts to surface waters from increased sedimentation would not occur since there are no surface waters in the vicinity. The collection of meteoric water for use in the guzzlers would result in decreased recharge to the hydrographic basin. Each catchment area would cover approximately 3,200 square feet. The average yearly precipitation has been estimated at 5.18 inches (MRG 2013). The tanks would be capable of holding up to 9,200 gallons each but, based on the catchment areas and average annual precipitation rates, would be filled with approximately 1,381 gallons of water per year (equaling 2,762 gallons for both sites). Considering that approximately three percent of rainfall actual reaches groundwater and recharges aquifers, installation of the guzzlers would result in an annual reduction of approximately 82 gallons of water (less than one- one-hundredth of an acre-foot) for the Clayton Valley hydrographic basin. This is negligible in comparison to the annual perennial yield of 20,000 acre feet.

A letter from the Nevada Office of the Attorney General states that the practice of capturing precipitation from legitimate structures is not prohibited under current Nevada law but that if a senior water right holder can factually show that precipitation captured by guzzlers causes their water rights to not be served, then they should petition the State Engineer to take action (State of Nevada 2011).

3.7.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to water resources would be the same as for the Proposed Action.

3.7.4 Environmental Consequences of the No Action Alternative

Surface water and groundwater resources would not be impacted under the No Action Alternative beyond impacts related to previously authorized activities.

3.8 Grazing Management

3.8.1 Affected Environment

The Project Area is located within the Silver Peak Allotment as shown on Figure 8. This allotment encompasses approximately 277,053 acres within Esmeralda County. The Silver Peak Allotment is in management category “M” where the objective is to maintain current resource conditions. The only allotment resource management objective listed in the Tonopah RMP for the Silver Peak Allotment is to maintain riparian spring habitat (BLM 1997). No range improvements are located within the Project Area.

3.8.2 Environmental Consequences of the Proposed Action

Under the Proposed Action, the Project Area would be extended to include an additional 1,197 acres. Up to 285 acres of previously undisturbed intermountain semi-desert shrub steppe, semi-desert grassland, mixed salt desert scrub, big sagebrush shrubland, xeric mixed sagebrush shrubland, pinion juniper woodland, and non-specific barren desert vegetation would be disturbed related to site facility developments for a total Project disturbance area of 906 acres.

A loss of vegetation would constitute a short-term reduction of forage for cattle. This reduction would persist until successful establishment of vegetation. Initial post-reclamation vegetation communities would be of a grassland type rather than a shrubland type which may be beneficial for grazing cattle. Over time, the vegetation would return to more closely resemble the pre-mining communities. Reclamation activities and revegetation would not occur on 54 acres of the proposed disturbance acres which would remain as open pit features.

The Proposed Action would not result in a decrease in AUMs in the short- or long-term. Based on the size of the proposed disturbance, the size of the Silver Peak Allotment, and forage types within the Project Area, potential impacts to grazing management as a result of the Proposed Action are considered to be negligible.

Disturbance related to the guzzler installations and road improvements/maintenance (discussed as mitigation under Section 3.16) would not reduce the number of AUMs in the area. The guzzlers are not designed for use by cattle. Impacts to cattle resulting from the guzzler installations are not anticipated to occur.

3.8.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The physical barrier proposed under this alternative would be constructed on previously disturbed ground. Impacts to grazing management would be the same as for the Proposed Action.

3.8.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative no further loss of forage would occur within the Project Area beyond those resulting from the authorized activities.

3.9 Land Use Authorizations

3.9.1 Affected Environment

Entities with an interest in the location or general vicinity of the Proposed Action are Sierra Pacific Power Company (now known as NV Energy), and Homestead Minerals. Table 3-7 lists right-of-way (ROW) holders adjacent to or within the proposed Project which are required to be notified of the Proposed Action (43 CFR § 2807.14). Existing ROWs are shown on Figure 9.

Table 3-7: Existing Rights-of-way within Project Area

ROW Holder	Case File	Type	Case Disposition
Sierra Pacific Power Company (NV Energy)	N-60662	ROW - Power Transmission - FLPMA	Authorized
Homestead Minerals	N-51529	ROW – Roads	Authorized
Esmeralda County	N-89441	ROW – Roads	Authorized

Other ROWs in the vicinity of the Project Area are N-54403 (Rhyolite Ridge Road and Coyote Road) and a road (N-54409) leading to the northwest part of the Project Area. These roads are used as access roads by MRG and are managed by Esmeralda County under ROW N-89441. At the request of Esmeralda County, the main access roads and certain haul roads crossing the Project Area would not be reclaimed in order to maintain access through the Project area for post-reclamation monitoring and long-term use by Esmeralda County.

3.9.2 Environmental Consequences of the Proposed Action

An extension of the existing power line is included under the Proposed Action as shown on Figure 3. The portion of the new alignment located on public land is within the proposed Plan boundary (Project Area). A new ROW for this alignment would not be sought. The main road crossing the Project Area would remain as a post-reclamation feature within the Esmeralda County ROW N-89441 including the portion of main road within the expanded Plan boundary.

The guzzler installations (discussed as mitigation under Section 3.16) and maintenance would be carried out under a cooperative agreement with the BLM and NDOW. A ROW would be filed by the BLM for each of the access roads. Road improvements/maintenance would be carried out by MRG in accordance with the BLM ROW.

3.9.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to land use authorizations under this alternative would be the same as for the Proposed Action.

3.9.4 Environmental Consequences of the No Action Alternative

No impacts to land use associated with the No Action Alternative are expected to occur.

3.10 Forest and Woodland Resources

3.10.1 Affected Environment

Approximately 709 acres of the Project Area is occupied by the Great Basin Pinion Juniper Woodland vegetation type (SRK 2013a, 2013b, 2014a, and 2014b). This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra

Nevada. It is typically found at lower elevations ranging from 4,800 to 7,800 feet amsl. The Great Basin Pinion Juniper Woodland ecological system occurs on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. The system is dominated by a mix of single-leaf pinion (*Pinus monophylla*) and the Utah juniper (*Juniperus osteosperma*) or in pure or nearly pure stands of either species. Common associate species are listed in Table 3-8 with their observed occurrence in the Project Area noted (SWReGAP 2014).

Table 3-8: Great Basin Pinion Juniper Woodland Species

Common Name[1]	Scientific Name[1]	
single-leaf pinion	*Pinus monophylla*	X
Utah juniper	*Juniperus osteosperma*	X
mountain mahogany	*Cercocarpus ledifolius*	
greenleaf manzanita	*Arctostaphylos patula*	
low sagebrush	*Artemisia arbuscula*	
black sagebrush	*Artemisia nova*	X
big sagebrush	*Artemisia tridentata*	
narrowleaf mahogany	*Cercocarpus intricatus*	
blackbrush	*Coleogyne ramosissima*	
Gambel oak	*Quercus gambelii*	
shrub live oak	*Quercus turbinella*	
needle-and-thread grass	*Hesperostipa comata*	X
Idaho fescue	*Festuca idahoensis*	
bluebunch wheatgrass	*Pseudoroegneria spicata*	
Great Basin wild rye	*Leymus cinereus*	

Common Name[1]	Scientific Name[1]	Observed in Project Area during Baseline Surveys[2]
muttongrass	*Poa fendleriana*	

[1]Source SWReGAP 2014

[2]Source SRK 2013a, 2013b, 2014a, and 2014b

3.10.2 Environmental Consequences of the Proposed Action

Approximately 28 acres of Great Basin Pinion Juniper Woodland would be disturbed resulting from facility development under the Proposed Action. Forest density within the proposed disturbance area is approximately 55 trees per acre as determined through aerial photography.

Disturbance of the Great Basin Pinion Juniper Woodland vegetation would result in the loss of single-leaf pinion and Utah juniper trees as well as understory species of this vegetation type. Disturbance to the species may also occur as tree trimming. Under the Proposed Action, forest and woodland resources (namely wood from the single-leaf pinion and Utah juniper trees and pine-nuts from the single-leaf pinion) would be removed. Trees within facility footprints would be cut down. Larger diameter pieces of wood would be bermed near areas accessible to the public and MRG employees and left for collection. Smaller material would be collected and managed as growth media as described in Section 2.2.5.

Additional disturbance of this vegetation type may also result from exploration activities. Exploration activities would take place with the expansion area which is dominated by Great Basin Xeric Mixed Sagebrush Shrubland vegetation but which also contains some Great Basin Pinion Juniper Woodland vegetation. Efforts would be made to place exploration roads and drill pads in such a manner that tree removal is unnecessary. If or when tree removal is necessary, the material would be bucked up and placed in berms near the drill road or pad.

The Tonopah RMP objective for Forestry and Vegetative Products is “to provide forest and other vegetation products for consumptive use on a sustained yield basis” (BLM 1997). Forest and woodland products removed under the Proposed Action would not be managed for consumptive use. However, considering the low number of trees to be disturbed and the lack of known use of the area for woodcutting or pine-nut gathering, the negative effects to forest and woodland resources resulting from loss and a lack of consumptive use is considered to be negligible.

No forest or woodland resources would be affected by the installation of guzzlers (discussed as mitigation under Section 3.16) since woodland and forest resources are not present in the proposed guzzler or guzzler access road areas.

3.10.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The physical barrier proposed under this alternative would be constructed on previously disturbed ground. No impacts would occur to forest and woodland resources.

3.10.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative no impacts to forest and woodland resources would occur beyond the impacts related to the approved activities.

3.11 Geology and Mineral Resources

3.11.1 Affected Environment

The Walker Lane Belt of western Nevada and eastern California forms a transition between the northwest trending Sierra Nevada block to the west and the north-northeast trending ranges of the Great Basin Province to the east. The rocks exposed in the Mineral Ridge Mine area range in age from Precambrian to Quaternary and consist of metamorphosed sedimentary rocks, limestones and dolomites, granitic intrusive rocks, volcanic rocks, and alluvium. The geologic structure of the Mineral Ridge area is complex due to the overlap of the two structural trends. Generally, the structure of the Mineral Ridge area is that of a gentle open anticline plunging at a low angle to the southeast. High-angle normal faults and strike slip faults are present in rocks of all ages. Early Quaternary deposits present in the Mineral Ridge area consist of colluvium, alluvium, and talus and fan deposits. They are distinguished from older units by their lack of lithification or consolidation. In addition, most of these deposits have not been uplifted or dissected.

The Mineral Ridge region has been described as an anticlinal dome interpreted as an uplifted contact metamorphic core complex where the unmetamorphosed and unfolded Cambrian strata are in detached-fault contact with underlying deformed granitoids and Precambrian metamorphic rocks. The Cambrian rocks generally consist of limestone and slates, with some dolomite marble beds that have been intruded by numerous alaskitic sheets and quartz veins, which have become largely locally schistose and gneissic (Bercaw 1986).

In general, the Project Area is underlain by Quaternary colluvium and alluvium, Tertiary intrusive rocks, Precambrian sedimentary rocks, and metamorphosed sedimentary rocks. Surface geology is shown on Figure 10. Quaternary residual soil and alluvium is the dominant lithology present at the surface near the processing area. This lithology has been classified as ranging from sandy silt with gravel to gravel with silt and sand from five WESTEC geotechnical borings and six WESTEC geotechnical test pits. The depths of these soils ranged from ten inches to 15 feet. Outcrops of Tertiary tuff, Precambrian Reed Dolomite, and Precambrian Deep Springs Formation are also present over limited areas (WESTEC 1995).

A series of north-northeast striking faults run through the Project Area as shown on Figure 10. A thrust contact is located between the Deep Springs Formation and the Reed Dolomite, and the Reed Dolomite and the Wyman Formations. A local unconformity is also located between the Reed Dolomite and the Wyman Formation, characterized by an iron-stained zone up to 50 feet wide accompanied by occasional conglomerates of grit and pebbles (Micon 2009).

The underlying geologic structural zones beneath the process facilities, Wedge B Pit, and Brodie Pit area dips at approximately 10 degrees to the south-southeast while the geologic structural zone beneath the Drinkwater Pit and the Mary Pit area dips at approximately 25° to 30° to the north-northeast as indicated by the Mineral Ridge Mine drill logs. The anticline fold axis located to the south of the Mary Pit and the Drinkwater Pit strikes to the west-northwest with a syncline fold axis located to the north of the Mary Pit and Drinkwater Pit.

Both the patented lands owned by MRG and lands administered by the BLM are located within the approved Project Area. The BLM-administered lands within the Project Area are within MRG unpatented claims, and MRG holds the mineral right patents to all lands within the Project Area.

3.11.2 Environmental Consequences of the Proposed Action

Under the Proposed Action, the Mary LC Pit, Brodie, and Wedge pits would be extended while two new pits, the Bluelite and the Solberry, would be developed. Approximately 2,044,700 additional tons of ore and 14,491,000 additional tons of waste rock would be removed. Direct impacts would include the permanent removal of ore to the heap leach pad and waste rock to the waste rock disposal areas.

The placement of the rock disposal areas immediately adjacent to the open pits could limit the future development of mineral resources located in the pit walls adjacent to the disposal areas should those potential mineral resources be amenable to development through open pit mining methods. Condemnation drilling would occur within proposed facility footprints to further assess mineral resource presence. At this time there is not sufficient reasonably available geologic and resource information to definitively address this potential impact.

Stability analyses for the waste rock disposal areas have been performed for both static and psuedostatic conditions (earthquake loading). The seismic coefficient for the pseudostatic analysis is determined from the peak ground acceleration (PGA). The PGA can be found by either probabilistic or deterministic analysis. Probabilistic analysis provides a PGA based on a given probability for a certain time period that an event producing that acceleration occurs. The PGA used for this analysis is a PGA of 0.20 fractions of standard gravity (g) resulting from an event with a ten percent chance of exceedance within a 50-year time period which has a return period of 475 years. The seismic coefficient for waste rock disposal areas at this site is 0.13g, assuming a reduction of one-third to account for attenuation of the acceleration in soils and loose rock structures (Appendix D).

A strong enough seismic event could occur resulting in slope failures or structural damage to mine facilities. Determining the event that would cause slope failure of the waste rock disposal areas is calculated by reducing the seismic coefficient in small increments on the most critical section until the FOS decreases to one. For the site, this is the circular failure of the 2.0H:1.0V dump slope with a seismic coefficient of 0.187g. Adding back the one-third reduction to get the PGA for the seismic event causing a failure results in 0.28g. An event resulting in an acceleration of 0.27g has a five percent chance of occurring in 50 years and has a recurrence interval of 975 years. Accounting for accuracy, the difference between 0.27g and 0.28g is minor; therefore, a failure-causing event has a probability of five percent in 50 years. With a recurrence interval of near 1,000 years this is approximately the equivalent to a four percent chance of occurrence during the mine life provided in previous reports.

There are no identified geologic conditions that would be exacerbated by the Proposed Action which would result in geological hazards. Facilities associated with the Proposed Action and the proposed expansion would be constructed in conformance with regulatory standards to minimize instability.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would not involve the removal of ore or minerals. However, guzzler construction may pose a limit for mineral development beneath them. Since they are located outside of the Project Area, this potential impact is considered negligible.

3.11.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to geology and mineral resources under this alternative would be the same as for the Proposed Action.

3.11.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed developments including the Plan boundary expansion and pit developments would not occur. Mining would continue as authorized.

3.12 Paleontological Resources

3.12.1 Affected Environment

The Project Area is located in Cambrian and Precambrian period strata. Algal mats as well as body and trace fossils have been identified in the middle member of the Precambrian Deep Springs Formation at other locations. They have not been identified within the Project Area but may be present. The Precambrian Wyman and Reed formations are also known to contain fossils or fossil traces. These formations are of great interest to paleontologists studying the transition between Precambrian and Cambrian assemblages. However, there are no known outcrops of Precambrian and Cambrian strata sequentially displayed in the Project Area. Sequential strata are present in the White-Inyo area of California and the Gold Point area of Nevada.

The main access road leading from Coyote Road and Rhyolite Ridge Road goes through the Campito, Poleta, and Harkless formations known to contain Cambrian-period fossils; no known index or significant Cambrian fossils have been identified at this location.

3.12.2 Environmental Consequences of the Proposed Action

No scientifically significant paleontological resources have been identified within the Project Area. Furthermore, the Project Area does not contain known outcrops of sequentially displayed Precambrian and Cambrian strata. Damage or destruction of the existing formations within the Project Area are not anticipated to adversely affect paleontological resources.

Considering the lack of paleontological resources in the area, installation of the guzzlers (discussed as mitigation under Section 3.16) is not anticipated to result in impacts to them.

3.12.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to paleontological resources under this alternative would be the same as for the Proposed Action.

3.12.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, no areas or formations would be mined which have not already been approved for disturbance. No unevaluated effects to paleontological resources are anticipated.

3.13 Recreation

3.13.1 Affected Environment

The Project Area is not located within an area designated as a special BLM recreation management area. Motorized recreation on BLM-administered lands in the areas surrounding and within the Project Area are limited to existing roads and trails (BLM 1997). Recreation within the Project Area is dispersed and may include mountain biking, historical touring, horseback riding, sightseeing, pine-nut gathering, outdoor photography, nature study, wildlife viewing, bird watching, hunting, hiking, and rock collecting.

The Project Area is located within Hunt Unit 211. In 2013, 81 mule deer tags and four pronghorn antelope tags were issued for Hunt Units 211 and 212 jointly. Nine bighorn sheep tags were issued for Hunt Unit 211 (NDOW 2014).

A Visual Resource Management (VRM) Class III corridor is located along Highway 264 Silver Peak Road. Visual resources are discussed further in Section 3.18. Historical touring recreation may take place anywhere within the vicinity of the Project Area but particularly within this corridor in route to the town of Silver Peak.

3.13.2 Environmental Consequences of the Proposed Action

Activities under the Proposed Action would occur primarily on BLM-administered lands located adjacent to MRG patented lands. The presence of equipment, vehicles, facilities, and personnel could indirectly affect the recreational experience in these immediate areas on a temporary basis. Recreational use within and around the Project Area is determined to be low based on the small number of hunting tags issued for Hunt Unit 211 and 212 and the lack of known popular recreational destinations or opportunities. Based on low recreational use within the Project Area, no appreciable impacts to recreation are anticipated as a result of the Proposed Action. Therefore, recreation is not carried forward for further analysis.

Improvement to the access roads associated with the guzzler installation (discussed as mitigation under Section 3.16) may result in increased public use of those areas. Of particular interest may be improved access for hunters who might use the guzzlers strategically in their hunt as a water source for game. Installation of the guzzlers would likely alter hunting patterns within the hunt unit but would not change the number of hunting tags issued and the overall number of hunters within the unit.

3.13.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to recreation under this alternative would be the same as for the Proposed Action.

3.13.4 Environmental Consequences of the No Action Alternative

No impacts to recreation would occur besides those associated with prior authorized activities.

3.14 Socio-Economic Values

3.14.1 Affected Environment

MRG is the largest employer, government or private, in Esmeralda County, followed by Rockwood Lithium, also located near the town of Silver Peak. The Mineral Ridge mine currently employs approximately 90 people. In addition, the contract mining company has approximately 20 people working at the site. The Mineral Ridge Mine and the contract mining company employees are residents of Elko, Tonopah, and Goldfield, Nevada as well as Bishop, California. Most of the employees stay at MRG-owned mobile homes and RV spaces in the town of Silver Peak during their eight-day shifts. Site managers usually stay in hotels in the town of Tonopah during site visits. In addition, MRG uses vendor services from Tonopah and Dyer, NV (Telesto 2013 and Scorpio 2014 and 2015).

American Community Survey population information for the towns of Silver Peak, Tonopah, Goldfield, Bishop, Elko, and Dyer are shown in Table 3-9.

Table 3-9: Population Information for Select Towns

Town, State	Population[1]	Median Age[2]	Median Household Income[2]	Unemployment[2]
Silver Peak, NV	107	51.2	$21,188	0.0%
Tonopah, NV	2,817	44.8	$41,688	4.0%
Goldfield, NV	268	49.8	$43,409	5.9%
Bishop, CA	3,879	43.2	$30,813	4.2%
Elko, NV	48,818	33.3	$70,238	4.0%
Dyer, NV	258	54	$30,938	4.0%

Source: U.S. Census Bureau 2015
[1]From the 2010 Census
[2]2009 to 2013 American Community survey five-year estimates

3.14.2 Environmental Consequences of the Proposed Action

Under the Proposed Action, additional ore resources would be extracted and the mine life would be extended by approximately one year for a total active mine life of approximately four years. In addition, the Proposed Action may require the temporary addition of five contract employees, but may result in a slight decrease in the overall number of employees over time due to the improved ore delivery procedures and operation of the permanent crusher. The reduction in numbers has been assumed at 10 employees.

The Proposed Action would extend the employment of approximately 105 to 115 people for an additional year. Mine employment impacts the local economies of Silver Peak and Tonopah. Under the Proposed Action, these communities would receive positive economic benefits related to the extended presence of the Mineral Ridge Mine and contract mining company employees. The economic benefits would be in the form of purchased hotel nights, food, drink, fuel, and other amenities. The economic benefits for the affected towns are discussed under Section 4.4.9

Installation of the guzzlers (discussed as mitigation under Section 3.16) would not affect socio-economic values.

3.14.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to socio-economic values under this alternative would be the same as for the Proposed Action.

3.14.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the Mineral Ridge Mine life would be approximately three years rather than four years. Being the largest employer in Esmeralda County, a shortened mine life would negatively affect the local economies of Tonopah and Silver Peak.

3.15 Soils

3.15.1 Affected Environment

According to the Natural Resources Conservation Service (NRCS 2014) soil resource report for Esmeralda County, soils in the Project Area affected by the Proposed Action consist of the following units as shown on Figure 11 and listed in Table 3-10.

Table 3-10: Soil Units within the Project Area

Map Unit Symbol (MUSYM)	Map Unit Name	Acres within Project Boundary (rounded to the nearest whole number)
490	Weepah-Kyler-Rock outcrop association	480
610	Ubehebe-Logring-Penelas association	76
701	Armoine-Tulecan association	161
705	Armoine-Penelas association	1,978
720	Penelas-Weepah association	2
1125	Rodad-Theriot-Kyler association	1

Source: NRCS 2014

The Weepah-Kyler-Rock outcrop association occurs at elevations between 6,500 and 7,800 feet amsl on 15 to 50 percent slopes. This association is comprised of approximately 20 percent rock outcrops which are normally found along ridges. The Kyler soil has a profile of very gravelly fine sandy loam to gravelly loam with unweathered bedrock located at approximately nine to 13 inches bgs. The Weepah soil has a profile of very gravelly loam and weathered bedrock located approximately eight to 12 inches bgs. Their ability to transmit water is very low.

The Ubehebe-Logring-Penelas association occurs at elevations between 5,200 and 8,000 feet amsl on mountainsides with slopes of 15 to 50 percent. The Ubehebe soil is a very gravelly to very gravelly sandy loam with weathered bedrock occurring at 17 to 50 inches bgs. The Logring soil is a very gravelly to extremely cobbly loam with unweathered bedrock occurring at 14 to 24 inches bgs. The Penelas soil is a very to extremely channery loam with weathered bedrock occurring at nine to 60 inches bgs. Their ability to transmit water ranges from very low to high.

The Armoine-Tulecan association occurs at elevations between 6,000 and 7,600 feet amsl on 15 to 50 percent slopes. The Armoine soil has a profile of very gravelly sandy loam to very sandy clay loam with weathered bedrock located approximately 15 to 19 inches bgs. The Tulecan soil has a profile of very cobbly coarse sandy loam to very cobbly sandy clay loam with weathered bedrock located approximately 15 to 19 inches bgs. Their ability to transmit water is very low.

The Armoine-Penelas association occurs at elevations from 6,200 to 7,000 feet amsl. The Armoine soil in this association is found on eight to 30 percent slopes. The Penelas soil is found on eight to 50 percent slopes and has a profile of very channery loam to extremely channery clay loam with weathered bedrock located nine to 13 inches bgs. The ability of soil to transmit water is very low.

The Penelas-Weepah association occurs at elevations from 3,500 to 7,800 feet amsl. The Penelas soil in this association is found on 30 to 50 percent slopes and has a profile of very channery loam located zero to three inches bgs; extremely channery clay loam located three to nine inches bgs; and weathered bedrock located nine to 60 inches bgs. The Weepah soil is found on hills at 30 to 50 percent slope and has a profile of very gravelly loam located zero to eight inches bgs with weathered bedrock located eight to 60 inches bgs. Both soils have a very low capacity to transmit water.

The Rodad-Theriot-Kyler association occurs at elevations from 5,300 to 7,800 feet amsl. The Rodad soil in this association is found on hills with a 15 to 50 percent slope and has a profile of very channery loam located zero to four inches bgs; very channery clay loam located four to 12 inches bgs; and weathered bedrock 12 to 60 inches bgs. The Theriot soil is found on hills ranging from 15 to 50 percent slope and has a profile of very stony loam located zero to four inches bgs; very cobbly loam located four to eight inches bgs; and unweathered bedrock located eight to 18 inches bgs. The Kyler soil is also found on hills with a 15 to 50 percent slope and has a profile of extremely cobbly loam located zero to three inches bgs; very gravelly loam located three to nine inches bgs; and unweathered bedrock located nine to 19 inches bgs. All three soils have a very low capacity to transmit water.

While the soil units within the Project Area have been defined, previously disturbed soils may not fit the above soil association descriptions.

3.15.2 Environmental Consequences of the Proposed Action

Under the Proposed Action, approximately 285 acres of previously undisturbed soil would be disturbed. Salvageable soils, where present, would be stockpiled and used during reclamation as growth media. The proposed disturbance areas would remain until reclamation efforts are complete, and revegetation success has been established. Approximately 54 acres of the proposed disturbance would remain unreclaimed as open pit features, for a Project total of unreclaimed open pit features of 171 acres. The unreclaimed open pit features would not be revegetated and would represent a long-term erosion source. Water-eroded mineral particles would be unlikely to travel far from their source as the meteoric water carrying them would drain to the pit bottoms where the water would infiltrate or evaporate. Available soil would have been previously removed from this area.

Soil disturbance would impede maturation of soil development, degrade soil structure, and hinder soil biological activity. Additionally, exposed soils would be susceptible to wind and water erosion; however, the potential impacts to the disturbed and reclaimed soils would be reduced by the applicant committed environmental protection measures and BMPs outlined in Section 2.2.5. Based on the existing level of activity at the site and environmental protection measures proposed by MRG, impacts to soils are expected to be minimal.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. Most of the disturbed area would be covered by the water collection apron, the tank, and drinker. Most perimeter areas would remain disturbed until natural revegetation occurs while the area around the drinker would likely remain unvegetated due to wildlife use. Environmental protection measures described in Section 2.2.5 would be followed by MRG while performing road improvements and maintenance. Considering the size of the disturbance area and adherence to environmental protection measures, impacts to soils resulting from erosion would be negligible.

3.15.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The localized air quality barrier would be located on previously disturbed ground. Impacts to soils would be the same as for the Proposed Action.

3.15.4 Environmental Consequences of the No Action Alternative

No impacts to soils associated with the No Action Alternative would occur beyond those resulting from the prior authorized activities of the Mineral Ridge Mine.

3.16 Special Status Species (Plants and Animals)

3.16.1 Affected Environment

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, guidance, or policy. Agencies were queried to obtain lists of species which may occur within the Project Area. Habitat requirements were then reviewed for each species, and an initial determination was made by consultants and BLM specialists regarding their potential presence or absence within the Project Area (BLM 1996 and 2011, SRK 2013a, 2013b, 2014a and 2014b). On this basis, the following special status species were determined to have the potential to occur within the Project Area:

- Beatley buckwheat (*Eriogonum beatleyae*);
- Tiehm buckwheat (*Eriogonum tiehmii*);
- Townsend's big-eared bat (*Corynorhinus townsendii*);
- Brazilian free-tailed bat (*Tadarida brasliensis*);
- western pipistrelle (*Parastrellus hesperus*);
- long-eared myotis (*Myotis evotis*);
- fringed myotis (*Myotis thysanodes*);
- long-legged myotis (*Myotis volans*);
- western small-footed myotis (*Myotis ciliolabrum*);

- Yuma myotis (*Myotis yumanensis*);
- pallid bat (*Antrozous pallidus*);
- big brown bat (*Eptesicus fuscus*);
- California myotis (*Myotis californicus*);
- little brown bat (*Myotis lucifugus*);
- silver-haired bat (*Lasionycteris noctivagans*);
- desert bighorn sheep;
- Pygmy rabbit (*Sylvilagus idahoensis*);
- dark kangaroo mouse (*Microdipodps megacephalus*);
- Golden Eagle;
- Western Burrowing Owl;
- Ferruginous Hawk;
- Prairie Falcon;
- Loggerhead Shrike; and
- Vesper Sparrow.

The NDOW and BLM Greater Sage-grouse habitat data indicate that the Project Area is located within both Category 5 (unsuitable habitat), Category 4 (low value habitat/transitional range), or non-habitat areas. No preliminary general or preliminary priority habitat is located within the Project Area. The closest area of higher value habitat is an area of Category 3 (Preliminary General Habitat) located approximately six miles to the west-southwest of the Project Area. No leks are located within four miles of the Project Area. The Project Area is not located within the Greater Sage-grouse Management Area addressed under the 2014 Nevada Greater Sage-grouse Conservation Plan (Sagebrush Ecosystem Technical Team 2014).

The Greater Sage-grouse habitat areas addressed under the temporary directive IM-NV-2015-017 does not include the Project Area or surroundings.

The NDOW data also indicates the Project Area is within occupied bighorn sheep habitat as shown on Figure 12 (SRK 2013a and SRK 2013b). Numerous bighorn sheep inhabit areas adjacent to and within the Project Area. During a BLM site visit, over 30 bighorn sheep, including lambs, were observed with the majority being in close proximity to the water truck fill station where runoff provides a consistent source of water. The bighorn sheep use this area as their primary water access point (BLM 2014c). According to MRG personnel, the bighorn sheep utilize the area year-round (Lancaster 2014).

Various field surveys have been conducted in the Project Area including: a raptor nest survey which covered the Project Area plus a one-mile buffer; an eagle nest survey which covered a 10-mile radius from the Project Area and which was performed by NDOW during 2014; and acoustic bat surveys during 2013 and 2014. No special status avian species nests were observed. The field surveys focused on areas which provided suitable habitat for special status species. Special status species observed within the Project Area, or which were determined to be present in the Project Area due to the presence of sign include the following (BLM 1996 and 2011, and SRK 2013a, 2013b, 2014a, 2014b, and 2014c):

- Townsend's big-eared bat;
- Brazilian free-tailed bat;

- western pipistrelle;
- western small-footed myotis;
- long-eared myotis;
- California myotis;
- Yuma myotis;
- pallid bat;
- big brown bat;
- little brown bat;
- silver-haired bat;
- desert bighorn sheep;
- Golden Eagle; and
- Loggerhead Shrike.

Special status animal species listed above having the potential to occur in the Project Area but which were not observed may still be present within or utilize the Project Area (BLM 1996 and 2011).

3.16.2 Environmental Consequences of the Proposed Action

3.16.2.1 Plants

No Beatley buckwheat or Tiehm buckwheat were identified within the Project Area during the surveys (SRK 2013a, 2013b, 2014a, and 2014b); therefore, impacts to these species are not expected to occur.

3.16.2.2 Animals

Bats

Rock outcrops, trees, snags, caves, mine workings, and abandoned buildings provide day roost sites for bats while caves and mines can provide for hibernation sites, maternity roosts, or bachelor roots.

Tree and snag bat roost sites have not been quantified, but in general, may be located anywhere within the Great Basin Pinion Juniper woodland vegetation types. Approximately 709 acres of pinion juniper woodland are located within the Project Area. Approximately 28 acres of this vegetation type is anticipated to be disturbed under the Proposed Action as discussed in Section 3.10. Additional losses to the Great Basin Pinion Juniper woodland vegetation type may result from exploration activities. Cliff roost sites may occur within areas of steep terrain and would generally remain undisturbed.

Suitable roost sites may provide habitat for various life phases. Roost site categories typically include maternity sites, hibernation sites, bachelor sites, and rest sites. Preferable roost characteristics may vary widely by species. In addition, the presence of swarming, mating, foraging, and drinking areas also influence the presence of bats and their use of roosting areas (Sherwin et al. 2009).

Potential roost site locations in the form of underground workings were collected from baseline studies, the Nevada Division of Mines, and from cultural resource surveys. Available undisturbed underground habitat sites are summarized in Table 3-11 and are shown on Figure 12.

Table 3-11: Summary of Potential Underground Bat Habitat

Type	Location Number
Undisturbed Underground Workings within Project Area	81
Undisturbed Underground Workings within ½ Mile Buffer	112

Bat foraging habitat would decrease as a result of the Proposed Action. Direct impacts to bats would include the removal or alteration of 285 acres of potential foraging habitat. This impact would persist until reclamation activities are complete, and vegetation has been reestablished. The unreclaimed open pit areas area would constitute a long-term loss of foraging habitat. The additional cliff-like features created along the pit walls may serve as day roost sites but would not likely provide additional hibernation, maternity, or bachelor roost sites.

Desert Bighorn Sheep

The proposed physical barrier fence would surround the truck shop filling station overflow area and would present a hazardous obstacle between the water source and adjacent terrain outside of the operational area. Bighorn sheep may become tangled in the fence while trying to cross. In addition, the physical barrier may alter bighorn sheep movement within the Project Area, pushing them into other hazardous areas in search of water such as along roads, increasing collision risks. The physical barrier fence would negatively impact bighorn sheep using the area for the short-term, until the fence is removed during reclamation.

Desert bighorn sheep would also be indirectly impacted by the loss of vegetation as described for other special status species below.

Other Special Status Species

Direct impacts associated with land clearing activities could result in mortality to small mammals like the dark kangaroo mouse. The taking of bird nests and young is not anticipated to occur as breeding bird surveys would be conducted prior to ground disturbance during the breeding bird season as described in Section 2.2.5. Other wildlife protection measures including adherence to speed limits and construction of the power line and communication facilities according to APLIC standards would minimize impacts to wildlife including special status species. Direct impacts to other special status species are expected to be negligible.

Indirect impacts to special status species would include the removal or alteration of 285 acres of potential habitat. This impact would persist until reclamation activities are complete, and vegetation has been reestablished. Approximately 54 acres would remain unreclaimed and unvegetated as open pit features. This area would constitute a long-term loss of habitat, although some species may eventually find the cliff-like pit walls suitable habitat.

The resulting post-mining vegetation community would initially differ from the existing community, and over time would be expected to return to a composition matching the surrounding undisturbed environment. Considering the stated environmental protection measures, the relatively undisturbed surrounding areas, and the size of the Proposed Action, impacts to special status species would be minimal with the exception of impacts to bighorn sheep resulting from the proposed physical barrier fence. Impacts to bighorn sheep are anticipated to be quantifiable.

3.16.3 Mitigation

MRG proposes to participate in the installation of two bighorn sheep guzzlers in coordination with the NDOW at two locations outside of the Project Area shown on Figure 3. Guzzler installation participation may be financial and/or in the form of equipment use. The Echo Canyon location is at the base of two drainages to the north of the mine, and the Galena Flats location is at the head of a tributary to Great Gulch. Both guzzlers would be located on public lands administered by the BLM.

The guzzlers would provide alternative water sources for bighorn sheep frequenting the Mineral Ridge Mine and would aid in extending habitat availability. Guzzler installation may include the construction of precipitation run-off catchment dams, catchment aprons, installation of piping (with trenching where possible), installation of storage tanks, wildlife friendly fencing, and drinkers. Specific construction details and dimensions are shown in Appendix F. The combined disturbance areas would be less than one-half an acre[1]. Additional details and installation timing would be decided by the NDOW.

Road improvements would need to be performed along an approximately 1.5-mile stretch of road in Great Gulch, primarily involving the removal of boulders. Some grading may also be necessary along an approximately 300-foot stretch of two-track located just below Galena Flats. Minimal additional disturbance is anticipated.

No ROW is assigned to either of the roads used to access the guzzlers. Guzzler access road ROWs would be assigned to the BLM, and a cooperative agreement would be signed between the BLM and NDOW for the guzzler installation and maintenance.

A study on the influence of construction activates to bighorn sheep water-use patterns indicates that, if undisturbed, bighorn sheep will water in the early morning during the cool part of the day. In the presence of construction activity, they tend to water at dawn (if bedded close to the water source) or in the evening after human activities in the area have decreased. Avoidance of construction activities and humans result in greater energy costs through less efficient use of their energy budget, which could result in lower reproductive output (Campbell and Remington 1981).

The older bighorn sheep age classes near Mineral Ridge are likely accustomed to the mining activity. Lambs and new immigrants, however, would likely experience some type of physiological stress from having to alter use patterns in response to human activity (Kipke 2015).

The guzzlers are anticipated to draw the bighorn sheep away from the truck shop filling station overflow and the active mining area with its associated hazards. Although the guzzler installations are anticipated to draw the bighorn sheep away from the operational area, their construction is unlikely to eliminate use of the truck shop filling station overflow as a water source in the short-term. Use of the guzzlers is anticipated to be energetically beneficial (i.e. use times would not be affected by human activity). The guzzlers would also provide water for the bighorn sheep and other animals in areas previously void of year-round water sources

[1] As stated in Appendix F, the cumulative disturbance footprint of each project is not expected to exceed 4,000 square feet or approximately one-tenth of an acre. A disturbance area not to exceed one-half an acre has been considered for this analysis.

beyond the life of the mine. The nearest natural water sources to the Project Area are Tarantula Spring to the south and Borgo Spring to the west.

3.16.4 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Under this alternative the physical barrier fence would be installed around the crusher area, not inclusive of the truck shop filling station as shown on Figure 5; bighorn sheep would continue to have unrestricted access to this water source without fence crossings where they may become tangled. The location of the physical barrier proposed under this alternative is not anticipated to alter bighorn sheep movement within the Project Area. They would continue to move between their foraging terrain and the truck shop filling station on the edge of the operational area.

Impacts to bighorn sheep related to the loss of foraging habitat, the altered post-reclamation vegetation community, noise, and human presence would be the same as under the Proposed Action. Impacts to bighorn sheep under this alternative are anticipated to be negligible and less than for the Proposed Action.

3.16.5 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed disturbance activities would not be carried out and no impacts to special status species would occur besides impacts related to the authorized activities.

3.17 Vegetation

3.17.1 Affected Environment

Vegetation within the proposed Project Area consists of upland vegetation communities varying between Intermountain Semi-desert Shrub Steppe, Semi-desert Grassland, Mixed Salt Desert Scrub, Big Sagebrush Shrubland, Xeric Mixed Sagebrush Shrubland, Pinion Juniper Woodland, Non-specific Barren Desert, and Cliffs and Canyons. A detailed botanical inventory can be found in the baseline reports (SRK 2013a, 2013b, 2014a, and 2014b). Forest and woodland resources are discussed in Section 3.10.

3.17.2 Environmental Consequences of the Proposed Action

An additional 285 acres of undisturbed vegetation would be removed or altered under the Proposed Action. Impacts to vegetation would last until reclamation efforts are complete, and revegetation occurs. The proposed pit areas, covering approximately 54 acres, would not be reclaimed or revegetated. Impacts to vegetation within this area would be long-term.

For the reclaimed areas, post-reclamation plant communities would differ in species composition and diversity from the adjacent native plant communities. Upon successful reclamation of these areas the existing vegetation communities would be modified to a predominantly grassland community until shrub species establish over time. This post-reclamation modification may change habitat values for specific species.

The unreclaimed pit areas may support some sparse vegetation over time. Their post-mining condition may also replicate existing barren desert cliff and canyon habitat types present within the proposed Project Area.

As stated in Section 2.2.5, environmental protection measures would be taken to minimize impacts to vegetation. Considering the size of the proposed disturbance, the sparse vegetation types currently present, proposed reclamation, and the surrounding undisturbed areas, the loss and alteration of vegetation related to the Proposed Action is not anticipated to have significant effects.

Installation of the two guzzlers (discussed as mitigation under Section 3.16) would involve the disturbance of less than one-half an acre and improvements to the access roads including grading and boulder removal. Most of the disturbed area would be covered by the water collection apron, the tank, and drinker. Most perimeter areas would remain disturbed until natural revegetation occurs while the area around the drinker would likely remain unvegetated due to wildlife use. Other impacts to vegetation may involve the altered grazing patterns of bighorn sheep over time as they habituate to the use of the guzzlers rather than the truck shop overflow area for water; grazing of areas adjacent to the guzzlers may increase while grazing of areas near site operations may decrease. Considering the size of the disturbance and that installation of the guzzlers is not anticipated to measurably change bighorn sheep herd sizes, impacts to vegetation are considered negligible.

3.17.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

The proposed physical barrier under this alternative would be located on previously disturbed ground. Impacts to vegetation would be the same as for the Proposed Action.

3.17.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative no impacts to vegetation would occur beyond the impacts related to the approved activities.

3.18 Visual Resources

3.18.1 Affected Environment

The Proposed Action is located in the Silver Peak Range in an area managed as a VRM Class IV area as shown on Figure 13. The objective of the VRM Class IV is "to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high". An area managed as a VRM Class III corridor is located along SR 265 between Blair Junction and Silver Peak. The objective of the VRM Class III is to "to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate" (BLM 2012c).

A visual resource inventory was conducted in 2011 as part of the Battle Mountain District RMP revision effort. That inventory identified the SR 265 corridor as recommended for Class II VRM objectives. The final VRM designation will be completed when the RMP ROD is finalized (BLM 2011b). The objective of the VRM Class II is to **"**To retain the existing character of the landscape. The level of change to the characteristic landscape should be low" (BLM 2012c).

For the purposes of this evaluation, the visual objectives are considered as a VRM Class III.

3.18.2 Environmental Consequences of the Proposed Action

The Proposed Action would result in changes to the landscape through the addition of waste rock to existing waste rock disposal areas, the creation of new waste rock disposal areas, the creation of new open pits, the extension of existing open pits, the addition of haul roads, and the alteration of a power line location. These activities would result in changes to the basic landscape design elements of form, line, color, and texture. Changes to the landscape would be long-term, lasting beyond the reclamation and revegetation phases. The anticipated changes are within the VRM Class IV objectives, which allows for major modifications to the landscape.

Portions of the Proposed Action disturbance areas and facilities would be visible from the VRM Class III management corridor along SR 265 between Blair Junction and Silver Peak. A visual assessment is included as Appendix G. Proposed facilities and areas which would be visible from one or more of the Key Observation Points (KOPs) 384, 385, or 381 include:

- The Solberry Pit;
- A portion of the Solberry waste rock disposal area with a maximum face height of 390 feet;
- General disturbance southeast of WD-6;
- The toe extension of WD-10; and
- A portion of the WD-11 toe extension.

In addition, some exploration activities may also be visible from the KOPs as shown in Appendix G. The visible activities and facilities would result in changes to the landscape. Changes to the landscape would be long-term, lasting beyond the reclamation and revegetation phases. From the listed KOPs, the resulting changes are anticipated to be within the VRM Class III objective "to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate".

Since activities within the Project Area will be visible from this corridor, every attempt would be made to minimize the impact of the Proposed Action through careful location, minimal disturbance, and reclamation activities that provide for a more natural, post-mining landscape. With successful reclamation and revegetation of the disturbance area, long-term visual impacts would be minimized and the VRM Class III objectives of the scenic corridor would be met.

The proposed guzzlers (discussed as mitigation under Section 3.16) would be constructed to blend into the surrounding environment as discussed in Appendix F. The Galena Flats Guzzler would not be visible from the KOPs, but the Echo Canyon guzzler would be (Appendix G). The installation would result in minor changes to the visual environment and still meet visual objectives.. these activities are not anticipated to change the overall visual characteristics within the landscape.

3.18.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to visual resources under this alternative would be the same as for the Proposed Action.

3.18.4 Environmental Consequences of the No Action Alternative

No additional changes to the landscape would occur under the No Action Alternative beyond those previously permitted.

3.19 Wild Horses and Burros

3.19.1 Affected Environment

The Project Area is located within the Silver Peak Herd Management Area (HMA) which encompasses approximately 242,455 acres shown on Figure 14. The Appropriate Management Level (AML) is set at six burros and zero wild horses. With exception of the relatively flat eastern and southeastern flanks of Fish Lake Valley, the HMA provides poor habitat for wild horses and burros due to sharp changes in elevation and relative lack of palatable grasses and browse.

Wild horse distribution is limited to the western and southern portions of the HMA, with the majority of the horses located on the eastern side of Fish Lake Valley and the western foothills of the Silver Peak Range. Some horse use has been documented south of McAfee Canyon, near White Canyon and the Cow Camp Spring complex. Despite an AML of zero, the 2014 pre-foaling population estimate for Wild Horses within the Silver Peak HMA was 101. Many of these horses likely migrated from the Fish Lake Valley HMA to the west and from California to the south. However, there are no current plans to conduct a gather within the HMA.

Wild burro distribution within the Silver Peak HMA is extremely limited. Few accounts of burro sightings have been documented. Those accounts indicate that burro use is limited to the central and eastern portions of the HMA. However, the 2014 pre-foaling population estimate for burros in the HMA is zero, as they have not been documented during population inventory flights.

Data indicate that wild horse and burro populations that inhabit the HMA make little or no use of the Project Area. The nearest sighting of wild horses and burros to the Project Area during the last five years of population and monitoring flights was in excess of eight miles. The extremely steep terrain over much of the proposed project area is the most likely reason for the lack of use.

Wild horse and burros have been observed along the access road to the Project Area which runs from Fish Lake Valley east over the Silver Peak Range.

3.19.2 Environmental Consequences of the Proposed Action

Wild horses and burros in the area could potentially be affected by the loss of habitat and fodder. An additional 285 acres, a small fraction of the Silver Peak HMA, would be disturbed under the Proposed Action resulting in a reduction of potential wild horse and burro habitat.

The total Project Area disturbance would be 906 acres. This impact would persist until reclamation has been completed and revegetation success established.

Post-mining reclamation and revegetation efforts would alter the existing plant community from its current configuration to a more grassland type. In the long-term, colonization from adjacent undisturbed areas would help reestablish the pre-mining vegetation communities.

Reclamation would not be performed on 54 acres of proposed pit disturbance. This area would represent a long-term loss of potential wild horse and burro grazing habitat. Based on the lack of use, the existing level of disturbance and activity at the site and the size of the Silver Peak HMA in relation to the proposed disturbance, potential impacts to wild horses and burros as a result of the Proposed Action are considered to be low.

However, wild horse and burros are vulnerable to mortality associated with mine-related traffic moving from the Fish Lake Valley across the Silver Peak Range to the Project Area. The speed limit on these county roads is 25 miles per hour, and MRG employees would be required to adhere to this speed limit or less to protect all species of wildlife, including wild horse and burros (see Section 2.2.5).

Installation of the guzzlers (described in Section 3.16) would provide additional water sources in an area otherwise void of water. The disturbance area resulting from the installation would reduce potential wild horse and burro habitat. Again, considering the lack of documented use of the area, this impact would be negligible.

3.19.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Wild horses and burros are not known to use the Project Area or the truck shop fill station overflow as a water source. Impacts to wild horses and burros under this alternative would be the same as for the Proposed Action.

3.19.4 Environmental Consequences of the No Action Alternative

No additional impacts to wild horses or burros would occur under the No Action alternative beyond the impacts associated with currently authorized activities.

3.20 Wildlife

3.20.1 Affected Environment

Information pertaining to the use of the Project Area by wildlife has been collected from baseline biological reports referenced for previously approved EAs (BLM 2011a and BLM 2013) as well as more recent migratory bird surveys and biological surveys conducted during 2011, 2012, 2013, and 2014. These surveys together have covered the Project Area. Recently performed surveys and reports include the following:

- 2011, 2012, 2013, and 2014 migratory bird surveys conducted by Knight & Leavitt Associates (Knight & Leavitt);
- SRK. 2014a. *Mineral Ridge Gold 2014 State Bank Expansion Biological Baseline.* August 2014;
- SRK. 2014b. *Mineral Ridge Gold 2014 Expansion Baseline.* June 2014;

- SRK. 2014c. *Mary 1 Escapeway (Adit and Escape Route for Mary Drinkwater Mine) Bat Survey*. Memo to Carlene Lancaster (MRG) from Angel Lino (SRK). October 12, 2014;
- SRK. 2013a. *Mineral Ridge Gold Biological Baseline Survey*. June 2013; and
- SRK. 2013b. *Mineral Ridge Gold Missouri Claim Biological Baseline Survey*. August 2013.

In addition to the species discussed previously in sections 3.5 and 3.16, the following wildlife species or their sign were observed within the Project Area (SRK 2013a and 2013b): House Sparrow (*Passer domesticus*);

- European Starling (*Sturnus vulgaris*);
- mule deer (*Odocoileus hemionus*);
- pronghorn antelope (*Antilocapra americana*);
- black-tailed jackrabbit (*Lepus californicus*);
- mountain cottontail (*Sylvilagus nuttallii*);
- least chipmunk (*Eutamias minimus*);
- Townsend ground squirrel (*Citellus townsendii*);
- white-tailed antelope squirrel (*Ammospermophilus leucurus*);
- desert woodrat (*Neotoma lepida*);
- desert horned lizard (*Phrynosorna* platyrhinos);
- desert collared lizard (*Crotaphyutus* insularis); and
- western rattlesnake (*Crotalus viridi*).

Other species likely to occur within the Project Area based on their general habitat requirements and ranges include the following (SRK 2013a and 2013b):

- Botta's pocket gopher (*Thomomys bottae*);
- northern pocket gopher (*Thomomys talpoides*);
- little pocket mouse (*Perognathus longimembris*);
- Great Basin pocket mouse (*Perognathus parvus*);
- Ord kangaroo mouse (*Dipodomys ordii*);
- chisel-toothed kangaroo rat (*Dipodomys microps*);
- deer mouse (*Peromyscus maniculatus*);
- northern grasshopper mouse (*Onychomys leucgaster*);
- sagebrush vole (Lemmiscus curtatus);
- house mouse (*Mus musculus*);
- desert spiny lizard (*Sceloporus magister*);
- gopher snake (*Pituophis melanoleucus*);
- ground snake (*Sonora semiannulata*);
- long-nosed leopard lizard (*Gambelia wislizenii*);
- long-nosed snake (*Rhinocheilus lecontei*);
- night snake (*Hypsiglena torquata*);
- racer (*Coluber constrictor*);
- sagebrush lizard (*Sceloporus graciosus*);
- short-horned lizard (*Phrynosorna douglassii*);
- side-blotched lizard (*Uta stansburiana*);
- striped whipsnake (*Masticophis taeniatus*);

- western fence lizard (*Sceloporus cccidentalis*);
- western rattlesnake (*Crotalus viridi*);
- western skink (*Eumeces skiltonianus*); and
- western whiptail (*Cnemidophorus tigrus*).

The NDOW data indicates that the Project Area is located within year-round mule deer habitat as shown on Figure 12.

Information regarding survey protocol and the types of observations made can be found in the separate baseline reports along with species-specific habitat requirements (SRK 2013a, 2013b, 2014a, 2014b, and 2014d).

3.20.2 Environmental Consequences of the Proposed Action

Direct impacts to wildlife could involve the taking of small mammals during land clearing activities. The taking of bird nests and young is not anticipated to occur as breeding bird surveys would be conducted prior to ground disturbance during the breeding bird season as described in Section 2.2.5. Other wildlife protection measures including adherence to speed limits and construction of the power line and communication facilities according to APLIC standards would minimize impacts to wildlife including special status species.

Loud and sudden noises associated with the Proposed Action could result in wildlife displacement for the life of the Project. In areas where habitats are at or near their wildlife carrying capacity, displacement could add further stresses to the habitat and/or reductions in wildlife populations in adjacent habitat areas.

Indirect impacts to wildlife would include the removal or alteration of 285 acres of potential habitat. This impact would persist until reclamation activities are complete, and vegetation has been reestablished. Approximately 54 acres would remain unreclaimed and unvegetated as open pit features. This area would constitute a long-term loss of habitat, although some species may eventually find the cliff-like pit walls suitable habitat.

The resulting post-mining vegetation community may differ somewhat from the existing vegetation. However, over time, vegetation would be expected to return to a composition matching the surrounding undisturbed environment, creating available habitat for wildlife species. In addition, the applicant committed environmental protection measures outlined in Section 2.2.5 would minimize potential direct impacts to wildlife and reduce impacts to habitat.

Potential impacts to bats are discussed under Section 2.2.5.

Installation of the guzzlers (described as mitigation in Section 3.16) would result in the disturbance of less than one-half acre of wildlife habitat. Most of the disturbed area would be permanently altered to a water catchment apron, water tank, and drinker. Perimeter areas may be naturally revegetated over time but the area around the drinker would likely remain disturbed from wildlife use. Impacts to wildlife related to habitat loss would be negligible given the small size of the disturbance area within an otherwise undisturbed surrounding. Some wildlife species would be positively impacted by the installation of the guzzlers and availability of water. These guzzlers would provide water sources in areas generally void of year-round water. The nearest natural water sources to the Project Area are Tarantula Spring to the south and Borgo Spring to the west.

3.20.3 Environmental Consequences of the Crusher Area Physical Barrier Alternative

Impacts to wildlife related to a loss of foraging habitat, the altered post-reclamation vegetation community, noise, and human presence would be the same as under the Proposed Action.

3.20.4 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the proposed activities would not occur and no further impacts to wildlife beyond impacts related to the approved activities would occur.

4.0 CUMULATIVE IMPACTS

Cumulative impacts have been defined under 40 CFR §1508.7 as:

> "The impact which results from the incremental impact of the action, decision, or Project when added to the other past, present, and reasonably foreseeable future actions (RFFAs), regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

This section addresses the cumulative effects to environmental resources within the cumulative effects study areas (CESAs) which could result from past, present and reasonably foreseeable future actions, including the Proposed Action. For the purposes of this analysis and under federal regulations, "impacts" and "effects" are assumed to have the same meaning and are interchangeable.

Environmental consequences of the Proposed Action and the No Action Alternative were evaluated previously in Section 3.0. The results of the direct and indirect impact analysis indicate that the following resources would be impacted by the Proposed Action and are thus evaluated for cumulative impacts:

- Air Quality;
- Cultural Resources;
- Noxious Weeds, Invasive and Non-native Species;
- Migratory Birds;
- Wastes, Hazardous and Solid;
- Forest and Woodland Resources;
- Geology and Mineral Resources;
- Water (Surface and Ground);
- Socio-Economic Values;
- Soils;
- Special Status Species;
- Vegetation;
- Visual Resources;
- Wild Horses and Burros; and
- Wildlife.

Based on the preceding analysis in Section 3.0, the following resources would not be impacted by the Proposed Action. Therefore, no cumulative impacts are expected for the following resources:

- Native American Cultural Concerns;
- Grazing Management;
- Land Use Authorizations;
- Paleontological Resources; and
- Recreation.

4.1 Description of Cumulative Effects Study Area Boundaries

The CESA boundaries used in this EA vary according to the resource being considered. The CESA boundaries are shown on Figure 15. Table 4-1 outlines the CESA areas by resource.

Table 4-1: Cumulative Effects Study Areas

CESA Name	Resources	CESA Size (acres)
Silver Peak Vegetation Allotment CESA	Migratory Birds, Noxious Weeds, Invasive, and Non-native Species, Forest and Woodland Resources, Soils, Special Status Species, Vegetation, Wild Horses and Burros, and Wildlife.	277,053
Air/Visuals CESA	Air Quality and Visual Resources	201,060
Hydrology CESA	Water Resources	67,124
Mining District CESA	Geology and Mineral Resources	18,556
Project Area CESA	Cultural Resources and Hazardous and Solid Wastes	2,700
Socio-Economics CESA	Socio-Economic Values	(towns of Silver Peak, Tonopah, and Dyer, NV)

The Silver Peak Vegetation Allotment CESA includes the Silver Peak Grazing Allotment. This area includes the Project Area and represents a reasonably-sized administrative boundary currently used for the management of grazing and vegetation. Vegetation management is related to soils management and affects wildlife (including migratory birds and special status species), noxious weeds, invasive, and non-native species, and wild horses and burros.

The Air/Visuals CESA has been chosen for the analysis of air quality and visual resources. It encompasses a ten-mile radius around the Project Area. This radius is commensurate for the amount of proposed disturbance and includes nearby mining operations which would contribute to cumulative impacts. For visual resources, this boundary includes nearby KOPs and portions of areas managed as Class-II VRM areas from which the proposed disturbance may be visible.

They Hydrology CESA is bounded to the west by the HUC boundary, and to the north and south of the Project Area by drainages which start near the Project Area. The eastern extent covers the Clayton Valley's valley floor. This CESA includes downstream water resources to the Project Area as well as other large operations occurring within Clayton Valley which may contribute to cumulative effects.

The Mining District CESA includes the Project Area and surrounding areas where hard rock mining has taken place (the Mineral Ridge Historic Mining District). It is within this area that ore presence and geologic stability concerns are comparable and potentially cumulative to the Proposed Action.

The Project Area has been used as the CESA for hazardous and solid wastes since their presence and management within the Project Area are handled by MRG under state and federal plans and permits. Outside the Project Area, solid and hazardous waste management is governed and carried out by other entities such as the Department of Transportation. The Project Area CESA has also been chosen for Cultural Resources. The Project Area size is appropriate for cultural resource analysis based on their known presence and the proposed disturbance acreage.

The CESA for socio-economics was determined to include those projects and activities regardless of location, that have a potential effect on socio-economics as analyzed in this EA. This was determined to include the towns of Silver Peak, Tonopah, and Dyer, NV. Silver Peak and Dyer are located in Esmeralda County while Tonopah is located in Nye County.

4.2 Past and Present Actions

Past and present actions in the CESAs include: exploration and mining, land exchanges and sales, renewable energy projects, livestock grazing, wildlife habitat improvements, transportation networks and ROWs, dispersed recreation, and wild horse and burro gathers. The BLM's Land and Mineral Legacy Rehost 2000 System (LR2000) was queried to access reports for actions on BLM land.

Aside from actions occurring on BLM-administered lands within the CESAs, the town of Silver Peak houses families and some businesses. Domestic and municipal construction and repair activities are ongoing.

4.2.1 Exploration and Mining

The Silver Peak Range CESA has been disturbed by both underground and surface mining operations which extend from the nineteenth century until the present day. Historic mining operations included mining, milling, and waste rock disposal.

Mineral exploration, mining, and mineral material operations that have occurred or are occurring within the CESAs are summarized in Table 4-2 by case type and disposition. The total authorized project acres as well as the reported acres disturbed and acres reclaimed are also shown for relevant categories.

Table 4-2: Past and Present Mining and Exploration Activities

Case Type	Disposition	Total Acres[1]	Acres Disturbed	
Silver Peak Vegetation Allotment CESA				
Material Sites	authorized	516	-	-
Surface Management Plan[2]	authorized	1,281	1,291	20
Surface Management Notice	authorized	11	2	0
Surface Management Notice	expired	28	27	1
Sub-Total		**1,836**	**1,320**	**21**
Air/Visuals CESA				
Material Sites	authorized	156	-	-
Surface Management Plan[2]	authorized	1,281	1,291	20
Surface Management Notice	authorized	4		
Surface Management Notice	expired	22	23	0
Sub-Total		**1,463**	**1,314**	**20**
Hydrology CESA				

Case Type	Disposition	Total Acres[1]	Acres Disturbed	Acres Reclaimed
Material Sites	authorized	116	-	-
Surface Management Plan[2]	authorized	1,281	1,291	20
Surface Management Notice	authorized	4	0	0
Surface Management Notice	expired	11	11	0
Sub-Total		**1,412**	**1,302**	**20**
Mining District CESA				
Material Sites	authorized	40	-	-
Surface Management Plan[2]	authorized	1,281	1,291	20
Surface Management Notice	authorized	4	0	0
Surface Management Notice	expired	11	11	0
Sub-Total		**1,336**	**1,302**	**20**
Project Area CESA				
Material Sites	authorized	0	-	-
Surface Management Plan[2]	authorized	621	621	621
Surface Management Notice	authorized	4	0	0
Surface Management Notice	expired	3	3	0
Sub-Total		**628**	**624**	**621**

Source: LR2000 2014, 2015 and file 202200.370_CAS_LR2000_Calculations_Rev6

[1]Acreage totals have been calculated as the project total and may not represent the actual acreage located within the CESA.

[2]Authorized surface management plan disturbance acres related to the Mineral Ridge Mine were reported as 547 in LR2000. For this investigation the authorized disturbance area of 621 acres was used.

One authorized potash lease and several closed lease actions for sodium, sodium prospecting, and other minerals exist within the CESAs. Disturbances associated with these actions are less than ten acres.

The largest mining activity within the vicinity of the Project Area is the Rockwood Lithium lithium brine operations located to the southwest of the Project Area (serial number NVN 072542). This mine is located on both public and private lands. The surface management plan covers approximately 630 acres of disturbance (LR2000 2014 and 2015). Lithium is mined through a brine aquifer pumping and evaporative concentration process. Adsorption trenches are used for the percolation of water back into the ground (NDEP 2013). The products include lithium carbonate and lithium hydroxide gas. The Rockwood Lithium operations are located within the Air/Visual, Mining District, and Hydrology CESAs.

Geothermal geophysical exploration projects and leases (competitive and non-competitive) occur within the CESAs and shown in Table 4-3 and Table 4-4. No disturbance acres have been recorded for these projects.

Table 4-3: Authorized Geothermal Exploration Projects

CESA	Allotment	Air/Visual	Hydrology	Mining District	Project Area
Number	**6**	**6**	**3**	**2**	**0**

Source: LR2000 2014, 2015 and file 202200.370_CAS_LR2000_Calculations_Rev6

Table 4-4: Authorized Geothermal Leases

CESA	Allotment	Air/Visual	Hydrology	Mining District	Project Area
Number	31	25	13	7	0

Source: LR2000 2014, 2015 and file 202200.370_CAS_LR2000_Calculations_Rev6

Most impacts related to surface management plans and mineral site activities would be minimized through resource management and reclamation required for projects located on federally managed lands. Surface disturbance-related impacts for most projects would generally last for the short-term, until reclamation and revegetation success is established.

The past and present exploration mining activities may affect the towns located within the Socio-Economic CESA through employment opportunities, services, and vendor retainment. They may also be affected through state, county, and federal tax revenue. The exact actions which may affect the towns have not been tabulated for this analysis.

4.2.2 Land Sales, Acquisitions, and Land Exchanges

Land transfers and sales can effectively remove land from BLM management. Resulting impacts would generally be long-term. Authorized land exchanges and sales within the CESAs are summarized in Table 4-5.

Table 4-5: Land Sales and Exchanges

Case Type/Description	Disposition	Total Acres[1]
Silver Peak Vegetation Allotment CESA		
Sale - Public Lands FLPMA	Authorized	5
Sale – Recreation and Public Purposes Act	Authorized	30
Federal Aviation Administration Site	Authorized	135
Sale - Section 203 & 209	Authorized	28
Sub-Total[1]		**198**
Air/Visuals CESA		
Sale - Public Lands FLPMA	Authorized	0
Sale – Recreation and Public Purposes Act	Authorized	0
Sale - Section 203 & 209	Authorized	28
Sale – Recreation and Public Purposes Act	Authorized	10
Sub-Total[1]		**38**
Hydrology CESA		
Sale - Public Lands FLPMA	Authorized	0
Sale – Recreation and Public Purposes Act	Authorized	0
Sale - Section 203 & 209	Authorized	28
Sale – Recreation and Public Purposes Act	Authorized	10
Sub-Total[1]		**38**
Mining District CESA		
Sale - Public Lands FLPMA	Authorized	0
Sale – Recreation and Public Purposes Act	Authorized	0
Sale - Section 203 & 209	Authorized	28
Sale – Recreation and Public Purposes Act	Authorized	10
Sub-Total[1]		**38**
Project Area CESA		
Sale - Public Lands FLPMA	Authorized	0
Sale – Recreation and Public Purposes Act	Authorized	0
Sale - Section 203 & 209	Authorized	0

Case Type/Description	Disposition	Total Acres[1]
Sale – Recreation and Public Purposes Act	Authorized	0
Sub-Total[1]		**0**

Source: LR2000 2014, 2015 and file 202200.370_CAS_LR2000_Calculations_Rev6

[1]Acreage totals have been calculated as the project total and may not represent the actual acreage located within the CESA.

Land sales and exchanges have not been tabulated for the Scio-Economic CESA since the land exchanges which may have occurred in those towns are anticipated to have a negligible effect on socio-economics.

4.2.4 Livestock Grazing

The Silver Peak Vegetation Allotment CESA encompasses the whole Silver Peak Allotment while the Mining District and Project Area CESAs are located within this. Livestock grazing has occurred within this allotment as a past action and continues to occur as a present action with 440 active AUMs currently permitted for use (RAS 2015).

The Air/Visuals and Hydrology CESAs are located partially within the Silver Peak Allotment as well as the Yellow Hills Allotment and the Sheep Mountain Allotment. The Yellow Hills Allotment covers approximately 62,203 acres and has 180 AUMs currently permitted for use. The Sheep Mountain Allotment covers approximately 88,435 acres and has 1,740 AUMs currently permitted for use (RAS 2015).

4.2.3 Wildlife Habitat Improvements

Three upland game and four big game water developments are located within the Silver Peak Vegetation Allotment CESA. One of the big game water developments is located within the hydrology CESA (Donham 2015).During the spring of 2004, two of these wildlife water developments were rebuilt, and a third was repaired in 2008, improving water availability for wildlife in the area (BLM 2011a).

4.2.4 Transportation Networks and Rights-of-Way (ROWs)

Closed ROWs which had resulted in disturbance acres include ROWs for power, communications, water, geothermal, and other energy facilities.

Authorized ROWs within the CESAs include ROWs for minor roads, county roads, highways, power facilities, communication facilities, water facilities, renewable energy, and other facilities. Most of these ROWs are linear features crossing portions of the landscape. Acreages associated with authorized ROWS are listed in Table 4-6; however, most of these linear features are located only partially within the CESAs, with a maximum length of approximately seven miles if crossing from north to south through the Silver Peak Vegetation Allotment CESA.

Most of the roads located within the CESAs are minor roads which require minimal maintenance including grading and gravelling. Larger roads within the Silver Peak Vegetation Allotment CESA include Highway 6 and Highway 95 as shown on Figure 15. State Highway 265 is located within both CESAs.

Table 4-6: Past and Present ROW Actions

ROW Type	Disposition	Total Acres[1]
Silver Peak Vegetation Allotment CESA		
Power and Power Transmission Lines	Authorized	23,642
Communication Facilities	Authorized	809
Communication Facilities	Expired	<1
Water Facilities	Authorized	33
Roads	Authorized	1,910
Other	Authorized	<1
Air/Visuals CESA		
Power and Power Transmission Lines	Authorized	23,577
Communication Facilities	Authorized	10
Communication Facilities	Expired	0
Water Facilities	Authorized	38
Roads	Authorized	1,340
Other	Authorized	0
Hydrology CESA		
Power and Power Transmission Lines	Authorized	2,197
Communication Facilities	Authorized	0
Communication Facilities	Expired	0
Water Facilities	Authorized	33
Roads	Authorized	997
Other	Authorized	0
Mining District CESA		
Power and Power Transmission Lines	Authorized	2,190
Communication Facilities	Authorized	0
Communication Facilities	Expired	0
Water Facilities	Authorized	33
Roads	Authorized	752
Other	Authorized	0
Project Area CESA		
Power and Power Transmission Lines	Authorized	27
Communication Facilities	Authorized	0
Communication Facilities	Expired	0
Water Facilities	Authorized	0
Roads	Authorized	65
Other	Authorized	0

Source: LR2000 2014, 2015 and file 202200.370_CAS_LR2000_Calculations_Rev6

[1]Acreage totals have been calculated as the project total and may not represent the actual acreage located within the CESA.

4.2.5 Recreation

Developed recreational opportunities are relatively sparse in this part of Nevada and tend to be limited to off-highway vehicle/all-terrain vehicle use, dirt bike riding, hunting/shooting, and camping. Other recreational activities may include mountain biking, horseback riding, sightseeing, historical touring, outdoor photography, nature study, pine-nut gathering, wildlife viewing, bird watching, and rock collecting.

The Silver Peak Vegetation Allotment, Air/Visuals, Hydrology, and Mining District CESAs are located within Hunt Unit 211 and 212. The Project Area CESA is located within Hunt

Unit 211. In 2013, 81 mule deer tags and four pronghorn antelope tags were issued for Hunt Units 211 and 212 jointly. Nine bighorn sheep tags were issued for Hunt Unit 211 (NDOW 2014).

Recreation within the Socio-Economic CESA may be less dispersed and more focused on sight-seeing historical features within each town. Recreation within the towns and adjacent areas may also result in use of hotels, restaurants, and other services offered by the affected communities.

4.2.6 Wild Horse and Burros Gathers

A wild horse and burro gather was conducted within the Silver Peak HMA during the fall of 2006. The Silver Peak HMA overlaps all of the discussed CESAs with the exception of the Socio-Economic CESA. The objective of the gather was the complete removal of horses due to a lack of appropriate habitat in the HMA. During the course of the gather, which occurred over a six-day period beginning October 2, 2006, 154 wild horse, mules, and burros were removed.

4.3 Reasonably Foreseeable Future Actions (RFFAs)

RFFAs within the CESAs would be dominated by prospecting, exploration, and mining activities. Mineral exploration and mining activities can be expected to continue based on current supply and demand of minerals and materials. Livestock grazing, transportation, and dispersed recreational activities are expected to continue into the foreseeable future. No additional wild horse and burros gathers are currently being contemplated and, therefore, are not reasonably foreseeable.

Much of the area surrounding the town of Silver Peak is identified as suitable for disposal, utilizing direct sale procedures, in the Tonopah RMP (BLM 1997). The authority for the potential sale of this land would come under Sections 203 and 209 of FLPMA, U.S.C. 1713 and 1719, or disposal through the Recreation and Public Purposes Act, and special legislation.

The following actions summarized in Table 4-7 are considered RFFAs. There are no listed RFFAs located within the Project Area CESA. No disturbance acres have been reported for these activities.

Table 4-7: Pending Actions Wholly or Partially Within CESA Boundaries

Case Type	Disposition	Total Acres[1]
Silver Peak Vegetation Allotment CESA		
Surface Management - Notice	Pending	18
Air/Visuals CESA		
Surface Management - Notice	Pending	17
Hydrology CESA		
Surface Management - Notice	Pending	16
Mining District CESA		
Surface Management - Notice	Pending	4
Project Area CESA		
Surface Management - Notice	Pending	4

Source: LR2000 2014, 2015 and file 202200.370_CAS_LR2000_Calculations_Rev6

[1]Activities may be located in all or part of the listed sections. Acreage totals may not represent the actual total located within the CESA.

In addition to the activities listed in the table above, there are 27 sodium or potassium prospecting activities listed as having a pending status within the LR2000 system for the Silver Peak Vegetation Allotment CESA, 20 for the Air/Visuals CESA, 16 for the Hydrology CESA, and one for the Mining District CESA. However, as disclosed through LR2000 some of the prospecting permits on file may be duplicates (LR2000 2014 and 2015).

4.4 Cumulative Impacts Associated with Past, Present and Reasonably Foreseeable Future Actions, including the Proposed Action

In accordance with the guidance document, *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997), potential cumulative impacts for resources presented and evaluated in Section 3.0 and found to be impacted by the Proposed Action are discussed herein.

4.4.1 Air Quality

The CESA for air quality is the Air/Visuals CESA encompassing approximately 201,060 acres.

Past and present actions within the Air/Visuals CESA likely to contribute to air quality impacts include exploration and mining, livestock grazing, transportation networks and ROWs, renewable energy projects, and dispersed recreation. These activities contribute point source particulate matter emissions and fugitive dust to the air. Fugitive dust emissions arise from roads, cleared areas, disturbed areas (such as may result from grazing and recreation), and earth-moving activities. Products of combustion are also emitted into the air primarily from mining operations and transportation.

Past and present mining and exploration activities located partially or wholly within the Air/Visuals CESA have associated quantifiable disturbance acres of approximately 1,320 acres, which is less than one percent of the CESA. The largest activity which may contribute to air quality impacts within the CESA is the Rockwood Lithium operations located to the southeast of Silver Peak. Winds have been observed transporting fugitive dust from the valley floor, including dry material from the lithium brine operation disturbed areas and evaporation pond edges, to higher elevations and into adjacent areas. Toxic Release Inventory reports indicate that 2,468 pounds of lithium carbonate were released in 2013. Of this, 250 pounds were released as fugitive air emissions while 2,218 were release as point-source emissions (Envirofacts 2015).

Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[2]. These disturbance areas may contribute to fugitive dust emissions, especially if not paved or otherwise maintained for dust.

---

[2] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Air/Visuals CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 581 acres which is less than one percent of either CESA.

Past and present air quality impacts from mining and exploration, transportation networks, and ROWs have not altered the “unclassifiable/attainment” classification of Esmeralda County and Hydrographic Area 143 (Clayton Valley) meaning that the existing background concentrations for criteria air pollutants are less than the minimum allowable ambient concentrations defined in the NAAQS.

Combustion emissions within the CESA would be created primarily by vehicles travelling along State Highway 265, by mining and exploration equipment, and some recreational uses. Impacts to air quality from these past and present combustion-related sources have not altered the “unclassifiable/attainment” classification of Esmeralda County or Clayton Valley and are considered to be minimal due to low traffic levels and climatic conditions which favor dispersion. Combustion emissions are also created by mobile and stationary mining and exploration equipment used in the area.

The majority of surface disturbance associated with RFFAs within the CESA would result from prospecting, exploration, and mining related activities. These activities would contribute to air quality impacts through fugitive dust and also through combustion emissions. Disturbance areas have not been identified for the RFFAs and are thus not quantified. Prior to receiving authorization to commence future operations, impacts to air quality would be analyzed separately for each new project occurring on federally administered lands.

4.4.1.1 Proposed Action

Under the Proposed Action the mine life would be extended by approximately one year. This would result in approximately one additional year’s worth of emissions. As discussed in Section 3.1, modelled emissions are not anticipated to cause an exceedance of NAAQS or Nevada ambient air quality standards, and GHG and HAP emission contributions are anticipated to be negligible.

The incremental contribution of the Proposed Action's combustion and fugitive dust emissions would be relatively small for both the short term and long term. The cumulative emissions resulting from past and present actions, RFFAs, and the Proposed Action would be generally dispersed and are not anticipated to alter Clayton Valley’s air quality rating of “unclassifiable/attainment”. In addition, applicant committed environmental protection measures for each authorized project occurring on public land would minimize potential cumulative effects to air quality. Reclamation of proposed surface disturbance areas would gradually eliminate most sources of fugitive dust resulting from wind erosion.

4.4.1.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to air resources from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.1.3 No Action Alternative

Impacts to air quality from previously permitted authorizations would continue to occur under the No Action Alternative. Cumulative impacts occurring from the No Action Alternative would result in no measurable change to Esmeralda County’s or Clayton Valley’s “unclassifiable/attainment” status. Fugitive dust emissions would result from the existing and authorized disturbance areas within the Project Area. Mobile and stationary source emissions would be the same as those previously discussed.

4.4.2 Cultural Resources

The CESA for cultural resources is the Project Area CESA encompassing approximately 2,700 acres.

Cultural resources within the Project Area CESA have had and continue to have the potential for disturbance resulting primarily from ground clearing activities which could disturb or remove cultural sites. Past and present actions involving surface disturbance include exploration and mining, transportation networks, and ROWs. Mining and exploration have associated quantifiable disturbance areas which total approximately 621 acres or 23 percent of the CESA.

Permitted activities occurring on federal lands are required to manage for cultural resources; impacts to cultural resources under these projects have been or are being avoided or mitigated. Unpermitted activities and activities occurring on private lands may impact cultural resources without mitigation.

RFFAs which may impact cultural resources within the Project Area CESA include livestock grazing and dispersed recreation, although the occurrence of these activities within the Project Area are anticipated to be non-existent or negligible.

4.4.2.1 Proposed Action

Impacts under the Proposed Action would occur but would be mitigated through the development of a treatment plan, data recovery, archaeological documentation, and report preparation in accordance with PA stipulations. Although the Proposed Action would result in the disturbance of 285 acres (11 percent of the CESA) the incremental contribution of the Proposed Action's impacts to cultural resources would be negligible due to avoidance and mitigation.

Pre-disturbance cultural inventories have been conducted and all eligible or unevaluated cultural resources have been and would be avoided. By incorporating the protection measures detailed in Section 2.2.5, significant cumulative impacts to cultural resources have not occurred and are not anticipated

4.4.2.2 Crusher Area Physical Barrier Alternative

The disturbance areas and disturbance locations for the Proposed Action and the Crusher Area Physical Barrier Alternative are the same. Cumulative impacts from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.2.3 No Action Alternative

Under the No Action alternative, impacts would continue to occur from authorized activities. According to past analysis, authorized activities within the Project Area are not anticipated to significantly impact cultural resources due to the implementation of environmental protection measures (BLM 2011a and 2013).

4.4.3 Noxious Weeds, Invasive and Non-native Species

The CESA for noxious weeds, invasive, and non-native species is the Silver Peak Vegetation Allotment which encompasses approximately 277,053 acres as shown on Figure 15.

Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to the presence or spread of noxious weeds, invasive, and non-native species are activities which include surface disturbances, vegetation removal, and movement of vehicles, people, and animals. These activities include exploration and mining, geothermal projects, livestock grazing, transportation networks and ROWS, and dispersed recreation. Disturbances associated with exploration and mining in the CESA equal approximately 1,320 acres or less than one percent of the CESA. Transportation networks and ROWs also have associated disturbance areas which are not fully contained within the CESA but are also estimated to equal less than one percent of the CESA[3].

Proponents of activities occurring on public lands are required to manage or mitigate for the presence of noxious weeds, invasive, and non-native species. Lands which are transferred to other entities may not receive the same kind of management for these species as they would under the BLM. Approximately 198 acres of land have been transferred or sold, equaling less than one percent of the CESA.

RFFAs which may impact noxious weeds, invasive, and non-native species within the Silver Peak Vegetation Allotment CESA include prospecting and exploration. These activities could contribute to the establishment and spread of these species through surface disturbances, the transportation of seeds, and the removal of lands from BLM management. Other RFFAs such as transportation, livestock grazing, and recreation are expected to continue to occur at their current rates, contributing incrementally to noxious weeds, invasive, and non-native species impacts. Disturbance areas have not been identified for the RFFAs and are thus not quantified.

4.4.3.1 Proposed Action

Impacts to noxious weeds, invasive, and non-native species under the Proposed Action would occur but would be minimal due to their current low occurrence within the Project Area and the related applicant committed environmental protection measures which would manage their presence and spread.

Cumulative impacts to noxious weeds, invasive, and non-native species would occur from the past, present, and RFFAs as described. The areas within which noxious weeds, invasive, and non-native species would be likely to establish is estimated at less than one percent of the CESA, although this area may be larger if these species become established on currently vegetated areas. Based on the environmental protection measures outlined in Section 2.2.5, the incremental contribution of the Proposed Action to noxious weeds, invasive, and non-native species cumulative impacts within the CESA would be negligible.

4.4.3.2 Crusher Area Physical Barrier Alternative

The disturbance areas and disturbance locations for the Proposed Action and the Crusher Area Physical Barrier Alternative are the same. Cumulative impacts to noxious weeds, invasive, and non-native species from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

---

[3] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

4.4.3.3 No Action Alternative

Cumulative impacts from previously authorized activities including grazing would continue to occur under the No Action Alternative. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon project completion with the exception of the unbackfilled open pits. Previously analyzed cumulative impacts related to authorized activities within the Project Area were determined to not result in significant incremental cumulative impacts to noxious weeds, invasive, and non-native species (BLM 2011a and 2013).

4.4.4 Migratory Birds

The CESA for migratory birds is the Silver Peak Vegetation Allotment.

Impacts to migratory birds generally result from activities involving habitat removal or alteration, human presence, and noise. Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to migratory bird impacts include exploration and mining, geothermal projects, transportation networks and ROWs, dispersed recreation, and livestock grazing. Most disturbances would be associated with land clearing and habitat removal or alteration. Disturbances associated with exploration and mining in the CESA equal approximately 1,314 acres or less than one percent of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[4].

Activities occurring on public lands are required to manage or mitigate for impacts to migratory birds. In particular, surveys for nesting birds are required prior to land clearing during the migratory bird nesting season, and reclamation of disturbed lands is usually incorporated into surface management plans. Lands which are transferred to other entities may not receive the same kind of management for migratory birds as they would under the BLM. Approximately 198 acres of land (less than one percent of the CESA) have been transferred or sold from the BLM.

RFFAs which may impact migratory birds within the Silver Peak Vegetation Allotment CESA include exploration and prospecting. These activities may involve the removal or alteration of migratory bird habitat and an increase in human presence and noise which could alter migratory bird use. Disturbance areas have not been identified for the RFFAs and are thus not quantified. Other RFFAs such as transportation, livestock grazing, and dispersed recreation are expected to continue at their current rates, impacting migratory birds primarily through noise and human presence. Habitat alteration may also occur from grazing and recreation.

4.4.4.1 Proposed Action

Impacts to migratory birds would occur under the Proposed Action as analyzed and would be minimized by the implementation of environmental protection measures including reclamation. Impacts would primarily occur during the short-term (disturbance of 285

[4] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

additional acres and increased human presence and noise) while some loss of habitat would be long-term resulting from unreclaimed open pit features.

Past and present actions and RFFAs would contribute to cumulative impacts to migratory birds as described primarily through land clearing and habitat removal/alteration. The incremental contribution of the Proposed Action's impacts to migratory birds in both the short- and long-term would be minimal in comparison to the CESA size. It is estimated that less than one percent of the CESA's migratory bird habitat would be cumulatively affected by land clearing, although a larger area may be considered impacted due to habitat alteration and human presence/noise.

4.4.4.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to migratory birds from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.4.3 No Action Alternative

Cumulative impacts from previously authorized activities involving vegetation or habitat removal/alteration, noise, and human presence would continue to occur under the No Action Alternative. These cumulative impacts would be less than but similar to those described for the Proposed Action. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon Project completion with the exception of the unbackfilled open pits. Approved operations within the Project Area would also involve noise, human presence, and the presence of various facilities which may pose risks to wildlife.

4.4.5 Wastes, Hazardous and Solid

The CESA for hazardous and solid wastes is the Project Area CESA.

Impacts to hazardous and solid wastes may occur from past and present actions related to exploration and mining and. Most activities dealing with hazardous wastes and hazardous materials are regulated and thus controlled under state and federal authorities. Most of the past and present actions would have measures in place for management of wastes and hazardous materials, their disposal, containment, spill prevention, and cleanup.

There are no RFFAs which may impact hazardous and solid wastes and hazardous materials within the CESA.

4.4.5.1 Proposed Action

Impacts to hazardous and solid wastes and hazardous materials would occur under the Proposed Action but would be minimized by the implementation of environmental protection measures and would last until reclamation is complete.

Past and present actions and the Proposed Action have the potential to contribute to the amount of hazardous materials used and the amount of waste created and handled within the CESA; however, impacts would only occur if they are mismanaged and released into the environment. Since the activities involving hazardous materials and wastes are located on public land and are required to comply with state and federal regulations, the chance of impacts occurring is anticipated to be low but cumulatively increased for each activity occurring within the CESA. Based on the relatively low amounts of solid and hazardous waste, and the environmental protection measures and plans in place for their management, the incremental contribution of the Proposed Action's impacts to hazardous materials and hazardous and solid wastes would be minimal.

4.4.5.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to solid and hazardous wastes from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.5.3 No Action Alternative

Cumulative impacts from previously authorized activities would continue to occur under the No Action Alternative. Cumulative impacts from the No Action Alternative would be similar to but slightly less than those described for the Proposed Action; the only measurable difference would be the extended mine life which would increase the time during which hazardous and solid wastes would be managed on-site.

4.4.6 Forest and Woodland Resources

The CESA for forest and woodland resources is the Silver Peak Vegetation Allotment.

Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to impacts to forest and woodland resources include exploration and mining, geothermal projects, livestock grazing, transportation networks and ROWs, and dispersed recreation. These activities generally involve vegetation removal, alteration, and ground disturbance. Surface management plans have associated quantifiable disturbance acres which total approximately 1,320 acres. This is less than one percent of the CESA. An unquantified portion of these activities may have affected forest and woodland resources which tend to occur at higher elevations and on steeper terrain that what occurs throughout the majority of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[5].

RFFAs which may impact forest and woodland resources within the Silver Peak Vegetation Allotment CESA include exploration and prospecting. These activities would likely involve some amount of vegetation removal and land clearing. Disturbance areas have not been identified for the RFFAs and are thus not quantified.

4.4.6.1 Proposed Action

The Proposed Action would impact forest and woodland resources through the disturbance of 285 acres of undisturbed land (less than one percent of the CESA). Environmental protection measures including reclamation would be implemented to minimize impacts.

Cumulative impacts related to land disturbance and forest and woodland removal or alteration would occur from past and present actions, RFFAs, and the Proposed Action. The cumulative surface disturbance proposed to occur on forest and woodland vegetation areas is estimated at less than one percent of the CESA. The incremental contribution of the Proposed Action's

[5] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

increased disturbance area would be minimal. Cumulative impacts to forest and woodland resources would be generally dispersed throughout the CESA, and the applicant committed environmental protection measures would minimize potential effects to vegetation.

4.4.6.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to forest and woodland resources from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.6.3 No Action Alternative

Previously authorized activities within the Project Area involving land disturbance would continue to occur under the No Action Alternative. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon Project completion with the exception of unbackfilled open pit. These activities would continue to contribute incrementally to cumulative impacts to forest and woodland resources within the CESA.

4.4.7 Geology and Mineral Resources

The CESA for geology and mineral resources is the Project Area CESA encompassing approximately 2,700 acres.

Past actions that had the potential to affect geology and mineral resources were mining and exploration related actions. Historically, this area has been mined for gold and silver. Most past mining operations were of a smaller scale and consisted of primarily underground operations with limited surface disturbance. Many of these remain undocumented. Most geology and mineral impacts resulted from a limited amount of mineral resource development activities.

Present actions that would potentially affect geology and mineral resources are mining and exploration related. These present actions are surface mining operations that affect geology and mineral resources by excavating, modifying, or covering existing topographic and geomorphic features and by removing mineral resources. MRG's permitted activities involve removal of an additional 3,905,300 tons of ore.

There are no RFFAs which would affect geology and mineral resources within the Project Area CESA.

4.4.7.1 Proposed Action

Under the Proposed Action approximately 5,950,000 tons of ore (constituting an additional 2,044,700 tons or ore) would be available to open pit gold mining and heap leach processing associated with the expanded open pits and addition of two new pits. Additional exploration would define mineral resources presence and potential. The proposed facilities would be designed, managed, and monitored to meet acceptable factors of safety during the operational and post-mining periods in regards to stability as discussed in Section 3.11.

Past and present disturbance within the CESA equals 621 acres or 23 percent of the CESA. The Proposed Action would disturb an additional 285 acres. The direct impacts affecting geology and mineral resources of the Proposed Action due to the open pit mining would be the permanent removal of the identified mineral resources. The cumulative impacts to geology and mineral resources from the Proposed Action for mineral development would not be significant due to the size of the project, the facility stability designs, and the lack of known geologic hazards or conditions in the area.

4.4.7.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to geology and mineral resources from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.7.3 No Action Alternative

Impacts to geology and mineral resources from previously permitted authorizations would continue to occur under the No Action Alternative. Mining and exploration would persist to the authorized extent. According to past analysis, authorized activities within the Project Area are not anticipated to significantly impact geology and mineral resources (BLM 2011a and 2013).

4.4.8 Water (Surface and Ground)

The CESA for water resources is the Hydrology CESA encompassing approximately 67,124 acres.

Past and present actions within the Silver Peak Vegetation Allotment CESA likely contributing to water resource impacts include exploration and mining, geothermal projects, transportation networks and ROWs, dispersed recreation, livestock grazing, and municipal activities. The largest contributor to water resource impacts within the CESA would likely be the Rockwood Lithium operations. They are permitted for groundwater use at approximately 20,000 acre-feet per year and are also permitted for water disposal.

Impacts from past and present actions may result from direct contamination or use of surface and ground water or through land clearing and sedimentation. These activities have the potential to impact surface and ground water quality and quantity through contamination and use. Water use in Clayton Valley is regulated by the NDWR. Furthermore, most of the surface-disturbing activities and activities involving potential pollutants are regulated at the federal or state levels, and project proponents are required to practice certain environmental protection measures for water resources.

RFFAs which may impact water resources within the Hydrology CESA include prospecting and exploration. These activities could contribute to water quality and quantity impacts through ground clearing, drilling, water use, and the use of potentially polluting substances. These activities would occur on public land and would be required to undergo impacts analysis and to follow environmental protection measures and/or mitigation measures for the protection of water resources.

4.4.8.1 Proposed Action

Impacts to water resources from past and present actions, RFFAs, and the Proposed Action may result from ground clearing and resulting sedimentation. Less than one percent of the CESA is estimated to experience surface disturbance. MRG currently holds water rights for 537.1 afy. This is approximately 2.6 percent of the Clayton Valley perennial yield and 2.3 percent of the hydrographic basin's allocated water rights. Water use would not change substantially under the Proposed Action and has not been quantified for the other activities; water use would be regulated by the NDWR and regulated levels would dissipate and would not combine with those from other actions to result in significant cumulative impacts. The incremental contribution of the Proposed Action to cumulative water impacts would be minimal.

4.4.8.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to water resources from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.8.3 No Action Alternative

Cumulative impacts from previously authorized activities would continue to occur under the No Action Alternative. These cumulative impacts would be less than but similar to those described for the Proposed Action. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon project completion with the exception of the open pit features. Exploration drilling, water wells, monitoring wells, and water use have also been permitted for the mine which has the potential to contribute to water quality impacts.

4.4.9 Socio-Economic Values

Past and present actions which may have an effect on socio-economic values include exploration and mining, geothermal projects, transportation, recreation, and municipal activities associated with the towns of Silver Peak, Tonopah, and Dyer. The main contributors to socio-economic factors are the employment opportunities provided by Mineral Ridge Mine and Rockwood Lithium, the two largest employers in Esmeralda County. The next largest employers in the county are local and federal governments (Nevada Workforce Informer 2014). Operations in the area also contract with vendors, suppliers, and pay for services in the affected towns.

The main RFFAs which may impact socio-economic values would include exploration and prospecting. Implementation of exploration and prospecting projects would likely provide job opportunities and would bring people into the affected towns on a temporary basis.

4.4.9.1 Proposed Action

The Proposed Action would extend the life of the mine and associated employment for about 105 to 115 people by approximately one year. Within the CESA, the extended mine life would directly impact the economies of Silver Peak, Tonopah, and Dyer. It would also affect county, state, and national tax revenues. The revenue created by the mine over one year (2014) is summarized in Table 4-8 by category.

Table 4-8: Revenue Summary for 2014

Description		
Silver Peak - housing		
MRG Man Camp - electricity	Silver Peak	$3,500
MRG Man Camp - cleaning	Silver Peak	$11,200
MRG Man Camp - propane	Silver Peak	$10,000
MRG Man Camp - water	Silver Peak	$1,600
MRG Man Camp - rental and utilities	Silver Peak	$11,600

Description	Location	Amount
Sub-Total		**$37,900**
Tonopah - housing		
Overflow Rental Housing	Tonopah	$29,000
Managers and Visitors - per diem	Tonopah	$67,600
Drillers - per dium	Tonopah	$187,200
Sub-Total		**$283,800**
Tonopah - vendors		
Giggle Springs - fuel	Tonopah	$9,320
Great Basin Industries - fabricator	Tonopah	$19,000
Tonopah NAPA	Tonopah	$13,600
Central NV AC/DC - internet	Tonopah	$20,600
M&K Enterprises - plumbing	Tonopah	$21,500
Sub-Total		**$84,020**
Dyer - vendors		
Chaparro's - contractor	Dyer	$734,000
Sub-Total		**$734,000**
Taxes		
Taxes paid on Net Proceeds[1]	County/Federal	$387,200
Property Taxes	County	$289,000
Sub-Total		**$676,200**
Grand Total		**$1,815,920**

[1]In 2012 this amount was $935,906 and it 2013 this amount was 977,014. This amount is general split between Esmeralda County and the federal government.

Cumulative impacts to socioeconomics within the CESA resulting from past and present actions, RFFAs, and the Proposed Action would be positive, resulting in increased employment and revenue. The incremental contribution of the Proposed Action's impacts to Silver Peak's socio-economics would be moderately important in the short-term considering the low number of employment opportunities and the rural population. However, the Proposed Action does not induce substantial growth or concentration of population, displace a large number of people, cause a substantial reduction in employment, reduce wage and salary earnings, cause a substantial net increase in county expenditures, or create a substantial demand for public services. In the volatile economy of the foreseeable future, it is expected that the cumulative and incremental socioeconomic effects of the Proposed Action would be beneficial.

4.4.9.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to socio-economic values from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.9.3 No Action Alternative

The positive socio-economic impacts anticipated under the Proposed Action would not occur under the No Action Alternative; employment for about 105 to 115 people would be shortened by approximately one year as compared to the Proposed Action. It can be assumed, based on the revenue discussed above, the rural location of the mine and that MRG is one of the two largest employers in Esmeralda County, that the impacts are measurably positive.

4.4.10 Soils

The CESA for soils is the Silver Peak Vegetation Allotment.

Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to soil impacts include exploration and mining, geothermal projects, livestock grazing, transportation networks and ROWs, and dispersed recreations. These actions generally involve some amount of land clearing and ground disturbance which can expose soils to erosive processes or otherwise disturb/remove them. Surface management plans have associated quantifiable disturbance acres totaling approximately 1,320 acres. This is less than one percent of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[6].

RFFAs which may impact soils within the Silver Peak Vegetation Allotment CESA include exploration and prospecting which also involve some amount of land clearing and ground disturbance. Transportation on un-paved roads, livestock grazing, and dispersed recreation are additional RFFAs which are expected to continue as presently occurring. Disturbance areas have not been identified for the RFFAs and are thus not quantified.

4.4.10.1 Proposed Action

The Proposed Action would impact soils through the disturbance of 285 acres of previously undisturbed ground. Disturbed areas would be reclaimed with the exception of the open pit features.

Cumulative surface disturbances and related impacts to soil are estimated to occur from past and present actions, RFFAs, and the Proposed Action on less than one percent of the CESA. A larger area may be impacted when considering soil disturbances caused by dispersed activities such as grazing and some types of recreation and transportation. Cumulative impacts to soils would be generally dispersed throughout the CESA, and the applicant committed environmental protection measures for authorized activities occurring on public lands would minimize potential effects. In addition, reclamation of surface disturbance for authorized activities occurring on public lands would gradually protect most disturbed soil resources from erosion. The incremental contribution of the Proposed Action's increased disturbance area would be minimal and incremental in both the short- and long-term.

4.4.10.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to soils from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

[6] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

4.4.10.3 No Action Alternative

Cumulative impacts from previously authorized activities involving ground disturbance and vegetation removal would continue to occur under the No Action Alternative. This includes the existing and authorized disturbance area of approximately 621 acres. Most of this area would be reclaimed upon Project completion with the exception of approximately 181 acres of open pit.

4.4.11 Special Status Species

The CESA for special status species is the Silver Peak Vegetation Allotment.

Impacts to special status species would generally occur from activities involving habitat removal or alteration, human presence, and noise. Impacts may also occur from species and human or equipment encounters. Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to special status species impacts include exploration and mining, geothermal projects, livestock grazing, transportation networks and ROWs, and dispersed recreation. Disturbances associated with surface management plans in the CESA equal approximately 1,320 acres or less than one percent of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[7].

Activities occurring on public lands are required to manage or mitigate for impacts to special status species. Lands which are transferred to other entities may not receive the same kind of management as they would under BLM management. Approximately 198 acres of land (less than one percent of the CESA) have been transferred or sold from the BLM.

RFFAs which may impact special status species within the Silver Peak Vegetation Allotment CESA include exploration and prospecting. These activities may involve the removal or alteration of habitat and an increase in human presence and noise which could disrupt special status species use of the area. Transportation, livestock grazing, and dispersed recreation are also expected to continue to occur and may impact special status species through human presence, noise, and habitat disturbance and/or alteration. Disturbance areas have not been identified for the RFFAs and thus have not been quantified.

4.4.11.1 Proposed Action

The Proposed Action would impact special status species through the disturbance of 285 acres of undisturbed land and the extension of operations by approximately one year. Impacts to special status species which would occur under the Proposed Action would be minimized by the implementation of environmental protection measures including reclamation and mitigation. Mitigation would involve the installation of two guzzlers which are anticipated to benefit bighorn sheep.

With the implementation of the environmental protection measures and the relatively small amount of surface disturbance associated with the Proposed Action, combined with the disturbance from past and present actions and RFFAs, the incremental impacts would not be

[7] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

significant. The cumulative surface disturbance expected is estimated at less than one percent of the CESA. This loss cannot be directly related to special species habitat loss or alteration since the areas in which surface disturbances occur have not been analyzed for their habitat potential. However, the incremental contribution of the Proposed Action's impacts to special status species would be minimal in both the short- and long-term.

4.4.11.2 Crusher Area Physical Barrier Alternative

The disturbance areas and disturbance locations for the Proposed Action and the Crusher Area Physical Barrier Alternative are the same. Cumulative impacts to special status species resulting from land disturbance would be the same for the Crusher Area Physical Barrier Alternative as for the Proposed Action.

Under this alternative the barrier location would not interrupt the use of the truck shop filling station overflow as a water source by bighorn sheep, thus making the impacts for this alternative slightly less than the Proposed Action. This alternative would also contribute less to cumulative impacts to bighorn desert sheep than the Proposed Action

4.4.11.3 No Action Alternative

Cumulative impacts from previously authorized activities involving a change in habitat, noise, and human presence would continue to occur under the No Action Alternative. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon Project completion with the exception of unbackfilled open pit. Approved operations which would occur under the No Action Alternative would also involve noise, human presence, and the presence of various facilities which may pose risks to special status species.

4.4.12 Vegetation

The CESA for vegetation is the Silver Peak Vegetation Allotment.

Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to impacts to vegetation include exploration and mining, geothermal projects, livestock grazing, transportation networks and ROWs, and dispersed recreation. These activities generally involve vegetation removal, alteration, and ground disturbance. Surface management plans have associated quantifiable disturbance acres which total approximately 1,320acres. This is less than one percent of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[8].

RFFAs which may impact vegetation within the Silver Peak Vegetation Allotment CESA include exploration and prospecting. These activities would likely involve some amount of vegetation removal and land clearing. Disturbance areas have not been identified for the RFFAs and are thus not quantified. Vegetation community alteration may also occur from grazing and recreation.

[8] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

4.4.12.1 Proposed Action

The Proposed Action would impact vegetation through the disturbance of 285 acres of undisturbed land. Environmental protection measures including reclamation would be implemented to minimize impacts to vegetation. However, open pit features would remain unreclaimed.

Cumulative impacts related to land disturbance and vegetation removal or alteration would occur from past and present actions, RFFAs, and the Proposed Action. The cumulative surface disturbance expected is estimated at less than one percent of the CESA. A larger area may be impacted due to activities such as grazing which would alter vegetation compositions over time. The incremental contribution of the Proposed Action's increased disturbance area would be minimal. Cumulative impacts to vegetation would be generally dispersed throughout the CESA, and the applicant committed environmental protection measures would minimize potential effects to vegetation. Reclamation of surface disturbances would gradually reestablish vegetation on most of the disturbed areas minimizing effects in the short-term but not eliminating long-term effects.

4.4.12.2 Crusher Area Physical Barrier Alternative

The disturbance areas and disturbance locations for the Proposed Action and the Crusher Area Physical Barrier Alternative are the same. Cumulative impacts to vegetation from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.12.3 No Action Alternative

Previously authorized activities within the Project Area involving land disturbance would continue to occur under the No Action Alternative. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon Project completion with the exception of the unbackfilled open pits. These activities would continue to contribute incrementally to cumulative impacts to vegetation within the CESA.

4.4.13 Visual Resources

The CESA for visual resources is the Air/Visuals CESA encompassing approximately 201,060 acres.

Past and present actions within the Air/Visuals CESA likely to contribute to visual resource impacts include exploration and mining and transportation networks and ROWs. These activities involve land disturbance and the construction of facilities which may alter elements of the landscape. Most visual resource impacts resulted from surface disturbance associated with the actions and the structures created by the actions. Mining and exploration related surface disturbances within the CESA have been calculated at about 1,314 acres. They consist of roads, open pits, underground operations, waste rock disposal facilities, crushing and processing facilities, evaporation ponds, and exploration (including road construction). Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[9].

4.4.13.1 Proposed Action

There are many actions that have an effect on the visual resources within the vicinity of the Project Area. The BLM's visual management for the Project Area allows for substantial change to the visual characteristics of the area. In addition, VRM classes do not establish management direction and should not be used as a basis for constraining or limiting surface disturbing activities. Therefore, the cumulative impacts to visual resources from the Proposed Action, along with the past and present actions and the RFFAs would not be significant; however, activities to minimize the visual effects are incorporated in the Project as identified in Section 2.2.5.

4.4.13.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to visual resources from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.13.3 No Action Alternative

Impacts to visual resources quality from previously permitted authorizations would continue to occur under the No Action Alternative. The proposed facilities which have not yet been fully constructed would be completed. These may be visible from areas outside of the Project Area.

4.4.14 Wild Horses and Burros

The CESA for wild horses and burros is the Silver Peak Vegetation Allotment.

No impacts to burros are anticipated to occur under the Proposed Action since population inventory flights have not recorded the presence of burros in the Silver Peak HMA. Impacts to wild horses would generally occur from activities involving habitat removal or alteration, human presence, and noise. Past and present actions within the Silver Peak Vegetation Allotment CESA likely to contribute to wild horse impacts include exploration and mining, geothermal projects, livestock grazing, wildlife habitat improvements, transportation networks and ROWs, and dispersed recreation. Disturbances associated with surface management plans in the CESA equal approximately 1,320 acres or less than one percent of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[10].

Past and present wild horse and burro gathers have resulted in a sharp reduction of animal numbers in the CESA. This reduction has proven to be temporary however, as migration from areas to the west and south has replenished populations to near pre-gather levels.

---

[9] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Air/Visuals CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 581 acres which is less than one percent of either CESA.

[10] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

Activities occurring on public lands are required to manage or mitigate for impacts to wild horses. Lands which are transferred to other entities may not receive the same kind of management as they would under the BLM. Approximately 198 acres of land (less than one percent of the CESA) have been transferred or sold from the BLM.

Positive impacts to wild horses may have occurred through the rebuilding of two wildlife water developments, effectively increasing the amount of habitat available for wildlife and potentially also for wild horses.

RFFAs which may impact wild horses include exploration and prospecting. These activities may involve the removal or alteration of habitat and an increase in human presence and noise which could disturb wild horse use of the area. Disturbance areas have not been identified for the RFFAs and are thus not quantified. Other RFFAs such as livestock grazing and dispersed recreation are expected to occur at their current rates and to impact wild horses through habitat alteration/disturbance, human presence, and noise. In addition, vehicles using transportation corridors continue to pose a threat to wild horses.

4.4.14.1 Proposed Action

The Proposed Action would result in the disturbance of 285 acres of vegetation which may provide wild horse habitat/forage. The Proposed Action would also involve an increased mine life of approximately one year, and the expansion of facilities which would increase the area influenced by human presence and noise. Impacts to wild horses would occur but would be minimal due to the lack of use of the area by wild horses and burros and by the implementation of environmental protection measures including reclamation.

Cumulative impacts resulting from land disturbances from past and present actions, RFFAs, and the Proposed Action have been estimated to equal a small fraction of the CESA. However, a larger area may be impacted by human presence, noise, and the alteration of habitats through such activities as livestock grazing. The incremental contribution of the Proposed Action's impacts to wild horses would be minimal.

4.4.14.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to wild horses and burros from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.14.3 No Action Alternative

Cumulative impacts from previously authorized activities involving a land clearing, noise, and human presence would continue to occur under the No Action Alternative. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon Project completion with the exception of 181 acres of open pit. Approved operations which would occur under the No Action Alternative would also involve noise and human presence, influencing areas outside of the disturbance areas.

4.4.15 Wildlife (Plants and Animals)

The CESA for wildlife is the Silver Peak Vegetation Allotment.

Impacts to wildlife would generally occur from activities involving habitat removal or alteration, human presence, and noise. Impacts may also occur from human or equipment encounters with wildlife. Past and present actions within the Silver Peak Vegetation

Allotment CESA likely to contribute wildlife impacts include exploration and mining, geothermal projects, livestock grazing, wildlife water developments, transportation networks and ROWs, and dispersed recreation. Disturbances associated with surface management plans in the CESA equal approximately 1,320 acres or less than one percent of the CESA. Transportation networks and ROWs also have associated disturbances areas which are not fully contained within the CESA but are estimated to equal less than one percent of the CESA[11].

Activities occurring on public lands are required to manage or mitigate for impacts to wildlife. Lands which are transferred to other entities may not receive the same kind of management as they would under the BLM. Approximately 198 acres of land (less than one percent of the CESA) have been transferred or sold from the BLM.

Positive impacts to wildlife may have occurred through the development of seven (three upland and four big game) water developments, effectively increasing the amount of habitat available for wildlife within reach of a water source within the area.

RFFAs which may impact wildlife within the Silver Peak Vegetation Allotment CESA include exploration and prospecting. These activities may involve the removal or alteration of habitat and an increase in human presence and noise which could disturb wildlife use of the area. Land disposal activities may remove lands from BLM management. Disturbance areas have not been identified for the RFFAs and are thus not quantified. Other RFFAs such as livestock grazing and dispersed recreation are expected to occur at their current rates and to impact wildlife through habitat alteration/disturbance, human presence, and noise. In addition, vehicles using transportation corridors continue to pose a threat to wildlife.

4.4.15.1 Proposed Action

The Proposed Action would result in the disturbance of 285 acres of potential wildlife habitat. The Proposed Action would involve an increased mine life of approximately one year and the expansion of facilities which would increase the area influenced by human presence and noise. Environmental protection measures including reclamation would be implemented to minimize impacts to wildlife. Mitigation would also involve the installation of two guzzlers which are anticipated to benefit bighorn sheep.

Cumulative impacts resulting from land disturbances from past and present actions, RFFAs, and the Proposed Action have been estimated to equal less than one percent of the CESA. However, a larger area may be impacted by related human presence, noise, and the alteration of habitats through such activities as livestock grazing. Impacts wildlife may also result from equipment use, land disturbance, and transportation. With consideration for the size of the project within the surroundings and the environmental protection measures listed in Section 2.2.5, the incremental contribution of the Proposed Action's impacts to wildlife would be minimal.

---

[11] This estimation has been made by assuming eight linear features traverse the 10 mile-length of the Silver Peak Vegetation Allotment CESA and that all features have a disturbance width of 60 feet. This conservative calculation results in a disturbance area of 814 acres which is less than one percent of either CESA.

4.4.15.2 Crusher Area Physical Barrier Alternative

Cumulative impacts to wildlife from the Crusher Area Physical Barrier Alternative would be the same as for the Proposed Action.

4.4.15.3 No Action Alternative

Cumulative impacts from previously authorized activities involving vegetation or habitat removal or alteration, noise, and human presence would continue to occur under the No Action Alternative. These cumulative impacts would be less than but similar to those described for the Proposed Action. To date, approximately 621 acres have been approved for disturbance within the Project Area. Most of this area would be reclaimed upon Project completion with the exception of 181 acres of open pit. Approved operations which would occur under the No Action Alternative would also involve noise, human presence, and the presence of various facilities which may pose risks to wildlife.

5.0 CONSULTATION AND COORDINATION

The scope of this EA was developed through consultation with the BLM resource specialists (meeting and subsequent conversations), review of project proponent files, and review of supporting documentation.

5.1 List of Preparers

5.1.1 BLM – Tonopah Field Office

Timothy Coward	Field Office Manager
Elizabeth Freniere	Rangeland Management Specialist
David Price	Wildlife Biologist
Austin Brewer	Wild Horse and Burro Specialist
Wendy Seley	Realty Specialist

5.1.2 BLM – Mount Lewis Field Office

Ben Cramer	Outdoor Recreation Planner
Katherine Russell	Archaeologist
Alden Shallcross	Hydrology Specialist
Christopher Worthington	Planning and Environmental Coord. and Project Lead
Juan Martinez	Native American Coordinator
David Dijikine	Mining/Minerals Engineer
Jon Sherve	Hazmat
Chad Lewis	Forestry and Rangelands
Kent Bloomer	Weed Management Specialist

5.1.3 BLM – National Operations Center

Craig Nicholls	National Air Quality Modeler

5.1.4 SRK Consulting (U.S.), Inc.

Valerie Sawyer	Project Principal
Carrie Schultz	Project Manager
Katie Bertrando	Consultant
Sierra Harmening	Staff Consultant
Brett Bingham	GIS Consultant

5.1.5 Stantec

Aaron Hoberg	Engineering Project Specialist

6.0 REFERENCES

AMEC. 2012. *Mineral Ridge Leach Pad Stacking Height Increase.* November 16, 2012.

APLIC. 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington DC and Sacramento CA.

Bercaw, Louise B. 1986. *Geology and Gold Deposits of Central Mineral Ridge, Esmeralda County, Nevada*.

Bureau of Air Pollution Control (BAPC). 2013. Letter from Jonathan McRae (BAPC) to Chris Zerga (MRG). *Re: Class II AQOP AP1041-2733, FIN A0398 Section VIII Schedule of Compliance.* December 30, 2014.

Bureau of Land Management (BLM). 2014a. *Mineral Ridge Mine: Fall 2014 Bat Exclusions DNA.* August 27, 2014.

BLM. 2014b. *An Environmental Assessment of Mineral Ridge Gold's Proposed Plan of Operations Amendment.* DOI-BLM-NV-B020-2014-0002-EA. February 2014.

BLM. 2014c. Letter from T. Coward (BLM) to Jeff Kinder (BAPC). July 14, 2014.

BLM. 2013. *Mineral Ridge Mine; Plan of Operations Amendment II Environmental Assessment*. DOI-BLM-NV-B020-2012-0230-EA. February, 2013.

BLM, 2012a. *Surface Management Handbook.* BLM Handbook H-3809-1. September 17, 2012.

BLM. 2012b. *Mineral Ridge Mine (N-73109/Reclamation Permit 0103): Plan of Operations Water Well Amendment II*. April 2012.

BLM. 2012c. *VRM System.* *http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS/2.html*. Accessed October 2013.

BLM. 2011a. *Amendment to the Mineral Ridge Mine Plan of Operations Environmental Assessment.* DOI-BLM-NV-B020-2010-0135-EA. August, 2011.

BLM. 2011b. *Visual Resource Inventory: BLM Battle Mountain District Office.* April 2011.

BLM. 1999. *Nevada Guidelines for Successful Revegetation for the Nevada Divisions of Environmental Protection, the Bureau of Land Management, and the U.S.D.A. Forest Service.*

BLM. 1997. *Tonopah Resource Management Plan and Record of Decision*. BLM Battle Mountain Field Office. October 6, 1997.

BLM. 1996. *Mineral Ridge Resources Incorporated, Environmental Assessment*. NV65-EA96-25. BLM Battle Mountain Field Office. #N65-96-001P. June 18, 1996.

BLM. 1992a. *U.S. Department of the Interior Bureau of Land Management Solid Minerals Reclamation Handbook.* BLM Manual Handbook H-3042-1. April 8, 1992.

BLM. 1992b. *BLM Manual 9015 – Integrated Weed Management*. December 2, 1992.

Campbell, B. and Remington, R. 1981. *Influence of Construction Activities on Water-Use Patterns of Desert Bighorn Sheep*. Wildlife Society Bulletin, Vol. 9 No. 1.

Comer, P., P. Crist, M. Reid, J. Hak, H. Hamilton, D. Braun, G. Kittel, I. Varley, B. Unnasch, S. Auer, M. Creutzburg, D. Theobald, and L. Kutner. 2013. *Central Basin and Range Rapid Ecoregional Assessment.* Prepared for the U.S. Department of Interior, Bureau of Land Management.

Council on Environmental Quality (CEQ). 1997. *Considering Cumulative Effects Under the National Environmental Policy Act*. January 1997.

Cedar Creek Associates, Inc. (CCA). 1995. Unpublished report to MRRI. *Vegetation and Range, Existing Condition*. Technical Memorandum. July 1995.

Donham. 2015. Email from Tom Donham (NDOW) to Carrie Schultz (SRK). *Re: Mineral Ridge Question.* March 2, 2015.

Envirofacts. 2015. *http://www.epa.gov/enviro/index.html*. Accessed February 2015.

Environmental Protection Agency (EPA). 2013a. *National Ambient Air Quality Standards (NAAQS).*Accessed December 2013.http://www.epa.gov/air/criteria.html

EPA. 2013b. *Overview of Greenhouse Gases. http://www.epa.gov/climatechange /ghgemissions/gases.html*. Accessed August 2013.

Esmeralda County. 2013. *Esmeralda County Public Lands Policy Plan. Final 2013.*

Executive Office of the President (E.O.). 1999. *Executive Order 13112 of February 3, 1999: Invasive Species.*

Golden Phoenix Minerals, Inc. (GPMI). 2002. *Water Pollution Control Permit Renewal Application, Mineral Ridge Mine, Esmeralda County, Nevada*. June, 2002.

Hydro-Search, Inc. 1996. *Baseline Hydrologic Characterization of the Mary/Drinkwater Project, Esmeralda County, Nevada*. January 10, 1996.

International Panel on Climate Change (IPCC). 2013. *Climate Change 2013: The Physical Science Basis.* Working group contribution to the IPCC Fifth Assessment Report.

Kipke, Tracy. 2015. Email from Tracy Kipke (NDOW) to Carrie Schultz (SRK). *Re: MRG guzzler question.* February 11, 2015.

Knight & Leavitt. 2014a. *A Noxious Weed Survey of the Mineral Ridge Mine Site, Esmeralda County, Nevada.* June 13, 2013.

Knight & Leavitt. 2014b. *Letter to D. Price (BLM) from C. Cogar (Knight & Leavitt).* May 27, 2014.

Knight & Leavitt. 2013a. *2013 Annual Noxious Weed Survey of the Mineral Ridge Mine Site, Esmeralda County, Nevada*. June 25, 2014.

Knight & Leavitt. 2013b. *Letter to D. Hollowell (BLM) from DeVon Ekenstam (Knight & Leavitt).* June 21, 2103.

Knight & Leavitt. 2012a. *A Noxious Weed Survey of the Mineral Ridge Mine Site, Esmeralda County, Nevada.* July 30, 2012.

Knight & Leavitt. 2012b. *Letter to D. Hollowell (BLM) from Melinda Stevens (Knight & Leavitt).* May 17, 2012.

Knight & Leavitt. 2012c. *Letter to D. Hollowell (BLM) from Melinda Stevens (Knight & Leavitt).* April 13, 2012.

Knight & Leavitt. 2012d. *Letter to D. Hollowell (BLM) from DeVon Ekenstam(Knight & Leavitt).* July 3, 2012.

Knight & Leavitt. 2011a. *Letter to D. Englestead (BLM) from Melinda Stevens (Knight & Leavitt).* May 13, 2011.

Knight & Leavitt. 2011b. *Letter to D. Englestead (BLM) from Melinda Stevens (Knight & Leavitt).* May 19, 2011.

Kautz Environmental Consultants, Inc. (Kautz). Kautz. 2014. List from B. Malinky Harmon (Kautz) to C. Schultz (SRK). *Synopsis of Mineral Ridge Cultural Resource Projects.* August 29, 2014.

Lancaster. 2014. Verbal communication between C. Lancaster (MRG) and C. Schultz (SRK). November 18, 2014.

LR2000. 2015. Site managed by the BLM. http://www.blm.gov/lr2000/. Accessed February 2015.

LR2000. 2014. Site managed by the BLM. http://www.blm.gov/lr2000/. Accessed September 2014.

Lumos & Associates (Lumos). 2011. *Mineral Ridge Mine Water Rights Assessment.* June 9, 2011.

Micon International Limited (Micon). 2009. *Scorpio Gold Corporation Technical Report on the Mineral Ridge Gold Project, Nevada, USA.* November 30, 2009.

Mineral Ridge Gold, LLC (MRG). 2014. Spring sample results on form 0190 for Coyote Spring and Tarantula Spring. Received October 2014.

MRG. 2013. *Meteorological Report for the Mineral Ridge Mine: Water Pollution Control Permit #NEV0096106 Minor Modification and Renewal 2013*. April 2013.

National Conference of State Legislatures. 2008. *Nevada: Assessing the Costs of Climate Change*. http://cier.umd.edu/climateadaptation/Climate%20change--NEVADA.pdf.

National Oceanic and Atmospheric Administration (NOAA). 2013. *National Oceanic Service: Education*. http://oceanservice.noaa.gov/education/. Accessed October 2013.

Natural Resource Conservation Service (NRCS). 2014. *Web Soil Survey.* Accessed November 2014.

Nevada Department of Environmental Protection (NDEP). 2010. *Mineral Ridge Mine Reclamation Permit*. Casefile #N-0103. September 2010

Nevada Department of Wildlife (NDOW). 2014. *2013-2014 Big Game Status*. 2014.

Nevada Division of Minerals (NDOM). 2013. AML Database. Silverpeak Allotment CESA section received by SRK Consulting (U.S.), Inc. August 2013.

Nevada Division of Environmental Protection (NDEP). 2013. *Factsheet: Rockwood Lithium Inc.* Permit number NS2013501. June 18, 2013.

Nevada Division of Water Resources (NDWR). 2015. *Water Rights Databases*. Accessed March 24, 2015.

NDWR. 2014. *Hydrographic Area Summary: Hydrographic Area 143*. Accessed August 25, 2014.

Nevada Workforce Informer. 2014. *Current Employment Statistics.* http://www.nevadaworkforce.com/. Accessed November 2014.

Rangeland Administration System (RAS). 2015. Site managed by the BLM. http://www.blm.gov/ras/. Accessed February.

Sagebrush Ecosystem Technical Team. 2014. *2014 Nevada Greater Sage-grouse Conservation Plan.* October 1, 2014.

Scorpio. 2015. Emails from Carlene Lancaster (Scorpio) to Carrie Schultz (SRK). *Re: Socio economic data.* February, 2015.

Scorpio. 2014. Email from Carlene Lancaster (Scorpio) to Carrie Schultz (SRK). *Re: Socio economic.* November 18, 2014.

Sherwin, R.E., Altenback, J.S., and Waldien, D.L. 2009. *Managing Abandoned Mines for Bats.* Bat Conservation International.

Sherwin, R. E., W. L. Gannon, and J. S. Altenbach. 2003. *Managing Complex Systems Simply: Understanding Inherent Spatial and Temporal Variation in the Use of Roosts by Townsend's Big-eared Bat*. Wildlife Society Bulletin, 31:62-72.

Southwest Regional GAP Analysis Project (SWReGAP). 2014. *Land Cover Descriptions.* http://earth.gis.usu.edu/swgap/data/atool/files/swgap_legend_desc.pdf . Accessed October 2014.

SRK Consulting (U.S.), Inc. (SRK). 2014a. *Mineral Ridge Gold 2014 State Bank Expansion Biological Baseline.* August 2014.

SRK. 2014b. *Mineral Ridge Gold 2014 Expansion Baseline.* June 2014.

SRK. 2014c. *Mary 1 Escapeway (Adit and Escape Route for Mary Drinkwater Mine) Bat Survey.* Memo to Carlene Lancaster (MRG) from Angel Lino (SRK). October 12, 2014.

SRK. 2013a. *Mineral Ridge Gold Biological Baseline Survey*. June 2013.

SRK. 2013b. *Mineral Ridge Gold Missouri Claim Biological Baseline Survey*. August 2013.

SRK. 2013c. *Waste Rock and Ore Geochemical Characterization for the Mineral Ridge Mine*. March 2013.

SRK. 2011. *Desktop Analysis of Potential Impact to Local Springs from New Pumping Well.* December, 2011.

Stantec Consulting Services Inc. (Stantec). 2014. *Air quality Impact Analysis Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Mary LC Expansion and Satellite Deposits Plan of Operations Amendment*. December 2014.

State of Nevada. 2011. Letter from Catherine Cortez Masto (Attorney General) to Ramona Morrison (Nevada Board of Agriculture). January 25, 2011.

Telesto. 2013. *NI 43-101 Technical Report on the Mineral Ridge Satellite Deposits, Esmeralda County, Nevada, USA*. September 25, 2013.

US Census Bureau. 2015. *2009-2013 American Community Survey*. http://factfinder2.census.gov. Accessed February 2015.

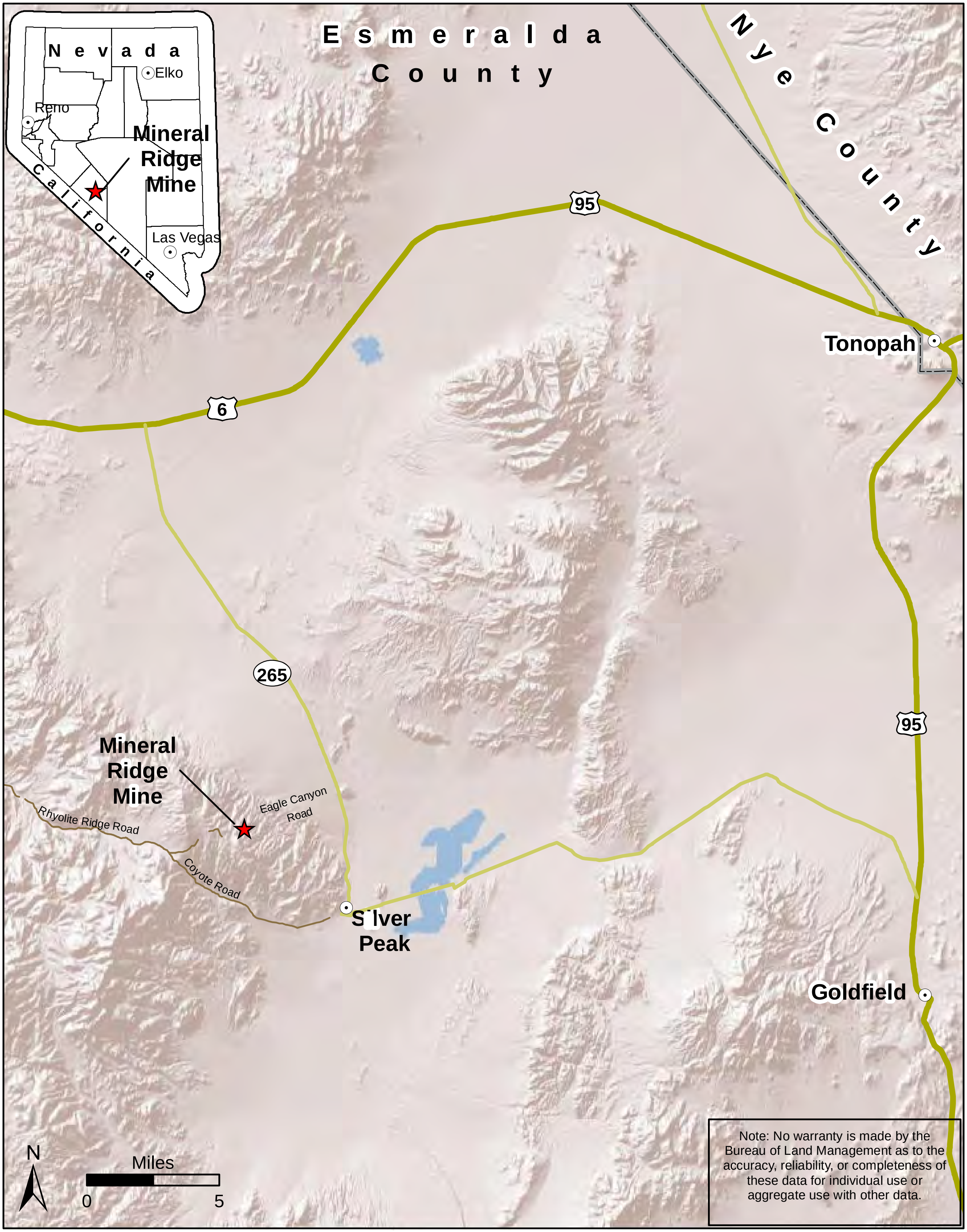
United States Fish and Wildlife Service (USFWS). 2010. *Bald Eagle Management Guidelines and Conservation Measures*. http://www.fws.gov/midwest/eagle/guidelines/bgepa.html. Accessed July 2010.

WESTEC. 1995. *Mary Drinkwater Project Heap Leach Facilities Design Report*. Prepared for Mineral Ridge Resources, Inc. December 1995.

WESTEC. 1996. Mary Drinkwater Project Heap Leach Facilities Design Report. December 1996.

Western Regional Climate Center (WRCC). 2014. Western Regional Climate Center. Silverpeak, Nevada Meteorological Station 267463. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nv7463. Accessed August 25, 2014.

Figures



Battle Mountain BLM District Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 26,400 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

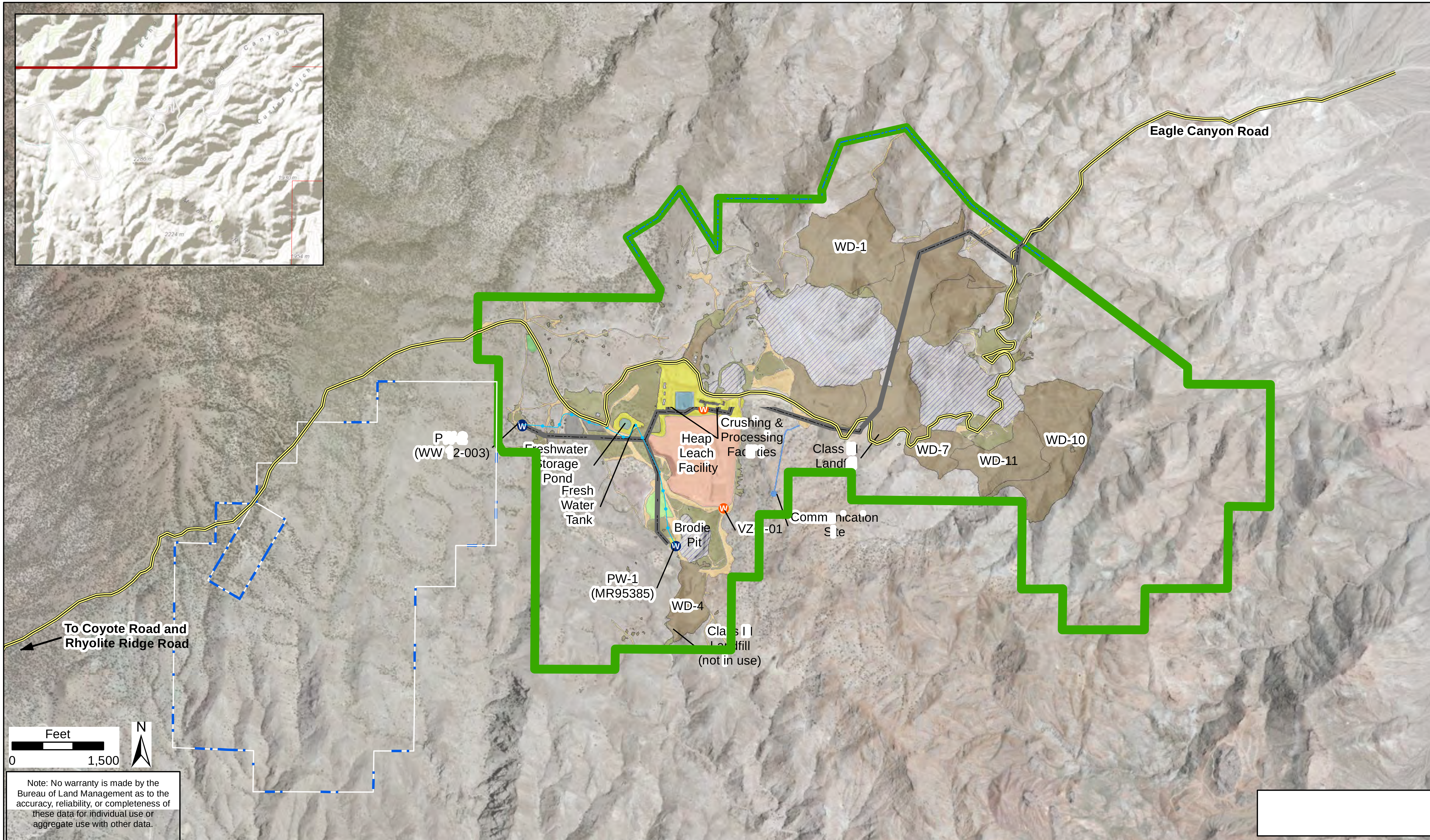
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **GENERAL LOCATION**

DRAWING NO.: **FIGURE 1**

DATE: **11/18/2014**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig01_General_Location_SCH_20140818.mxd



Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Well/Borehole
Vadoze Zone Monitoring Well
Authorized Plan Boundary
State Bank Notice Area (See Figure 5)
Existing Exploration Road
Mineral Ridge Road
Existing Power Line
Existing Water Line
Borrow Area
Building
Communication Site
Crusher/Conveyor
General Disturbance
Growth Media Stockpile
Heap Leach Facility
Ore Stockpile
Pit
Pond
Road
Waste Rock Disposal Facility
Yard
Pre-1981 Disturbance

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 1,500 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

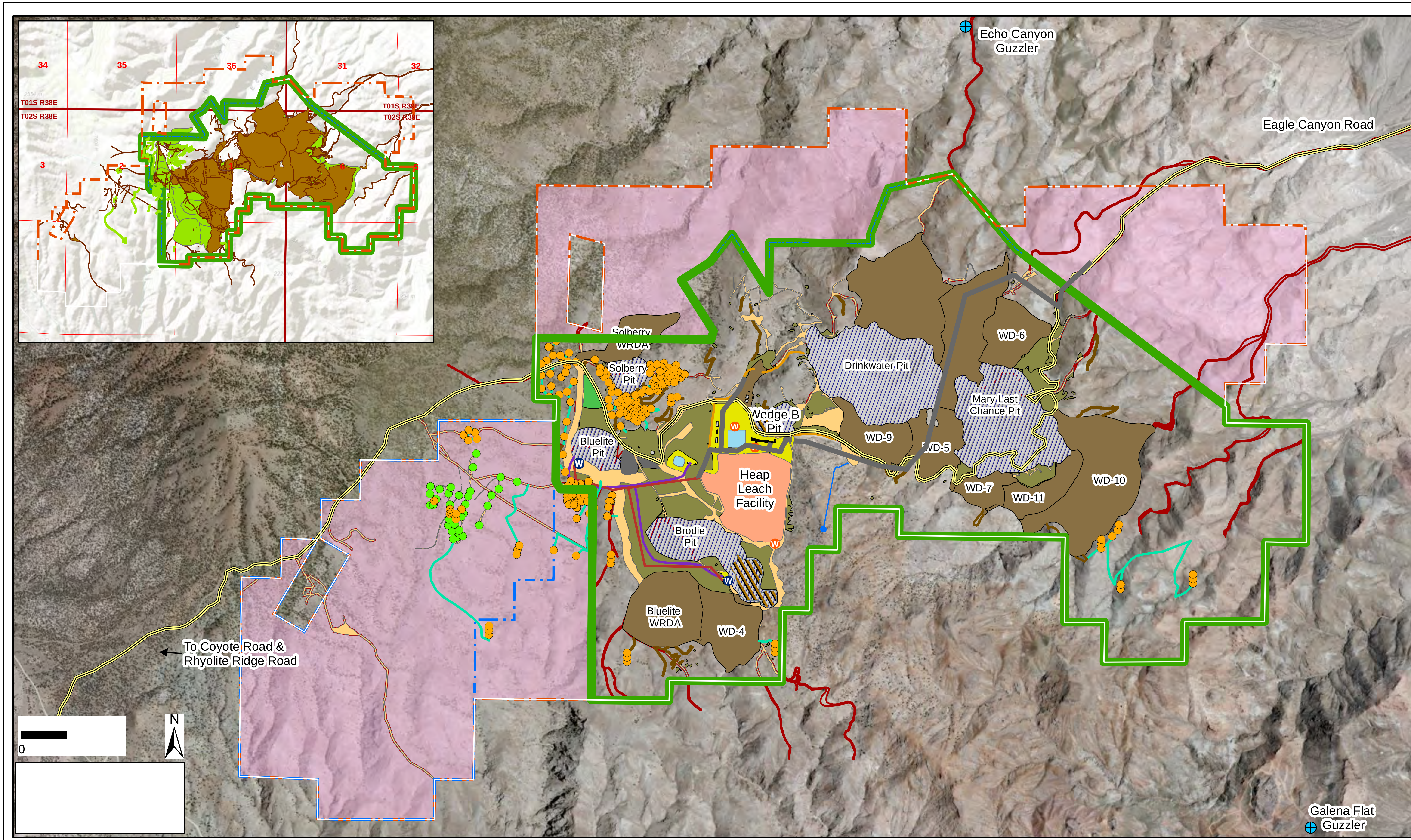
MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **AUTHORIZED FACILITIES**

DRAWING NO. **FIGURE 2**

DATE: **3/3/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig02_Auth_SCH_20140818.mxd



Authorized Plan Boundary
Proposed Plan Boundary
Expansion Area
State Bank Notice
Pre-1981 Disturbance
Existing State Bank Notice Drill Hole*
Proposed Phase I Exploration
Existing Exploration Road
Existing Power Line
Mineral Ridge Road
Proposed Physical Barrier
Proposed Power Line
Proposed Water Line
Proposed Phase I Exploration Road
Well/Borehole
Vadoze Zone Monitoring Well
Mitigation - Guzzler
Borrow Area
Building
Communication Site
Crusher/Conveyor
General Disturbance
Growth Media Stockpile
Heap Leach Facility
Ore Stockpile
Pit
Pit Backfill
Pond
Road
Waste Rock Disposal Facility
Yard

* Multiple holes may exist at each site.

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 1,500 feet

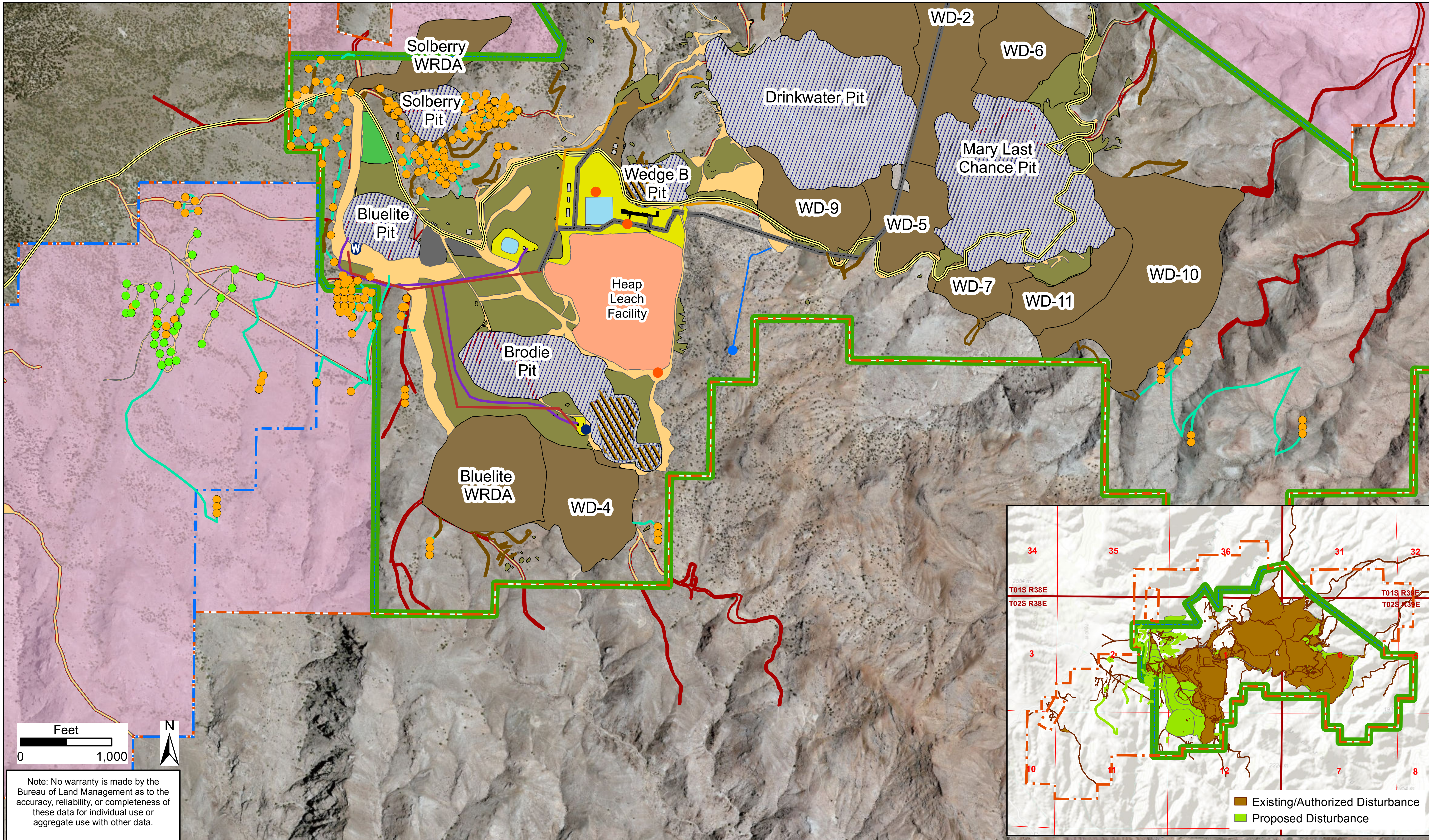
MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE:
PROPOSED FACILITIES

DRAWING NO.
FIGURE 3

DATE:
3/3/2015



Authorized Plan Boundary
Proposed Plan Boundary
Expansion Area
State Bank Notice
Pre-1981 Disturbance
Existing State Bank Notice Drill Hole*
Proposed Phase I Exploration
Existing Exploration Road
Existing Power Line
Mineral Ridge Road
Proposed Physical Barrier
Proposed Power Line
Proposed Water Line
Proposed Phase I Exploration Road
Well/Borehole
Vadoze Zone Monitoring Well
Mitigation - Guzzler
Borrow Area
Building
Communication Site
Crusher/Conveyor
General Disturbance
Growth Media Stockpile
Heap Leach Facility
Ore Stockpile
Pit
Pit Backfill
Pond
Road
Waste Rock Disposal Facility
Yard

* Multiple holes may exist at each site.

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 1,000 feet

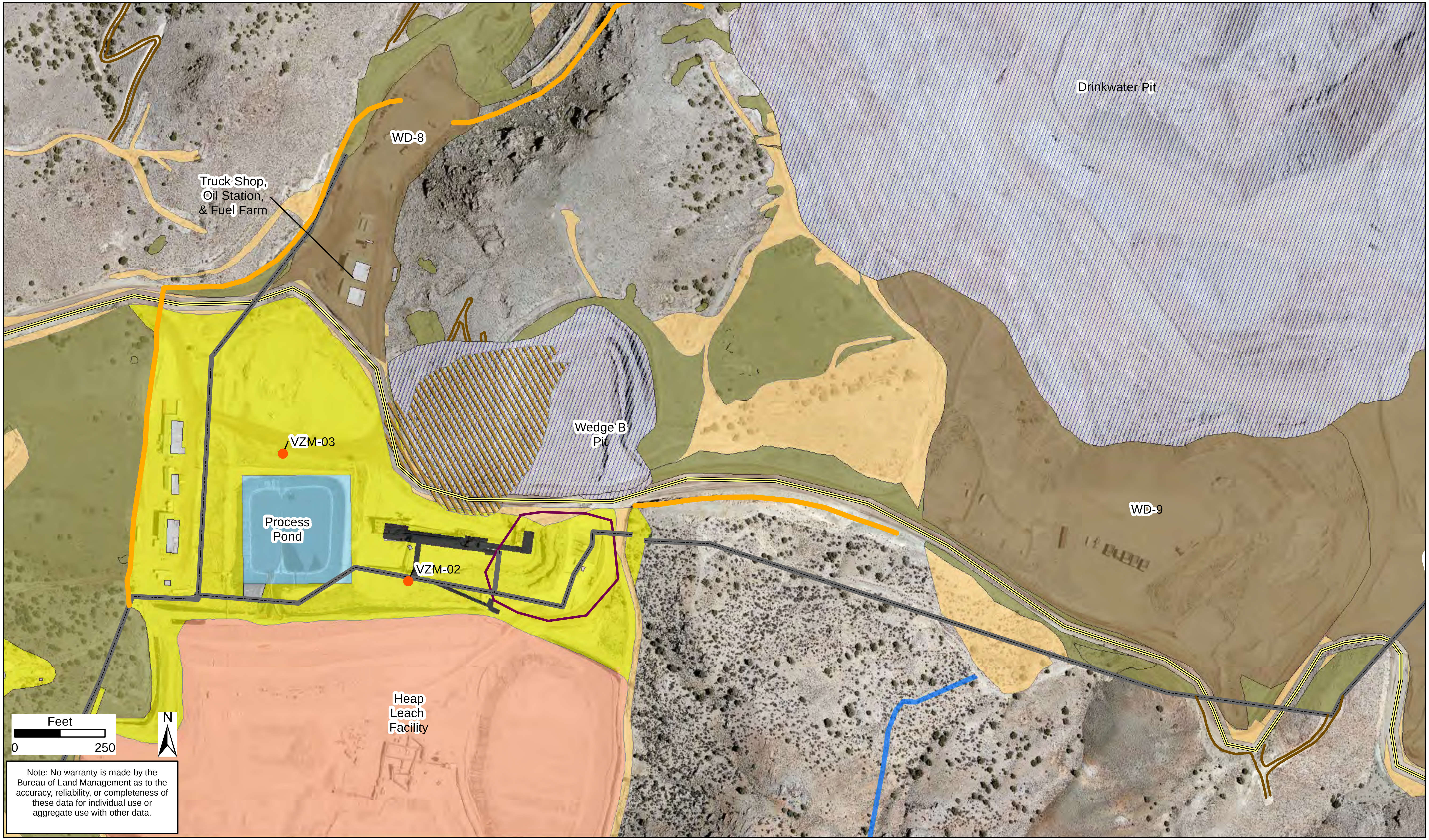
MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: PHASE I EXPLORATION

DRAWING NO. FIGURE 4

DATE: 3/23/2015



Existing Exploration Road
Existing Power Line
Mineral Ridge Road
Physical Barrier Alternative - Minimum Area within Barrier
Proposed Action - Physical Barrier
Vadoze Zone Monitoring Well
Borrow Area
Building
Communication Site
Crusher/Conveyor
General Disturbance
Heap Leach Facility
Pit
Pit Backfill
Pond
Road
Waste Rock Disposal Facility
Yard

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 250 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

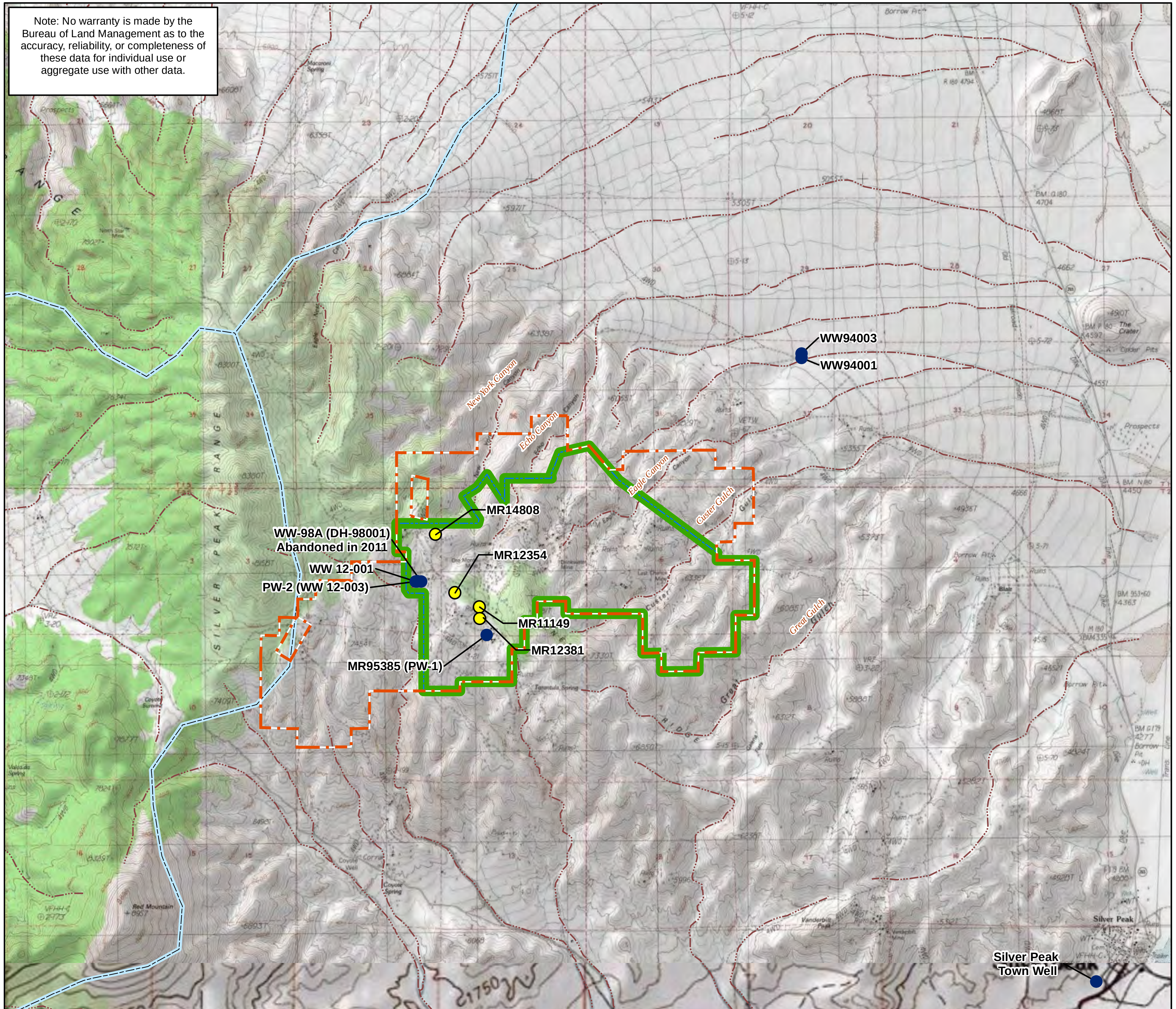
DRAWING TITLE: **CRUSHER AREA PHYSICAL BARRIER ALTERNATIVE**

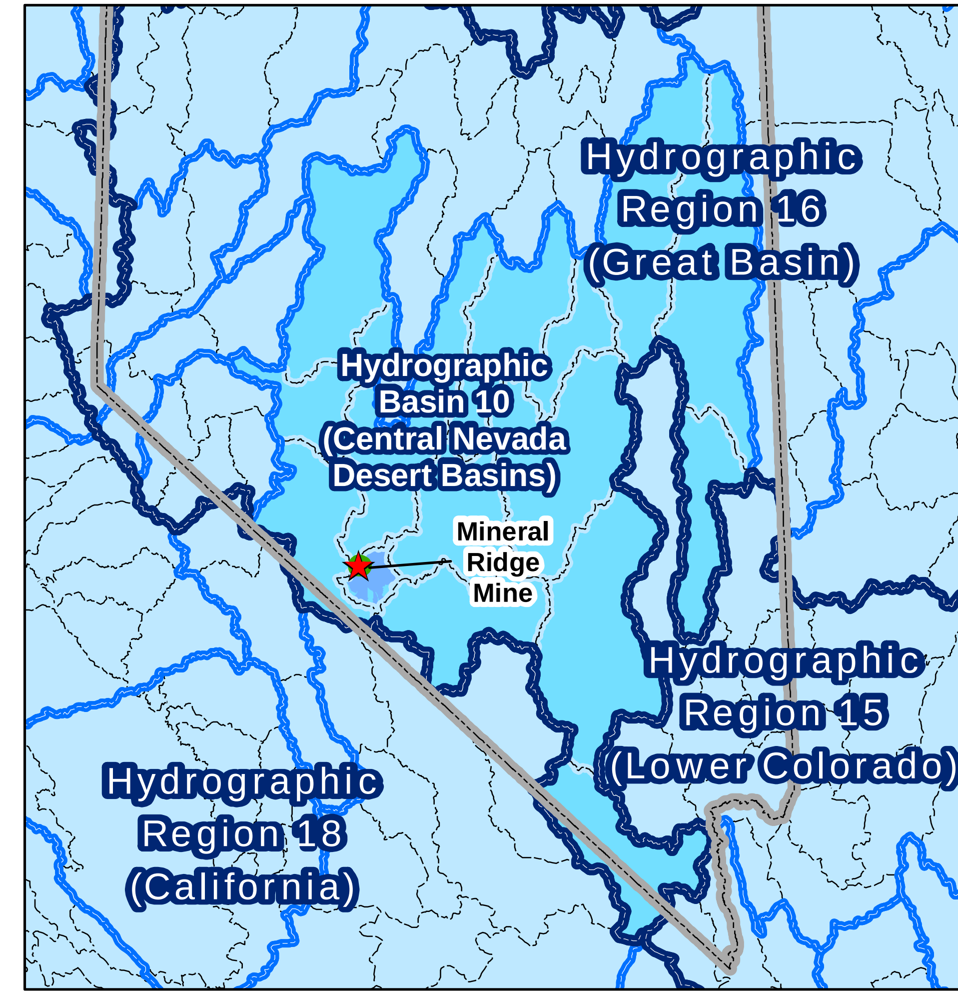
DRAWING NO. **FIGURE 5**

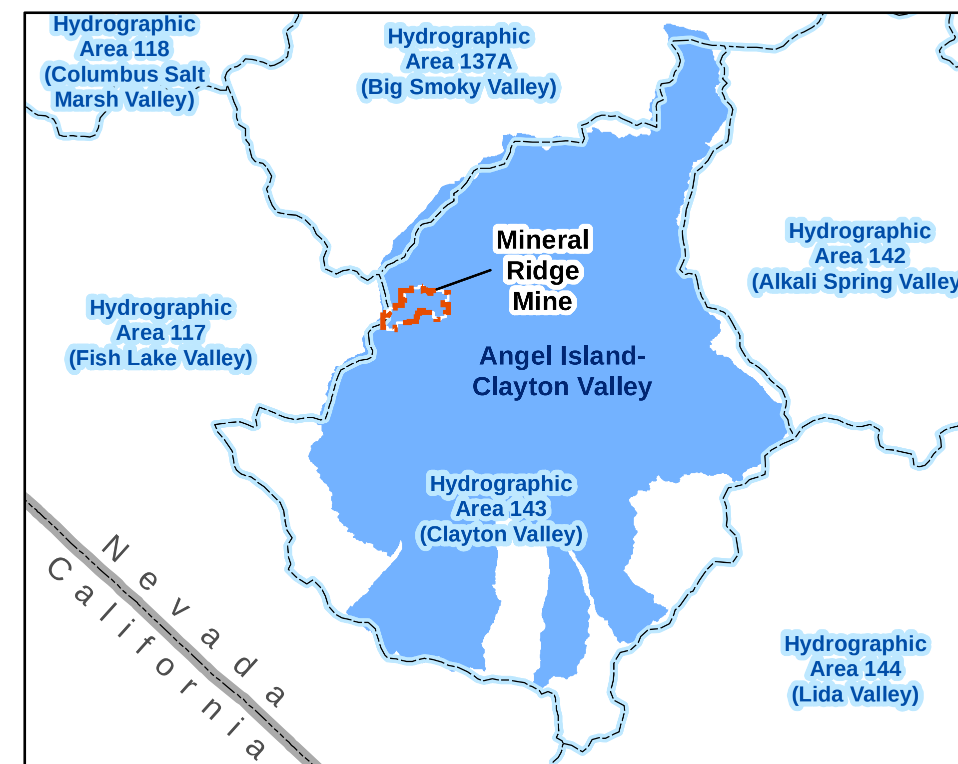
DATE: 3/23/2015

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig05_Barrier_SCH_20141202.mxd

Basemap Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community







N

Feet

0 4,000

Authorized Plan Boundary
Proposed Plan Boundary
State Boundary
Drainage
Well
Exploration Drill Hole
HUC 12 Watershed

NDWR Hydrographic Data (2012)
Hydrographic Region
Hydrographic Basin
Hydrographic Area

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 4,000 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

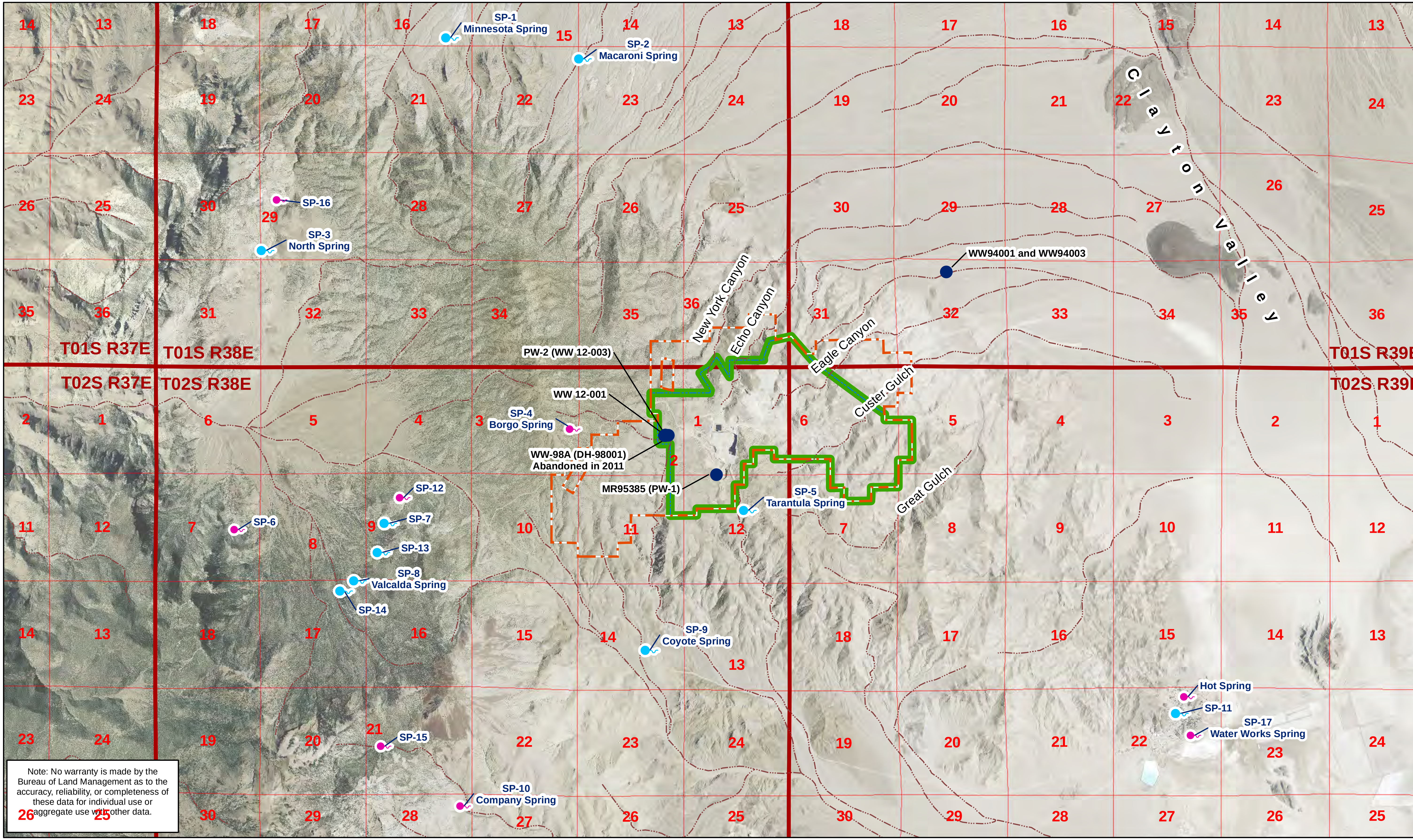
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **HYDROGRAPHIC BOUNDARIES**

DRAWING NO. **FIGURE 6**

DATE: **3/23/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig06_Hydro_SCH_20140819.mxd



N

Feet

0 4,500

Authorized Plan Boundary

Proposed Plan Boundary

Spring / Sampled

Spring / Not Sampled

Well

Drainage

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 4,500 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

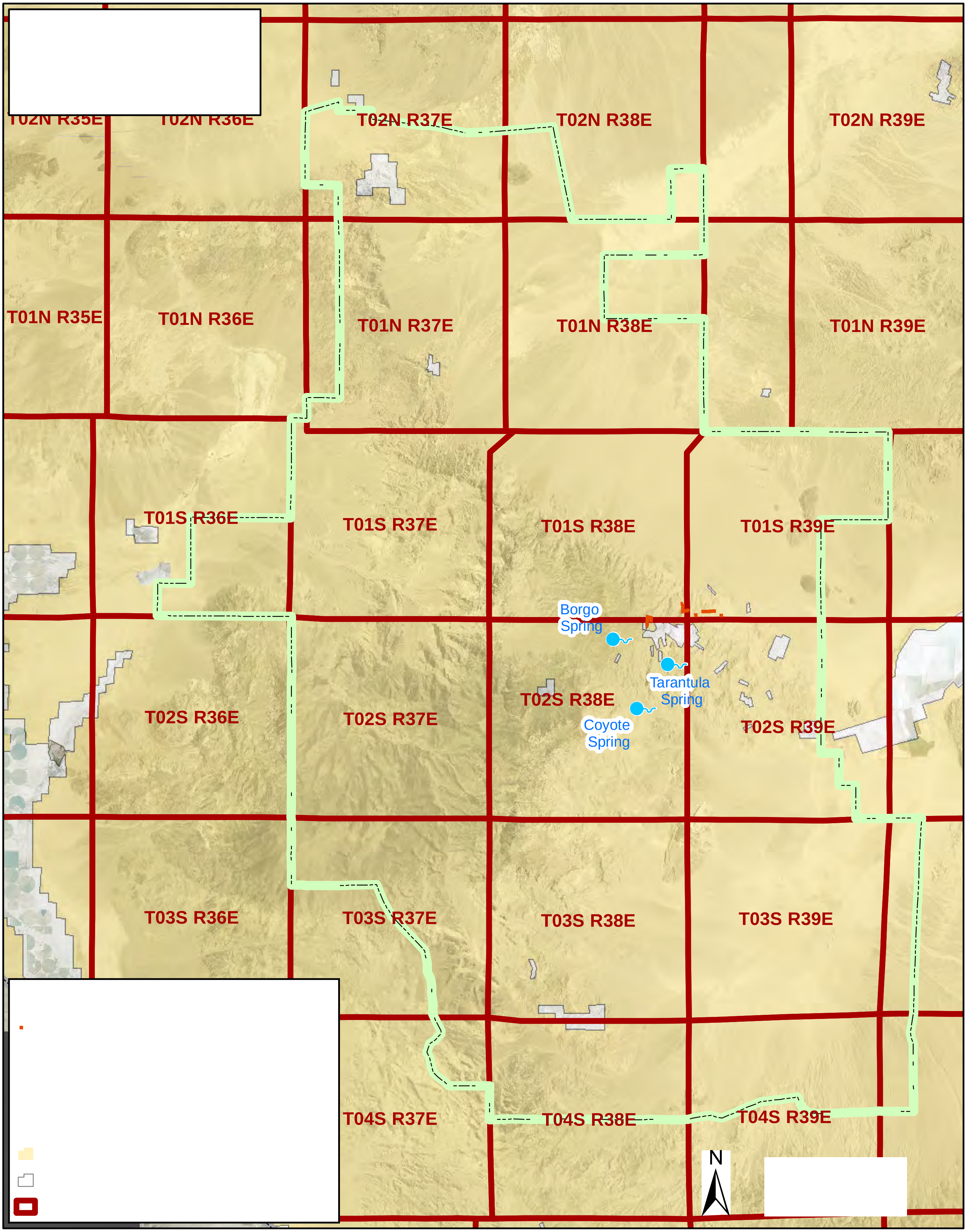
MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **WATER RESOURCES**

DRAWING NO. **FIGURE 7**

DATE: **3/23/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig07_WaterRes_SCH_20140819.mxd



Battle Mountain BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 21,120 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

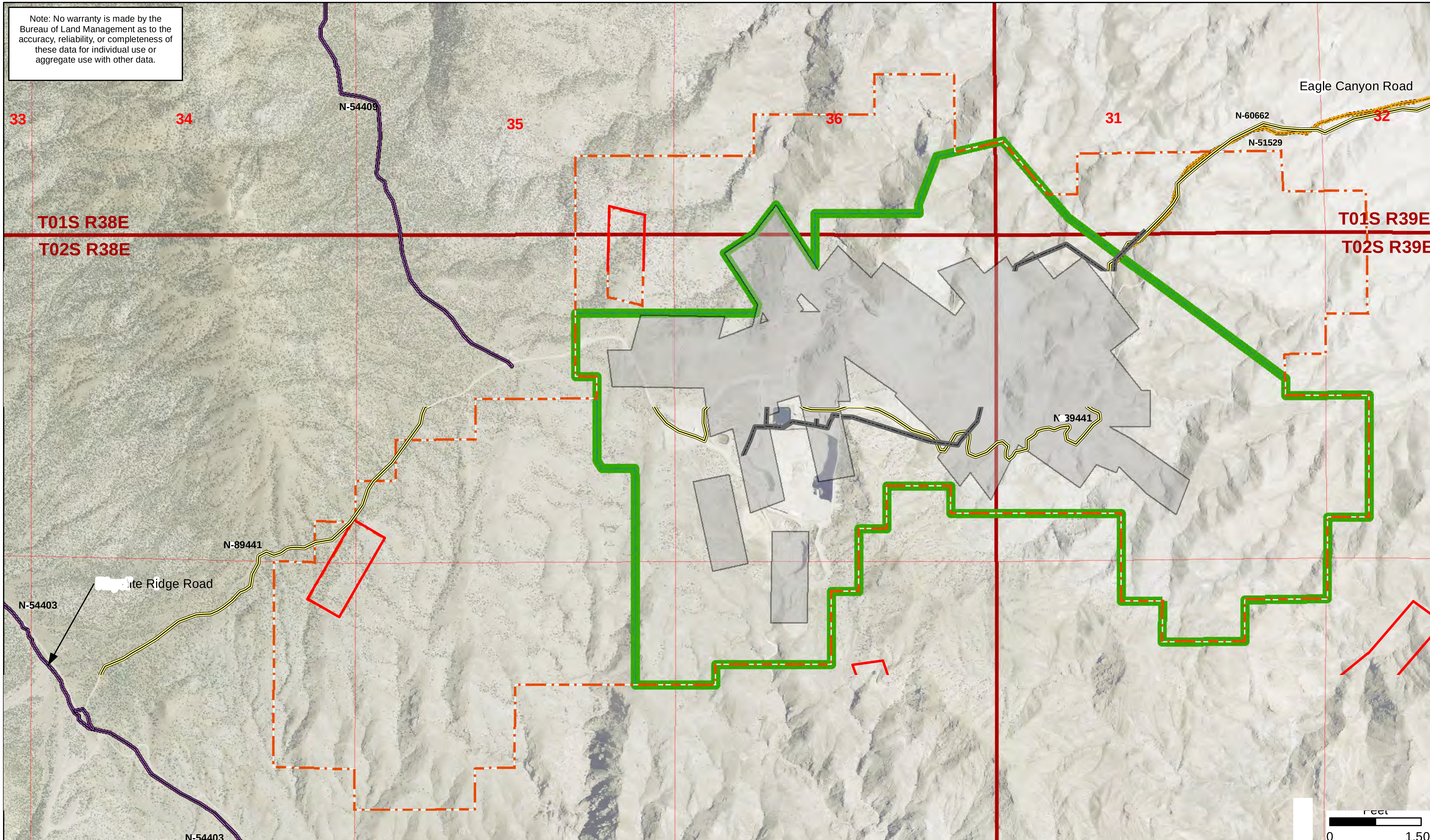
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **GRAZING**

DRAWING NO. **FIGURE 8**

DATE: **3/23/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig08_grazing_SCH_20140819.mxd



Authorized Plan Boundary
Proposed Plan Boundary
Existing Power Line
Mineral Ridge Road ROW
Road ROW
Power Line ROW
Patented Claim
Patented Claim by Other
Township
Section

Battle Mountain BLM District Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 1,500 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

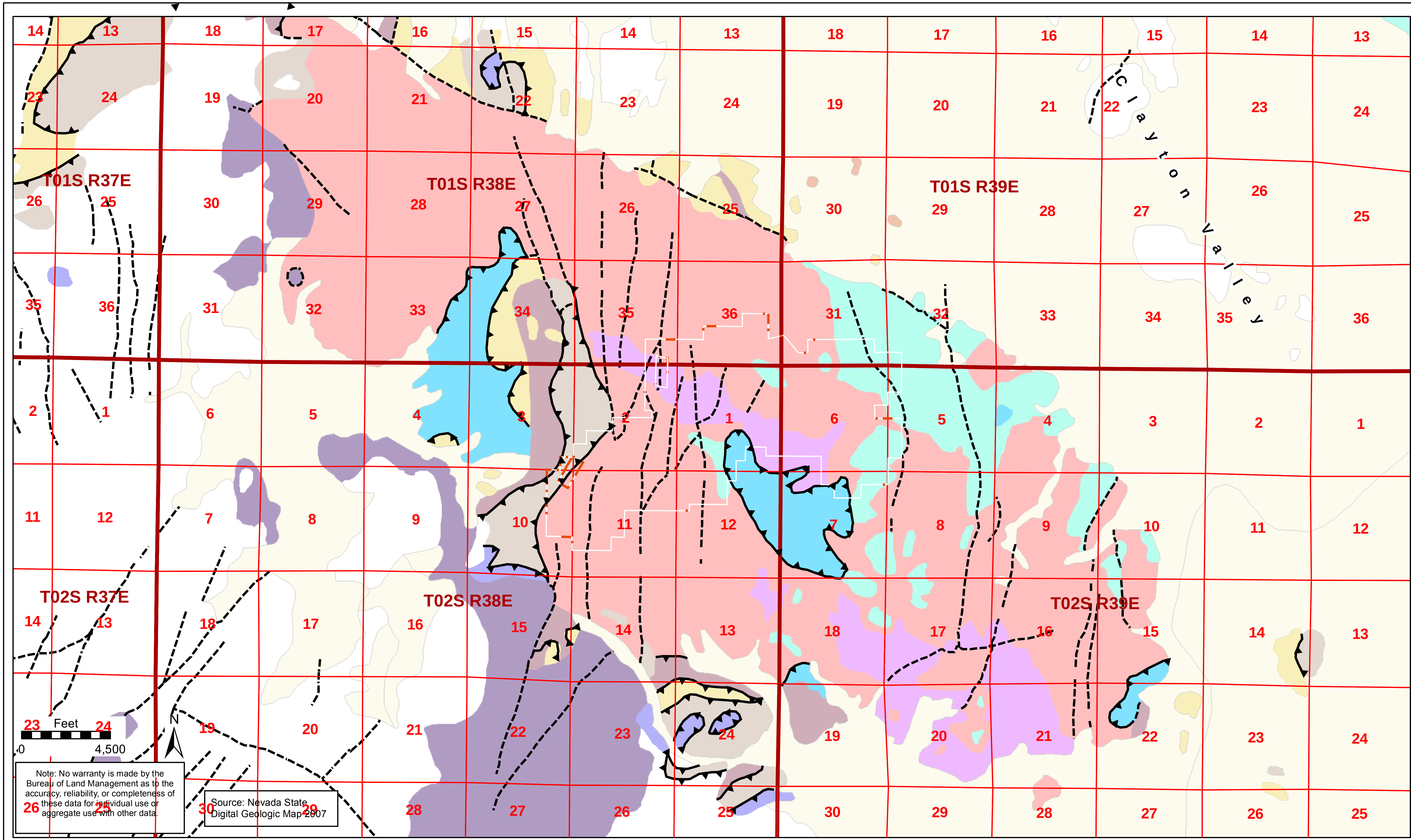
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **LAND USE**

DRAWING NO. **FIGURE 9**

DATE: **3/23/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig09_LandUse_SCH_20140819.mxd



Proposed Plan Boundary
Fault
Thrust Fault
Qal - Alluvium
Taf - Ashflow Deposits
Ts2 - Tuffaceous shale and sandstone
TJg - Tertiary - Jurassic
Cms - Mule Spring Limestone
Cca/Ccm - Campito
Ch - Harkless
Cp - Poleta
P€ds - preCambrian Deep Springs
P€re - preCambrian Reed
P€wy - preCambrian Wyman

Battle Mountain BLM District Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 4,500 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

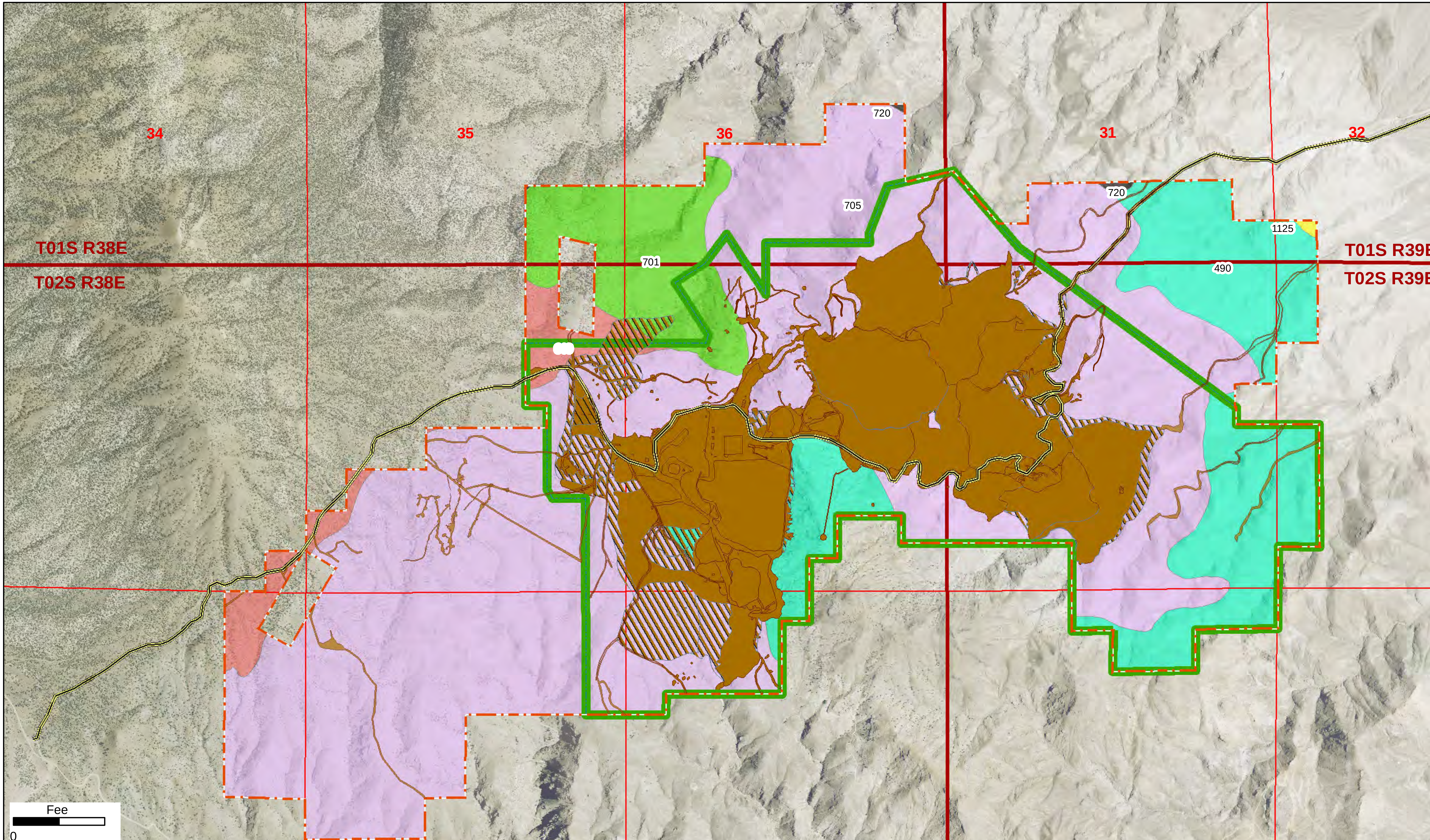
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: SURFACE GEOLOGY

DRAWING NO. FIGURE 10

DATE: 3/23/2015

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig10_Geology_ABR_20150225.mxd



Authorized Plan Boundary
Proposed Plan Boundary
Existing/Authorized Disturbance
Proposed Disturbance
Mineral Ridge Road
Proposed Phase I Exploration Road
Existing State Bank Notice Drill Hole
Proposed Phase I Exploration
Township
Section

Battle Mountain BLM District Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 1,500 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

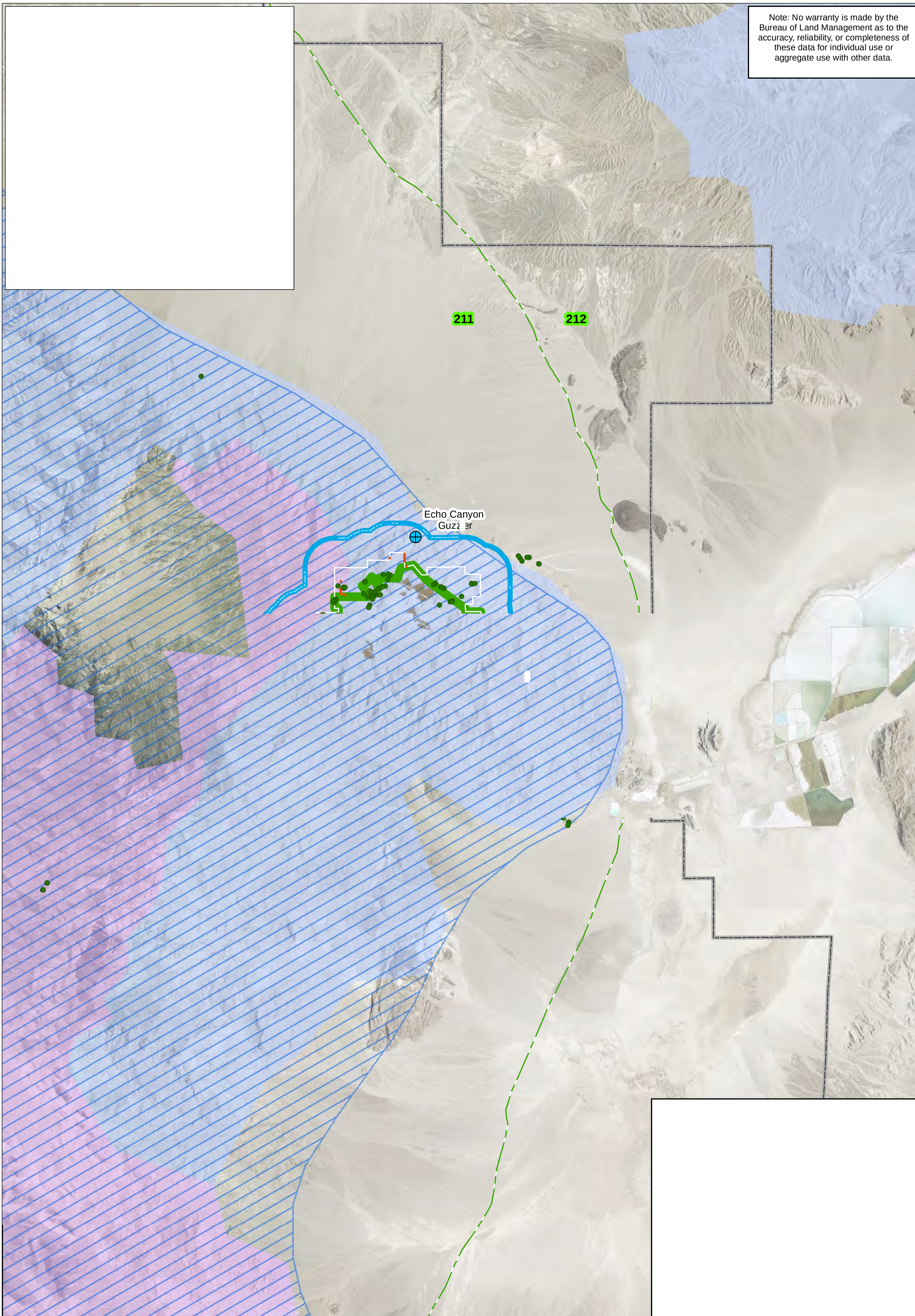
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **SOILS**

DRAWING NO. **FIGURE 11**

DATE: **3/23/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig11_Soils_SCH_20140819.mxd



N

Feet
0 8,000

Battle Mountain BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 8,000 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

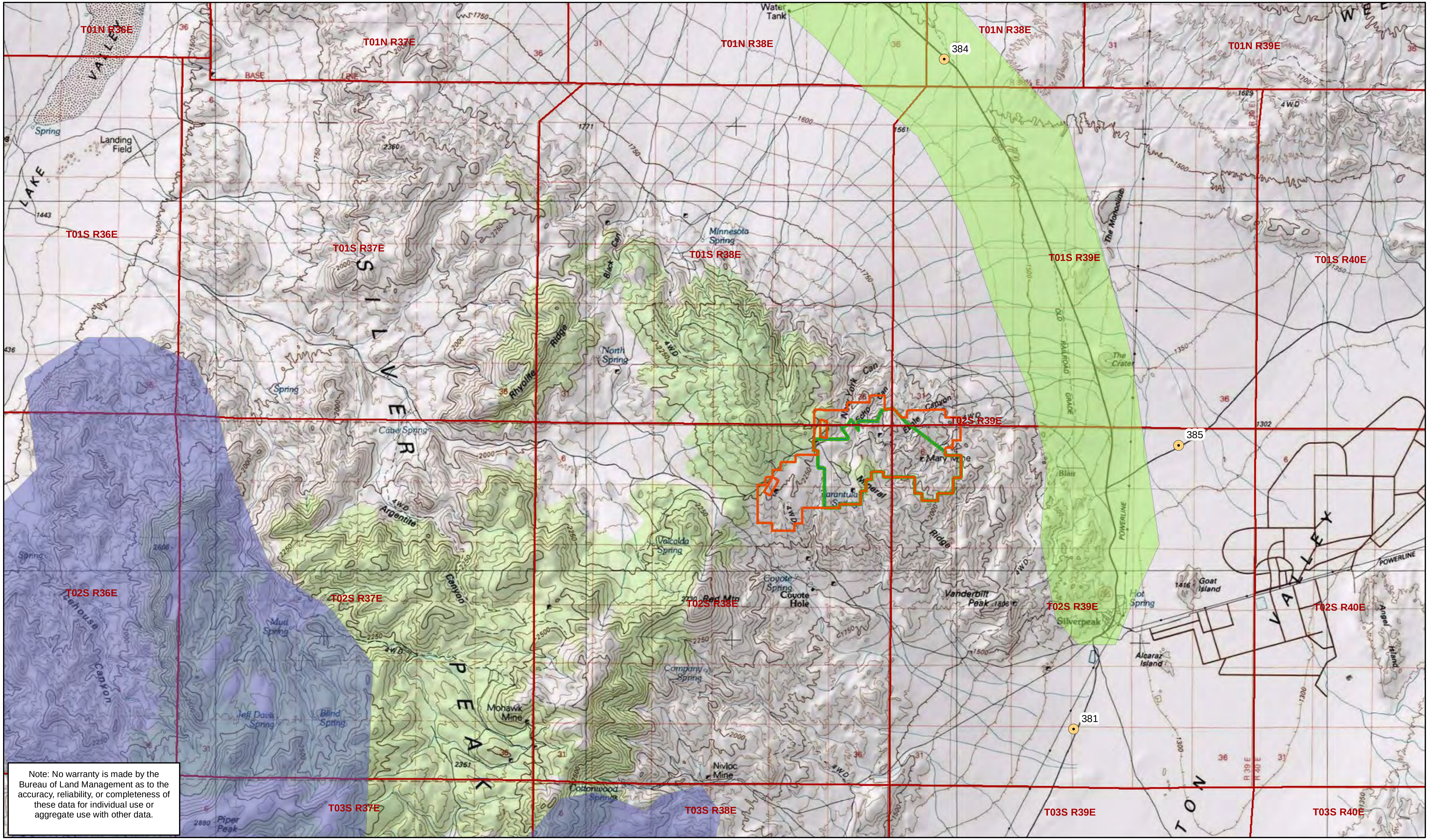
MARY LC & SATELLITE DEPOSITS ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **WILDLIFE**

DRAWING NO. **FIGURE 12**

DATE: **3/24/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig12_Wildlife_SCH_20140819.mxd



N
Feet
0 8,000

Authorized Plan Boundary
Proposed Plan Boundary
Key Observation Point

VRM Categories (1997 Tonopah RMP)
Area Managed as Class II VRM
Area Managed as Class III VRM

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N
SCALE: 1 inch = 8,000 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

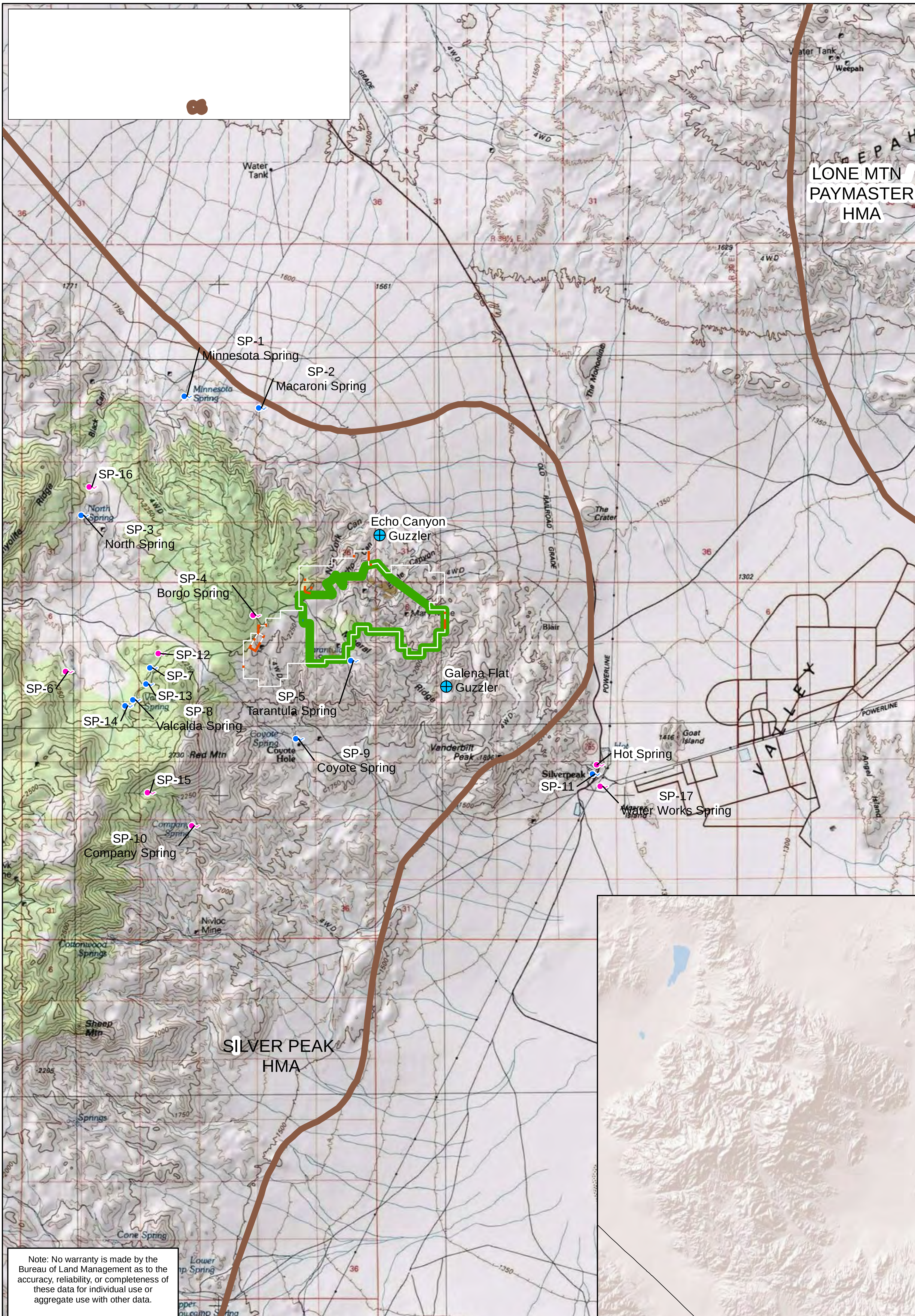
MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE: **VISUAL RESOURCES**

DRAWING NO. **FIGURE 13**

DATE: 3/23/2015

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig13_VIS_SCH_20141023.mxd



N

Feet

0 8,000

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 8,000 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

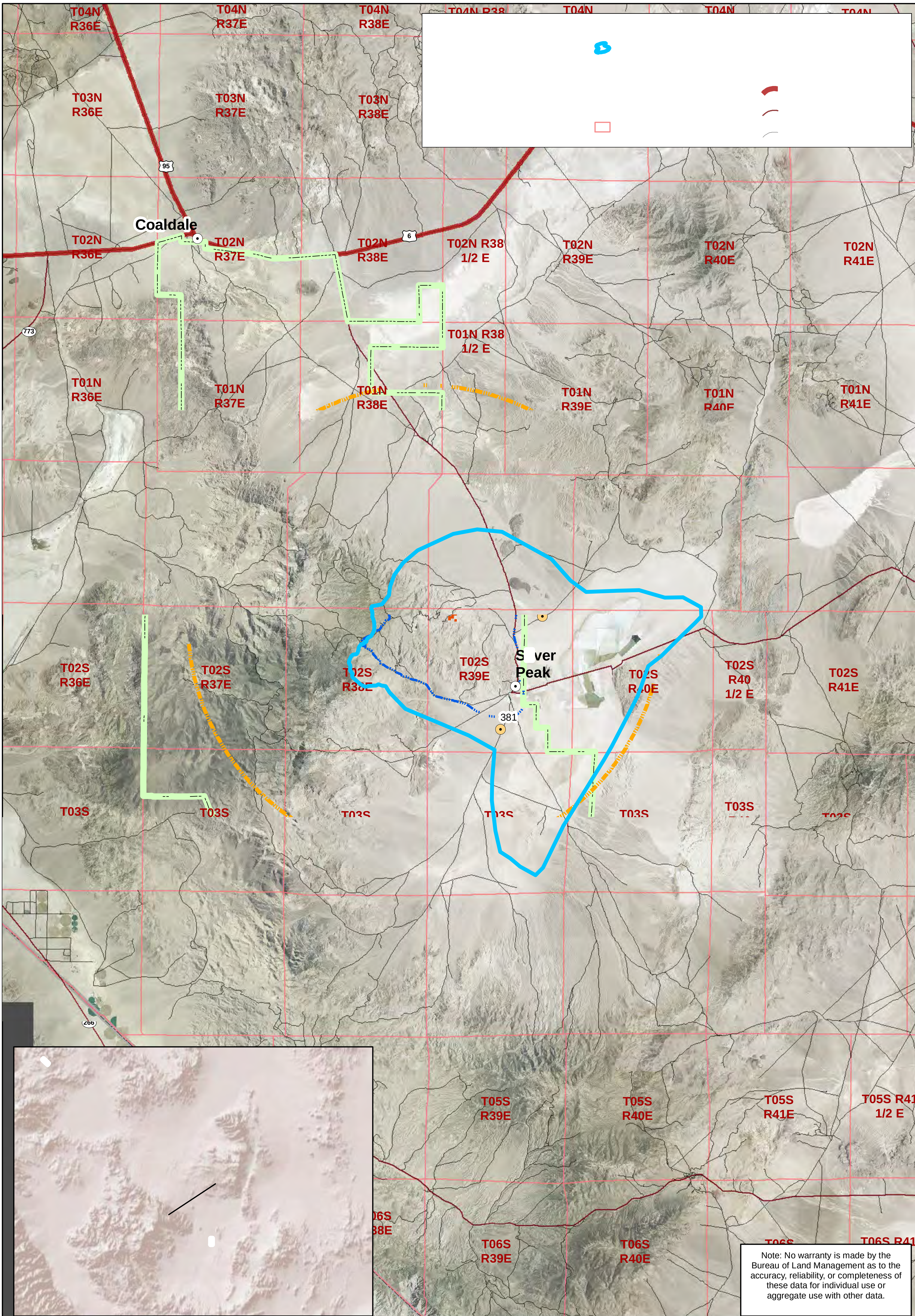
MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE:
SILVER PEAK HMA

DRAWING NO.
FIGURE 14

DATE:
3/23/2015

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig14_HMA_SCH_20140819.mxd



N

Miles

0 5

Battle Mountain
BLM District
Tonopah Field Office

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 20,000 feet

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

MARY LC & SATELLITE DEPOSITS
ENVIRONMENTAL ASSESSMENT

DRAWING TITLE:
CUMULATIVE EFFECTS STUDY AREAS

DRAWING NO. **FIGURE 15**

DATE: **3/23/2015**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig15_CESA_SCH_20140819.mxd

Appendix A- Public Comments and Responses

This appendix has been reserved for public comments and responses.

Appendix B- 1 – 1995 Open Pit Geotechnical Report

Gurlym

COPY

Golder Associates Inc.
4104-148th Avenue, NE
Redmond, WA 98052
Telephone (206) 883-0777
Fax (206) 882-5498

Golder Associates

November 6, 1995

Our ref: 953-1049.100

Cornucopia Resources Ltd.
355 Burrard Street, 540 Marine Bldg.
Vancouver BC V6C 2G8
Canada

ATTENTION: Mr. Jim Curry

RE: PIT SLOPE DESIGN RECOMMENDATIONS TO SUPPORT FEASIBILITY STUDY OF MINERAL RIDGE RESOURCES, INC. DRINKWATER AND MARY PITS, SILVER PEAK, NEVADA

Dear Jim:

INTRODUCTION

On Tuesday, 3 October, 1995, Graeme Major, Associate Rock Mechanics engineer with Golder Associates, completed a site reconnaissance at Mineral Ridge Resources, Inc.'s (MRRI) Mary/Drinkwater gold deposit near Silver Peak. The property is located on patented claims approximately five miles northwest of the town of Silver Peak, in Esmeralda County, Nevada. The purpose of the site reconnaissance was to review site conditions, collect available geologic and mine planning information, and recommend any additional data collection required to support feasibility-level pit slope design recommendations. The site reconnaissance and review was undertaken with the assistance of Mr. Terry Tew, Mine Superintendent, and Mr. Dan Kilby, Site Geologist. Site topography is shown on Figure 1.

A feasibility study is currently being undertaken by Behre-Dolbear, who will coordinate and utilize technical and environmental input from various sources. Proposed development includes expansion of the existing Drinkwater pit, and development of two new pits in the Mary area (Mary-Liz and Mary-LC) to the east of the Drinkwater pit. The pit slope design recommendations provided in this report will be used to support the feasibility study. Other studies that will be considered in developing the feasibility study that are pertinent to the pit slope design recommendations, and the companies that are performing or have completed the studies, include site geohydrology (Hydrosearch, Reno), ore reserve estimates (MRDI, San Mateo), preliminary pit optimization (Simons, Calgary), and process and facilities design (Kilborn, Vancouver).

GEOLOGY AND SITE CONDITIONS

Our understanding of the regional and site geology is based on discussions with site geological personnel and review of Draft, Geology of Mary/Drinkwater Gold Deposit, Esmeralda County, Nevada, by D. C. Hruska, Q. Deng, and D. Kilby, dated November 13, 1994. The following geologic descriptions are generally taken from this draft.

Geologic Units

The site is located on the northeast slope of Mineral Ridge. A schematic stratigraphy provided by MRRI is included as Figure 2. The Precambrian Wyman Formation, the principal host of the gold mineralization, consists of phyllite, calc-silicate, marble, and limestone which has been regionally metamorphosed to the lower amphibolite facies. Metasediment are almost a skarn; garnets occur locally close to intrusives. Significant pit slopes will all be developed within the Wyman Formation. Low angle faulting is common within this unit, and some of the more prominent shears bound the following structural/stratigraphic subunits ("plates"), although the shears have been strongly silicified and are difficult to trace for long distances:

Lower Cataclastite Unit - consists of sheared (Mary) limestone, foliaform alaskite and pegmatite, and smaller amounts of calc-silicate, phyllite, diabase and mylonite. It generally consists of large blocks of intrusive, and in some cases quartz, surrounded by plastically deformed metasediments set in a mylonitic groundmass. The entire unit appears as a series of folded and sheared metasediments within anastamosing shears which in turn surround blocks of intrusive and follow contacts of the more massive units. The lower contact of this subunit is generally considered to be the contact of the metasediments (usually Mary limestone, which is commonly marked by quartz and gold mineralization) with the underlying biotite granodiorite intrusion the forms the footwall rocks, although the contact is often uncertain in areas where wisps and slivers of the metasediments appear to have been assimilated within the upper part of the intrusion. The upper contact, by contrast, is at a prominent low angle fault named Vivian's fault.

Middle Unit - is composed of brown-weathering, slightly calcareous calc-silicate and phyllite, with minor gray limestone. Deformation within this unit is significantly less intense than in the lower unit; in this unit small-scale folding is subdued with long wavelength, low amplitude folding most common, but also with local areas of short wavelength large amplitude deformation. Low angle shearing is not prominent. The upper contact is gradational.

Upper Unit - is a transitional unit containing limestone, phyllite, some dolomite, and minor quartzite. The dolomite occurs as blocky lenses in the upper part of the unit. Structural deformation is similar to the middle unit, although fold amplitudes are slightly lower.

Structure

Major Structures

Intrusion and structural disruption significantly alter the character of the Wyman Formation. It has been pervasively intruded by pegmatite that has completely surrounded some lenticular pendants of metasediments in the pegmatite "rind" of the underlying granite/granodiorite stock.

Intrusion was followed by folding and low-angle thrusting that is most intense in the lower 100 to 200 feet of the formation, where significant portions are partially to completely mylonitized. Smaller intrusive bodies were commonly folded during this deformation; larger bodies were not folded and contacts of these larger intrusions served as favored slippage planes. The character of deformation changes from low amplitude folds higher in the Wyman Formation, to tighter folds on a smaller scale with shearing toward the bottom of the formation near the mineralized shear. Foliation developed sub-parallel to the low angle shearing within the intrusives, and generally along bedding in the metasediments, near the contacts with the larger intrusive bodies, but is commonly poorly developed where present. As described subsequently, pervasive silicification of the low-angle thrust zone has overprinted any clay alteration that may have been associated with the shearing.

Later northerly-trending high angle faulting cuts the low angle shearing; this set includes the Drinkwater Faults that cut the low-angle mineralized fault zone within the Drinkwater Pit. These faults strike approximately N20E and dip at an average of about 70 degrees to the west; they have a displacement aggregating approximately 80 feet, down to the west. It is consistent with the high-angle normal faulting that is commonly termed "Basin and Range" faulting in Nevada, and is the principal structure in the Drinkwater pit that is associated with clay alteration.

The clay-filled Cord fault that has been documented in underground workings in the Mary area strikes approximately N-S and dips at an average of 35 degrees to the west. Evaluation of its location and orientation indicates that this fault will intersect the west slope of the Mary-LC pit, where it will be exposed as a north-trending shear zone generally dipping into the pit slope. It will not intersect the currently proposed Mary-Liz pit, and so will not affect slope stability in that pit.

Rock Fabric

Rock fabric comprising joints and foliation fractures within the rock mass form discontinuities that could control stability of benches and larger-scale slopes. Surface geology, including lithology, alteration, and structure, has been mapped from outcrops by MRRI geologist Dan Kilby. This has been supplemented by selected underground mapping at accessible locations.

During our site reconnaissance, we inspected the areas where surface mapping of rock fabric had been undertaken with MRRI staff. This inspection indicated that the mapped structures are generally the prominent, relatively long structures that are important for evaluation of slope stability, and therefore provide a reasonable basis for evaluating slope stability and developing recommended slope design configurations. Structural mapping locations are shown on Figure 1.

Structural orientations from surface mapping were compiled into a geotechnical database that was used to evaluate structural conditions in various areas of the proposed pits. The database is included in Attachment A. In addition to the orientation of each structure (dip and dip direction), the structural database includes the pit area where the data were collected (Drinkwater or Mary), the level where the data were collected (upper, middle, or lower benches, or pit bottom), the side of the pit where data were collected (east or west for the Drinkwater pit, north or south areas for the Mary pit), and the type of structure (joint, bedding, or shear). These criteria were used to sort the structural data for plotting according to location.

Prominent jointing documented on both sides of the existing Drinkwater pit and within the Mary pit is sympathetic to the Drinkwater Fault. The primary joint sets defined by contoured stereoplots of 123 structural measurements from the Drinkwater pit area and 48 structural measurements from the Mary pit area dip at an average of 70 degrees in a direction of 295 to 300 degrees, as shown in Figures 3 and 4. This is identical to the reported orientation of the Drinkwater Fault. There is some variation apparent in the documented azimuths of structures, particularly in the limited data available from the Mary pit area, where measured dip directions range across the northwest quadrant. However, the mean dip of joints at all azimuths is consistently 70 degrees or greater. No low angle structural sets were identified with the exception of a flattening of joint dips at the upper benches on the east side of the Drinkwater pit. A more detailed evaluation of structural orientations is included in the Geotechnical Evaluation section.

Mineralization

The Mary and Drinkwater deposits are part of the same mineralized fault zone that has been partially eroded by the development of Elizabeth Canyon. Mineralization is associated with veins developed within a flat-lying plastically deformed shear zone within the lower sub-unit of the Wyman Formation at or near the contacts with the larger intrusive units, and particularly near the contact with the "basement" intrusion. The mineralized shear zone varies from as little as five feet to as much as 100 feet in thickness, and dips at an average of approximately 25 to 30 degrees to the northeast. Mineralized veins are lenticular in the plane of the shearing, but internally they are poddy; they pinch and swell and twist. While a general trend is recognized of veins comprising the predominant mineralization occurring near the hanging wall and footwall of the lower sub-unit, the thickness of these veins is highly variable, and they are not continuous. The mineralized shear zone has been described as a typical cataclastite. Multiple episodes of shearing and silicification are evident.

Major lithologic components and their approximate proportions within the mineralized shear zone include alaskite/pegmatite (50%), limestone (30-40%), milky quartz (10-15%), with the remainder comprised of calc-silicate, phyllite, diorite, and mylonite. Contacts between quartz, limestone, and alaskite/pegmatite are commonly shears, but they are also gradational with both the quartz and the limestone locally partly assimilated within the alaskite/pegmatite.

Alteration

A number of alteration phases including silicification, sericitization, and propylitization have been identified, but their distribution is not well understood because of extensive post-alteration shearing.

Silicification of hydrothermal and/or metasomatic origin occurs throughout the mineralized shear zone and has effectively cemented the low-angle faulting that occurs within the Wyman formation. The calc-silicates/metasediments of the middle and upper units are generally moderate to high strength rocks. Pervasive weak sericitization and local strong sericitization of the alaskite/pegmatite, and propylitic alteration that is evident in the diorite dikes, is not expected to significantly influence slope stability.

There is little clay present except in association with late stage faulting, particularly the Drinkwater fault and the Cord fault; clay alteration or clay gouge are not characteristic of the low-angle faulting at the site.

Groundwater Conditions

We understand that the groundwater table at the mine site lies well below the mineralized zone, and will not be encountered during pit development.

Core Logs

Exploration drilling at the site has been predominantly Reverse Circulation (RC) drilling, supplemented by a limited amount of core drilling. Twenty-four HQ coreholes have been drilled by MRRI to an average depth of about 300 feet.

Little geotechnical information is available from existing coreholes. Detailed geologic logs prepared for the core do not include any geotechnical information on rock strength, fracturing, or other mechanical characteristics. However, core from metasediments is generally characterized by MRRI personnel as "hard". Hanging wall and ore zone rocks are characterized as "blocky" in the drill core, generally requiring five-foot core runs, while 10-foot core runs were typically used in the footwall granodiorite. Core photographs have not been used to document the condition of the core. All core has been split for assaying and metallurgical testing.

Inspection of a limited amount of split core indicated that the metasediments could generally be characterized as medium strong to strong rock. Fracturing was more intense in the upper weathered zone that contained iron oxides. Fracture intensity in fresh metasediments appeared to be relatively low, but quantitative evaluation of fracture intensity was not possible because the core was split.

Bench Face Angle Measurements

MRRI staff documented bench face angles in the existing Drinkwater pit by measuring the angle from the crest of the bench to the top of the raveled rock at the toe of the bench at approximately 50-foot intervals along each accessible bench. Our spot check of selected measurements in the field indicates that these measurements are a reasonable representation of actual bench face angles.

Measured bench face angles vary with location in the pit. On the southeast side of the pit, bench face angles in the upper benches are typically on the order of 50 degrees to 55 degrees, steepening to about 60 degrees at the lower bench in this area. These upper benches are where flat-dipping joints are documented in the structural mapping, as discussed subsequently. Bench face angles on the footwall (southwest) slope of the pit are typically between 45 degrees and 50 degrees. On the northwest side of the pit, bench face angles are variable, ranging from as high as 65 to 70 degrees on the upper benches, where it appears that some attempt has been made to reduce blast damage and to clean bench faces, to around 50 degrees or less in the lower portion of the pit.

Review of plans of the existing Drinkwater pit indicate that inter-ramp slopes are generally constructed at an angle of approximately 45 degrees. Maximum slope heights of approximately 200 feet occur on the southwest side of the pit. Production bench height was approximately 20 feet, and steeper slopes were double benched. However, substantial raveling and rockfall is common on existing slopes. The narrow catch benches on the existing slopes, which are generally less than about 15 feet wide, do not provide access for cleanup, and provide only limited protection against rockfall.

Bench face angles and conditions in the existing pit indicate the need to implement improved blasting and excavation practices if steep inter-ramp slopes are to be developed. Steep inter-ramp slopes would not be possible with most of the existing bench face angles by the time adequate catch benches are incorporated into the slope design.

PREVIOUS OPERATIONS

The mineralized veins within the mineralized shear zone were mined by underground methods in both the Mary and the Drinkwater areas prior to 1942. Old stopes and mine entries are exposed within the Elizabeth Canyon sidewall, and in the slopes of the existing Drinkwater pit. Open stopes have generally remained stable, even where large spans and minimal pillars have been left, and even where the stopes have been developed to within a few feet of the ground surface. Timber support is generally not used or is minimal except where workings are developed through argillically altered fault zones. Ground lines of accessible underground workings have been mapped to supplement existing composite plan maps.

The Drinkwater pit was last worked in 1992. There is no evidence that the pit has been developed with any significant attempt to maximize bench face angles or pit slope angles. There is no evidence of controlled blasting being practiced in the vicinity of the existing pit slopes; exposed rock in the bench faces is generally highly fractured. Although it is not possible to determine definitively the extent to which this fracturing is due to blast damage, since there is no quantitative fracture data available from the core drilled through the undisturbed units that comprise the pit slopes, it appears that a substantial component of the fracturing in the pit benches is due to blast damage. This is consistent with our observations of the rock adjacent to exposed stopes in the Mary area, where the rock does not appear to be heavily fractured, probably reflecting the difference between the scale of the blasting used for open pit and underground mining.

No known significant slope failures have occurred in the Drinkwater pit, although low-angle jointing has controlled bench stability on the upper benches of the east side of the pit, and local instability on a bench scale has developed associated with underground workings.

PLANNED DEVELOPMENT

It is currently planned to mine ore in 10-foot high benches, and waste in 20-foot high benches. Wheel loaders such as Caterpillar 988 or 992 machines will be used for loading ore and scaling bench faces. All ore will be processed by heap leaching. Preliminary floating cone pits developed assuming 10-foot bench heights and 45 degree inter-ramp slope angles are shown in Figure 5. We assume that 20-foot bench heights will generally be implemented at the pit limit.

In general terms, the footwall slope of the Drinkwater pit will be developed along the base of the Lower Cataclastic unit, resulting in an average dip of the footwall slope of approximately 22 degrees to the northeast over its 400 foot total height. The presence of broad horizontal benches alternating with steeper inter-ramp slopes on the order of 50 to 70 feet in height will result in irregular undulations of the footwall slope. At the west end of the footwall slope a segment of slope on the order of 200 to 240 feet in height will be developed through the Middle and Upper units where the pit will recover a northwest extension of the mineralized shear zone. This extension of the pit is adjacent to the highest slope in the pit, a 270-foot high slope at the northwest end of the pit that will be oriented approximately northeast-southwest. The hanging wall slope, at the down-dip (northeast) end of the pit. will generally be less than 100 feet high, but will locally reach up to 160 feet in height where the slope is developed across a ridge formed partially by the existing pit slope. The southeast extension of the pit will be developed through an existing ridge, so significant slopes at this end of the pit, which reach a maximum height of approximately 150 feet, will generally be aligned northwest-southeast; only very limited sections of this slope will be developed parallel to the

Drinkwater faults, which are located northwest of this area and are exposed in the existing pit.

The Mary-Liz and Mary-LC pits, which will be smaller than the Drinkwater pit, will also be developed along the base of the Lower cataclastic unit. Maximum slope heights in the Mary-Liz pit will be approximately 200 feet in both the footwall (southwest) and hanging wall (northeast) slopes; significant slopes will be oriented predominantly northwest-southeast, with some variations in slope orientation as the pit is developed to recover irregular pods of mineralization. The pit bottom will daylight along strike at both the northwest and southeast ends of the pit. While design details of the Mary-LC pit are not known, the pit will be smaller and will generally have smaller slope heights than the Mary-Liz pit.

GEOTECHNICAL EVALUATION TO SUPPORT FEASIBILITY-LEVEL PIT SLOPE DESIGN

General

Based on the character of the rock that is exposed in the existing Drinkwater pit slopes, the strength of the rock in the core that we inspected, the limited slope heights proposed for the Mary and Drinkwater pits, and the performance of slopes in the existing Drinkwater pit, we do not expect slope stability for the Mary and Drinkwater pits to be controlled by intact rock strength or rock mass strength. Achievable inter-ramp slope angles will be determined by the limitations that structural conditions and operating procedures place on the safe development of suitable bench configurations and stable bench face angles.

Structural Evaluation

Structural data from each pit area were plotted and evaluated based on the mapping location to assess whether there are significant spatial variations in structural orientations that could affect bench or inter-ramp slope stability. Contoured stereoplots of data sorted according to location are included in Attachment A.

Contoured stereoplots of structural measurements plotted by location within the Drinkwater pit indicate some significant variations in preferred structural orientations in the immediate vicinity of the Drinkwater fault. Mean orientations of significant discontinuity sets indicated by these plots, listed in order of importance as indicated by intensity on the contoured stereoplots, are tabulated below.

Drinkwater Pit Area Mean Structural Orientations

Area	No. of Measurements	Mean Orientation	
		Dip	Dip Direction
All Areas	123	72	302
		90	315
		90	265
East Side	36	70	295
West Side	71	72	305
		90	315
		90	260
East Side, Upper Level	14	50	300
		70	305
East Side, Middle Level	8	63	290
		55	320
East Side, Lower Level	14	70	295
		90	345
West Side, Upper Level	28	90	265
		70	315
West Side, Lower Level	43	73	305
		90	315
		90	250
		37	060
Pit Bottom	16	70	290
		80	340

In general terms, these data demonstrate the strong similarity between the predominant structural orientations and the orientation of the Drinkwater fault, with the following modifications:

- The dip of the structures flattens significantly to about 50 to 60 degrees in the upper levels of the east side of the pit from the characteristic dip of approximately 70 degrees, probably due to some structural influence such as drag along the fault. This is consistent with our field observations, and with the documented bench face angles.

- All other structural sets identified are vertical to sub-vertical and are approximately parallel to the Drinkwater fault.

Flat-dipping foliation and bedding plane joints observed in the west slope of the Drinkwater pit are generally sub-parallel to the low-angle mineralized zone, dipping at an average of 20 to 30 degrees to the northeast. However, these surfaces are not continuous, and are irregular in orientation due to the character of the folding. Locally, they may dip out of the west slope of the Drinkwater pit at a low angle, but where this occurs, it is only expected to extend over a limited area.

The limited data from the planned Mary pit area (48 measurements) are generally aligned close to the orientation of the Drinkwater fault. Data from the north end of this area (38 measurements), which approximately correspond to the north limit of the pit, are predominantly aligned parallel to the Drinkwater fault, dipping at an average of 70 degrees in a direction of 295 degrees. The more limited data from the south end of this area (10 measurements), which approximately correspond to the central and northwest end of the footwall slope of the pit, have a similar steep dip, but dip in an average direction of 250 degrees, some 50 degrees from the measurements in the north end of the area.

Evaluation of Structural Control of Bench Stability

Slope designs in competent rock are based on bench configurations determined by bench face angle, vertical catch bench separation, and catch bench width, as illustrated in Figure 6, which define a design inter-ramp (crest-to-crest or toe-to-toe) slope angle. The final overall slope angle is based on the design inter-ramp slope angle, flattened as required by incorporating ramps or wide catch benches. Achievable bench face angles are determined by structural controls of stability, and by operating procedures.

Structural conditions are generally favorable for the development of steep bench face angles at most locations within the Mary and Drinkwater pits based on the current pit design. Jointing is generally steeply-dipping to the northwest. Flat-dipping joints documented in the upper benches on the east side of the Drinkwater pit are expected to have limited influence on slope stability because they apparently occur only locally in an area that will be located near the pit crest in the southeast corner of the Drinkwater pit. Bench orientations in the current Ultimate Pit design are not generally aligned with the structures at this location. The dip of these structures is expected to steepen with increasing pit depth. This evaluation should be reviewed if the pit design illustrated in Figure 6 is modified significantly.

Generally, the northwest-southeast orientations of the footwall and hanging wall pit slopes will result in the predominant structure striking into the pit slopes. This structure is therefore not expected to control bench or inter-ramp slope stability, since the structure does not dip out of the slope. While a short section of hanging wall slope in the Drinkwater pit will be approximately aligned with the Drinkwater fault, the limited structural data available from this vicinity indicates that the structure in this area will be steeply-dipping.

Documented structure will generally dip into the slope at a steep angle on the west side of the Drinkwater pit, and so will not limit achievable bench face angles by forming potential failure surfaces. Flat-dipping foliation and bedding plane joints may cause local block failures of limited extent in this slope, but are not expected to result in substantial failures that could control the stability of multiple benches.

Evaluation of structural data from the area of the Mary pits identified no structures that will limit design bench face angles to less than 70 degrees with the exception of the Cord fault, which will be exposed in the west slope of the Mary-LC pit. Because this fault dips to the west, it is not expected to control overall stability of this slope. However, where it is exposed, it can be expected to result in reduced bench stability that will require development of a flatter inter-ramp slope.

Recommended Bench Configurations

With the limited exceptions discussed above, we have not identified structures or combinations of structures that will limit bench face angles to less than about 70 degrees. We therefore consider that this is a realistic design bench face angle provided good drilling and blasting practices are implemented. This angle approximately corresponds to the steepest bench face angles achieved in the existing Drinkwater pit, and is substantially steeper than most of the bench face angles for benches that were apparently developed without controlled blasting and excavation practices. Although steeper bench face angles may be possible under favorable conditions with careful controlled blasting, we do not recommend basing slope designs on the assumption of bench face angles steeper than 70 degrees unless these can be demonstrated to be achievable based on field experience.

Development of steep slopes will only be possible with the selection of an appropriate bench configuration, successful implementation of a program of good controlled blasting to minimize blast damage, and careful excavation control. Because the bench height in waste is 20 feet, it will be necessary to stack benches in order to achieve inter-ramp slope angles as steep as geotechnical conditions will allow. Because of the potential for variable geotechnical conditions, and for operational flexibility and convenience, we recommend that a modified double bench configuration be assumed for feasibility-level design, since this should be readily achievable with reasonable care with drilling, blasting, and excavation practices.

<u>Slopes Developed in Competent Bedrock</u>

Assuming that a program of controlled drilling and blasting will be implemented to minimize blast damage to rock at the pit limit, we recommend that final pit slopes in competent rock be developed with the modified double bench configuration illustrated in Figure 7. Assuming bench face angles of 70 degrees, a 25-foot wide permanent catch bench should be developed at vertical intervals of 80 feet. In our experience, this is the minimum design permanent catch bench width that is likely to be effective and to enable access for cleanup. It is preferable to have fewer but effective permanent catch benches than to have catch benches that are too narrow and are ineffective at each production bench level. Although catch benches may never be accessed for cleanup, adequate permanent catch benches at regular intervals are necessary to provide sufficient holding capacity for rockfall in the event of unusually large backbreak or local bench failures, and to enable access for documentation and cleanup.

Intermediate berms with a design width of 15 feet should be developed at the mid point between permanent catch benches to provide temporary protection against rockfall during drilling and excavation of the production benches below the intermediate berm. It is expected that access to these intermediate berms will be lost due to rockfall and bench crest failures. However, we believe that this bench configuration will be more easily and safely implemented than alternative methods of developing steep inter-ramp slope angles, such as triple benching.

This recommended bench configuration will result in an inter-ramp slope angle of approximately 49 degrees in competent bedrock.

Slopes Developed in Weathered or Highly Fractured Bedrock or Areas of Low-Angle Jointing

For slopes developed in weathered rock or rock that is fractured through natural processes or by blasting, it should be expected that the narrow design intermediate berms recommended in competent bedrock would not provide adequate protection during development of the underlying benches. We therefore recommend that a double bench configuration with a design 25-foot wide catch bench every two benches (40 vertical feet) be assumed under these conditions. This will result in a design inter-ramp slope angle of approximately 45 degrees, as illustrated in Figure 8. A similar design bench configuration should be assumed if low-angle joints dipping into the pit are encountered locally. In practice, such conditions would result in reduced bench face angles as planar failures developed along joint surfaces. However, with careful scaling of bench faces back to prominent jointing, it should be possible to develop alternative catch bench configurations to provide adequate protection against rockfall while still maintaining an inter-ramp slope angle on the order of 45 degrees.

A flatter inter-ramp slope angle of 40 degrees should be assumed through clay-altered fault zones such as the Cord fault.

While the distribution of weathered and highly fractured rock in the Ultimate pit slopes can not be accurately defined from available information, we recommend that the preliminary slope design incorporate a 25-foot wide catch bench at the bottom of the first double bench, 40 feet below the pit crest, to accommodate expected increased rockfall associated with surficial weathering.

Possible Variations to Recommended Slope Design

Safe development of the recommended double bench configurations should be feasible with good control of drilling, blasting, scaling, and excavation. A suitable program of controlled blasting that can be demonstrated to produce bench faces that are not prone to excessive rockfall should be implemented. Optimum bench configurations should ultimately be determined based on field experience. Steeper design inter-ramp slopes may be possible if the production bench height is increased. Steeper slopes could also be achieved by triple benching. However, we do not recommend using a triple bench configuration unless field trials can demonstrate that such a design can be implemented safely.

Operating Considerations

While the recommended slope design are considered to be reasonable for preliminary design purposes, we expect that local variations in geological conditions may require local modifications to the recommended bench configurations. Ultimately, bench configurations, and drilling and blasting practices, should be optimized based on site conditions, field trials, and documented slope performance.

Areas where local stability problems are most likely to be encountered include:

- Footwall and west slopes, where bedding plane and foliation joints may locally dip into the pit at an unusually steep angle;
- West slope where joints dipping steeply into the slope could result in loosening of rock blocks and potential development of toppling failures if closely-spaced joints occur locally, particularly if these are disturbed by blast damage;
- East and southeast (northwest facing) pit slopes where jointing is locally flatter than the average dip of 70 degrees that is characteristic of the primary joint sets;
- Fault zones, particularly the Drinkwater fault, and the Cord fault in the Mary-LC pit, where reduced bench face angles and increased raveling should be expected within highly fractured and clay-altered zones; and
- Slopes where underground workings daylight.

The risk of slope stability problems in all these areas will be reduced by minimizing rock mass disturbance by implementing good drilling and blasting practices. Good blasting practices including some form of controlled blasting and careful scaling of the final bench faces will be essential for maximizing slope angles and for the protection of the operating crews. For current purposes, we recommend that buffer blasting be assumed with the final three to four rows against the bench face fired to a free face. The design of this buffer blast would likely include a trim row against the slope, and at least one buffer row. The blastholes could be drilled at standard production size, and would not require special equipment; charges would be modified depending on the rock quality and the proximity to the design line.

Special consideration of blast design will be required where drillholes penetrate underground mine workings for operating safety, to prevent loss of explosives into the workings, and to ensure effective blasting. Where the location of underground workings can not be accurately determined from existing exposures or available mine plans, exploratory drilling and/or geophysical methods may be appropriate for ensuring an adequate crown pillar is maintained below operating equipment. An adequate crown pillar will have to be maintained between the workings and operating equipment for operator safety.

At some mining operations, backfilling of abandoned stopes is necessary to prevent excessive dilution during open pit mining. Fill within underground stopes can require special consideration of slope design for interim and permanent slopes. We understand that Ultimate Pit slopes will generally be located beyond the limits of underground workings. However, the effect of underground workings on the stability of interim and permanent slopes will have to be considered when detailed mine plans are developed.

Geotechnical Evaluation During Development of Pit Slopes

Basic geotechnical documentation of the pit slopes during pit development should be undertaken to enable optimization of the final pit slopes. This should include:

- Structural mapping to confirm the validity of structural orientations documented in this report that form the basis for our pit slope design recommendations;
- Surveillance monitoring of bench and pit slope stability, and documentation of bench stability following controlled blasting trials;
- Monitoring and documentation of any significant slope failures that develop; and
- Documenting the effect of underground workings on bench stability.

We recommend collecting basic geotechnical data during future core logging to enable application of a quantitative rock mass classification system. As a minimum, the core should be photographed soon after it is boxed, RQD (Rock Quality Designation - a modified core recovery in which only sound core recovered in lengths of 4-inches or greater is counted as recovery) should be recorded, and an estimate of rock strength should be recorded based on field strength classifications supported by a limited amount of laboratory strength testing. This will provide a basis for quantitative evaluation and comparison of geotechnical units and of variations within geotechnical units. For example, it will facilitate evaluation of whether the favorable geotechnical conditions that have resulted in stable excavations in the underground workings are also characteristic of the overlying units that will comprise most of the pit slopes, and the extent to which in place rock is fractured.

Methods for safely mining stable slopes through areas of abandoned underground mines should be developed during detailed pit design. Because of the limited information currently available for defining geotechnical conditions at the final pit limit, the expected importance of operating practices on the performance of the pit slopes, and the potential impact of underground workings on the stability of interim and permanent slopes, we recommend that geotechnical reviews be undertaken to support final design, and development of the pit.

* * *

We hope this report is sufficient for your current purposes. Please call if you require any additional information.

Sincerely,

GOLDER ASSOCIATES INC.

Graeme Major

Graeme Major, P.E.
Associate Geotechnical Engineer

cc: Terry Tew (MRRI 4 copies)
Don Hruska (MRRI)
Mike Martin (Behre-Dolbear & Co.)
Rob Gwilym
Peter Stacey

1106gm1.rpt

Attachments:

Figure 1	Site Topography
Figure 2	Schematic Stratigraphic Column, Mineral Ridge Project
Figure 3	Contoured Stereoplot of All Structures Measured in the Drinkwater Pit Area
Figure 4	Contoured Stereoplot of All Structures Measured in the Mary Pit Area
Figure 5	Proposed Mary and Drinkwater Ultimate Pits
Figure 6	Bench Design Terminology
Figure 7	Recommended Design Bench Configuration in Competent Bedrock
Figure 8	Recommended Design Bench Configuration in Weathered and Highly Fractured Bedrock

Attachment A Contoured Stereoplots and Structural Database

FIGURES

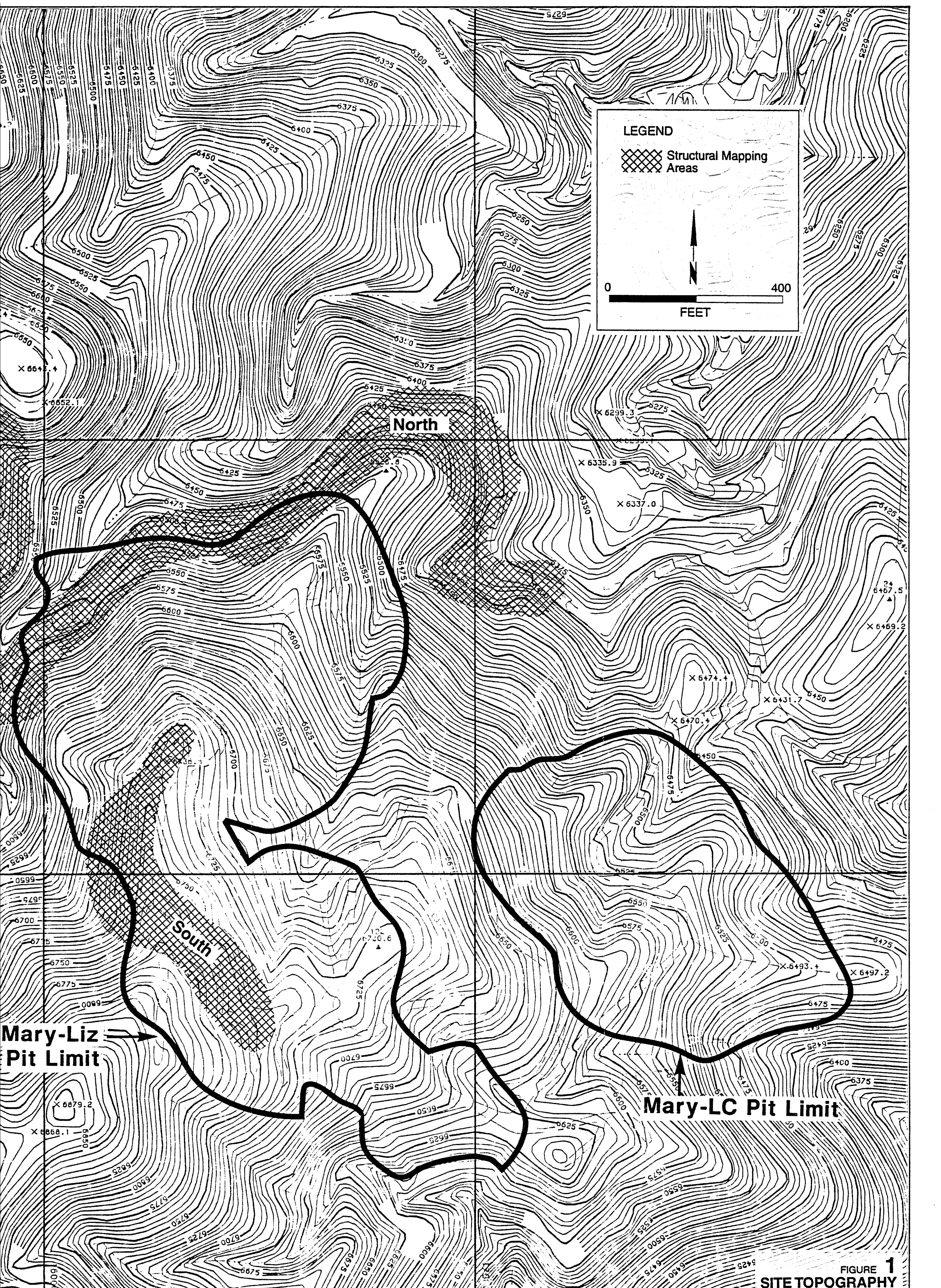
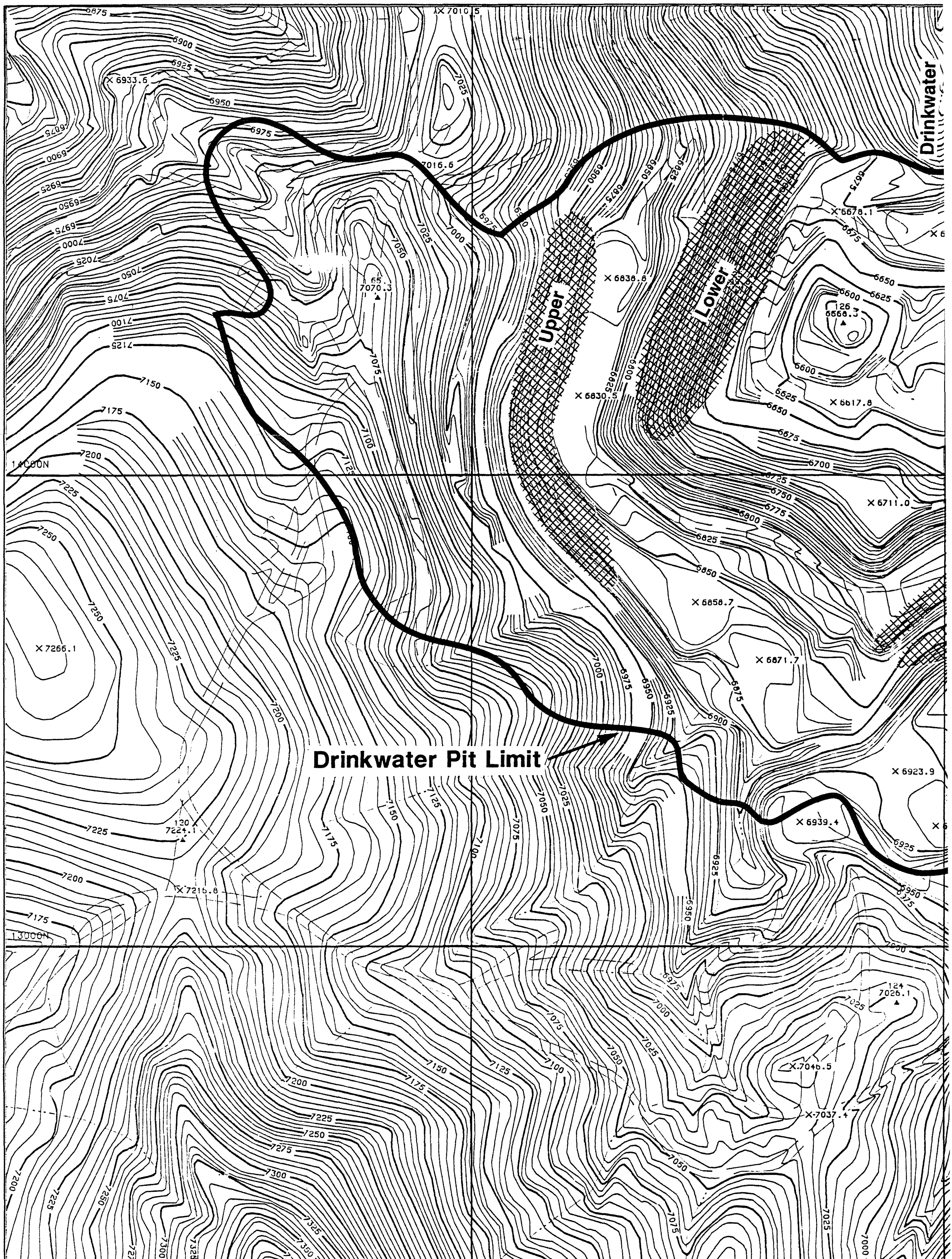


FIGURE 1
SITE TOPOGRAPHY
MRRI/MARY/DRINKWATER/NV

Golder Associates


Drinkwater Canyon
Lower
Lower
Middle
Upper
Elizabeth Canyon
South
Mary-Liz Pit Limit



PROJECT NO. 953 1049.100 DRAWING NO. 63105 DATE 10/19/95 DRAWN BY EA

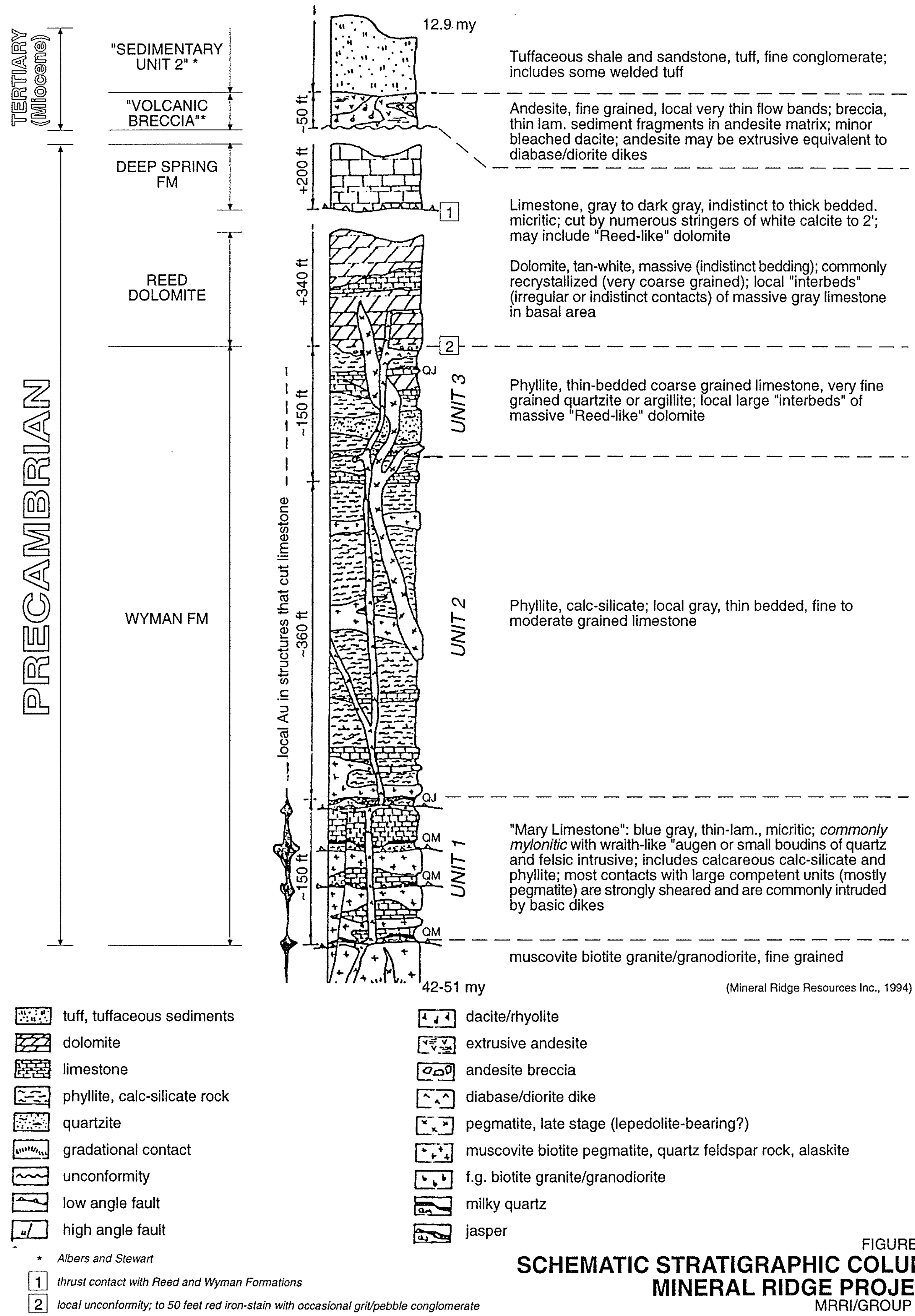


FIGURE 2
SCHEMATIC STRATIGRAPHIC COLUMN
MINERAL RIDGE PROJECT
MRRI/GROUP I/NV

PROJECT NO. 953 1049.000 DRAWING NO. 55472 DATE 10/19/95 DRAWN BY CB

Golder Associates

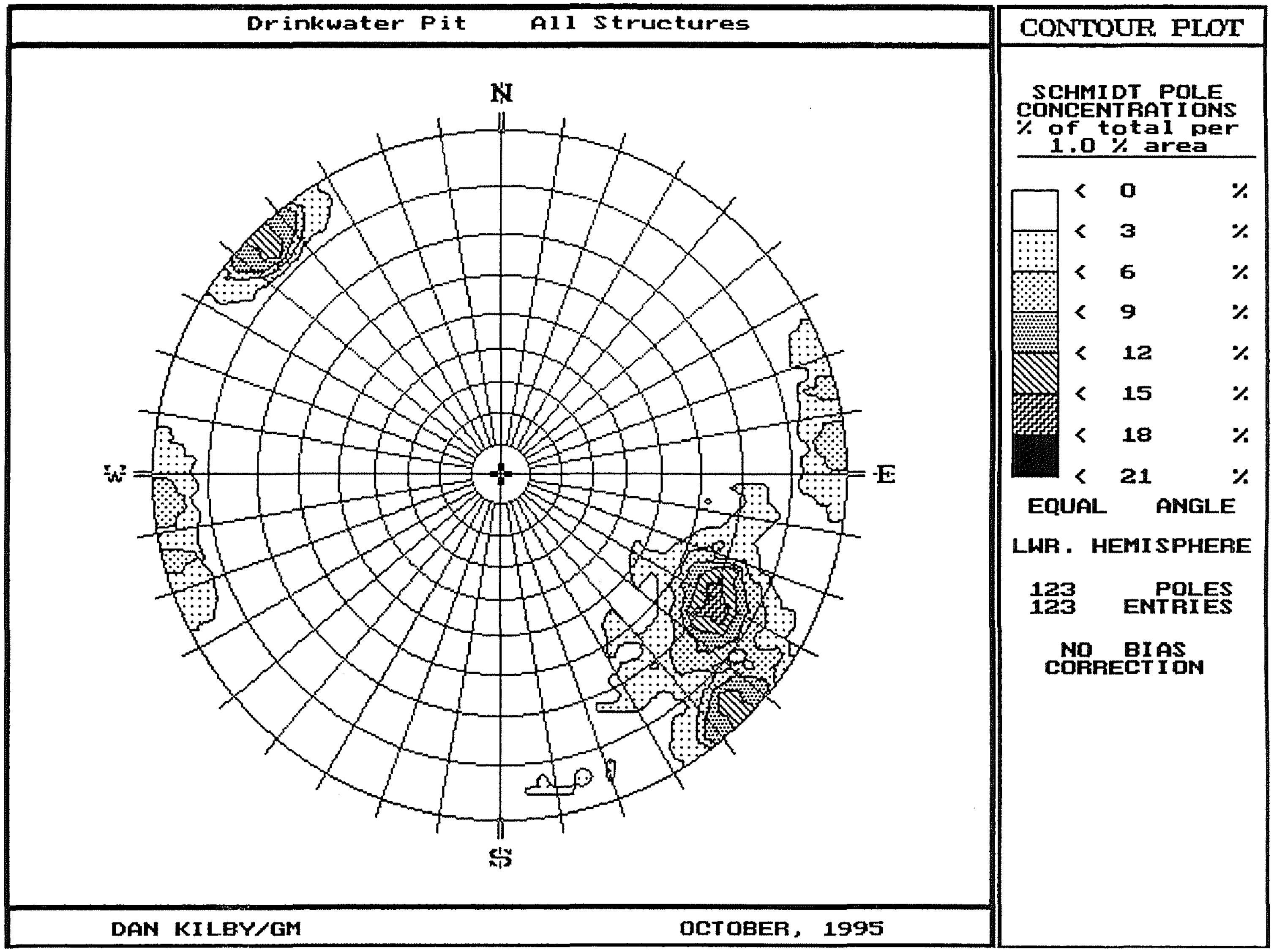


FIGURE 3
CONTOURED STEREOPLOT OF ALL STRUCTURES MEASURED IN DRINKWATER PIT AREA
MRRI/MARY DRINKWATER/NV

PROJECT NO. 953-1049.100 DRAWING NO. 54809 DATE 10/19/95 DRAWN BY TB

Golder Associates

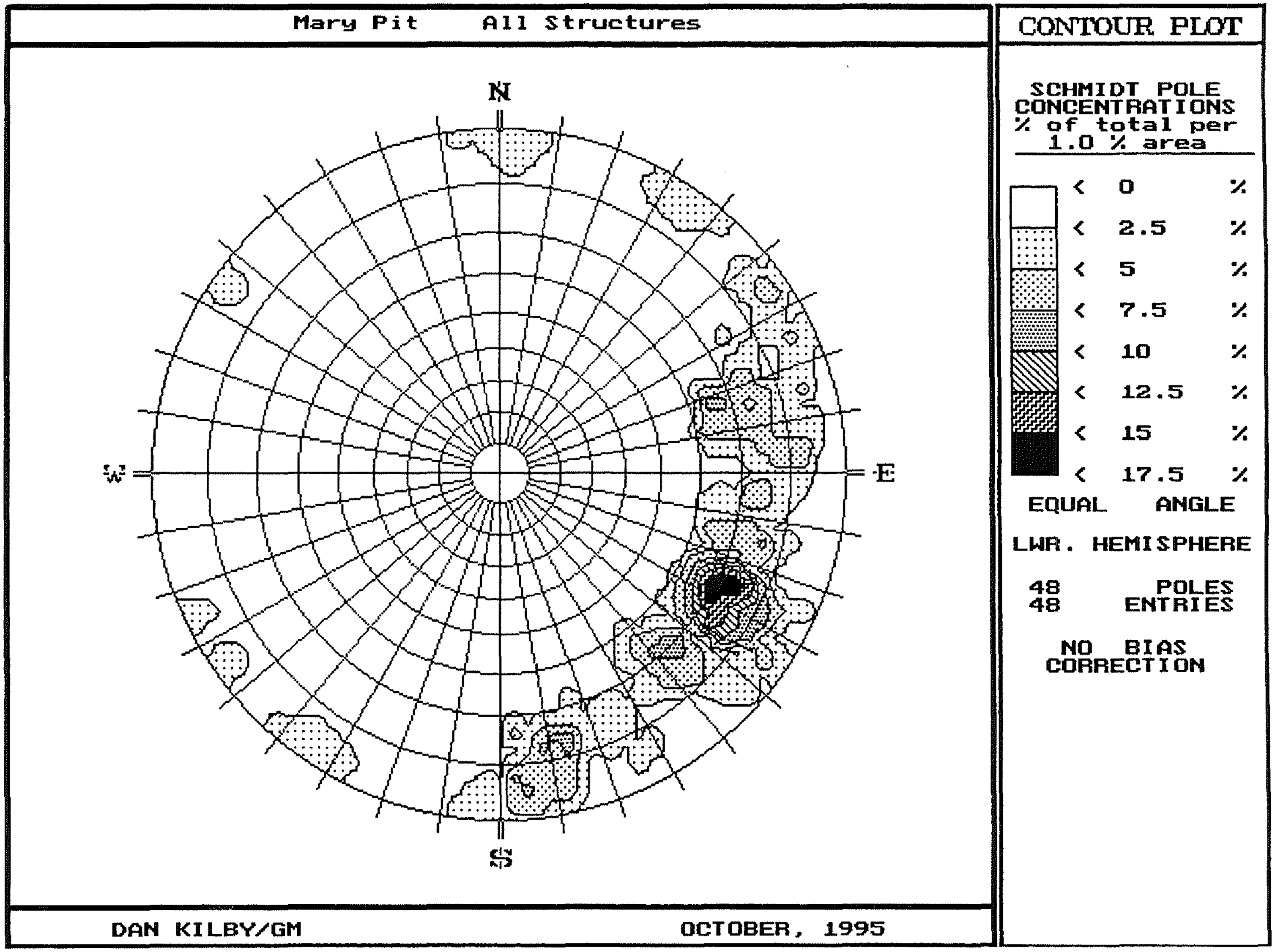


FIGURE 4

CONTOURED STEREOPLOT OF ALL STRUCTURES MEASURED IN MARY PIT AREA

MRRI/MARY DRINKWATER/NV

PROJECT NO. 953-1049.100 DRAWING NO. 54810 DATE 10/19/95 DRAWN BY TB

Golder Associates

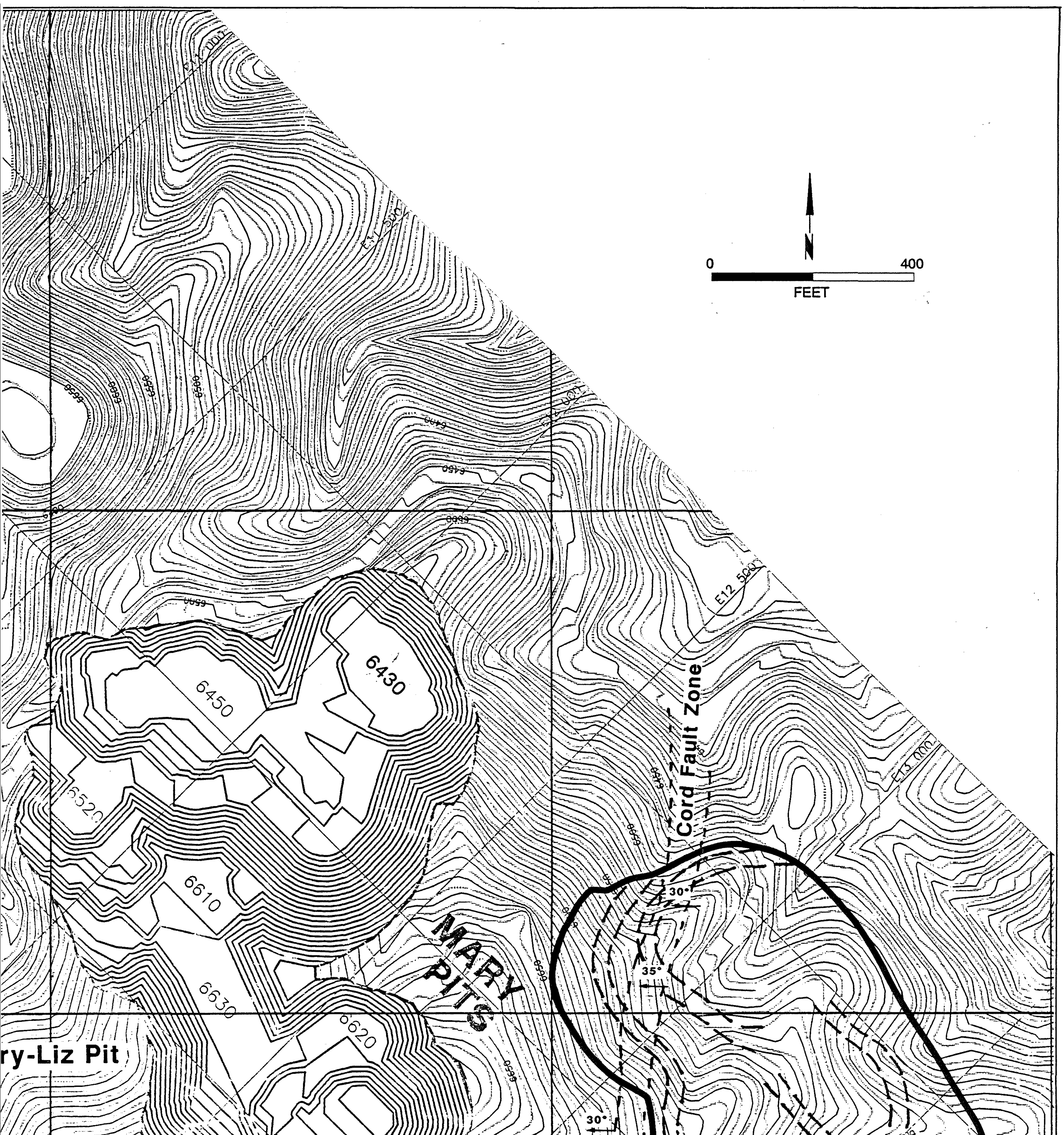
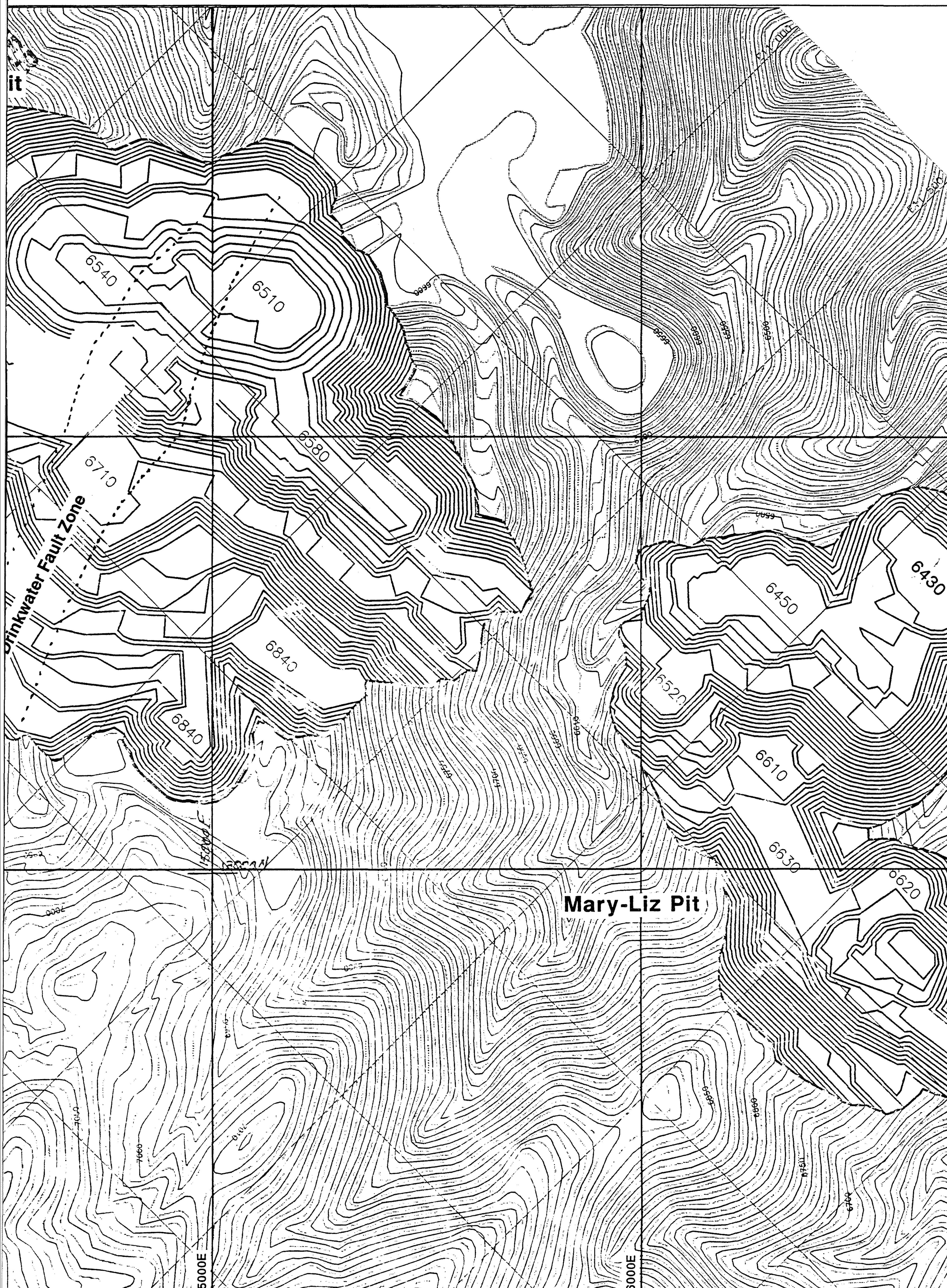
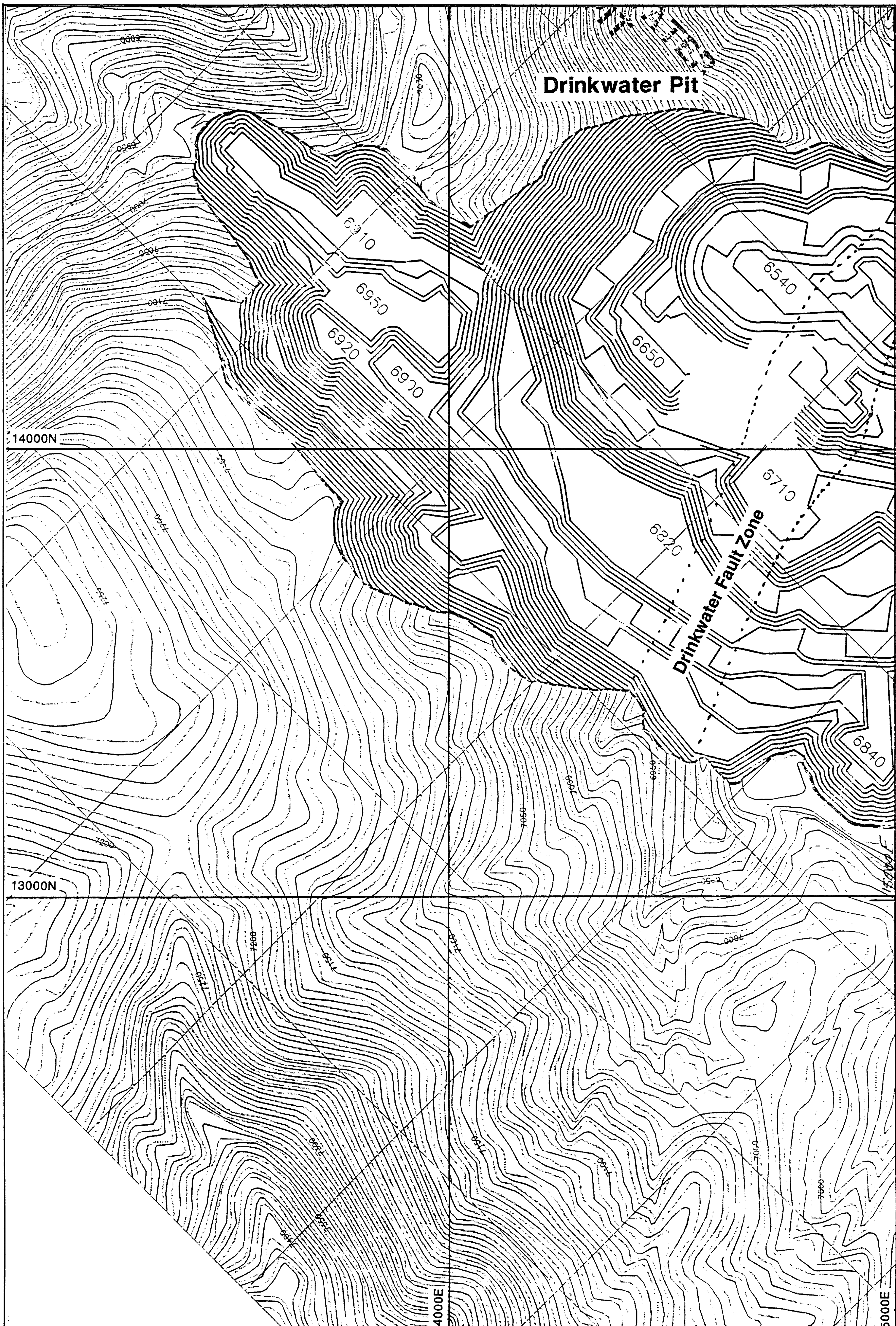


FIGURE 5
PROPOSED MARY AND DRINKWATER ULTIMATE PITS
MRRI/MARY/DRINKWATER/NV

Golder Associates



it
6540
6510
6580
6710
Drinkwater Fault Zone
6840
6840
6450
6430
6520
6610
6630
6620
Mary-Liz Pit
15000E
16000E



PROJECT NO. 953 1049.100 DRAWING NO. 63106 DATE 10/19/95 DRAWN BY EA

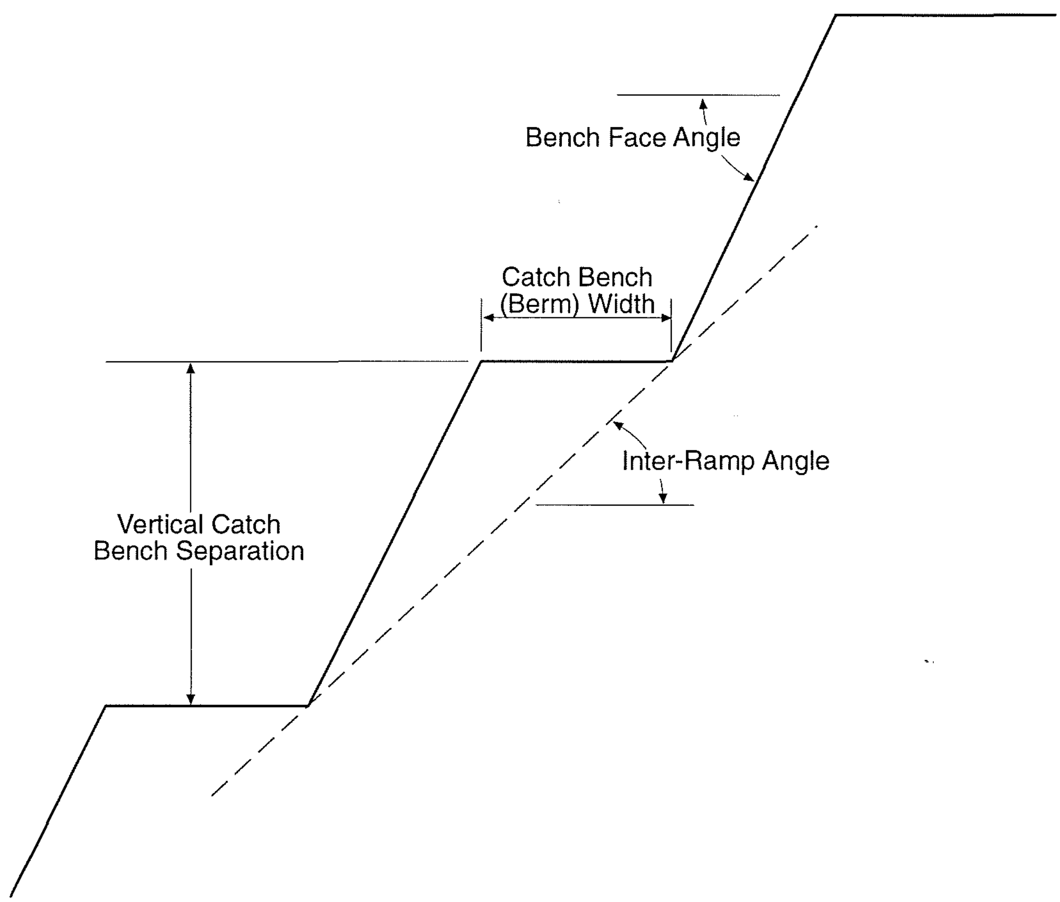


FIGURE 6
BENCH DESIGN TERMINOLOGY
MRRI/MARY DRINKWATER/NV

PROJECT NO. 953-1049.100 DRAWING NO. 54806 DATE 10/18/95 DRAWN BY TB

Golder Associates

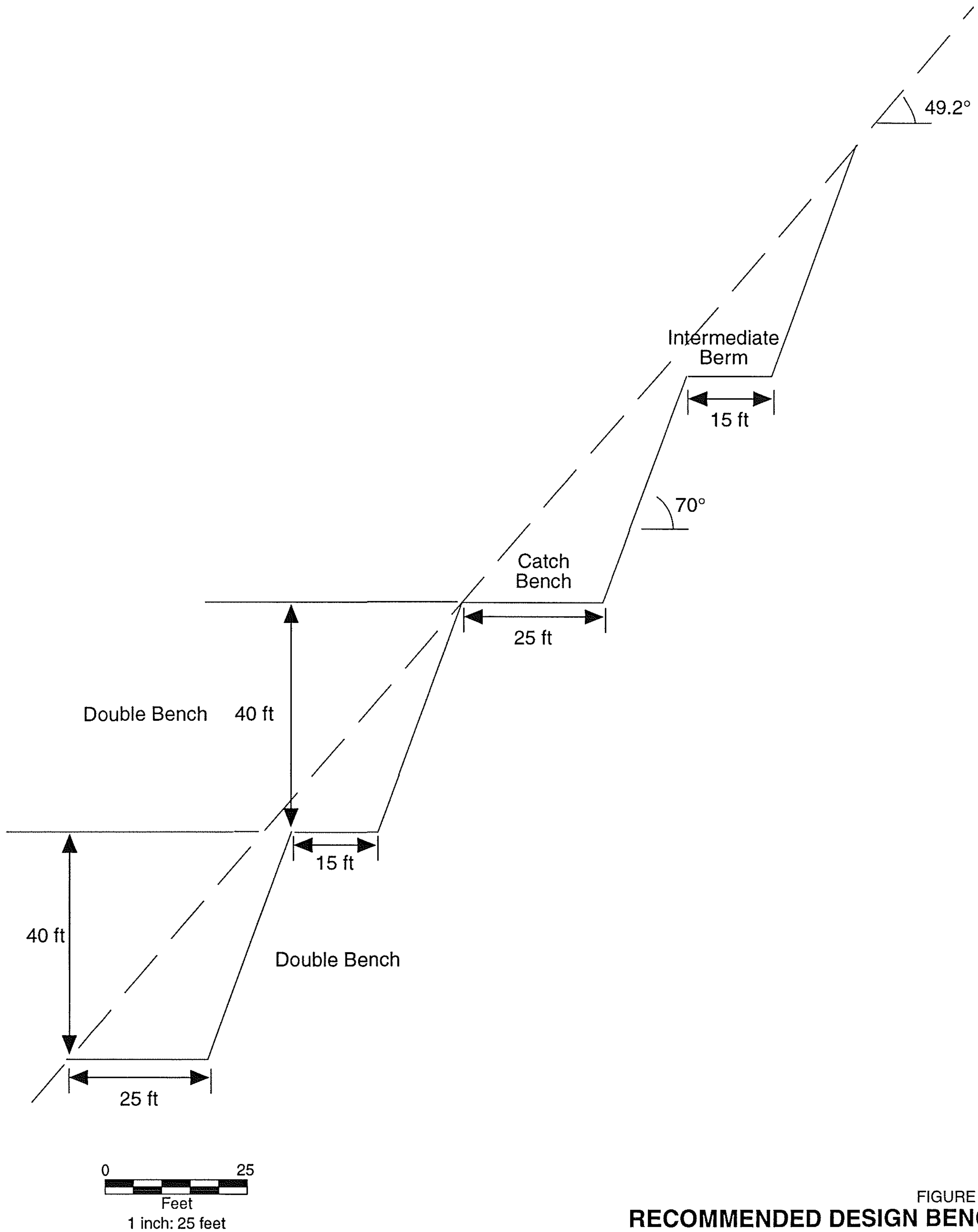


FIGURE 7
RECOMMENDED DESIGN BENCH CONFIGURATION IN COMPETENT BEDROCK
MRRI/MARY DRINKWATER/NV

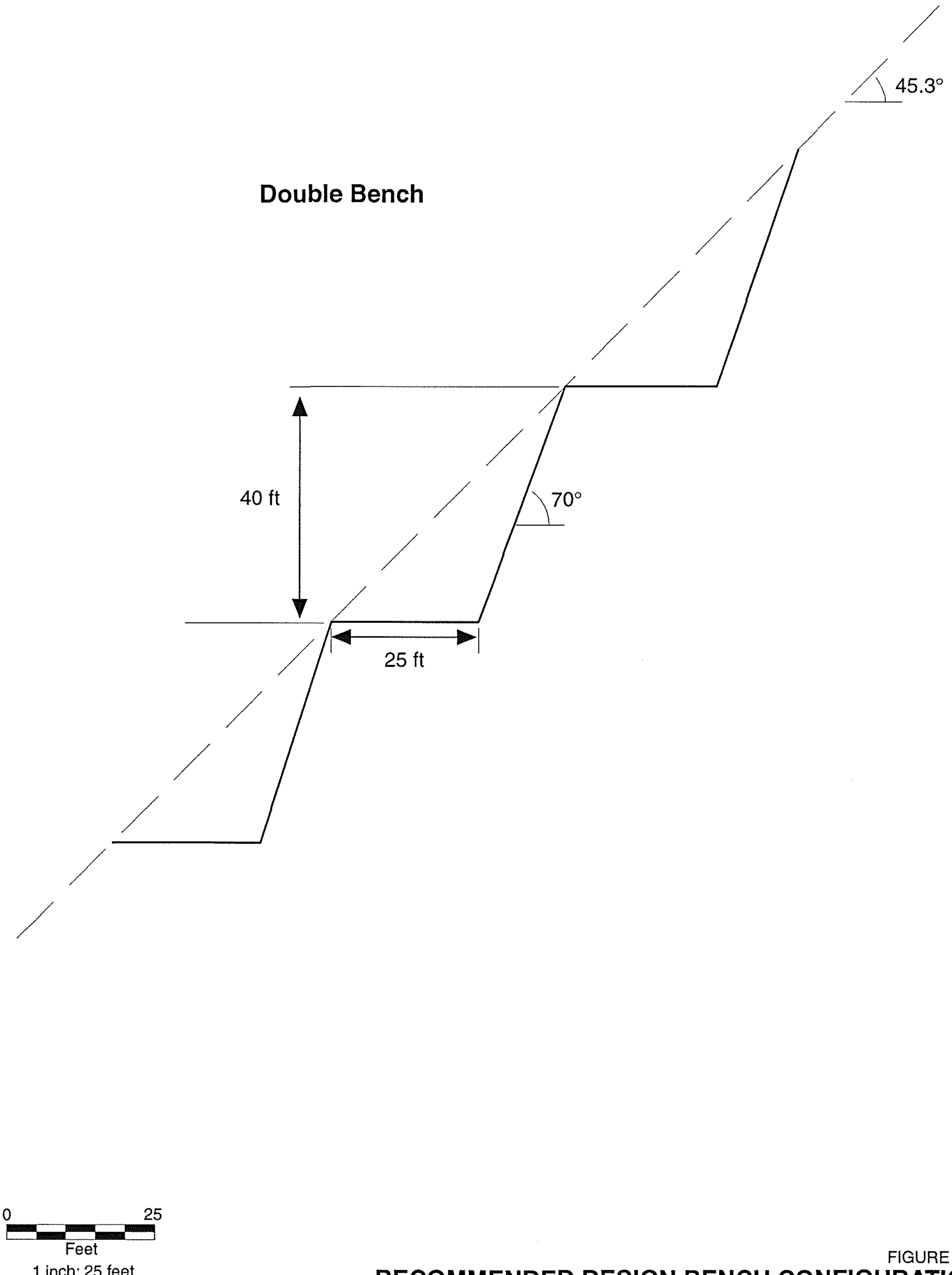


FIGURE **8**

RECOMMENDED DESIGN BENCH CONFIGURATION IN WEATHERED AND HIGHLY FRACTURED BEDROCK

MRRI/MARY DRINKWATER/NV

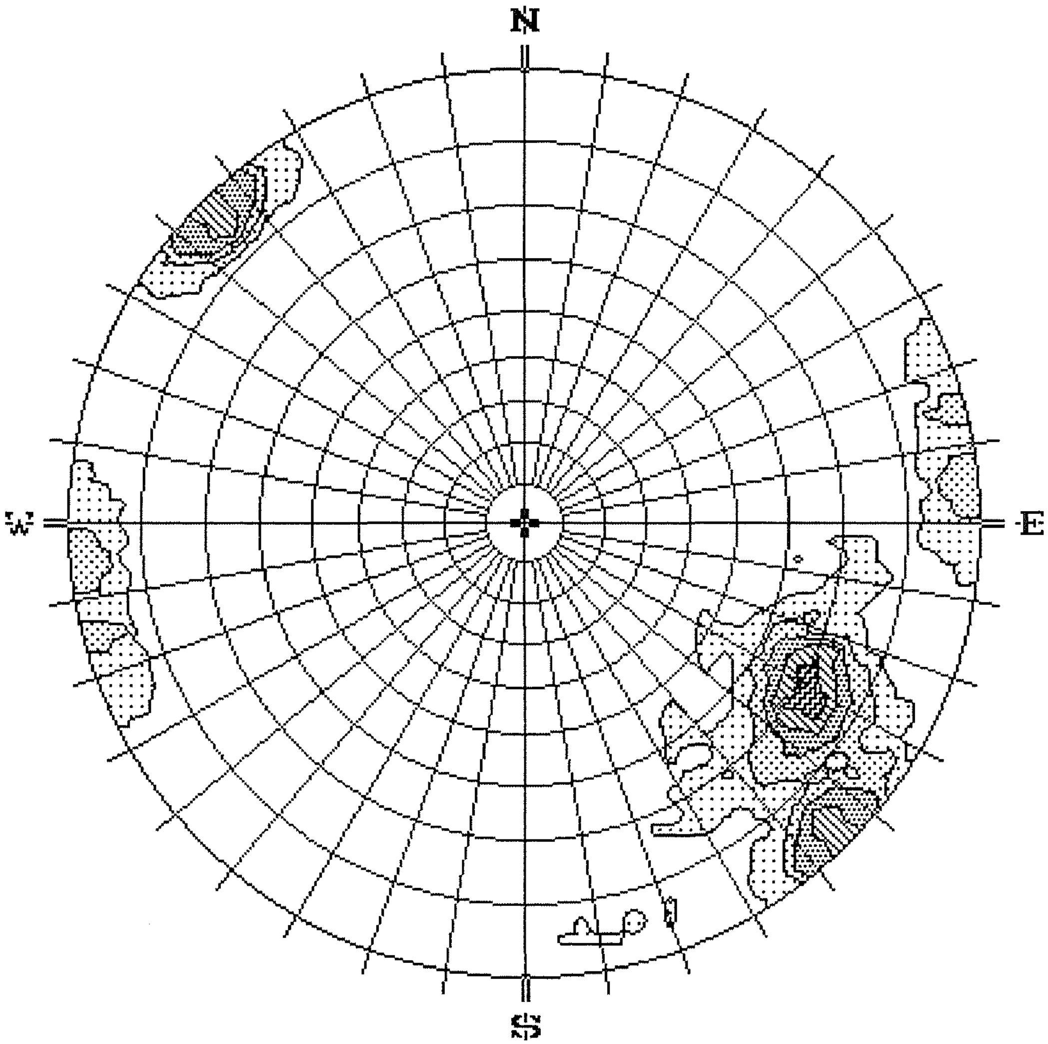
PROJECT NO. 953-1049.100 DRAWING NO. 54808 DATE 10/19/95 DRAWN BY TB

Golder Associates

ATTACHMENT A

CONTOURED STEREOPLOTS AND STRUCTURAL DATABASE

Drinkwater Pit   All Structures



DAN KILBY/GM   OCTOBER, 1995

CONTOUR PLOT

SCHMIDT POLE
CONCENTRATIONS
% of total per
1.0 % area

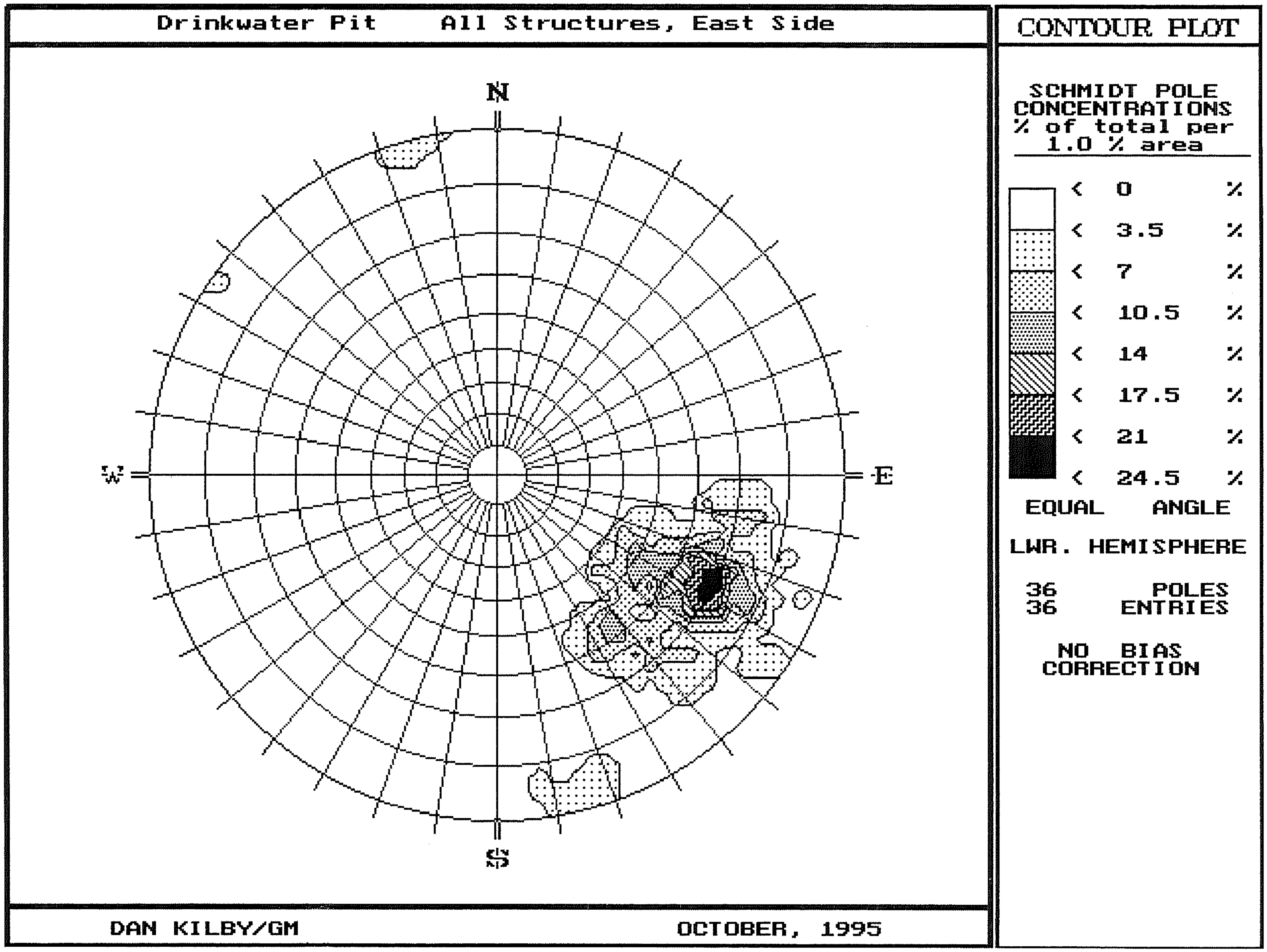
<	0 %
<	3 %
<	6 %
<	9 %
<	12 %
<	15 %
<	18 %
<	21 %

EQUAL ANGLE

LWR. HEMISPHERE

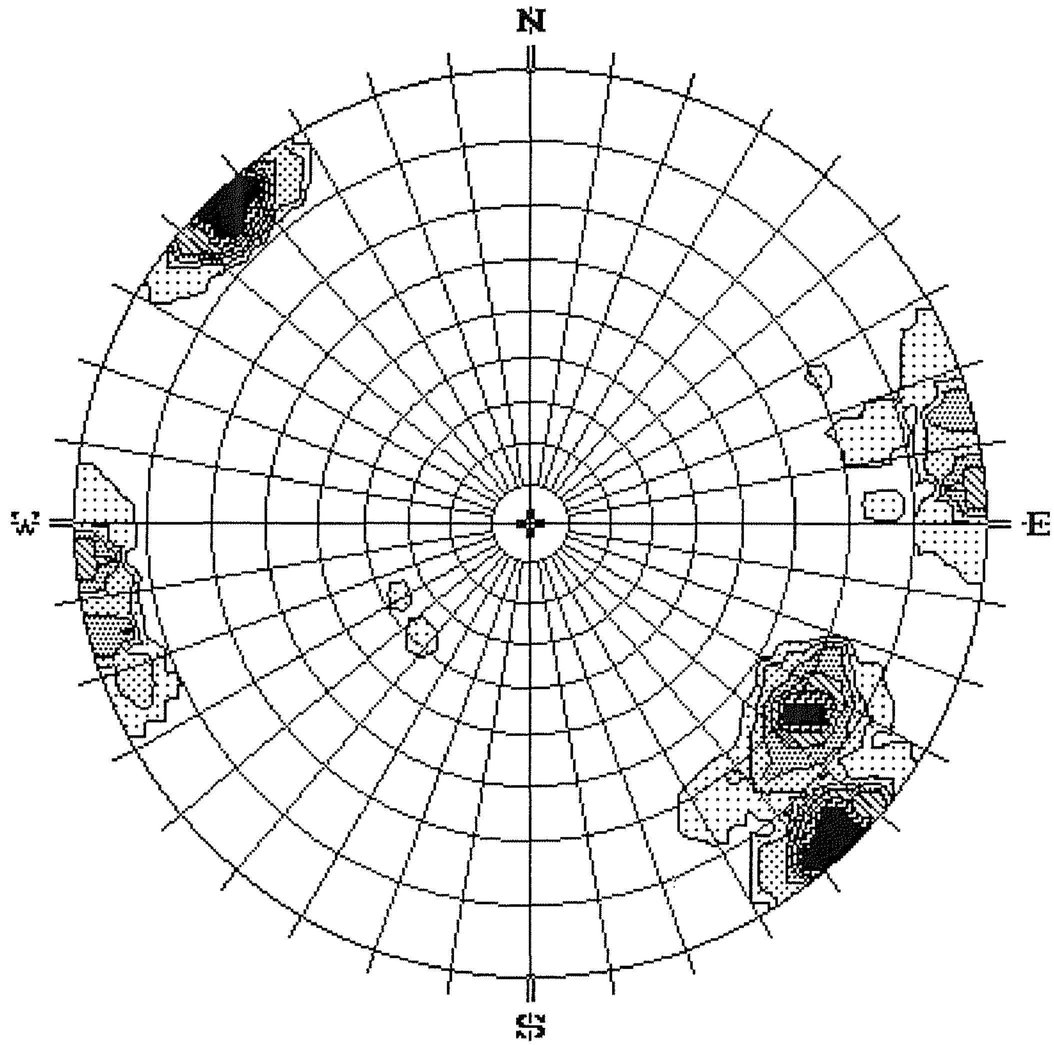
123 POLES
123 ENTRIES

NO BIAS
CORRECTION



Drinkwater Pit All Structures, East Side
N
W
E
S
DAN KILBY/GM
OCTOBER, 1995
CONTOUR PLOT
SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area
< 0 %
< 3.5 %
< 7 %
< 10.5 %
< 14 %
< 17.5 %
< 21 %
< 24.5 %
EQUAL ANGLE
LWR. HEMISPHERE
36 POLES
36 ENTRIES
NO BIAS CORRECTION

Drinkwater Pit   All Structures, West Side



DAN KILBY/GM   OCTOBER, 1995

CONTOUR PLOT

SCHMIDT POLE
CONCENTRATIONS
% of total per
1.0 % area

< 0 %
< 3 %
< 6 %
< 9 %
< 12 %
< 15 %
< 18 %
< 21 %

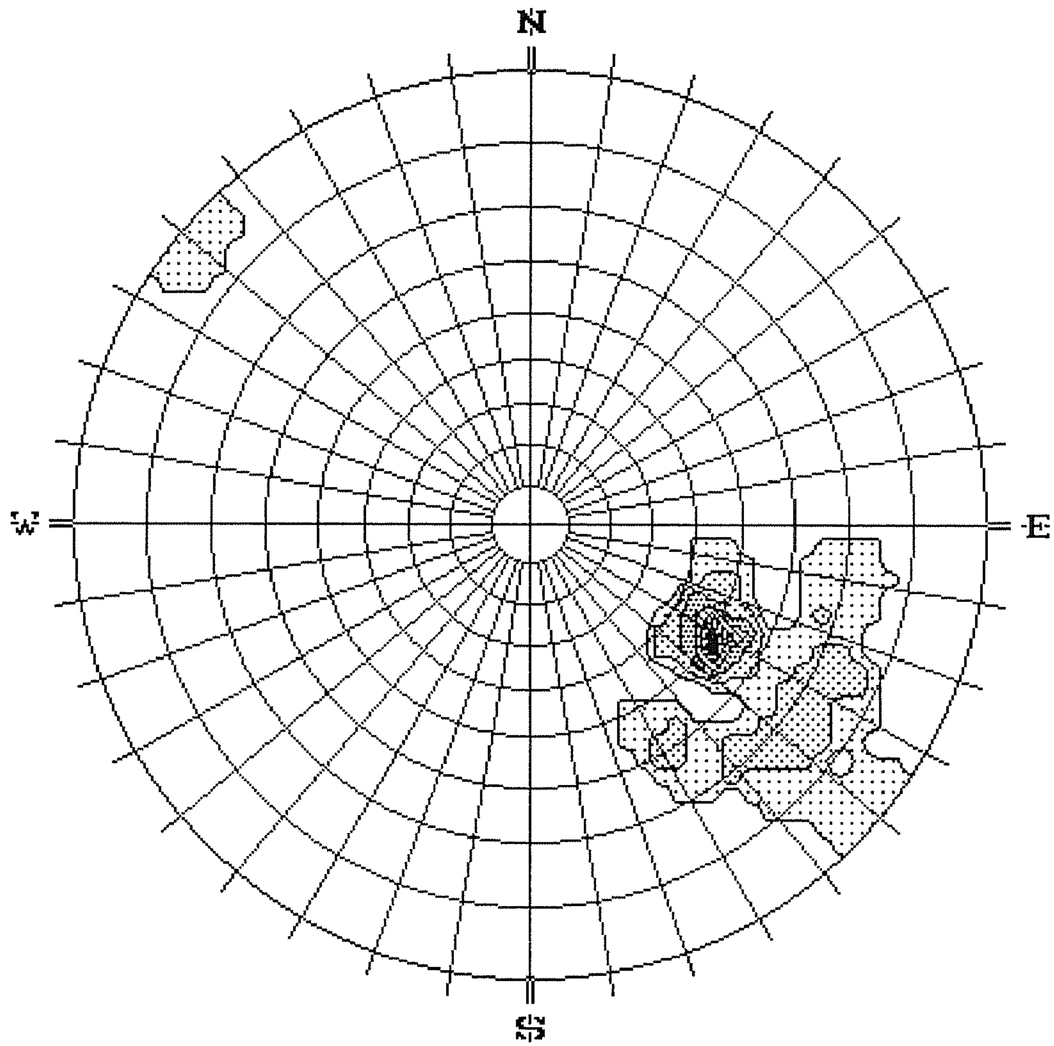
EQUAL ANGLE

LWR. HEMISPHERE

71 POLES
71 ENTRIES

NO BIAS
CORRECTION

Drinkwater Pit Upper Level, East Side



DAN KILBY/GM OCTOBER, 1995

CONTOUR PLOT

SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area

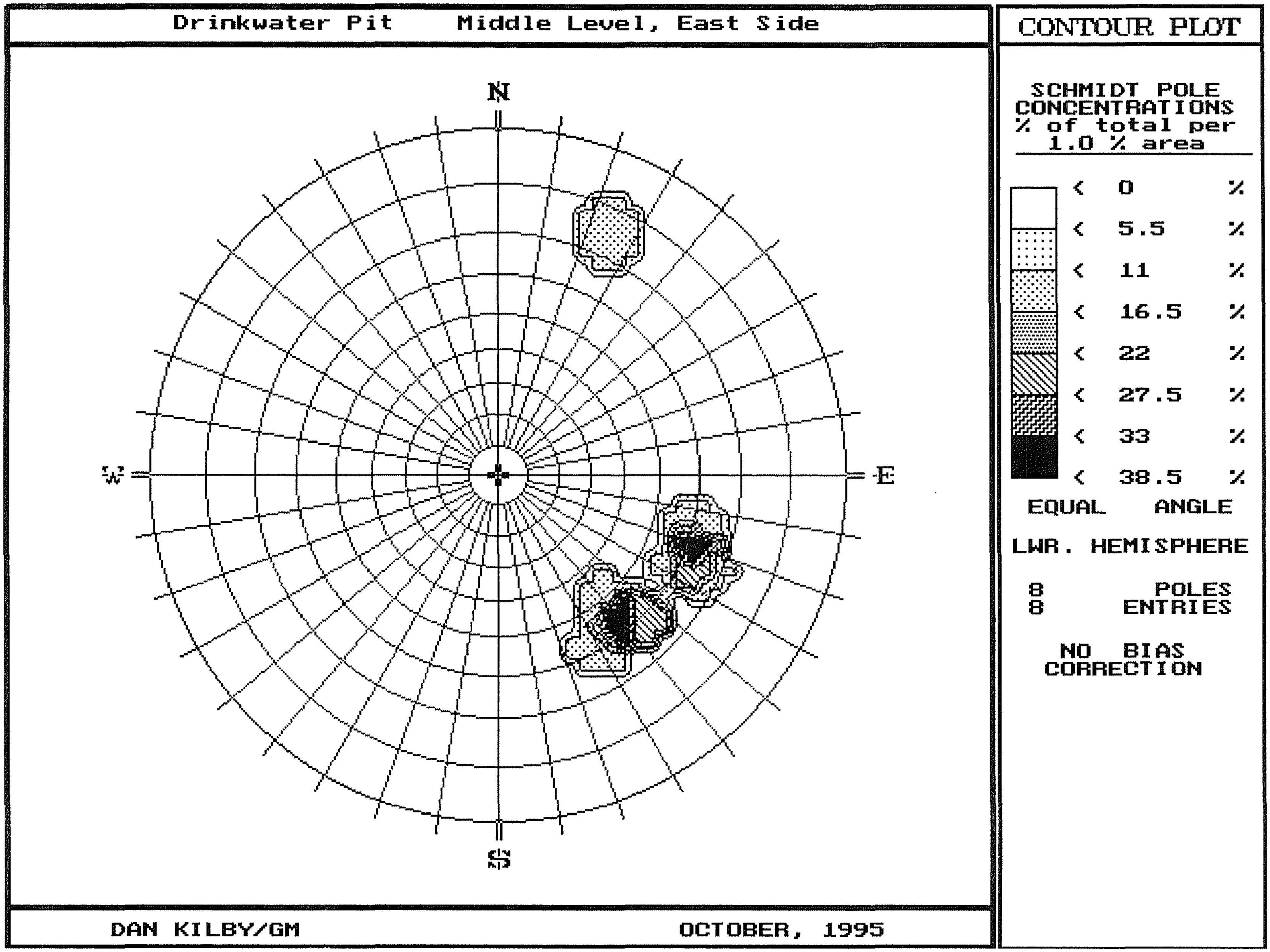
< 0 %	
< 5.5 %	
< 11 %	
< 16.5 %	
< 22 %	
< 27.5 %	
< 33 %	
< 38.5 %	

EQUAL ANGLE

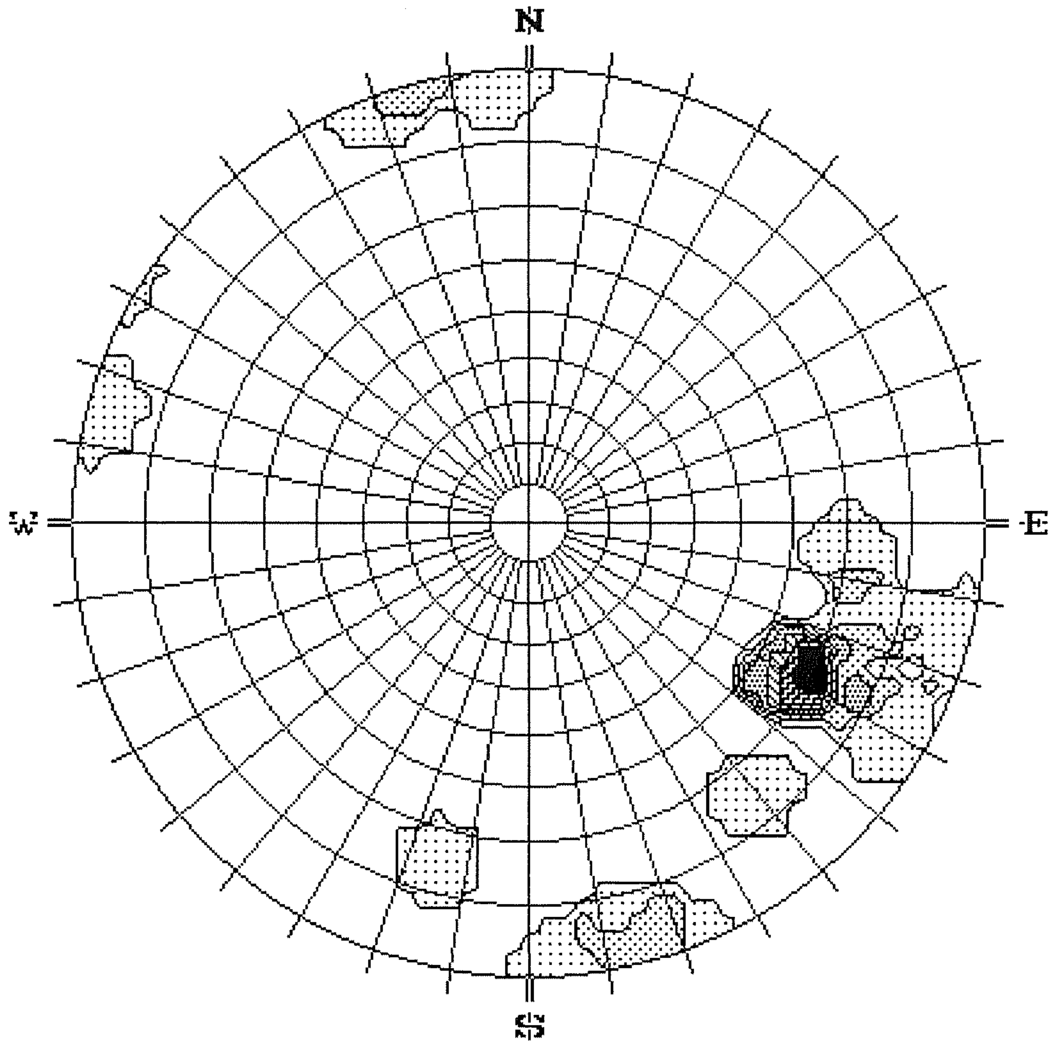
LWR. HEMISPHERE

14 POLES
14 ENTRIES

NO BIAS CORRECTION


Drinkwater Pit Middle Level, East Side
N
W
E
S
CONTOUR PLOT
SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area
< 0 %
< 5.5 %
< 11 %
< 16.5 %
< 22 %
< 27.5 %
< 33 %
< 38.5 %
EQUAL ANGLE
LWR. HEMISPHERE
8 POLES
8 ENTRIES
NO BIAS CORRECTION
DAN KILBY/GM
OCTOBER, 1995

Drinkwater Pit Lower Level, East Side



DAN KILBY/GM OCTOBER, 1995

CONTOUR PLOT

SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area

<	0 %
<	5.5 %
<	11 %
<	16.5 %
<	22 %
<	27.5 %
<	33 %
<	38.5 %

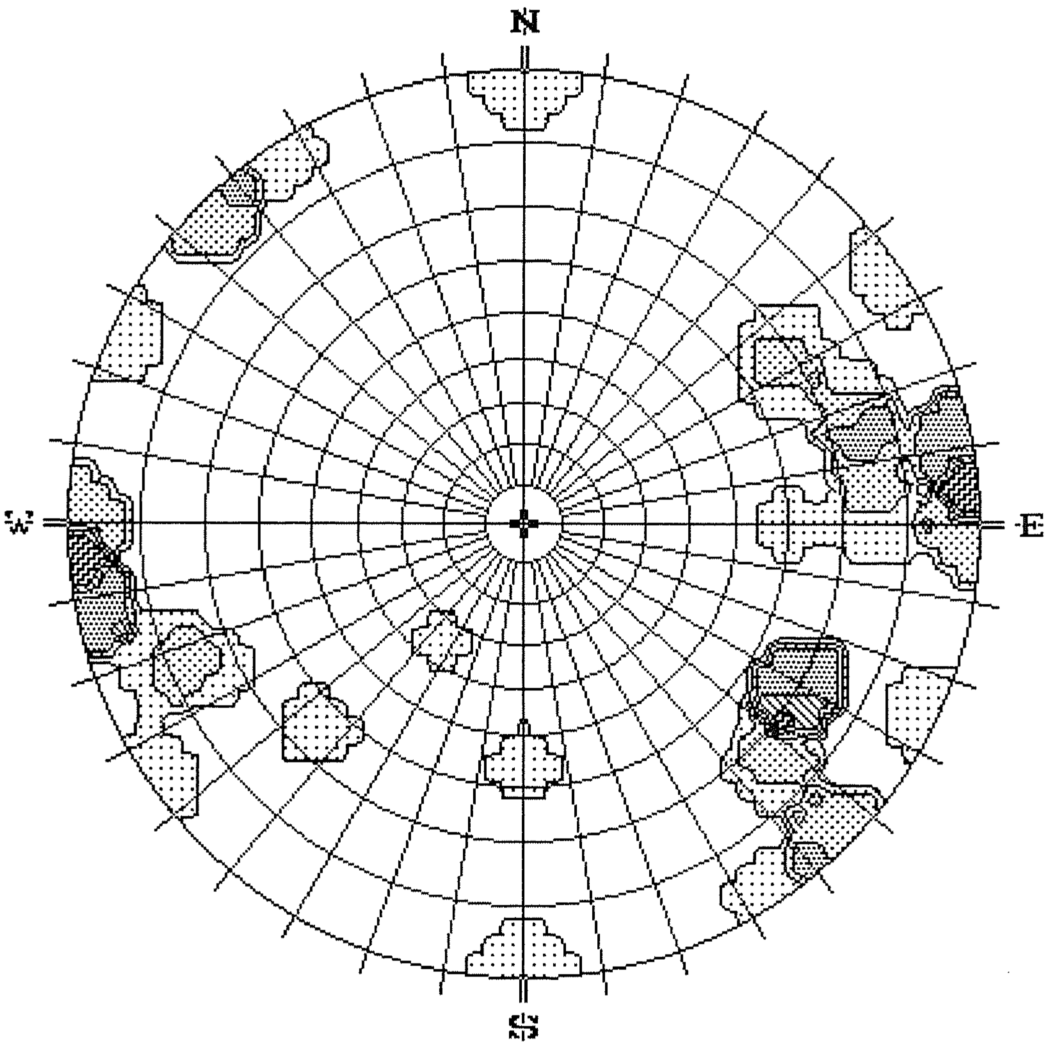
EQUAL ANGLE

LWR. HEMISPHERE

14 POLES
14 ENTRIES

NO BIAS CORRECTION

Drinkwater Pit   Upper Level, West Side



CONTOUR PLOT

SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area

<	0	%
<	3	%
<	6	%
<	9	%
<	12	%
<	15	%
<	18	%
<	21	%

EQUAL ANGLE

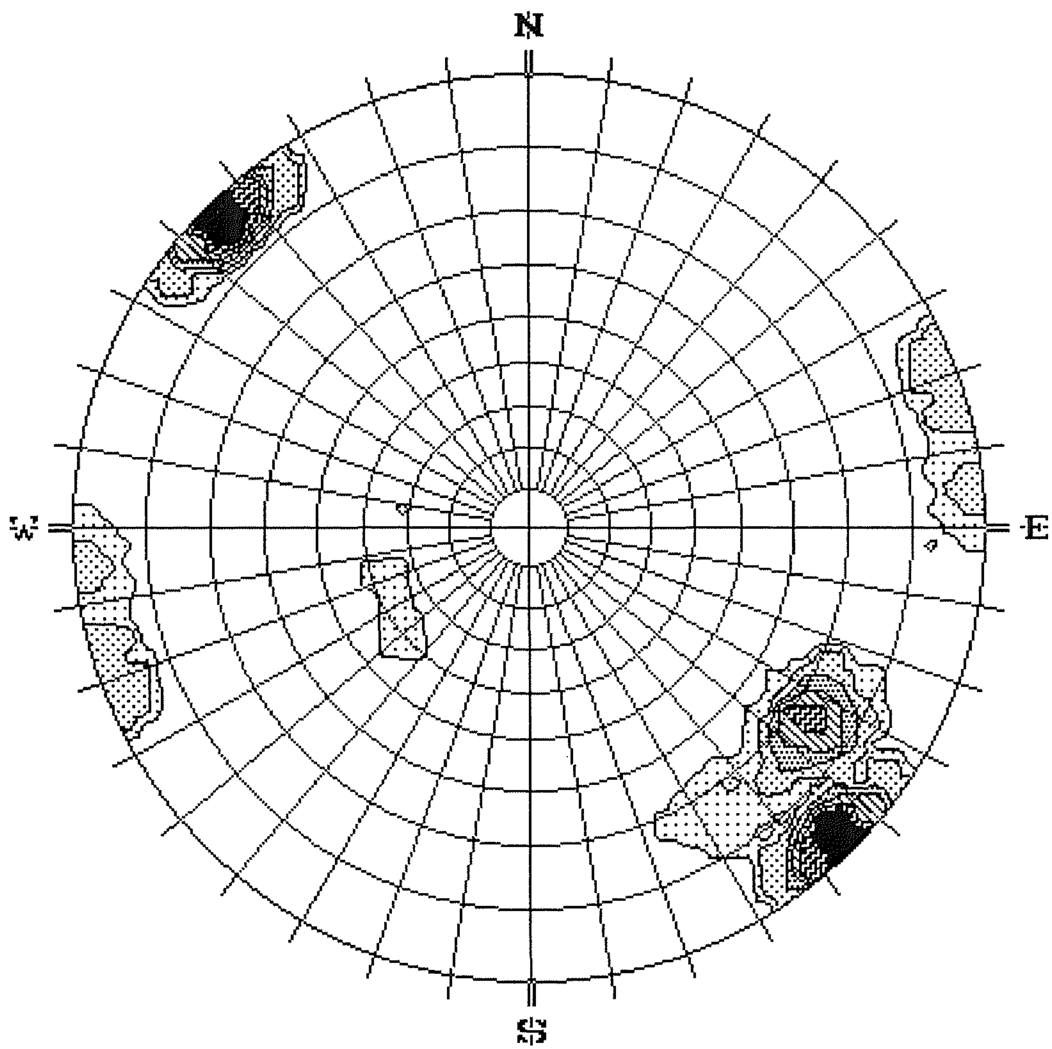
LWR. HEMISPHERE

28 POLES
28 ENTRIES

NO BIAS
CORRECTION

DAN KILBY/GM   OCTOBER, 1995

Drinkwater Pit Lower Level, West Side



CONTOUR PLOT

SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area

<	0 %
<	4 %
<	8 %
<	12 %
<	16 %
<	20 %
<	24 %
<	28 %

EQUAL ANGLE

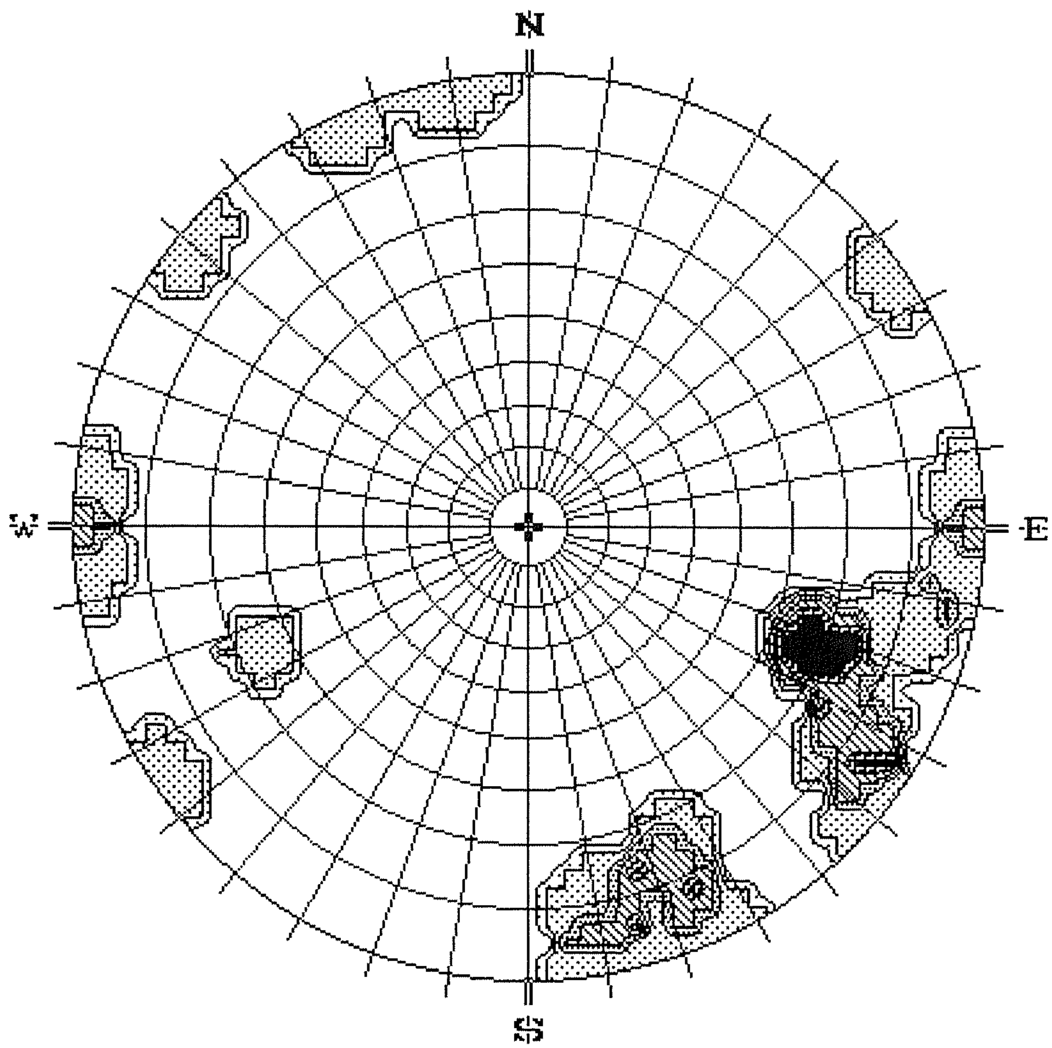
LWR. HEMISPHERE

43 POLES
43 ENTRIES

NO BIAS CORRECTION

DAN KILBY/GM OCTOBER, 1995

Drinkwater Pit Bottom



DAN KILBY/GM

OCTOBER, 1995

CONTOUR PLOT

SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area

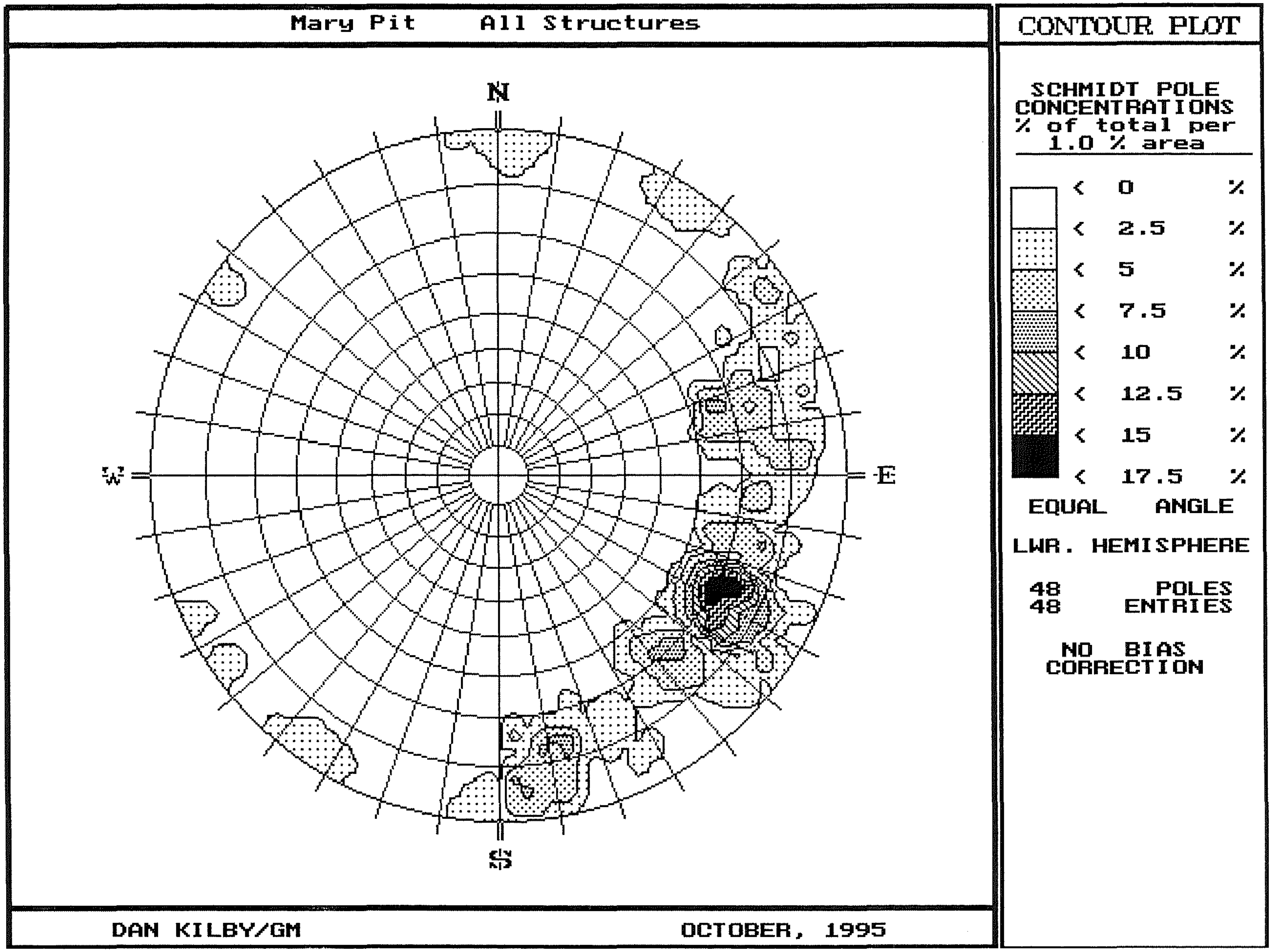
< 0 %
< 3 %
< 6 %
< 9 %
< 12 %
< 15 %
< 18 %
< 21 %

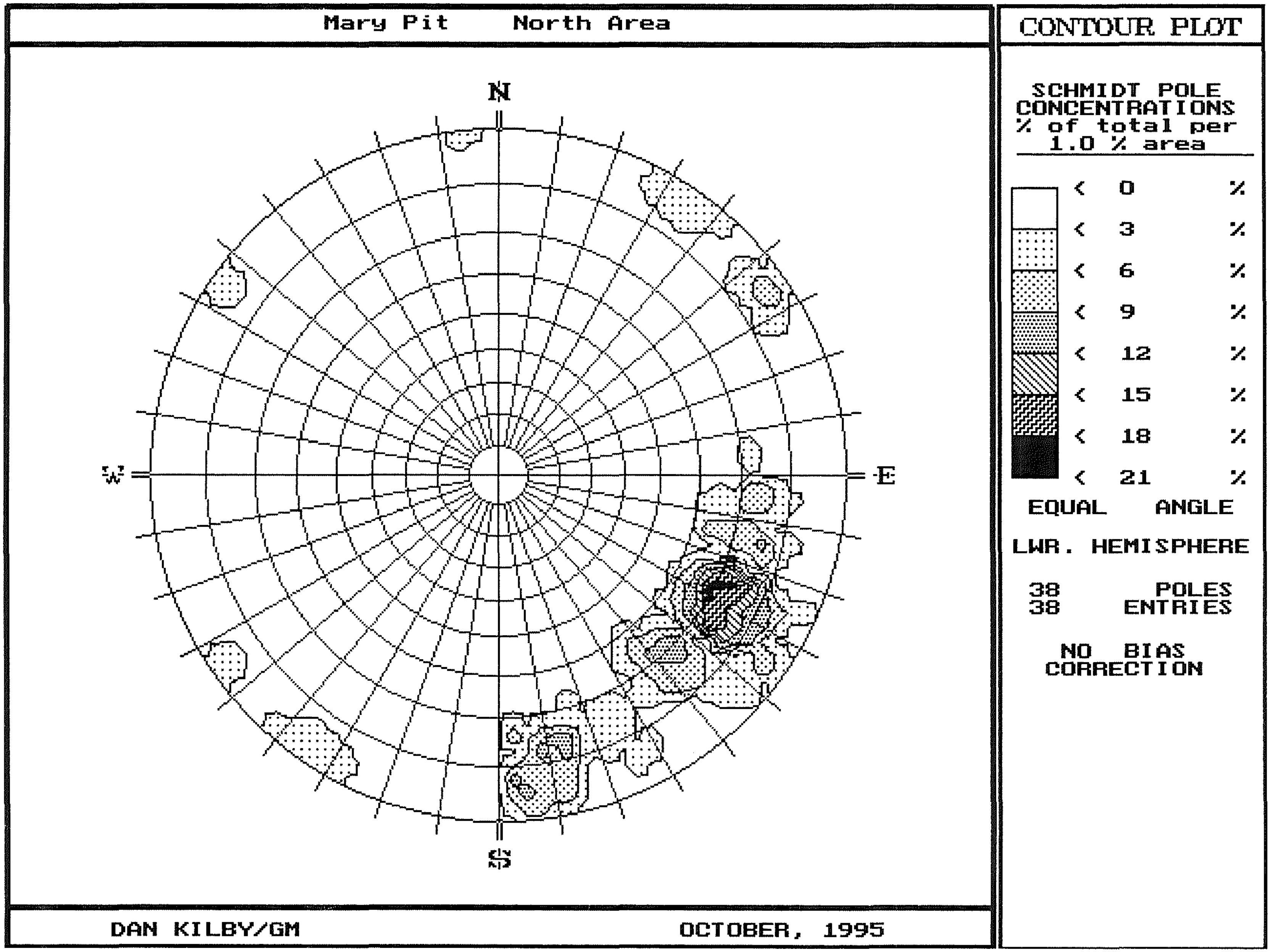
EQUAL ANGLE

LWR. HEMISPHERE

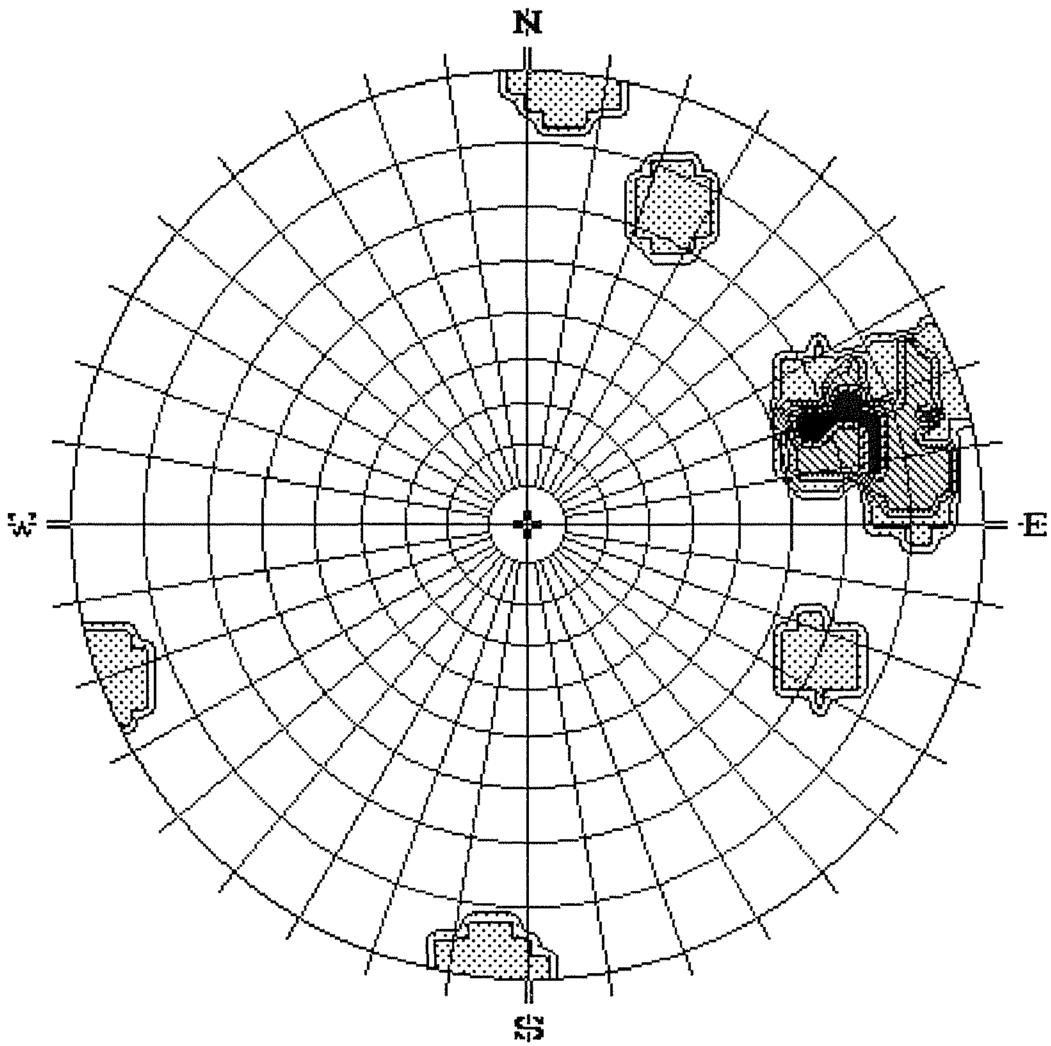
16 POLES
16 ENTRIES

NO BIAS CORRECTION


Mary Pit All Structures
N
W
E
S
DAN KILBY/GM
OCTOBER, 1995
CONTOUR PLOT
SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area
< 0 %
< 2.5 %
< 5 %
< 7.5 %
< 10 %
< 12.5 %
< 15 %
< 17.5 %
EQUAL ANGLE
LWR. HEMISPHERE
48 POLES
48 ENTRIES
NO BIAS CORRECTION


Mary Pit North Area
N
W
E
S
DAN KILBY/GM
OCTOBER, 1995
CONTOUR PLOT
SCHMIDT POLE
CONCENTRATIONS
% of total per
1.0 % area
< 0 %
< 3 %
< 6 %
< 9 %
< 12 %
< 15 %
< 18 %
< 21 %
EQUAL ANGLE
LWR. HEMISPHERE
38 POLES
38 ENTRIES
NO BIAS
CORRECTION

Mary Pit South Area



DAN KILBY/GM OCTOBER, 1995

CONTOUR PLOT

SCHMIDT POLE CONCENTRATIONS
% of total per 1.0 % area

<	0	%
<	4.5	%
<	9	%
<	13.5	%
<	18	%
<	22.5	%
<	27	%
<	31.5	%

EQUAL ANGLE

LWR. HEMISPHERE

10 POLES
10 ENTRIES

NO BIAS CORRECTION

*EXAMPLE.DIP (or LOTUS equivalent EXAMPLE.WK1) for DIPS 2.2
*Comments are permitted in the data file if * is the first character.

*Blank lines are ignored by program
*
*The first two lines are project titles;
*these will appear on the top and bottom of hard copy plots:

MINERAL RIDGE MARY/DRINKWATER PITS
DAN KILBY/GM OCTOBER, 1995

*The next line gives the number of traverse identifiers;
*Traverses are used in the program for bias correction (Terzaghi)
*If no traverse data is available or if no correction desired (program
*calculates both corrected and uncorrected values if traverses are
*specified) specify 0 traverses in the next line. This "turns off"
*the otherwise mandatory TRAVERSE column in the data file (below).
*If # of traverses =0 then do not include this column.
*If # of traverses >0 this column must be present and contain reference
*to specifed traverse numbers.

0 Traverses (note that only the numeric character is read,
* Comments are permitted on the same line.)

*The next lines contain traverse information in the form;

*traverse #;trav.orient[optional];type;orientation 1;orientation 2;title

*NOTE semi colons separating items in the string.
*Traverse # is an integer identifier

*The OPTIONAL trav. orientation can be used if data on this traverse is
*measured with a different oriantation type than the global type
*(see `data orientation type flag' below);
*The entries for this flag are the same as for the data orientation
*type flag discussed later.
*If the "trav.orient[optional]" flag is not required, simply ignore it.
*DO NOT LEAVE A BLANK space between semicolon separators.
*See manual chapter 3 for a discussion of this flag.
*
*Traverse types are LINEAR,PLANAR,BOREHOLE,BOREHOLETOP,BOREHOLEAZI
*LINEAR -> Linear scanline survey
* where: orientation1 = trend of scanline
* orientation2 = plunge of scanline
*PLANAR -> Planar 'window' survey (2 - dimensional)
* where: orientation 1 and 2 correspond to planar data
* type specified by the 'data orientation type flag'
* (ie. if flag = DIP/DIPDIRECTION, then:
* orientation1 =dip of

* survey plane
* orientation2 =dip direction
* survey plane
*BOREHOLE -> oriented core measurements
* see manual for details
*1;LINEAR;120;30;Level 3,Stope 3.A,sublevel 310
*2;PLANAR;100;10;Level 5,Stope 5.D roof before shrinkage
*3;BOREHOLE;20;145;120;borehole
*4;DIP/DIPDIRECTION;PLANAR;10;190;Level 5 Stope 5.D roof(aux data)
*For explanation of "trav.orient" DIP/DIPDIRECTION in line 4 see manual.
*The next line is 'data orientation type flag' , choices are;
*DIP/DIPDIRECTION (of plane)
*TREND/PLUNGE (of pole to plane or of linear structure)
*STRIKE/DIPL (of plane - left hand rule)
*STRIKE/DIPR (of plane - right hand rule)
*The two orientation columns must be in order consistent with this flag.
DIP/DIPDIRECTION
*The next line is for magnetic declination;
*positive value refers to west declination,
*negative value to east declination.
0 degrees (east) (note comment permitted after data)
*This next line is a flag for a quantity column in the data list;
*This lets you specify multiple data units with the same measurements.
*Choices are QUANTITY, or NO QUANTITY (note single space).
*if the flag is QUANTITY, then the 'quantity' column must be present
*if the flag is NO QUANTITY do not include a 'quantity' column
NO QUANTITY
*This data line specifies number of additional columns (up to 15)
*of data to be used for data selection and later analysis.
*Column entries may be either numeric (measurements) or alphanumeric.
*When SELECTING or TRACKING data the program will ask if the
*data is quantitative(numeric) or qualitative(alphanumeric).
*Be sure to use only one or the other in a given column.
4 extra data columns
*The next line is the header containing data titles;
*the first three are compulsory, the next two, quantity and traverse,
*can be switched off as described above.
*The order of the first 3 mandatory columns and the 4th and 5th if
*present must be as follows:

* data number ; orientation 1; orientation 2 ; quantity ; traverse # ;
*Extra data columns follow these mandatory columns.
*NOTE mandatory semicolon after each column title...
*Data title PLUS trailing semicolon specifies column width.
*Maximum column width is 18 characters but column titles and
*data labels (excluding leading and trailing spaces) less than 13
*characters are suggested for complete output in program.

number ;	dip ;	direc ;	pit ;	level ;	side ;	type ;
1	70	295	Drinkw.	upper	east	joint
2	55	300	Drinkw.	upper	east	joint
3	90	310	Drinkw.	upper	east	joint
4	55	330	Drinkw.	upper	east	shear
5	70	280	Drinkw.	upper	east	joint
6	45	285	Drinkw.	upper	east	joint
7	47	305	Drinkw.	upper	east	joint
8	70	310	Drinkw.	upper	east	joint
9	50	295	Drinkw.	upper	east	joint
10	75	300	Drinkw.	upper	east	joint
11	65	325	Drinkw.	upper	east	joint
12	55	305	Drinkw.	upper	east	joint
13	45	305	Drinkw.	upper	east	joint
14	75	315	Drinkw.	upper	east	joint
15	60	295	Drinkw.	middle	east	joint
16	60	285	Drinkw.	middle	east	joint
17	60	317	Drinkw.	middle	east	joint
18	60	315	Drinkw.	middle	east	joint
19	75	205	Drinkw.	middle	east	joint
20	65	295	Drinkw.	middle	east	joint
21	60	330	Drinkw.	middle	east	joint
22	50	320	Drinkw.	middle	east	joint
23	75	295	Drinkw.	lower	east	joint
24	85	300	Drinkw.	lower	east	joint
25	65	300	Drinkw.	lower	east	joint
26	72	300	Drinkw.	lower	east	joint
27	67	300	Drinkw.	lower	east	joint
28	90	340	Drinkw.	lower	east	joint
29	67	300	Drinkw.	lower	east	joint
30	75	15	Drinkw.	lower	east	joint
31	70	275	Drinkw.	lower	east	joint
32	90	285	Drinkw.	lower	east	joint
33	85	345	Drinkw.	lower	east	joint
34	75	320	Drinkw.	lower	east	joint
35	90	355	Drinkw.	lower	east	joint
36	75	285	Drinkw.	lower	east	joint
37	65	240	Drinkw.	upper	west	joint
38	70	235	Drinkw.	upper	west	joint
39	90	0	Drinkw.	upper	west	joint
40	75	250	Drinkw.	upper	west	joint

41	75	255 Drinkw.	upper	west	joint			
42	35	35 Drinkw.	upper	west	bedding			
43	75	270 Drinkw.	upper	west	joint			
44	75	260 Drinkw.	upper	west	joint			
45	90	270 Drinkw.	upper	west	joint			
46	55	0 Drinkw.	upper	west	joint			
47	90	295 Drinkw.	upper	west	joint			
48	70	300 Drinkw.	upper	west	joint			
49	90	325 Drinkw.	upper	west	joint			
50	90	260 Drinkw.	upper	west	joint			
51	90	260 Drinkw.	upper	west	joint			
52	75	65 Drinkw.	upper	west	joint			
53	75	315 Drinkw.	upper	west	joint			
54	80	70 Drinkw.	upper	west	joint			
55	72	310 Drinkw.	upper	west	joint			
56	90	260 Drinkw.	upper	west	joint			
57	90	315 Drinkw.	upper	west	joint			
58	90	55 Drinkw.	upper	west	joint			
59	70	300 Drinkw.	upper	west	joint			
60	90	270 Drinkw.	upper	west	joint			
61	70	300 Drinkw.	upper	west	joint			
62	90	315 Drinkw.	upper	west	joint			
63	60	270 Drinkw.	upper	west	joint			
64	65	45 Drinkw.	upper	west	shear			
65	90	315 Drinkw.	lower	west	joint			
66	90	310 Drinkw.	lower	west	joint			
67	90	310 Drinkw.	lower	west	joint			
68	90	65 Drinkw.	lower	west	joint			
69	90	315 Drinkw.	lower	west	joint			
70	70	315 Drinkw.	lower	west	joint			
71	70	300 Drinkw.	lower	west	joint			
72	90	300 Drinkw.	lower	west	joint			
73	75	305 Drinkw.	lower	west	joint			
74	90	315 Drinkw.	lower	west	joint			
75	40	45 Drinkw.	lower	west	bedding			
76	90	320 Drinkw.	lower	west	joint			
77	75	310 Drinkw.	lower	west	joint			
78	75	305 Drinkw.	lower	west	joint			
79	90	320 Drinkw.	lower	west	joint			
80	75	300 Drinkw.	lower	west	joint			
81	75	300 Drinkw.	lower	west	joint			
82	90	315 Drinkw.	lower	west	joint			
83	75	300 Drinkw.	lower	west	joint			
84	70	305 Drinkw.	lower	west	joint			
85	75	310 Drinkw.	lower	west	joint			
86	90	265 Drinkw.	lower	west	joint			
87	90	260 Drinkw.	lower	west	joint			
88	75	275 Drinkw.	lower	west	joint			
89	70	330 Drinkw.	lower	west	joint			

90	75	325	Drinkw.	lower	west	joint			
91	90	315	Drinkw.	lower	west	joint			
92	90	250	Drinkw.	lower	west	joint			
93	90	325	Drinkw.	lower	west	joint			
94	90	250	Drinkw.	lower	west	joint			
95	90	320	Drinkw.	lower	west	joint			
96	90	250	Drinkw.	lower	west	joint			
97	75	330	Drinkw.	lower	west	joint			
98	90	310	Drinkw.	lower	west	joint			
99	75	315	Drinkw.	lower	west	joint			
100	90	260	Drinkw.	lower	west	joint			
101	90	320	Drinkw.	lower	west	joint			
102	40	70	Drinkw.	lower	west	bedding			
103	35	70	Drinkw.	lower	west	bedding			
104	25	95	Drinkw.	lower	west	bedding			
105	40	50	Drinkw.	lower	west	bedding			
106	37	105	Drinkw.	lower	west	bedding			
107	90	270	Drinkw.	lower	west	shear			
108	90	275	Drinkw.	bottom		joint			
109	90	265	Drinkw.	bottom		joint			
110	90	310	Drinkw.	bottom		joint			
111	90	350	Drinkw.	bottom		joint			
112	80	285	Drinkw.	bottom		joint			
113	90	235	Drinkw.	bottom		joint			
114	80	350	Drinkw.	bottom		joint			
115	65	65	Drinkw.	bottom		joint			
116	80	300	Drinkw.	bottom		shear			
117	65	292	Drinkw.	bottom		joint			
118	70	295	Drinkw.	bottom		joint			
119	80	305	Drinkw.	bottom		joint			
120	90	335	Drinkw.	bottom		joint			
121	75	335	Drinkw.	bottom		joint			
122	80	340	Drinkw.	bottom		joint			
123	68	290	Drinkw.	bottom		joint			
124	70	245	Mary		south	joint			
125	70	255	Mary		south	joint			
126	75	205	Mary		south	joint			
127	90	250	Mary		south	joint			
128	65	255	Mary		south	joint			
129	80	260	Mary		south	joint			
130	80	265	Mary		south	joint			
131	90	5	Mary		south	joint			
132	80	250	Mary		south	joint			
133	70	295	Mary		south	joint			
134	90	230	Mary		north	joint			
135	75	340	Mary		north	joint			
136	75	315	Mary		north	joint			
137	80	310	Mary		north	joint			
138	75	300	Mary		north	joint			

139	90	35 Mary	north	joint			
140	60	330 Mary	north	joint			
141	78	335 Mary	north	joint			
142	70	320 Mary	north	joint			
143	90	35 Mary	north	joint			
144	75	280 Mary	north	joint			
145	85	350 Mary	north	joint			
146	75	300 Mary	north	joint			
147	80	352 Mary	north	shear			
148	70	350 Mary	north	joint			
149	68	300 Mary	north	joint			
150	60	280 Mary	north	joint			
151	82	350 Mary	north	joint			
152	82	290 Mary	north	joint			
153	72	5 Mary	north	joint			
154	90	300 Mary	north	joint			
155	67	260 Mary	north	joint			
156	60	20 Mary	north	joint			
157	70	290 Mary	north	joint			
158	73	300 Mary	north	joint			
159	77	300 Mary	north	joint			
160	72	320 Mary	north	joint			
161	80	235 Mary	north	joint			
162	62	300 Mary	north	joint			
163	77	270 Mary	north	joint			
164	90	200 Mary	north	joint			
165	90	310 Mary	north	joint			
166	70	280 Mary	north	joint			
167	70	300 Mary	north	joint			
168	65	315 Mary	north	joint			
169	90	0 Mary	north	shear			
170	90	330 Mary	north	joint			
171	90	240 Mary	north	joint			
-1							

Appendix B-2- 2011 Open Pit Geotechnical Report

AMEC Earth & Environmental
2000 S. Colorado Blvd., Suite 2-1000
Denver, Colorado 80222
www.amec.com

Mineral Ridge Open Pit Geotechnical Report
Feasibility Study Level

Submitted to:

Scorpio Gold US Corp.

Submitted by:

AMEC Earth & Environmental,
2000 S. Blvd., Suite 2-1000
Denver, Colorado 80222

January 2011

TABLE OF CONTENTS

Page

1.0 INTRODUCTION AND SCOPE OF WORK ... 1

2.0 GENERAL SETTING ... 2
2.1 Mineral Ridge Mine Setting ... 2
2.2 Geologic Setting ... 3
2.2.1 Local Geology ... 4

3.0 GEOTECHNICAL SITE INVESTIGATION PROGRAM ... 11
3.1 General ... 11
3.2 Structural Controls ... 11
3.3 Existing Pit Slope Measurements ... 13

4.0 OPEN PIT DESIGN ... 15
4.1 General ... 15
4.2 Geotechnical Domains ... 17
4.3 Bench Design - Kinematic Analysis ... 18
4.3.1 Design Sector 1 ... 18
4.3.2 Design Sector 2 ... 19

5.0 CONCLUSIONS AND RECOMMENDATIONS ... 20

6.0 LIMITATIONS AND CLOSURE ... 21

IMPORTANT NOTICE

This report was prepared exclusively for Scorpio Gold by AMEC Earth & Environmental, a wholly owned subsidiary of AMEC Americas. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

1.0 INTRODUCTION AND SCOPE OF WORK

AMEC Earth & Environmental (AMEC) was commissioned by Scorpio Gold (Scorpio) to carry out the open pit geotechnical design for the Drinkwater and Mary Open Pits as part of the Feasibility Study for the Mineral Ridge Project. The Mineral Ridge Project is located in western Nevada, near the town of Silver Peak. The Mineral Ridge Project is located within an historic mining district, and includes the existing Drinkwater Open Pit and the Mary Underground Mine.

This report presents the summary of the site investigation program completed in 2010 and the geotechnical recommendations for the open pit design for the Mineral Ridge Project.

Prior to this study, two Feasibility-Level studies were completed at Mineral Ridge. Golder (1999) completed a pit slope design study. This study was based on observations and field mapping of structural features within the Drinkwater Pit. The Golder study recommended pit slopes be developed with 70 degree BFA, 20 foot bench heights, and 15 foot bench widths. The recommended inter-ramp slope angles (IRA) ranged from 49 degrees (for competent rock) to 45 degrees (for fractured rock).

GeoSolutions (2008) completed a slope stability assessment on the existing and potential pit slopes, focusing primarily on bench-scale failures. The pit slope stability assessment considered 45 different pit slope faces, and developed pit slope designs to achieve a factor of safety of 1.3.

The current study integrates information from the previous Golder and GeoSolution studies, with site observations and bench-scale mapping completed in the Drinkwater Pit, observations from the Mary Underground Mine, and outcrop mapping in the Potential Mary Open Pit area.

2.0 GENERAL SETTING

2.1 Mineral Ridge Mine Setting

The Mineral Ridge Property is located in Esmeralda County, Nevada, 30 miles west of Tonopah, near the town of Silver Peak. A general site location map is shown in Figure 2.1.

Gold and silver mineralization was discovered in the Silver Peak area in the 1860s. Since then, the area was intermittently mined using both small-scale surface and underground mining methods. The primary underground mines in the area were the Drinkwater, Crowning Glory, Homestead, Western Soldier, and Last Chance mines. More recently, open pit methods have been employed with the development of the current Drinkwater Pit.

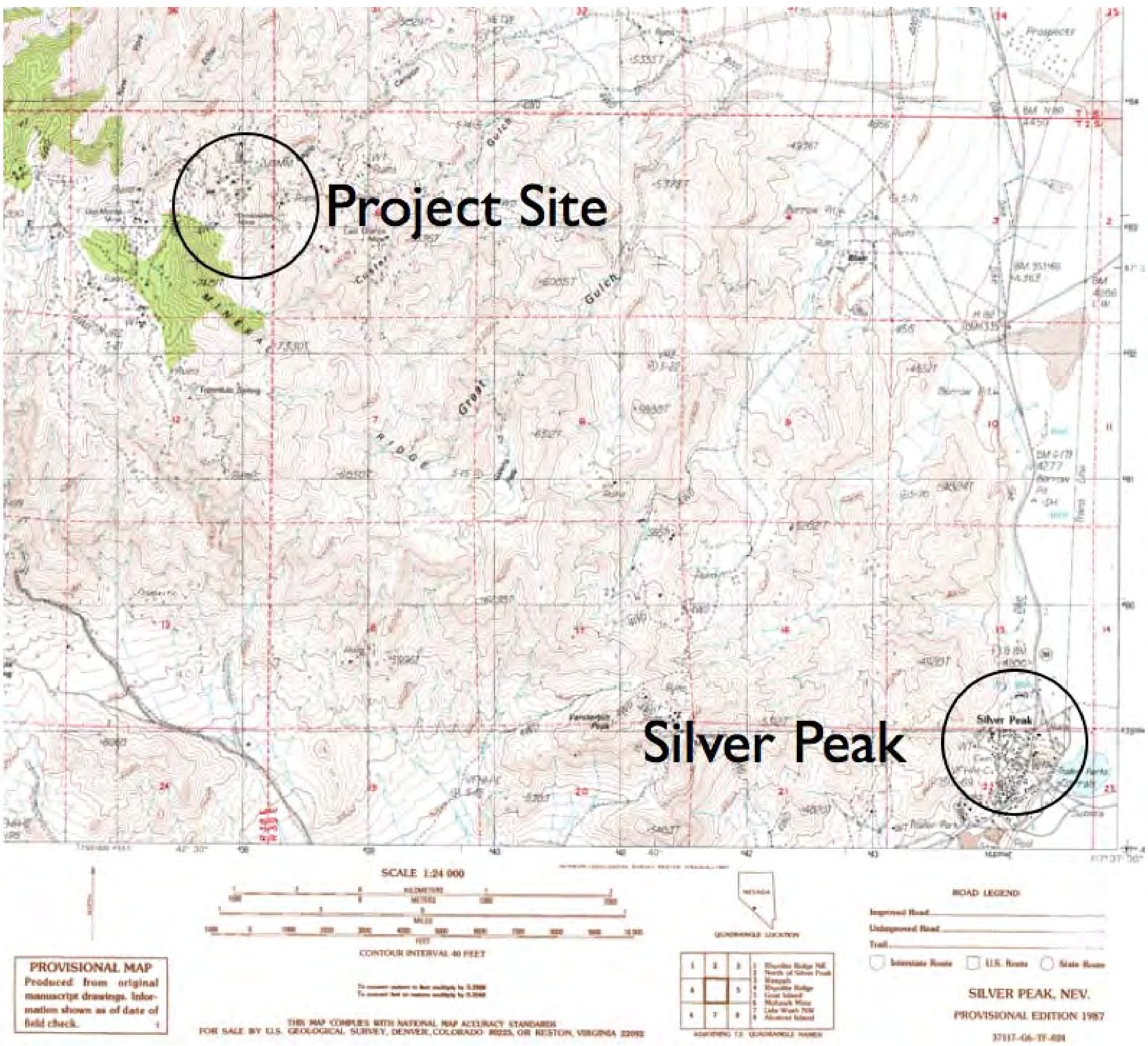


Figure 2.1 Project Location

The Drinkwater Pit was inactive during the time of the site visit, but the benches were accessible for inspection and mapping. The pit is approximately 2,000 feet long by 1,500 feet wide. The western pit highwall is approximately 300 feet high, while the northern highwall is approximately 225 feet. The eastern side of the pit abuts a waste rock dump. A general plan map of the Drinkwater Pit is presented in Figure 2.2.

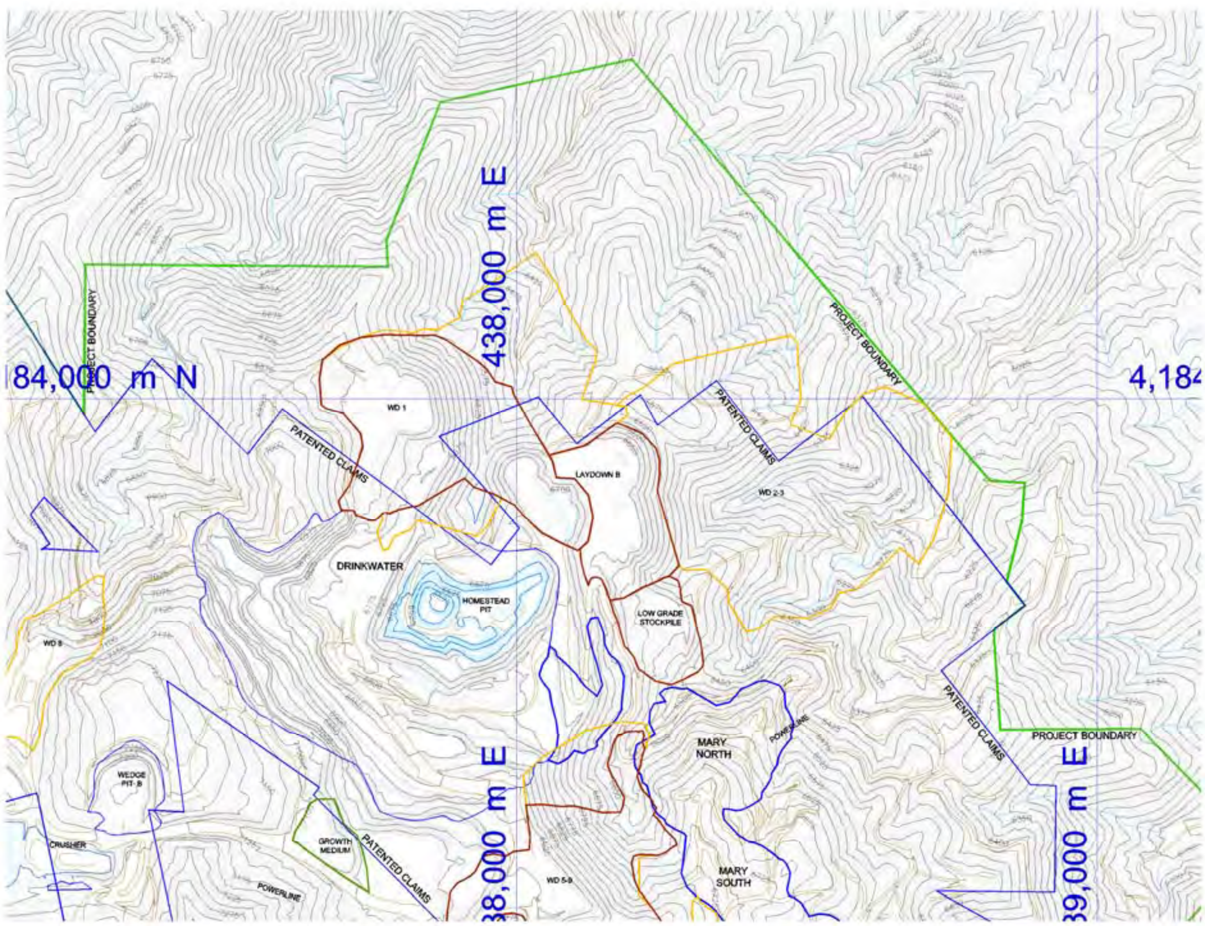


Figure 2.2 Existing Drinkwater Pit

2.2 Geologic Setting

2.2.1 Local Geology

Mineral Ridge is part of the eastern flank of the Silver Peak Range, and is primarily comprised of Precambrian meta-sedimentary rocks, with scattered outcrops of Cambrian and Precambrian sedimentary rocks and Tertiary sedimentary and volcanic rocks. The Precambrian rocks consist of calc-silicate schists, mica schists, marbles, and quartzites that are part of the Wyman Formation and Reed Formation of the White Mountains of California (Albers and Stewart, 1962; McKee and Moiola, 1962). These units have been intruded by granites and complexly folded and metamorphosed in pre-Tertiary time.

As reported in Spur (1906), the prevalent intrusive rock is alaskite, which gradually transitions into quartz veins. Gold mineralization occurs within the Wyman Formation as auriferous quartz veins intruded into metamorphosed slaty limestones. The majority of the wall rock for the Drinkwater and proposed Mary open pits will be developed within the Wyman Formation.

Based on the geologic information presented in Spur (1906) and Golder (1999), the general stratigraphic section for the area includes the following primary units of the Wyman Formation:

- **Lower Unit**: This unit includes the Mary Limestone that has been intruded by alaskite and pegmatites. Minor occurrences of phyllite, diabase, and mylonite are also present within this unit. This unit has been folded and sheared. It is noted that low angle shearing is prominent in this unit.

- **Middle Unit**: The lower unit is overlain by a series of calc-silicates, phyllites, dolomitic limestones and quartzites. This unit has not been folded or sheared to the same extent as the lower unit.

- **Upper Unit**: The middle unit is overlain by slates and dark limestones. The structural deformation is similar to the middle unit.

In a structural sense, the Wyman Formation has been significantly altered by intrusions, metamorphism, folding, and faulting. Intrusions of alaskite and pegmatite are present throughout the formation. Folding and low-angle thrusting occurred in the formation from the Jurassic through the Tertiary (Spur, 1906) as part of the Sierra Nevada mountain-building processes.

The primary fault in the Drinkwater Pit area is the Drinkwater Fault, which strikes approximately N20E and dips 70 degrees to the west. The fault is not a single structural element, but rather a set of high-angle faults that course through the pit area. A photograph of one of the fault structures associated with the Drinkwater Fault is shown in Figure 2.3.

In the Mary Underground, the primary structural feature is the Cord Fault (see Figure 2.4), a clay filled structure that strikes North-South with a dip of 35 degrees to the west. Based on the latest pit layouts, it is unlikely the Cord Fault will have any influence on the Mary Pit slope designs.

The fabric of the rock mass is expressed in jointing and pronounced foliation. Local bench-scale mapping completed during the site visit and data from previous investigations (Golder, 1999) indicate there are two primary features reflected in the rock mass fabric, jointing and foliation. Jointing within the Wyman Formation occurs as clean, planar to rough joints (Jr of 1.0 to 1.5) that are oriented parallel to the Drinkwater Fault. Typical jointing in the Drinkwater Pit area and Mary underground is shown in Figures 2.5 and 2.6. It is important to note that the rock mass jointing is relatively free of any alteration, with the exception of the Cord Fault.

Figure 2.3 Drinkwater Fault Exposures

Figure 2.4 Cord Fault in Mary Underground

Foliation is ubiquitous in the Wyman Formation and occurs as low-angle bedding that generally strikes North-South and dips 20 to 35 degrees to the North East. In the Drinkwater Pit and the Mary Underground, slickensides were observed associated with foliation. Figure 2.7 presents a photograph of slickensides on a bench-scale planar failure. In the Mary Underground, many of the stopes were developed along foliation, as shown in Figure 2.8.

Figure 2.5 Sub-Vertical Jointing – Drinkwater Pit

Figure 2.6 Sub-Vertical Jointing – Mary Underground

Figure 2.7 In-Pit Slickenside along Foliation

Figure 2.8 Underground Stoping along Foliation

3.0 GEOTECHNICAL SITE INVESTIGATION PROGRAM

3.1 General

The geotechnical site investigation for this project consisted of observations and field measurements in the existing Drinkwater Pit and Mary Underground. As part of this project, a site visit was conducted at the Mineral Ridge Property during November 2nd and 3rd , 2010. During the site visit, field observations and measurements were made at the Drinkwater Pit, Mary Underground, and rock outcrops in the vicinity of the proposed Mary Open Pit. The existing Drinkwater Pit provides the best example of the rock mass performance under actual mining conditions. As such, the slopes of the Drinkwater Pit were inspected closely for signs of instability or movement. A photograph of the current 300 foot high west highwall is presented in Figure 3.1.

The current overall pit slopes appear stable, and do not show signs of movement or instability. Some bench-scale wedge and planar failures are present. For the most part, these local failures occur along existing structural planes that may have been mobilized by blast damage. A significant portion of the pit wall rocks exhibit signs of blast damage from previous mining operations. This is apparent in the general nature of the slopes (e.g. block, poor face development, and lack of clean breaks) and the large amount of debris present in the pit. Future mining operations need to focus on development and implementation of proper blasting techniques to minimize blast damage.

3.2 Structural Controls

As discussed in Section 2.0, there are two primary structural controls in the Drinkwater Pit and Mary Underground, jointing and foliation. During the site visit, measurements of both joints and foliation were obtained from pit benches and outcrops using a Brunton compass. These structural measurements were combined with those presented in Golder (1999) to generate a stereonet for the primary structural controls. Figure 3.2 presents the combined stereonet for joints and foliation.

As shown in Figure 3.2, the primary joint set (J1) strikes North 20-30 East, with a dip of approximately 70 degrees to the West. These joints are roughly parallel to the Drinkwater Fault, as noted in the Golder (1999) study. There are several sub-vertical joints that are also present, but these were not considered as a primary set.

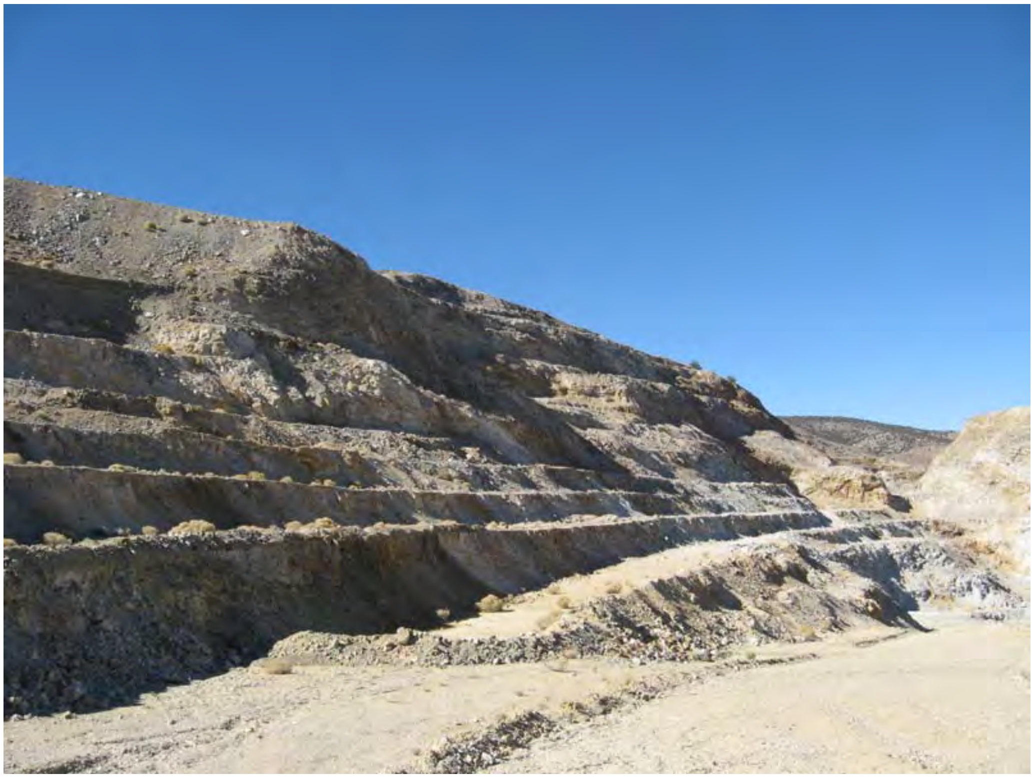


Figure 3.1 Drinkwater Pit West Highwall

Primary foliation (F1) strikes North 10-30 West, with a dip of 30 to 40 degrees to the East. As noted previously, foliation is ubiquitous throughout the rock mass in the Drinkwater and Mary areas. However, as noted in the following section, the pit slopes along the West Highwall clearly indicate benches and pit slopes are stable, even with the foliation orientation (dip of foliation is less than the existing BFAs and overall slopes).

A photograph of the persistent foliation present along the West Highwall is presented in Figure 3.3.

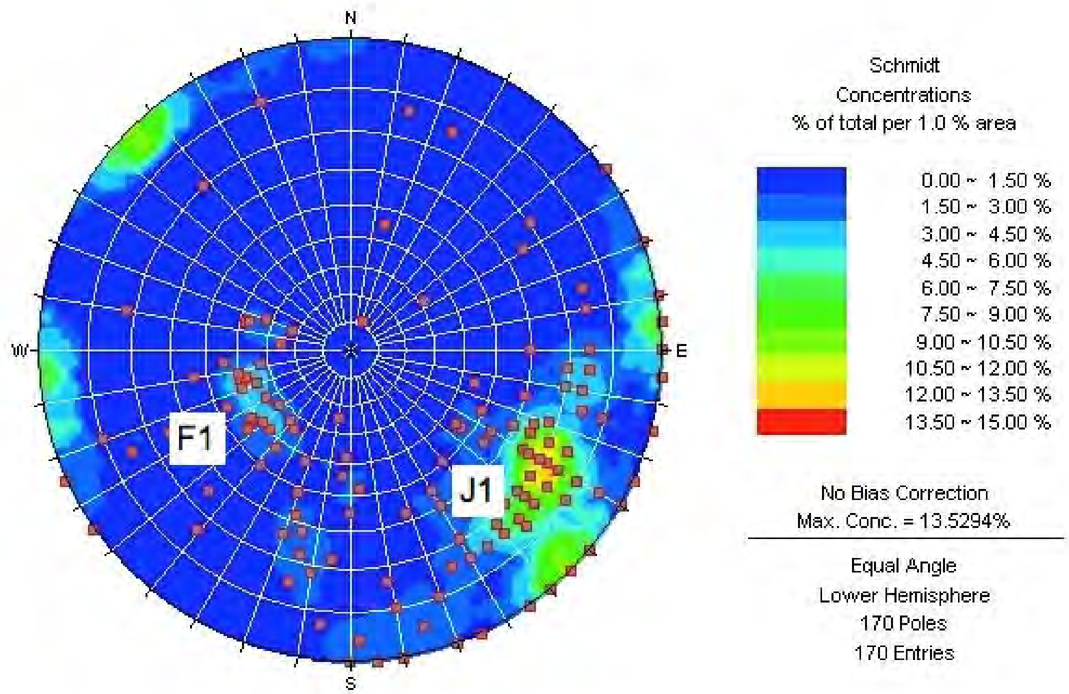


Figure 3.2 Primary Structural Controls

3.3 Existing Pit Slope Measurements

The overall and interramp slopes in the Drinkwater Pit were measured during the site visit using a hand-held clinometer. In general, the following slope conditions were observed:

- North Pit Slope: Interramp slope angles vary between 43 and 51 degrees, with overall slope angles varying between 25 to 36 degrees.
- West Pit Slope: Interramp slope angles vary between 40 and 48 degrees, with overall slope angles varying between 31 to 43 degrees.
- South Pit Slope: Interramp slope angles vary between 39 and 49 degrees, with overall slope angles varying between 28 to 32 degrees.
- East Pit Slope: Interramp slope angles vary between 39 and 43 degrees, with overall slope angles varying between 33 to 37 degrees.

BFAs varied considerably, reflecting the degree of blast damage. On the West highwall that hasbenches with obvious high blast damage, the bench had failed roughly parallel to the primary foliation (30 to 35 degrees), eliminating the bench (see Figure 3.3). In other areas, where blast damage was not as extensive, BFAs of 70 to 75 degrees were observed. On the North, South, and East pit walls, BFAs were overall steeper, with a range of 65 to 75 degrees.

Based on observations from the pit wall rock exposures, the Geological Strength Index (GSI) is estimated to be between 65 and 75, indicating good rock quality. Observations from underground indicate that groundwater levels are well below the pit bottom for both the Drinkwater and Mary Open Pits.

Figure 3.3 Foliation West Highwall

4.0 OPEN PIT DESIGN

4.1 General

Pit slope design in Moderate to Strong rock masses, such as those observed at the Drinkwater Open Pit and the Mary Underground, are typically controlled by structural features (i.e. joints and foliation) at the bench scale level and rock mass strength at the interramp and overall slope scale levels. Depending on continuity, interramp slopes can also be controlled by structural features (usually longer than the height of two benches). Therefore, for such geomechanical environments it is current practice to apply kinematic methods for bench face and interramp design, and numerical methods for interramp and overall pit design.

For slope design, the pit is typically divided into geotechnical domains and each geotechnical domain analysed based on the main orientation of the walls within the sector; where the wall orientation is defined by its average dip direction. For each wall orientation, kinematic analyses are completed and potential critical failure mechanisms identified. Based on the identified potential failure mechanism and attitude of the controlling structure(s) the bench face angle is determined to avoid and/or minimize potential failures both at the bench and interramp scale. Once kinematic analyses are completed, the stability of the overall slope is verified based on numerical methods. If necessary, the bench face and interramp angles are modified to obtain the desired level of overall slope stability.

A pit slope has six major components as defined in Figure 4.1: bench slope, bench width, ramp or geotechnical bench width, bench height, interramp slope, and overall slope. The bench height is usually controlled by the size of mining equipment, which in the present case is assumed to be sized for a production bench height of 15 feet. The BFA is typically controlled by discrete joints or foliation. These features are more or less planar defining natural breaks in the rock mass with or without displacement. The interramp slope angle (IRA) may also be controlled by structural features. Of particular importance is the presence of structural features that extend over multiple bench heights, as these may lead to multi-bench slope failures. As shown in Figure 4.1, IRAs are flatter than bench face angles. Therefore, a bench face angle designed to avoid day lighting of a particular joint structure will as well ensure that this particular structure does not daylight at the inter-ramp scale.

Based on observations from the Drinkwater Pit and the Mary Underground, the joints and foliation within the Wyman Formation are considered to be laterally extensive and continuous, therefore these features will affect the BFA and IRA designs. Also, given the continuity of the structural features, double or triple-bench development is not recommended as this could lead to significant, multi-bench failures.

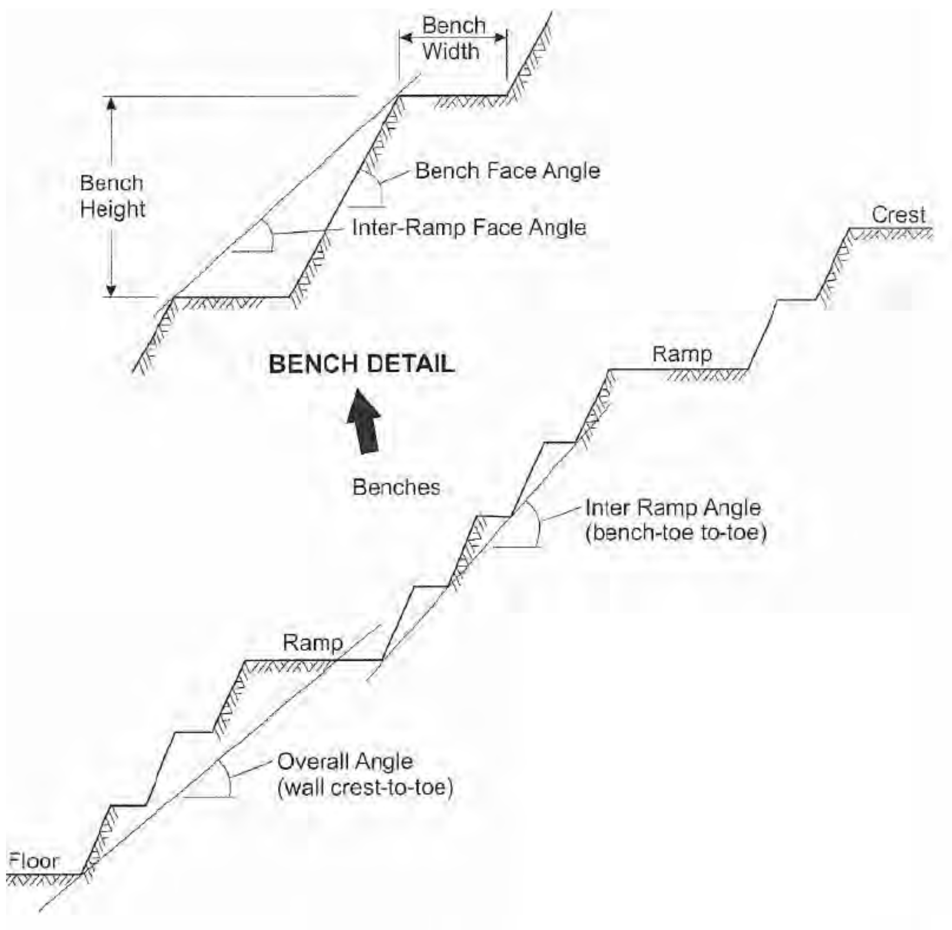


Figure 4.1 Pit wall major components (modified from Read and Stacey, 2009)

4.2 Geotechnical Domains

A geotechnical domain defines a volume of rock where similar geotechnical and structural characteristics are anticipated. Based on site observations and field data, there are two primary geotechnical domains for the Drinkwater and Mary Open Pits, as shown in Figure 4.2. The geotechnical domains are roughly divided by lines oriented at 345 and 195 azimuth from the pit centers. Figure 4.2 presents the pit layouts and existing historic underground mine workings.

The selection of two geotechnical domains is justified based on the laterally extensive and pervasive jointing and foliation. In addition, the open pits are relatively small in expanse, with few unconfined slopes.

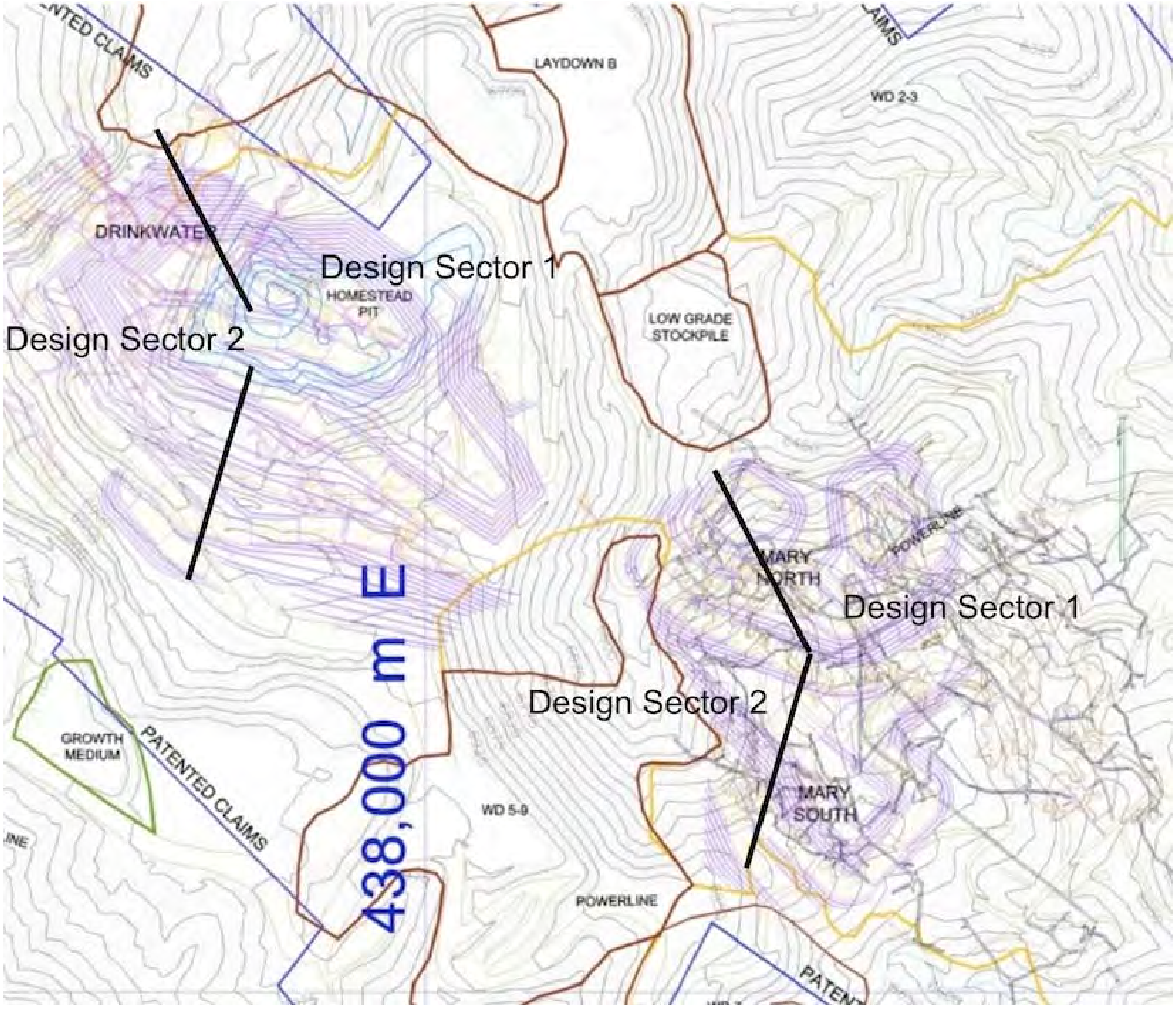


Figure 4.2 Pit Geotechnical Domains

4.3 Bench Design - Kinematic Analysis

For the purposes of the present study, each geotechnical domain was analysed based on the main orientation of the walls within the domain; where the wall orientation is defined by its average dip direction. For each main wall orientation, a kinematic analysis was completed, the potential critical failure mechanism identified, and the bench face angle determined to minimize/avoid bench failure.

As there are only two primary structural features (jointing that is roughly parallel to the Drinkwater Fault, and foliation), the potential kinematic failure mode is primarily planar failures associated with joints and along foliation. There are some structural orientations that may result in toppling, however, no signs of toppling movements are observed in the existing Drinkwater Pit, so this failure mode is considered unlikely.

Based on observations from the Drinkwater Pit, planar failures appear to be associated with foliation, rather than jointing. The observed planar failures along foliation (such as that shown in Figure 2.7) primarily occur along western facing slopes (where foliation is undercut). However, these failures appear to be the result of blast damage, which has weakened the interface along foliation planes. Where blast damage is less severe (such as that shown in Figure 3.3), the slopes appear to be stable.

Based on these observations, the pit slope design can be developed based on achievable BFAs and single bench heights of 15 feet (present stable bench heights).

4.3.1 Design Sector 1

Design Sector 1 generally consists of the North, East, and South walls of both pits. Bench face angles for these walls will be primarily influenced by the sub-vertical jointing associated with the Drinkwater Fault. These structures dip 70 to 75 degrees to the west. For this design section, a BFA of 75 degrees was selected. The current BFA's range from 65 to 75 degrees, with lower BFAs associated with blast damage. Assuming good blast controls and management, it is anticipated that a BFA of 75 degrees will be achievable for the majority of benches developed in this sector.

The current bench widths in the Drinkwater Pit vary considerably depending on location and degree of blast damage. The majority of the stable slopes have catch bench widths on the order of 12 feet. While this width is less than that typically used for open pits, the Drinkwater and Mary Open pits are anticipated to have highwalls less than 150 to 180 feet in this design sector, therefore it is reasonable to adopt a relatively small catch bench for these pits.

4.3.2 Design Sector 2

Design Sector 2 consists of the West walls of both pits. Bench face angles for these walls will be primarily influenced by the shallow-angled foliation that is observed in the Drinkwater Pit and Mary Underground. As shown in Figure 3.3, relatively steep and continuous slopes can be developed within the foliation, provided the damage from blasting can be kept to a minimum. For this design section, a BFA of 70 degrees was selected. The current BFA's range from 30 to 75 degrees, with lower BFAs associated with blast damage and bench loss along foliation. Assuming good blast controls and management, it is anticipated that a BFA of 70 degrees will be achievable for the majority of benches developed in this sector.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The specific recommendations for pit slope design are summarized in Table 5.1. Note that the current Drinkwater Pit has a high wall (West) of 225 feet, which shows no signs of instability or movement. The current pit slope layouts have highwalls on the order of 150 to 180 feet, therefore rock mass strength and performance is not anticipated to be different from those observed in the existing Drinkwater Pit. It is noted that the current Drinkwater Pit slopes are significantly impacted by blast damage. The slope designs presented in Table 5.1 are considered achievable, assuming good blast controls and management.

Geotechnical bench mapping during the initial phases of pit development is strongly recommended to confirm the assumed geomechanical model. Moreover, surface mapping can potentially allow for bench steepening and consequently overall slope steepening if the pit slopes and benches perform better than expected.

Table 5.1 Recommended Pit Slope Configurations

Design Sector	BFA[note 1] (deg)	Bench width (ft)	Bench height (ft)	IRA (deg)	Max. bench stack height (ft)
1	75	12	15	45	300
2	70	12	15	43	300

Notes
1. BFA: bench face angle; rounded to the closest degree.
2. IRA: inter ramp slope angle; rounded to the closest degree.

6.0 LIMITATIONS AND CLOSURE

Recommendations presented herein are based on geotechnical investigations completed by AMEC in 2010. If conditions other than those reported are noted during subsequent phases of the project, AMEC Earth & Environmental should be notified and given the opportunity to review and revise the current pit slope recommendations. It should be noted that special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing program implemented in accordance with professional Standard of Care may fail to detect certain subsurface conditions. As a result, variability in subsurface conditions should be anticipated and it is recommended that contingency for unanticipated conditions are included in budgets and schedules.

This report has been prepared for the exclusive use of Scorpio Mineral for the specific application to the area within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report has been prepared in accordance with generally accepted rock slope engineering practices. No other warranty, expressed or implied, is made.

Respectfully submitted,

AMEC Earth & Environmental

John F. Lupo, Ph.D., P.E.
Principal Engineer

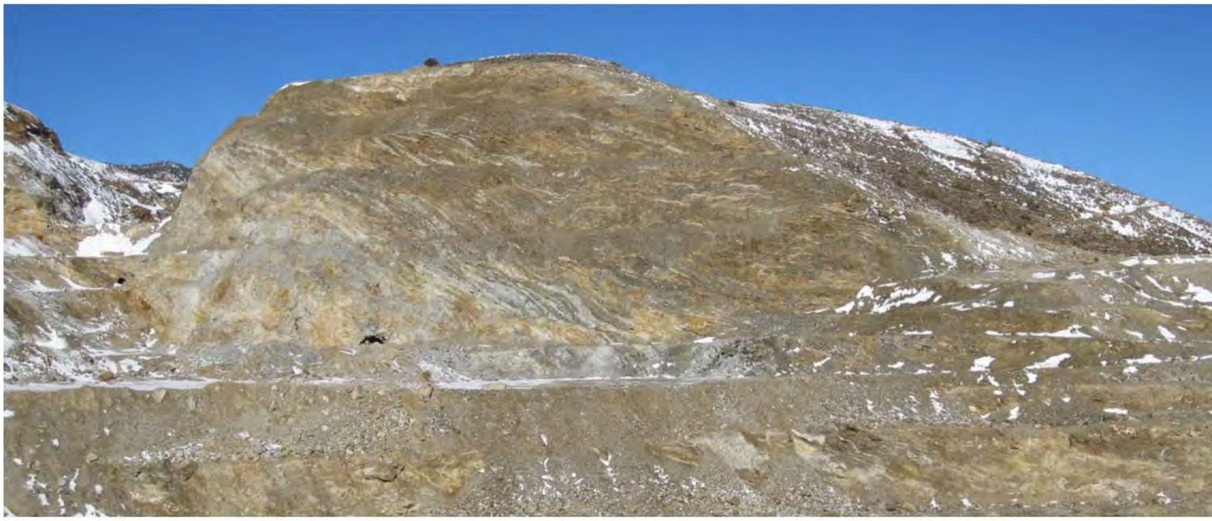
Appendix C – Waste Rock Characterization Memo

Waste Rock and Ore Geochemical Characterization for the Mineral Ridge Mine

Report Prepared for

Mineral Ridge Gold L.L.C.

Scorpio Gold (US) Corporation



Report Prepared by

SRK Consulting (U.S.), Inc.
SRK Project Number 202200.110
March 2013

Waste Rock and Ore Geochemical Characterization for the Mineral Ridge Mine

Mineral Ridge Gold L.L.C.

Scorpio Gold (US) Corporation

1515 7th Street
Elko, NV 89801
Elko, Nevada 89801

SRK Consulting (U.S.), Inc.
5250 Neil Road
Suite 300
Reno, NV 89502

e-mail: reno@srk.com
website: www.srk.com
Tel: (775) 828-6800
Fax: (775) 828-6820

SRK Project Number 202200.110

March 2013

Authors:
Amy Prestia, MSc, P.G.
Senior Consultant (Geochemistry)

Peer Reviewed by:
Eur. Geol. Rob Bowell PhD C. Chem C. Geol
Corporate Consultant (Geochemistry)

Ruth Warrender BSc, MSc, PhD, FGS
Consultant (Geochemistry)

Table of Contents

1 Introduction 1
1.1 Objectives and Approach 1
2 General Site Conditions 2
2.1 Location and Topography 2
2.2 Climate 2
2.3 Geology 4
2.3.1 Project Geology 5
2.3.2 Mineralization 6
2.3.3 Deposits 7
3 Mine Plan and Program Design 10
4 Existing Geochemical Data 12
4.1 1994/1995 Characterization Program 12
4.2 Quarterly Waste Rock Monitoring Program 13
4.2.1 Monitoring Data from Previous Operators 13
4.2.2 Monitoring Data from Current Operations 15
5 2012 Waste Rock Characterization Program 18
5.1 Mineral Ridge Waste Rock Material Types 18
5.2 Sample Collection 18
5.3 Laboratory Testing 19
5.3.1 Multi-Element Analysis 19
5.3.2 Acid Base Accounting 20
5.3.3 Net Acid Generation 21
5.3.4 Meteoric Water Mobility Procedure 22
6 Waste Rock Characterization Results 22
6.1 Multi-Element Analysis Results 22
6.2 Acid Base Accounting Results 24
6.3 Net Acid Generation Results 26
6.4 Meteoric Water Mobility Procedure Results 28
7 Predicted Geochemical Behavior 32
7.1 Acid Generation 32
7.2 Metal Leaching 32
8 Conclusions and Recommendations 32
9 References 34

List of Tables

Table 2-1: Average Monthly Precipitation....4
Table 3-1: Summary of Geochemical Characterization Program Design....10
Table 4-1: 1994 and 1995 Mineral Ridge Waste Rock and Spent Ore ABA Results....12
Table 4-2: 1994 and 1995 Mineral Ridge Select Waste Rock MWMP Results....13
Table 4-3: Quarterly Waste Rock ABA Results from Previous Operators....14
Table 4-4: Quarterly Waste Rock MWMP Results from Previous Operators....14
Table 4-5: Quarterly Waste Rock ABA Results from Current Operations....16
Table 4-6: Pregnant and Barren Solution Chemistry....17
Table 5-1: Mineral Ridge Sample Frequency and Testing Matrix....19
Table 5-2: Interpretation of GAI values....20
Table 5-3: Acid Generation Criteria for NAG Results....21
Table 6-1: Summary of Multi Element Data for Key Parameters Relating to ARDML....23
Table 6-2: Summary of Acid Base Accounting Results....24
Table 6-3: Summary of Net Acid Generation Test Results....27
Table 6-4: Comparison of Heap Ore MWMP Results to Heap Solution Chemistry....31

List of Figures

Figure 2-1: Project Location Map....3
Figure 2-2: Regional Geology Map....8
Figure 2-3: Mineral Ridge Stratigraphic Column....9
Figure 3-1: Existing and Proposed Disturbance for the Mineral Ridge Mine....11
Figure 6-1: Scatter Plot of Acid Generating Potential vs. Neutralizing Potential....25
Figure 6-2: Scatter Plot of NPR vs. NNP....25
Figure 6-3: Scatter Plot of Paste pH vs. Sulfide Sulfur....26
Figure 6-4: Scatter Plot of NAG pH vs. NAG....27
Figure 6-5: Scatter Plot of Sulfide Sulfur vs. NAG pH....28
Figure 6-6: MWMP pH vs. Ficklin Metal Release....29
Figure 6-7: MWMP pH vs. Arsenic Release....29
Figure 6-8: MWMP pH vs. Antimony Release....30

Appendices

Appendix A: 1994 and 1995 Laboratory Reports

Appendix B: 2004 and 2005 WPCP Tables and Laboratory Reports

Appendix C: 2011 and 2012 WPCP Tables and Laboratory Reports

Appendix D: 2012 Static Test Results

Appendix E: Mineral Ridge MWMP Results NDEP Reference Value Comparison

1 Introduction

This report has been prepared by SRK Consulting, U.S. (SRK) to provide Mineral Ridge Gold, LLC (MRG) with the results of the geochemical characterization study that assess the Acid Rock Drainage and Metal Leaching (ARDML) potential of the waste rock and ore materials specific to the Mineral Ridge Mine located in Esmeralda County, Nevada.

A waste rock characterization program was initiated by SRK for the Mineral Ridge Mine to provide waste rock and ore characterization data for the current mine plan and support the next phase of the project's development, which will likely include environmental assessment. The objectives, approach and laboratory testwork methods of the geochemical characterization study are described herein along with a summary of the results.

1.1 Objectives and Approach

The objective of the geochemical characterization program is to address mineralogy, bulk geochemical characteristics and the potential of the waste rock and ore (stockpiled and spent heap ore) associated with the Mineral Ridge Mine to generate acid or net neutral drainage. The characterization program is designed to provide a qualitative prediction of future water quality that would result from precipitation contacting the material(s) and the influence this may have on groundwater and surface water quality in the area.

In order to accomplish the objectives of the study, samples representative of waste rock and ore material were collected and characterized using industry recognized geochemical test methods as outlined in the *BLM Instruction Memorandum NV-2010-014, Nevada Bureau of Land Management Rock Characterization Resources and Water Analysis Guidance for Mining Activities (BLM, January 8, 2010)*.

Mine waste characterization programs are designed to investigate the potential for ARDML due to oxidation of naturally-occurring sulfide minerals, such as pyrite, that are unstable under atmospheric conditions. Upon exposure to oxygen and water, sulfide minerals will oxidize, releasing metals, acidity and sulfate. The geochemical testing of mine waste materials provides a basis for risk assessment and the evaluation of options for design, construction and closure of the waste rock and heap leach facilities. Therefore, the two main considerations of this geochemical characterization program are:

- Acid generation due to oxidation of sulfide minerals, which can potentially lead to development of Acid Rock Drainage (ARD); and
- Potential for leaching of metals (e.g., manganese) and salts (e.g., sulfate).

The processes of acid generation and leaching can operate independently, although the development of acidic conditions enhances the leachability of many metals. To address this, an extensive characterization program has been completed to define the geochemical characteristics of the waste rock in terms of their potential to generate acid and leach metals.

Geochemical characterization data applicable to the Mineral Ridge Mine is also available from previous studies conducted for the project as well as monitoring as part of Water Pollution Control Permit NEV0096106. Results from these studies have been compiled and incorporated into the current investigation, as appropriate.

2 General Site Conditions

2.1 Location and Topography

The Mineral Ridge Mine site is located approximately five miles northwest of Silver Peak, in Esmeralda County, Nevada (Figure 2-1).

The Mineral Ridge project is on the northeastern flank of the Silver Peak range in an area of rugged relief with drainage into the adjacent Clayton valley. Elevations range from 5,800 to 7,400 feet above sea level with the terrain ranging from hilly to steep in the immediate project area. Red Mountain, four miles from the project, reaches an elevation of 8,957 feet above sea level.

The project area is very dry. There are no natural sources of standing water within the project boundaries and no running water in the drainages other than briefly following infrequent storms. As a result, vegetation in the area is mostly sparse, consisting of desert shrubs, succulent grasses and forbs (Spiny Mendoza, Shadscale, Hopsage, Budsage, Galleta) in the lower portions giving way to black Sage and Pinion Pine, locally, in the higher areas.

Wildlife species and habitats are typical of southern Great Basin desert areas. There are a few springs in the area which provide water for the local wildlife, but do not flow far downstream.

2.2 Climate

Climate for the Mineral Ridge Mine is typical of the Great Basin area, with hot, dry summers and cool, dry winters. Maximum daytime summer temperatures are generally less than 100°F and summer nighttime temperatures are generally above 40°F. Winter temperature extremes vary between highs of 50°F and a low of -10°F. The high elevation and proximity of the mountains contribute to the wide temperature range.

Historical climate data have been obtained from the Silver Peak Meteorological Station No 267463, a Western Regional Climate Center (WRCC) meteorological station located in the vicinity of the mine. More recent site-specific climate data has also been collected from the Mineral Ridge Mine meteorological station by Scorpio since March of 2010.

Located approximately five miles from the project area, the Silver Peak meteorological station is the closest station to the Mineral Ridge Mine. However, the station is located at an elevation of approximately 4,297 feet above mean sea level (amsl), while the Mineral Ridge project area is located at an elevation of between 7,000 and 7,100 feet amsl. However, because the Mineral Ridge project site is at a considerably higher elevation than the town of Silver Peak higher precipitation levels can be expected.

Table 2-1 provides a summary of the historical average monthly precipitation for the Silver Peak meteorological station rain gauge for the years 1967 to 2011 and from the Mineral Ridge Mine meteorological station rain gauge for the years 2010 to 2012.

Evaporation rates exceed annual precipitation rates in the project area by an approximate ratio of 14:1. Prevailing winds are from the southwest.

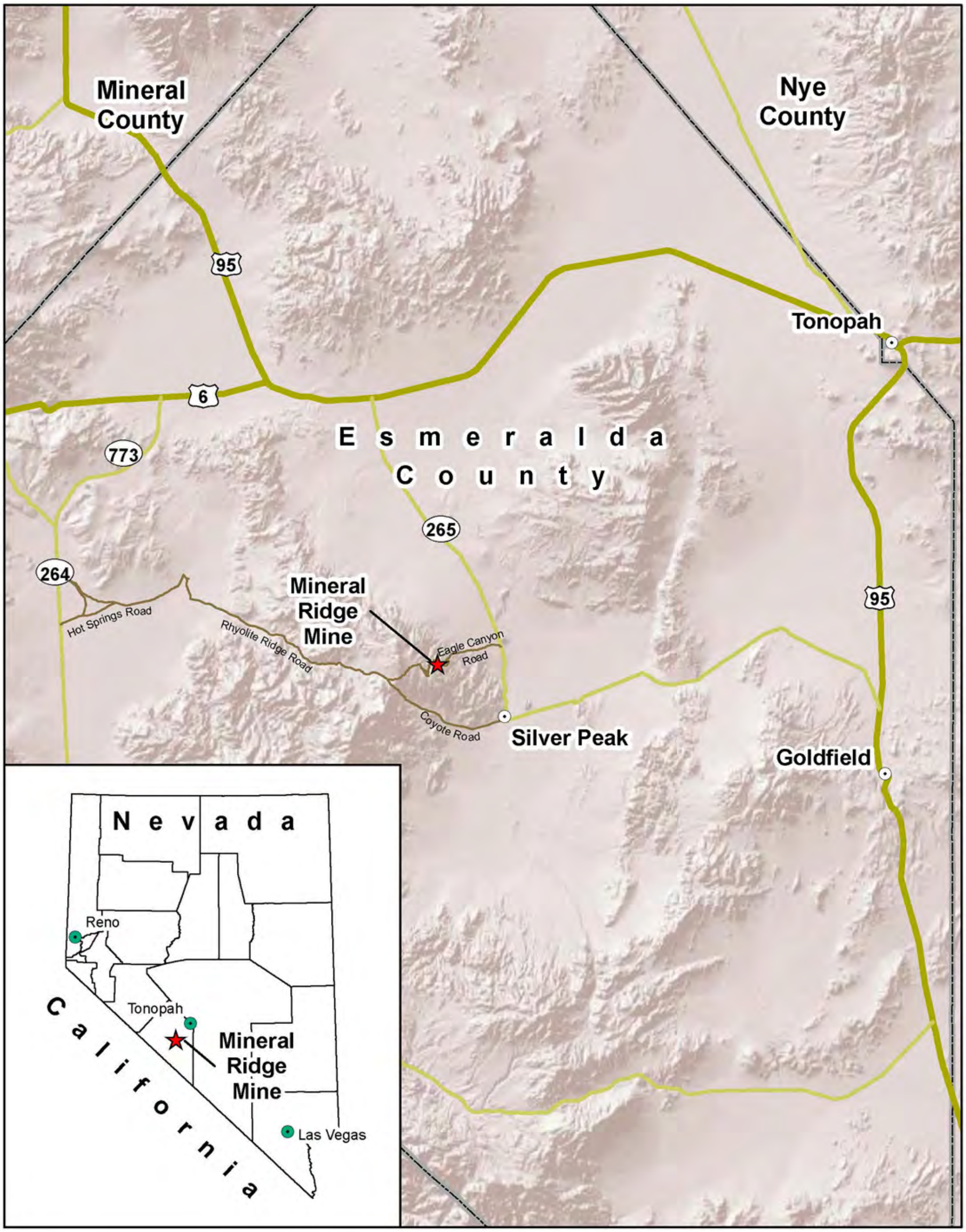


Figure 2-1: Project Location Map

Table 2-1: Average Monthly Precipitation

Month	Mineral Ridge Mine Meteorological Station (2010-2012)*	Silver Peak Meteorological Station (1967-2011)
January	0.58	0.31
February	0.30	0.38
March	0.38	0.54
April	0.12	0.39
May	0.20	0.36
June	0.01	0.25
July	0.51	0.44
August	0.67	0.48
September	1.41	0.44
October	0.79	0.36
November	0.12	0.29
December	0.11	0.17
TOTALS	**5.18**	**4.41**

*Data Collected January 2010 through December 2010 and May 5, 2011 through December 4, 2012. Data was not obtained during the following periods: May 16 through May 22, 2012; July 14 through July 17, 2012; August 19, 2012; September 15 through September 19, 2012; and October 28, 2012.

Data source: Silver Peak Met. Station - WRCC, 2012 and MRG, 2012

2.3 Geology

The following description of geology has been modified from the N*I 43-101 Technical Report on Life of Mine Plan for the Mineral Ridge Project* (AMEC, 2012).

The Mineral Ridge gold deposits occur on the northeast flank of the Silver Peak range of the Silver Peak mining district. The mining district occurs along the Walker Lane structural corridor, a structurally complex region, with the Sierra Batholith to the west and the Basin and Range Province to the east (Figure 2-2). Within the corridor, Precambrian through Cenozoic age metamorphic, intrusive and sedimentary rocks occur that have been subjected to folding and thrust faulting, low angle extensional deformation, and high-angle faulting.

Present in the Silver Peak range are Precambrian sedimentary and meta-sedimentary rocks, lower Paleozoic sedimentary rocks, and Eocene intrusive occurrences. At the center of the range, the older rocks are overlain by a late Tertiary felsic volcanic center representing a possible caldera complex. A Proterozoic sequence is exposed in the area that consists of metasedimentary rocks of the Wyman Formation overlain by the Reed Dolomite, which is in turn overlain by the limestones, dolomites and siliciclastic rocks of the Deep Springs Formation (Figure 2-3). The metasedimentary rocks are folded in a doubly plunging, open, upright anticline that trends northwest-southeast.

The Wyman Formation is underlain and intruded by an Eocene granodiorite and related alaskite, aplite, and pegmatite intrusives. The contact is highly irregular in detail, due in part to the contorted condition of the Wyman Formation which it intrudes. Spur (1906) describes the intrusives as mineralogically and chemically the same varying, only in crystal size and muscovite content. The exception is that the granodiorite contains biotite. Spur also describes the alaskite as grading into milky quartz-rich rock by a reduction in the amount of feldspar in the rock.

The geologic characteristics of Mineral Ridge are typical of a metamorphic core complex. The ridge forms a dome cored by a granitic intrusive that has been age dated at 46.5 Ma +/- 2.5 Ma. The overlying Wyman Formation exhibits abundant evidence of extensional deformation particularly in the bottom part of the formation referred to as “Unit 1, Lower Cataclastic Unit” described below, with boudinage structures and low angle, sinuous shears. The felsic intrusives (alaskite, pegmatite, and aplite) and milky quartz are commonly deformed into boudins as well as follow the sinuous low angle structures without deformation, indicating they were intruded throughout the time the Wyman Formation was being extended.

A feature present at Mineral Ridge and rarely seen in other core complexes is the preservation of the Wyman carapace across the top of the core complex. The core-carapace boundary tends to be the best locus for ore with the largest gold mineral deposits associated with the Mary limestone. Smaller flexures on the limbs of the anticline were given the name “strike anticlines” by early workers. Ore shoots are typically related to dilatancy zones related to changes in dip on the flanks of these flexures. Barry (1939) noted that the higher grade ore shoots occur at the intersection of these dilatancy zones with northeast-southwest “dip flexures”. North-south, generally down to the west structures, host gold bearing quartz veins. In addition, these same structures commonly offset the tabular deposits indicating post-ore offset.

Diabase dikes intrude along high and low angle structures throughout Mineral Ridge. The dikes commonly follow the same structures as the gold-bearing quartz veins but are unaltered and not mineralized. Assuming much of the gold mineralization is associated with a later quartz injection related to emplacement of the felsic intrusives along the low angle structures, the age of mineralization is probably Late Eocene. Age dates indicate the unmineralized diabase dikes were emplaced between 11 and 13 Ma.

2.3.1 Project Geology

The Project geology is illustrated in Figure 2-2. Within the Mineral Ridge deposit area, starting from the structural base, the Wyman Formation is overlain, in sequence, by the Reed Dolomite, a tan to white, massive bedded and commonly re-crystallized dolomite unit, and the Deep Springs Formation, a grey to dark-grey, micritic, massively bedded limestone commonly cross-cut by calcite veining. Within the area, the Reed Dolomite and the Deep Springs Formation only occur as remnants and are not mineralized.

The Wyman Formation consists of phyllite, calc-silicate, marble, limestone, and minor, fine-grained quartzite. The formation has been regionally metamorphosed to almandine-amphibolite facies with some sillimanite. Locally, there has also been some contact metamorphism related to the intrusion of the sedimentary rocks and metasedimentary rocks by granodiorite, alaskite, pegmatite, and aplite. This has resulted in the formation of some semi-conformable jasper and is possibly responsible for the recrystallization of some of the limestone into calc-silicate. Milky "bull" quartz is ubiquitous within low-angle shear zones near the base of the Wyman Formation, with the quartz likely being emplaced in conjunction with the extensional event.

Low-angle faulting is common within the Wyman Formation and some of the more prominent shears act as bounding planes for the three major structural stratigraphic units which are characterized as follows.

Unit 1 - Lower Cataclastic Unit

This unit is dominated by the sheared "Mary limestone", which is the main host for the Mineral Ridge mineralization. The "Mary limestone" is blue-grey in color, finely crystalline, and commonly sheared by regional, low-angle, ductile, extensional deformation. The unit commonly contains boudins of alaskite, pegmatite, and granodiorite and is otherwise re-crystallized into calc-silicates, and calcareous phyllites. The base of the unit is locally invaded by the felsic intrusives which decrease upward through the section. Diabase sills and several generations and types of barren and gold-bearing quartz have been emplaced in and follow the low angle shear zones, increasing in thickness and ore grade in dilatancy zones located where the dip steepens on the shoulders of subordinate “strike anticlines”.

Unit 2 - Middle Unit

The middle unit is comprised of slightly calcareous phyllite, calc-silicates, minor gray limestone, and some intrusive alaskite, although in lesser quantities than in the lower unit. This unit is characterized by its brown weathering color and extensive folding, both on a regional and local scale.

Unit 3 - Upper Unit

This uppermost subdivision of the formation consists of phyllitic limestone, phyllite, dolomite and minor, very finely crystalline quartzite. Dolomite and phyllite are locally interleaved toward the contact with the overlying Reed Dolomite, suggesting a depositional transition.

Within the Drinkwater and Mary areas, the stratigraphy and mineralized horizons dip to the northeast at approximately 25 degrees. On the opposite side of Mineral Ridge, the stratigraphy and mineralized zones are roughly flat-lying. Mineralization occurs in the lower unit of the Wyman Formation where deformation resulting from regional metamorphism and extensive low-angle faulting has resulted in variable shearing of the unit. Low-angle faults generally parallel the stratigraphy and bound the mineralized horizons, and are considered to be both pre-mineralization and post mineralization in age. Locally, high-angle faulting is also significant; the most notable is the northeast trending Drinkwater Fault zone in the Drinkwater deposit area.

Near the original topographic surface and throughout the Drinkwater and Mary areas, weathering has resulted in the partial to complete oxidation of the sulfides to iron oxides. The degree of oxidation decreases with depth in the deposits. Existing records show that cyanide assays versus fire assays did not indicate a change in recovery with depth.

2.3.2 Mineralization

The precious metal deposits at Mineral Ridge consist of structurally controlled gold mineralization hosted by the lowermost unit of the Wyman Formation. The gold mineralization is invariably associated with quartz impregnations either as:

- Quartz veins and veinlets/stringers in alaskite
- Quartz veins and veinlets/stringers in Wyman Formation limestone
- Quartz veins ranging from about one foot to over 15 feet.

Dilation resulting from multiple periods of dip-slip movement along a series of braided extensional faults created the conduits for the multi-stage emplacement of quartz and the attendant gold mineralization. As a result, the Mineral Ridge deposits are considered to be detachment fault hosted.

The gold bearing quartz impregnations were emplaced along low-angle or bedding plane extensional faults developed in the limestone and alaskite rocks. There are two or more phases of quartz injection but it is apparent that only one phase is associated with the gold mineralization.

The gold mineralization at Mineral Ridge is primarily associated with milky quartz veins and lenses accompanied by local argillization and some sericitization. The individual zones can be as much as 50 feet thick, typically consisting of a higher grade quartz veins from five to 30 feet thick, surrounded by a lower grade envelope of mineralization. Two or more high grade zones are commonly observed stacked in en echelon patterns.

Gold deposition is structurally controlled, and some of the highest grade mineralization is found in shoots that are at an oblique angle to the direction of movement of extension. Gold is present as native gold and electrum that occurs as irregular shaped intergrowths in quartz associated with interstitial space and small fractures. Gold also occurs as irregularly shaped intergrowths and as fracture fillings associated with goethite, much of which was derived from original pyrite. In partially oxidized mineralization, gold occurs with both pyrite and goethite. Gold particle size varies from 1 to 2 microns to about 700 microns, but most of the particles are in the 5 to 50 micron size range. Gold to silver ratios are typically in the 2:1 range. Because of the small gold particle size and intergrowths with quartz, extensive crushing is needed to allow for the effective cyanide heap leaching of the gold. Locally, minor amounts of galena, sphalerite and anglesite/cerrusite have been observed in the mineralization.

Gold deposits at the Mineral Ridge Mine are hosted within a structural envelope in the lower unit of the Wyman Formation near its contact with the crystalline core rocks. Quartz and felsic intrusive boundaries are common in this structural zone. These boundaries are elongate within, and sub-parallel to the direction of extension as a whole and are exposed in outcrop and in the underground workings. Elongate, braided, ductile shear zones surround the boundaries, with these shear zones being preferentially in-filled by milky quartz veining associated with mineralization and the better gold grades. This zone of ductile shearing comprises the structural mineralized envelope, and is internal, and sub-parallel to the limits of the structural slab. Internal to the mineralized envelope, other, smaller-scale fault and fold sets occur, which correspond to higher grade mineralized shoots. Based on mapping of the historical underground stopes within the Mary and Drinkwater deposits, some of the high grade shoots historically exploited by underground methods were localized at the inflection point of small flexures where dilation zones were formed when the limb of the fold steepened. These shoots lie at an angle of 38° to 45° from the horizontal, versus the average 25° angle of the structural zone. It is believed that the highest-grade mineralized shoots are related to a second, perpendicular set of flexures accompanied by normal faulting that intersect the dilation zones.

2.3.3 Deposits

Historical drilling resulted in the delineation of several deposits in the area. Several of these deposits have been mined by either underground or open-pit methods, including Drinkwater; Mary; Mary LC; Wedge A, B, C, and D; and Brodie. The Drinkwater and Mary are the two main deposits currently in production at the Mineral Ridge Mine and the Last Chance Mary deposit is planned to be mined as part of the Mineral Ridge Expansion.

Drinkwater Deposit

The Drinkwater deposit is the largest known mineral deposit at the Project, and is located on the northeastern side of the metamorphic and intrusive core complex. It was partially mined by underground methods from the 1860s to the early 1940s and by open pit methods from 1989 to 2005. The mineralized zones in the Drinkwater deposit strike northwest-southeast and dip about 20 to 25 degrees to the northeast. Mineralized zones are irregular in shape, and have variable thicknesses. MRG commenced pre-production mining at Drinkwater in May 2011.

Mary and Mary Last Chance Deposits

The Mary deposit is located about 500 feet southeast of the Drinkwater deposit and was also partially mined by underground methods from the 1860s to the early 1940s. Like Drinkwater, mineralized zones at Mary are irregular in shape and variable in thickness. MRG commenced pre-stripping operations at Mary in December 2011.

The Mary Last Chance deposit is located approximately 500 feet east of the Mary deposit. The style of mineralization is similar to that found at Drinkwater and Mary. Exploration results indicate that the Mary and Mary LC deposits may form one continuous deposit. Like the Mary Mine, the Mary Last Chance area has been mined by underground methods in the past. The Mineral Ridge Expansion will include expanding the Mary Pit to incorporate the Mary Last Chance zone into a larger pit, the dimensions of which will be larger than the existing Drinkwater pit.

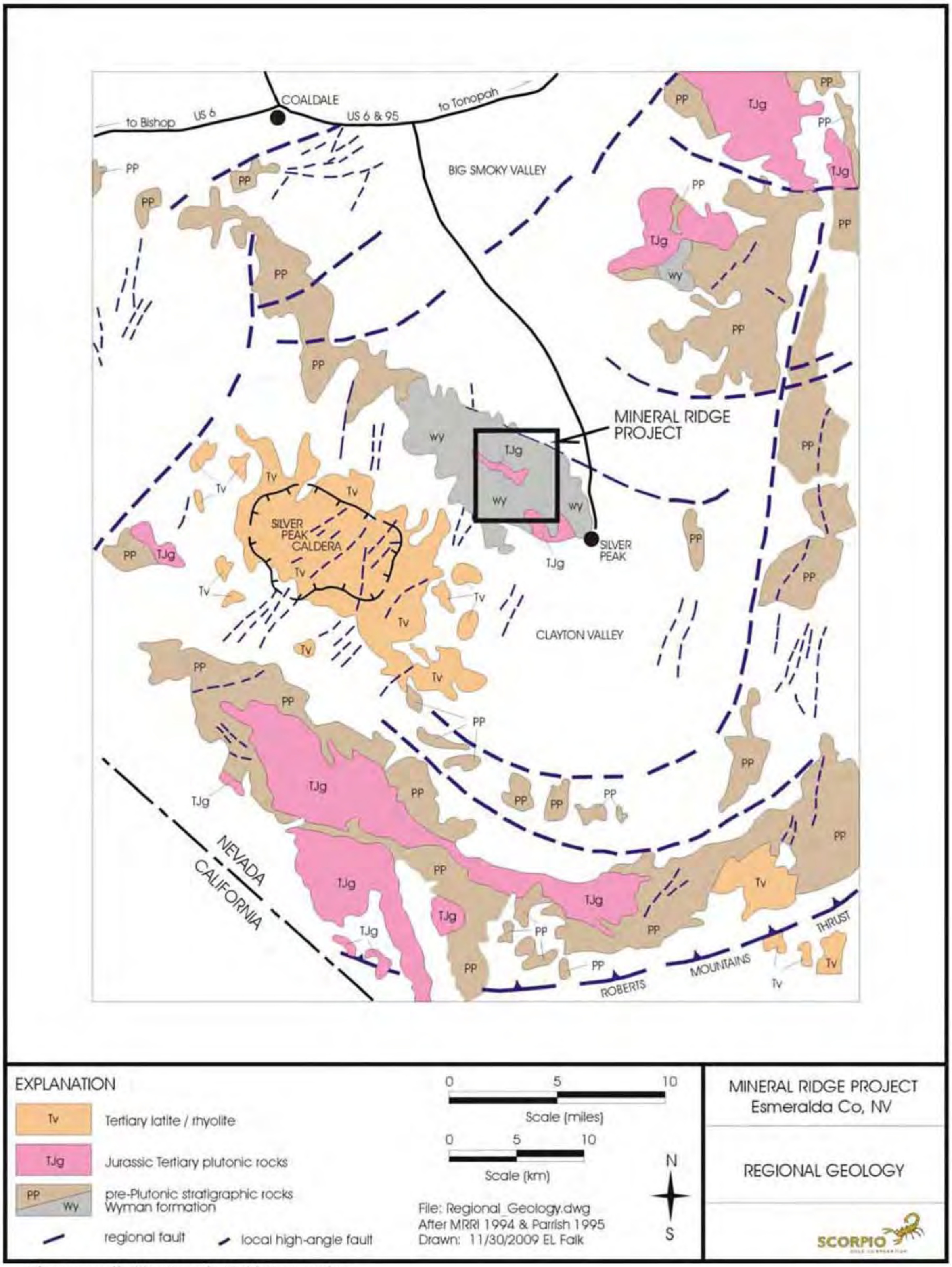


Figure supplied by Scorpio Gold Corporation.

Figure 2-2: Regional Geology Map

Source: AMEC (2012)

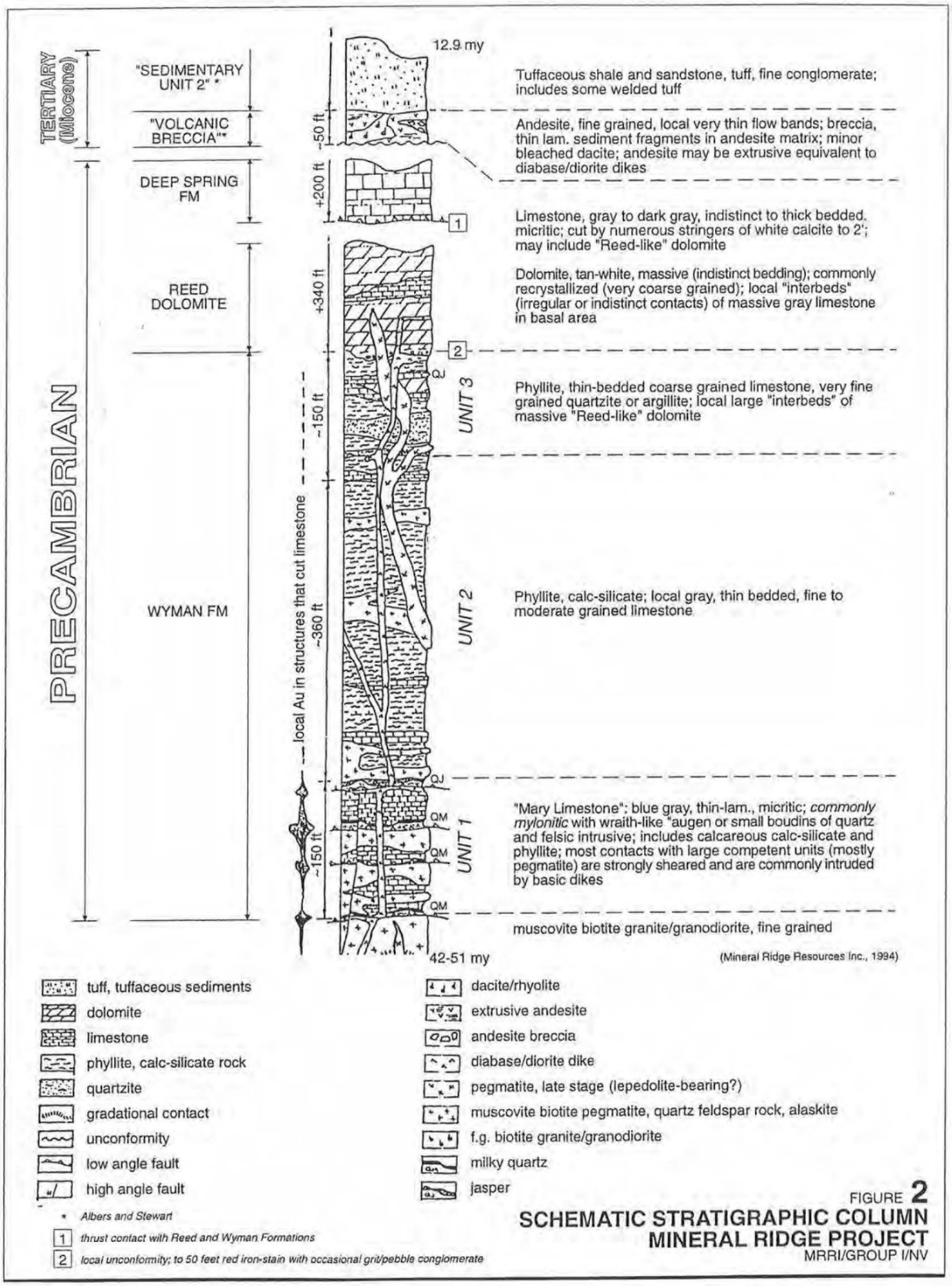


Figure supplied by Scorpio Gold Corporation.

Figure 2-3: Mineral Ridge Stratigraphic Column

Source: AMEC (2012)

3 Mine Plan and Program Design

The Drinkwater and Mary are the two main deposits currently in production at the Mineral Ridge Mine and are being mined using conventional open pit methods. The Mineral Ridge Expansion will include expanding the Mary Pit to incorporate the Mary Last Chance resource area into a large open pit, the dimensions of which will be larger than the existing Drinkwater pit. The geology and type of mineralization is similar for all three resource areas. Both the Brodie Pit and Wedge Pit were mined in the past and current exploration activities are showing positive results which may lead to the mining of these deposits in the future. However, at this time they are not included in the proposed expansion.

Ore material from the pits is transported to ore stockpiles, crushed and placed on the heap leach pad. The waste rock disposal areas for the Mineral Ridge Mine are shown in Figure 3-1 and include WD-1 through WD-9. The footprint of WD-2, and WD-6, dumps will increase as a result of the expansion project and an additional dump will be added (WD-10), along with a haul truck ramp identified as WD-11. The existing and proposed disturbance is shown in Figure 3-1.

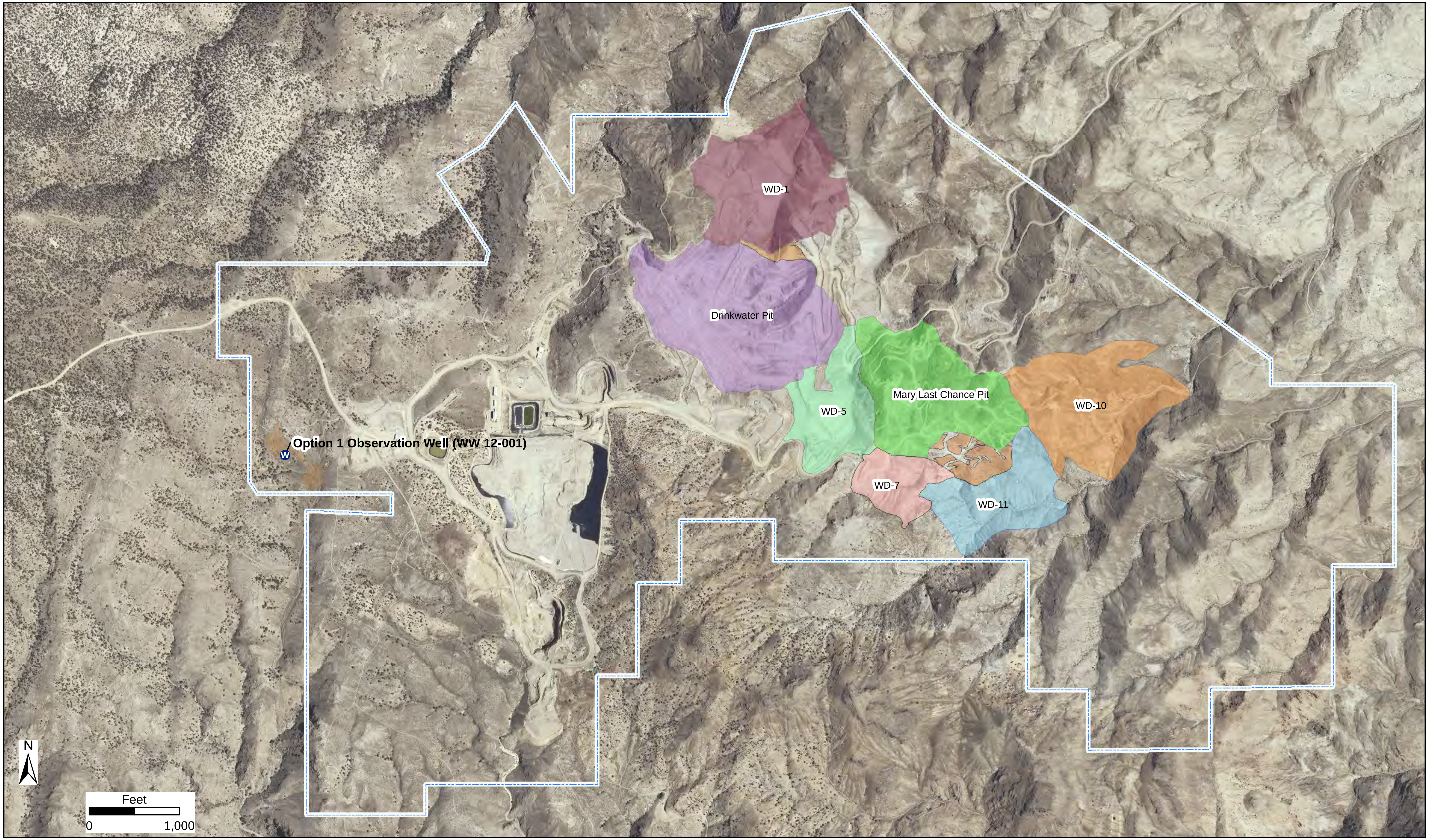
The design of the geochemical characterization program is based on the mine plan information and included the following steps:

- Development of a conceptual geochemical model for each component of the mine including understanding of the geological materials involved and the conceptual management approach.
- Design of the sampling approach for each component.
- Selection of suitable test procedures.

Table 3-1 provides a list of the proposed Mineral Ridge Mine facilities as currently understood, the phase of mining during which the facility will require geochemical characterization data and the types of geochemical data required for permitting.

Table 3-1: Summary of Geochemical Characterization Program Design

Mine Component	Phase	Management	Geochemical Prediction Requirements
Waste rock dumps	Operation and closure	Sub-aerial exposure, reclaim	• ARDML segregation criteria • Runoff and seepage chemistry
Pit walls	Operation and closure	Sub-aerial exposure (no pit lakes)	• Loading to mine sump during operations • Runoff and seepage chemistry
Ore stockpiles	Operation	Short term sub-aerial exposure	• Lag time to acidic conditions • Runoff chemistry
Spent heap ore	Operation and closure	Sub-aerial exposure, reclaim	• Draindown chemistry (operations) • Runoff and seepage chemistry (closure)



Proposed Plan Boundary
2012 Water Well 12-001
Drinkwater Pit
General Disturbance
Mary Last Chance Pit
WD-1
WD-10
WD-11
WD-5
WD-7

srk consulting

Mineral Ridge Approximate

DESIGN:	CS	DRAWN:	SCH	REVIEWED:	VS
SCALE:	1 inch = 1,000 feet		DATE:	2/25/2013	
FILE:	workingPoO_SCH_20130212				

MINERAL RIDGE MINE

MINERAL RIDGE GOLD, LLC

DRAWING TITLE: MINERAL RIDGE
- - - - - - - - - -

ISSUED FOR: -

DRAWING NO. FIGURE 3-1

REVISION NO. A

SRK JOB NO. 202200.110

PATH: K:\GIS\Sites\Mineral_Ridge\Scorpio_Gold\202200_120_WPCP_2013\workingPoO_SCH_20130212.mxd

4 Existing Geochemical Data

4.1 1994/1995 Characterization Program

In 1994 and 1995, the previous property operators, Mineral Ridge Resources Incorporated (MRRI), completed a geochemical testing program on waste rock and spent ore for inclusion in the 2002 WPCP renewal application (ERM 2002). For this program, eight waste rock samples were collected and analyzed using static Acid Base Accounting (ABA) and Meteoric Water Mobility Procedure (MWMP) methods. A spent ore sample was also collected from a metallurgical test column for ABA and MWMP testing. This sample was crushed, agglomerated, leached, and rinsed in a manner that was representative of the proposed operation. Samples were submitted to Sierra Environmental Monitoring, Inc. in Reno, Nevada for the geochemical testwork. The laboratory reports are provided in Appendix A.

Table 4-1 provides a description of the samples and the ABA results and shows all eight waste rock samples and the spent ore sample are net neutralizing according to the NDEP criteria with Neutralization Potential Ratio (NPR) values greater than 1.2. These samples also meet the BLM criteria for acid neutralizing material with Net Neutralization Potential (NNP) values greater than 20 kg $CaCO_3$/t and NPR values greater than 3. Full details of the ABA and MWMP test methods and criteria used to evaluate the results are provided below in Section 5.3.

From the summary of MWMP results in Table 4-2, the only constituent above the NDEP reference value is arsenic. However, the laboratory detection limit for antimony is higher than the NDEP reference value; therefore, an evaluation of the potential for antimony to leach at concentrations above the NDEP reference value cannot be made.

Table 4-1: 1994 and 1995 Mineral Ridge Waste Rock and Spent Ore ABA Results

Sample ID	Area	Rock Type	Paste pH (s.u.)	Sulfide Sulfur (wt %)	NP (kg $CaCO_3$/t)	AP (kg $CaCO_3$/t	NNP (kg $CaCO_3$/t)	NPR
123036	DW	Metasediments	8.9	0.002	25	0.063	25	400
123037	DW	Felsic intrusive phases	8.6	<0.001	14	0.031	14	440
123038	DW	Mafic dikes/sills	8.5	0.002	140	0.063	140	2200
123039	DW	Mary limestone	8.3	0.002	380	0.063	380	6100
123040	M/DW	Composite	8.6	<0.001	30	0.031	30	970
GB-1	B	Composite	8.2	0.25	170	7.8	160	22
GB-2	B	Dolomite and limestone	8.3	0.012	420	0.38	420	1100
OMW-1	W	Composite	8.5	0.006	42	0.19	42	230
Spent Ore	--	Met column residues	8.8	0.02	44	0.63	43	73

NP = Neutralization Potential
AP = Acidification Potential
Net Neutralization Potential (NNP) = NP – AP
Neutralization Potential Ratio (NPR) = NP/AP
Data source: ERM, 2002

Table 4-2: 1994 and 1995 Mineral Ridge Select Waste Rock MWMP Results

Sample ID	pH	Alk	As	Ba	Cd	Cr	Pb	Hg	Se	Sb[1]	Ag
123036	8.06	65	0.008	0.5	<0.0002	<0.05	<0.002	<0.0005	<0.001	<0.1	<0.0005
123037	8.19	67	0.06	0.5	<0.0002	<0.05	0.005	<0.0005	<0.001	<0.1	0.0007
123038	7.92	104	<0.005	0.6	<0.0002	<0.05	<0.002	<0.0005	<0.001	<0.1	<0.0005
123039	8.05	55	0.007	0.7	<0.0002	<0.05	<0.002	<0.0005	<0.001	<0.1	0.0018
123040	8.44	51	0.012	1	<0.0002	<0.05	0.003	<0.0005	<0.001	<0.1	<0.0005
GB-1	7.54	64	<0.005	<0.1	<0.0002	<0.1	<0.002	<0.0005	<0.001	<0.5	0.0025
GB-2	7.78	62	0.008	<0.1	<0.0002	<0.1	0.006	<0.0005	<0.001	<0.5	0.0006
OMW-1	8.11	86	0.006	<0.1	<0.0002	<0.1	0.003	<0.0005	<0.001	<0.5	<0.0005
NDEP Value	**6.5-8.5**	**----**	**0.01**	**2**	**0.005**	**0.1**	**0.015**	**0.002**	**0.05**	**0.006**	**0.1**

All values reported as mg/L except pH, which is in standard units (s.u.)
< Denotes less than the specified method detection limit.
Shaded values are greater than the respective NDEP reference value.
[1] Detection limit for antimony is greater than the NDEP reference value.
Data source: ERM, 2002

4.2 Quarterly Waste Rock Monitoring Program

4.2.1 Monitoring Data from Previous Operators

Geochemical data for the project is available from quarterly waste rock monitoring conducted for the Mineral Ridge Mine during operations.

Monitoring data collected by the previous operators is available for 1997, 4th Quarter 1998 and 2nd Quarter 2004 through 1st Quarter 2005. The summary data from each of these datasets is presented in Table 4-3 and Table 4-4. With the exception of some data collected during 2007, the rock type for these samples is unknown. These samples were submitted for ABA and MWMP testing with Profile I analysis of MWMP extracts. Tables and laboratory reports for the 2004 through 2005 monitoring results are provided in Appendix B.

The results from the operational waste rock are similar to the original characterization program and indicate the Mineral Ridge waste rock has a low potential for ARDML. The samples collected between 1997 and 2005 show net neutralizing potential with NPR values greater than 3 and NNP values greater than 20 for all but 4 samples.

The MWMP results presented in Table 4-4 show that the only constituent elevated above NDEP reference values is arsenic. All other constituents are below the respective NDEP reference values.

Table 4-3: Quarterly Waste Rock ABA Results from Previous Operators

Sample Date	Area	Rock Type	Paste pH (s.u.)	Sulfide Sulfur (wt %)	NP (kg $CaCO_3$/t)	AP (kg $CaCO_3$/t	NNP (kg $CaCO_3$/t)	NPR
1st Qtr 1997	DW	--	8.7	<0.01	5.8	0.16	5.6	37
	DW	--	8.7	<0.01	140	0.16	140	900
2nd Qtr 1997	DW	Schist	9.2	<0.01	130	0.16	130	850
	DW	Granite	8.7	<0.01	57	0.16	57	360
3rd Qtr 1997	DW	Schist	8.6	<0.01	220	0.16	220	1400
	DW	Granite	8.9	<0.01	6.1	0.16	5.9	39
4th Qtr 1997	DW	Schist	9	<0.01	70	0.16	70	450
	DW	Granite	8.3	<0.01	140	0.16	140	920
4th Qtr 1998	--	--	--	<0.02	15	0.63	15	25
2nd Qtr 2004	Brodie	--	7.8	<0.01	9	0.16	8.8	58
	DW	--	8.3	<0.01	66	0.16	66	420
3rd Qtr 2004	DW	--	7.7	0.03	24	0.94	23	26
4th Qtr 2004	DW	--	8.9	<0.01	64	0.16	64	410
1st Qtr 2005	DW	--	8.7	0.01	33	0.31	33	110

NP = Neutralization Potential, AP = Acidification Potential,
Net Neutralization Potential (NNP) = NP - AP
Neutralization Potential Ratio (NPR) = NP/AP2

Table 4-4: Quarterly Waste Rock MWMP Results from Previous Operators

Date	Area	pH	Alk	As	Ba	Cd	Cr	Pb	Hg	Se	Sb	Ag
1st Qtr 1997	DW	8.09	68	0.084	0.036	<0.001	0.01	<0.001	0.001	<0.001	--	<0.001
	DW	8.36	46	0.012	0.029	<0.001	0.003	<0.001	<0.0005	<0.001	--	<0.001
2nd Qtr 1997	DW	8.97	182	0.130	0.046	<0.001	0.012	0.013	0.0006	0.006	0.001	0.001
	DW	7.69	148	0.006	0.170	<0.001	0.003	<0.001	<0.0005	<0.001	<0.001	0.001
3rd Qtr 1997	DW	7.68	42	0.005	0.037	<0.001	0.004	<0.001	<0.0005	<0.001	--	<0.001
	DW	7.57	26	0.098	0.021	<0.001	0.003	<0.001	<0.0005	<0.001	--	<0.001
4th Qtr 1997	DW	8.19	79	0.16	0.26	<0.002	0.011	<0.002	<0.0005	<0.002	--	<0.002
	DW	7.88	52	0.13	0.19	<0.001	0.008	<0.001	<0.0005	<0.001	--	<0.001
4th Qtr 1998	--	n/a	n/a	<0.025	0.130	<0.003	<0.010	<0.007	<0.002	<0.007	<0.003	<0.035
2nd Qtr 2004	Brodie	8.06	67	0.007	0.025	<0.002	<0.002	<0.002	0.0005	<0.01	0.002	<0.002
	DW	8.05	47	0.043	0.016	<0.002	<0.002	<0.002	<0.0002	<0.01	<0.002	<0.002
3rd Qtr 2004	DW	7.9	42	0.059	0.036	<0.002	<0.004	<0.002	<0.0002	<0.01	<0.002	<0.002
1st Qtr 2005	DW	7.9	43	0.090	0.016	<0.002	<0.002	<0.002	<0.0002	<0.01	0.002	<0.002
NDEP Value	**--**	**6.5-8.5**	**--**	**0.01**	**2**	**0.005**	**0.1**	**0.015**	**0.002**	**0.05**	**0.006**	**0.1**

All values reported as mg/L except pH, which is in standard units (s.u.)
< Denotes less than the specified method detection limit.
Shaded values are greater than the respective NDEP reference value.
-- No data available.

4.2.2 Monitoring Data from Current Operations

MRG commenced mining in May 2011 from the Drinkwater pit and in December 2011 from the Mary pit, and since then has been sampling waste rock according to WPCP NEV0096106 on a quarterly basis. The waste rock sampling program consists of sampling the main rock units deposited in each active rock disposal area during the quarter. Active rock disposal areas are sampled once per month and samples are composited after the third month in the quarter. Since 3rd Quarter 2012, NDEP requires only one composited Wyman sample be submitted per quarter. The quarterly samples are submitted to Sierra Environmental Monitoring, Inc. for ABA and MWMP testing with Profile I analysis. Tables and laboratory reports for the 2011/2012 monitoring program are provided in Appendix C.

The main rock units mined during 2011 and 2012 are the Alaskite and Wyman Formations. Quarterly sample results are shown in Table 4-5. These results are also provided in the data evaluation graphs in Section 6. The results confirm the 1994/1995 characterization results and indicate both the Alaskite and Wyman Formation generate considerable acid-neutralizing material with NPR values consistently above the BLM criteria of 3 and NDEP criteria of 1.2.

Results for the MWMP samples are tabulated in Appendix E and show antimony and arsenic are elevated above the NDEP reference values. Arsenic was only elevated in 7 out of 30 of the waste rock samples collected during this timeframe; two of these samples also had elevated antimony. Aluminum and nitrate concentrations were elevated above NDEP reference values in one sample, but not the same sample. The remaining constituents are below the respective NDEP values.

In addition to the waste rock monitoring, samples of the pregnant and barren solution from the heap leach ponds have been collected bi-annually (1st and 3rd Quarter) since initiation of mining. The samples are submitted to Sierra Environmental Monitoring, Inc. for Profile II analysis. Monitoring results are available for 4th Quarter 2011 and 1st and 3rd Quarter 2012 for the pregnant and barren solution ponds. Prior to initiation of operations, the heap leach ponds had an excess amount of solution which required evaporation using snow makers on the leach pad to bring the levels down to the appropriate operation levels. Prior to the evaporation activities, a sample was collected from the process overflow pond during 1st Quarter 2011, representing a mixture of the pregnant and barren solution.

The available heap solution data is summarized Table 4-6 and show the heap solution, both pregnant and barren, is highly alkaline with pH values greater than 10 s.u.. Constituents that are elevated above NDEP reference values for the samples collected during operations include arsenic, cadmium, copper, iron, mercury, nickel, nitrate, silver, sulfate, total dissolved solids, WAD cyanide and zinc. In comparison, samples collected prior to initiation of operations show much lower metals concentrations with only arsenic, cadmium, nitrate, sulfate, TDS and WAD cyanide elevated above NDEP reference values. This increase in metals concentrations observed for the operational heap solution is related to the effects of evapoconcentration that occurred during the evaporation activities and subsequent recirculation of the solution. Therefore, this data provides a general indication of the chemistry of the heap draindown solution that can be expected during the initial phases of closure that will involve the active management of the heap solution inventory.

Table 4-5: Quarterly Waste Rock ABA Results from Current Operations

Quarter	Dump	Lithology	Paste pH (s.u.)	Sulfide Sulfur (wt %)	NP (kg $CaCO_3$/t)	AP (kg $CaCO_3$/t)	NNP (kg $CaCO_3$/t)	NPR
2nd Qtr 2011	Dump 2	Alaskite	8.4	0.02	310	0.7	310	440
		Wyman	8.5	0.11	94	3.4	91	28
3rd Qtr 2011	Dump 1	Alaskite	9.1	<0.01	38	<0.3	38	130
		Wyman	9.1	<0.01	150	<0.3	150	500
	Dump 2	Alaskite	9.4	<0.01	40	<0.3	40	130
		Wyman	8.8	<0.01	150	<0.3	150	500
4th Qtr 2011	Dump 1	Alaskite	8.5	0.64	91	20	71	4.6
		Wyman	8.8	0.1	280	3	280	93
	Dump 2	Alaskite	9.6	0.02	63	0.6	62	110
		Wyman	9	<0.01	140	<0.3	140	470
1st Qtr 2012	Dump 2	Alaskite	8.6	0.78	31	24	7	1.3
		Wyman	9	0.07	200	2.1	200	95
	Dump 7	Reed Dolomite	9.1	<0.01	140	<0.3	140	470
		Deep Springs	9.5	<0.01	270	<0.3	270	900
2nd Qtr 2012	Dump 2	Alaskite	9.7	<0.01	27	<0.3	27	90
		Wyman	9.3	<0.01	73	<0.3	73	240
	Dump 5	Alaskite	9	0.26	41	8	33	5.1
		Wyman	9.3	<0.01	290	<0.3	290	970
	Dump 7	Wyman	9	<0.01	160	<0.3	160	530
3rd Qtr 2012	Dump 2	Alaskite	8.7	<0.01	16	<0.3	16	53
	Dump 5	Alaskite	9.1	0.53	140	16	120	8.8
		Wyman	9	0.07	410	2	410	210
	Dump 6	Alaskite	8.7	1.1	96	33	63	2.9
		Wyman	8.9	<0.01	280	<0.3	280	930
	Dump 7	Alaskite	8.8	<0.01	49	<0.3	49	160
		Wyman	8.9	<0.01	260	<0.3	260	870
4th Qtr 2012	Dump 2	Alaskite	9.2	<0.01	19	<0.3	19	63
		Wyman	8.4	0.05	61	1.5	60	41
	Dump 5	Alaskite	9.2	<0.01	45	<0.3	45	150
	Dump 6	Alaskite	9.4	0.11	31	3.3	28	9.4
	Dump 7	Alaskite	9.4	<0.01	110	<0.3	110	370
		Wyman	8.7	<0.01	170	<0.3	170	570

NP = Neutralization Potential and AP = Acidification Potential,
Net Neutralization Potential (NNP) = NP - AP and Neutralization Potential Ratio (NPR) = NP/AP

Table 4-6: Pregnant and Barren Solution Chemistry

Parameters	NDEP Value	Preg/ Barren Pond	Pregnant Pond			Barren pond		
		1st Qtr 2011	3rd Qtr 2011	1st Qtr 2012	3rd Qtr 2012	3rd Qtr 2011	1st Qtr 2012	3rd Qtr 2012
Bicarbonate	-	<2	<2	<2	<2	<2	<2	<2
Alkalinity, Total	-	356	322	359	260	456	233	376
Aluminium	0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Antimony	0.006	<0.01	<0.004	<0.01	<0.004	<0.004	<0.01	<0.004
Arsenic	0.01	0.02	0.12	0.19	0.17	0.15	0.18	0.18
Barium	2	0.04	0.035	0.023	0.037	0.036	0.03	0.034
Beryllium	0.004	<0.01	<0.004	<0.01	<0.004	<0.004	<0.01	<0.004
Cadmium	0.005	<0.01	0.41	0.47	0.27	0.47	0.44	0.25
Calcium	-	390	280	220	330	330	220	310
Chloride	400	360	350	290	310	400	280	320
Chromium	0.1	0.02	0.082	0.08	0.1	0.093	0.08	0.098
Cobalt	-	0.35	0.6	0.54	0.67	0.61	0.54	0.64
Copper	1	0.02	2.8	3.2	4.7	2.7	3.1	4.5
Fluoride	4	<1	0.2	<1	<1	<1	<1	1
Iron	0.6	0.3	1.7	0.9	1.6	1.7	0.9	1.6
Lead	0.015	<0.04	0.004	<0.01	<0.004	<0.004	<0.01	<0.004
Magnesium	150	3	10	<1	2	2	2	1
Manganese	0.1	<0.01	0.017	<0.01	<0.004	0.01	<0.01	<0.004
Mercury	0.002	<0.0002	0.022	0.03	0.0086	0.024	0.026	0.0043
Molybdenum	-	0.17	0.58	0.7	0.84	0.67	0.67	0.8
Nickel	0.1	<0.01	0.56	0.39	0.44	0.57	0.32	0.25
Nitrate + Nitrite	10	76	50	38	63	58	38	64
pH	6.5 - 8.5	11.52	10.02	10.69	10.01	10.36	10.34	10.26
Potassium	-	19	19	15	26	21	15	26
Selenium	0.05	<0.05	<0.02	<0.05	0.02	<0.02	<0.05	0.02
Silver	0.1	<0.01	0.24	0.35	0.4	0.11	0.09	0.066
Sodium	-	890	780	520	570	650	520	600
Sulfate	500	1400	1200	700	970	1300	720	960
Thallium	0.002	<0.005	0.002	<0.005	<0.002	0.002	<0.005	<0.002
TDS	1000	3700	2900	2400	2700	3300	2300	2800
WAD cyanide	0.2	82	100	130	80	140	120	78
Zinc	5	<0.1	19	23	17	22	22	16

All values reported in mg/L except pH which is in standard units (s.u.).
< Denotes less than the specified laboratory method detection limit.
Shaded values exceed the respective comparative value from NDEP Form 0190 for Profile II constituents.

5 2012 Waste Rock Characterization Program

5.1 Mineral Ridge Waste Rock Material Types

Waste rock is typically classified and tested according to material type and the number of samples selected for geochemical testing is based on the relative percentage of each material type predicted to be mined from the geologic model. Material types for the Mineral Ridge Mine were delineated from a review of data available from the exploration drilling programs.

Four main rock units are identified for the Mineral Ridge project with various lithologic sub-units including:

1. **Igneous Intrusive Complex**

   The intrusive complex is composed of pegmatites, alaskite interbedded with quartz, granodiorite and undifferentiated mafic intrusives.

2. **Wyman Formation**

   The Wyman formation consists of interbedded units of metamorphosed sedimentary rocks including phyllites, schists and calc-silicates in addition to limestone. For the characterization program, individual lithologies identified for this main rock unit include limestone (undifferentiated), Mary limestone, metasediments and calc-silicates.

3. **Reed Dolomite**

   The Reed Dolomite is a tan colored dolomite unit that is limited in occurrence and only occurs as an erosional remnant in the area. Therefore, only a minor portion of the waste rock that will be mined from the project will consist of this rock type.

4. **Deep Springs Formation**

   The Deep Springs Formation is a grey micritic limestone commonly cross-cut by calcite veining. As with the Reed Dolomite, this unit only occurs as a remnant and will comprise an insignificant percentage of the material that will be mined as part of the project.

The material types identified for the Mineral Ridge Mine are summarized in Table 5-1. However, an estimate of the percentage of waste rock represented by each material type based on the current mine plan was not available at the time of sample collection.

5.2 Sample Collection

A total of 32 waste rock samples were collected for geochemical characterization during an initial site visit by SRK personnel in April 2012. The samples were collected from drill core from the recent exploration drilling programs. For each core sample interval, approximately 8-10 kg of sample material was pulled from existing core boxes, placed in sample bags and labeled with the drill hole number and the start and ending interval. For larger sample intervals (extending more than 10 feet), representative sub-samples were taken every couple feet in order to generate an appropriately sized sample. In such cases, the material collected across the interval was identical in character.

During the April 2012 site visit, five bulk samples were also collected from the surface of the ore stockpiles and active heap leach pad in addition to five samples that were collected from the active waste rock dump/pit surfaces.

Following the initial sample collection, an additional 99 samples of coarse reject material from the assay program were collected to augment the core dataset and improve the spatial distribution of the samples. During sample collection, the individually bagged 5-foot intervals were pulled from 55-gallon drums for each sample interval and shipped to the laboratory for compositing prior to testing.

The core and coarse reject sample intervals were selected to be spatially representative (both laterally and vertically) of the range of waste rock material types that will be encountered during operations and were classified according to lithology. Drill holes that were targeted for sampling were reviewed in the context of the final pit boundaries in plan view. Other than the few samples of ore grade material collected from the active facilities onsite, only waste grade samples were targeted for characterization purposes. Table 5-1 summarizes the number of samples collected for each material type that were submitted for geochemical testing. Full details of these tests are provided in the following sections.

Because the location and rock type of the 2011 and 2012 quarterly waste rock samples are well documented, the data from the recent WPCP monitoring program have been incorporated into the current database and are included in the following evaluation of ARDML for the Mineral Ridge Mine waste rock. Data from the initial characterization program and pre-2011 WPCP monitoring data have not been included due to a lack of information on material type and limited analytical documentation.

Table 5-1: Mineral Ridge Sample Frequency and Testing Matrix

Grade	Main Unit	Material Type	Number of Samples				
			ICP	ABA	NAG	MWMP[1]	HCT[2]
Waste Rock	Igneous Intrusive	Alaskite	33	33	33	14	--
		Pegmatite	20	20	20		--
		Granodiorite	7	7	7		--
		Mafic Intrusive	3	3	3		--
		Quartz	12	12	12		--
	Wyman Formation	Limestone (Undiff)	30	30	30	14	--
		Mary Limestone	18	18	18		--
		Metasediments	8	8	8		--
		Calc-silicate	3	3	3		--
	Reed Formation	Dolomite	2	2	2	1	--
Ore	Stockpile Ore	Ore	2	2	2	2	--
	Heap Ore	Ore	3	3	3	3	--
Total			**141**	**141**	**141**	**33**	**--**

[1] MWMP data from 2011 and 2012 WPCP monitoring program.
[2] Not required based on the ABA/NAG results.

5.3 Laboratory Testing

5.3.1 Multi-Element Analysis

Multi element analysis of the samples has been completed through ALS Chemex, Reno, to provide an absolute upper limit of metals available for leaching from the samples. For this study, the Mineral Ridge samples were submitted for ALS Chemex Method ME-MS61m - involving a near-complete digestion of a solid sample into solution using multiple strong acids (i.e., four acid digest) followed by ICP-MS analysis to determine total concentrations for 48 elements plus mercury.

The results of the multi element analysis for the Mineral Ridge samples were analyzed using the Geochemical Abundance Index (GAI) (INAP, 2009), which compares the concentration of an element in a given sample to its average crustal abundance. GAI values are particularly useful in determining the relative enrichment of elements based on lithology and may be used to identify elements enriched above average crustal concentrations.

GAI values are calculated as follows:

$$GAI = \log_2 [C/(1.5*S)]$$

Where C is the concentration of an element as determined from the multi element assay and S is the average crustal abundance of the element of interest (Mason, 1966). Materials are then assigned a GAI value between zero and six based on the degree of enrichment (Table 5-2). According to the INAP (2009) protocol, a GAI value greater than three indicates significant enrichment. These elements therefore have potential to be leached in sufficient concentration to have an environmental impact.

Table 5-2: Interpretation of GAI values

GAI Value	Interpretation
0	< 3 times average crustal concentrations
1	3 to 6 times average crustal concentrations
2	6 to 12 times average crustal concentrations
3	12 to 24 times average crustal concentrations
4	24 to 48 times average crustal concentrations
5	48 to 96 times average crustal concentrations
6	>96 times average crustal concentrations

5.3.2 Acid Base Accounting

Acid Base Accounting provides an industry-recognized assessment of the acid generation or acid neutralization potential of rock materials. The ABA method used for the characterization of the Mineral Ridge project is the Modified Sobek ABA method (Sobek, 1978), which includes both laboratory analysis and empirical calculations based on acid potential (AP) and neutralizing potential (NP). An estimate of acid generation is made by assuming complete reaction between all of the minerals with acid potential and all of the minerals with neutralizing potential (essentially dissolution of carbonate minerals and to very limited extent silicate minerals as the latter have very slow reaction kinetics, Bowell et al., 2000). The AP values were calculated from sulfide sulfur concentrations and reported as kg $CaCO_3$ tonnes of rock. The NP values were determined using the modified Sobek protocol that includes a digestion to expel any CO_2 followed by a back titration with NaOH to a pH of 8.3 s.u. Neutralizing potential is calculated as $CaCO_3$ equivalents per 1,000 tonnes of rock. Acid Base Accounting indicates the theoretical potential for a given material to produce net acid conditions. The technique can be considered as characterizing the ‘total potential reservoir of acidity or alkalinity in a given material’ but does not take into account mineralogy, kinetics or other influencing factors controlling natural sulfide oxidation.

The balance between the acid generating mineral phases and acid neutralizing mineral phases is referred to as the net neutralization potential (NNP), which is equal to the difference between NP and AP. The NNP allows classification of the samples as potentially acid consuming or acid producing. A positive value of NNP indicates the sample neutralizes more acid than is produced during oxidation. A negative NNP value indicates there are more acid producing constituents than acid neutralizing constituents. Material that would be considered to have a high potential for acid neutralization produces a net neutralizing potential greater than 20 kg $CaCO_3$/t. Those materials considered to have a higher potential for acid generation produce an NNP less the -20 kg $CaCO_3$/t. Acid Base Accounting data is also described using the neutralization potential ratio (NPR), which is calculated by dividing the NP by the AP. Paste pH values were also obtained from the ABA samples and provides an indication of the availability of the acid neutralizing minerals for buffering.

Acid Base Accounting results are typically compared to criteria provided by the BLM (2004) and guidance provided by the NDEP (1990) in order to determine the potential for the waste rock material to generate acid. Criteria provided by the NDEP (1990) considers samples in which NP exceeds AP by 20% (NP:AP = 1.2) to be non-acid generating without further testing. The *Nevada BLM Water Resource Data and Analysis Guide for Mining Activities* (BLM 2004) establish the following guidelines for the evaluation of ABA test results:

- NP:AP values greater than 3 and/or NNP values greater than 20 eq. kg $CaCO_3$/ton are not acid generating and do not require further testing; and
- NP:AP values less than 3 and/or NNP values less than 20 eq. kg $CaCO_3$/ton have uncertain potential and require further evaluation using kinetic test methods.

These criteria are typically used to categorize the samples and determine if kinetic testing is needed to address the uncertainties of the ABA data.

5.3.3 Net Acid Generation

Static NAG testing was performed as a second measure of ARD potential. NAG testing was carried out by SVL laboratories in accordance with the method described by Miller et al. (1997). The method essentially involves intensive oxidation of the sample using hydrogen peroxide (H_2O_2), which accelerates the dissolution of sulfide minerals and has the net result that acid production and neutralization can be measured directly.

The leachate was then titrated with sodium hydroxide in two stages (to pH 4.5 and to pH 7 s.u.) to determine the NAG value, which was calculated as follows:

$$NAG = (V_{Init} / X) (49 * V_{NaOH} * M) / W$$

Where:
NAG = net acid generation (kg H_2SO_4/tonne);
V_{Init} = volume of initial hydrogen peroxide solution (mL);
X = volume used to determine NAG by titration (mL);
V_{NaOH} = volume of NaOH used in titration (mL);
M = concentration of NaOH used in titration (moles/liter); and
W = weight of sample reacted (g).

The guidelines used for assessing the acid generation potential based on NAG results are summarized in Table 5-3. In general, a NAG pH greater than 4 s.u. and a NAG value equal to zero are indicative of a non-acid forming material. A NAG value greater than one kg H_2SO_4/t indicates the sample will generate some acidity in excess of available alkalinity. However, by convention, any NAG value below 10 kg H_2SO_4/t has a limited potential for acid generation and the results are considered inconclusive because a blank hydrogen peroxide solution can generate a NAG artifact value up to 10 kg H_2SO_4/t (Sapsford et al., 2009).

Table 5-3: Acid Generation Criteria for NAG Results

Acid Generation Capacity		Final NAG pH (s.u.)	Static NAG (kg H_2SO_4/t)
Potentially Acid Forming (PAF)	Higher Capacity	< 4	>10
	Lower Capacity	< 4	$\leq$10, >1
Non-Acid Forming (NAF)		$\geq$ 4	0

5.3.4 Meteoric Water Mobility Procedure

Nevada Meteoric Water Mobility Procedure (MWMP) testing was carried out to give an indication of constituent mobility from the Mineral Ridge materials. The MWMP test was developed to simulate the leaching of mine waste materials with meteoric water during precipitation events. The results of the MWMP test can be used to identify the presence of leachable constituents and readily soluble salts stored in the material as well as provide an indication of their availability for dissolution and transport in response to a precipitation event.

The Meteoric Water Mobility Procedure is conducted according to standard test methods (ASTM E-2242-02) that involve a 24-hour, single pass column leach using a 1:1 distilled water:rock ratio. The resulting leachate is submitted for metals analysis. The MWMP test was developed to simulate the leaching of mine waste materials by meteoric water under typical low precipitation environmental field conditions. The results of the MWMP test can be used to identify the presence of leachable metals and readily soluble salts stored in the material, as well as provide an indication of their availability for dissolution and transport in response to a precipitation event.

6 Waste Rock Characterization Results

6.1 Multi-Element Analysis Results

Multi element analysis was undertaken to provide an absolute upper limit of metals available for leaching from the Mineral Ridge materials. The multi-element data were analyzed using the Geochemical Abundance Index (GAI) (INAP, 2009), which compares the concentration of an element in a given sample to its average crustal abundance. The Chemex laboratory reports are provided in Appendix D.

The results are presented in Table 6-1 and show that concentrations of silver, arsenic, mercury, lead, sulfur, antimony and tungsten are present at greater than three times their average crustal concentration in one or more of the material types. Zinc and cadmium are also slightly elevated for the ore grade samples, which is consistent with the observation that minor amounts of galena and sphalerite are associated with the mineralization.

Arsenic concentrations were found to be elevated in all material types, in particular the mineralized quartz samples. Maximum measured arsenic concentrations in the waste rock were 454 mg/kg compared to an average crustal abundance of 1.8 mg/kg. These concentrations of arsenic are not uncommon in gold deposits and represent the association of arsenic with the mineralization. This is confirmed by the observation of arsenic concentrations up to 137 mg/kg in the ore samples. The elevated concentrations of silver, mercury, sulfur, antimony and tungsten in the waste rock and ore samples can also be explained by the common association of these elements with gold deposits (Rose, Hawkes and Webb, 1979).

Table 6-1: Summary of Multi Element Data for Key Parameters Relating to ARDML

Grade	Main Unit	Material Type	*n*	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Mo	Ni	Pb	S	Sb	Tl	U	W	Zn
Average crustal abundance (Mason, 1966) >>				*0.07*	*81,300*	*1.8*	*0.2*	*100*	*55*	*50,000*	*0.08*	*950*	*1.5*	*75*	*13*	*260*	*0.2*	*0.5*	*1.8*	*1.5*	*70*
Waste Rock	Igneous Intrusive	Alaskite	33	0.23	63,173	15.0	0.16	8.79	10.5	11,112	0.15	168	0.88	4.41	53.4	1,955	1.43	0.95	4.75	3.79	41.2
		Pegmatite	20	0.12	66,345	7.97	0.20	14.3	9.17	10,155	0.05	181	0.89	6.69	37.2	1,330	0.56	0.97	6.43	4.31	35.7
		Granodiorite	7	0.10	74,871	16.4	0.07	76.7	15.5	26,743	0.28	400	1.14	40.3	23.6	2,243	2.67	0.88	4.61	3.00	71.1
		Mafic Intrusive	3	0.13	68,667	12.8	0.10	341	37.2	51,200	0.16	887	0.79	119	10.1	2,700	1.42	0.66	2.27	3.50	80.7
		Quartz	12	0.17	57,533	23.9	0.14	17.8	12.6	12,658	0.29	191	1.26	7.58	38.1	1,258	3.72	0.99	5.44	4.26	39.8
	Wyman Formation	Limestone (Undiff)	30	0.23	63,253	16.5	0.51	34.4	16.5	18,510	0.16	371	1.59	16.0	52.3	2,713	1.78	0.89	5.27	4.71	101
		Mary Limestone	18	0.29	60,456	16.8	0.23	62.1	11.7	20,706	0.08	440	0.83	25.9	41.8	2,706	1.23	0.67	3.72	5.74	64.9
		Metasediments	8	0.31	70,000	70.4	0.20	106	17.7	32,688	0.47	427	1.27	35.0	27.7	1,338	7.49	0.93	3.69	4.70	69.6
		Calc-silicate	3	0.21	64,200	28.9	0.18	49.7	18.1	25,833	0.23	341	1.17	21.9	94.6	100	2.79	1.15	2.87	6.33	73.0
	Reed Formation	Dolomite	2	0.02	2,900	9.00	0.04	3.50	1.60	8,200	0.01	817	0.17	2.65	1.85	100	0.25	0.03	0.50	0.75	8.5
Ore	Stockpile Ore	Ore	2	1.30	40,850	52.0	1.96	17.0	11.0	13,650	0.38	286	1.04	8.55	199	1,150	4.52	0.84	3.00	2.95	190
	Heap Ore	Ore	3	1.5	56,467	94.1	1.31	34.3	10.3	16,533	0.20	318	1.55	13.1	150	1,433	2.49	0.98	3.33	8.07	163

GAI = 0 represents less than 3 times average crustal concentrations
GAI = 1 represents 3 to 6 times average crustal concentrations
GAI = 2 represents 6 to 12 times average crustal concentrations
GAI ≥ 3 represents greater than 12 times average crustal concentrations

6.2 Acid Base Accounting Results

Acid Base Accounting was carried out on 141 samples to assess the balance of acid generating sulfide minerals and acid neutralizing carbonate minerals. The results are summarized in Table 6-2 and are illustrated on the scatter plots presented in Figure 6-1 to Figure 6-3. The SVL laboratory reports are provided in Appendix D.

The waste rock samples were found to be characterized by a low sulfide content (typically <0.2 wt%) and a significant excess of neutralizing capacity (NPR typically > 10). Of the 141 waste rock samples tested, 83% showed non-acid forming characteristics based on the BLM criteria. The remaining samples showed uncertain acid generating characteristics with NPR values less than 3 and/or NNP values less than 20 kg $CaCO_3$/t. The majority of the samples (98%) have NPR values greater than 3 and all but one of the samples met the NDEP criteria of NPR>1.2 for classification as non-acid generating rock (Figure 6-1). The five samples of stockpile and heap ore collected as part of the characterization program also show non-acid forming characteristics based on ABA testwork results.

Measurements of paste pH were made to assess the short-term reactivity of the samples. The results are shown in Figure 6-3 and show uniformly circum-neutral to moderately alkaline paste pH values (7.75 to 9.68). This indicates minimal presence of soluble acid sulfate salts on the material surface and demonstrates that the short-term potential for acid generation is low.

Overall, the carbonate nature of the host rocks coupled with the low sulfide content means that any waste rock and ore generated by the project is likely to present a low risk for acid generation. Furthermore, WPCP monitoring data for waste rock are shown in Figures 6-1 through 6-3 and are within the same range of results as the 2012 samples indicating the proposed expansion does not present an additional risk for ARDML.

Table 6-2: Summary of Acid Base Accounting Results

Grade	Main Unit	Material Type	*n*	Sulfide sulfur	AP	NP	NNP	NPR
				(wt%)	kg $CaCO_3$/t			-
Waste Rock	Igneous Intrusive	Alaskite	33	0.12	3.84	52.3	48.5	49.5
		Pegmatite	20	0.06	1.83	34.8	33.0	49.8
		Granodiorite	7	0.09	2.95	45.3	43.2	20.3
		Mafic Intrusive	3	0.09	2.81	253	251	441
		Quartz	12	0.08	2.42	32.7	30.3	56.0
	Wyman Formation	Limestone (Undiff)	30	0.13	4.16	139	135	209
		Mary Limestone	18	0.14	4.36	222	217	300
		Metasediments	8	0.08	2.58	90.9	88.3	101
		Calc-silicate	3	0.01	0.31	172	172	551
	Reed Formation	Dolomite	2	0.01	0.31	980	979	3134
Ore	Stockpile Ore	Ore	2	0.05	1.41	322	320	213
	Heap Ore	Ore	3	0.06	1.77	102	99.8	60.8
WPCP samples	-	-	22	0.13	3.85	134	130	285

Non Acid Forming (NAF)

Potentially Acid Forming (PAF)

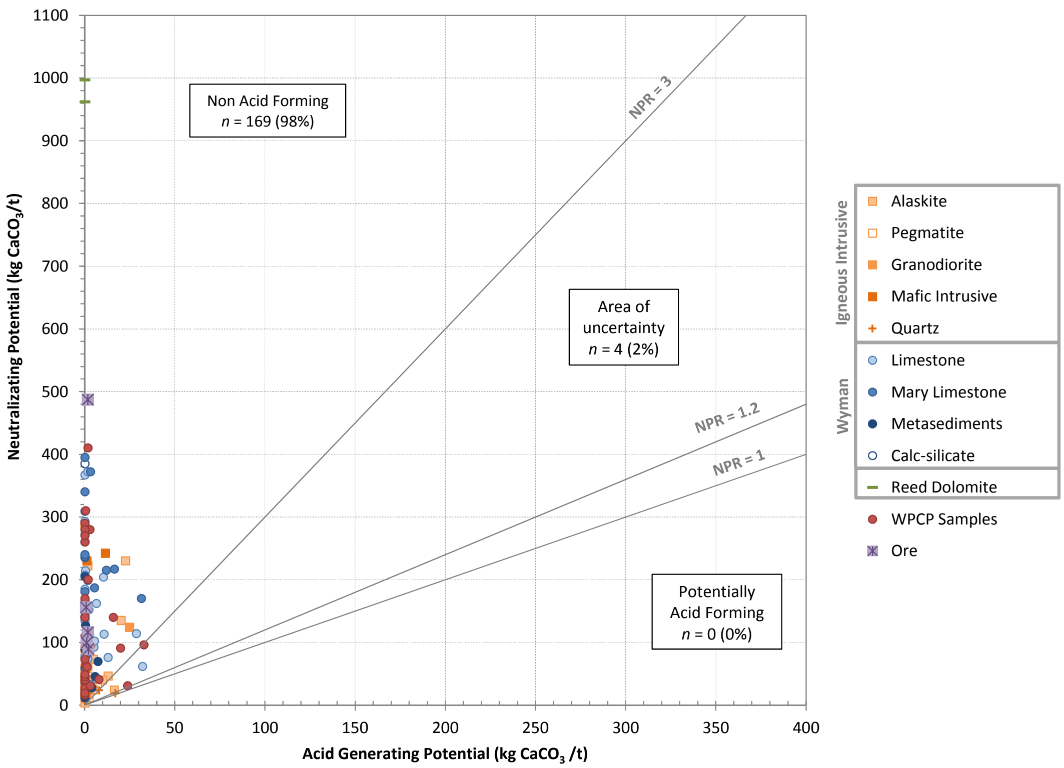


Figure 6-1: Scatter Plot of Acid Generating Potential vs. Neutralizing Potential

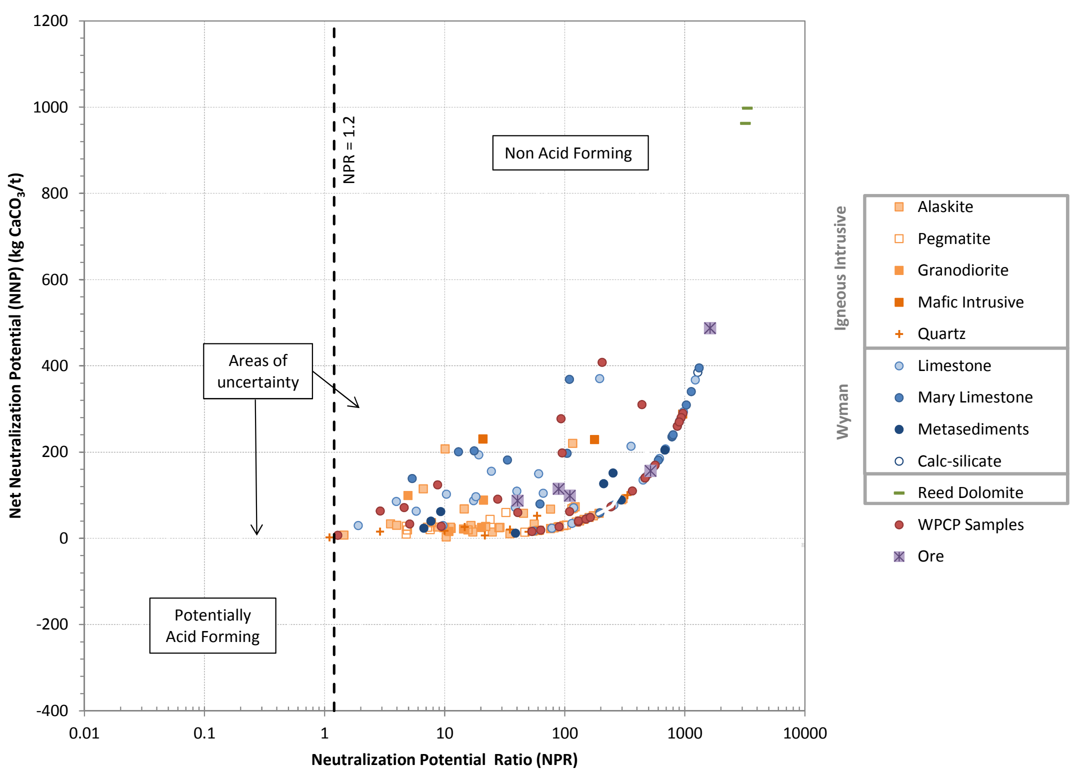


Figure 6-2: Scatter Plot of NPR vs. NNP

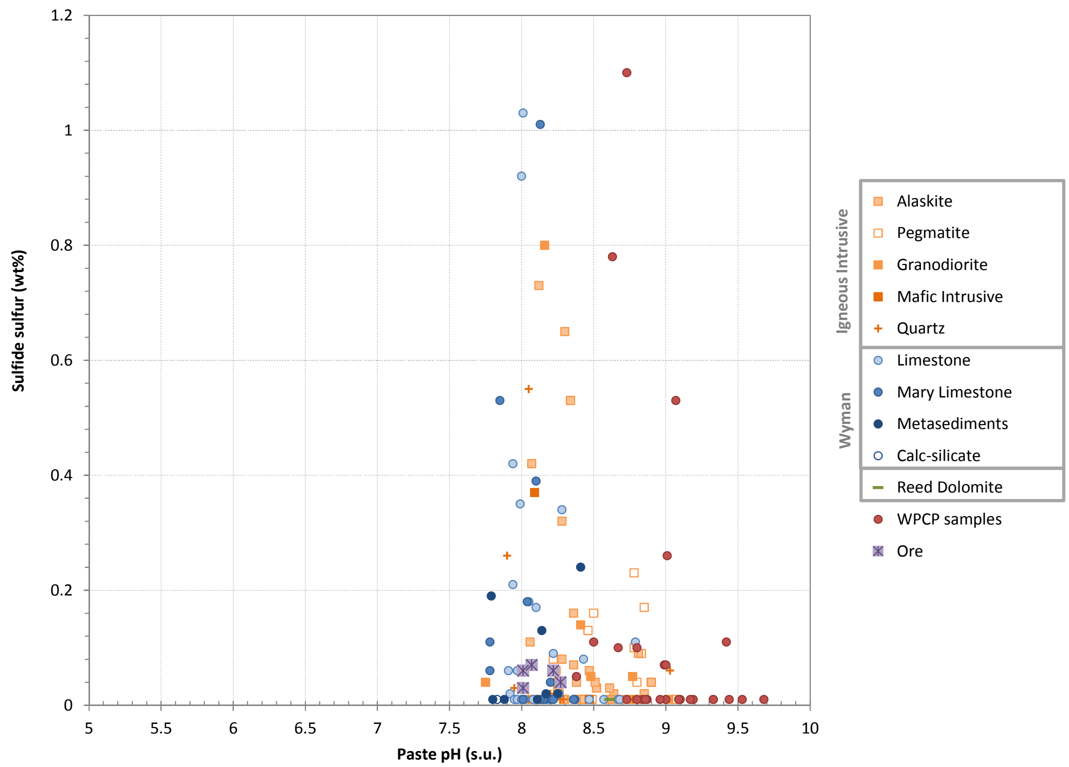


Figure 6-3: Scatter Plot of Paste pH vs. Sulfide Sulfur

6.3 Net Acid Generation Results

Net Acid Generation testing was carried out on a total of 138 waste rock and ore samples in order to assess the potential for acid generation given complete oxidation of sulfide minerals in the Mineral Ridge materials. The results are summarized in Table 6-3. In general, a NAG pH greater than 4 s.u. and a NAG value equal to zero are indicative of a non-acid generating material. The SVL laboratory reports are provided in Appendix D.

In Figure 6-4, NAG pH is plotted against the final NAG values for the Mineral Ridge samples. From the NAG results, all but one sample can be classed as non-acid generating, with NAG pH values greater than 4 s.u. and a NAG value of zero. The one sample with measurable acidity was a sample of mineralized quartz material. However, the NAG value for this sample was less than 10 kg H_2SO_4/t, indicting this sample has a low potential for acid generation. The NAG test results support the ABA prediction and confirm that essentially no acid generation is predicted for the waste rock to be mined from the Mineral Ridge deposit.

A plot of sulfide sulfur versus NAG pH is provided in Figure 6-5 and shows that there is no correlation between sulfide sulfur and the NAG pH. This is due to the high neutralization potential of the Mineral Ridge lithologies, indicating the samples will be net neutralizing despite sulfide sulfur concentrations as high as one percent by weight (1 wt%).

The five samples of stockpile ore and spent heap ore collected as part of the characterization program also show non-acid forming characteristics based on the NAG test results with NAG pH values between 8 and 10 s.u. and NAG values of zero.

Table 6-3: Summary of Net Acid Generation Test Results

Grade	Main Unit	Material Type	*n*	NAG pH	NAG
				(s.u.)	kg H_2SO_4/t
Waste Rock	Igneous Intrusive	Alaskite	33	7.67	<0.2
		Pegmatite	20	7.99	<0.2
		Granodiorite	7	7.76	<0.2
		Mafic Intrusive	3	8.39	<0.2
		Quartz	12	7.29	0.69
	Wyman Formation	Limestone (Undiff)	30	8.16	<0.2
		Mary Limestone	18	8.53	<0.2
		Metasediments	8	7.77	<0.2
		Calc-silicate	3	7.63	<0.2
	Reed Formation	Dolomite	2	8.32	<0.2
Ore	Stockpile Ore	Ore	2	8.14	<0.2
	Heap Ore	Ore	3	10.4	<0.2

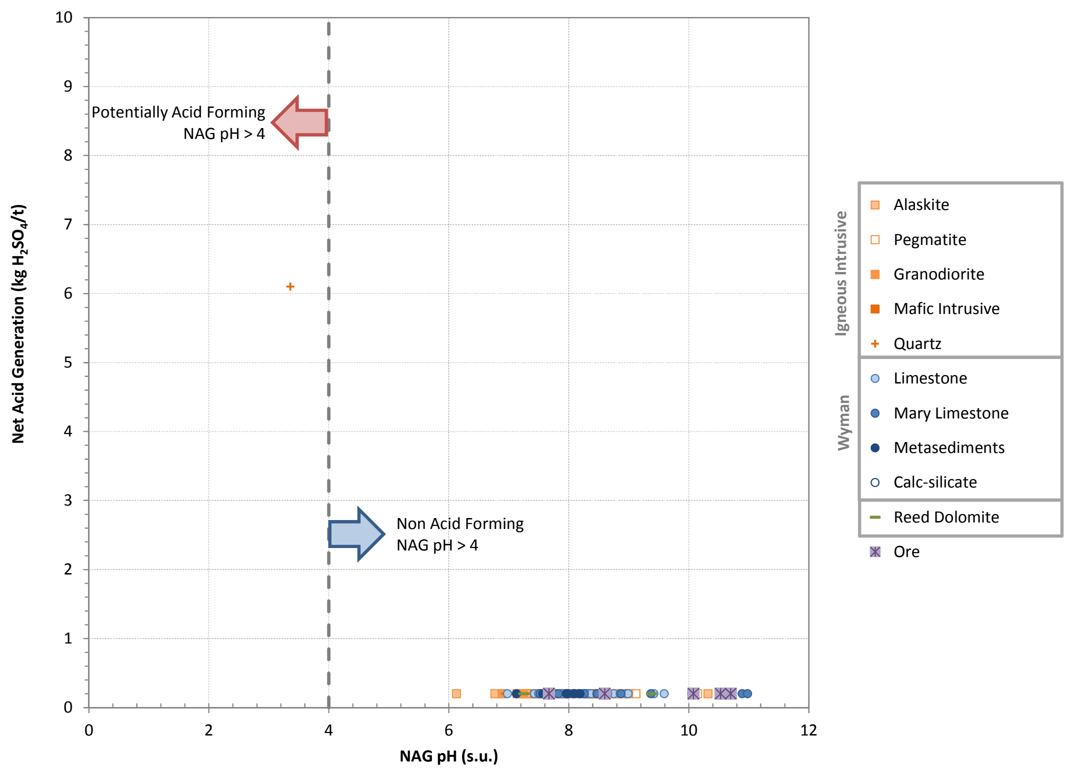


Figure 6-4: Scatter Plot of NAG pH vs. NAG

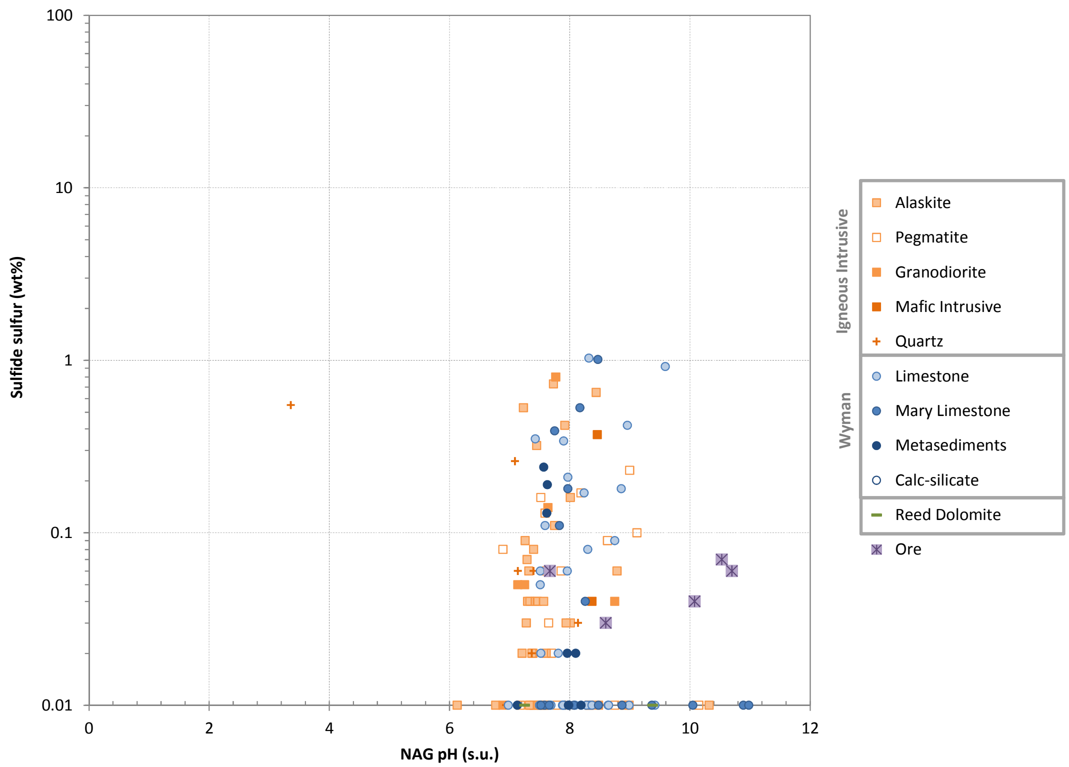


Figure 6-5: Scatter Plot of Sulfide Sulfur vs. NAG pH

6.4 Meteoric Water Mobility Procedure Results

MWMP data are available for a total of 30 waste rock and 5 ore samples and provide an indication of elemental mobility and metal(loid) release from the Mineral Ridge material types. The MWMP data for waste rock included in this evaluation are from the 2011 and 2012 WPCP monitoring program as described in Section 4.2.2 above. A plot of MWMP pH vs. Ficklin metal (cobalt + cadmium + copper + lead + nickel + zinc) release is presented in Figure 6-6. A complete tabulation of the results are presented and compared to NDEP reference values in Appendix E.

The MWMP leachates for the waste rock samples were almost uniformly circum-neutral to moderately alkaline (pH 7.5 to 9) with generally low metal release (i.e., less than 0.1 mg/L). Only one of the Wyman Formation WPCP monitoring samples produced an acidic leachate (pH 3.16 s.u.) during the MWMP test. However, an increase in metal release as a result of the lower pH was not observed for this sample.

These results support the findings of the ABA and NAG testing, which demonstrated that acid generation is unlikely to be a problem for the Mineral Ridge Project. Nonetheless, a few parameters are likely to be mobile under the neutral to alkaline pH conditions and the MWMP tests show elevated release of arsenic in six of the samples tested (Figure 6-7) and antimony in a further three samples (Figure 6-8). Aluminum, antimony and nitrate concentrations were elevated above NDEP reference values in one waste rock sample, but not the same sample. All remaining constituents are below the respective NDEP reference values for the waste rock samples.

Despite elevated concentrations of cadmium, lead, mercury and silver from the multi-element analysis, these constituents were not mobilized during the MWMP tests.

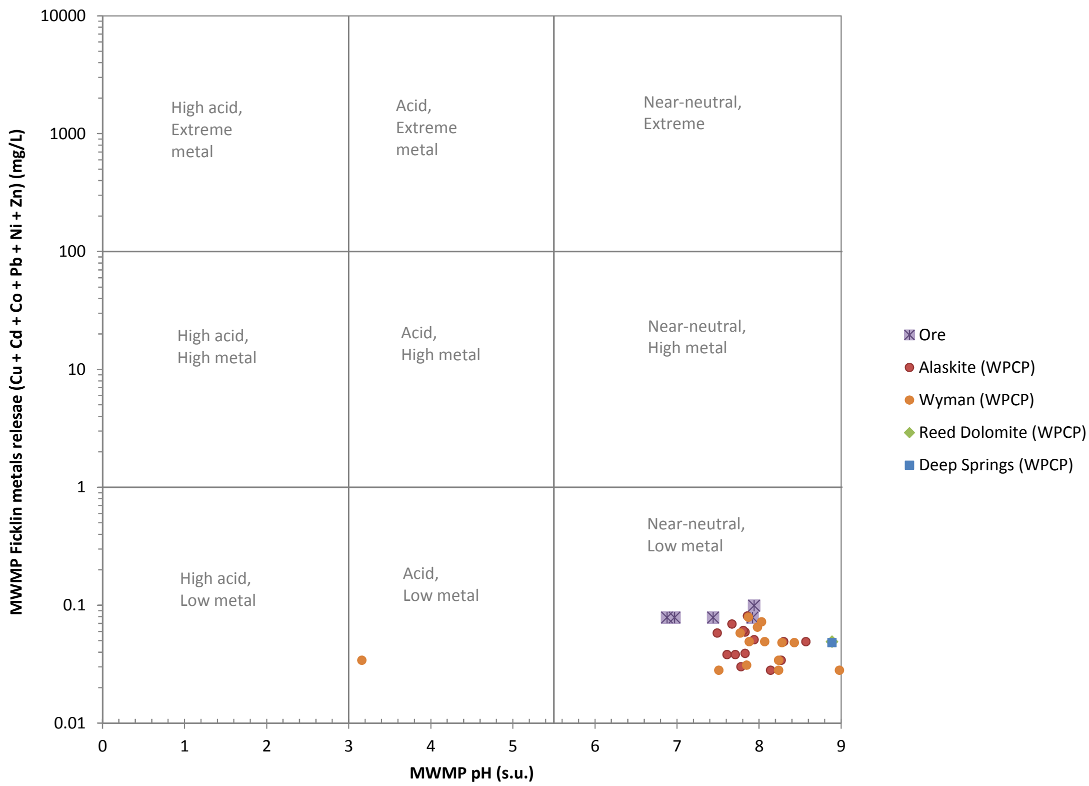


Figure 6-6: MWMP pH vs. Ficklin Metal Release

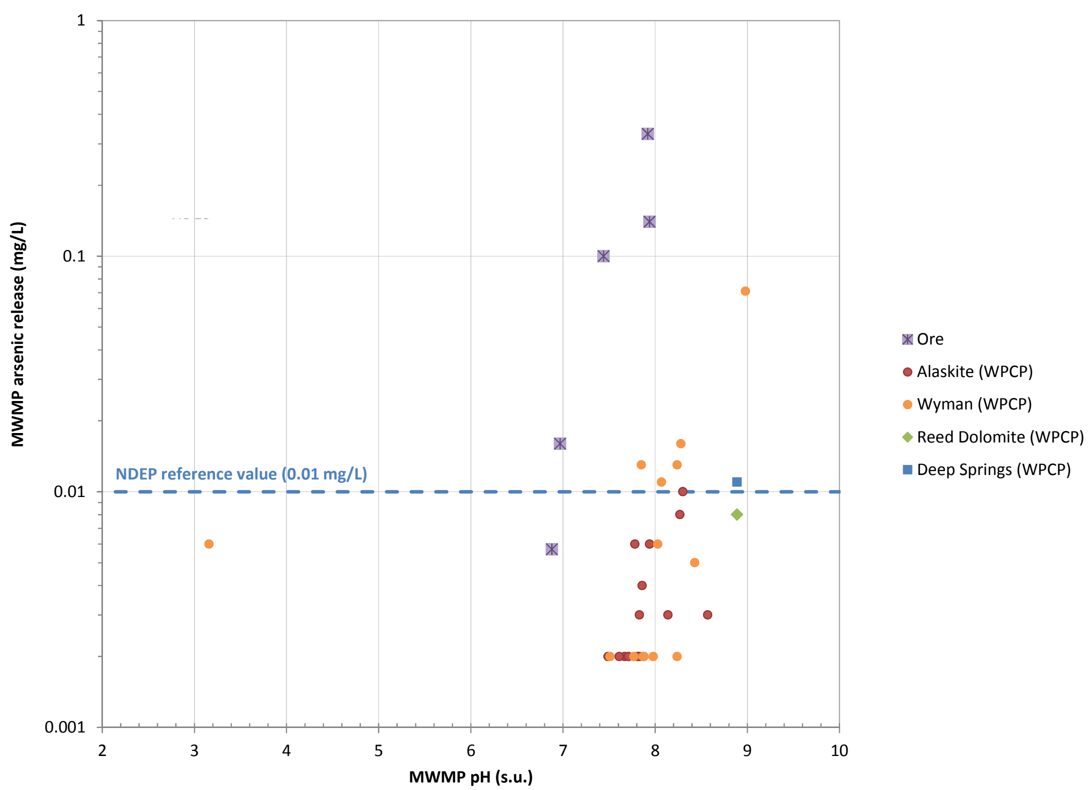


Figure 6-7: MWMP pH vs. Arsenic Release

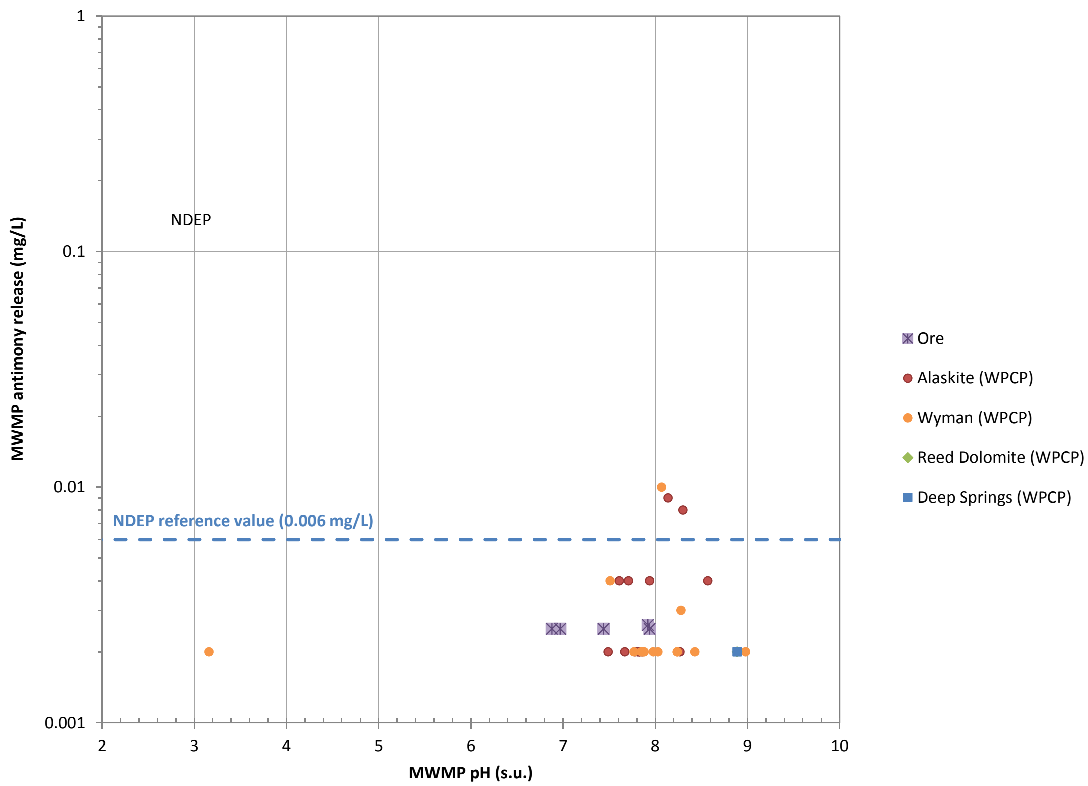


Figure 6-8: MWMP pH vs. Antimony Release

The two samples of stockpile ore collected as part of the characterization program show similar results to the waste rock WPCP samples, with circum-neutral to moderately alkaline and low metal release (i.e., less than 0.1 mg/L). Similar to the waste rock samples, arsenic concentrations for the stockpiled ore samples were slightly above the NDEP reference value of 0.01 mg/L. The remaining constituents were leached at concentrations below NDEP values from the waste rock and stockpiled ore samples, with the exception of nitrate in one of the two samples.

The greatest arsenic release is seen for the samples of heap ore collected from the active heap, with concentrations between 0.1 and 0.33 mg/L. This likely relates to the primary mineralization in the ore and indicates that some of the arsenic is held in a mobile or leachable form. The heap ore samples showed release of several other constituents above NDEP reference values including:

- Sulfate release was elevated for two of the three samples, with concentrations of 600 mg/L and 1200 mg/L compared the NDEP reference value of 500 mg/L.
- Mercury is elevated above the reference value in one of the three samples, with a concentration of 0.0095 mg/L compared to the NDEP reference value of 0.002 mg/L.
- WAD cyanide is just above the NDEP reference value of 0.2 mg/L in the heap material along with nitrate concentrations.

A comparison of the MWMP results for the heap ore samples to the operational pregnant and barren pond solution chemistry and pre-operational pregnant/barren solution chemistry is provided in Table 6-4. This comparison shows that metal loads are higher in the operating pregnant and barren ponds in comparison to the MWMP leachate from the heap ore material. During the early phases of closure, draindown solution from the heap will likely have high metal loads comparable to the operating pregnant and barren pond chemistry. However, as the solution inventory of the heap decreases, the metals load in the heap solution will likely decrease in the long term due to the limited amount of metals loading anticipated from the spent heap ore based on the MWMP results.

Table 6-4: Comparison of Heap Ore MWMP Results to Heap Solution Chemistry

Parameters	NDEP Value	Average Results			
		Preg/ Barren Pond n = 1	Preg Pond n = 3	Barren Pond n = 3	Heap Ore MWMP n = 3
Alkalinity, Total	-	360	310	360	57
Bicarbonate	-	<2	<2	<2	<1
Aluminum	0.2	<0.5	<0.1	<0.1	<0.045
Antimony	0.006	<0.01	<0.004	<0.004	0.0025
Arsenic	0.01	0.02	0.16	0.17	0.19
Barium	2	0.04	0.032	0.033	0.016
Beryllium	0.004	<0.01	<0.004	<0.004	<0.001
Cadmium	0.005	<0.01	0.38	0.39	0.0015
Calcium	-	390	280	290	120
Chloride	400	360	320	330	180
Chromium	0.1	0.02	0.087	0.09	<0.005
Cobalt	-	0.35	0.6	0.6	0.35
Copper	1	0.02	3.6	3.4	<0.05
Fluoride	4	<1	0.73	1	1.6
Iron	0.6	0.3	1.4	1.4	0.26
Lead	0.015	<0.04	0.006	<0.004	<0.0025
Magnesium	150	3	4.3	1.7	8.2
Manganese	0.1	<0.01	0.01	0.008	<0.005
Mercury	0.002	<0.0002	0.02	0.018	0.0034
Molybdenum	-	0.17	0.71	0.71	0.12
Nickel	0.1	<0.01	0.46	0.38	0.016
Nitrate + Nitrite	10	76	50	53	28
pH	6.5 - 8.5	12	10	10	7.8
Potassium	-	19	20	21	16
Selenium	0.05	<0.05	0.03	0.03	0.009
Silver	0.1	<0.01	0.33	0.089	0.015
Sodium	-	890	620	590	400
Sulfate	500	1400	960	990	720
Thallium	0.002	<0.005	0.003	0.003	0.001
TDS	1000	3700	2700	2800	1600
WAD cyanide	0.2	82	100	110	0.21
Zinc	5	<0.1	20	20	<0.01

All values reported in mg/L except pH which is in standard units (s.u.).
< Denotes less than the specified laboratory method detection limit.
Shaded values exceed the respective comparative value from NDEP Form 0190 for Profile II constituents.

7 Predicted Geochemical Behavior

7.1 Acid Generation

The results of the static and kinetic geochemical testwork demonstrate that the Mineral Ridge waste rock material is net neutralizing and presents a low risk for ARDML. The carbonate nature of the sedimentary host rocks results in a significant excess of neutralizing (buffering) capacity. A total of 141 samples were characterized using ABA testing, which classified the majority of the samples as non-acid generating materials based on the BLM criteria. All but one of the samples met the NDEP criteria for classification as non-acid generating rock. These results are consistent with previous characterization studies and data from the WPCP monitoring program.

The stockpile and spent heap ore samples included in this study were also found to contain significant neutralizing capacity and are predicted to be non-acid generating from both the ABA and NAG results.

7.2 Metal Leaching

The excess of neutralizing capacity means that net acid conditions are unlikely to develop at Mineral Ridge and metal leaching from the waste rock and stockpiled ore will be low. However, a few metal(loid)s are likely to be mobile under the circum-neutral to moderately alkaline conditions. MWMP tests from the WPCP monitoring program provide an indication of the elements that may be released during meteoric rinsing of the waste rock and showed elevated release of arsenic and antimony from two or more of the waste rock and stockpile ore samples.

The potential for metal leaching from the spent heap ore material is also low, however, this material shows a greater potential for arsenic release in comparison to the waste rock and stockpiled ore samples. In addition, mercury, nitrate, sulfate and WAD cyanide also occur above the NDEP reference values in one or more of the heap ore samples. These constituents are mobile under alkaline conditions and are predicted to be elevated in the heap draindown solution.

8 Conclusions and Recommendations

The results of the static and kinetic geochemical testwork demonstrate that the Mineral Ridge waste rock material is net neutralizing and presents a low risk for ARDML. Therefore, no special handling or management of the waste rock material is required and no changes to the current waste rock management practices are proposed for existing or future operations at the Mineral Ridge Mine.

Furthermore, based on the ABA and NAG results, kinetic testing is not needed to demonstrate the Mineral Ridge waste rock materials have a low potential for ARDML. However, continued monitoring of the waste rock material generated during the quarter is recommended. This monitoring program will continue to provide data for all material types encountered during mining.

Results of the study indicate the stockpiled ore geochemistry is similar to the waste rock material and presents a low risk for ARDML. Therefore, no special handling or management of the stockpiled ore is required and a liner for the ore stockpile facilities is not warranted.

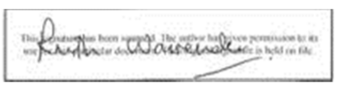
The spent ore collected from the active heap also has a low potential for acid generation; however, several constituents are likely to be mobile under the neutral to alkaline pH conditions and will likely be present in the long term heap draindown including arsenic, mercury, sulfate, nitrate and WAD cyanide.

Prepared by

Amy Prestia, M.Sc., P.G.
Senior Consultant (Geochemistry)

Reviewed by

Eur. Geol. Rob Bowell PhD C. Chem C. Geol
Corporate Consultant (Geochemistry)



Ruth Warrender BSc, MSc, PhD, FGS
Consultant (Geochemistry)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

9 References

AMEC, 2012. Mineral Ridge Project, Esmeralda County, Nevada USA, NI 43-101 Technical Report on Life of Mine Plan (July 15, 2012).

ASTM, 1996 (reapproved 2001). Standard test method for accelerated weathering of solid materials using a modified humidity cell: American Society for Testing and Materials. West Conshohocken, PA, (www.astm.org), D 5744-96(2001), p. 13.

Bowell, R.J., Rees, S.B., and Parshley, J.V., 2000. Geochemical predictions of metal leaching and acid generation: geologic controls and baseline assessment: Geology and Ore Deposits 2000, in The Great Basin and Beyond Proceedings, Volume II: Geological Society of Nevada, Reno, p. 799-823.

Bureau of Land Management, 2010. Instruction Memorandum NV-2010-014, Nevada Bureau of Land Management Rock Characterization Resources and Water Analysis Guidance for Mining Activities. January 8, 2010.

Environmental Geochemistry International (EGi), 2002. Net acid generation (NAG) test procedures. Unpublished report for BHP Billiton, February 2002, p. 6.

Ficklin, W.H., Plumlee, G.S., Smith, K.S., and McHugh, J.B., 1992. Geochemical classification of mine drainages and natural drainages in mineralized areas: Proceedings, 7th International Symposium on Water-Rock Interactions, Park City, Utah, p. 381-384.

Hem, John D., 1985. Study and Interpretation of the Chemical Characteristics of Natural Water, U.S. Geological Survey Water-Supply Paper 2254.

Lappakko, K.A., and White, III, W.W., 2000. Modification of the ASTM 5744-96 kinetic test: ICARD 2000, p. 631-639.

Mason, B., 1966, Principles of Geochemistry, Third edition, p. 329

Micon, 2009. Technical Report on the Mineral Ridge Gold Project, Nevada. September 2009.

Miller, S., Robertson, A., and Donohue, T., 1997. Advances in acid drainage prediction using NAG test: ICARD ‘97, Vancouver, Mine Environmental Neutral Drainage Program, Ottawa, Canada, p. 535-549.

Nevada Division of Environmental Protection (NDEP), 1990. Waste Rock and Overburden Evaluation, September 14, 1990.

Price, W.A., 1997. Draft guidelines and recommended methods for the prediction of metal leaching and acid rock drainage at minesites in British Columbia: British Columbia Ministry of Employment and Investment, Energy and Minerals Division, Smithers, BC, April 1997, p. 143.

Roberts, R.J., 1966, Metallogenic provinces and mineral belts in Nevada: Nevada Bureau of Mines and Geology Report 13, p. 47-72.

Rose, A.W., Hawkes, H.E. and Webb, J.S., 1979, Geochemistry in Mineral Exploration. Academic Press, 657pp

Sobek, A.A, Schuller, W.A., Freeman, J.R., and Smith, R.M., 1978. Field and laboratory methods applicable to overburden and minesoils: EPA 600/2-78-054, 203 pp.

Sverdrup, H.U., 1990. The kinetics of base cation release due to chemical weathering: Lund

White, III, W.W., and Lapakko, K.A., 2000. Preliminary indications of repeatability and reproducibility of the ASTM 5744-96 kinetic test for drainage pH and sulfate release rate: ICARD 2000, p. 621-630.

The appendices will be provided by the BLM upon request.

Appendix D – Waste Rock Slope Stability Memo

SRK Consulting (US) Inc.
Suite 520 - 1250 Lamoille Highway
Elko, NV 89801

T: 775.753.4151
F: 775.753.4152

elko@srk.com
www.srk.com

Memo

To:	Carrie Schultz	**Date:**	February 26, 2015
Company:	SRK Consulting (US) Inc	**From:**	John Cooper
Copy to:	Val Sawyer	**Project #:**	202200.370
Subject:	Waste Rock Dump Stability Methods		

This memorandum presents the methodology for conducting stability analysis on waste rock facilities (dumps) on mine sites. This methodology is generally accepted practice. Following the presentation of the methodology, a review and discussion of the Mineral Ridge waste rock slope stability analysis completed by WESTEC is presented.

Methodology

The first step is determine the three-dimensional (3-D) geometry of the dump and underlying soils or stratigraphy including the ground water surface, if present. In most cases the operator has determined what the dumps will look like or they will have already been designed to a configuration that is acceptable to the client. Both the operational and reclaimed slopes are evaluated in the analysis. The critical elements in the geometry are the underlying ground surface (existing topography), the soil layers and the bedrock surface.

Once the geometry is established the critical section can be determined and is either normal to the dump face at the highest part of the dump or down the fall line of the underlying surface. If the two potential critical sections are not coincidental then both sections are analyzed. A cross section of the 3-D model is then “cut” along the critical sections for analysis. With some dumps the critical section may not be obvious and several sections must be run to determine the most critical.

Material properties for each soil or rock type need to be assigned to the layers in the model of the waste rock dump and include shear strength and unit weights. For the waste rock these values are often estimated based on published values and with consideration for rock type. Because of the large particle sizes involved, laboratory testing is often not feasible. If a dump of similar material is on site or at a nearby site the angle of repose can be determined and used as the internal angle of friction. Also if the underlying ground was surveyed and the tonnage of waste rock tracked, a better estimate of unit weight can be made. Typically waste rock is assumed to be cohesionless with Phi angles of 35 to 40 degrees and a unit weight of 100 to 125 pounds per cubic foot with some rock types running as high as 140 pcf.

Soil values are typically determined from drilling or test pitting to collect samples for laboratory testing. Testing typically includes gradation, Atterberg limits, unit weight and shear strength testing. Shear strength can also be estimated from the blow counts from sample drives (standard penetration test). For shallow soil profiles a review of the soil surveys published by the Natural Resource and Conservation Service may suffice to estimate shear strengths based on soil type by using the low end of published values. The soil layers are often the weak link in the system, and therefor receive the most attention. Rock strengths are generally assumed or estimated from testing performed on core samples.

Analysis is conducted for both static and psuedostatic conditions to account for earthquake loading. The seismic coefficient for the pseudostatic analysis is determined from the peak ground acceleration (PGA). The PGA can be found by either probabilistic or deterministic analysis. Probabilistic analysis provides a PGA based on a given probability for a certain time period that an event producing that acceleration occurs. The seismic coefficient is half to two-thirds of the PGA to account for attenuation of the acceleration in soil and loose rock structures. For the Mineral Ridge site the PGA is 0.20g for the 10% in 50-year event resulting in a seismic coefficient of 0.13g assuming a reduction of 1/3. This is comparable to the coefficient of 0.12g used in the WESTEC analysis. The PGA value was obtained from the USGS interactive deaggregations tool (2008) found at the following website: http://earthquake.usgs.gov/hazards/?source=sitenav

A deterministic analysis simply considers the maximum possible event based on potential magnitude of the fault and the distance of the fault from the site. In Nevada the data is often inferred from limited observations and can lead to unrealistic accelerations that may not have a realistic chance of occurring. With this in mind the probabilistic hazard analysis is used most often.

Analysis is conducted using the SLIDE 6 2D slope stability software produced by RocScience. Spencer's method of slices is used for the analyses as that method satisfies both force and moment equilibrium and is generally accepted as being more accurate than other common methods. Circular and noncircular (block) failure modes are analyzed for each cross section under static and psuedostatic conditions. The end result is that each section is analyzed four times to consider all potential failure conditions. If any of the results have a factor of safety (FOS) less than required (1.3 for static conditions and 1.05 for psuedostatic conditions) the condition is mediated by redesign of the dump, adding buttress zones, stability berms or other methods.

WESTEC Data Review

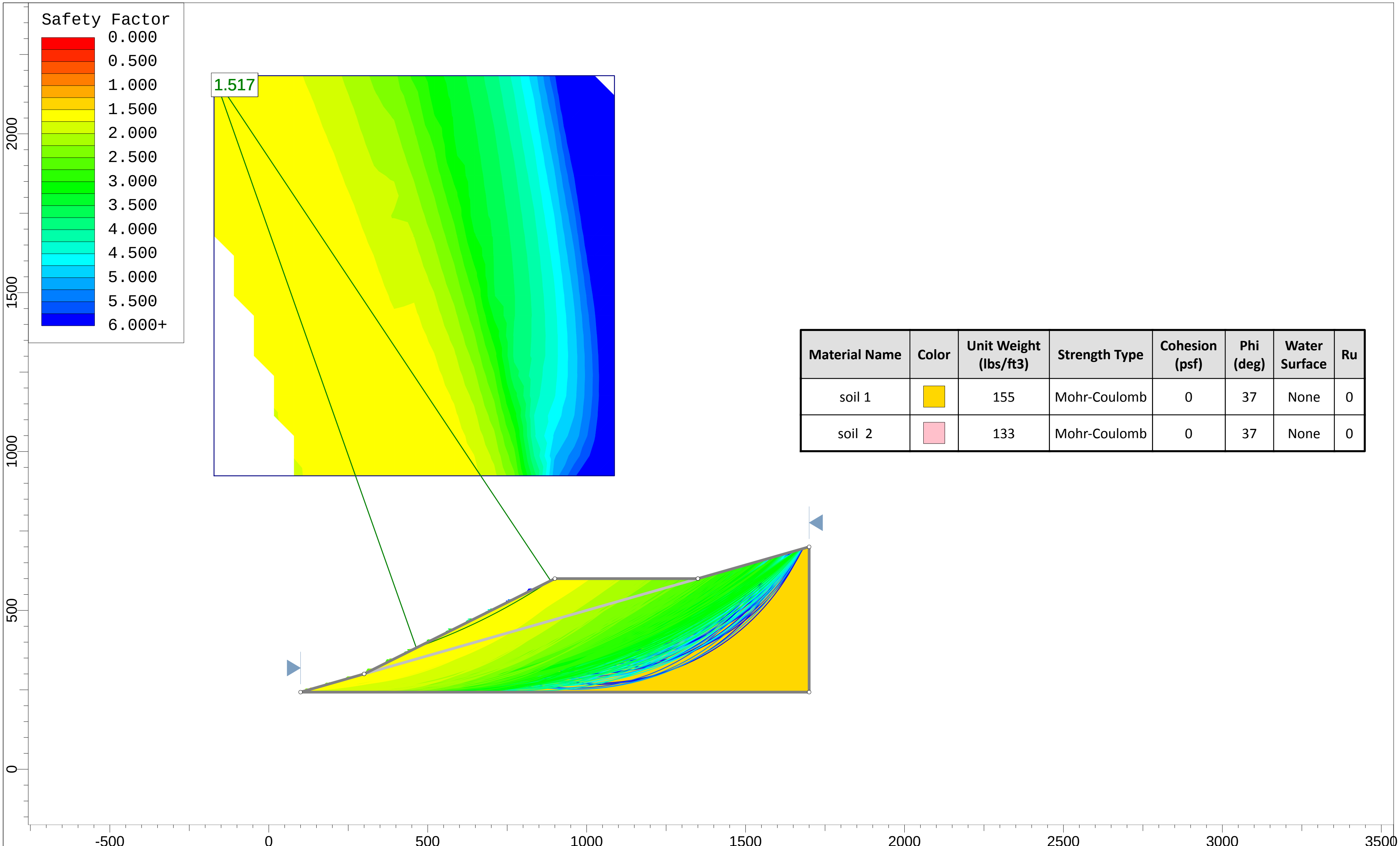
SRK has reviewed the stability output files included in Appendix C of the 2003 Golden Phoenix Plan of Operations. These files are dated March 28, 1996 and were included in the original design for this property completed by WESTEC. It appears that WESTEC identified that WD-2 as the most critical waste dump, so the remaining dumps would have higher factors of safety. The geometry of the dump consists of a two- layer system consisting of waste rock lying on bedrock. The bedrock has a unit weight of 155 pcf, the waste rock has a unit weight of 130 pcf, and both units have shear strength represented with an internal friction angle of 37 degrees with no cohesion. These values are reasonable, and therefore were used in SRK's evaluation using SLIDE 6 software incorporating seismic coefficients determined from the 2008 deaggregation PGAs. Using the geometry provided in the output files Spencer's method was used for the analysis and the following results were obtained:

Scenario	Reclaimed Slope 2.0:1.0 FOS	Reclaimed slope 2.5:1.0 FOS
Circular Failure Static	1.52	1.90
Circular Failure seismic loading	1.13	1.36
Block Failure Static	1.73	2.05
Block Failure seismic loading	1.31	1.48

The factors of safety are slightly lower than the previous analysis as WESTEC used Bishops modified method (circular) and Janbu's method (block failure). In all cases the results exceed minimum requirements for waster rock dump stability.

Determining the event that would cause a slope failure of the waste rock dump is done by reducing the seismic coefficient in small increments on the most critical section until the factor of safety decreases to 1. For the Mineral Ridge this is the circular failure of the 2:1 dump slope with a seismic coefficient of 0.187g. Adding the one-third reduction back in the PGA for the seismic event causing a failure is 0.28g. An event resulting in an acceleration of 0.27g has a 5% chance of occurring in 50 years and has a recurrence interval of 975 years. Accounting for accuracy, the difference between 0.27g and 0.28g is not a large difference therefor a failure causing event has a probability of 5% in 50-years. With a recurrence interval of near 1,000 years this is approximately the equivalent to the 4% chance of occurrence during the mine life provided in previous reports.

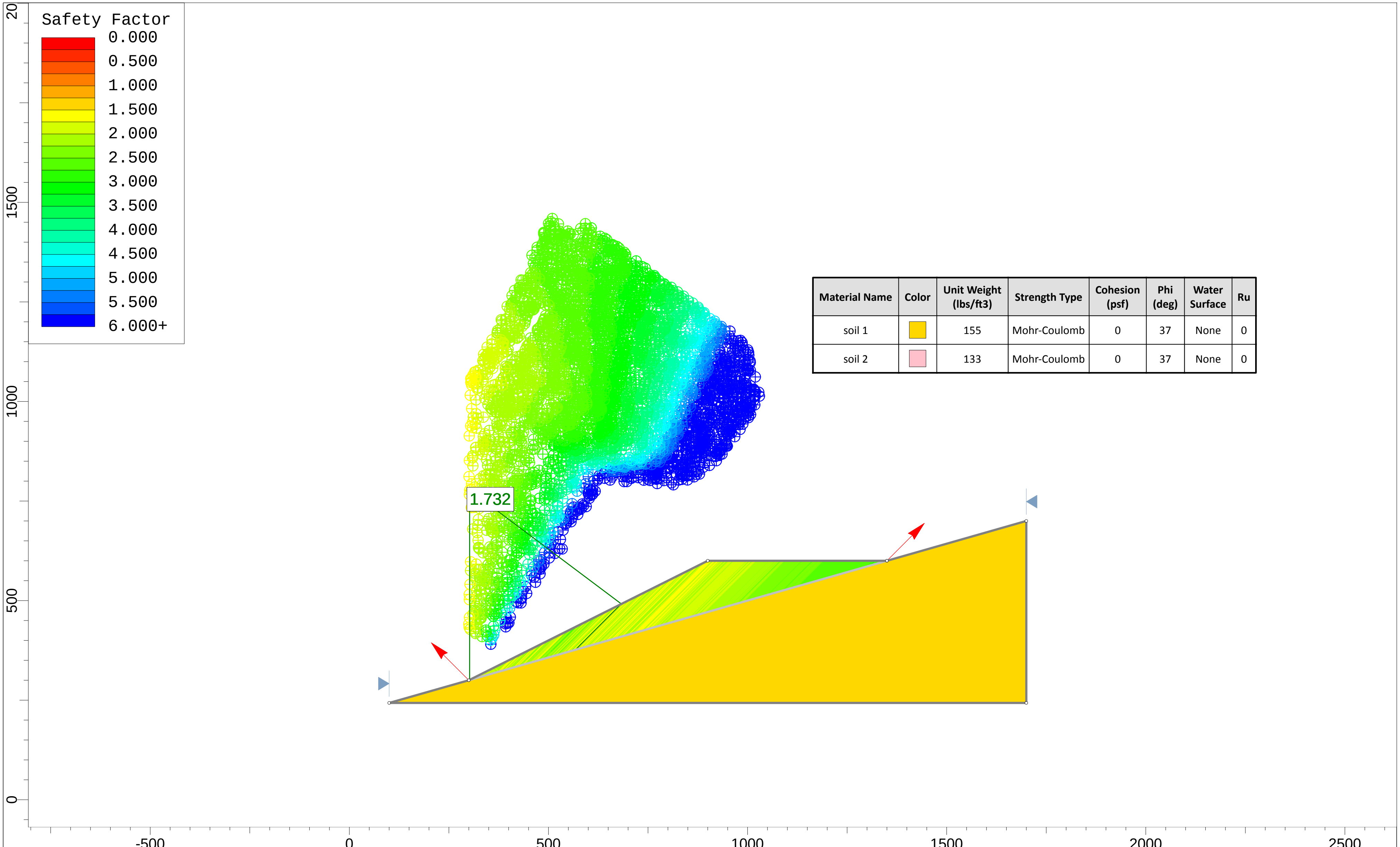
SLIDE 6 Output files in graphic form, for all scenarios listed in the table and the determination of the yield coefficient, are attached.



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 1		155	Mohr-Coulomb	0	37	None	0
soil 2		133	Mohr-Coulomb	0	37	None	0

Slide-Slope Stability Analysis Mineral Ridge Dump W9			
	Scale 1:5000	Company	SRK Consulting
2015, 1:07:18 PM		File Name	Dump W9 Stability Analysis

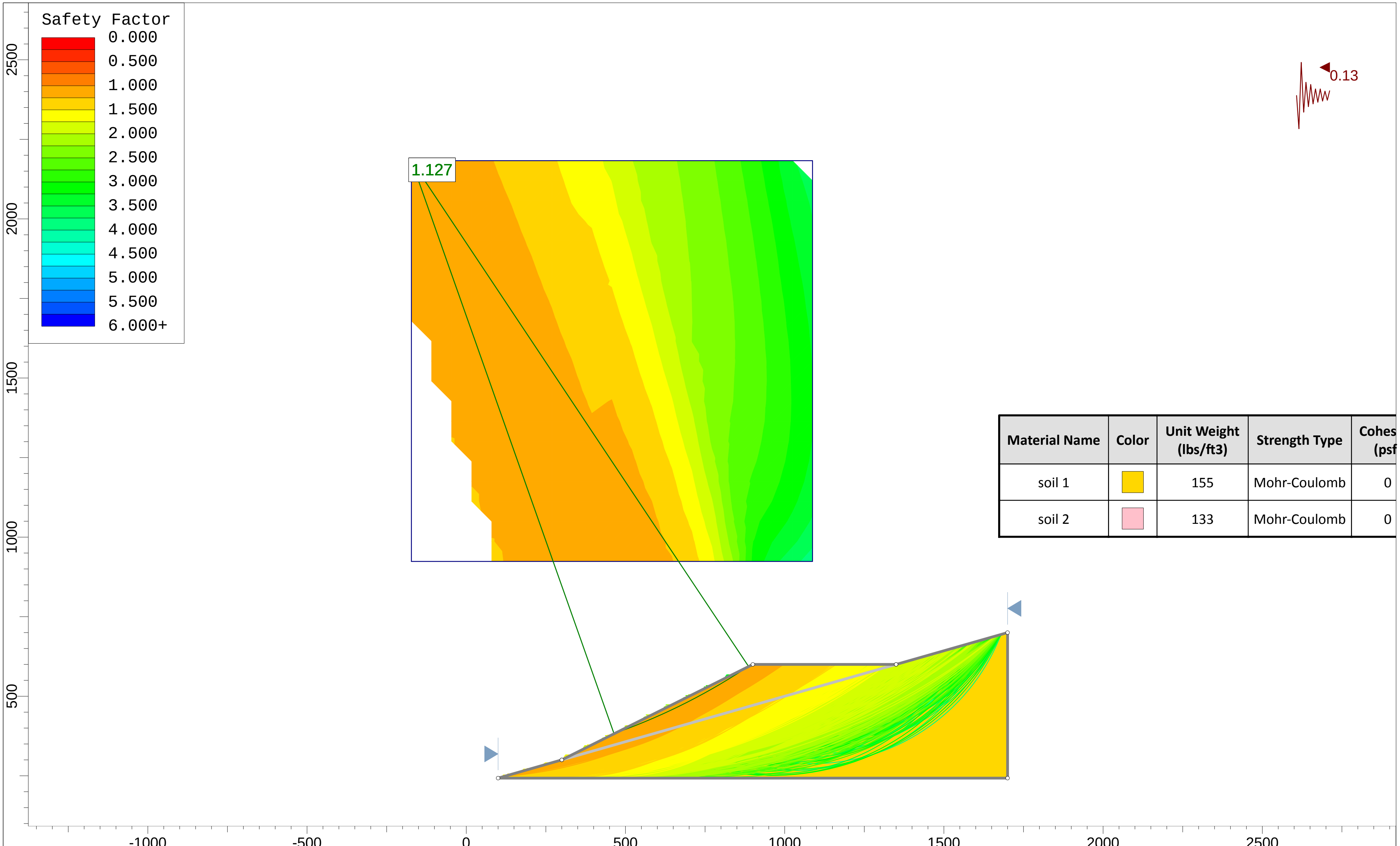
SLIDEINTERPRET 6.033



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 1		155	Mohr-Coulomb	0	37	None	0
soil 2		133	Mohr-Coulomb	0	37	None	0

Project	Slide-Slope Stability Analysis Mineral Ridge Dump W9
	Sideslope 2.0:1 Non-Circular Failure
Drawn By	JN
Scale	1:4000
Company	SRK Consulting
Date	2/23/2015, 1:07:18 PM
File Name	Dump W9 Stability Analysis

SLIDEINTERPRET 6.033

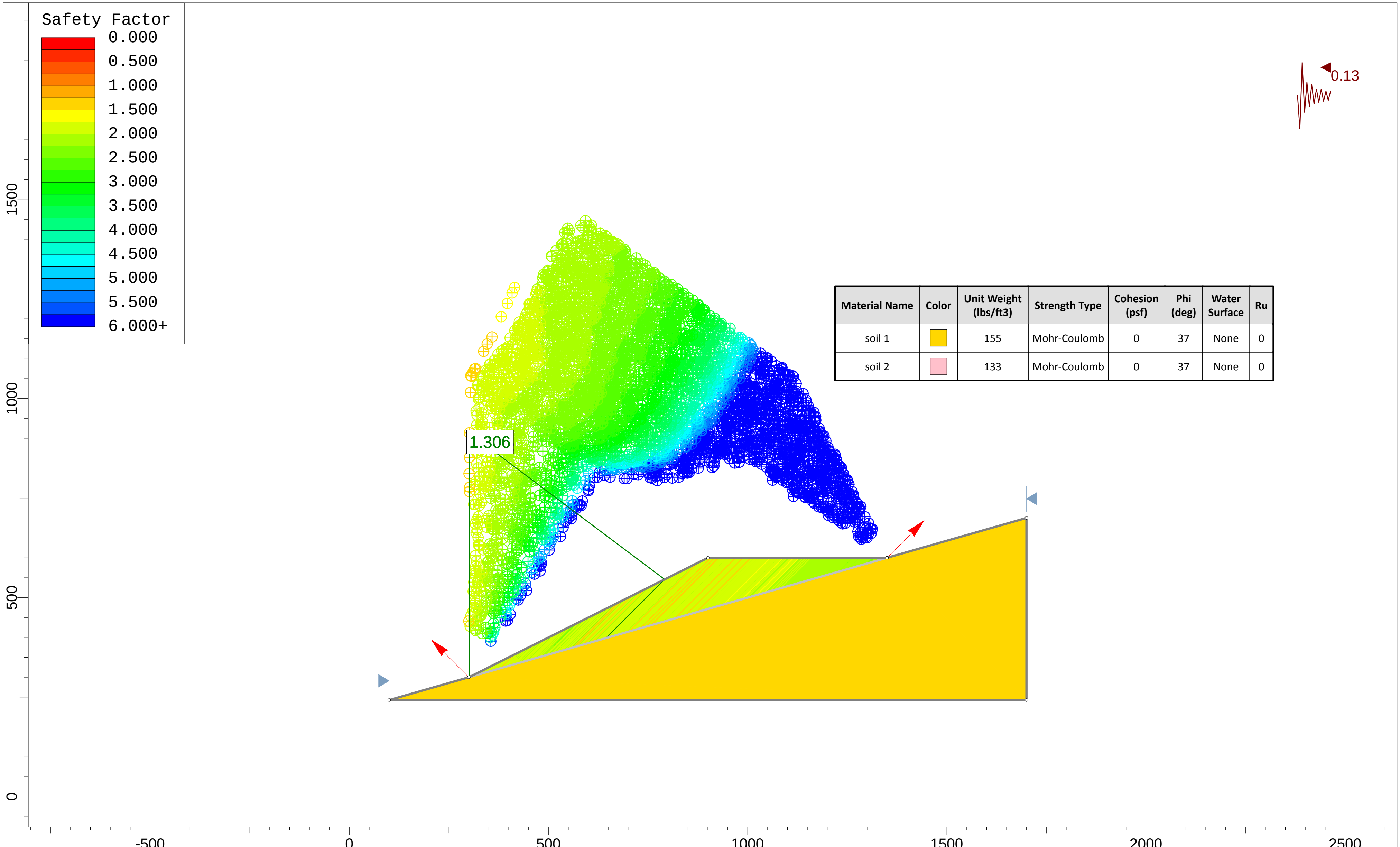


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohes (psf
soil 1		155	Mohr-Coulomb	0
soil 2		133	Mohr-Coulomb	0

rocscience

SLIDEINTERPRET 6.033

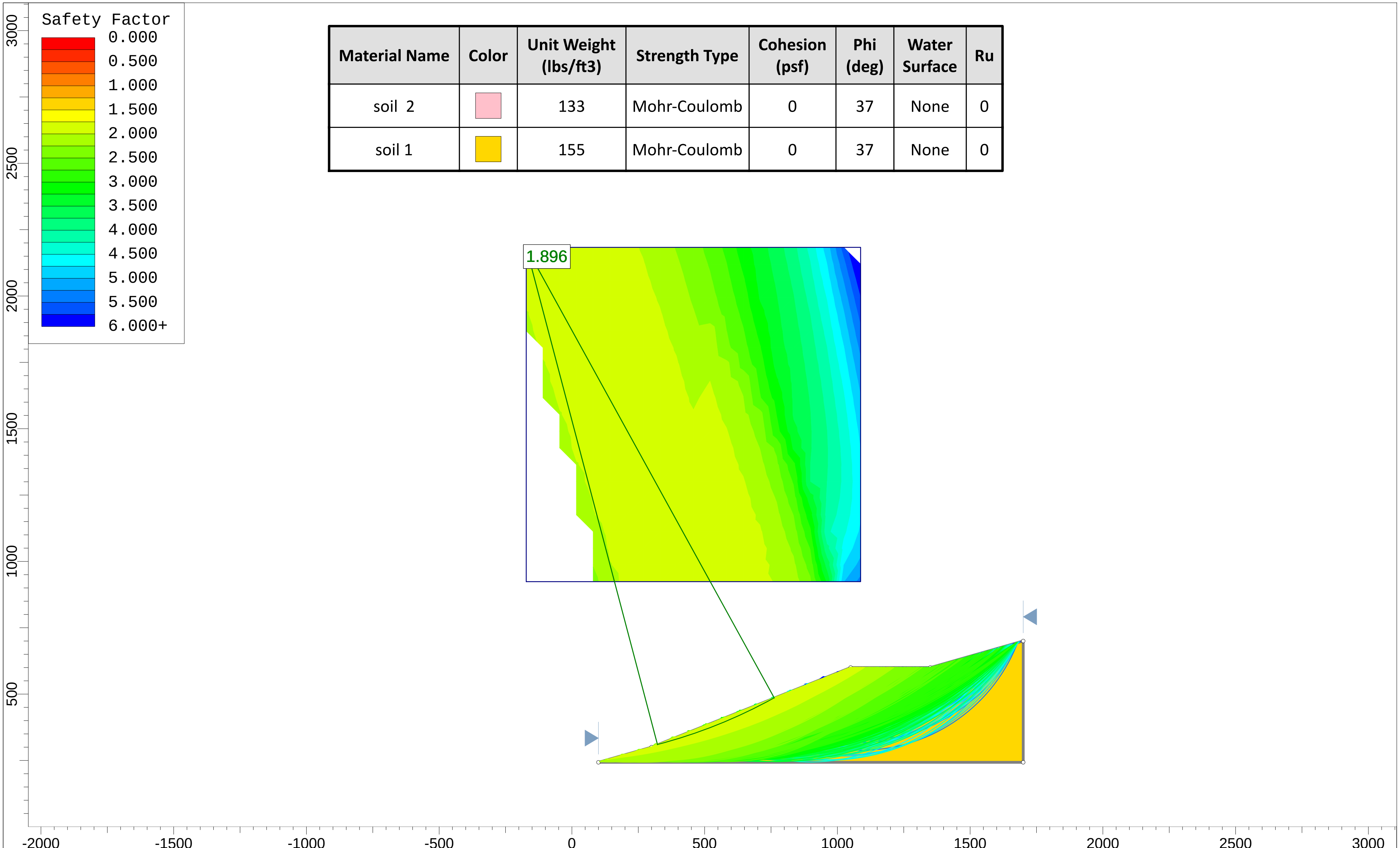
Project	Slide-Slope Stability Analysis Mineral Ridge Dump W9		
Sideslope 2.0:1 Circular Failure, Seismic constant=0.13			
Drawn By JN	*Scale* 1:5000	*Company* SRK Consulting	
Date 2/23/2015, 1:07:18 PM		*File Name* Dump W9 Stability Analysis	



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 1		155	Mohr-Coulomb	0	37	None	0
soil 2		133	Mohr-Coulomb	0	37	None	0

Project	Slide-Slope Stability Analysis Mineral Ridge Dump W9
	Sideslope 2.0:1 Non-Circular Failure, Seismic constant=0.13
Drawn By	JN
Scale	1:4000
Company	SRK Consulting
Date	2/23/2015, 1:07:18 PM
File Name	Dump W9 Stability Analysis

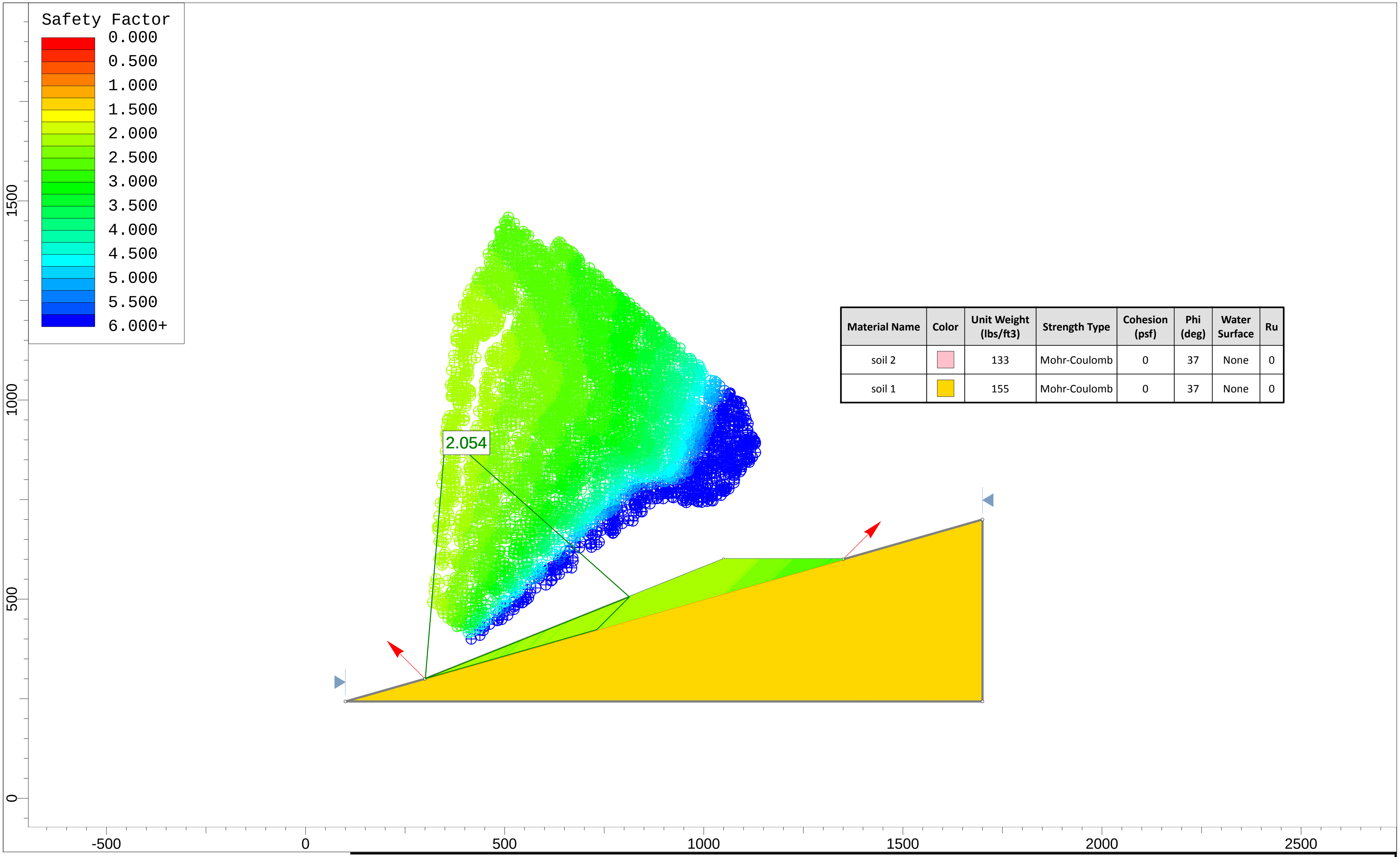
SLIDEINTERPRET 6.033



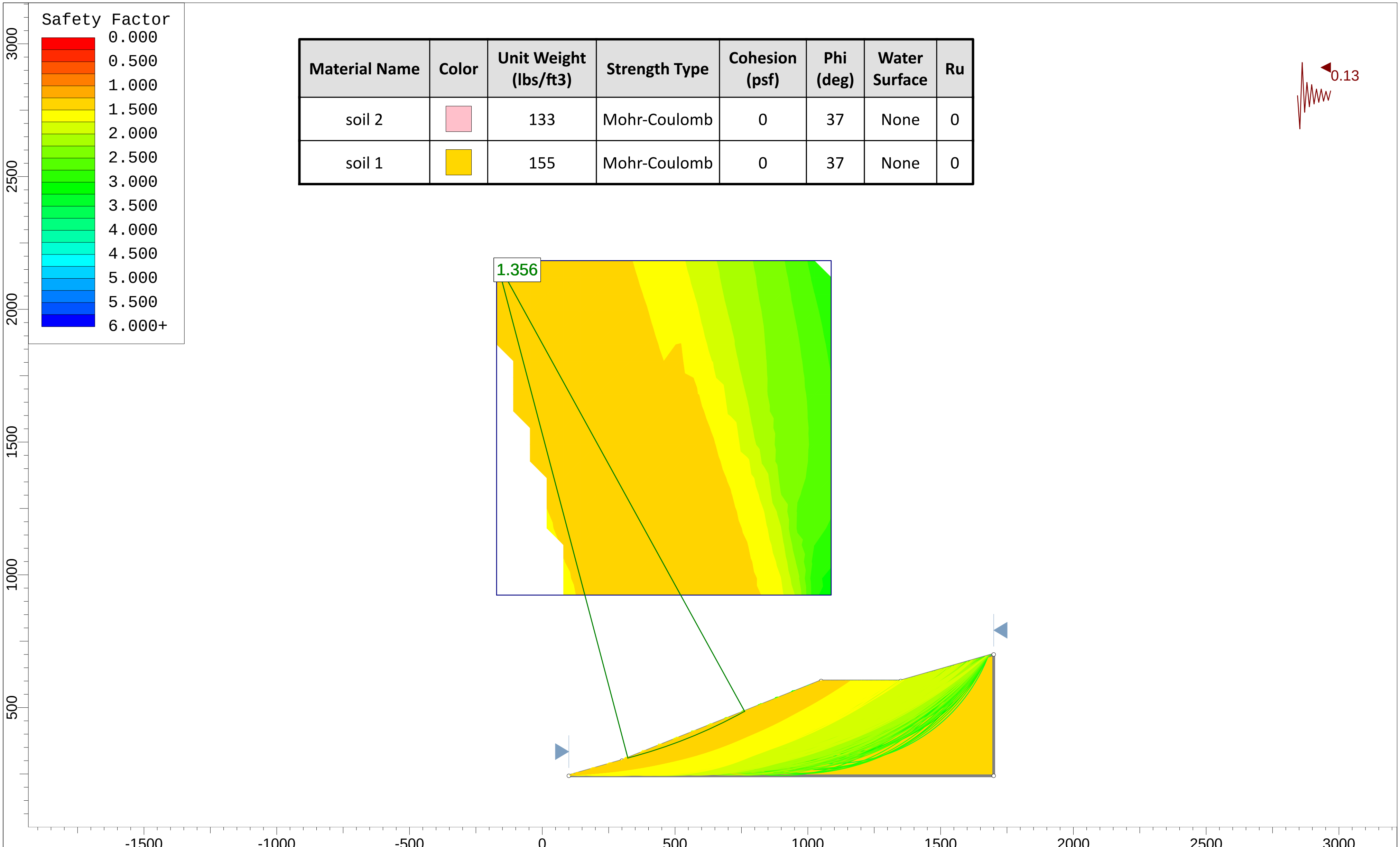
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 2	(pink)	133	Mohr-Coulomb	0	37	None	0
soil 1	(yellow)	155	Mohr-Coulomb	0	37	None	0

SLIDEINTERPRET 6.033

Project	Slide-Slope Stability Analysis Mineral Ridge Dump W9
	Side slope 2.5:1 Circular Failure
Drawn By	JN
Scale	1:6000
Company	SRK Consulting
Date	2/26/2015, 2:50:44 PM
File Name	Dump W9 Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 2		133	Mohr-Coulomb	0	37	None	0
soil 1		155	Mohr-Coulomb	0	37	None	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 2		133	Mohr-Coulomb	0	37	None	0
soil 1		155	Mohr-Coulomb	0	37	None	0

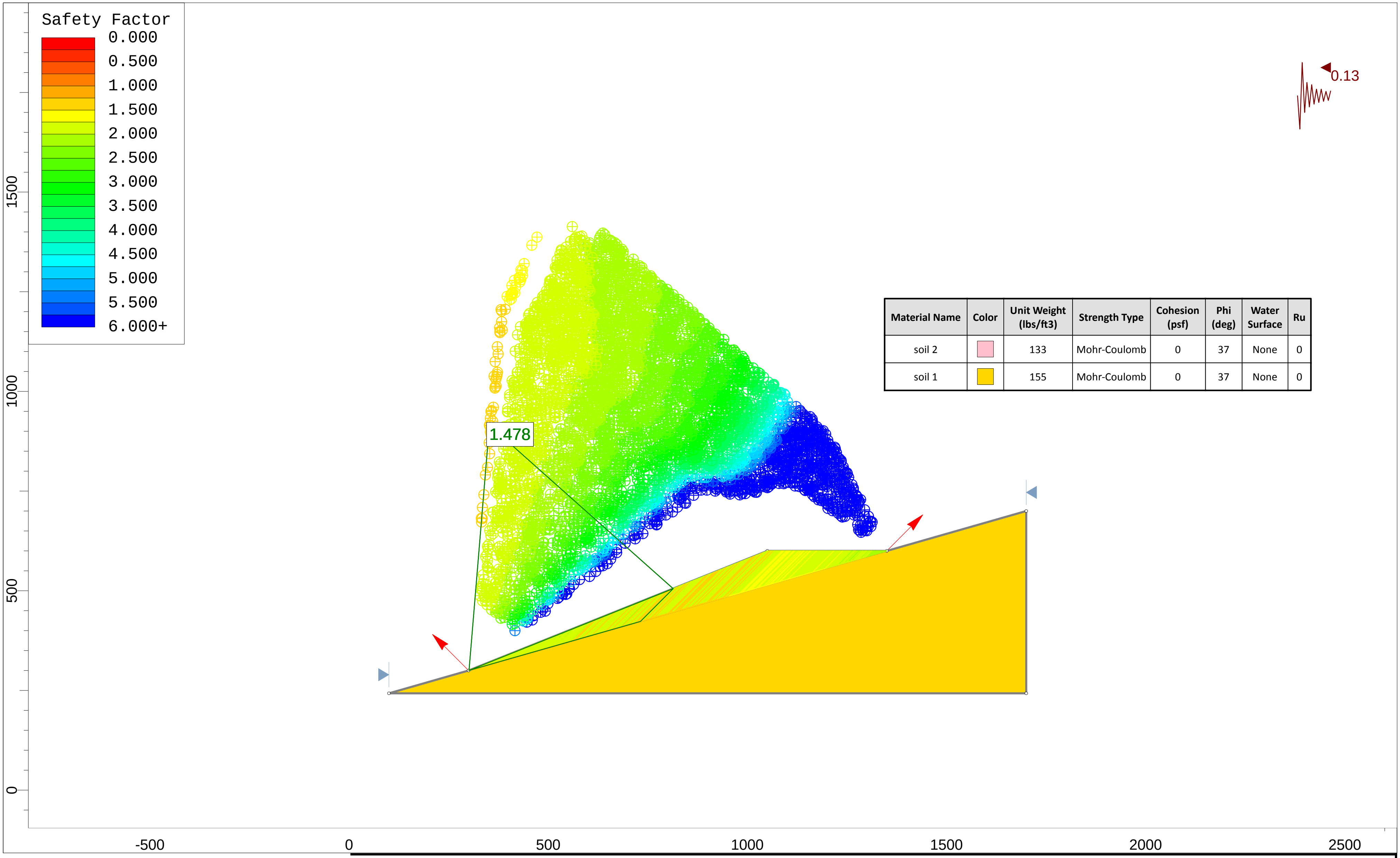
SLIDEINTERPRET 6.033

Project

Slide-Slope Stability Analysis Mineral Ridge Dump W9

Side slope 2.5:1 Circular Failure, Seismic constant=0.13

Drawn By	JN	*Scale*	1:6000	*Company*	SRK Consulting
Date	2/26/2015, 2:50:44 PM			*File Name*	Dump W9 Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 2		133	Mohr-Coulomb	0	37	None	0
soil 1		155	Mohr-Coulomb	0	37	None	0

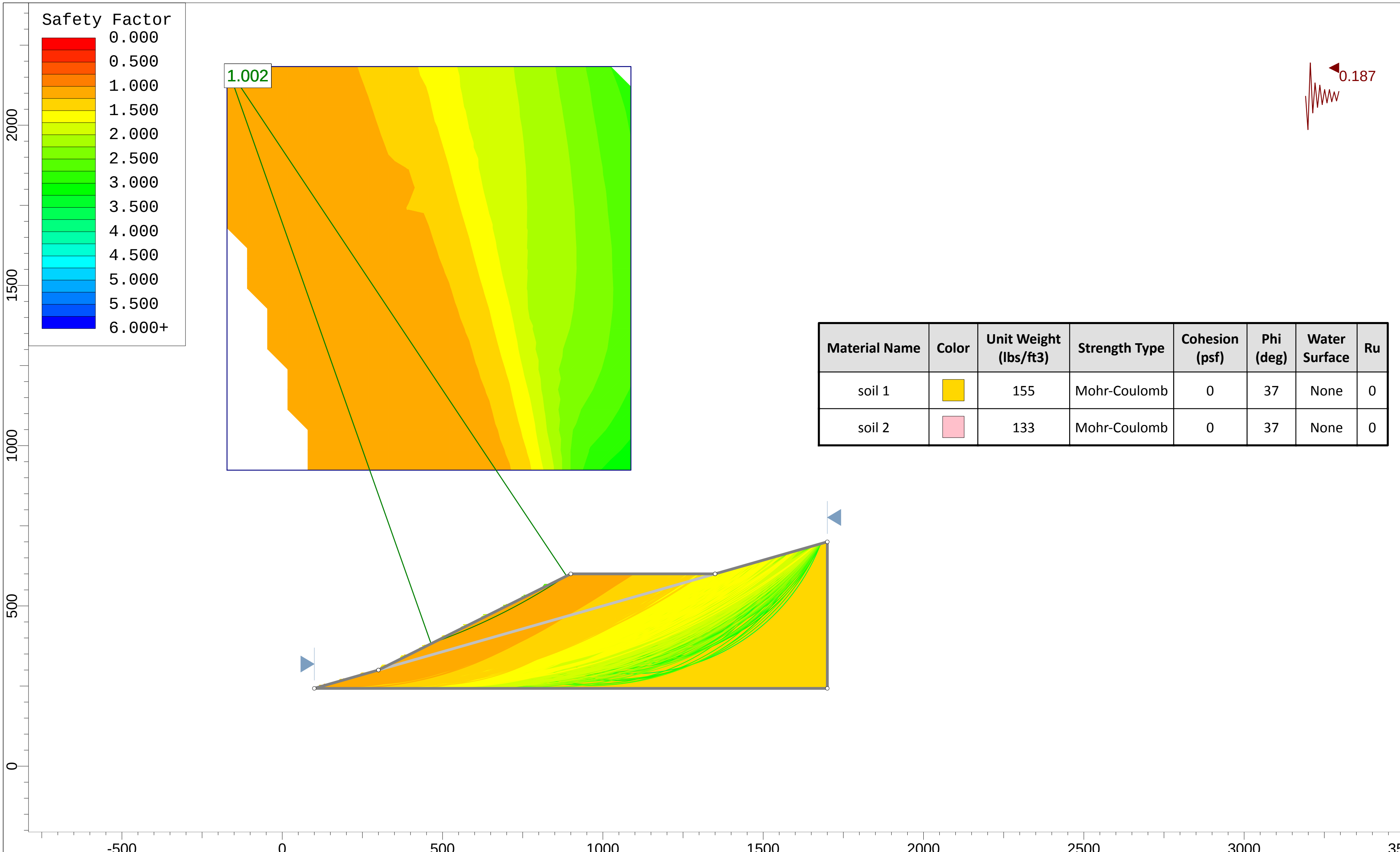
Project

Slide-Slope Stability Analysis Mineral Ridge Dump W9

Side slope 2.5:1 Non-Circular Failure, Seismic constant=0.13

Drawn By JN	*Scale* 1:4000	*Company*	SRK Consulting
Date 2/26/2015, 2:50:44 PM		*File Name*	Dump W9 Stability Analysis

SLIDEINTERPRET 6.033



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
soil 1		155	Mohr-Coulomb	0	37	None	0
soil 2		133	Mohr-Coulomb	0	37	None	0

SLIDEINTERPRET 6.033

Project	Slide-Slope Stability Analysis Mineral Ridge Dump W9
	Side slope 2.0:1 Circular Failure, Seismic constant=0.187
Drawn By	JN
Scale	1:5000
Company	SRK Consulting
Date	2/23/2015, 1:07:18 PM
File Name	Dump W9 Stability Analysis

Appendix E – Air Modelling Results

AIR QUALITY IMPACT ANALYSIS
MINERAL RIDGE MINE
(NVN-73109/RECLAMATION PERMIT 0103)
MARY LC EXPANSION AND SATELLITE DEPOSITS
PLAN OF OPERATIONS AMENDMENT

Prepared for:

Mineral Ridge Gold, LLC
1515 7th Street
Elko, Nevada 89801

Stantec

Prepared by:

Stantec Consulting Services Inc.
595 Double Eagle Court, Suite 2000
Reno, Nevada 89521

Stantec Project Number 203703038

December 4, 2014

Table of Contents

1.0 INTRODUCTION 1
1.1 PROJECT DESCRIPTION 2

2.0 MODELING METHODOLOGY 4
2.1 ASSESSMENT PERIOD SELECTION 4
2.2 MODELING PROTOCOL... 4
2.3 MODEL SELECTION 4
2.4 ELEVATED TERRAIN 4
2.5 LAND CLASSIFICATION 4
2.6 BUILDING DOWNWASH 5
2.7 RECEPTORS 5
2.8 METEOROLOGICAL DATA 5
2.9 MODELING FOR ONE-HOUR NITROGEN DIOXIDE IMPACTS 6
2.10 BACKGROUND CONCENTRATIONS 6

3.0 EMISSION SOURCE INPUTS FOR AERMOD 7
3.1 EMISSION SOURCE CHARACTERIZATION 7

4.0 MODELING RESULTS...8

5.0 ADDITIONAL EMISSIONS ANALYZED...11
5.1 GREENHOUSE GAS EMISSIONS 11
5.2 HAZARDOUS AIR POLLUTANT EMISSIONS... 11

TABLES
Table 4.1 Ambient Air Quality Standards 9
Table 4.2 Modeling Results... 10
Table 5.1 Summary of Yearly Emissions 11

FIGURES

Figure 1.1 Mine Location
Figure 1.2 Proposed Facilities
Figure 2.1 Meteorological Wind Rose

APPENDICES

Appendix A Graphical Modeling Results
Appendix B Source Master List
Appendix C Emissions Spreadsheets
Appendix D Revised Protocol
Appendix E Electronic Modeling Files

ABBREVIATIONS

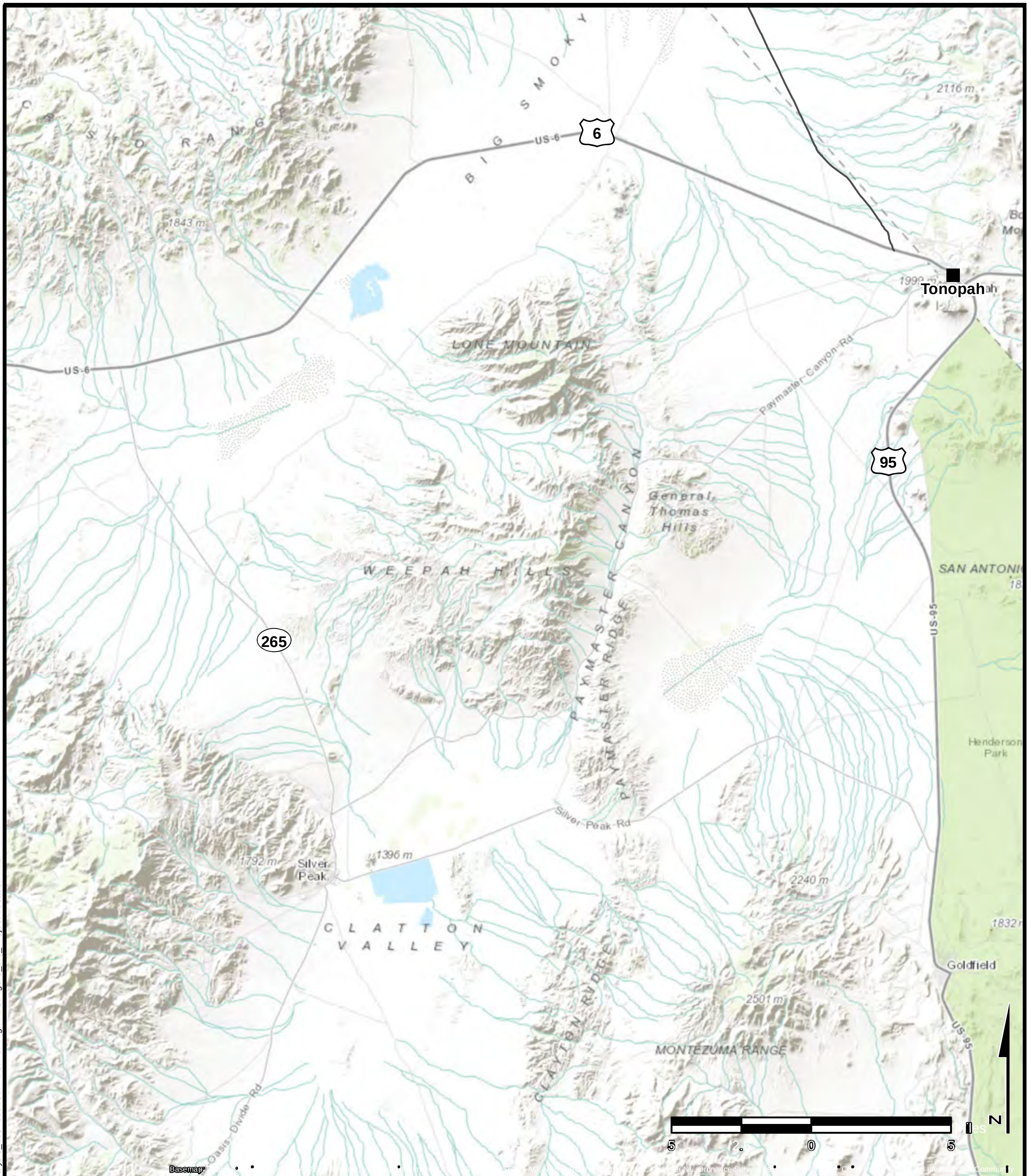
AQIA	Air Quality Impact Analysis
BLM	Bureau of Land Management
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DEM	Digital Elevation Models
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
HAP	Hazardous Air Pollutant
MRG	Mineral Ridge Gold, LLC
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NBAPC	Nevada Bureau of Air Pollution Control
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act of 1969
NO_2	Nitrogen Dioxide
O_3	Ozone
Pb	Lead
Plan Amendment	Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Mary LC Expansion and Satellite Deposits Plan of Operations Amendment
ppm	Parts Per Million
SO_2	Sulfur Dioxide
typ	Tons Per Year
$\mu g/m^3$	Micrograms Per Cubic Meter of Air

1.0 INTRODUCTION

The Mineral Ridge Mine is an open-pit mine located in Esmeralda County, Nevada approximately five miles northwest of Silver Peak, Nevada on private land controlled by Mineral Ridge Gold, LLC (MRG) as well as on unpatented mining claims on public lands administered by the Bureau of Land Management (BLM) Tonopah Field Office. The MRG mine is located at the crossing point of Townships 1 South and 2 South, between Ranges 38 East and 39 East, in Air Quality Hydrographic Area 143, the Clayton Valley, which is currently unclassified for all criteria pollutants. The project location is shown in Figure 1.1.

MRG operates the open-pit mine under the existing Class II Air Quality Operating Permit, AP1041-2733, and has submitted the *Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Pit Expansion Plan of Operations Amendment* (Plan Amendment) to the BLM and the Nevada Division of Environmental Protection (NDEP) Bureau of Mining Regulation and Reclamation. The Plan Amendment proposes modifications to existing and authorized operations. The proposed changes will increase the project disturbance area from approximately 621 acres to 785 acres. The Plan Amendment includes the following changes:

- Expansion of the plan area boundary;
- Addition of haul roads on the western side of the Plan area;
- Addition of the Bluelite and Solberry pits;
- Increase the size of and production from the Mary LC, Wedge B, and Brodie pits;
- Addition of two new waste rock disposal areas, Solberry and Bluelite;
- Partial backfilling of the Brodie Pit with about 900,000 tons of material;
- Backfilling of the Wedge B Pit with about 200,000 tons of material;
- Increase the capacity of waste rock disposal areas WD-2, WD-4, WD-6, WD-9, WD-10, and WD-11 with area changes also occurring for WD-1, WD-5, and WD-7;
- Salvaging growth media and expansion of the growth media stockpile;
- Changes to the "General Disturbance" category;
- Re-alignment of water and power lines;
- Addition of a physical barrier to public access near the crusher to comply with the NDEP Bureau of Air Pollution Control requirements;
- Reallocation of exploration disturbance areas, development of the "Phase I Exploration Work Plan", and focus of future exploration tracking on surface disturbance;
- Changes to mobile equipment;
- Changes to employment; and
- Bat exclusion and closure of the Mary 1 Escape-way.



X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_1.1_Project Location.mxd

Project Area

MINERAL RIDGE GOLD, LLC

FIGURE 1.1
MINE LOCATION

Stantec

DRAWN BY JT	DATE DRAWN 12/3/2014
SCALE 1 in = 5 miles	
PROJECT 203703028	

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

This Air Quality Impact Analysis (AQIA) has been prepared to support the Environmental Assessment required by the National Environmental Policy Act of 1969 that is currently in review with the BLM Tonopah Field Office. The AQIA uses the near-field air dispersion modeling software, AERMOD, to quantify and evaluate the impacts from the MRG operations on ambient air quality at points accessible to the public. Both the National Ambient Air Quality Standards (NAAQS) and the State of Nevada Standards will be used in this AQIA.

1.1 PROJECT DESCRIPTION

MRG is planning to increase the Plan area from the existing 1,503 acres to approximately 2,700 acres. The proposed Plan area will include approximately 2,044 acres of public lands administered by the BLM and 656 acres of private land. No United States Forest Service administered land or state lands are located within the proposed Plan area. Figure 1.2 shows the proposed facilities as described in the Plan Amendment.

The Mineral Ridge open pits are mined using conventional open pit techniques including drilling, blasting, and loading the ore and waste rock into mine haul trucks with front-end loaders and hydraulic excavators. The mine waste rock is truck-hauled to waste rock disposal areas, road fill areas, and other construction facilities. The mined ore is truck-hauled to the crushing facility where it is resized and conveyed to the heap leach facility.

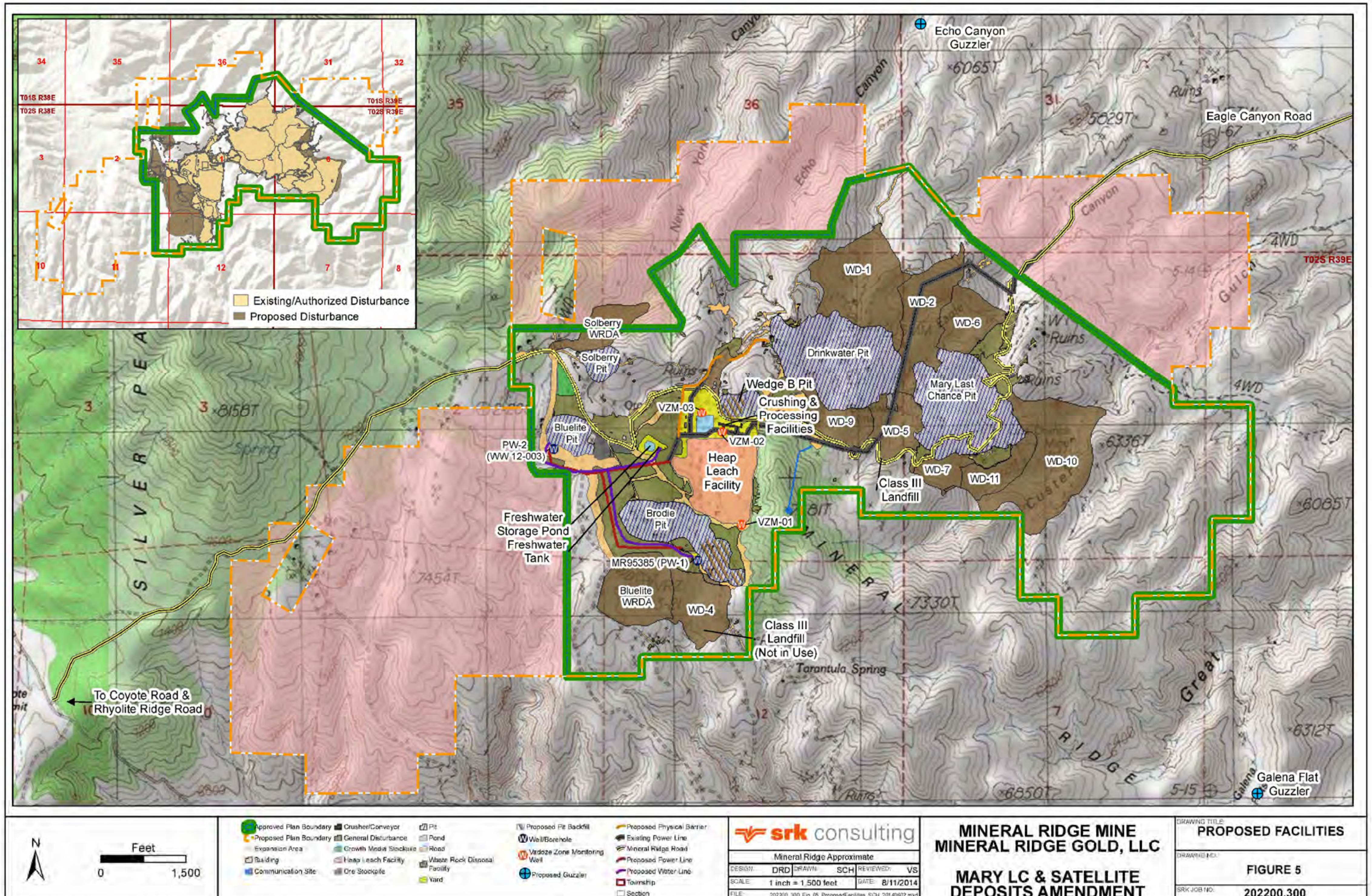
A dilute solution of cyanide is then applied to the top of the heap leach facility. The application rate of solution is approximately 0.004 gallons per minute per square foot of leach pad surface area. As the solution percolates downward through the material, gold and certain other metals are leached from the ore. This solution flows under the ore pile along the impervious liner via gravity to the pregnant solution portion of the double-lined process pond.

The pregnant solution, containing both cyanide and dissolved metals, is then pumped to the process plant where gold and other metals are extracted using the carbon-in-column adsorption/desorption process. The loaded carbon is shipped off-site for further processing.

Under the Plan Amendment, MRG proposes to expand the Mary LC Pit and to expand mining operations within the Brodie and Wedge B pits. In addition, MRG proposes to begin mining from two new pits named the Bluelite Pit and the Solberry Pit. Bench heights may range from ten to 60 feet with inter-ramp slope angles ranging from 45 to 49 degrees and bench face angles of up to 70 degrees.

The Brodie Pit will be backfilled with approximately 900,000 tons of material once the Brodie Pit extensions have been mined. This backfill is projected to occur in 2016. The Brodie backfill will generally be placed in 40-foot lifts, where practical, with reclaimed slopes of about 2.5H:1.0V.

Approximately 300,000 tons of waste rock from the upper portion of the expanded Wedge B Pit will be hauled to WD-9. The remaining 200,000 tons will be temporarily placed in the laydown area north of the process pond and then used to backfill the Wedge B Pit in order to reestablish access to the crusher. No regrading is anticipated to be necessary for the relatively flat backfilled area. Backfilling is projected to occur near the end of 2014 or the beginning of 2015.



MINERAL RIDGE GOLD, LLC

FIGURE 1.2
PROPOSED FACILITIES

Stantec

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	NOT TO SCALE		
PROJECT	203703028		

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_1_2_Proposed_Facilities_11x17L.mxd

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

The Bluelite and WD-4 waste rock disposal areas will generally be constructed in 40-foot lifts where practical. The remaining waste rock disposal facilities will generally be constructed by end dumping over the face with a maximum face height of about 390 feet. The waste rock disposal facilities will have maximum reclaimed slopes of 2.5H:1.0V with the exception of the upper portion of WD-5.

MRG is proposing the construction of new haul roads on the west side of the proposed Plan area. The haul roads will link the proposed Bluelite and Solberry facilities with the process area. The new haul roads will have a nominal running width of between 50 and 55 feet. Safety berms will be constructed as required to a height of about four feet, adding approximately 12 feet to the overall width of the road. The haul roads will be constructed out of waste rock or by contouring and reshaping the existing topography.

MRG proposes to conduct exploration within the expanded Plan area. Because exploration is an iterative endeavor, the exact number of drill sites and the precise locations of the drill roads and drill sites, are not known. Drill holes may be located at a wider spacing initially, and depending on the results, more closely spaced holes may be drilled. Multiple holes may be drilled from a single drill pad. This exploration disturbance will occur anywhere within the Plan area.

2.0 MODELING METHODOLOGY

The AQIA methodology and modeling techniques utilized to estimate the impacts to ambient air quality as a result of the MRG operations are presented in the following sections.

2.1 ASSESSMENT PERIOD SELECTION

The Plan Amendment covers approximately 15 years of operations at the mine. Some years include operational activities, while others include reclamation activities, or monitoring activities. Modeling the potential impacts of the MRG mine required an analysis as to what activities would produce the highest emissions over a one-year period. The analysis showed that one year in particular would see material being mined from three of the pits, five waste rock facilities used, and one backfill area used. This year was chosen to represent the worst case scenario for modeling purposes. It should be noted that mining operations do not always occur in three pits simultaneously and typically only one waste rock facility is used per active pit. The model assumes that mining activities occur in all areas simultaneously for conservative results.

2.2 MODELING PROTOCOL

A modeling protocol was prepared and submitted to the BLM in October 2014 by Employees Company of Nevada, Inc. The protocol was revised by Stantec Consulting Services Inc. in November 2014 after discussions with the BLM. The revised protocol can be found in Appendix D. Air dispersion modeling was conducted in accordance with the revised protocol except as noted below.

2.3 MODEL SELECTION

The Environmental Protection Agency's (EPA) approved air dispersion model, AERMOD (version 14134), was used to perform the air quality modeling analysis for criteria pollutants. AERMOD is the EPA's recommended air dispersion modeling software to be used for near-field modeling analyses.

2.4 ELEVATED TERRAIN

Elevated terrain was imported to the AERMOD program using Digital Elevation Models (DEM) downloaded from the WebGIS website. A total of four DEM files were needed to cover the MRG sources and the receptor grid surrounding the mine. The DEM files include Lida Wash NW, Mohawk Mine, Ryolite Ridge, and Silver Peak. These four DEM files assigned elevations to all sources and receptors used in the modeling analysis.

2.5 LAND CLASSIFICATION

BREEZE AERMOD-ISC 7 includes rural and urban algorithm options. These options affect the wind speed profile, dispersion rates, and mixing-height formula used in calculating ground-level pollutant concentrations. A protocol was developed by the EPA to classify an area as either rural or urban for dispersion modeling purposes. The classification is based on average heat flux, land use, or population density within a three-kilometer radius from the plant site. Of these techniques, the EPA has specified that land use is the most definitive criterion. Land use analysis showed a lack of development in the vicinity significant to produce urban wind channeling and affect the surface roughness setting. The land in the vicinity of the facility and across the model domain is generally open and features limited development. Therefore, the rural dispersion option was used for this modeling analysis.

2.6 BUILDING DOWNWASH

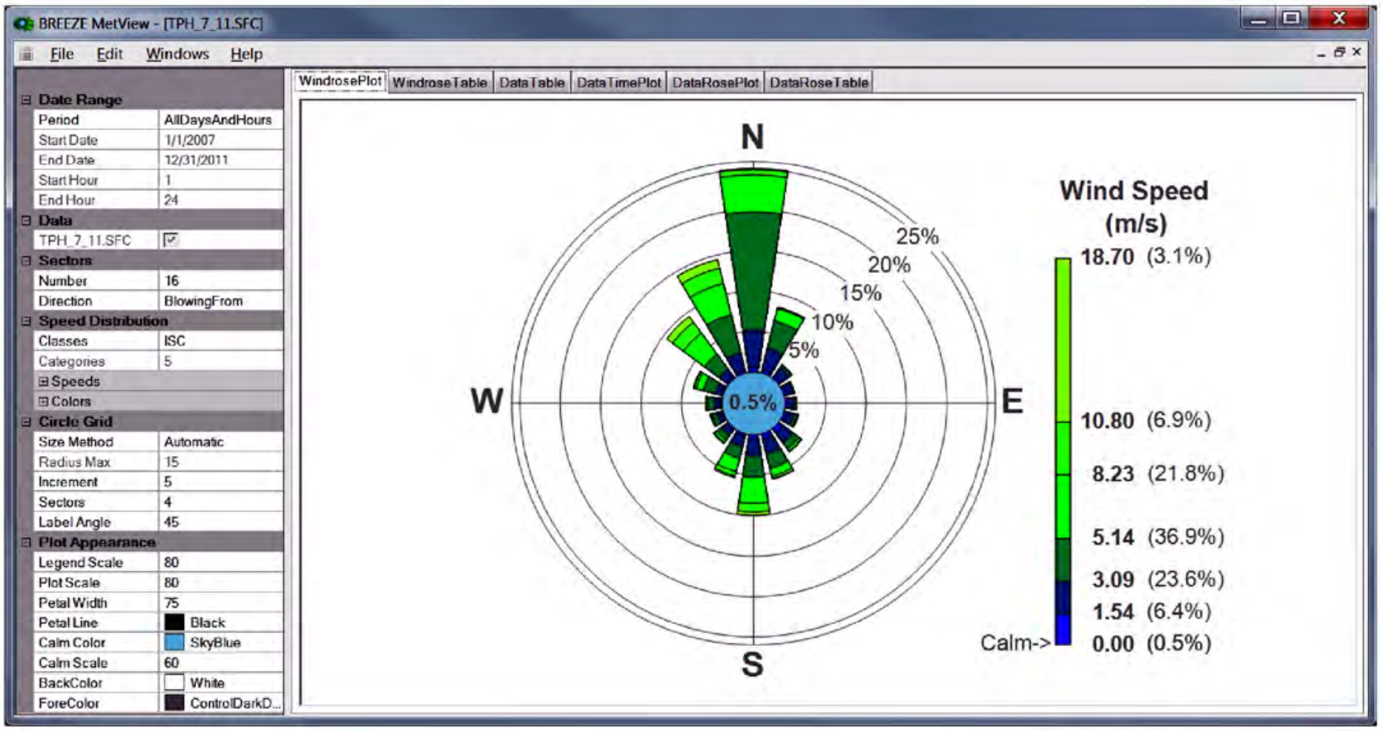
BREEZE AERMOD-ISC 7 includes a downwash analyst for use when there are buildings included in the model. The Building Profile Input Program with Plume Rise Model Enhancement (BPIP-PRIME) was used to determine downwash effects from buildings.

2.7 RECEPTORS

Receptors were created in AERMOD and processed through the AERMAP terrain processor program to assign heights based on the topography around the mine. The spatial attributes of the receptors were set up to capture air pollutant dispersion impacts from the MRG operations at areas accessible by the public. Facility boundary receptors were spaced at 25-meter intervals coinciding with the proposed plan boundary and consisting of the fence, berms, and terrain barriers. The local fine-grid receptor network was spaced at 100-meter intervals extending approximately 1,000 meters from the property boundary. A coarser receptor grid was spaced at 500-meters intervals out to approximately 5,000 meters from the boundary receptors. The receptor network is shown in Figure 1 in Appendix A.

2.8 METEOROLOGICAL DATA

The Nevada Bureau of Air Pollution Control (NBAPC) recommended the use of the meteorological data from the Tonopah National Weather Service data, collected at the Tonopah Airport National Weather Service station for this modeling analysis. The NBAPC collects and processes this data using the most recent EPA guidance. The data used was provided by the NBAPC in model-ready form and covered five years, 2007 through 2011. Figure 2.1 shows the combined wind rose for the five years of data.



X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_2_1_Wind_Rose.mxd

MINERAL RIDGE GOLD, LLC

FIGURE 2.1
METEOROLOGICAL WIND ROSE

Stantec

DRAWN BY	JT	DATE DRAWN	12/3/2014
SCALE	NOT TO SCALE		
PROJECT	203703028		

2.9 MODELING FOR ONE-HOUR NITROGEN DIOXIDE IMPACTS

The nitrogen oxide emissions from combustion sources are mainly composed of nitrogen oxide and nitrogen dioxide (NO_2). In the atmosphere, the nitrogen oxide can convert to NO_2 through chemical reactions with ambient ozone. This modeling analysis uses the Plume Volume Molar Ratio Method for analyzing the 1-hour NO_2 impacts. A September 30, 2014 Memorandum from the EPA suggests that using a value of 0.2 for the in-stack ration, rather than the default recommended in-stack ratio of 0.5, will provide a more reasonable prediction of actual NO_2 impacts. The 1-hour NO_2 model inputs included the 0.2 in-stack ratio, along with a single background ozone concentration of 61.44 parts per million (ppm), found from the EPA Airtrends Ozone information page.

2.10 BACKGROUND CONCENTRATIONS

The NBAPC does not operate any ambient monitoring sites in the vicinity of MRG's project. Therefore, the background concentrations for PM_{10}, developed by the NBAPC using ambient data collected by the NBAPC at Lehman Caves in the Great Basin National Park, will be used. The concentrations are 10.2 micrograms per cubic meter of air ($\mu g/m^3$) for a 24-hour period and 9.0 $\mu g/m^3$ for an annual period. For $PM_{2.5}$, background concentrations of 7.0 $\mu g/m^3$ for a 24-hour period and 2.4 $\mu g/m^3$ for an annual period will be used. These $PM_{2.5}$ background concentrations were estimated from the monitored data from the Great Basin National Park Interagency Monitoring of Protected Visual Environments monitoring station for the three-year period from 2005 through 2007. Gaseous pollutants are not monitored in rural sites such as MRG. The NBAPC recommends assuming a zero concentration for gaseous pollutants in areas such as MRG. Carbon monoxide (CO), NO_2, and sulfur dioxide (SO_2) will use the NBAPC assumption of a zero background for this analysis due to lack of monitoring data. Background concentrations are not included in the model, but are added to the predicted impacts from the model.

3.0 EMISSION SOURCE INPUTS FOR AERMOD

The AQIA included development of an emissions inventory based on the worst case year of emissions. The worst case year was decided as stated above as the year in which the most material would be processed and the greatest number of areas would be disturbed. Two emissions spreadsheets were developed with utilization factors based on source use and availability over the averaging time period. One spreadsheet was used to account for the short term averaging periods (1-hour, 3-hour, and 8-hour periods). The other spreadsheet was used to account for the longer term averaging periods (24-hour and annual periods). These spreadsheets are located in Appendix C.

3.1 EMISSION SOURCE CHARACTERIZATION

The complete list of sources included in the modeling analysis is included in Appendix B. The emissions from all sources were modeled as Point, Volume, Area, or Pit sources for the AQIA. The emission inventories in Appendix C have separate sections for each type of AERMOD input. Each emission input in the modeling field has a defined Universal Transverse Mercator coordinate projected in North American Datum of 1983.

The point sources include exhaust stack emissions such as baghouses and generator stacks. Volume sources include operations such as material transfer controlled by water sprays and vehicular traffic on the mine roads. The roadways were developed from haul patterns using the pits as a starting point and their associated destinations as the finishing point. Other roadways used similar start and stop points to describe the road. Emissions are calculated for all roads based on what vehicles will be traveling on that particular road and include both fugitive and combustion emissions. The roads are then modeled as a series of adjacent volume sources that use the road width as a determining factor on source spacing along the road with emissions split evenly between the number of volume sources needed on the roadway.

Area sources include large zones of operation such as the pits, WRF, heap leach facility, exploration, and backfill areas. AERMOD allows for large open pit areas to be modeled with a pit volume. There are three open pits analyzed for this AQIA. Pit sources include pollutant emissions from activities of blasting, loading, dozing, hauling, wind erosion, and light plants. Area sources include pollutant emissions from activities such as unloading, dozing, hauling, wind erosion, and light plants.

4.0 MODELING RESULTS

Air dispersion modeling was performed for the following criteria pollutants and averaging periods:

- Particulate Matter less than 10 microns in aerodynamic diameter (PM_{10}): 24-hour and Annual;
- Particulate Matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$): 24-hour and Annual;
- Carbon Monoxide (CO): 1-hour and 8-hour;
- Nitrogen Dioxide (NO_2): 1-hour and Annual; and
- Sulfur Dioxide (SO_2): 1-hour, 3-hour, 24-hour, and Annual.

The modeling was not performed for Ozone (O_3) or Lead (Pb). The MRG mine sources do not support the precursor pollutants and conditions for O_3 formation and Pb is expected to be negligible as it is not a fuel additive or major component in ore handling.

The ambient air quality standards for compliance demonstration for federal and Nevada standards are shown in Table 4.1. The EPA is required under the Clean Air Act to promulgate National Ambient Air Quality Standards or NAAQS, for protection of human health and the environment. The EPA delegates implementation and enforcement of the NAAQS to the states. The Nevada standards are adopted as part of the State Implementation Plan and are regulated under Nevada Administrative Code 445B.22097. The standards represent criteria pollutants of concern for impacts to human health in Nevada and are measured in ppm or $\mu g/m^3$.

Regulated criteria pollutants of concern include particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), CO, NO_2, and SO_2. The estimated hourly emissions for the regulated pollutants are modeled in AERMOD and the resultant impacts are added to the background pollutant concentrations for comparison to the NAAQS and the Nevada standards for compliance demonstration.

Table 4.1 Ambient Air Quality Standards

Pollutant		Averaging Time	National Standard	Nevada Standard	Form
Carbon Monoxide		8-hour	9 ppm	9 ppm (<5,000 feet)	Not to be exceeded more than once per year
				6 ppm (>5,000 feet)	
		1-hour	35 ppm	35 ppm	
Lead		Rolling 3 month average	0.15 µg/m^3	1.5 µg/m^3	Not to be exceeded
Nitrogen Dioxide		1-hour	100 ppb	-	98th percentile, averaged over 3 years
		Annual	53 ppb	0.053 ppm	Annual Mean
Ozone		8-hour	0.075 ppm	-	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
		1-hour	Revoked	0.12 ppm	Not to be exceeded more than once per year
				0.10 ppm	Lake Tahoe Basin #90
Particle Pollution	$PM_{2.5}$	Annual	12 µg/m^3	-	Annual mean, averaged over 3 years
		24-hour	35 µg/m^3	-	98th percentile, averaged over 3 years
	PM_{10}	Annual	-	50 µg/m^3	Not to be exceeded more than once per year
		24-hour	150 µg/m^3	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		1-hour	75 ppb	-	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		3-hour	0.5 ppm	0.5 ppm	Not to be exceeded more than once per year
		24-hour	Revoked	0.14 ppm	Not to be exceeded more than once per year
		Annual	Revoked	0.030 ppm	Not to be exceeded more than once per year

With the exception of the NO_2 1-hour, the SO_2 1-hour, and the $PM_{2.5}$ 24-hour averaging periods, all predicted impacts from the model are the first high values over the five meteorological years of data. The 1-hour NO_2 and the 24-hour $PM_{2.5}$ standards are in the form of the 98th percentile, averaged over three years. The 98th percentile represents the eighth high for this AQIA and model predicted values for these two pollutant averaging periods are reported as the eighth high value. The 1-hour SO_2 standard is in the form of the 99th percentile, averaged over three years. The 99th percentile represents the fourth high for this AQIA and model predicted values for the 1-hour SO_2 averaging period are reported as the fourth high value.

The modeling results are provided in Table 4.2 below. Appendix A shows the graphical plots of each pollutant result and the corresponding isopleths of the predicted concentrations. All results are below the lowest air quality standards.

Table 4.2 Modeling Results

Pollutant	Averaging Period	Modeled Impact (µg/m³)	Background (µg/m³)	Total (µg/m³)	Lowest Standard (µg/m³)	Percent Of Standard	Compliance with Standard (Yes/No)
CO	1-hour	2159.66		2159.66	40000	5.40%	Yes
	8-hour	351.04		351.04	10000	3.51%	Yes
NO_x	1-hour	134.38		134.38	188	71.48%	Yes
	Annual	4.25		4.25	100	4.25%	Yes
SO_2	1-hour	14.68		14.68	196	7.49%	Yes
	3-hour	6.69		6.69	1300	0.51%	Yes
	24-hour	0.64		0.64	365	0.18%	Yes
	Annual	0.08		0.08	80	0.10%	Yes
PM_{10}	24-hour	138.05	10.2	148.25	150	98.83%	Yes
	Annual	18.55	9	27.55	50	55.10%	Yes
$PM_{2.5}$	24-hour	7.61	7	14.61	35	41.75%	Yes
	Annual	1.86	2.4	4.26	12	35.50%	Yes

As shown in Table 4.2, the modeled concentrations with the associated background concentrations are below the lowest applicable ambient air quality standards.

5.0 ADDITIONAL EMISSIONS ANALYZED

In addition to criteria pollutant modeling, there are also greenhouse gas (GHG) emissions and hazardous air pollutant (HAP) emissions that are released from operations such as fuel burning at the MRG mine. Table 5.1 is a summary of the total emissions in tons per year (tpy) from all sources over the assessment period.

Table 5.1 Summary of Yearly Emissions

TSP (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	NO_x (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2e (metric tpy)	HAP (tpy)
1.25E+03	3.72E+02	3.48E+01	2.08E+02	6.62E+01	1.21E+00	7.48E+01	9.30E+04	9.27E-01

tpy = tons per year

5.1 GREENHOUSE GAS EMISSIONS

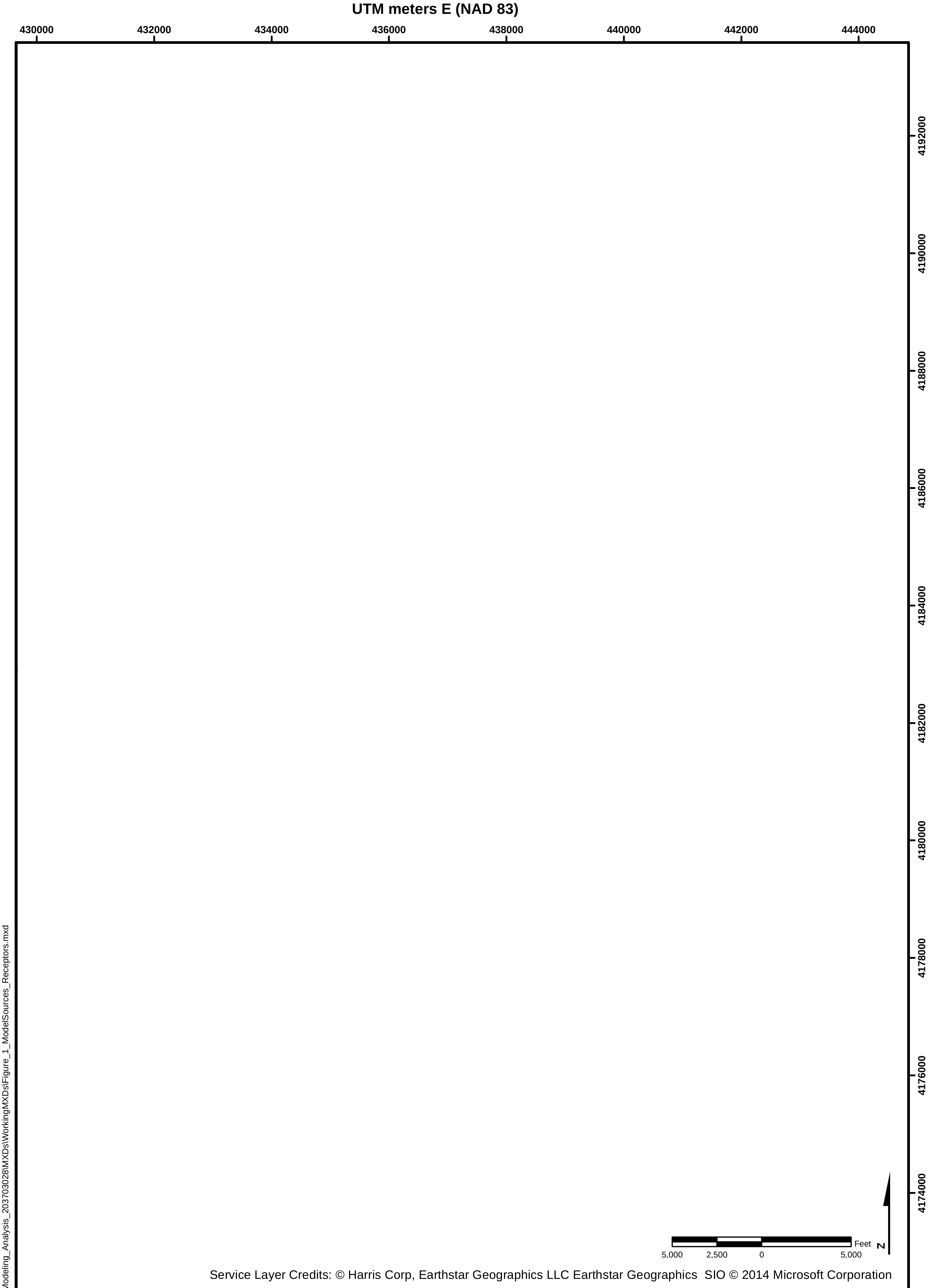
The primary constituents of GHG emissions are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O). GHG emissions are reported in CO_2 equivalent (CO_2e) using CO_2 as a reference gas with a global warming potential of 1. CH_4 has a global warming potential of 21 and N_2O has a global warming potential of 310 from the Code of Federal Regulations Part 98. The GHG emissions reported in Table 5.1 were calculated using the yearly estimated emissions from diesel and gasoline combustion with the global warming potential as stated above. The most recent data analysis from the NBAPC showed that the statewide gross GHG emissions from 2010 totaled 45 million metric tons of CO_2e and the gross GHG emissions for the United States totaled 6,822 million metric tons. Emissions from the MRG mine are negligible when compared to these quantities.

5.2 HAZARDOUS AIR POLLUTANT EMISSIONS

The total HAP emissions were assessed using the same approach as the calculations for GHG emissions. The primary source of HAP emissions come from diesel combustion sources. A small quantity of HAP emissions are derived from fugitive dust containing trace elements. The fugitive HAP emissions are typically negligible when compared to combustion source emissions. The NBAPC regulates HAP emissions for stationary sources based on a threshold of 10 tpy for any single HAP and 25 tpy for any combination of HAPs. HAP emissions from the MRG mine are calculated using a conservative approach with the total fuel usage estimates and the EPA emission factors for large internal combustion engines. Emissions from the MRG mine are well below the state imposed thresholds with the mobile sources included.

APPENDIX A

Graphical Modeling Results



- Receptor Grid
- Model Sources

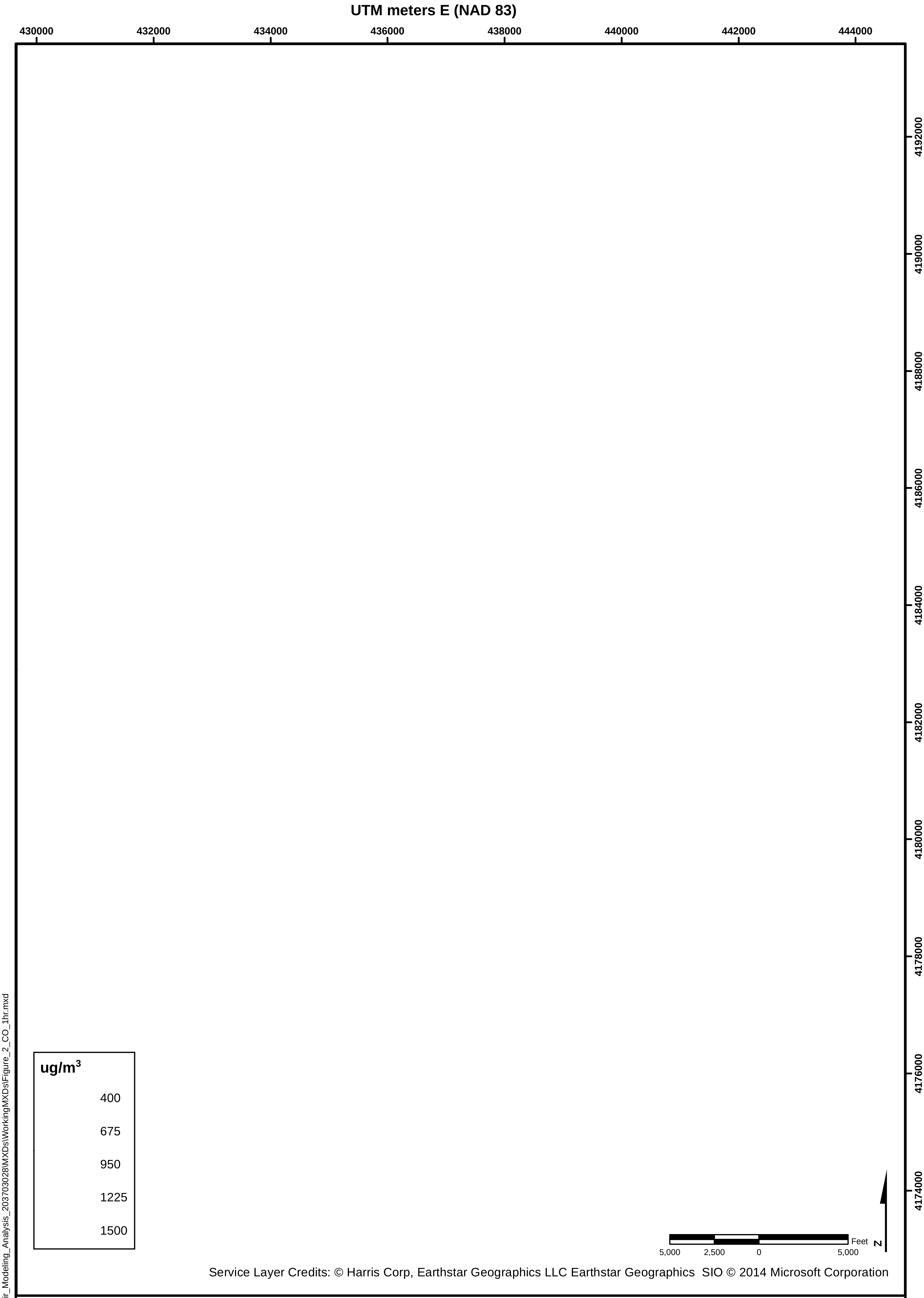
MINERAL RIDGE GOLD, LLC

FIGURE 1
MODEL SOURCES AND RECEPTORS

DRAWN BY	JT
DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet
PROJECT	203703028

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_1_ModelSources_Receptors.mxd



CO_2 1-Hour High Value

Model Sources

Receptor Grid

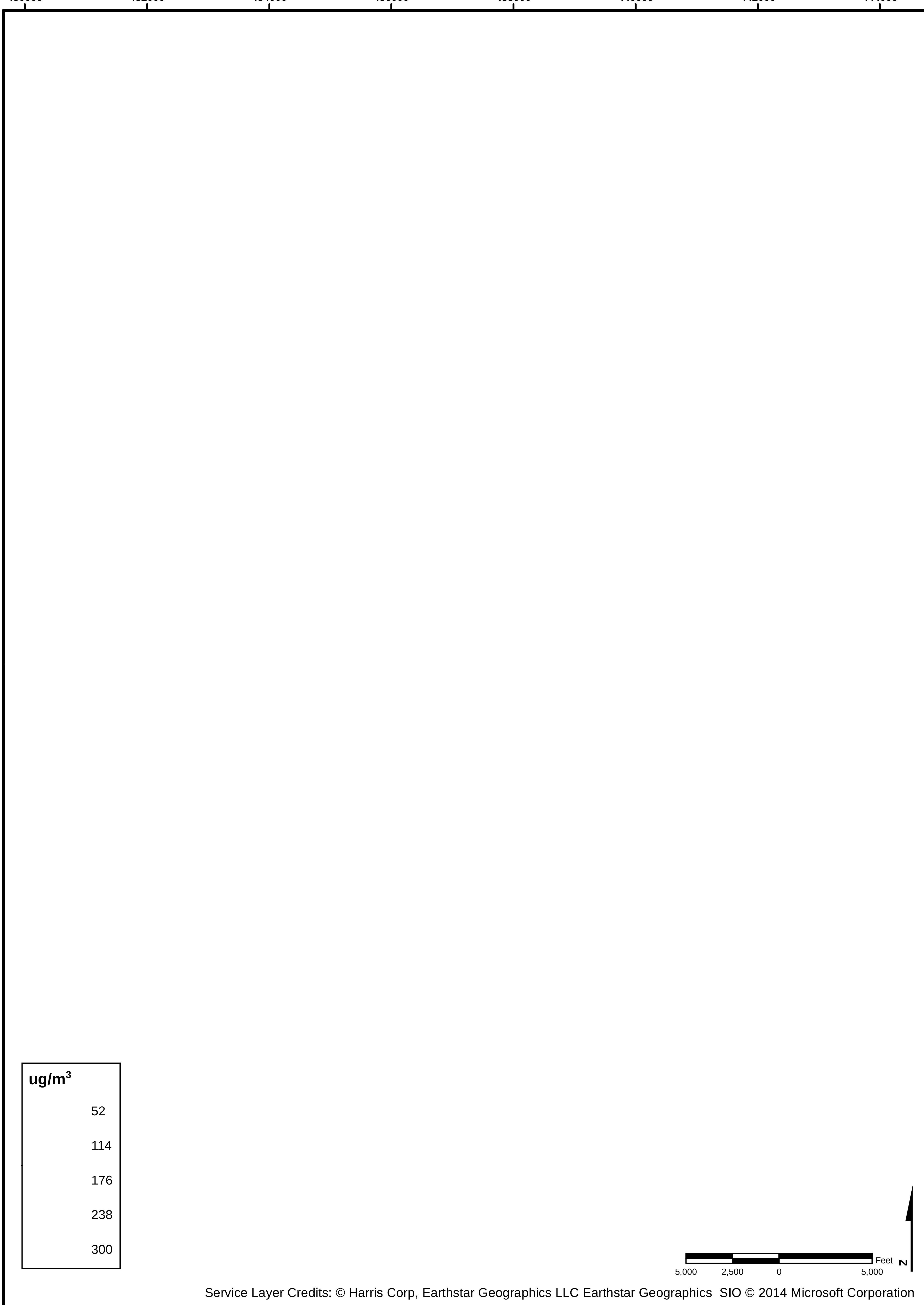
MINERAL RIDGE GOLD, LLC

FIGURE 2
MAXIMUM MODELED IMPACT FOR THE
CO_2 1-HOUR AVERAGING PERIOD

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_2_CO_1hr.mxd



CO_2 8-Hour High Value

Model Sources

Receptor Grid

MINERAL RIDGE GOLD, LLC

FIGURE 3
MAXIMUM MODELED IMPACT FOR THE
CO_2 8-HOUR AVERAGING PERIOD

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_3_CO_8hr.mxd

UTM meters E (NAD 83)

430000 432000 434000 436000 438000 440000 442000 444000

4192000 4190000 4188000 4186000 4184000 4182000 4180000 4178000 4176000 4174000

ug/m^3

50

75

100

125

Feet

5,000 2,500 0 5,000

N

Service Layer Credits: © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2014 Microsoft Corporation

NO_2 1-Hour High Value

Model Sources

Receptor Grid

MINERAL RIDGE GOLD, LLC

FIGURE 4
MAXIMUM MODELED IMPACT FOR THE
NO_2 1-HOUR AVERAGING PERIOD

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_4_NO_1hr.mxd

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

UTM meters E (NAD 83)

430000 432000 434000 436000 438000 440000 442000 444000

4192000 4190000 4188000 4186000 4184000 4182000 4180000 4178000 4176000 4174000

ug/m³

0.4

1.1

1.8

2.5

3.2

5,000 2,500 0 5,000 Feet

N

Service Layer Credits: © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2014 Microsoft Corporation

NO_2 Annual High Value

Model Sources

Receptor Grid

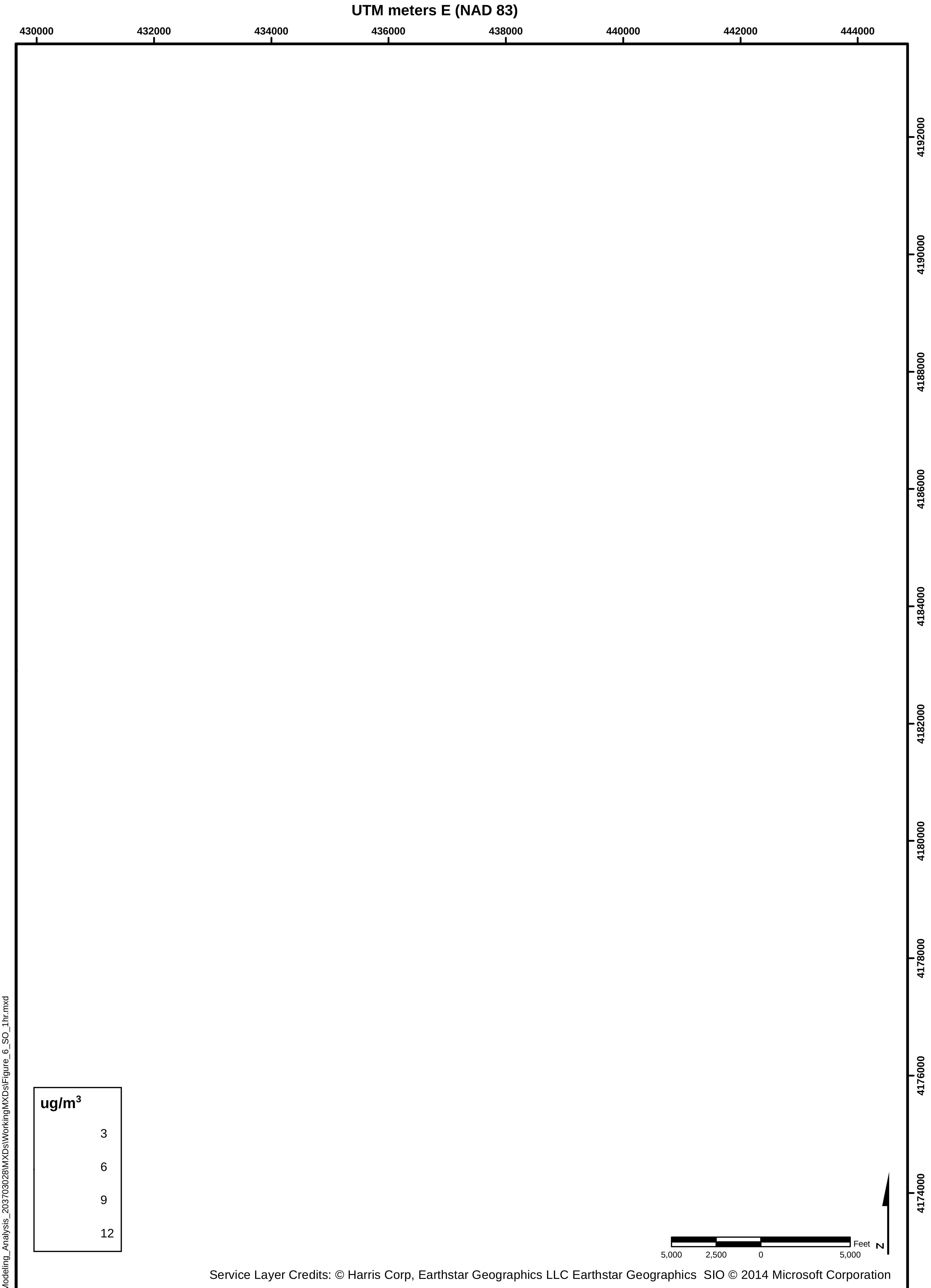
MINERAL RIDGE GOLD, LLC

FIGURE 5
MAXIMUM MODELED IMPACT FOR THE
NO_2 ANNUAL AVERAGING PERIOD

DRAWN BY: JT	DATE DRAWN: 12/2/2014
SCALE: 1 in = 5,000 feet	
PROJECT: 203703028	

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_5_NO_Annual.mxd



SO_2 1-Hour High Value

Model Sources

Receptor Grid

MINERAL RIDGE GOLD, LLC

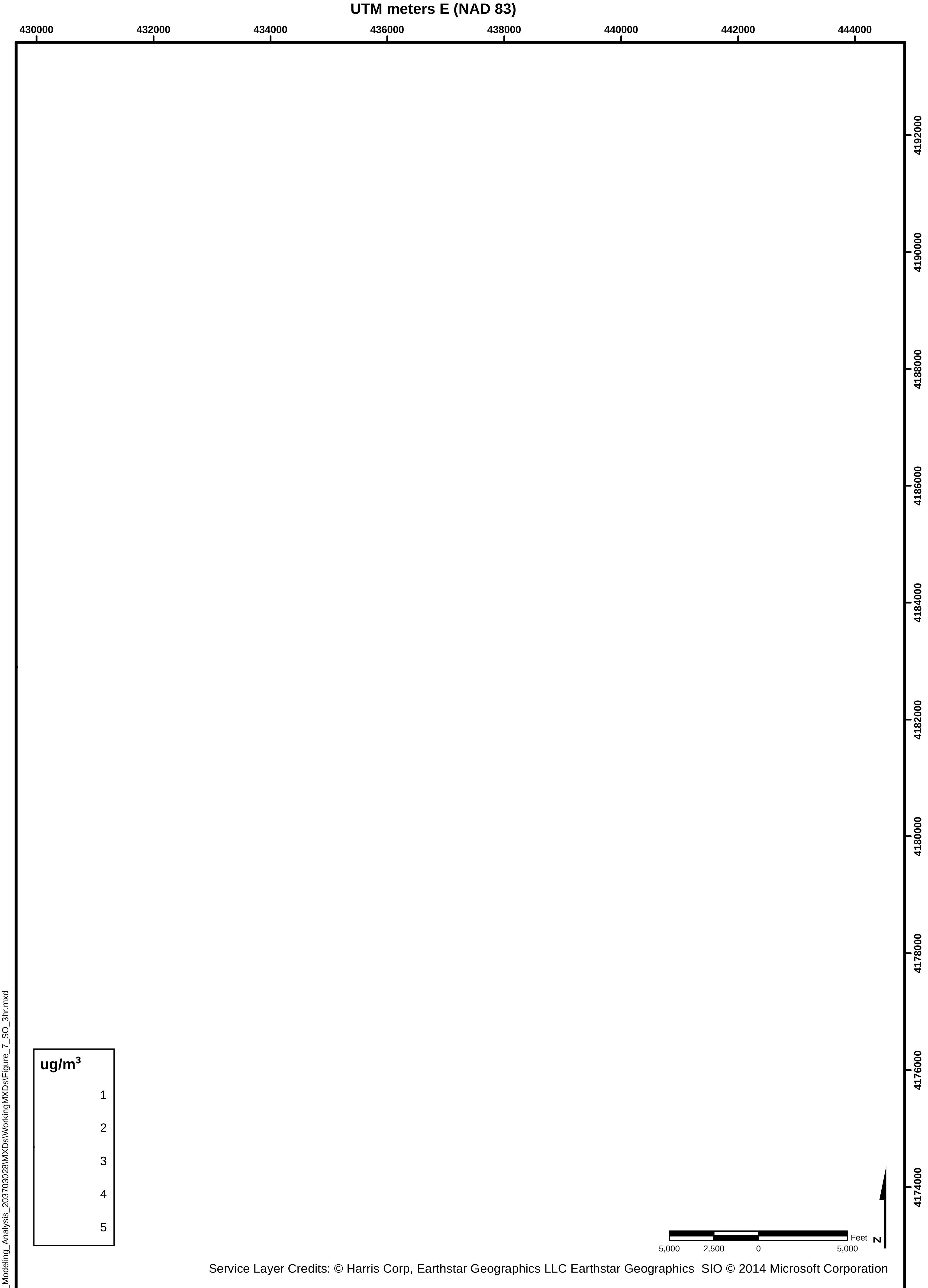
FIGURE 6
MAXIMUM MODELED IMPACT FOR THE
SO_2 1-HOUR AVERAGING PERIOD

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_6_SO_1hr.mxd

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_7_SO_3hr.mxd

SO_2 3-Hour High Value

Model Sources

Receptor Grid

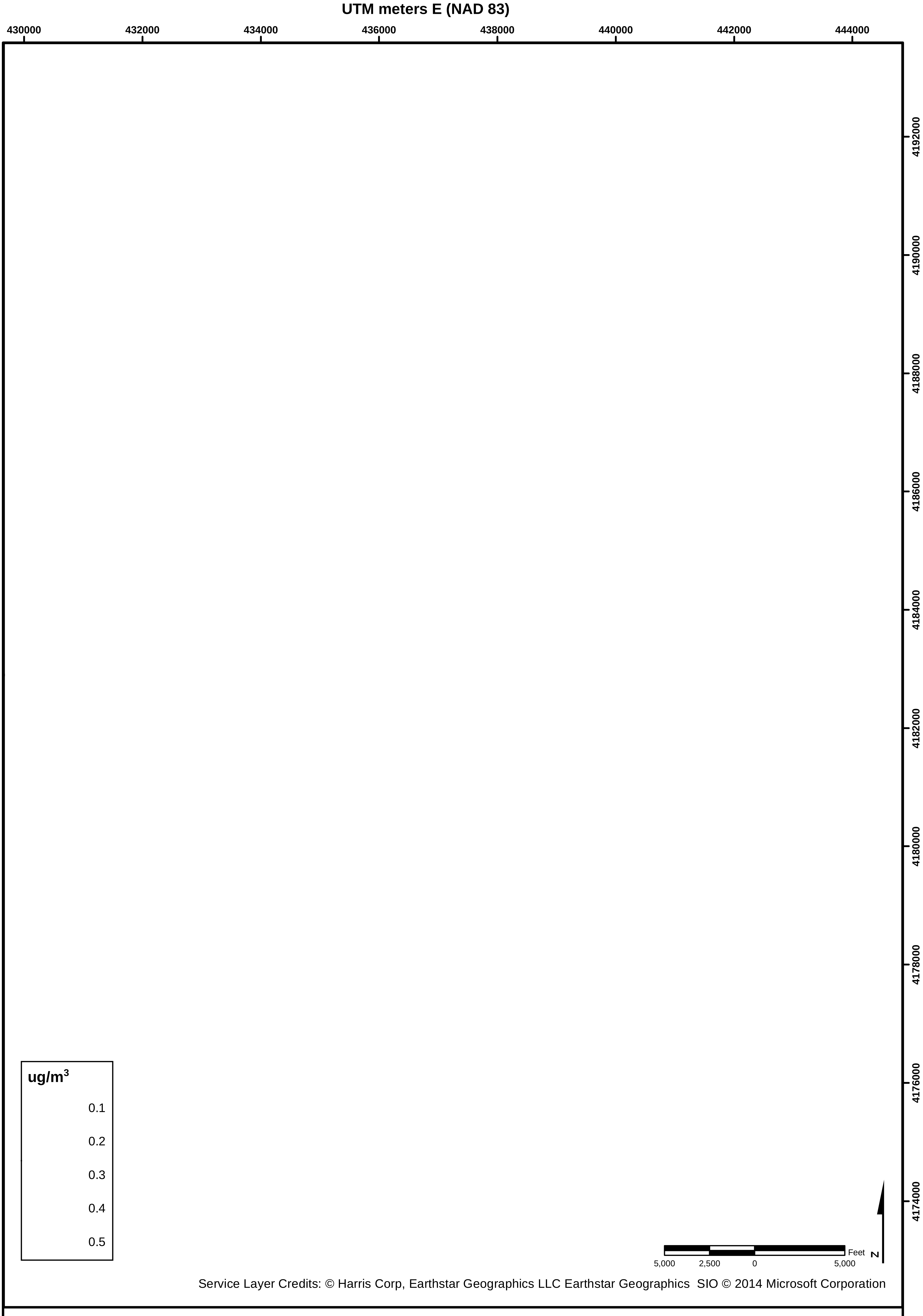
MINERAL RIDGE GOLD, LLC

FIGURE 7
MAXIMUM MODELED IMPACT FOR THE
SO_2 3-HOUR AVERAGING PERIOD

Stantec

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



SO_2 24-Hour High Value

Model Sources

Receptor Grid

MINERAL RIDGE GOLD, LLC

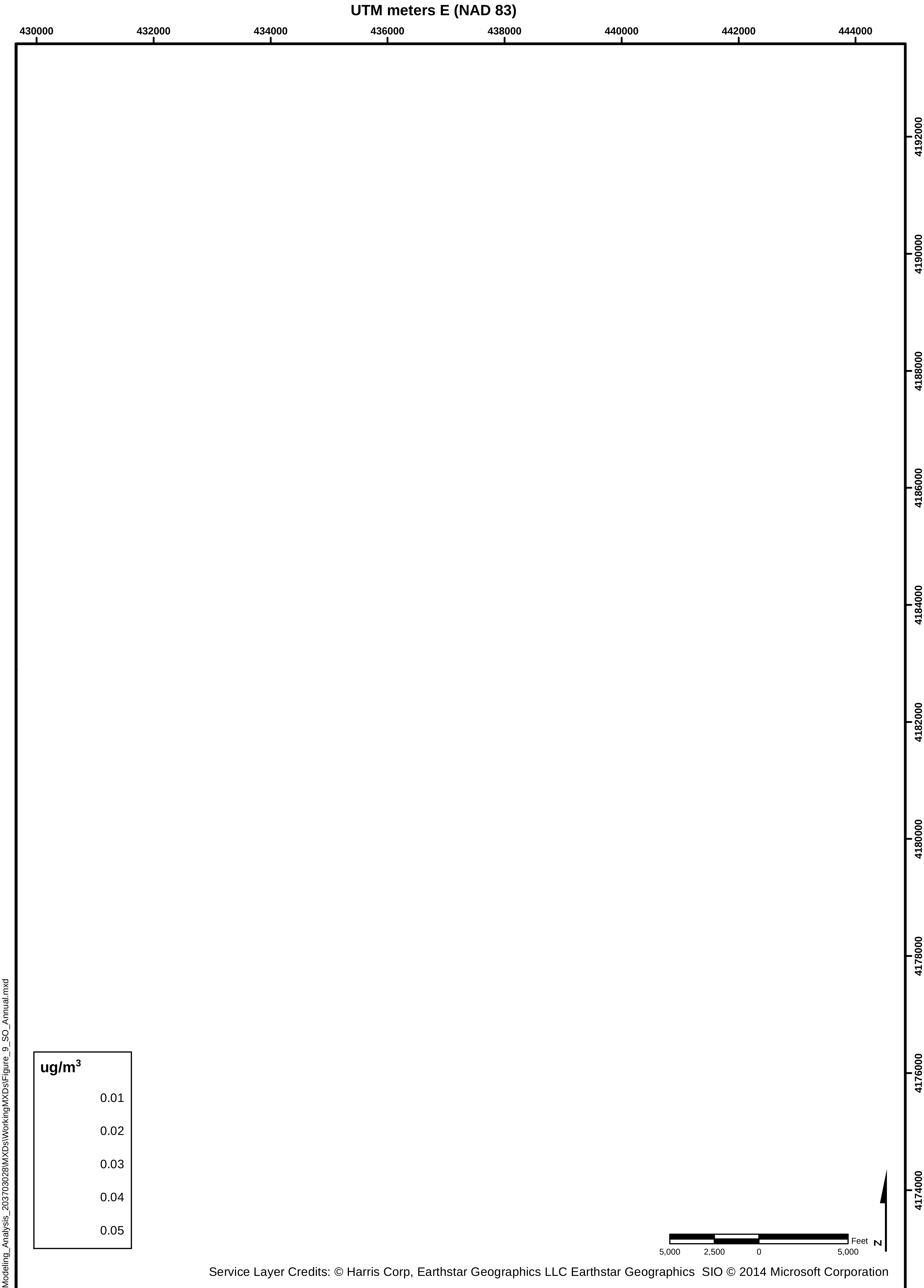
FIGURE 8
MAXIMUM MODELED IMPACT FOR THE
SO_2 24-HOUR AVERAGING PERIOD

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_8_SO_24hr.mxd

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_9_SO_Annual.mxd

Symbol	Legend
Red X	SO_2 Annual High Value
Cyan line	Model Sources
Black dot	Receptor Grid

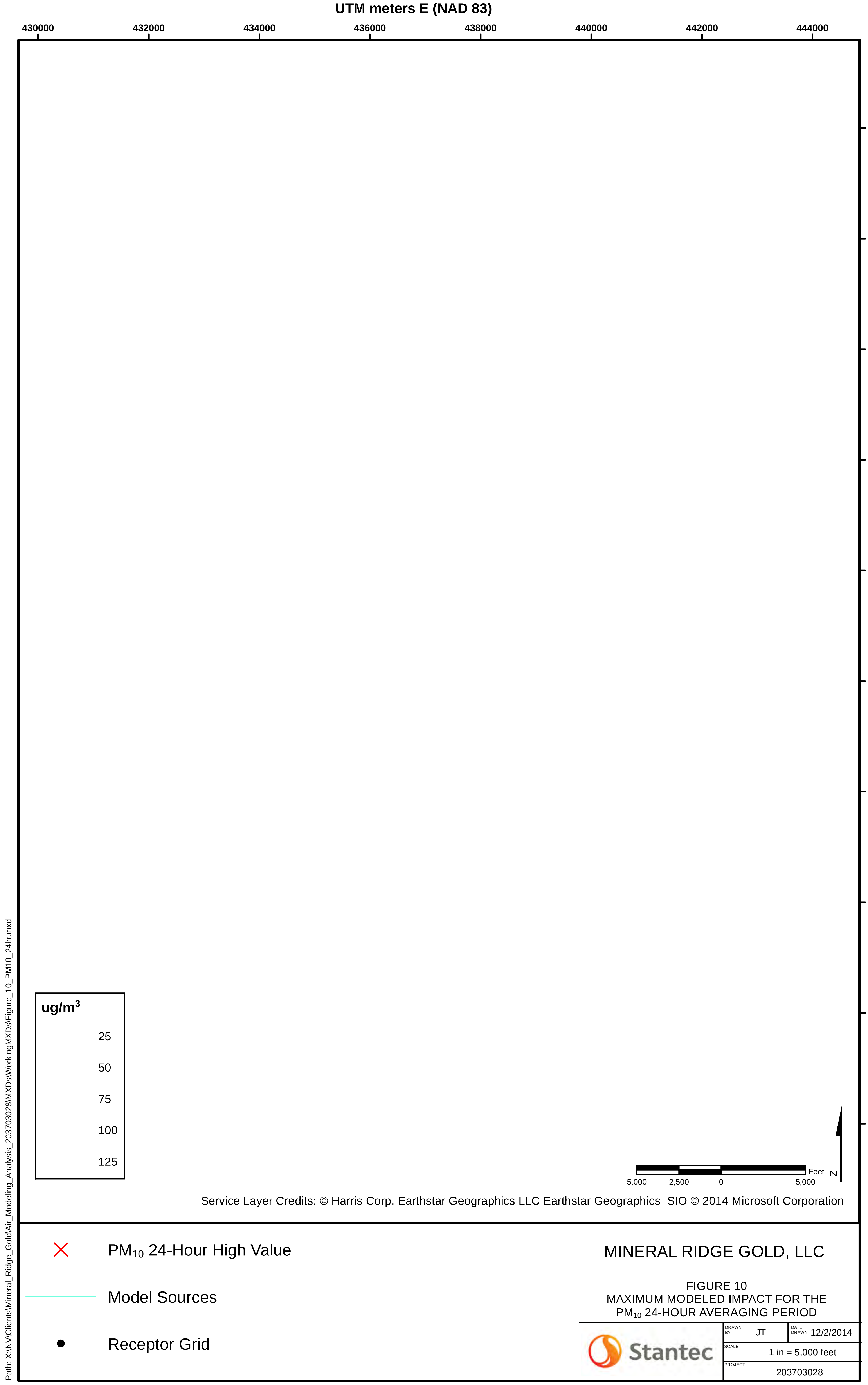
MINERAL RIDGE GOLD, LLC

FIGURE 9
MAXIMUM MODELED IMPACT FOR THE
SO_2 ANNUAL AVERAGING PERIOD

Stantec

DRAWN BY	JT
DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet
PROJECT	203703028

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



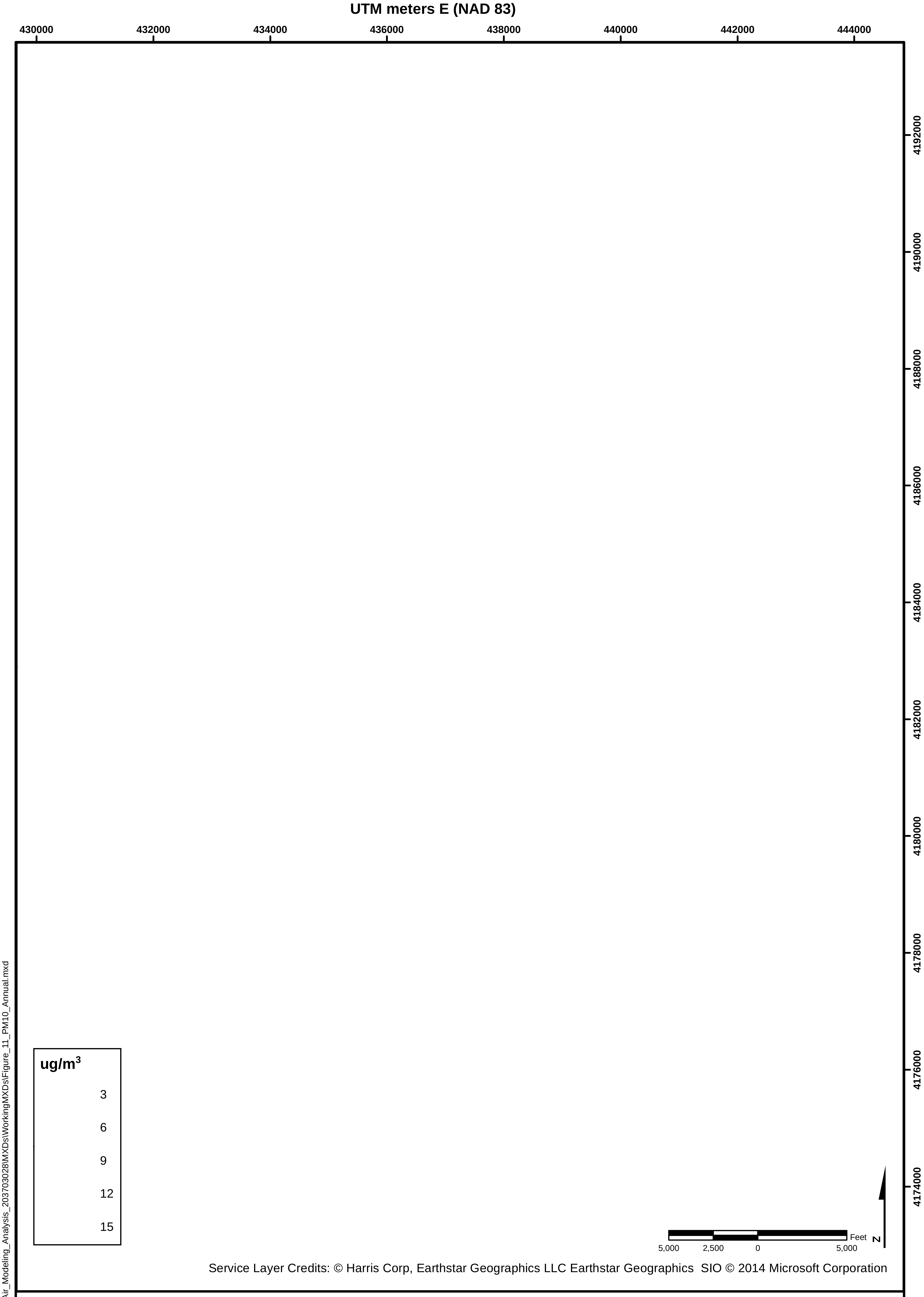
MINERAL RIDGE GOLD, LLC

FIGURE 10
MAXIMUM MODELED IMPACT FOR THE
PM_{10} 24-HOUR AVERAGING PERIOD

DRAWN BY JT	DATE DRAWN 12/2/2014
SCALE	1 in = 5,000 feet
PROJECT	203703028

Stantec

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.



PM_{10} Annual High Value

Model Sources

Receptor Grid

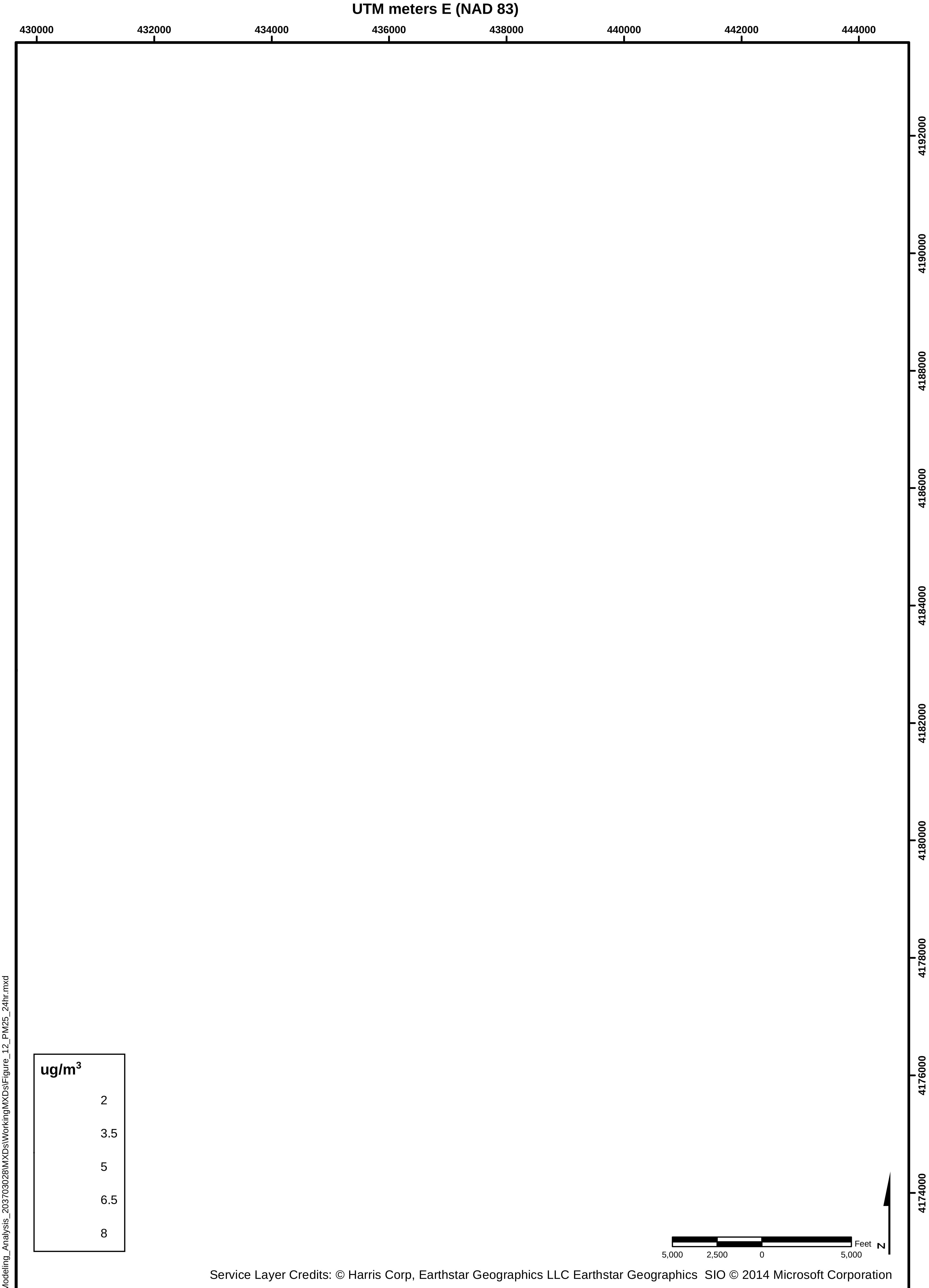
MINERAL RIDGE GOLD, LLC

FIGURE 11
MAXIMUM MODELED IMPACT FOR THE
PM_{10} ANNUAL AVERAGING PERIOD

DRAWN BY: JT	DATE DRAWN: 12/2/2014
SCALE: 1 in = 5,000 feet	
PROJECT: 203703028	

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_11_PM10_Annual.mxd



× PM_{25} 24-Hour High Value

Model Sources

Receptor Grid

MINERAL RIDGE GOLD, LLC

FIGURE 12
MAXIMUM MODELED IMPACT FOR THE
PM_{25} 24-HOUR AVERAGING PERIOD

DRAWN BY: JT	DATE DRAWN: 12/2/2014
SCALE: 1 in = 5,000 feet	
PROJECT: 203703028	

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_12_PM25_24hr.mxd

UTM meters E (NAD 83)

430000 432000 434000 436000 438000 440000 442000 444000

4192000
4190000
4188000
4186000
4184000
4182000
4180000
4178000
4176000
4174000

ug/m³

0.3
0.6
0.9
1.2
1.5

5,000 2,500 0 5,000 Feet

N

Service Layer Credits: © Harris Corp, Earthstar Geographics LLC Earthstar Geographics SIO © 2014 Microsoft Corporation

PM_{25} Annual High Value

Model Sources

Receptor Grid

MINERAL RIDGE GOLD, LLC

FIGURE 13
MAXIMUM MODELED IMPACT FOR THE
PM_{25} ANNUAL AVERAGING PERIOD

DRAWN BY	JT	DATE DRAWN	12/2/2014
SCALE	1 in = 5,000 feet		
PROJECT	203703028		

Stantec

Path: X:\NV\Clients\Mineral_Ridge_Gold\Air_Modeling_Analysis_203703028\MXDs\WorkingMXDs\Figure_13_PM25_Annual.mxd

APPENDIX B

Source Master List

Mineral Ridge Gold

Mary LC Expansion and Satellite Deposits Project

Esmeralda County, Nevada

Air Pollution Emission Inventory

Master List of All Modeled Sources and Pollutants

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 1: Pit Sources		
1.001	Drilling - Ore	PM, PM_{10} , $PM_{2.5}$
1.002	Drilling - Waste Rock	PM, PM_{10} , $PM_{2.5}$
1.003	Blasting - Ore	PM, PM_{10} , $PM_{2.5}$
1.004	Blasting -Waste Rock	PM, PM_{10} , $PM_{2.5}$
1.005	Explosive Detonation - Ore Blasting	CO, SO_2, NOx
1.006	Explosive Detonation - Waste Rock Blasting	CO, SO_2, NOx
1.007	Ammonium Nitrate Prill Silo Loading #1	PM, PM_{10} , $PM_{2.5}$
1.008	Ammonium Nitrate Prill Silo Loading #2	PM, PM_{10} , $PM_{2.5}$
1.009	Ammonium Nitrate Prill Silo Unloading #1	PM, PM_{10} , $PM_{2.5}$
1.010	Ammonium Nitrate Prill Silo Unloading #2	PM, PM_{10} , $PM_{2.5}$
1.011	Loading - Ore	PM, PM_{10} , $PM_{2.5}$
1.012	Loading - Waste Rock	PM, PM_{10} , $PM_{2.5}$

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 2: Vehicles		
2.001	Drill Rig - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.002	Drill Rig - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.003	ANFO Truck - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.004	ANFO Truck - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.005	Haul Trucks - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.006	Haul Trucks - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.007	Dozers - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.008	Dozers - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.009	Graders - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.010	Graders - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.011	Water Trucks - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.012	Water Trucks - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.013	Loaders - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.014	Loaders - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.015	Light Vehicles - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.016	Light Vehicles - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs
2.017	Service Vehicles - Fugitive	PM, PM_{10}, $PM_{2.5}$
2.018	Service Vehicles - Combustion	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NO_2, HAPs

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 3: Milling		
3.001	Loader to Hopper	PM, PM_{10} , $PM_{2.5}$
3.002	Hopper to Feeder	PM, PM_{10} , $PM_{2.5}$
3.003	Feeder to Jaw	PM, PM_{10} , $PM_{2.5}$
3.004	Jaw to Feeder 2	PM, PM_{10} , $PM_{2.5}$
3.005	Jaw to C1	PM, PM_{10} , $PM_{2.5}$
3.006	C1 to C2	PM, PM_{10} , $PM_{2.5}$
3.007	System P-3 Secondary Crushing	PM, PM_{10} , $PM_{2.5}$
3.008	System P-4 Screening and Conveying	PM, PM_{10} , $PM_{2.5}$
3.009	Conveyor C18 transfers	PM, PM_{10} , $PM_{2.5}$
3.010	Conveyor C20 to stockpile	PM, PM_{10} , $PM_{2.5}$
3.011	Loader to Hopper	PM, PM_{10} , $PM_{2.5}$
3.012	Hopper to C21	PM, PM_{10} , $PM_{2.5}$
3.013	C21 to C18	PM, PM_{10} , $PM_{2.5}$
3.014	Cement Silo Loading	PM, PM_{10} , $PM_{2.5}$
3.015	Cement Silo Unloading to C19	PM, PM_{10} , $PM_{2.5}$
3.016	Cement Transfer Station to C19	PM, PM_{10} , $PM_{2.5}$
3.017	C19 to Agglomerator	PM, PM_{10} , $PM_{2.5}$

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 4: Generators		
4.001	1,865 hp Emergency Generator (diesel)	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NOx, CO_2, HAPs

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 5: Other Sources		
5.001	Light Plant (20kW)	PM, PM_{10}, $PM_{2.5}$,VOCs, CO, SO_2, NOx, CO_2, HAPs
5.002	Red Diesel Storage Tank (10,000 gallon capacity)	VOCs
5.003	Diesel Storage Tank (7,000 gallon capacity)	VOCs
5.004	Diesel Storage Tank (15,000 gallon capacity)	VOCs
5.005	Gasoline Storage Tank (3,000 gallon capacity)	VOCs
5.006	Lab Equipment	PM, PM_{10}, $PM_{2.5}$, Hg

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 6: Heap Sources		
6.001	Heap Leach Facility Unloading via Conveyor	PM, PM_{10} , $PM_{2.5}$

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 7: Waste Rock Facilities		
7.001	WD-4 Unloading	PM, PM_{10} , $PM_{2.5}$
7.002	WD-6 Unloading	PM, PM_{10} , $PM_{2.5}$
7.003	WD-10 Unloading	PM, PM_{10} , $PM_{2.5}$
7.004	Bluelite Unloading	PM, PM_{10} , $PM_{2.5}$
7.005	Solberry Unloading	PM, PM_{10} , $PM_{2.5}$

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 8: Backfill Sources		
8.001	Brodie Pit Backfill	PM, PM_{10}, $PM_{2.5}$

Emission Source ID	Emission Source Description	Pollutants
Emission Unit Group 9: Wind Erosion		
9.001	WD-4 - Wind Erosion	PM, PM_{10}, $PM_{2.5}$
9.002	WD-6 - Wind Erosion	PM, PM_{10}, $PM_{2.5}$
9.003	WD-10 - Wind Erosion	PM, PM_{10}, $PM_{2.5}$
9.004	Bluelite - Wind Erosion	PM, PM_{10}, $PM_{2.5}$
9.005	Solberry - Wind Erosion	PM, PM_{10}, $PM_{2.5}$
9.006	Brodie Pit Backfill - Wind Erosion	PM, PM_{10}, $PM_{2.5}$
9.007	Heap Leach Facility - Wind Erosion	PM, PM_{10}, $PM_{2.5}$

Emission Source ID	Emission Source Description	Count
Emission Unit Group 10: Roads		
10.001	Solberry Pit to Solberry WRF	3
10.002	Solberry to Milling	32
10.003	Bluelite Pit to Waste/Backfill	27
10.004	Bluelite Pit to Milling	17
10.005	Mary LC to Milling	26
10.006	Mary LC to WD6/WD10	12
10.007	Service and Commuter East	128
10.008	Service/Commuter/Exploration	60

APPENDIX C

Emissions Spreadsheets

The emissions spread sheets will be provided by the BLM upon request.

APPENDIX D

Revised Protocol

AIR QUALITY IMPACT ANALYSIS MODELING PROTOCOL
MINERAL RIDGE MINE
(NVN-73109/RECLAMATION PERMIT 0103)
MARY LC EXPANSION AND SATELLITE DEPOSITS
PLAN OF OPERATIONS AMENDMENT

Prepared for:

Mineral Ridge Gold, LLC
1515 7th Street
Elko, Nevada 89801

Prepared by:

Employees Company of Nevada, Inc.
2901 Sherman Lane
Carson City, Nevada 89706
(775) 230-2173
(775) 882-6566 (fax)
gmccleary@pyramid.net

Revised by:

Stantec Consulting Services Inc.
595 Double Eagle Court, Suite 2000
Reno, Nevada 89521

Stantec Project Number 203703038

Revised November 2014
October 2014

Table of Contents

1.0 INTRODUCTION 1

2.0 MODEL SELECTION AND OPTIONS 3

2.1 MODELING FOR NITROGEN DIOXIDE IMPACTS 3
2.2 METEOROLOGICAL DATA 3
2.3 FACILITY BOUNDARY 4
2.4 RECEPTORS 4
2.5 BACKGROUND CONCENTRATIONS 4

3.0 EMISSION INVENTORY AND SOURCE INPUTS FOR AERMOD 5

4.0 EMISSION SOURCES 6

5.0 FINAL REPORT AND MODELING FILES 7

FIGURES

Figure 1 Meteorological Tower Location
Figure 2 Wind Rose – 2007 Tonopah Meteorological Data
Figure 3 Wind Rose – 2008 Tonopah Meteorological Data
Figure 4 Wind Rose – 2009 Tonopah Meteorological Data
Figure 5 Wind Rose – 2010 Tonopah Meteorological Data
Figure 6 Wind Rose – 2011 Tonopah Meteorological Data
Figure 7 Property Boundary Overlay

APPENDICES

Appendix A Meteorological Tower Location and Wind Roses
Appendix B Facility Boundary Google Earth Image

ABBREVIATIONS

BLM	Bureau of Land Management
EPA	Environmental Protection Agency
MRG	Mineral Ridge Gold, LLC
NBAPC	Nevada Bureau of Air Pollution Control
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act of 1969
O_3	Ozone
Pb	Lead
Plan Amendment	Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Mary LC Expansion and Satellite Deposits Plan of Operations Amendment
$\mu g/m^3$	micrograms per cubic meter of air

1.0 INTRODUCTION

The Mineral Ridge Mine is an open-pit mine located in Esmeralda County, Nevada on private land controlled by Mineral Ridge Gold, LLC (MRG) as well as on unpatented mining claims on public lands administered by the Bureau of Land Management (BLM) Tonopah Field Office. The BLM and the Nevada Division of Environmental Protection (NDEP) Bureau of Mining Regulation and Reclamation have previously authorized MRG to disturb approximately 621 acres under the *Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Pit Expansion Plan of Operations Amendment*. Existing and authorized disturbances and facilities within the Mineral Ridge Mine Plan boundary include:

- Four open pits [Mary Last Chance (LC), Drinkwater, Wedge B, and Brodie];
- Two underground workings (Wilson Decline and Mary Portal);
- Ten rock disposal areas (WD-1, WD-2, WD-4, WD-5, WD-6, WD-7, WD-8, WD-9, WD-10, and WD-11);
- Crushing and agglomeration facilities;
- Heap leaching facilities including barren and pregnant solution ponds;
- Haul and access roads;
- One clay and soil borrow pit;
- Exploration activities;
- A utility corridor; and
- Office, shop, warehouse, and ancillary facilities including water supply wells and pipelines, ore stockpiles, a fuel farm, a 69-kilovolt power line and substation, communication equipment, stepdown transformers, site distribution electrical lines, a ready line, stormwater diversions and controls, two septic systems, explosives storage (managed by others), and Class III waivered landfills.

MRG has submitted the *Mineral Ridge Mine (NVN-73109/Reclamation Permit 0103) Mary LC Expansion and Satellite Deposits Plan of Operations Amendment* (Plan Amendment) which proposes modifications to existing and authorized operations. The proposed changes will increase the Project disturbance area from approximately 621 acres to 785 acres. The Plan Amendment includes the following changes:

- Expansion of the Plan area boundary;
- Addition of haul roads on the western side of the Plan area;
- Addition of the Bluelite and Solberry pits;

- Increase the size of and production from the Mary LC, Wedge B, and Brodie pits;
- Addition of two new waste rock disposal areas, Solberry and Bluelite;
- Partial backfilling of the Brodie Pit with about 900,000 tons of material;
- Backfilling of the Wedge B Pit with about 200,000 tons of material;
- Increase the capacity of waste rock disposal areas WD-2, WD-4, WD-6, WD-9, WD-10, and WD-11 with area changes also occurring for WD-1, WD-5, and WD-7;
- Salvaging growth media and expansion of the growth media stockpile;
- Changes to the "General Disturbance" category;
- Re-alignment of water and power lines;
- Addition of a physical barrier to public access near the crusher to comply with the NDEP Bureau of Air Pollution Control requirements;
- Reallocation of exploration disturbance areas, development of the "Phase I Exploration Work Plan", and focus of future exploration tracking on surface disturbance;
- Changes to mobile equipment;
- Changes to employment; and
- Bat exclusion and closure of the Mary 1 Escapeway.

In order to support the Environmental Assessment required by the National Environmental Policy Act of 1969 (NEPA), MRG is proposing to conduct an air quality analysis to quantify and evaluate the impacts on ambient air quality resulting from the Plan Amendment. This modeling protocol proposes the methods and data sets that will be used to conduct the air quality analysis to demonstrate MRG's compliance with the applicable ambient air quality standards.

2.0 MODEL SELECTION AND OPTIONS

The Environmental Protection Agency's (EPA) approved air dispersion model, AERMOD (version 14134), will be used to perform the air quality analysis for emissions of criteria pollutants for applicable averaging periods as listed below. BREEZE AERMOD-ISC 7 (version 7.9), will be used to prepare the input files and run the models. Elevated terrain will be imported using digital elevation models downloaded from the WebGIS website. AERMAP will be used to process the terrain data and assign heights to all buildings, sources, and receptors. Due to limited land use in the vicinity of the project, the rural options will be utilized.

AERMOD will be run to predict potential air quality impacts for the following criteria pollutants and averaging periods:

- Particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) – 24-hour and annual.
- Particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$) – 24-hour and annual.
- Carbon monoxide – one-hour and eight-hour.
- Nitrogen dioxide – one-hour and annual.
- Sulfur dioxide – one-hour, three-hour, 24-hour and annual.

Note: Modeling will not be performed for ozone (O_3) or lead (Pb). The MRG project does not support the precursor pollutants and conditions for O_3 formation and Pb is expected to be negligible as it is not a fuel additive or major component in ore handling. Mercury emissions are also negligible, due to the very low mercury content of the ore being mined and processed.

2.1 MODELING FOR NITROGEN DIOXIDE IMPACTS

The nitrogen oxide emissions from combustion sources are mainly composed of nitrogen oxide and nitrogen dioxide. In the atmosphere, the nitrogen oxide can convert to nitrogen dioxide through chemical reactions with ambient ozone. This modeling analysis will use the Plume Volume Molar Ratio Method for analyzing the one-hour nitrogen dioxide impacts. The default recommended in-stack ratio of 0.5 will be used along with a single background ozone concentration found on the EPA Airtrends Ozone information page. The background ozone will be 61.44 particles per million, the average of the 2005 through 2013 recorded levels from the Fallon, Nevada monitoring station.

2.2 METEOROLOGICAL DATA

Air quality modeling assessments performed as part of the air quality permitting process required by the Nevada Bureau of Air Pollution Control (NBAPC) used five years of Tonopah National Weather Service data, collected at the Tonopah Airport National Weather Service station. For this modeling process, updated Tonopah meteorological data was obtained from the NBAPC for 2007 through 2011, which has been processed in accordance with EPA's recent update of AERMET. A map showing the location of the Tonopah Airport in relation to the MRG project is contained in Appendix A along with figures for the wind roses for each meteorological year.

2.3 FACILITY BOUNDARY

Universal Transverse Mercator North American Datum 83 coordinates were obtained from MRG for the facility boundary. These coordinates were input to the preliminary AERMOD file to generate the facility boundary. The results were then exported to Google Earth. Appendix B contains the Google Earth image with the facility boundary.

2.4 RECEPTORS

Boundary receptors will be spaced at 25 meter increments along the facility boundary. A near field, fine grid of receptors will be placed from the facility boundary out to approximately 1,000 meters with receptors spaced at 100 meter increments. A second, coarse grid of receptors will extend from the fine grid out to approximately 5,000 meters with receptors spaced at 500 meter increments.

2.5 BACKGROUND CONCENTRATIONS

The NBAPC does not operate any ambient monitoring sites in the vicinity of MRG's project. Therefore, the background concentrations for PM_{10}, developed by the NBAPC using ambient data collected by the NBAPC at Lehman Caves in the Great Basin National Park, will be used. The concentrations are 10.2 micrograms per cubic meter of air ($\mu g/m^3$) for a 24-hour period and 9.0 $\mu g/m^3$ for an annual period. For $PM_{2.5}$, a review of protocols submitted to BLM for other mining operations was conducted. Based on this review, $PM_{2.5}$ background concentrations of seven $\mu g/m^3$ for a 24-hour period and 2.4 $\mu g/m^3$ for an annual period will be used. These $PM_{2.5}$ background concentrations were estimated from the monitored data from the Great Basin National Park Interagency Monitoring of Protected Visual Environments monitoring station for the three-year period from 2005 through 2007. Gaseous pollutants are not monitored in rural sites such as MRG. The NBAPC recommends assuming a zero concentration for gaseous pollutants in areas such as MRG. Carbon monoxide, nitrogen dioxide, and sulfur dioxide will use the NBAPC assumption of a zero background for this analysis due to lack of monitoring data.

3.0 EMISSION INVENTORY AND SOURCE INPUTS FOR AERMOD

An emissions inventory for the current mining operation has been developed as part of MRG's State air quality permitting process, and will be used to develop the model input for this NEPA process. In addition, an emissions inventory for mobile equipment has been prepared. The maximum production year will be used in the modeling analysis and emissions will be based on those areas and sources that will be operating during that maximum production year. The following source categories will be included to develop the maximum potential to emit:

- Process related emission sources – material handling, crushing, screening, and conveying, laboratory equipment, and emergency generators.
- Area sources – equipment located in the active pits, waste rock facilities, backfill areas, and heap leach areas.
- Fugitive emission sources – hauling and other vehicular traffic, wind erosion of stockpiles, and vehicular exhaust.

Maximum hourly emission rates will be calculated for all emission sources. The emission rates will be calculated using maximum hourly throughputs and EPA's AP-42 emission factors where applicable, manufacturer's guarantees where applicable, stack testing results, and information obtained from EPA and BLM sources as approved for use in calculating emissions.

AERMOD includes a building downwash option for use when there are buildings included in the model. The Building Profile Input Program (BPIP-PRIME) will be used to determine downwash effects from buildings.

Fugitive dust and gaseous tailpipe emissions from vehicular traffic on the internal mine roads will be modeled as a series of volume sources that follow the roadways.

4.0 EMISSION SOURCES

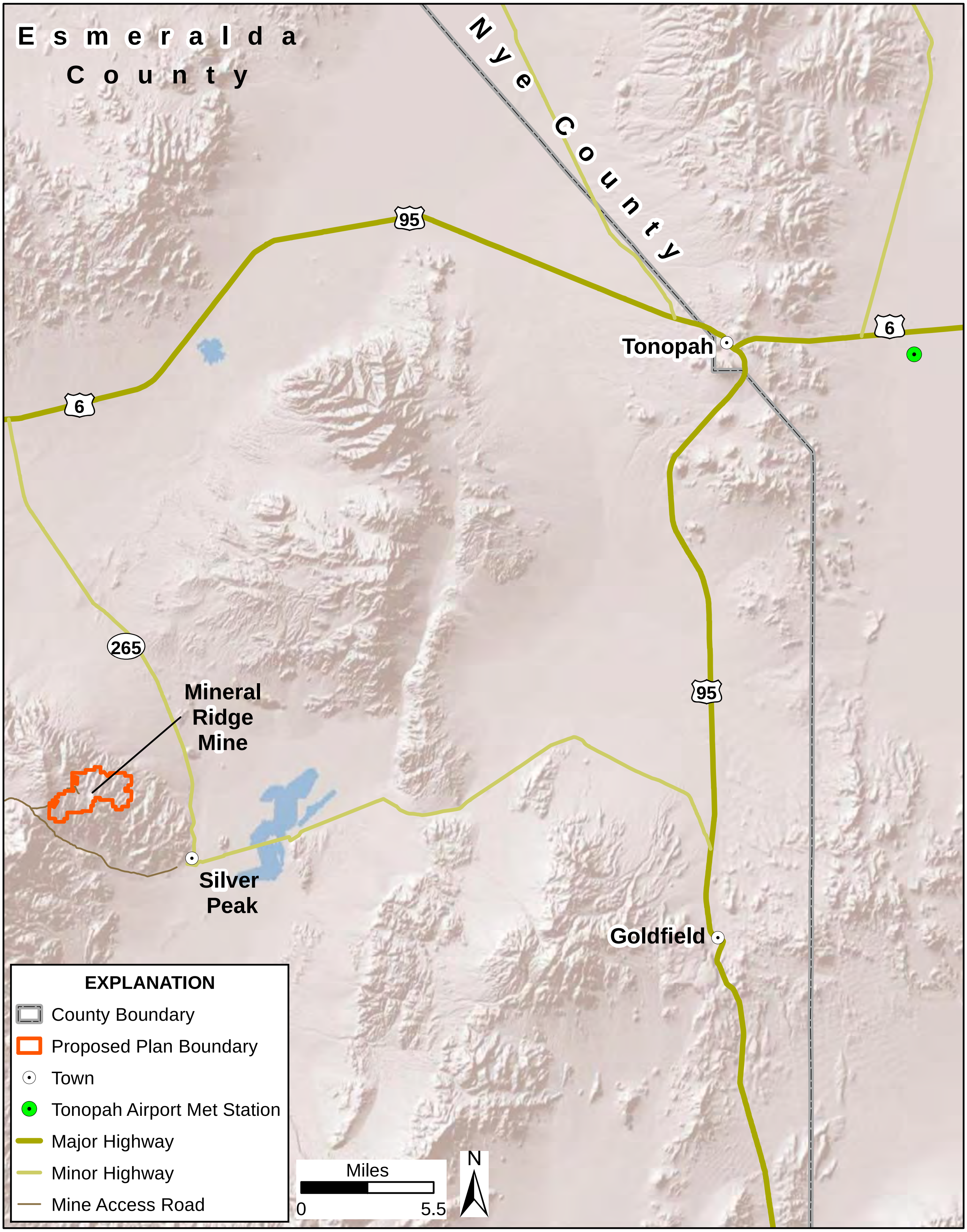
The air quality modeling analysis will include emissions from process sources (material handling, crushing, screening, conveying and combustion), insignificant activities, and fugitive emissions (from existing and proposed drilling, blasting, material loading and unloading, hauling, stockpiles, and mobile equipment tailpipe emissions). Emission sources with stacks including the generator, primary and secondary crushing and screening (baghouses) and assay lab will be modeled as point sources, and process fugitive sources (conveyors and other transfer points whose emissions are not exhausted through a stack) will be modeled as volume sources. The active pits will be modeled as PIT sources. Areas such as the waste rock facilities, backfill areas, and heap leach areas will be modeled as area sources. All roads will be modeled as volume sources.

5.0 FINAL REPORT AND MODELING FILES

A final Air Quality Impact Assessment will be prepared that addresses all model input as discussed in this Protocol, and the model results compared to the National and Nevada Ambient Air Quality Standards. All modeling files will be provided on a CD accompanying the Assessment.

APPENDIX A

Meteorological Tower Location and Wind Roses



srk consulting

NAD 1983 UTM Zone 11N

SCALE: 1 inch = 5.5 miles

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

DRAWING TITLE:
TONOPAH AIRPORT MET STATION LOCATION

DRAWING NO. FIGURE 1

DATE: 10/27/2014

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\EA_202200_370_Fig01_MetLocation_SCH_20141024.mxd

Figure 2 Wind Rose – 2007 Tonopah Meteorological Data

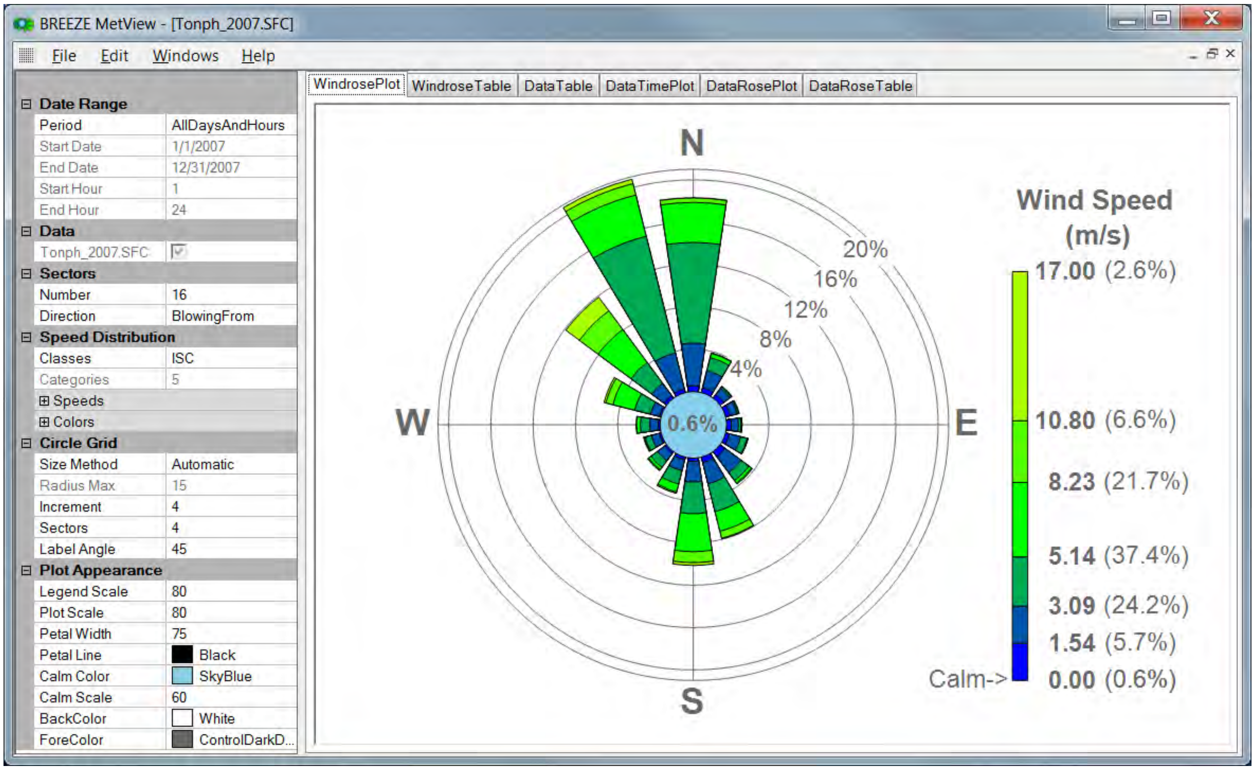


Figure 3 Wind Rose – 2008 Tonopah Meteorological Data

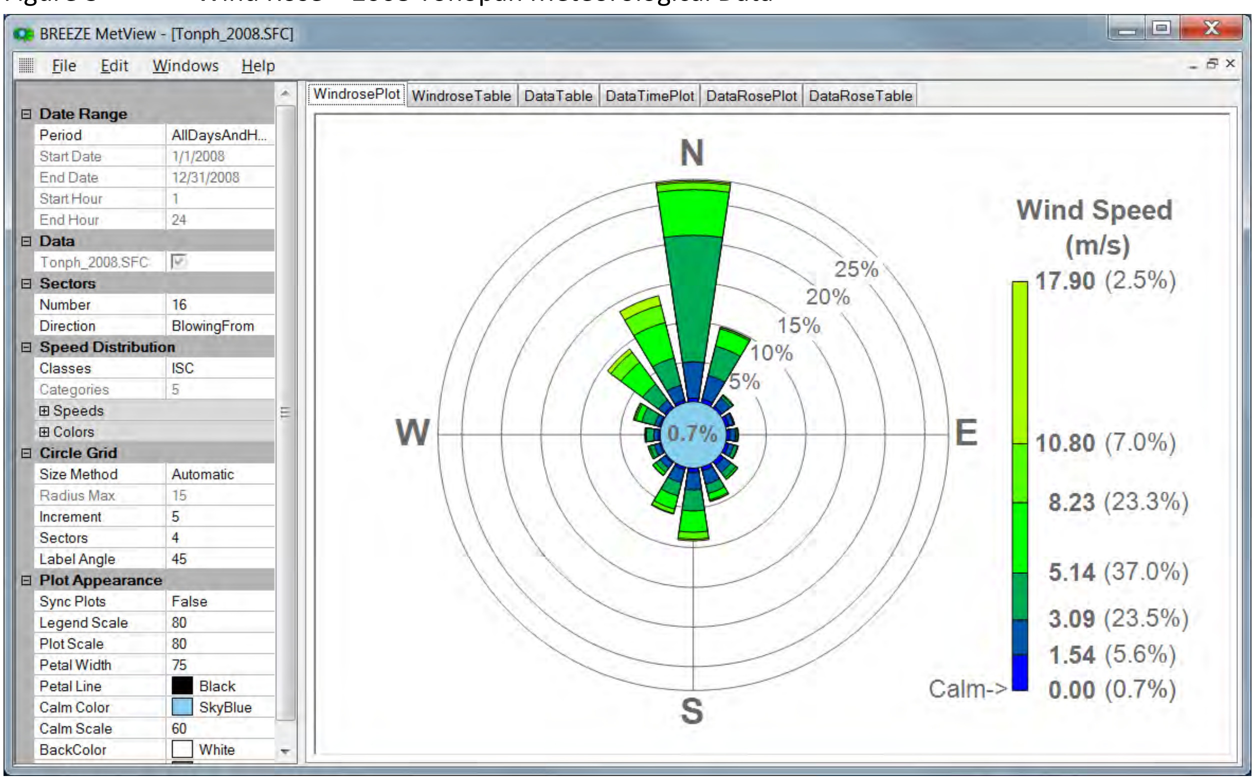


Figure 4 Wind Rose – 2009 Tonopah Meteorological Data

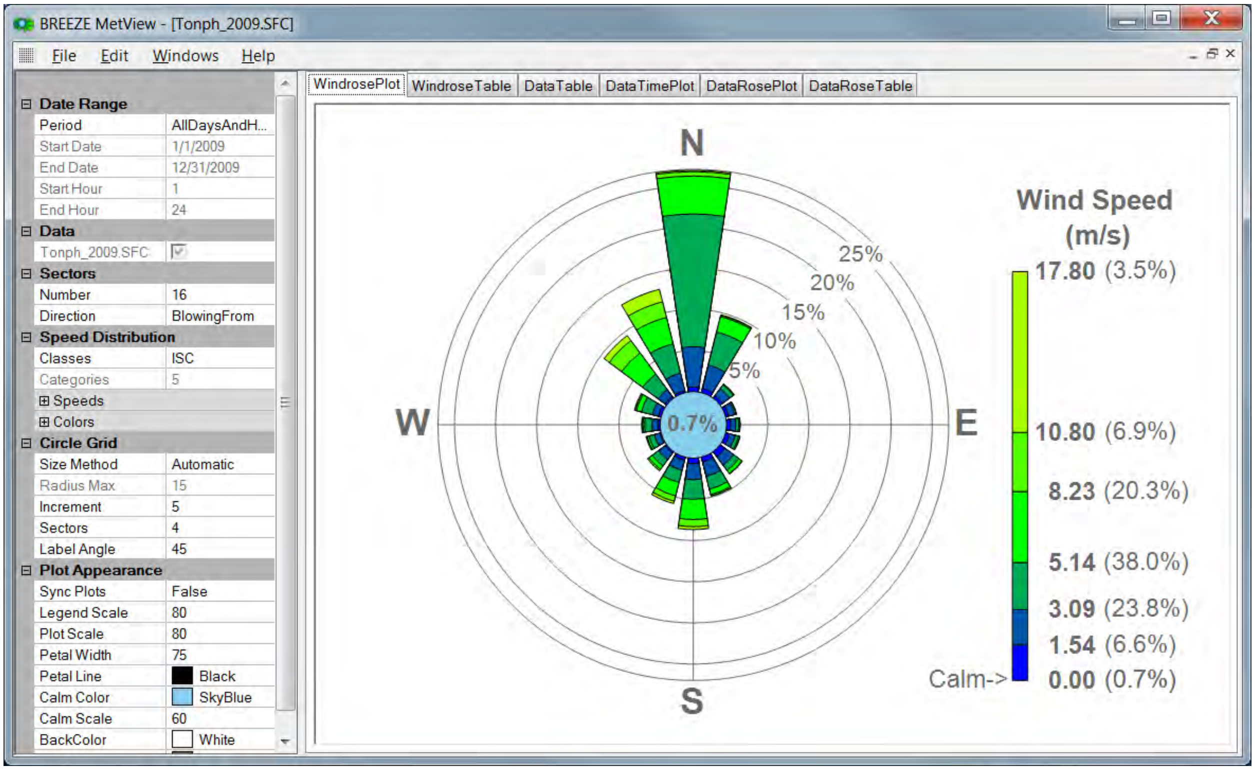


Figure 5 Wind Rose – 2010 Tonopah Meteorological Data

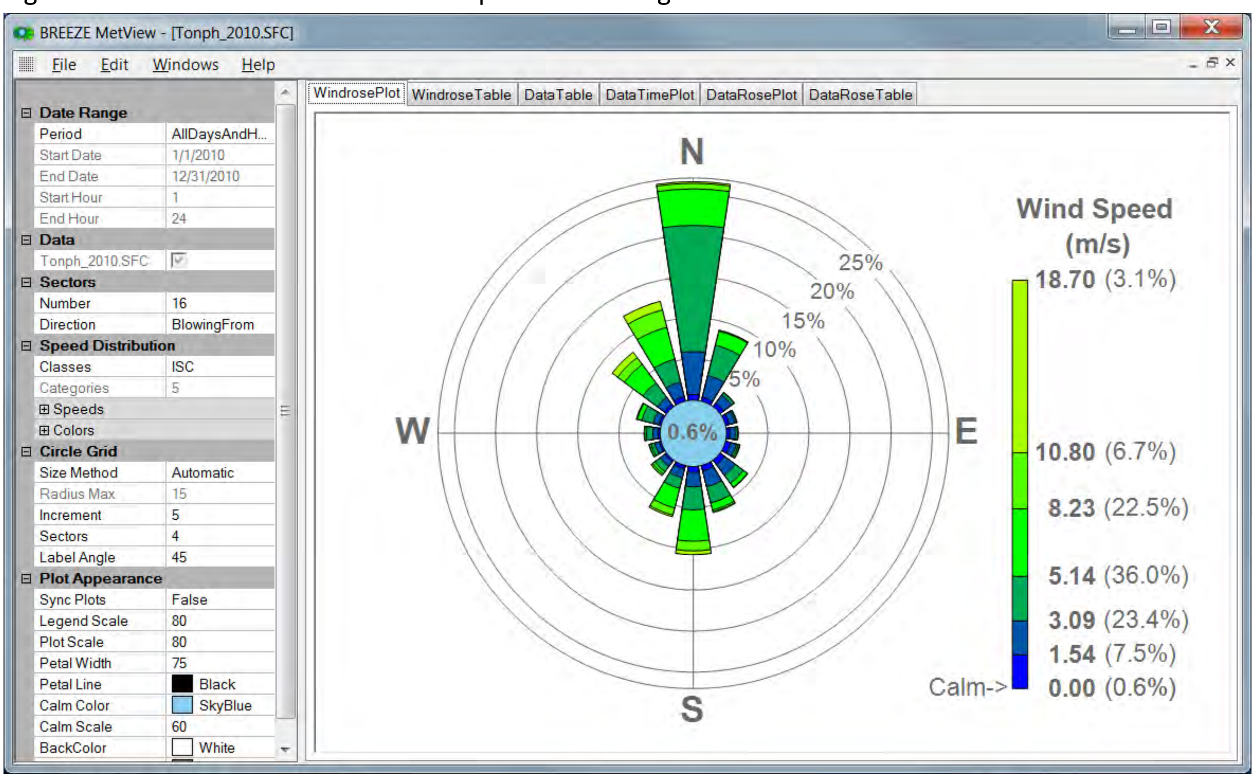
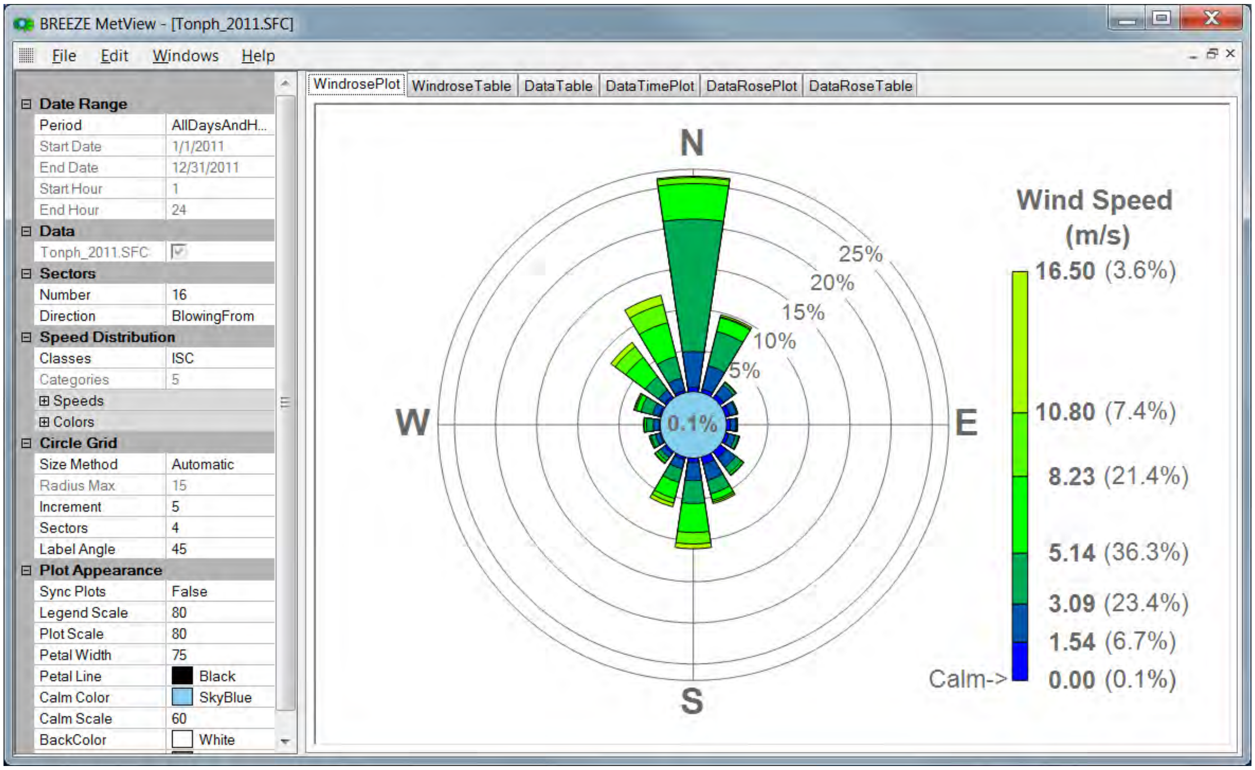


Figure 6 Wind Rose – 2011 Tonopah Meteorological Data



APPENDIX B

Facility Boundary Google Earth Image

Figure 7 Property Boundary Overlay

APPENDIX E

Electronic Modeling Files

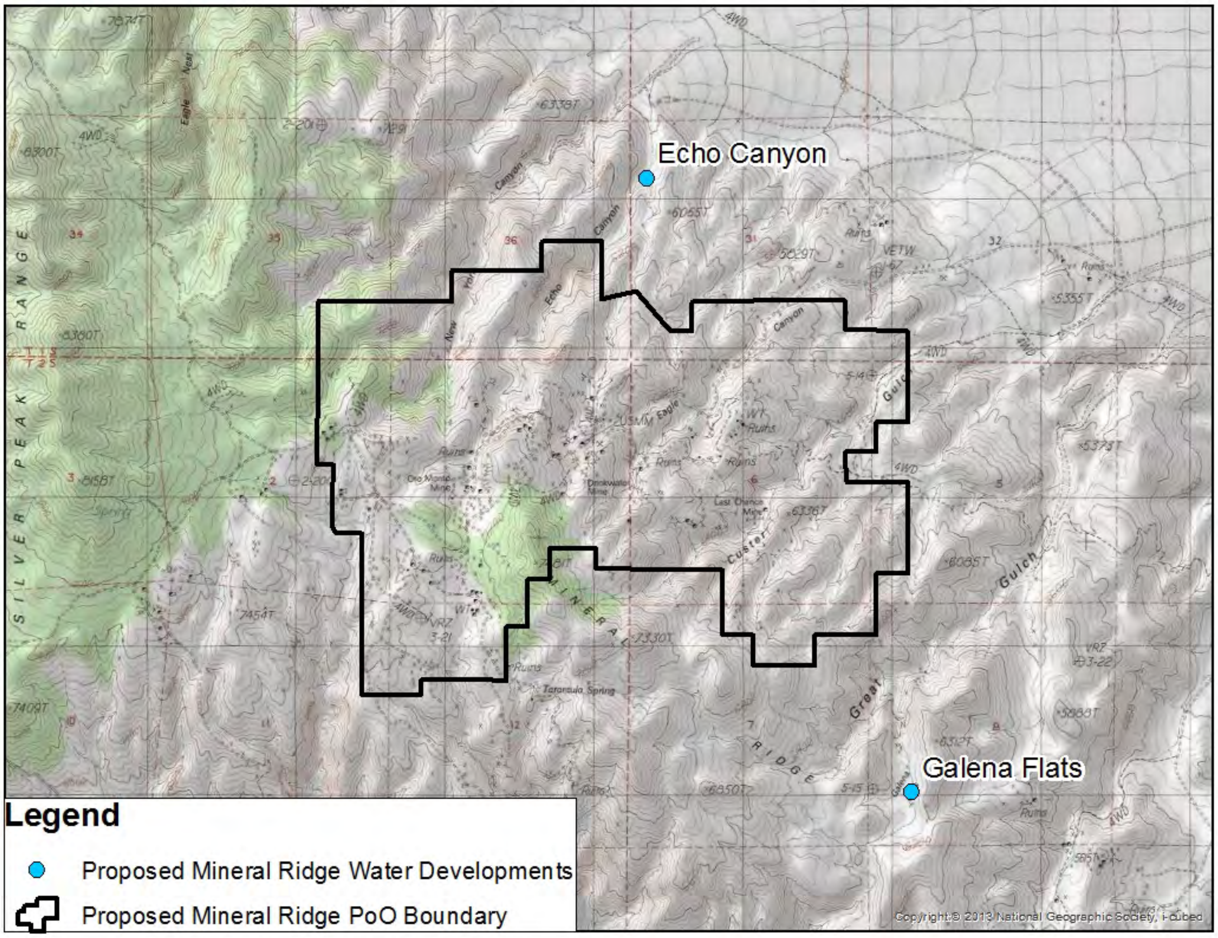
Appendix F – Mineral Ridge Water Development Evaluations

Nevada Department of Wildlife

Mineral Ridge Water Development Evaluation

Silver Peak Range

12 June 2014



Echo Canyon, 11 S E 438271 N 4185341

The Echo Canyon location is at the base of 2 drainages to the north of the Mineral Ridge Mine on lands administered by the Bureau of Land Management (BLM). This location is accessible by road, which is an important consideration for future maintenance and repair activities, as well as for hauling water during times of drought. We also observed an abundance of bighorn sheep sign on the slopes immediately to the west of the proposed location, indicating fidelity to the area. A water development in this location would be effective at providing an alternate source of water to bighorn sheep frequenting the Mineral Ridge Mine, as well as mitigating for the potential loss of water at the mine due to unforeseen circumstances (Fig. 1).

Figure 1. A diagram of the proposed layout at the Echo Canyon location.

Galena Flats, 11 S E 440048 N 4181216

The Galena Flats location is located at the head of a tributary to the Great Gulch on public land administered by the BLM (Fig. 2). A water development at this location would provide adequate habitat connectivity between Tarantula Spring and the proposed Echo Canyon water development. This location is safely accessible by all-terrain vehicle (ATV) but the road would need to be improved to allow access by full-size vehicles. The Great Gulch and surrounding topographic features provide an abundance of precipitous terrain, which is a key feature of suitable habitat for bighorn sheep, especially during the lambing season. The addition of a water source in the Galena Flat area would also extend habitat availability to the far southeast of Mineral Ridge toward Vanderbilt Peak.

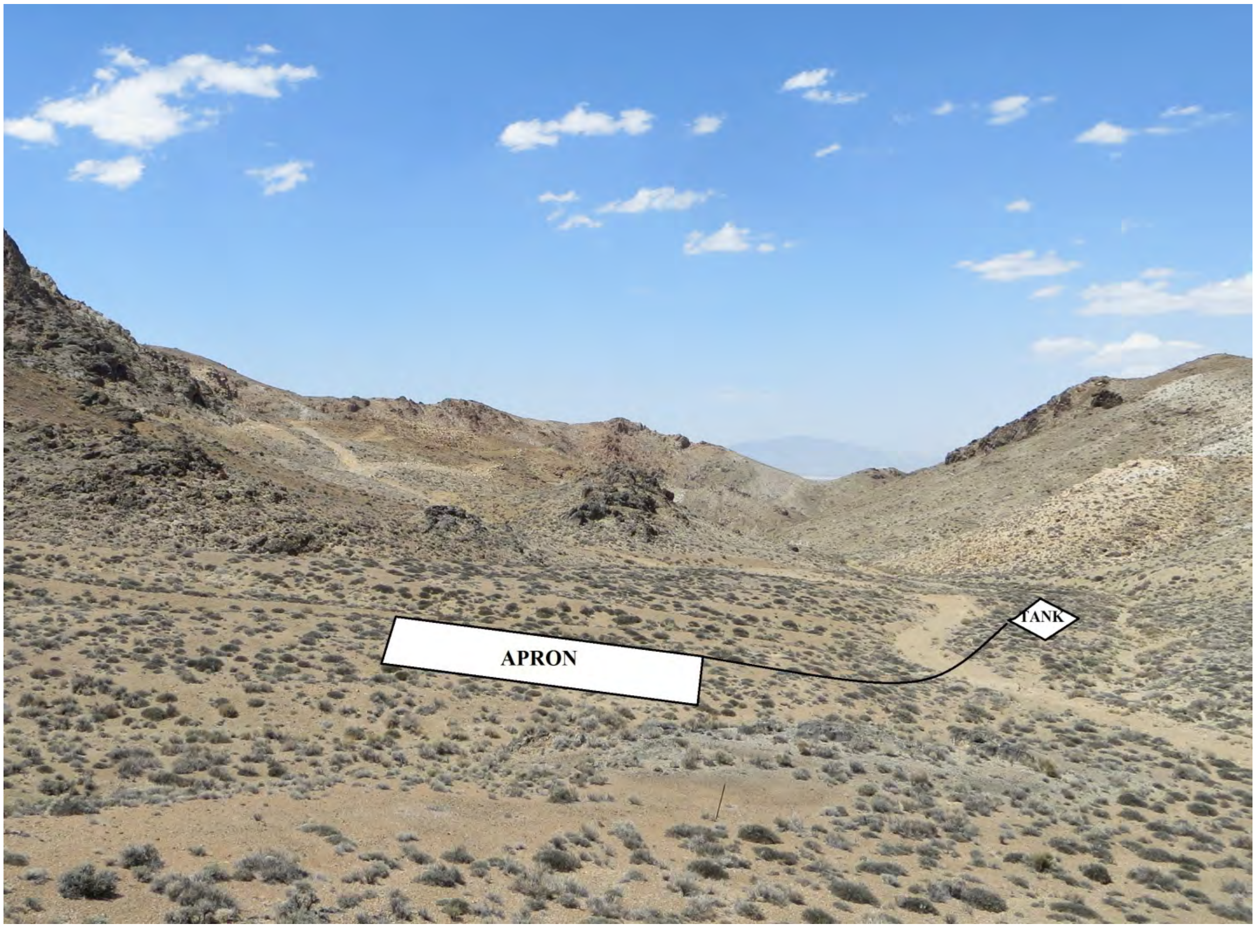


Figure 2. A diagram of the proposed layout at the Galena Flats location.

Specifications

Echo Canyon

Precipitation run-off in Echo Canyon will be captured behind a concrete and rebar dam (approximate dimensions: 10 ft. long, 6 ft. high, and 1 ft. wide; Fig. 3) placed on an exposed rock slab in a constricted section of the drainage (*hereafter*, slickrock dam). Concrete for the slickrock dam will be mixed using a portable concrete mixer powered by generator. We will also construct a 40 ft. by 40 ft. metal apron as a supplemental collection surface to the slickrock dam. The apron will be composed of steel roof decking, steel purlins, and sheet metal. Water from both the apron and slickrock dam will be transported to the storage tanks using 400 ft. of 2 in. polyethylene pipe. The polyethylene pipe will be buried, where possible, in a trench 4 in. wide and 6 in. deep.

Figure 3. A slickrock dam at a water development in the Spring Mountains of Clark County, Nevada.

Galena Flats

Precipitation at Galena Flats will be captured on a 40 ft. by 80 ft. (3200 $ft.^2$) metal apron composed of steel roof decking, steel purlins, and sheet metal (Fig. 4). Water collected on the apron will be transported to the storage tanks using 150 ft. of 2 in. polyethylene pipe. The polyethylene pipe will be buried, where possible, in a trench 4 in. wide and 6 in. deep.

Figure 4. A collection apron at a water development in the South Hiko Range of Lincoln County, Nevada.

Common Features

Each of the proposed water developments on Mineral Ridge will be capable of storing up to 9,200 gallons of water in 4 low-profile tanks (Fig. 5). Each storage tank will be of the approximate dimensions of 8.5 ft. wide, 16 ft. long, and 2.5 ft. high. Tanks will be placed successively on a dirt pad leveled with a John Deere 110 Backhoe, a generator-powered rotary hammer, and hand tools. Standard 1/2 in. to 3/4 in. plywood will be placed on the tank pad between tanks and ground to protect the tanks from rock punctures. The cumulative disturbance footprint for the tank pad will be 16 ft. x 34 ft. or 544 ft^2.

A non-permeable 4-strand wire fence may be constructed around the tanks to protect components from degradation by feral horses. The fence will consist of a smooth bottom wire at 16 in. above the ground and 3 strands of barbed wire at 22 in., 30 in., and 40 in. above the ground. The fence corners will be reinforced with 2 H-brace assemblies constructed using galvanized posts and rails. Steel t-posts will be spaced between the corner post assemblies. The dimension of the wire fence will be dictated by the tank layout.

Figure 5. The storage tanks at a water development in the Sheep Range of Clark County, Nevada.

Water will be transported $\leq$ 100 ft. from the storage tanks to the drinker in a 2 in. polyethylene pipe. The polyethylene pipe will be buried, where possible, in a trench 4 in. wide and 6 in. deep. The drinker, capable of storing up to 84 gallons of water, is the wildlife access point and is constructed to allow safe use by bighorn sheep and other wildlife (Fig. 6). The top of the drinker will be leveled to the top of the tanks, allowing for the water level in the drinker to representative of the water level in the tanks (i.e., an equilibrium or self-leveling system). The drinker will be rocked and concreted in place resulting in a disturbance footprint of approximately 6 ft. x 6 ft. or 36 ft2. Again, concrete will be mixed using portable cement mixer with generator.

Figure 6. The drinker at a water development in the Virgin Mountains of Clark County, Nevada.

A galvanized pipe-rail fence will be installed around the drinker at both water developments to prevent the potential use or degradation by feral horses. The wildlife friendly fence will measure 71 ft. by 71 ft and rail heights will be 45 in. and 24 in. above the ground (Arizona Game and Fish Department 2004). There will be 20 supporting line posts, including corner posts, each buried and concreted 2.5 ft. deep in an approximate 1 ft. by 1 ft. trench. Post-holes will be dug using a hydraulic auger and hand tools while rail installation will be accomplished with electric drill and gas-powered generator.

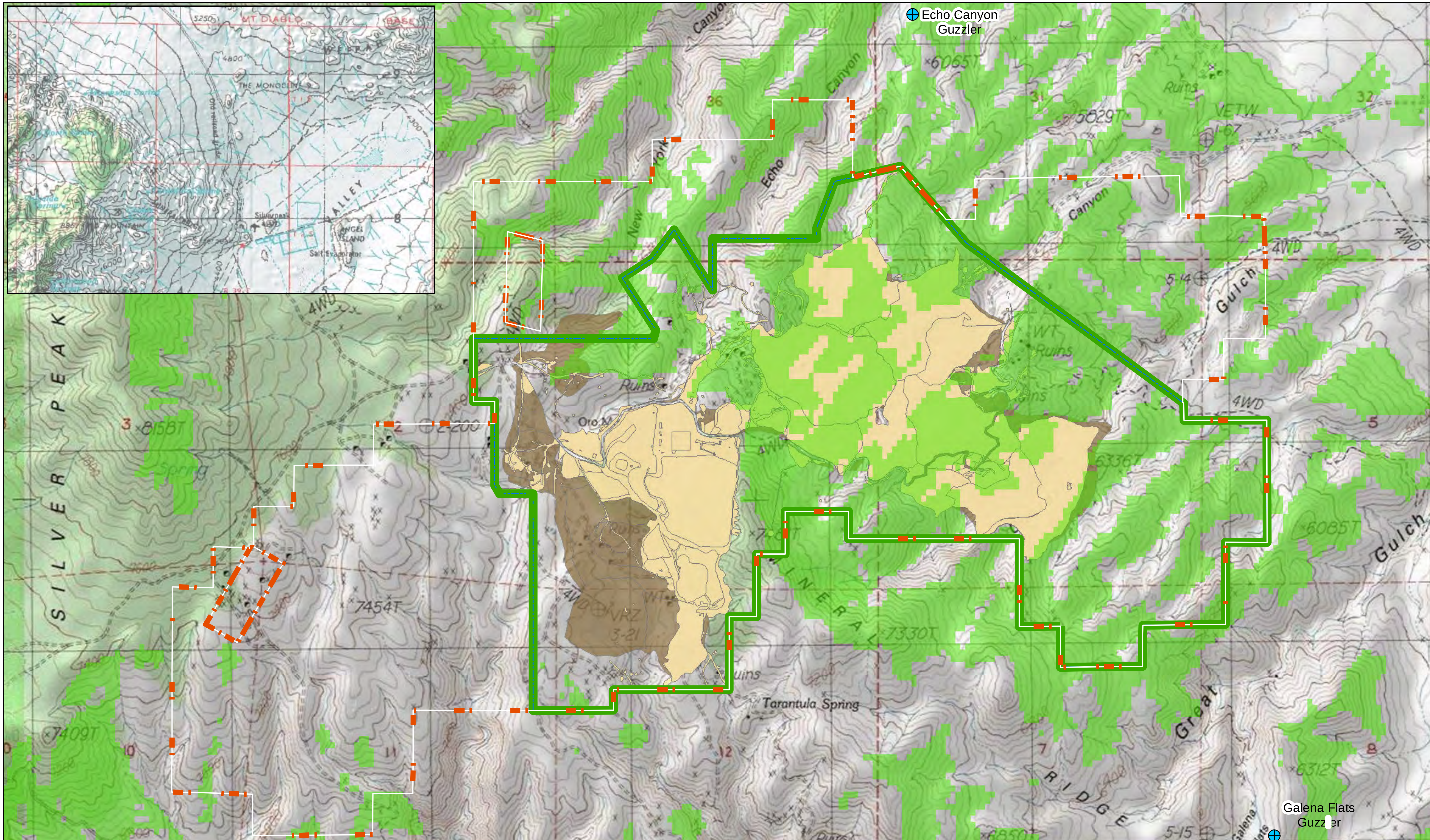
A non-permeable 4-strand wire fence may be constructed around the apron at the Galena Flats to protect components from degradation by feral horses. The fence will consist of a smooth bottom wire at 16 in. above the ground and 3 strands of barbed wire at 22 in., 30 in., and 40 in. above the ground. The fence corners will be reinforced with 2 H-brace assemblies constructed using galvanized posts and rails. Steel t-posts will be spaced approximately 10 ft. apart between the corner post assemblies. The dimension of the wire fence will be dictated by the apron layout.

The roads to each proposed water development may need to be improved in order to access the construction site. Improvement would include the removal of large boulders and debris piles, or the repair of washouts. The width of the road will not be manipulated. If the roads cannot be restored, materials will be transported to each project location via helicopter. Access by personnel will be by vehicle, ATV, or foot.

Once construction is complete, collection aprons, tanks, fencing, and piping will be camouflaged with brushes and a gas-powered paint sprayer using Sherwin-Williams A-100 Flat Latex paint using the BLM's Visual Resource Management Best Management Practices. All waste and left-over materials and supplies will be removed. The cumulative disturbance footprint of each project is not expected to exceed 4,000 ft^2 or approximately 1/10th of an acre.

Annual inspections will be conducted by Nevada Department of Wildlife (NDOW) personnel following construction of each project to ensure proper functionality and to monitor use by bighorn sheep and other wildlife. Aerial inspections will be conducted during the winter of each year, while ground inspections will occur opportunistically. Maintenance activities will be confined to the existing disturbance boundary and may include procedures such as fence repair, repainting, plumbing repair, drinker replacement, or tank repair. NDOW will notify the BLM when a major repair is necessary (e.g., complete replacement of project components).

Appendix G – Visual Assessment



N

Feet

0 1,000

EXPLANATION

- KOP Location
- Proposed Guzzler
- Authorized Plan Boundary
- Area Visible from KOP(s)
- Proposed Plan Boundary
- Existing/Authorized Disturbance
- Proposed Disturbance

srk consulting

Mineral Ridge Approximate

DESIGN: ABR | DRAWN: ABR | REVIEWED: VS

SCALE: 1 inch = 1,500 feet | DATE: 2/9/2015

FILE: 202200_370_AppD_Visual_ABR_20150209.mxd

MINERAL RIDGE MINE
MINERAL RIDGE GOLD, LLC

DRAWING TITLE: **VISIBLE AREAS**

ISSUED FOR: **Viewshed Analysis**

DRAWING NO. **Figure 1**

REVISION NO. **A**

SRK JOB NO. **202200.370**

PATH: G:\Sites\Mineral_Ridge\Scorpio_Gold\202200_370_EA_2014\202200_370_AppD_Visual_ABR_20150209.mxd