Supplier Document Status Stamp

BSC

A. Records Designator: ☐ QA: QA ☒ QA: NA
B. LSN Relevancy: ☐ LSN Relevant ☒ Not LSN Relevant
C. Privileged or Copyright Protected: ☐ Yes _____ ☒ No
D. Procurement Document No. NN-HC4-00197
E. BSC Standard Document No. V0-CY05-NHC4-00197-00026-001-004

F. SUPPLIER DOCUMENT STATUS

1. ☒ WORK MAY PROCEED.
2. ☐ REVISE AND RESUBMIT. WORK MAY PROCEED SUBJECT TO RESOLUTION OF INDICATED COMMENTS.
3. ☐ REVISE AND RESUBMIT. WORK MAY NOT PROCEED.
4. ☐ REVIEW NOT REQUIRED. WORK MAY PROCEED.
5. ☐ FOR INFORMATION ONLY.

PERMISSION TO PROCEED DOES NOT CONSTITUTE ACCEPTANCE OR APPROVAL OF DESIGN DETAILS, CALCULATIONS, ANALYSES, TEST METHODS, OR MATERIALS DEVELOPED OR SELECTED BY THE SUPPLIER AND DOES NOT RELIEVE SUPPLIER FROM FULL COMPLIANCE WITH CONTRACTUAL OBLIGATIONS.

G. REVIEW COPY													
	NVM	NE											
	bg	RAM											

H. Area Code NA System Code NA Baseline Level NA

I. DOCUMENT CATEGORY NA
(Attach 3, Attach 4, or SSRS Form as applicable)

J. William Garfield _____ 9/5/07
RESPONSIBLE ENGINEER/ANALYST (Printed Name and Signature) DATE

Title: Mineral & Energy Resource Occurrence Report Mina Rail Corridor

Supplier Document #: 21-1-20102-233

Supplier Rev.: 1

Supplier Date: 07/27/07

NVM Nevada Transportation Manager Bill Garfield
NE Nevada Engineering Kathy Mrotek

Reference #: NVT-DV-00010 |

BSC

Supplier Document Distribution

Complete only applicable items.

QA: N/A

1. Supplier/Subcontractor Name:	Purchase Order/Subcontract No. and Title:	
Shannon And Wilson	NN-HC4-00197 / Task 3.4: Preliminary Mineral and Energy Resource Assessment Report	
2. BSC Submittal No.:	Revision:	Title:
V0-CY05-NHC4-00197-00026-001	004	Mineral and Energy Resource Occurrence Report Mina Rail Corridor

Responsible Individual:	Name (Print)	Initials	Mailstop	Date	Due Date
	Garfield, W	wg	423	09/05//2007	09/14/2007

DISTRIBUTION

Discipline/Organizations	Abbrev.*	3. Name	Mailstop	4. For Review	5. After Acceptance
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H
				☐	☐ E ☐ H

6. Document transmitted contains OUO information? ☐ **Yes** ☒ **No**

*** Use these abbreviations on the Supplier Document Status stamp to indicate reviewers.**

Subcontractor:	Item Number/Title/Revision:	Submittal Date:	SRCT No.:
Shannon & Wilson, Inc.	Mineral & Energy Resource Occurrence Report – Mina Rail Corridor, Rev. 1 (Submittal No. 7.34)	27 Jul 2007	07-00028

Section I. Submittal Information (includes above information)

Submittal Description and Revision Summary for Entire Submittal:

This report documents information collected from a literature review and field reconnaissance performed for the purpose of identifying occurrences of mineral and energy resources along the proposed Mina alignment of the Nevada Rail Line for the Yucca Mountain Project.

Revision Summary:
Rev 0, 17 Apr 07: Original submittal
Rev 1, 27 Jul 07: Revised Appendix A to address copyrighted material, and corrected text to reflect Appendix revisions and typographical errors

Special Instructions:

Section II. Data File Information (Add lines below if needed for additional files. Indicate "Last item" or "End of list" after last line used.)

Filename	Rev	File Size	Description (File description and revision summary for file)	Application and Version/ Add-in or Extension and Version
_Cover 27 Jul 07.ppt	1	698 KB	Preliminary Mineral & Energy Resource Occurrence Report Front Cover	MS Power Point 2003 SP2
SW-ColourMidWidth 100.ctb	1	5 KB	Preliminary Mineral & Energy Resource Occurrence Report Cover	AutoCAD 2007
_Spines 2007.dwg	1	302 KB	Preliminary Mineral & Energy Resource Occurrence Report Cover Spine	AutoCAD 2007
Spine 1.5.jpg	1	417 KB	Preliminary Mineral & Energy Resource Occurrence Report Cover Spine	Corel PHOTO-PAINT 8.0 Image
BSC Logo.jpg	1	22 KB	Preliminary Mineral & Energy Resource Occurrence Report Cover and CD Label Image	Corel PHOTO-PAINT 8.0 Image
Jacobs LOGO.jpg	1	29 KB	Preliminary Mineral & Energy Resource Occurrence Report Spine Image	Corel PHOTO-PAINT 8.0 Image
CD Background 2007.jpg	1	1,280 KB	Preliminary Mineral & Energy Resource Occurrence Report CD Label	Corel PHOTO-PAINT 8.0 Image
_CD Labels 2007.dwg	1	619 KB	Preliminary Mineral & Energy Resource Occurrence Report CD Label	AutoCAD 2007
21-1-20102-233-R1X-Rev1.doc	1	283 KB	Preliminary Mineral & Energy Resource Occurrence Report, Title Sheet	MS Word 2003 SP2
21-1-20102-233-Change-History-M-Min-Rev1.doc	1	34 KB	Preliminary Mineral & Energy Resource Occurrence Report Change History Sheet	MS Word 2003 SP2
21-1-20102-233-Rev1.doc	1	740 KB	Preliminary Mineral & Energy Resource Occurrence Report, Main Text and Appendix Flysheets	MS Word 2003 SP2
21-1-20102-233-T1-Rev1.xls	1	68 KB	Preliminary Mineral & Energy Resource Occurrence Report, Table 1, Summary of Mineral Occurrences	MS Excel 2003 SP2
21-1-20102-233-T2-Rev1.xls	1	51 KB	Preliminary Mineral & Energy Resource Occurrence Report, Table 2, Mineral Materials Sites	MS Excel 2003 SP2
21-1-20102-233-APX A-Rev1.xls	1	605 KB	Preliminary Mineral & Energy Resource Occurrence, Appendix A, Field Data Reports	MS Excel 2003 SP2
21-1-20102-233-APX B-PHOTO LOG-Rev1.xls	1	173 KB	Preliminary Mineral & Energy Resource Occurrence Report, Appendix B, Photograph Log	MS Excel 2003 SP2

Data Definitions for Mineral and Energy Resource Occurrence Report GIS Features

Feature Class: Geothermal_Lease_sw_mina

Description: This polygon feature class represents sections flagged for Geothermal usage, according to the BLM LR 2000 database.

Purpose: Highlight proximity of geothermal leases to the Mina alignment.

Revision History: No Changes.

Number of records: 228

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon
Serial_No	Text	Serial number from LR2000 database.
Case	Text	Case type from LR2000 database.
Status	Text	Case status from LR2000 database.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: Mineral_Land_Status_sw_mina

Description: Polygon featureclass showing Mineral Claim Land Status in the Mina Corridor. Data was produced from records retrieved from BLM's LR2000 database.

Purpose: Identify current and future mineral claims

Revision History: No Changes.

Number of records: 101

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
SERIAL_NUM	Text	Serial number from LR 2000 database.
Type	Text	Authorized and Pending Status – Notice or Plan.
Action	Text	Level of action on claim, from LR 2000 database.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: Mineral_Material_Sales_sw_mina

Description: Polygon Featureclass showing Mineral Material Sites in the Mina Corridor. Data was produced from records retrieved from BLM's LR2000 database and compiled from NDOT pit locations.

Purpose: Identify mineral material sales

Revision History: No Changes.

Number of records: 248

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
Serial_No	Text	Serial number from LR 2000 database.
Case	Text	Case type from LR 2000 database.
Status	Text	Case status from LR2000 database.
Propietor	Text	Ownership. (Designated as "NDOT" or "other").
NDOTID	Text	NDOT name, if applicable.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: Mining_Districts_sw_mina

Description: Polygon Featureclass showing Mining Districts in Mina Corridor

Purpose: To identify mining districts in the Mina Corridor

Revision History: No Changes.

Number of records: 45

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Point.
Name	Text	Mining district name
Type	Text	Type of mining – metallic or non-metallic
Commoditie	Text	Commodities mined in the district
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: OilGas_Lease_sw_mina

Description: Polygon Featureclass showing Oil and Gas leases in the Mina Corridor. Data was produced from records retrieved from BLM's LR2000 database.

Purpose: To identify Oil and Gas Leases in the Mina Corridor

Revision History: No Changes.

Number of records: 101

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Point.
Serial_No	Text	Serial number from LSR2000 database
Case	Text	Case type from LSR2000 database
Status	Text	Case status from LSR2000 database
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: Potassium_Prospecting_Permit_sw_mina

Description: Polygon Featureclass showing Potassium Prospecting Permits in the Mina Corridor. Data was produced from records retrieved from BLM's LR2000 database.

Purpose: To identify potassium prospecting claims in the Mina corridor

Revision History: No Changes.

Number of records: 31

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon
Serial_No	Text	Serial number from LSR2000 database
Case	Text	Case type from LSR2000 database
Status	Text	Case status from LSR2000 database
SHAPE_Area	Double	Area of feature in feet generated by software.
SHAPE_Length	Double	Length of feature in feet generated by software.

Feature Class: Sodium_Prospecting_Permit_sw_mina

Description: Polygon Featureclass showing Sodium Prospecting Permits in the Mina Corridor. Data was produced from records retrieved from BLM's LR2000 database.

Purpose: To identify sodium prospecting claims in the Mina corridor.

Revision History: No Changes.

Number of records: 12

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon
Serial_No	Text	Serial number from LSR2000 database.
Case	Text	Case type from LSR2000 database.
Status	Text	Case status from LSR2000 database.
SHAPE_Area	Double	Area of feature in feet generated by software.
SHAPE_Length	Double	Length of feature in feet generated by software.

Feature Class: Mineral_Waypoints_sw_mina

Description: Shannon & Wilson, Inc. field team reconnaissance waypoints along Mina corridor for Mineral Report

Purpose:

Revision History: No Changes.

Number of records: 61

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Point.
WaypointID	Text	Waypoint ID.

Feature Class: Buffer_of_mina022307_SW_10

Description: This polygon feature class represents a 10 mile buffer of the alignment file "mina022307.shp" provided by BSC.

Purpose: To identify limits of project area.

Revision History: No Changes.

Number of records: 1

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
BufferDist	Double	Distance, in miles, of buffer based on mina022307.shp.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: title_block_250k_sw_mina

Description: This polygon feature class is for drafting presentation purposes only. This feature is associated with the production of Shannon & Wilson, Inc. plates only. It contains no data associated with study of this report.

Purpose: For presentation purposes only. The feature allows areas to be masked at a 250k scale to clearly represent the title block area.

Revision History: No Changes.

Number of records: 1

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: Mining_Claims_sw_mina

Description: This polygon feature class represents active mining claims in the Mina Corridor. Mining Claim data obtained from BLM Land & Mineral Records System: http://www.blm.gov/lr2000 in March, 2007.

Purpose: Show active mining claims in MRC.

Revision History: No Changes.

Number of records: 1813

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
SHAPE_Length	Double	Length of feature in feet generated by software.
SHAPE_Area	Double	Area of feature in feet generated by software.

Feature Class: OilGas_Occurrences_sw_mina

Description: This polygon feature class represents oil/gas occurrences in the Mina Corridor. Oil/Gas Occurrences data obtained from Nevada Oil and Gas Well Database Map (NBMG Open-File Report 01-7), http://www.nbmg.unr.edu/lists/oil/oil.htm in January, 2007.

Purpose: Show Oil and Gas occurrences by type and activity in the MRC.

Revision History: No Changes.

Number of records: 742

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
OPERATOR	Text	Well owner/operator.
WELL	Text	Well name/identification.
PLOT	Text	Well type.

Feature Class: Geothermal_Occurrences_sw_mina

Description: This polygon feature class represents geothermal occurrences in the Mina Corridor. Geothermal Occurrences data obtained from Geothermal Resources of Nevada interactive map (simplified version of NBMG Map 141, Nevada Geothermal Resources), http://www.nbmg.unr.edu/geothermal/gthome.htm in April, 2007.

Purpose: Show geothermal occurrences by type and activity in the MRC.

Revision History: No Changes.

Number of records: 200

Field Name	Data Type	Description of field
OBJECTID	Object ID	Unique identifier generated by the software. This identifier will act as a primary key.
SHAPE	Geometry	Polygon.
well_type	Text	Well type.
name	Text	Well name/identification, if applicable.

Mineral and Energy Resource Occurrence Report Mina Rail Corridor

SRCT:
07-00028

Task 3.3a: Preliminary Mineral and Energy Resource Assessment Report (Submittal No. 7.34)

Rev. 1

Prepared by:

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

In Association With:

JACOBS

Ninyo & Moore

Prepared for:

BECHTEL SAIC COMPANY, LLC

Nevada Rail Corridor
Yucca Mountain Project
Geotechnical Analysis
NN-HC4-00197

July 27, 2007

Preliminary Mineral and Energy Resource Occurrence Report
Rev. 1
Mina Rail Corridor
Yucca Mountain Project, Nevada

Subcontract No. NN-HC4-00197

27 July 2007

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

At Shannon & Wilson, our mission is to be a progressive, well-managed professional consulting firm in the fields of engineering and applied earth sciences. Our goal is to perform our services with the highest degree of professionalism with due consideration to the best interests of the public, our clients, and our employees.

Submitted To:
Bechtel SAIC Company
1180 Town Center Drive
Las Vegas, Nevada 89144

By:
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, Washington 98103

21-1-20102-233

Prepared using MS-WORD 2003

CHANGE HISTORY

Revision Number	Date	Description of Change
00	17 April 2007	Initial Issue
01	27 July 2007	Revised Appendix A and corrected text to reflect Appendix revisions and typographical errors

TABLE OF CONTENTS

Page

ACRONYMS AND ABBREVIATIONS iv

1.0 INTRODUCTION 1
- 1.1 Project Description 1
- 1.2 Purpose 2
- 1.3 Scope 2
- 1.4 Acknowledgements 4
- 1.5 Authorization 4

2.0 LITERATURE AND DATA REVIEW 5
- 2.1 Existing Data Analysis and Compilation 5
- 2.2 Land Status 7
  - 2.2.1 Mining Claims 9
  - 2.2.2 Mineral Leases 10
  - 2.2.3 Mineral Material Sites 11
  - 2.2.4 Land and Mineral Use Records 12

3.0 FIELD RECONNAISSANCE 14

4.0 REGIONAL GEOLOGY AND TECTONIC SETTING 15

5.0 KNOWN MINERAL AND ENERGY RESOURCE OCCURRENCES ALONG THE MINA RAIL CORRIDOR 15
- 5.1 Desert Mountains 16
- 5.2 Wabuska Marsh 18
- 5.3 Holy Cross 19
- 5.4 Benway 21
- 5.5 Yerington 23
- 5.6 Red Ridge 26
- 5.7 Calico Hills 28
- 5.8 Mountain View 29
- 5.9 Double Springs Marsh 32
- 5.10 Buckley 34
- 5.11 Mount Grant 36
- 5.12 Fitting 39
- 5.13 Santa Fe 41
- 5.14 Pamlico 47
- 5.15 Garfield 49
- 5.16 Ashby 51

Page

5.17 Pilot Mountains 54
5.18 Crow Springs 57
5.19 Silver Star 58
5.20 Sodaville 60
5.21 Rhodes Marsh 61
5.22 Candelaria 63
5.23 Gilbert 67
5.24 Tonopah 70
5.25 Rock Hill 74
5.26 Columbus Marsh 77
5.27 Coaldale 78
5.28 Lone Mountain 80
5.29 Divide 83
5.30 Weepah 86
5.31 Klondyke 87
5.32 Fish Lake Marsh 88
5.33 Alum 89
5.34 Alkali Spring Valley 90
5.35 Silver Peak 91
5.36 Red Mountain 94
5.37 Silver Peak Marsh 96
5.38 Montezuma 98
5.39 Goldfield 102
5.40 Railroad Springs 110
5.41 Cuprite 112
5.42 Stonewall 114
5.43 Lida 116
5.44 Gold Point 117
5.45 Wagner 119
5.46 Mineral Material Resources 120
5.47 Oil and Gas Occurrences 122
5.47.1 Big Smoky Valley Leasing and Exploration 123
5.47.2 Mason Valley Leasing and Exploration 124
5.47.3 Existing Authorized Oil and Gas Leases 125
5.47.4 Past Oil and Gas Leasing Activity 125
5.48 Coal Occurrence 126
5.49 Geothermal Resource Occurrences 127
5.49.1 Wabuska Marsh District – Wabuska Hot Springs 127
5.49.2 Silver Peak Marsh District – Pearl Hot Springs 128
5.49.3 Silver Peak Marsh District – Silver Peak Hot Springs 128

Page

5.49.4 Alkali Spring Valley District – Alkali Hot Springs....129
5.49.5 Hawthorne Area – Warm Wells....129
5.49.6 Soda Spring Valley – Warm Springs....130
5.49.7 Alum District – Warm Wells....130
5.49.8 Warm Wells North of Columbus Marsh....130

6.0 CONCLUSIONS....131

7.0 LIMITATIONS....133

REFERENCES....135

LIST OF TABLES

Table No.

1 Summary of Mineral Occurrences
2 Mineral Material Sites

LIST OF PLATES

Plate No.

1 Project Alignment and Land Jurisdiction
2 Mining Districts and Mining Claims
3 Energy Resource Occurrences and Leases
4 Mineral Material Sites and Industrial Mineral Prospecting Permits

LIST OF APPENDICES

Appendix

A Field Data Summaries
B Photographs from Field Reconnaissance (on CD)

ACRONYMS AND ABBREVIATIONS

A	insufficient evidence for certainty rating (as relates to mineral potential)
AASHTO	American Association of State Highway and Transportation Officials
Ag	silver
ANSI	American National Standards Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
As	arsenic
ASTM	American Society for Testing and Materials
Au	gold
AWWA	American Water Works Association
B	low certainty rating (as relates to mineral potential)
Ba	barium
BAH	Booz, Allen, Hamilton
BBE	Busted Butte East
BCFG	billion cubic feet of gas
Be	beryllium
BGRR	Bullfrog Goldfield Railroad
Bi	bismuth
BLM	U.S. Bureau of Land Management
BMPs	Best Management Practices
BNSF	Burlington Northern Santa Fe Railway Company
BSC	Bechtel SAIC Company, LLC
C	moderate certainty rating (as relates to mineral potential)
CAPP	Chemical Accident Prevention Program
Cd	cadmium
CFR	Code of Federal Regulations
cm	centimeter
Co	cobalt
CPT	cone penetrometer test
Cr	chromium
CRC	Caliente Rail Corridor
CS	common segment
Cu	copper
D	high certainty rating (as relates to mineral potential)
DCM	Design Criteria Manual
deg C	Degree Celcius
deg F	Degree Farenheit
DEIS	Draft Environmental Impact Statement
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy

ACRONYMS AND ABBREVIATIONS (cont.)

E.	East
EIS	Environmental Impact Statement
EOR	engineer of record
EPA	U.S. Environmental Protection Agency
EWDP	Early Warning Drilling Program
F	fluorine
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FOB	free on board
FR	Federal Register
FRA	Federal Railroad Administration
FY	fiscal year
GCMC	Goldfield Consolidated Mines Company
G-DCM	Geotechnical Design Criteria Manual
GF3	Goldfield 3 Route
GIS	Geographic Information System
gpm	gallons per minute
GPS	global positioning system
GROA	Geologic Repository Operations Area
g/t	grams per ton
H	high mineral potential
HASP	Health and Safety Plan
Hg	mercury
HSA	hollow-stem auger
H:V	horizontal to vertical
HSU	hydrostratigraphic units
IDW	investigation-derived waste
in/sec	inches per second
ISRM	International Society of Rock Mechanics
Jacobs	Jacobs Engineering, Inc.
K	potassium
KGRA	known geothermal resource area
km	kilometer
L	low mineral potential
LR2000	Legacy Rehost 2000, a BLM land and minerals records system
LV&TRR	Las Vegas and Tonopah Railroad
M	moderate mineral potential
Ma	million years old or million years ago or million years before present
MGR	Managed Geologic Repository
MILS	mineral property location database, compiled by the U.S. Bureau of Mines
mm	millimeter

ACRONYMS AND ABBREVIATIONS (cont.)

mm/sec	millimeters per second
mm/yr	millimeters per year
MMBO	million barrels of oil
Mn	manganese
MnO	manganese oxide
Mo	molybdenum
M&O	Maintenance and Operation
mph	miles per hour
MPR	Mineral Potential Report
MRC	Mina Rail Corridor
MRDI	Mineral Resource Development, Inc.
MRDS	mineral resource dataset, compiled by U.S. Geological Survey
MS	mineral survey
MSE	mechanically stabilized earth
MVGI	Metallic Ventures Gold, Inc.
MW	megawatt
N.	North
N&M	Ninyo & Moore, Inc.
Na	sodium
NAC	Nevada Administrative Code
NBMG	Nevada Bureau of Mines and Geology
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NEPA	National Environmental Policy Act
Ni	nickel
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRL	Nevada Rail Line
NRP	Nevada Rail Partners
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range (formerly Nellis Air Force Base and Testing Range)
NVT	Nevada Transportation
NWRPO	Nuclear Waste Repository Project Office
O	no mineral potential
OCRWM	Office of Civilian Radioactive Waste Management
O.D.	outside diameter
opt	ounces per ton
oz	ounce, specifically troy ounce in this report
oz/t	ounces per ton
P	phosphorous

ACRONYMS AND ABBREVIATIONS (cont.)

Pb	lead
PGA	peak ground acceleration
PGR	Preliminary Geotechnical Report
PM	particulate matter
POC	Point-of-Contact
ppb	parts per billion
ppm	parts per million
PSHA	probabilistic seismic hazard analysis
psi	pounds per square inch
PV	prefabricated vertical
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
R.	Range
RA DEIS	Rail Alignment Draft Environmental Impact Statement
RFI	Request for Information
RFP	Request for Proposal
ROD	Record of Decision
ROE	right-of-entry
ROW	right-of-way
RQD	Rock Quality Designation
Rs.	Ranges
RSS	reinforced soil slopes
S.	South
S&W	Shannon & Wilson, Inc.
Sb	antimony
Sc	scandium
SCS	Soil Conservation Service
Se	selenium
sec.	section
secs.	sections
SFRS	steel fiber-reinforced shotcrete
SI	International System of Units
Sm	samarium
Sn	tin
SPT	Standard Penetration Test
Sr	strontium
SR	State Route
SSURGO	Soil Survey Geographic Database
T&TRR	Tonopah and Tidewater Railroad
TBM	Tunnel Boring Machine

ACRONYMS AND ABBREVIATIONS (cont.)

T.	Township
Tl	thallium
tpd	tons per day
Tps.	Townships
tpy	tons per year
tsf	tons per square foot
U	uranium
UPRR	Union Pacific Railroad Company
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USBM	U.S. Bureau of Mines
USBR	U.S. Bureau of Reclamation
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
V	vanadium
W	tungsten
W.	West
WPCP	Water Pollution Control Permit
WSA	Wilderness Study Area
wt%	weight percent
YMP	Yucca Mountain Project
Zn	zinc

PRELIMINARY MINERAL AND ENERGY RESOURCE OCCURRENCE REPORT

MINA RAIL CORRIDOR YUCCA MOUNTAIN PROJECT, NEVADA

1.0 INTRODUCTION

This report summarizes the results of an investigation to identify areas of potential conflict between occurrences of known mineral and energy resources and a corridor for a possible rail line to a proposed repository at Yucca Mountain.

1.1 Project Description

The U.S. Department of Energy (DOE) is studying two corridors in Nevada for possible construction of a rail line to transport spent nuclear fuel and high-level radioactive waste to a proposed repository at Yucca Mountain, Nevada. The corridors, both 0.25 mile-wide, are referred to as the Caliente and Mina corridors. DOE may eventually select one alignment within one of these corridors for the rail line. This report identifies and examines known mineral conflicts for the Mina corridor.

The Mina Rail Corridor (MRC) originates at the terminus of the Union Pacific Railroad (UPRR) at the Fort Churchill siding near Wabuska, Nevada (Plate 1). From that point the corridor extends southeastward along various alternate alignments until it intersects with the Caliente Rail Corridor (CRC) either along the Caliente Alternative Alignment GF4 at CRC Station 42710+00 or along Caliente Common Segment CS4 at CRC Station 14146+54. From these intersections, the segment, common to both the Caliente corridor and the Mina corridor, would continue southeastward where it would terminate at Yucca Mountain near the southwest corner of the Nevada Test Site (NTS). Geotechnical and other studies of the segment common to both the Caliente corridor and the Mina corridor have already been completed and are contained in several reports, as referenced in subsequent sections.

1.2 Purpose

This report provides preliminary information to the Nevada Rail Line (NRL) conceptual designers for evaluating whether known mineral and energy resource occurrences would likely constitute a potential conflict with alignment selection and construction. For this report, a mineral "occurrence" refers to any known mineral and energy resource occurrence, mining district, deposit, or known existence of such. The occurrence of a mineral resource does not necessarily imply that the mineral can be economically exploited or that it is likely to be developed. The study area where we reviewed known mineral and energy resources consisted of the lands within 10 miles of the proposed MRC alignment.

This report does not address mineral and energy resource potential; that is, the likelihood for the occurrence of undiscovered mineral deposits along the corridor.

1.3 Scope

The scope of work for this preliminary investigation consisted of studying known mineral and energy resource occurrences, crossed, adjacent to, or in the vicinity of the MRC. The various alignments under consideration are presented on Plate 1.

This investigation included reviewing, analyzing, and compiling known mineral and energy resource occurrences, mining districts, and areas of recent mineral or energy resource interest and activity along the MRC; conducting an initial field reconnaissance of these identified areas; and preparing this report summarizing results of this investigation. Mineral and energy occurrences were classified according to whether they would likely present a low, medium, or high potential conflict to the MRC.

In the remainder of this report, the term "mineral occurrence" includes occurrences of energy resources (coal, geothermal, gas, oil, and uranium).

The following work was performed:

1. We obtained, reviewed, analyzed, and compiled readily available mineral and energy resource land status and occurrence data into a Geographic Information System (GIS) database, which was subsequently plotted on maps (Plates 2, 3, and 4).

2. We interviewed knowledgeable persons at state and federal agencies and industry professionals with respect to available data and specific properties.

3. We conducted a field reconnaissance of known accessible mineral occurrences, mining districts, and areas of known recent mining activity to generally verify office research; to fill in data gaps; to clarify inconsistencies in the data; to update potentially outdated information; and to evaluate historical, existing, and new areas of mineral interest, exploration, and development activity levels. This information is summarized in the report and on the *field data* sheets.

4. We classified each of the mineral occurrences with respect to whether they would likely present a low, medium, or high potential to conflict with construction of the MRC.

5. We prepared this report with an accompanying plates and tables indicating locations of identified mineral occurrences, mining districts, and areas of recent mining activity or interests.

A conflict between a mineral occurrence and the MRC is created when a mineral occurrence is close enough to the alignment such that construction of the MRC would interfere with the development or exploration of the occurrence. This report classifies the mineral occurrences as potentially creating a low, moderate, or high conflict with construction of the MRC based on various factors. These factors include, but are not limited to, the level of current and past mineral exploration and development activity, reported mineral discoveries, existing rights to the occurrences, and the geology of the area in the vicinity of the mineral occurrence and proximity of the occurrence to the alignment.

The study area for this report includes some areas (mining districts) that were previously included in the study area of the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). These areas were re-evaluated as part of this study for the following reasons:

- The MRC alignment traverses different lands than the CRC alignment. These different areas may contain mineral resources that were not previously discussed as they were distant from the CRC.
- New mineral exploration activity, claim staking and mineral leasing near the MRC has occurred since the CRC reports were completed.

Additional descriptions of mineral occurrences have been added to the description of mining districts where occurrences are in the vicinity of the MRC alignment. In addition, brief

discussions of recent mineral exploration activity and claim staking have been added where appropriate. Where new information has been added to the description of mining districts that were described in both this report and previous reports, we added text that indicates this in the mining district description.

The conflicts identified in this report are based on our evaluation of readily available information, existing concepts of geologic processes, current economic conditions, and records of existing mineral and energy (encumbrances). With the passage of time, additional information may become available, economic conditions may change, and technologies may become available such that areas now ranked as having a low conflict could be ranked at a later time as having a high conflict. The converse is also possible.

1.4 Acknowledgements

This report was prepared by Shannon & Wilson, Inc. (S&W). Paul Godlewski (Project Manager) provided oversight for the work. George Lightwood (Task Manager) managed the field reconnaissance and report preparation. The reconnaissance along portions of the study area was performed by Art Geldon, George Lightwood, Bill Laprade, Scott Shimel, Paul Zehfuss, and Nell Beedle. Data review and report preparation was primarily accomplished by George Lightwood, Art Geldon, Matt Grizzell, and Garrett Bayrd. George Lightwood, assisted by Garrett Bayrd, performed the land status research. Dex McCulloch (Principal-in-Charge) and Paul Godlewski reviewed this report.

1.5 Authorization

This work was performed in general accordance with Yucca Mountain Project (YMP) Technical Services contract No. NN-HC4-00197, Nevada Rail Corridor Geotechnical Analysis. The Mina Corridor studies were authorized by Subcontract Modification 17, effective 15 August 2006. This document was prepared under Work Item 3.3a of the contract and this version is submittal number 7.34.

2.0 LITERATURE AND DATA REVIEW

2.1 Existing Data Analysis and Compilation

Background data obtained and reviewed for this investigation included locations and descriptions of mineral and energy occurrences, deposits, mining districts, historical mining activities, and geologic information. A majority of these data were obtained from a combination of published data (maps, open file reports, professional papers, bulletins, and reports) and personal communications with industry professionals and knowledgeable government agency personnel familiar with mineral exploration or development activities on public and private lands.

Background and historical data in the form of publications were primarily obtained from the following sources:

- Nevada Bureau of Mines and Geology (NBMG) geologic maps of the state, as well as for Lyon, Mineral, and Esmeralda Counties
- U.S. Geological Survey (USGS) bulletins, open-file reports, and professional papers
- NBMG survey maps, bulletins, open-file reports, and professional papers

In 1998, the USGS published a database that identified the largest known deposits of gold, silver, copper, lead, and zinc in the United States (Long et al., 1998). Part of the National Mineral Resource Assessment, this database lists 1,117 entries that account for approximately 99 percent of domestic production of the above-listed metals. Sixteen of the entries occur in 10 mining districts within 10 miles of the MRC.

Since 1960, NBMG has published considerable material pertaining to mining and energy resources in Nevada. Reports by Tingley and Smith (1983), Tingley (1990, 1998), and Tingley et al. (1998) provide summary information about Nevada's mining districts. A book, "Minerals of Nevada," by Castor and Ferdock (2004), provides a comprehensive discussion of Nevada's minerals and the places where they can be found, preceded by brief summaries of subjects related to mining and minerals in Nevada. Since 1997, the NBMG has published a series of reports annually about Nevada's mineral industry. These reports, including NBMG (2004, 2005) and (Driesner and Coyner, 2006), present annual production figures since 1974 for gold, silver, copper, barite, aggregate (sand and gravel), petroleum (oil and gas), and geothermal energy. Activities since the previous year in the metal, precious metal, industrial minerals, petroleum, and geothermal energy sectors are discussed briefly by county and mining district; directories of

mining and milling operations; and statewide distributions of mining claims are also provided. Recent information about mining and mineral exploration activities was obtained from the internet web sites of various mining companies identified as conducting these activities within or near the study area.

In 2004, previous reports about petroleum resources culminated in release of a statewide database for oil and gas resources, NVOILWEL (Hess, 2004). Similarly, in 2005, previous statewide reports about geothermal energy occurrences culminated in release of an online, statewide interactive map by Shevenall and Garside (2005) about the subject. Reports discussing statewide occurrences of specific minerals have been published for titanium (Beal, 1963), turquoise (Morrissey, 1968), montmorillonite and other clays (Papke, 1970), evaporites and brines (Papke, 1976), fluorspar (Papke, 1979), molybdenite (Schilling, 1980), lead (Jones, 1983), barite (Papke, 1984), zinc (Jones, 1984), tungsten (Stager and Tingley, 1988), porphyry copper (Wendt and Albino, 1992), industrial minerals (Papke and Castor, 2003), gold and silver (Davis and Tingley, 2005), and other minerals.

Most of the above-cited mineral and energy sources were used by S&W (2005) to prepare reports for DOE's evaluation of the Caliente rail corridor to Yucca Mountain. A mineral and energy occurrence report, similar to this one, identifies and discusses mineral and energy resources within 12 miles of the CRC.

There is less published data for industrial minerals, sand and gravel, and stone/decorative rock occurrences because these types of operations typically are driven by periods of construction activity and, therefore, are cyclic. Existing publications generally contained more information about the larger metallic mineral occurrences, (e.g., large, producing or previously producing mines). Therefore, industrial minerals, sand and gravel, and stone/decorative rock occurrences are likely underrepresented in published data.

Knowledgeable persons at state, local, and federal agencies were interviewed to generally confirm that known sources of geologic and mineral and energy occurrence data have been obtained, to discuss specific mineral/mining properties/sites that they may be familiar with because of previous work/experience, and to obtain information regarding where recent mineral exploration work was/is being conducted. Mining industry professionals were also interviewed

to provide additional information not found in publications and databases about current local mineral exploration or resource development.

Information from personnel interviews were summarized on field data sheets (Appendix A) for the respective mineral occurrence. In general, the interview Data Sheets include information regarding who was interviewed, where they worked, their position, and a summary of relevant information provided by the interviewee.

Various GIS databases were obtained from the U.S. Bureau of Land Management (BLM), NBMG, USGS, Bechtel SAIC Company, LLC (BSC), and S&W. The relevant information obtained from these databases used for this investigation included the following:

- Mina Rail Corridor and additional alternate alignments, herein referred to as the MRC
- Topographic base map
- Boundaries of the Nevada Test and Training Range (formerly Nellis Air Force Base and Testing Range) (NTTR) and the Nevada Test Site (NTS)
- Boundaries of Wilderness Study Areas (WSAs)
- Township, range, and sections
- Boundaries of Nevada counties
- Locations of towns and cities
- Transportation infrastructure
- Locations of known spring complexes, hot springs, and warm springs
- Land ownership information (private and public lands)
- Locations, delineations, and names of mining districts as defined by NBMG Report 47
- Locations of public lands containing mining claims
- Location of public land containing oil, gas, and geothermal leases and sodium and potassium prospecting permits
- Locations of public lands containing mineral material sites

2.2 Land Status

Land status for the areas within and along the MRC generally includes the following:

- Private properties, such as those owned by ranchers or private residences and patented mining claims
- Lands administered by the BLM
- WSA including the Gabbs Valley Range WSA
- U.S. Department of Defense (DOD) lands, including the NTTR and the Hawthorne Naval Ammunitions Depot
- Tribal and allotted lands within the Walker River Indian Reservation

Most of the lands in the study area are administered by the BLM. These lands are open to claim staking and mineral leasing where they have not been withdrawn or segregated from application of the mining laws and mineral leasing. The Department of Energy has filed an application with BLM requesting the Secretary of Interior to withdraw lands, including the MRC, from surface entry and mining through 27 December 2015. On 10 January 2007, a notice was published in the Federal Register (72 FR 135) that segregates lands encompassed within a 1-mile-wide corridor from surface entry and mining for up to two years, while various studies and analyses are made to support a final decision on the withdrawal application.

Permission to remove common variety minerals such as sand and gravel and stone used for construction aggregate from BLM administered land may be obtained by individuals, private corporations and federal, state, and local government agencies through free use permits, contract sales, and dedicated materials rights-of-way.

Lands within the Walker River Indian Reservation and those lands administered by the DOD and within the Gabbs Valley Range WSA have been withdrawn from the mining and mineral leasing laws. Authorization to explore for and develop minerals on the Walker River Indian Reservation would come from the Walker River Paiute Tribe. There are active mining claims within the Walker River Indian Reservation and Gabbs Valley Range WSA that were staked prior to withdrawal of those lands from the mining laws.

Other areas that are closed to mineral leasing and claim staking on lands administered by the BLM are described in Resource Management Plans for the various BLM districts that include the study area. BLM lands contained within Lyon and Mineral counties are administered by the BLM's Carson City District, and BLM lands contained within Esmeralda and Nye counties are administered by the BLM's Tonopah Field Station of Battle Mountain District.

2.2.1 Mining Claims

Mining claims are staked to acquire locatable minerals under the Mining Law of 1872. A mineral is "locatable" under the Mining Law of 1872 if it meets certain requirements and was not specifically removed from location by either the Mineral Leasing Act of 1920 or the Common Varieties Act of 1955. The Mineral Leasing Act stipulated that certain minerals including oil and gas, coal, potassium, sodium can only be acquired by lease. The Common Varieties Act removed certain commonly occurring mineral materials including sand and gravel, stone used for construction aggregate, pumice, and cinders from those minerals that may be acquired through staking of mining claims. Locatable minerals must also be valuable and pass a marketability test as defined by both the Mining Law and subsequent court cases. In general, mining claims have been staked in the study area to acquire mineral rights to both metallic and non-metallic minerals including gold, silver, copper, lead, zinc, mercury, uranium, molybdenum, tungsten, barite, and fluorite among other minerals. Mining claims have been also staked to acquire minerals that have characteristics that are unique or unusual so to give the mineral a distinct and special value over the same mineral as it commonly occurs. For example, mining claims have been staked to acquire mineral rights to limestone used for the manufacturing of cement and silica used for smelter flux or manufacturing cement as opposed to limestone and quartzite used for road aggregate. In the study area, mining claims have been staked to acquire mineral rights on land containing deposits of minerals such as turquoise used in the manufacture of jewelry and other decorations.

The Mining Law of 1872 authorizes two types of claims, lode claims and placer claims. Both types of claims have been staked within the study area. Lode claims are typically staked to acquire mineral rights to valuable minerals concentrated in lodes, veins, and stockworks, or disseminated throughout rock in place. Placer claims are typically staked to acquire mineral rights to valuable minerals such as gold occurring in unconsolidated deposits. Lode claims may not exceed 1,500 feet long and 300 feet wide with parallel end lines; however, non-parallel end lines do not invalidate a claim. Placer claims can be no larger than 20 acres for a claim staked by an individual locator and no larger than 160 acres for claims staked by an association, or group of persons with 20 acres for each of the individuals making up the association. Placer claims must be staked as near as practical to the legal subdivision of the public lands on surveyed lands.

The Mining Law of 1872 also allows for non-mineral land to be acquired for mining and milling purposes through the staking of mill site claims. The maximum size of a mill site is 5 acres and multiple mill sites may be staked by an individual. Mill sites have been staked within the study area, particularly near the town of Mina.

A claim owner who has made a discovery of a valuable mineral on a mining claim may apply for a patent to the claim. If all the requirements of the mining laws and regulations have been satisfied and the claimant can demonstrate the existence of a valuable mineral deposit that meets certain requirements, the Mining Law of 1872 allows the claimant to purchase the claim from the Federal Government. The title to the mining claim is then passed to the claimant making the claim private land with rights of ownership to both the surface and the minerals within the claim. In 1994, Congress passed a moratorium on issuing patents, although patent applications received prior to that date may be processed and issued. There are many patented mining claims within the study area, shown on the plates as private property.

To prevent unnecessary and undue degradation of public lands by operations authorized by the mining law, the BLM requires operators of mining and mineral exploration projects to either file a notice of intent or a plan of operations when activities may result in disturbance of the surface beyond that of from casual use (43 Code of Federal Regulations [CFR] 3809). Casual use generally includes geologic mapping, collection of mineral specimens using hand tools, and geochemical and geophysical surveys. A claimant must submit a plan of operations and obtain BLM's approval prior to initiating activities that will result in more disturbance than casual use or when more than 1,000 tons of ore will be removed for bulk sampling. A notice of intent to explore for minerals must be filed with the BLM prior to initiating activities that result in less than 5 acres of surface disturbance. Within the study area numerous notices of intent and plans of operations have been filed by claimants. The locations of these plans and notices show areas where claimants either plan to or actually are conducting mining activities or mineral exploration projects that include drilling, trenching, or bulk sampling.

2.2.2 Mineral Leases

Rights to oil and gas occurring on BLM land are acquired through leases under the Mineral Leasing Act of 1920. Oil and gas leases are offered by competitive bid and become available by non-competitive leasing if no minimum acceptable bid is received. Primary lease terms are 10 years and may be extended under certain conditions.

Mineral rights to potassium and sodium minerals occurring on BLM land within the study area are also obtained through leasing under the Mineral Leasing Act of 1920. Prospecting permits that allow the holder an exclusive right to explore for sodium and potassium minerals are issued by the BLM. Prospecting permits are issued for two years and prospecting permits for potassium may be extended for an additional two years. In the event that the holder of a potassium or sodium prospecting permit discovers a valuable deposit, they may be entitled to a preference right lease for these minerals within the permit area. Leases for potassium are issued for and indefinite period; however, the lease term may be readjusted on renewal at the end of 20 years. Sodium leases are issued and renewed for 10 year periods. There are active sodium and potassium prospecting permits within the study area.

Coal occurs within the study area and the rights to acquire rights to mine coal are obtained through the Mineral Leasing Law of 1920. Based on our research of BLM records no coal leases have been issued in the study area.

Rights to geothermal resources on public lands are acquired by leasing through the provisions of the Geothermal Steam Act of 1970, which treats the resource as if it were a leasable mineral. Geothermal leases are for a primary term of 10 years and may be renewed for up to 40 years providing paying quantities of steam are provided. There are authorized geothermal leases within the study area.

2.2.3 Mineral Material Sites

Common variety minerals such as and including sand and gravel, stone, pumice, petrified wood, cinders and clay are obtained through the BLM's Mineral Materials Sales program. The Materials Act of 1947 authorized disposal of common variety minerals by sale and the Common Varieties Act of 1955 removed these materials from location under the Mining Law of 1872. Common variety minerals may be obtained by competitive bid or non-competitive sales if there is no competitive interest. The BLM maintains community pits from which it may make small sales (less than $1,000 fair market value) of common variety minerals. The BLM also grants free use permits to governmental agencies and non profit organizations and corporations. The lands designated by the BLM from which common variety minerals may be removed through contract sales and free use permits are referred to as Material Sites or Material Disposal Sites. The location and size of these sites and the duration of the sales contract or free use permit vary and are specific to each permit or sales contract.

Within the study area there are sites where the State of Nevada Department of Transportation (NDOT) acquires mineral materials such as sand, gravel and rock for use in Federal-aid highway construction and maintenance. NDOT acquires the right to remove these materials in accordance with a BLM-Federal Highway Administration (FHWA) Interagency Agreement through which FHWA has the authority to monitor and administer a land transfer program that includes material sources. NDOT acquires the right to remove mineral materials from these sites until they relinquish that right. NDOT may also acquire mineral materials for use in non Federal-aid highways by free use permits obtained from the BLM.

2.2.4 Land and Mineral Use Records

BLM maintains a database of land and mineral use records referred to as the Legacy Rehost 2000 (LR2000, 2007), which can be accessed on the internet directly at http://www.blm.gov/lr2000 or through an interactive map on the BLM's Geocommunicator website, http://www.geocommunicator.gov. The BLM LR2000 database is considered preliminary and is a compilation of information added into their database through the date on which the database is accessed. The BLM does not warrant the accuracy, completeness, or reliability of the data; nonetheless, the data is useful for identifying the approximate location of mineral exploration and development activities in the vicinity of the MRC.

Records obtained from the BLM LR2000 database included the following:

- Mining Claims (lode, placer and mill sites) – Case Types 384101, 384201, and 384401
- Non-competitive oil and gas leases – Case Type 321011
- Non-competitive geothermal leases – Case Type 321000
- Surface management (plans of operation and notices of intent to operate) – Case Types 380919 and 380913
- Sodium Prospecting Permits – Case Type 352201
- Potassium Prospecting Permits – Case Type 353201
- Mineral Disposal Sites (salable free use permits) – Case Type 360413
- Mineral Disposal Sites (negotiated) – Case Type 361113
- Mineral Disposal Sites (free use permit - government) – Case Type 362113
- Mineral Materials Right-of-Way (Sec 107) – Case Type 282102

- Mineral Materials Right-of-Way (Sec 317) – Case Type 282104
- Mineral Materials Right-of-Way (Sec 17) – Case Type 282106

The BLM database was also checked to see if competitive oil and gas leases, competitive geothermal leases, and coal leases occur within the study area. The results of this search indicate that these lease types do not occur within the study area.

For surface management and active mining claims, we only searched the LR2000 database for pending and authorized plans of operations, notices of intents, and active mining claims. For the other mineral leases, prospecting permits, and materials sites, we searched for both authorized, pending, and closed leases and permits. The closed leases and permits are those where the mineral interests have reverted to public ownership. The location of closed leases and permits provides an indication where private companies have explored for energy resources and industrial minerals that have occurrence that may be underreported in NBMG and USGS publications. The locations of closed mineral material sites, typically sand and gravel pits, provides an indication of where those resources have been utilized by private companies and state and local governments.

The BLM LR2000 database does not contain a record of all land actions that have ever affected a parcel of land. Older land actions that may provide information about acquisition of mineral rights or the right to explore for minerals, particularly under programs no longer current or in effect, may not be reflected in the database. In some cases, such information is contained in the BLM's master title plat, use plat, and historical index for each township. We used these sources when appropriate to obtain information about a specific parcel of land.

In this report, where appropriate, we have identified lands containing mining claims, mineral leases, material sites, and other features by referencing their location within the public-land rectangular surveys. The descriptions including the order of listing townships, sections, and sectional subdivisions, abbreviations, and nomenclature generally follows the conventions described in Maley (1984).

The information obtained from the LR2000 database is current as of the date of the search and was provided electronically for input into the GIS database. The records were compiled into map sheets so they could be used during the field investigations to identify areas of recent exploration activity. These data were also summarized into the plates included with

this report (Plates 2, 3, and 4). The plates identify which sections of land contain one or more mining claim, leases, or mineral materials site and not the actual location of any individual claim, lease, and materials site. For example, some sections on the plates may contain so many mining claims that virtually all land within the section has been claimed and some sections may contain only one mining claim.

3.0 FIELD RECONNAISSANCE

To facilitate planning of our field reconnaissance program, we reviewed geology, land status, and recent reports of mineral exploration activity along the proposed MRC before any field visits. As it was not practical to visit all mining districts, prospects, or reported occurrences, only a small portion of these features were selected for site visits. This list was then modified during the course of fieldwork so only approximately 20 sites were visited during the field program.

The field reconnaissance was initially conducted between 26 November and 6 December 2006 by George Lightwood (team leader) and Art Geldon. A second trip between 20 February and 7 March 2007 was conducted along additional alignments. Field reconnaissance along MN-3 was performed by Bill Laprade and Scott Shimel, and along S-4, S-5, and S-6 by Paul Zehfuss and Nell Beedle. The teams collected information on geology, historical mining operations, and signs of recent mineral exploration and claim staking activities.

Sites were accessed via established roads and existing two-wheel tracks, or by hiking short distances. A four-wheel-drive sport utility vehicle was used and no off-road driving was performed.

While in the field, the team determined their positions relative to the alignment using a Global Positioning System (GPS) device, which enabled the field personnel to know their location relative to the MRC at all times. Typical data collection procedures at each stop during the reconnaissance included taking digital photographs, recording a GPS waypoint, observing geologic features and mineralization, historical mining activities, and recording information about observed recent and past mining and mineral exploration activities as appropriate. Discrete GPS waypoint designations were identified for each team, beginning with the team number (i.e., MT6) followed by a sequential three digit number. For instance, the 15th waypoint

recorded by Team 6 would be recorded as MT6015. A summary of information recorded at each waypoint is presented in Appendix A. A table and a CD of the reconnaissance photographs are presented in Appendix B.

Daily work activities were planned each evening. The S&W Point-of-Contact (POC), Samuel Bernofsky, was informed of the field team's itinerary for the next day. Before entering the field each day, team members contacted the POC, discussed the planned work activities, conducted and documented a pre-shift safety meeting, and inspected the vehicle, field equipment, safety equipment, and the other team members' physical and mental condition. Each evening the team contacted the POC, reviewed daily progress, reconciled field notes, and reviewed safety issues that came up in the course of the fieldwork. The observations and collected field data were backed up each day by making photocopies of field notebooks and downloading photographs into laptop computers.

4.0 REGIONAL GEOLOGY AND TECTONIC SETTING

A geographical description of the MRC is presented in the Preliminary Geotechnical Report (S&W, 2007b) prepared for Task 1. A discussion of the geologic setting, tectonics, regional seismicity, and hydrogeology are also presented there.

5.0 KNOWN MINERAL AND ENERGY RESOURCE OCCURRENCES ALONG THE MINA RAIL CORRIDOR

The following report section numbers correspond to the Mining District IDs presented in Plates 1 and 2. Each mining district that was the subject of the initial field reconnaissance in 2006 are numbered sequentially and discussed below in order of north to south along the MRC. Areas that were the subject of the subsequent field reconnaissance in February 2007 are included at the end. Background information, including field data sheets, maps, and interviews for each area, are included in Appendix A. Photographs are presented in Appendix B. Mining district boundaries as presented in NBMG 47 were used when providing distances of areas evaluated during the field reconnaissance from the MRC.

The term "mining district" was coined in the gold camps of California following the gold rush to the Sierra Nevada in 1849 (Tingley, 1998). Mining districts were created to administer mining

and civic matters in the camps, but regulations varied from camp to camp, leaving many matters open to dispute. Laws passed by the Federal Government, the General Mining Act of 1866, and the Mining Act of 1872, formalized the concept of mining districts nationwide and did much to standardize regulations among districts (Tingley, 1998).

Nevada's first mining district was established in 1858 to administer mining activity along the Comstock Lode (Tingley, 1998). Most of the mining districts currently recognized in Nevada are discussed briefly in a report by Tingley (1998) and are shown on a 1:1,000,000-scale map included in Tingley's report. Forty-six mining districts in Lyon, Mineral, Esmeralda, and Nye Counties (Plate 1) provide the structure for discussing mineral and energy occurrences in this report. This discussion relies heavily on information from mineral inventory reports by Tingley and Smith (1983), Tingley (1990, 1998), and Tingley et al. (1998).

Six of the mining districts described in this report were previously described in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). These previously described districts include Klondyke, Cuprite, Stonewall, Wagner, Goldfield, and Montezuma. District descriptions for Goldfield and Montezuma were updated for this report as the MRC segments cross or border these districts in different locations than the CRC segments. The description of the Klondyke, Cuprite, Stonewall, and Wagner mining districts are substantially the same as those presented in the Preliminary Mineral and Energy Resources Occurrence Report for the CRC. For those districts, additional description of mining claims activity and recent mineral exploration efforts has been added if appropriate. Descriptions of potential conflicts between mining districts and the MRC were provided in Table 1.

Summaries of each mining district's potential for conflict and the rationale for our decisions are found in Table 1.

5.1 Desert Mountains

***Mining District Location*:** The informally recognized Desert Mountains mining district is located in Lyon County, and includes all or parts of Townships 15 and 16 North, Range 25 East, Mount Diablo Baseline (Tps. 15 and 16 N., R. 25 E) (Plate 1). Mines and prospects extend from Mason Valley in the vicinity of U.S. Highway 95A to the crest of the Desert Mountains east of Cleaver Peak (Plate 1). The district is 2 to 9 miles north of Wabuska, Nevada, where the MRC

starts. Desert Mountains mining district will be referenced with Plate ID No. 1 in this report and in Plate 1.

***History of Discovery, Exploration, and Mining*:** Little is known about the mining history of the Desert Mountains district (Tingley, 1990). Metallic prospects east of Cleaver Peak appear to date from the late 1880s. Metallic prospects north of the Thompson smelter site near Wabuska appear to date from the early 1900s. There is no record of production from these prospects. Diatomite prospects in canyons south of Cleaver Peak were known as early as 1931 but no production is reported from them (Stoddard and Carpenter, 1950).

***Geologic Description*:** Formations cropping out in the southern part of the mining district consist mostly of metamorphosed Jurassic and Triassic volcanic and sedimentary rocks (Moore, 1969). Throughout much of the district, Miocene and Pliocene (?) andesite lava flows, flow breccias, and agglomerates interfinger with lacustrine and fluvial deposits of sandstone, mudstone, shale, marl, diatomite, limestone, and tufa (Moore, 1969). In the eastern part of the district, thin Pliocene or Pleistocene basalt flows, intercalated with diatomaceous sediments, overlie the Miocene and Pliocene (?) volcanic and sedimentary rocks. In southern and eastern parts of the area, a swarm of northeast-striking faults cuts the Pliocene or Pleistocene basalt flows, diatomite, and underlying volcanic and sedimentary rocks.

***Mineral and Energy Resource Occurrence*:** Prospects in the Desert Mountains north of the Thompson Smelter site occur along a shallow-dipping fault separating thin-bedded hornfels from metamorphosed andesite. Mine workings follow brecciated quartz veins containing oxidized specular hematite in fault gouge. (The exploration target most likely was gold and silver deposits, but discovery of commercial-grade gold or silver ore was not reported.)

Prospects in the mountains about 2 miles east of Cleaver Peak (probably) were excavated to follow brecciated quartz veins in migmatized and metamorphosed volcanic rocks. Quartz veins contained limonite, galena, and, possibly, silver sulfide minerals were observed, but nothing of commercial interest was located.

Diatomite occurs in a canyon on the south side of Cleaver Peak, about 3 miles north-northwest of Wabuska, where it is largely covered by talus from overlying basalt flows. Bulldozer cuts into the talus over a distance of 2,000 feet exposed diatomite interbedded with tuffaceous rocks.

However, the diatomite was so extensively faulted (Archbold, 1969) that it could not be traced reliably between bulldozer cuts, nor considered to be a commercial deposit.

5.2 Wabuska Marsh

Mining District Location: The Wabuska Marsh mining district is located in Lyon County, and includes all or parts of Sections (secs.) 10 through 15, 22 and 23, T. 15 N., R. 25 E. (Plate 1). With the Desert Mountains just to the north, the mining district is located at the northern end of Mason Valley, where hot springs issue from playa sediments. The southern edge of the district is about 1 mile north of Wabuska, Nevada, and UPRR tracks at the start of the MRC. Alternate U.S. Highway 95 skirts the western edge of the mining district.

History of Discovery, Exploration, and Mining: From about 1925 until the early 1930s, American Sodium Co. produced sodium sulfate from Wabuska Salt Marsh, which it processed in a mill at Wabuska (Papke, 1976). The mineable sodium sulfate occurred as a 6- to 24-inch-thick surface crust composed of partly dehydrated mirabilite (hydrous sodium sulfate). The surface crust was underlain by clay containing as much as 50 percent mirabilite. There has been no recorded production of evaporite minerals from the Wabuska Marsh district since the 1930s (Papke, 1976).

The principle commodity in demand from the Wabuska Marsh district is hot water from the hot springs that issue along a northeasterly trending fault scarp and hot water available from shallow or flowing wells. The hot springs have been used commercially at various times since 1959 to operate power plants, to grow vegetables hydroponically, and to produce ethanol.

Geologic Description: Wabuska Salt Marsh is a Quaternary playa. Near the surface of the playa, clay interbedded and mixed with evaporite minerals and calcite, is overlain by a soft to hard saline crust. When examined in 1974, the surface crust consisted of thenardite (sodium sulfate), gypsum, and clay with impurities (Papke, 1976). With temperatures ranging from 59 to 72°C, hot springs issue from northeast-trending faults near the base of the Desert Mountains and form mounds or terraces. This fault zone was named the Wabuska lineament by Stewart (1988). Thee faults zone is believed to facilitate upward movement of water heated at depth by the Earth's geothermal gradient, and not by a buried intrusive body (Stewart, 1988, 1999).

Mineral and Energy Resource Occurrence: Water from hot springs and wells in Wabuska Salt Marsh was sampled intermittently from 1949 to 1979 (Shevenell and Garside, 2005). In 14 samples, the water contained dissolved solids concentrations of 209 to 1,250 milligrams per liter (mg/L), classifying the water as fresh to brackish or slightly saline, as might be expected in an area with salt crusts and bedded evaporite deposits. In six samples with complete analyses of major ions, the sampled water was a slightly alkaline (pH = 8.0 to 8.6), sodium-sulfate type, indicating that it is in equilibrium with the sodium sulfate minerals that predominate in surface crusts and shallow bedded evaporite deposits.

5.3 Holy Cross

***Mining District Location*:** The Holy Cross mining district is located mostly in Churchill County, but about 20 percent of it is located in Lyon and Mineral Counties (Tingley, 1998). Geographicallly, the district covers an arcuate area extending from the Terrill Mountains across the Rawhide Flats into the Barnett Hills and Blow Sand Mountains. The district includes parts of Tps. 14 and 15 N., Rs. 29, 30, and 31 E.; and T. 16 N., Rs. 29 and 30 E. The southern half of the district is located in the Walker River Indian Reservation.

***History of Discovery, Exploration, and Mining*:** The first discovery of silver and gold in the Holy Cross district was made by J.B. Terrell and George Pollinger in 1910, in the mountains southwest of Rawhide Flats (Tingley, 1990). The original discovery was on the Silver Star claim, near what is now Camp Terrell. Other discoveries were made nearby and, by 1913, the district was very active (Schrader, 1947). From 1911 to 1965, however, intermittent production of silver, gold, and other metals from mines in the southwest Holy Cross district earned about $103,000 (based on production figures reported by Vanderburg, 1940; Willden and Speed, 1974). The Pyramid mine, in the Camp Terrell area, was operated for a short period in the 1980s and then shut down (Tingley, 1990; Utterback, 2002). Production potential for mines on the Reservation was summarized in a report by Utterback (2002), as follows: "A group of mines in the Terrill Mountains produced the largest amounts of base and precious metals known from any of the mines on the Reservation. Most of that production came from the Black Butte and Pyramid mines. The Pyramid mine lies within the only block of valid mining claims left on the Reservation. The claims are held by the Silver Trend Mining Company of Couer d'Alene, Idaho. Although the production was significant, the veins are narrow, and the zones with ore grade are small and sparsely distributed. It is doubtful that any of these small mines were profitable in the

past, and it is unlikely that enough ore remains undiscovered to make any of them profitable enough to reopen in the foreseeable future."

The active mining claims referred to by Utterback are located less than 1 mile from MRC segment S6 in secs. 10 and 11, T. 14 N., R. 29 E., and were still active in late 2006. Despite finding no mineral deposits, Utterback considers that additional exploration efforts may be worthwhile to look for larger deposits at greater depths.

The U.S. Bureau of Mines published a report by Satkoski et al. (1985) that discussed results of past mineral exploration on the reservation. From 1997 to 2000, reservation-wide exploration was done for the tribe to identify bedrock areas showing alteration and mineralization that might have been missed previously because of their remoteness (Utterback, 2002). Activity in the southwestern Holy Cross district involved geologic mapping, sampling rock chips from silver- and gold-bearing quartz veins in the Terrill Mountains, conducting resistivity surveys in Rawhide Flats, and drilling through a previously recorded negative magnetic anomaly in Rawhide Flats. According to Utterback (2002), the negative magnetic anomaly centered over Rawhide Flats was determined to be fine-grained lacustrine sediments, and the only valuable resource found from the drilling in the southwestern Holy Cross district was a supply of ground water 315 to 375 feet below the land surface. The discharge rate of the water during airlift tests was 18 to 25 gallons per minute (gal/min).

***Geologic Description*:** Utterback (2002) indicates that the Terrill Mountains are a fault block, uplifted on its northwest and southeast sides by northeast-striking, high-angle faults that are exposed at the surface or concealed beneath Quaternary basin-fill sediments. The fault block is uplifted on its northeast and southwest sides by northwest-striking, high-angle faults that are concealed by Quaternary basin-fill and alluvial fan sediments, which Utterback (2002) calls pediment deposits. A north-northwest-trending, high-angle fault crossing the southeast side of the Terrill Mountains block appears to offset the youngest volcanic unit in the block with right-lateral strike-slip and down-to-the-east movement. Rawhide Flats appears to be a graben, which is filled by Quaternary alluvial fan sediments, playa apron sediments, playa deposits, and eolian sand and silt.

The Terrill Mountains block is made up of a westerly tilted sequence of Tertiary volcanic rocks (Utterback, 2002). In ascending order, these volcanic rocks consist of: (a) light-green, gray,

yellowish-brown, and reddish-brown, typically porphyritic dacite, rhyodacite, and rhyolite lava flows, flow breccias, locally lithic-rich, variably welded ash-flow tuff, ash-fall tuff, and vitrophyre; and (b) dark-gray to black, glassy to finely crystalline and porphyritic basalt, basaltic andesite, and andesite lava flows, flow breccias, and lahars. Four shallow intrusive bodies, which might be connected in the sub-surface, intrude the tuffs and lava flows. These early Miocene (21.2 Ma) intrusives and related dikes consist of light-gray to gray, porphyritic, biotite dacite with a medium- to coarsely grained phaneritic groundmass. The intrusive rocks readily weather to grus.

***Mineral and Energy Resource Occurrence*:** The ore deposits near Camp Terrell occur mostly in zones of narrow quartz veins that cut kaolinized dacite intrusive bodies near contacts with rhyolitic ash-flow tuff (Tingley, 1990). The veins follow steep shear zones that are brecciated and cemented with hematite, limonite, and manganese oxides. At the Black Butte mine, west of Camp Terrell (shown in Plate 1), mineralization follows the contact zone between an altered dacite intrusive and rhyolitic tuff. The contact zone has been highly silicified, brecciated, and recemented with silica. Native gold occurs in narrow quartz veins that cut the silicified intrusive and tuff. Further to the west, at the Pyramid mine, galena, sphalerite, and pyrite occur in thin quartz veins that cut silicified, moderately-welded ash-flow tuff.

Although the veins mined near Camp Terrell are reported to be very narrow, zones of associated shearing, brecciation, and alteration appear to be wide and have considerable linear extent (Tingley, 1990). Schrader (1947) observed that quartz stringers in the tuff, which are oblique to the contact between the tuff and a dacite intrusive, occur in zones as much as 200 feet wide and 1,000 feet long. Some of these stringer zones are richer in gold and silver than ore zones in the intrusive, and because of their width, they might have potential for the development of bulk-mineable gold-silver deposits (Tingley, 1990).

5.4 Benway

***Mining District Location*:** The Benway mining district is located in Lyon County, secs. 1 and 2, 11 through 14, T. 14 N., R. 29 E.; and secs. 6, 7, and 18, T. 14 N., R. 29 E. (Plate 1). The mines and prospects are located on the south end of Painted Mesa, a 2-mile-wide, southwest-trending lobe of the Desert Mountains. The district is about 10 miles north of Schurz and 1 mile west of U.S. Highway 95. The district is entirely within the Walker River Indian Reservation.

***History of Discovery, Exploration, and Mining*:** According to Schrader (1947), discovery of the Benway mining district probably occurred before 1910, when the nearby Holy Cross mining district was discovered (Tingley, 1998). By 1916, a mine shaft was being sunk in the Benway district, but there is no recorded production from this mine (Tingley, 1990). The district apparently was inactive from about 1917 to 1955. Aeromagnetic surveys flown in 1956 showed a positive anomaly centered on the main exploration target in this district, the Afterthought prospect, and smaller mine shafts (Satkoski et al., 1985; Utterback, 2002). Between 1963 and 1974, the Idaho Mining Co. and the Walker-Martel Mining Co. drilled 20 exploration holes in the area of the magnetic anomaly, hoping to find a copper or gold deposit (Utterback, 2002). No further exploration work was done in the area until 1997 and 1998, when 34 rock chip samples were collected to test for anomalous metals (Utterback, 2002).

***Geologic Description*:** Rocks in the Benway mining district consist of Mesozoic limestone (inferred to be in the Triassic Luning Formation), which has been contact-metamorphosed by intrusion of Cretaceous plutons and covered partly by Tertiary volcanic rocks (Satkoski et al., 1985; Utterback, 2002). The plutonic rocks consist of coarsely crystalline to porphyritic granite grading to quartz monzonite and coarsely crystalline gabbro grading to diorite, which are present apparently as zoned stocks. The metamorphic rocks consist of marble and skarn (Utterback, 2002). Tertiary volcanic rocks consist of rhyolite to dacite lava flows and variably welded ash-flow tuffs. The volcanic rocks appear to post-date the introduction of ore minerals in skarn rocks (Utterback, 2002).

A northeast-striking, high-angle fault crosses through the mining district along the contact between metamorphosed Mesozoic limestone and the Cretaceous granitic pluton (Utterback, 2002). Another northeast-striking fault and a northwest-striking fault were inferred and mapped at the edges of the mining district by Utterback (2002).

***Mineral and Energy Resource Occurrence*:** Two types of ore deposits have been explored in the Benway mining district. These ore deposits include: (a) copper-silver-gold-bearing quartz ± calcite veins; and (b) disseminated sulfide deposits in silicified zones associated with intrusive contacts.

At least 10 veins containing gold, silver, and copper minerals strike nearly east-west, dip steeply south, and cut both intrusive rocks and metamorphosed limestone (Schrader, 1947). These ore

veins are as much as 20 feet wide and a mile long. Typically, they consist of metallic sulfides and quartz ± calcite in crushed, sheared, altered, and oxidized rock and clayey gouge. Metallic minerals present include argentite, chalcopyrite, and pyrite with minor molybdenite and stibnite. Cerargyrite (chlorargyrite), malachite, hematite, limonite, stibiconite, manganese oxides, gold, and silver are present in oxidized parts of the veins. Mines developed in these oxidized zones include the Eureka mine and the Afterthought, Copper King, Reservation Hill, and Riovista prospects (Schrader, 1947; Satkoski et al., 1985; Castor and Ferdock, 2004). No production from these mines and prospects has been reported (Tingley, 1998).

Disseminated sulfide deposits are centered on a silicified diorite-quartz monzonite contact that follows a northeast-trending fault (Tingley, 1990). Drilling in the area of the silicified intrusive contact revealed extensive amounts of disseminated pyrite and minor amounts of disseminated copper, lead, and zinc sulfides that were too deep or too low-grade to be of economic interest (Satkoski et al., 1985).

5.5 Yerington

***Mining District Location*:** The Yerington mining district (Proffett and Dilles, 1984) is one of the largest districts in Nevada, but only about half of the district extends within 10 miles of the MRC (Plate 1). The entire mining district is located in Lyon County (Tingley, 1990). The district is bordered on the east by the Wassuk Range and a chain of buttes extending south from the Desert Mountains; on the west by the Singatse Range, and on the north and south by Mason Valley (Proffett and Dilles, 1984; Tingley, 1990). The district includes all or parts of Tps. 13 and 14 N., Rs. 24 through 27 E.; T. 12 N., Rs. 24 through 26 E.; and T. 11 N., Rs. 24 and 25 E. (Plate 1).

***History of Discovery, Exploration, and Mining*:** Most of this discussion is condensed from Tingley (1990). The Yerington district was discovered in 1865. Initially, only "bluestone" (copper sulfate ore) was produced from outcrops and near-surface oxidized zones in the Ludwig, Bluestone, and Mason Valley mines to supply Comstock Lode mills near Carson City, Nevada. Copper metals were first mined in 1883 from skarn deposits in the Singatse Range. In 1941, the Anaconda Company acquired the Yerington property to explore for disseminated copper minerals. Exploration led to starting an open-pit mine in 1953, from which copper oxide minerals and later copper sulfide minerals were extracted. After 1978, Anaconda sold the Yerington mine to Arimetco, who closed the mine in the 1990s.

In response to a worldwide boom in the copper industry during the 1960s and early 1970s, exploration activity by several mining companies resulted in discovery of at least six large copper deposits in the Yerington district – Pumpkin Hollow (1960), Bear (1961), and Ann Mason (1968), Lagomarsino (date unknown), Lyon (date unknown), and MacArthur (date unknown).

Although known for its copper mines, the Yerington district has, also, been a major producer of gypsum since 1911. Gypsum was produced from the Ludwig copper mine from 1911 to 1930 and the Regan quarry from 1922 to 1983. Reserves remain at both properties, although neither property has been active for many years.

From 1906 to 1955, mines at Yerington produced 871,472 pounds of copper from skarn deposits (Long et al., 1998). From 1953 to 1993, the Yerington mine owned by Anaconda and, later, Arimetco produced 107,970,964 pounds of copper and 45,208 ounces of silver from porphyry copper deposits (Long et al., 1998). Production figures released for the six prospects/mines discovered from 1960 to the early 1970s are uncertain, and are not reported here. Meaningful production figures for gypsum also are lacking.

***Geologic Description*:** Material in this section is derived mostly from a map of the Yerington district by Proffett and Dilles (1984). The oldest rocks in the Yerington district, the Triassic Volcanics of McConnell Canyon, consist of andesite to intermediate lava flows, which are intercalated with conglomerate and sandstone. These volcanic and sedimentary rocks were intruded by pegmatite and aplite dikes and fingers of a Triassic composite quartz monzonite-diorite pluton and metamorphosed to meta-andesite, schist, and hornfels.

Overlying the basal volcanic unit are thousands of feet of Triassic to Jurassic dolomitic limestone, limestone, argillaceous limestone, argillite, mudstone, siltstone, sandstone, quartzite, andesite to dacite tuff, tuff breccia, and bedded gypsum and anhydrite deposits, which are capped by Jurassic andesite to dacite lava flows, breccia, and conglomerate.

In the Jurassic period, plutons and dikes intruded and metamorphosed previously deposited sedimentary and volcanic rocks. These plutons include the composite Yerington batholith and the younger Shamrock batholith. The Yerington batholith ranges from quartz monzodiorite to quartz monzonite and granite in composition, contains a layered gabbro stock, and is

hydrothermally altered in many places. The younger Shamrock batholith is composed of quartz monzonite.

With a basal 400 feet thick conglomerate and basalt flow, Oligocene (27.5 to 24 million years ago [Ma]) nonwelded to densely welded ash-flow tuffs were deposited on terrain with considerable relief. These tuffs, which range in composition from dacite to rhyolite, are overlain by basalt and andesite lava flows of early Miocene age. After the onset of normal faulting (see discussion of tectonics below), Middle to late Miocene (12.5 to 7.5 Ma) fanglomerate, sandstone and tuffaceous sedimentary rocks were deposited in syntectonic basins. Middle to late Miocene (8 to 11 Ma) olivine-pyroxene basalt flows were deposited in the Singatse Range between intervals of conglomerate.

Basin-and-Range tectonics began in the mining district during the early Miocene, about 17 to 18 Ma, with the initial appearance of northerly striking, eastward-dipping, listric-normal faults. Movement along these faults resulted in net displacements of up to 2 miles and caused steep ($\leq 60^0$) westward tilting of Miocene andesite flows and older rocks. Even as olivine-pyroxene basalt flows erupted in the Singatse Range, tilting of these flows at progressively shallower angles upward in the sequence upward indicates that faulting in the area was waning by late Miocene time. Faults cutting 8 to 11 Ma basalt flows and unconsolidated basin-fill sediments, including some range-front faults, are Quaternary. Tectonic events caused >100 percent westerly extension across the Yerington district and is ongoing.

***Mineral and Energy Resource Occurrence*:** The major ore bodies of the Yerington mining district are: (a) contact -metamorphosed, replacement copper-skarns formed in Triassic carbonate rocks; and (b) porphyry copper deposits formed in Jurassic plutonic rocks. Placer gold deposits are found in Tertiary river channel deposits and in alluvium that overlies these deposits. Gypsum at the Ludwig mine and Regan quarry was mined from a relatively thin gypsum-anhydrite sequence in the Jurassic sedimentary section.

Copper skarn deposits were mined at the Ludwig, Mason Valley, Bluestone, Douglas Hill, Casting Copper, Western Nevada, McConnell, and smaller mines on both sides of the Singatse Range. These deposits, in general, are composed of chalcopyrite ± pyrite in gangue consisting of brecciated masses of pyroxene, garnet, epidote, gypsum selenite, quartz, and calcite. Secondary copper minerals in outcrops and shallow oxidized zones of the mines, include: chalcanthite

(bluestone), brochantite, azurite, chrysocolla, chalcocite, covelite, cuprite, melaconite (copper pitch), and sparse native copper.

An unusual iron-copper-skarn deposit was detected in the hills east of Mason Valley by airborne magnetic surveys of the area, followed by extensive drilling within the detected anomaly. Drilling revealed copper-sulfide and copper-precious metal- sulfide-skarn deposits occurring between lenses of massive magnetite skarn and bleached marble. The copper-skarn deposits consist of up to 90 percent pyrrhotite, chalcopyrite, and pyrite.

Copper deposits in the Yerington porphyry copper mine are illustrative of porphyry copper deposits in the mining district. Typically in the Yerington mine, which is contained in a quartz monzonite porphyry pluton, primary sulfide minerals occur as minute grains in the groundmass of the rock, within feldspar and quartz phenocrysts, and as narrow seams. Generally, chalcopyrite and slightly lesser amounts of pyrite are the main sulfide minerals; small amounts of bornite, covelite, and chalcocite are present; molybdenite is rare; and no appreciable gold or silver is present. In the oxidized, high-grade zone of mineralization, the porphyry is intensely silicified, and ore minerals consist mostly of chrysocolla with some cuprite, tenorite, melaconite, malachite, and azurite.

5.6 Red Ridge

***Mining District Location*:** The Red Ridge mining district is located in Mineral County adjacent to the Churchill County line, about 13 miles northeast of Schurz, Nevada (Plate 1). Although relatively small, the northwest-trending mining district spans parts of Tps. 13 and 14 N., Rs. 30 and 31 E. (Plate 1). The district coincides with Red Ridge, which is bordered on the northeast by Rawhide Flats, on the southeast by Hu-Pwi Wash, on the southwest by Double Spring playa, and on the northwest by the Terrill Mountains (Tingley, 1998; Utterback, 2002). The west edge of the mining district is approximately 1 to 2 miles east of alternate S6 of the MRC. The mining district is located entirely within boundaries of the Walker River Indian Reservation.

***History of Discovery, Exploration, and Mining*:** The Red Ridge mining district is known mostly for its uranium occurrences. Two groups of now abandoned uranium claims were located in the district before 1967 (Garside, 1973). The Robinson claims, in secs. 21 and 23, T. 14 N., R. 30 E., and the Bubbles claims, in secs. 27, 28, and 29, T. 14 N., R. 30 E. contain the uranium mineral, carnotite, in a Miocene sequence of rhyolite to rhyodacite welded ash-flow tuff and lava

flows (Garside, 1973; Utterback, 2002). Several prospect pits were excavated at each site, but none of the claims is still active (U.S. Department of Interior Bureau of Land Management, accessed 2007, LR2000 database).

Two exploration holes were drilled for the Walker River Paiute Tribe in November and December 2000 to determine if altered Cretaceous granodiorite cropping out in sec. 3, T. 13 N., R. 30 E; contained anomalous copper or molybdenum values at depth (Utterback, 2002). Extensive oxidation and argillic alteration were observed to depths of 560 feet in one hole and 465 feet in the other hole, but the only anomalous mineralization found were two zones of weak uranium enrichment at depths of 230 to 260 feet and 390 to 460 feet in the two holes. Results of surface geophysical surveys and rock chip sampling were interpreted as not indicative of the existence of a mineral deposit in the vicinity of the drill holes (Utterback, 2002).

***Geologic Description*:** The geology of Red Ridge is relatively simple. Two exposures of a Cretaceous granodiorite stock are overlain in places by a sequence of Miocene rhyolite to rhyodacite welded ash-flow tuff layers and lava flows (Garside, 1973; Utterback, 2002), part of which is assigned to the Tuff of Copper Mountain by Hardyman (1980). The granodiorite and silicic volcanic rocks are overlain by Miocene basalt, basaltic andesite, and andesite lava flows, flow breccias, and lahars and Quaternary alluvium (Hardyman, 1980; Utterback, 2002).

The contact between Cretaceous granite and Miocence volcanic rocks north of the summit of Red Ridge is a northeast-striking, high-angle fault with apparent down-to-the-northwest offset (Utterback, 2002). An inferred northeast-striking fault truncates Red Ridge on the south. A northwest-striking, high-angle fault with apparent down-to-the-southwest offset truncates Red Ridge on the southwest and forms one of the bounding faults for the graben in which Double Spring playa is located (Utterback, 2002).

***Mineral and Energy Resource Occurrence*:** Argillized and oxidized granodiorite, of Cretaceous age, contains intervals with minor uranium enrichment (Utterback, 2002). Uranium in the district is most abundant in silicic tuffaceous rocks. At the Robinson claim site, carnotite(?) occurs in opalized plant material including logs, in a 1 to 3 feet thick tuffaceous bed at the base of a rhyodacite, welded ash-flow tuff layer or lava flow of Miocene age (Garside, 1973). Radioactivity can be detected for a distance of 1,000 feet along the tuffaceous bed. Another tuff bed also is radioactive. At the Bubbles claim site, carnotite is present in abundant opalized wood

and along altered zones in a rhyolitic tuff layer of Miocene age (Garside, 1973). Anomalous radioactivity can be detected for a distance of 500 feet along the base of a hill. No mineralization was observed in the youngest unit at Red Ridge, a sequence of Miocene andesite to basalt lava flows and related volcanic rocks (Utterback, 2002).

5.7 Calico Hills

***Mining District Location*:** The Calico Hills mining district is located in Mineral County, in parts of Tps. 13 and 14 N., R. 29 E. (Plate 1). The district coincides with the Calico Hills, which are 3 to 5 miles north and east of the Walker River on the Walker Indian Reservation, and about 6 miles north of Schurz, Nevada (Tingley, 1998). The district is entirely within the Walker River Indian Reservation.

History of Discovery, Exploration, and Mining: The Calico area was discovered in 1956 based on the results of an Aeromagnetic Survey by the Columbia Iron Co., a subsidiary of U.S. Steel (Satkoski et al., 1985). Idaho Mining Corporation acquired a prospecting permit for the reservation in 1962 and negotiated a joint venture with Martel Mining Co. In 1965, the Walker-Martel Mining Company was organized as part of an option agreement with Occidental Petroleum to manage all exploration in the area. Exploration was conducted from 1963 to 1974 and consisted of geologic mapping, sampling, geophysical surveys, gravity studies, and drilling (Satkoski et al., 1985).

As a result of the exploration, the Calico iron-copper deposit was discovered along with the West Calico and Little Calico prospects. Satkoski et al. (1985) provides the location of the Calico deposit and the other two prospects as follows:

- Calico – secs. 5, 6, 7, and 8, T. 13 N, R. 29 E.
- West Calico – secs. 31 and 32, T. 14 N., R. 29 E.
- Little Calico – secs., 3, 4, 9, and 10, T. 13 N., R. 29 E.

There is a considerable amount of available information about the Calico deposit; however, no information about the West Calico and Little Calico prospects were found as part of this study. The Calico deposit is located approximately midway between MRC alternatives S1/S3 and S4/S5 and approximately ¼ to ½ mile away from the two alternatives.

***Geologic Description*:** The Calico Hills are underlain by Triassic or Jurassic sedimentary rocks that have been contact-metamorphosed to iron-rich, calcic skarn by intrusion of Jurassic to Cretaceous quartz diorite and quartz monzonite (Satkoski et al., 1985; Tingley, 1990; Utterback, 2002). The Mesozoic rocks are overlain by Tertiary varicolored, rhyolite to rhyodacite ash-flow and ash-fall tuffs, which are 400 to 2,000 feet thick and are intruded by dikes and irregularly shaped bodies of dacite (Satkoski et al., 1985; Tingley, 1990; Utterback, 2002). The Tertiary rocks also are metamorphosed to skarn in places.

***Mineral and Energy Resource Occurrence*:** Based on the limited drilling, Satkoski et al. (1985), state the Calico deposit contains and estimated 200 million tons of ore averaging 40 percent iron and 0.08 percent copper. The deposit, which may still be open at depth, lies beneath 400 to 2,000 feet of Tertiary volcanic and Mesozoic igneous-sedimentary rocks. The precious metal content of the ores is reported to be very low.

Utterback (2002) considers the Calico and similar deposits such as the Hottentot deposit in the Buckley district to be transitional between contact metasomatic skarns and hydrothermal stockwork, porphyry style iron-copper deposits. While Utterback states that the deposits are too low grade to profitable to mine, both he and Satkoski et al. (1985) compare them to the copper deposits in the Yerington district. They state that the problem with the Calico deposit is that the existing drilling failed to find a large enough volume of reactive limestone that has been shown to be associated with formation of the higher grade copper deposits of the Yerington district. Both Utterback and Satkoski recommend that the deposit be tested by additional exploration drilling. Utterback also states that geology of the area in the vicinity of the geology of the area of the reservation in the vicinity of the Calico, Benway, and the portions of Buckley districts located close to Hottentot deposit is favorable for the occurrence of porphyry and copper and skarn deposits.

5.8 Mountain View

***Mining District Location*:** The Mountain View district is located in Mineral County, northwest of Walker Lake and west of the town of Schurz, Nevada (Tingley, 1998). Most of the district is on the Walker River (Paiute) Indian Reservation. The district, which coincides with the north end of the Wassuk Range, is bordered on the east by the Walker River valley and U.S. Highways 95 and 95A; on the north by Campbell Valley and U.S. Highway 95A; on the west by the Lyon

County line and Mason Valley; and on the south by the lower Reese River Canyon. The district includes parts of Tps. 12 and 13 N., Rs. 27 and 28 E.; and T. 11 N., Rs. 28 and 29 E.

***History of Discovery, Exploration, and Mining*:** Gold was discovered in 1904 by William Wilson near Black Mountain, at the northwest end of the Wassuk Range. (Most of the following discussion is from Tingley, 1990.) The discovery site was on the Walker Lake Indian Reservation. Wilson did nothing with his find until the Government passed a law in 1906 that opened the Reservation for prospecting. Wilson then filed several claims in the area of his discovery site (Vanderburg, 1937). Two small mining settlements quickly sprang up at the north end of Black Mountain near Wilson's discovery site, Mountain View and Granite. According to Lincoln (1923), gold and silver worth more than $4,500 were produced by lessees at Granite in 1908 and 1909. Couch and Carpenter (1943) indicate that a little more than $29,000 was produced from the Beach mine, south of Granite, from 1916 to 1917. No production has been reported from the Mountain View district since 1917.

In the late 1960s, several major mining companies explored the Black Mountain area for porphyry copper deposits. With the exception of some surface work in the Penrod Canyon area, little appears to have been done in this district from the 1960s until 2000 (Tingley, 1990; Utterback, 2002). On November 20 and 21, 2000, two angled, 500-foot-deep exploration holes were drilled into the North Wassuk copper prospect for the Walker River Paiute Tribe (Utterback, 2002). The prospect is located at Black Mountain in SW¼ sec. 25, T. 13 N., R. 27 E. Drilling penetrated hydrothermally altered granodiorite and quartz diorite with varying amounts of epidote and pyrite and anomalous values of copper, cobalt, and molybdenum. However, this prospect was considered to have low potential for profitable development (Utterback, 2002).

***Geologic Description*:** Imbricate thrust faults bordered by mylonitized and brecciated rock coincide with the lower Reese River canyon and divide the Wassuk Range into northern and southern parts. Only the northern part of the range is discussed in this section.

The northern Wassuk Range is cored by Jurassic and Cretaceous intrusive rocks that comprise a composite batholith (geologic discussion based on Bingler, 1978). The batholith was emplaced partly along *en echelon,* northwest-trending, high-angle, normal faults. Jurassic intrusive rocks, which are concentrated at the northern end of the batholith near Black Mountain, mostly consist of irregularly shaped masses of gray to greenish-gray, finely phaneritic to porphyritic hornblende

granodiorite and quartz diorite, which locally are metamorphosed to epidote amphibolite. Cretaceous rocks in the batholith far exceed the Jurassic rocks in surface area and consist mostly of grayish-to yellowish- white-weathering, medium-grained-phaneritic to porphyritic, biotite quartz monzonite. In places, wall rocks were assimilated into the Cretaceous magma, resulting in a hybrid rock with abundant xenoliths of the wall rock.

Triassic and Jurassic sedimentary and volcanic rocks were uplifted with the batholith and now exist as metamorphosed roof pendants on the northwest and southeast ends of the batholith and on its southwest side. At the southeast end of the batholith metamorphosed Triassic andesite lava flows, overlain by rhyodacite ash-flow tuff of the Oligocene Singatse Tuff and sandstone and siltstone of the Miocene Wassuk Group, are displaced down to the southeast by an east-northeast-trending high-angle normal fault. These same rocks also are displaced westward onto quartz monzonite in the southern part of the Wassuk Range by imbricate thrust faults. At the northwest end of the batholith, metamorphosed Triassic andesite lava flows and latite ash-flow tuff, which are overlain by Oligocene rhyolite to rhyodacite lava flows and ash-flow tuff, are displaced down to the northwest by low-angle normal faults. On the southwest side of the batholith, in the vicinity of the Northern Lights mine, roof pendants composed mostly of Triassic to Jurassic metamorphosed andesite lava flows, siliceous argillite, and tremolite marble are overlain by faulted, southwesterly dipping Oligocene rhyolite to rhyodacite lava flows and ash-flow tuff, middle Miocene hornblende latite lava flows, middle Miocene sedimentary rocks, and late Miocene basalt flows.

***Mineral and Energy Resource Occurrence*:** Mines and prospects in this district are clustered in four general areas. These areas include the mouth of Penrod Canyon, in the south part of the district; the area north of Hussman Spring, in the west-central part of the district; the northwest tip of Black Mountain; and a canyon draining north from Black Mountain, in the northeast part of the district. The following discussion is mostly from Tingley (1990).

In the Penrod Canyon area, at the southeast end of the Mountain View district, numerous small prospects expose weakly-mineralized quartz veins in shear zones. The diversely oriented shear zones cut both Cretaceous quartz monzonite and metamorphosed Triassic andesite roof pendants. The quartz veins, which are brecciated and recemented with silica, contain minor iron oxides, copper oxides, chalcopyrite, pyrite, and galena. Skarn mineralization was noted at two prospects in this area.

In the area of Hussman Spring, several shafts, adits, and stopes at the Northern Lights mine, expose northwest-trending, steeply-dipping fissure veins in limy shale. These veins are up to 6 feet thick and follow breccia zones. Outcropping veins appear as siliceous gossans. These gossans contain copper and iron oxide minerals, which on mine dumps, include malachite, azurite, cuprite, and native copper. Observed sulfide minerals on mine dumps include chalcopyrite, bornite, and pyrite.

Northwest of Black Mountain, east of the camp of Mountain View, the Big Twenty and Mountain View veins follow shear zones in sericitized granodiorite. The vein at the Big Twenty mine strikes east-northeast and consists of iron-oxide-stained quartz stringers that are a few inches to 4 feet wide. Ore remaining on the mine dump consists mainly of massive pyrite in quartz; some native sulfur occurs in soft, porous vein material.

Near the camp of Granite north of Black Mountain, the Beach Copper mine, was excavated into granodiorite where a series of 8 to 25 feet wide quartz veins containing copper carbonate minerals could be seen cutting the granodiorite. Underground, these veins split into zones of narrow quartz stringers that contain pyrite, copper carbonate minerals, and chalcocite. Large areas of metamorphosed volcanic rocks and shallow intrusive rocks in the vicinity of the Beach mine exhibit intense quartz-sericite-pyrite alteration, but no commercial deposits of porphyry copper have been found there.

On the northern edge of the Mountain View district, just south of U.S. Highway 95A, several small workings expose weak skarn mineralization, and northerly to northwesterly trending quartz veins and breccias associated with aplite dikes. Pyrite is present in quartz veins in east-west-trending, north-dipping shear zones and with iron and manganese oxides in silicified, northerly to northwesterly trending shear zones that have been brecciated and intruded by latite dikes.

5.9 Double Springs Marsh

***Mining District Location*:** The Double Springs Marsh mining district coincides with a playa that is located in Mineral County, about 8 miles east of Schurz, Nevada, on the Walker River Indian Reservation (Papke, 1976; Tingley, 1998). The elliptical playa is about 2 miles long and 0.5 mile wide, and is located in T. 13 N., Rs. 29 and 30 E. The playa is bordered on the north by the Terrill Mountains, on the east by Red Ridge, on the south by the Gillis Range, and on the west by the Calico Hills (Plate 1). Surface runoff from surrounding mountains and hills

infiltrates basin-fill sediments and is forced under artesian pressure to issue from Double Springs Marsh as springs and flowing well water. Two springs and a flowing well were observed at the southwest end of the marsh, and wild horses were observed at the springs in 2006. MRC alternate S1/S3 crosses the western part of the playa near the springs and flowing well. MRC alternate S5/S6 crosses through the east-eastern part of the playa. The district is entirely within the Walker River Indian Reservation.

***History of Discovery, Exploration, and Mining*:** The only mining activity on the playa occurred about 1898, when the Occidental Alkali Company produced a considerable amount of high-grade soda (trona) from saline crust on the playa surface (Vanderburg, 1937; Papke, 1976). The playa crust is generally 3 to 6 inches thick and consists of natron (hydrous sodium carbonate), trona (hydrous sodium bicarbonate), thenardite (sodium sulfate), and halite (sodium chloride).

***Geologic Description*:** Double Springs Marsh is a Quaternary playa. The playa sediments consist of medium stiff (soft when wet) to hard, light-brown, yellowish-brown, and grayish-brown clay and silty clay. The playa sediments either are desiccated, covered with white saline crust (described above), or veneered with eolian deposits consisting of loose, grayish- to reddish-brown, slightly silty, fine to coarse-grained sand and silty sand. Water in the playa sediments is discharging from a flowing well in NW¼ sec. 25, T. 13 N., R. 29 E. at an estimated rate of >5 gal/min. This water is a sodium bicarbonate type with unusually large concentrations of dissolved boron (7.3 mg/L) and fluoride (9.3 mg/L), and a dissolved solids concentration of 1,790 mg/L (USGS, accessed 2007).

***Mineral and Energy Resource Occurrence*:** The chemistry of ground water at Double Springs Marsh indicates that it is in equilibrium with the playa crust. Assuming that the crust is an evaporative residue of minerals dissolved from playa sediments by ground water, layers containing trona, natron, thenardite, halite, and ulexite must be interbedded with clay and possibly other fine-grained terrigenous sediments beneath the playa surface. Natron, trona, thenardite, halite, and ulexite have been mined and used elsewhere, but neither academic nor commercial interest in these minerals at Double Springs Marsh is reported. It is unlikely that more will be learned about the characteristics of evaporite deposits at the marsh until the marsh sediments are excavated. At present, the only known use of ground water from the marsh is by wild horses.

5.10 Buckley

***Mining District Location*:** The Buckley mining district, which is located in Mineral County, is located primarily in Tps. 11 and 12 N., Rs. 29 and 30 E.; and Tps. 10 and 10½ N., R. 30 E. (Plate 1). The mining district encompasses the northern end of the Gillis Range, which is called the Agai Pah Hills (see, for example, Hardyman, 1980). About two-thirds of the district is north of Walker Lake. Physical boundaries include the Walker River Valley and Walker Lake on the west, Double Spring Marsh and adjacent lowlands on the north, Wovoka Wash and Hidden Wash on the east, and Buckley Flat and the head of Wildhorse Canyon, on the south (Hardyman, 1980; Stewart et al., 1981). Most of the northern part of the mining district is included within the Walker River Indian Reservation.

***History of Discovery, Exploration, and Mining*:** Very little is known of the mining district history (Tingley, 1990). Activity in the district no doubt dates from the 1906 to 1907 prospecting rush triggered by discoveries at Rawhide, to the north of the Buckley district. Several of the mines appear to have produced small amounts of gold and copper ore (Satkoski et al., 1985), but the only recorded production is about 800 (20-pound) units of WO_3 from the Lucky Four tungsten mine between 1937 and 1956 (Stager and Tingley, 1988).

In the early 1960s, the Hottentot iron-copper deposit in the Hu-Pwi Wash area on the north end of the district based on an aeromagnetic survey flown for U.S. Steel Corp. that revealed a magnetic anomaly in the Hu-Pwi Wash area (Tingley, 1990). Between 1963 and 1978, Idaho Mining Co., Walker-Martel Mining Co., and Occidental Petroleum Co. drilled the anomaly, and outlined a deposit, now called the Hottentot prospect, which contains an estimated 625,000 tons of ore averaging 46.2 percent iron and 0.1 to 0.15 percent copper (Satkoski et al., 1985). This prospect has not been developed (Satkoski et al., 1985).

Areas within the district were explored for porphyry copper and skarn deposits during the late 1960s and 1970s. Considerable geophysical work and drilling has been done at the Copper Hill prospect. There was no mining activity reported in the district as of the late 1980s (Tingley, 1990). Utterback (2002) considers the geoleogy favorable for the occurrence of yet undiscovered porphyry and skarn copper deposits.

***Geologic Description*:** This part of the Gillis Range is composed of Triassic limestone, argillite, shale, siltstone, volcanic breccia, tuff, and lava flows, that have been intruded and

contact-metamorphosed by Jurassic and Cretaceous plutons, overlain by a thick sequence of Tertiary volcanic rocks, and intensely faulted (Hardyman, 1980). Contact-metamorphosed rocks include calc-silicate hornfels (skarn) and biotite schist. The Jurassic intrusive rocks range from diorite to latite and rhyodacite. The Cretaceous intrusive rocks include diorite, granodiorite, granite, monzonite, and quartz monzonite. Where inspected at waypoint MT1047, south of Gillis Canyon, the plutonic rock was very high-strength, light-gray to pinkish-gray, porphyritic quartz monzonite, that was commonly weathered to grus-covered slopes with medium to widely spaced, rectangular fractures (≤10 feet apart). The dominant fracture set here strikes N23-30°W and dips 84-87°NE. The Tertiary volcanic rocks consist of Oligocene, nonwelded to densely welded, rhyolite to rhyodacite ash-flow tuff with minor lava flows that are overlain by Miocene, rhyodacite to basalt lava flows and dikes with subordinate ash-flow tuff. Structurally, the Buckley district is an elongate, northwest-trending, fault-bound trough with thousands of fault slices of Tertiary volcanic rocks filling the trough and faulted Mesozoic rocks forming its margins. Ekren et al. (1980) inferred a detachment fault at the base of the Tertiary section.

***Mineral and Energy Resource Occurrence*:** Mines and prospects in this district are confined to occurrences of Mesozoic rocks (Stager and Tingley, 1988). Prospects are found along Gillis and Wildhorse Canyons on the west side of the district and in the areas of the Red Granite and Centipede mines on the north end of the district (Tingley, 1990). Mineralization at most properties consists of sulfide-bearing skarns associated with limestone-intrusive contacts. The deposits typically contain small amounts of gold, silver, and copper minerals. (Tingley, 1990).

The BLM's LR2000 database (LR2000, 2007) indicates two properties for which mining claims have been filed: (a) in all or parts of secs. 2 and 3, 10 and 11, T. 10 N., R. 30 E.; and (b) sec. 5, T. 11 N., R. 30 E. (Plate 2). The latter claims are near the Lucky Four mine, which Stager and Tingley (1988) indicate is a tungsten mine on the south side of Gillis Canyon. The mine consists of four shafts, five adits, and several pits and trenches excavated into garnetiferous skarn replacing limestone of the Triassic Luning Formation(?), where the limestone was intruded by Cretaceous quartz monzonite and quartz diorite. The tungsten mineral, scheelite, is disseminated in the skarn (Ross, 1961). With an average grade of 1.5 percent WO_3, the ore shipped from this mine between 1937 and 1956, resulted in production of 800 (20-pound) units of WO_3.

A copper-skarn prospect at Copper Hill has received more exploration attention over the years than any other prospect in this district (Tingley, 1990). At the Copper Hill prospect, quartz veins

containing pyrite, minor chalcopyrite, and trace amounts of silver, lead, zinc, and molybdenum occur in a quartz monzonite pluton and in garnetiferous skarn. Drilling of the prospect indicated large areas of alteration, but discovery of mineable reserves of copper or molybdenum was not reported. Further examination of this property was recommended by USBM (Satkoski et al., 1985). The Cooper Hills prospect is located in secs. 7, 8, 17, and 18, T. 11 N., R. 31 E., about 3 miles east of the MRC.

At two separate properties on the north end of the district, the Red Granite and the Centipede, work has been directed at gold-bearing quartz veins that cut granitic rocks. The Hottentot prospect, lying generally between the Red Granite and Centipede mines, is a contact metamorphosed iron-copper deposit similar to others which occur in a northwest-trending belt that extends toward the Calico Hills. At the Hottentot prospect, magnetite and hematite occur as pods and in bodies of skarn within a fine-grained, silicified, and albitized intrusive, that ranges from gabbro to quartz monzonite in composition. Other minerals present in the Hottentot prospect include pyrite, chalcopyrite, and traces of galena. Based on surface exploration and diamond drilling by several mining companies between 1963 and 1975, the Hottentot prospect is estimated to contain 625,000 tons of ore reserves averaging 46.2 percent iron and 0.1 to 0.15 percent copper (Satkoski et al., 1985). The Hottentot prospect is located about 2 miles south of MRC alternative S5/S6 within sec. 2, T. 12 N., R 30 E.

The Joe Hicks prospect is located on the west side of the Buckley district in sec. 17, T. 12 N, R. 29 E. and about 1 mile east of the MRC. While there was a small amount of production form quartz veins containing copper, gold, and silver, Utterback (2002) does not recommend additional exploration of this prospect as he believes that these types of vein systems hold little potential for containing economic ore deposits. While there are no recorded prospects south of the Joe Hicks prospect, Utterback recommends that mineral exploration in the area south of the prospect may be worthwhile.

5.11 Mount Grant

***Mining District Location*:** The Mount Grant mining district is located in Mineral County and includes within it the historic East Walker, Walker Lake, Cat Creek, and Deseret mining districts (Tingley, 1998). Mount Grant, the highest mountain in the MRC study area, Hawthorne, the largest town in Mineral County, and about half of the Hawthorne Naval Ammunitions Depot are in the southern part of the mining district (Plate 1). The mining district occurs mostly in Tps. 7

through 11 N., Rs. 28 and 29 E., but it also includes small parts of Tps. 7 and 8 N., R. 30 E.; and T. 12 N., R. 28 E. Except for the immediate vicinity of Hawthorne, which is in the Walker Lake Valley, the mining district occurs entirely within the northerly trending Wassuk Range. The district is bordered on the north by the Reese River Canyon, on the east by Walker Lake and Walker Lake Valley, on the south by the north slope of Corey Peak, and on the west by the Lyon County line and the East Walker River valley (Plate 2). Hugging cliffs above Walker Lake, U.S. Highway 95 follows the eastern edge of the mining district north of Hawthorne. The MCS1 alternate connects with existing UPPR tracks on the east side of Walker Valley, 7 miles northeast of the Mount Grant mining district. Existing UPPR tracks on the east side of Walker Lake are about 3 to 6 miles east of the mining district.

***History of Discovery, Exploration, and Mining*:** Discovered in 1865 and organized in 1866, the Mount Grant mining district is known for producing gold, silver, and possibly, molybdenum (Tingley, 1998). Through the 1880s, discoveries of gold and silver apparently took place in the Corey Creek drainage between Corey Peak on the south and Big Indian Mountain on the north (Ross, 1961; Tingley, 1990, 1998). Mines in this area apparently produced small quantities of precious metals (Ross, 1961). For example, the Cory mine, on the South Fork of Corey Canyon, produced $200,000 worth of silver in 1884 and 1885 (Vanderburg, 1937). The mine consisted of several tunnels and shallow shafts. The Big Indian mine, believed to have been located on the east side of Big Indian Mountain in sec. 6, T. 7 N., R. 29 E. produced about $100,000 worth of gold at an unspecified date (Vanderburg, 1937). This mine consisted of several adits and numerous shallow shafts. At some point in time, molybdenite deposits were discovered in Corey Canyon (Vanderburg, 1937), but Schilling (1980) indicates that the molybdenite probably was a secondary mineral present in sub-economic quantities.

As more prospectors arrived in the mining district, they spread out from the discovery site and made other discoveries in other canyons draining the Wassuk Range. Gold and copper ore were found in Cat Canyon, about 7 miles northwest of Hawthorne, in the early 1880s, which led to production of these metals from a mine owned by the Nevada Consolidated Mines and Selling Co. (Ross, 1961).

According to Tingley (1990), the most extensive mining operations in the district are related to gold placer deposits in Laphan Canyon, which drains the southwest slope of Mount Grant. These deposits apparently were worked continuously from 1906 until the middle 1930s and have

been worked intermittently since then. The Grant Mountain placer mine, the first placer mine in the canyon, produced $8,000 worth of gold between 1933 and about 1935 (Ross, 1961).

With the establishment of the Hawthorne Naval Ammunitions Depot in 1927, most of the Mount Grant district popular with miners was closed to mineral entry (Tingley, 1990). However, areas around the Big Indian mine and Laphan Canyon were left outside the boundaries of the munitions depot, and these areas have been prospected ever since. In June 1989, when NBMG personnel visited the Laphan Canyon, no mining activity was observed, but mining equipment was scattered over the length of the canyon, indicating that placer mining was still taking place in this area (Tingley, 1990).

Geologic Description: Most of Mount Grant, from Corey Creek on the south to Cottonwood Creek on the north and from just east of the mountain's summit to its western foothills, is composed of Permian to Cretaceous metamorphic rocks (Stewart et al., 1981c). These rocks consist mostly of dark gray to greenish gray, metamorphosed mafic volcanic rocks and subordinate light-gray rhyolite lava flows and welded ash-flow tuff. The remainder of the Mount Grant district, except for small areas on the western flank of Mount Grant, is underlain by Jurassic and Cretaceous plutons composed mostly of granodiorite and granite (Stewart et al., 1981c). Tertiary andesite lava flows and flow breccias partly cover the lower west flank of Mount Grant.

Mineral and Energy Resource Occurrence: Placer operations in Laphan Canyon are concentrated in a former river channel incised into granitic terrain (Ross, 1961). Relatively coarse gold recovered in many placer operations indicates a possible source in granitic outcrops higher in the same drainage basin as the placer deposits (Tingley, 1990).

All lode mines and prospects in the Mount Grant district are developed on narrow, iron- and copper-oxide-stained, brecciated quartz veins that follow shear zones in granodiorite and, rarely, in metamorphosed volcanic rocks (Tingley, 1990). The wall rock tends to be argillized. These veins, which range from <1 inch to several feet thick, contain small amounts of gold associated with pyrite and, less commonly, chalcopyrite. In general, oxides are more common than sulfides in these veins. Chrysocolla and limonite, respectively, are the most common copper and iron oxides.

5.12 Fitting

Mining District Location: The Fitting mining district as defined by Tingley (1998) includes the southeastern Gillis Range and part of the northern Gabbs Valley Range. The district extends from just west of Ryan Canyon on the west to Nevada Highway 361 on the east, and from the Margin of Soda Spring Valley on the south to the margin of Win Wan Valley on the north. It is located entirely in Mineral County, and is alternately known as Acme, Kincaid, Kinkaid, Ryan Canyon, or Gillis and Gabbs Valley Ranges (Tingley, 1998). The district includes all or parts of T. 8 N., Rs. 32, 33, and 34 E.; T. 9 N., Rs. 30 through 35 E.; and T. 10 N., Rs. 30, 31, and 32 E. (Plate 1). The MCS1 segment of the MRC within about 2 miles of the southern extent of the Fitting district as it traverses northern Soda Spring Valley. The most important commodities of the district include gold, silver, lead, and copper, along with reported occurrences tungsten, iron, uranium, thorium and rare earth elements, barite, montmorillonite clay, andalusite, and corundum (Tingley, 1998).

History of Discovery, Exploration, and Mining: Accounts of the Fitting district indicate only minor historic production. Tingley (1990) reports the discovery of gold mineralization in Ryan, Montreal, and Paymaster Canyons in about 1906. Soon after, the town of Acme was built just south of the Montreal and Paymaster Canyon mines along a railroad siding. When mines in the district quickly proved subeconomic, the area was abandoned (Tingley, 1990). Around 1929, minor andalusite production occurred from the Green Talc mine in the southern Gillis range east of Thorne (Tingley, 1990). Ross (1961) reports apparent additional minor production of aluminous minerals from other parts of the district continuing through the end of World War II. Following World War II, exploration efforts to locate economical iron- and tungsten-bearing skarn deposits and later uranium prospecting resulted in no development or production through 1990 (Tingley, 1990).

Active mining claims closest to the MRC in this district are located in secs. 1, 2, 11, and 12, T. 8 N., R. 32 E. near the Montreal mine and secs. 3, 4, 9, and 10, T. 8 N., R. 33 E. near the Holiday mine area.

Geologic Description: The western part of the district in the Gillis Range is underlain primarily by Triassic or Jurassic intermediate to felsic composition metavolcanic rocks intruded by extensive Cretaceous-age diorite and quartz monzonite plutons (Ross, 1961; Tingley, 1990). The area from Paymaster Canyon to the east slopes of Indian Head Peak are underlain by carbonate

and clastic metasediments and metavolcanics of the Triassic Luning Formation and the Jurassic Dunlap Formation, which are also intruded by Cretaceous-age diorite and quartz monzonite plutons (Ross, 1961). The eastern part of the district in the northern Gabbs Valley Range is underlain primarily by Pliocene-age felsic and intermediate composition welded ash flow tuffs (Ross, 1961; Tingley, 1990).

Mineral and Energy Resource Occurrence: Very minor historic production from the Fitting district has occurred primarily from a variety of small quartz vein/replacement and contact metamorphic deposits, most of which occur along or near contacts of Cretaceous intrusives with older Mesozoic metavolcanic and metasedimentary rocks (Ross, 1961; Tingley, 1990; Hess, 2001). Production of silver, lead, and copper from the Silver King, Montreal, and other mines in the Montreal and Paymaster Canyon area occurred from a series of north northeast-trending quartz and calcite veins in metavolcanic rocks (Tingley, 1990). Barite is also reported in veins in this area (Papke, 1984). At the Hawaiian claim group in Ryan Canyon, gold, silver, iron, copper, and manganese minerals are found along a silicified and locally brecciated Cretaceous quartz monzonite dike intruded into Triassic metavolcanics (Ross, 1961; Tingley, 1990; Hess, 2001). Calc-silicate skarn minerals are also reported in Ryan Canyon (Tingley, 1998).

The historically productive Green Talc and Dover mines east of Ryan Canyon exploited replacement masses of andalusite, corundum, quartz, and other minerals in metavolcanic rocks (Tingley, 1990). Hess (2001) reports minor gold associated with this deposit.

Contact metasomatic iron and tungsten occurrences are present at numerous localities in the district (Ross, 1961; Hess, 2001). Uranium and thorium occurrences are reported along veins in the Montreal Canyon area, and along a fault zone in Cretaceous intrusive quartz monzonite and albitite at the Holiday mine south of Indian Head Peak (Hess, 2001).

West of Ryan Canyon on the south flank of the Gillis Range, Hess (2001) reports a clay deposit with gypsum, jarosite, and carbonates hosted by hydrothermally altered andesite at the Chiatovich Claims.

In the Gabbs Valley Range in the eastern part of the district, Tingley (1990) reports minor iron mineralization along shear zones in rhyolite ash flow tuff, and minor copper mineralization in massive ash flow tuff.

Production: Based on the results of this study, it appears that quantitative information regarding historic mineral production from the Fitting district does not exist. Ross (1961) and Tingley (1990) indicate that total production, while not well-recorded, was likely small. Tingley (1990) indicates unsubstantiated reports of approximately $2 million in gold, silver, and lead from the Montreal and Silver King mines early in the 1900s. Ross (1961), however, reports total gold, silver, lead and copper production prior to 1912 as only $2,000. Elsewhere, the Green Talc mine shipped a few hundred tons of andalusite prior to World War II (Tingley, 1990).

5.13 Santa Fe

***Mining District Location*:** The Santa Fe mining district is located in Mineral County between the towns of Mina on the south and Luning on the north (Plate 1). With Soda Spring Valley between highlands, the district extends from the southern Gabbs Valley Range on the east to the Garfield Hills on the west (Tingley, 1998). The district is located primarily in Tps. 7, 8, and 9 N., Rs. 34, 35, and 36 E. (Plate 1). The mining district is bordered by Stewart Valley on the east; the Pilot Mountains on the south, Nevada Highway 361 and the Garfield Hills west of Black Dyke Mountain on the west, and Highway 361 at Calavada Summit (Santa Fe Pass) on the north. U.S. Highway 95 and segment MCS1 of the MRC cross the mining district on its west side.

The Santa Fe district is so large and diverse geologically and mineralogically that it is divided into four sections for purposes of discussion. These sections, which correspond to claim blocks shown in Plate 2, are:

- Santa Fe-Calavada Summit mines and prospects in secs. 4 through 6, T. 8 N., R. 35 E.; secs. 1 and 3, T.8 N., R. 34 E.; sec. 36, T. 9 N., R. 34 E.; and secs. 28 and 31 through 33, T. 9 N., R. 35 E.
- New York Canyon mines and prospects, in sec. 4, T. 7 N., R. 35 E.; and secs. 33 and 34, T. 9 N., R. 35 E.
- Copper Queen sulfide-porphyry prospect, in sec. 6, T. 7 N., R. 35 E.; and sec. 31, T. 8 N., R. 35 E.
- New Boston-Blue Ribbon mines and prospects, in secs. 7 through 10 and 15 through 17, T. 7 N., R. 34 E.

History of Discovery, Exploration, and Mining: Tingley (1990) reports that ore deposits in the Santa Fe-Calavada Summit area were discovered in 1879. The Santa Fe Mine was excavated underground near Calavada Summit. From 1883 to 1894, it primarily produced silver. From

1900 to 1929, copper-lead deposits containing some silver were mined. The period of greatest activity was during World War I, when high copper prices enabled lessees to work at a profit, and a copper smelter in operation at Wabuska, Nevada, expedited copper production.

Deregulation of the gold price in 1971 stimulated new exploration around old mines in the Santa Fe district. By 1979, two properties were found near the site of the old Santa Fe mine, the Santa Fe-Calavada gold-silver prospect, and the smaller Isabella-Pearl prospect (Tingley, 1990; Long et al., 1998).

After exploration activity to characterize ore reserves on the property, Corona Corp. in 1988 (succeeded by Homestake Mining Co. in 1991) began an open-pit/heap-leach operation to mine the Santa Fe-Calavada prospect (Long et al., 1998). From 1988 to 1995, the Santa Fe-Calavada mine produced 12,657,861 tons of ore containing 356,700 ounces of gold, >721,523 ounces of silver, and an unknown amount of mercury (Long et al., 1998). In 1996, Homestake shut down the mine to reclaim it (Long et al., 1998).

Mines in New York Canyon have a long history of production dating back to 1875 when copper oxide deposits were first discovered in the area (Canyon Copper Corp., accessed 2007). The first recorded production from the district occurred when the Wall Street Copper Company consolidated the Anderson, Champion, Mayflower, New York, Turk, Vacation, and Wall Street Mines. From 1906 to 1929, the Wall Street Copper Company produced an estimated 8.9 million pounds of copper from about 110,000 tons of ore (Canyon Copper Corp., accessed 2007).

From the late 1960s to the mid 1970s, exploration of the New York Canyon area was conducted by several mining companies interested in major porphyry copper deposits (Tingley, 1990). This work defined mineralization in the Longshot Ridge copper oxide zone. Between 1992 and 1997, additional exploration of the New York Canyon property, primarily in the Longshot Ridge area, was conducted by Aberdene Mines Ltd. (Canyon Copper Corp., accessed 2007). Aberdene drilled approximately 181 exploration holes and confirmed significant zones of copper mineralization throughout the Longshot Ridge area.

Claims covering the New York Canyon property lapsed in 1999. New claims were staked and acquired by Nevada Sunrise LLC. Canyon Copper (under its former name, Aberdene Mines) acquired an option on claims held by Nevada Sunrise in March 2004. Canyon Copper has identified several target areas in the vicinity of New York Canyon, but principal interests

reported on its website (accessed 2007) are the Longshot Ridge area and the Copper Queen sulfide-porphyry prospect (discussed below). With the recent staking of 550 mining claims to cover mineral prospects and logistical needs, Canyon Copper now controls 1,003 claims encompassing more than 20,000 acres in the New York Canyon area and reports that they are planning more exploration of this area in 2007.

According to James Fredle (NBMG, accessed 2006, unpublished report in Nevada mining district files), the Copper Queen sulfide-porphyry prospect was discovered about 1923. In that year, C.E. Van Schoik obtained a patent for the Copper Queen #1, Copper Queen #2, and Mildred claims. This prospect is centered on a 224 feet deep vertical mine shaft through fan alluvium on the west flank of the Gabbs Valley Range, contact-metamorphosed skarn, and a quartz porphyry dike. The shaft, which is well-shored with wood, leads down to a sub-horizontal drift. The drift leads to a polymetallic skarn deposit formed by contact metamorphism of Triassic limestone by the quartz porphyry dike. Fredle's report indicates that the shaft formerly was surrounded by a large ore dump that contained abundant blue and green copper oxide minerals (including turquoise), powellite (a secondary molybdenum mineral), and a fluorescent tungsten mineral (scheelite?) in variably fractured and iron -stained quartz porphyry tailings and apparently barren, silicified limestone. The ore dump has been removed since Fredle's report was written, but gravel and cobbles containing chrysocolla and other copper oxide minerals that may have originated from the dump can be found in a road near the shaft. Drilling between 1992 and 1997 confirmed and delimited mineralization in the Copper Queen copper sulfide prospect (Canyon Copper Corp., accessed 2007).

The Boston-Blue Ribbon prospect in the eastern Garfield Hills is a polymetallic skarn with significant tungsten and molybdenum and subordinate copper and silver (Frost, 1984). Major interest has been shown in tungsten and molybdenum occurrences, while minor interest has been shown in copper oxide deposits. Tungsten occurs as scheelite and molybdoscheelite in quartz-garnet-idocrase veins. Molybdenum occurs as molybdenite in quartz veins and in stockwork veinlets in limestone. Tungsten is found near the surface, whereas molybdenum is found much deeper. Supergene chalcocite blankets the area of the Blue Ribbon mine.

Copper oxide deposits were patented in the area of the New Boston-Blue Ribbon prospect in 1906. These deposits, which contain as much as 7 percent copper and small amounts of silver, were found in skarn in the Blue Ribbon mine (Stager and Tingley, 1988). Subsequently,

numerous shallow shafts, pits, and adits were driven to explore for copper-skarn mineralization in the mine (Frost, 1984). Tungsten was not found in the mine until 1950, by which time it had been discovered elsewhere in the area (Stager and Tingley, 1988).

Tungsten was discovered in vein and skarn deposits at the Copper Chief mine in 1943 (Stager and Tingley, 1988). Small quantities of tungsten were produced from World War II through the mid-1950s, as one mine after another discovered tungsten ore in its midst (Stager and Tingley, 1988). The Jeep (New Boston) mine, in the same claim block as the Blue Ribbon mine and about 1 mile east of it, contains scheelite, molybdenite, chalcopyrite, pyrite, and fluorite in calc-silicate veins cutting limestone, argillite, and tuffaceous sedimentary rocks (Stager and Tingley, 1988).

During the 1960s and early 1970s, many of the mines in the east Garfield Hills were explored for porphyry copper and molybdenum potential (Tingley, 1990). Considerable exploration by FRM Minerals and Conoco was done in the New Boston-Blue Ribbon area, but no large ore deposits were found, and these companies withdrew from the area by 1988 (Frost, 1984; Tingley, 1990). Nevada Sunrise LLC now (2007) holds claims to the New Boston (Jeep) and Blue Ribbon mines. Current exploration plans are unknown.

In this district, the alignment crosses numerous active mining claims in T. 7 N., R. 35 E.; T. 8 N., R. 35 E.; and T. 8 N., R. 34 E. (Plate 2). These claims have been staked by a number of different companies and individuals. Based on our studies, the most active mining company in the area appears to be Copper Canyon Corp. Copper Canyon Corp. (formerly Aberdeen Minerals LTD) has acquired mineral rights on claims staked by Nevada Sunrise, LLC. Copper Canyon Corp. has been exploring for copper in this area, and completed borings in 2004 and 2005 (Copper Canyon Corp., 2007). They report that they intend to continue explorations in this area with further drilling, metallurgical testing, and environmental base line studies. The most recent exploratory drilling is occurring on Longshot Ridge, 2 miles east of the alignment. The claims held by Copper Canyon Corp. within 3 miles of the alignment, are within secs. 22, 27, and 34 through 36, T. 8 N., R. 34 E.; and secs. 19 through 20 and 28 through 33, T. 8 N., R. 35 E., Mount Diablo Meridian. The MRC crosses the claim block held by Copper Canyon Corp.

***Geologic Description*:** Three of the four designated mining areas in the Santa Fe district are located at the southern part of the Gabbs Valley Range and the fourth area, the New Boston-Blue

Ribbon prospect, is located in the Garfield Hills. The four areas are discussed together in this section because of similar geology in each area. The following discussion mostly is from Ekren and Byers (1985).

The oldest rocks present in the southern Gabbs Valley Range, from Calavada Summit south to New York Canyon, are laminated to very thickly bedded, light- to dark-gray, black, and brown, finely to coarsely crystalline limestone, dolomitic limestone, and dolomite with subordinate carbonaceous shale, and shale of the Triassic to Jurassic Luning, Gabbs, and Sunrise Formations. The carbonate rocks are diverse and can be locally cherty, sandy, clayey, or ferruginous. Near Calavada Summit, the Luning Formation contains a middle member composed of siltstone and sandstone that have been metamorphosed to phyllite and schist. The Sunrise Formation in the New York Canyon area is overlain conformably by the Jurassic to Cretaceous Dunlap Formation, which consists of sandstone, interbedded with conglomerate and shale, and overlain by tuffaceous sandstone and lava flows and breccias of intermediate composition.

Intrusion of masses of Jurassic diorite and a Cretaceous (70 Ma) quartz monzonite pluton metamorphosed the Triassic and Jurassic sedimentary rocks into white to banded, coarsely crystalline marble, calc-silicate skarn, and argillite, partially or completely destroying original sedimentary textures. Concurrently with the intrusive events and metamorphism, tectonic activity associated with the Sevier Orogeny thrust sedimentary and volcanic rocks over small to large distances from their source areas. Extensive folding, resulting in tight, commonly recumbent folds and overturned stratigraphic sequences accompanied the thrust faulting.

From the Oligocene to the late Miocene epoch, about 36 to 5.5 Ma, silicic (rhyolite to rhyodacite) to intermediate (dacite, latite, and andesite) lava flows, flow breccias, lahars, and nonwelded to welded ash-flow tuffs, with related ash-fall tuffs and volcaniclastic rocks, poured over a landscape of considerable relief. Basin-and Range and younger high-angle faults offset and tilted older rocks, starting in mid-Miocene time.

From Pleistocene to Holocene time, sediments shed from rising mountains accumulated along the flanks of mountains and in syntectonic basins. Fault scarps developed in alluvial fan sediments and an abundance of hot springs indicate that the tectonic forces that shaped the present-day landscape are still active.

***Mineral and Energy Resource Occurrence*:** Although ore deposits in the Santa Fe district typically are associated with igneous-sedimentary contacts and skarn, it is not clear that all of the ore was emplaced with the igneous intrusions. In fact, in some places, such as the Tonopah mining district, evidence clearly indicates that mineralization occurred in middle Miocene time, about 16 to 17 Ma. It is possible that some mineralization is the result of faulting and emplacement of volcanic rocks during the Miocene epoch. The following discussion mostly is taken from, and reflects interpretations by Tingley (1990):

The low-grade gold-silver deposit at the Santa Fe-Calavada mine, in the northeastern part of the district, occurs as sheeted and pipe-like bodies within a 50- to 1,000-foot-wide breccia zone in carbonate rocks of the Triassic Luning Formation. This breccia consists of gray and brown, finely to coarsely crystalline limestone and marble that have been variably argillized, sericitized, dolomitized, and silicified. Economic oxide mineralization occurs only in areas of highly faulted and fractured rock within the breccia. Primary mineralization at this property consisted of native gold, electrum, and probably argentum and associated marcasite, stibnite, cinnabar, and quartz. A later stage of mineralization introduced jasperoid, quartz, and pyrite along with additional gold and silver. During a third stage of mineralization, quartz-pyrite, quartz-calcite, and quartz-barite veins formed. Trace amounts of pyrrhotite, chalcopyrite, and stibiconite are occasionally associated with the precious metals. Anomalous gold and silver values continuously follow the surface trace of the main breccia zone for 4,000 feet, but economic oxide mineralization is confined to areas of highest fracture-fault strand density within the breccia zone (Fiannaca, 1987).

In the New York Canyon area, contact metamorphism and mineralization of Triassic sedimentary rocks occurred in association with emplacement of a Cretaceous quartz monzonite pluton. Metal-bearing skarn deposits formed at the contact between the Luning Formation and the quartz monzonite. Replacement ore deposits formed in thin-bedded limestone of the Gabbs Formation. Primary ore minerals include argentiferous galena, auriferous pyrite, chalcopyrite, and molybdenite, which apparently were mined only during World War I, when copper prices were high (Ferguson et al., 1954). Normally, ore deposits containing secondary copper minerals were mined in the area. These minerals include chrysocolla, malachite, azurite, cuprite, and chalcocite. They occur with other secondary minerals, such as cerussite, powellite, hematite, and limonite, and skarn minerals, such as garnet, diopside, calcite, and hemimorphite.

According to James Fredle (NBMG, accessed 2006, unpublished report in Nevada mining district files), the Copper Queen sulfide-porphyry prospect formed by intrusion of a quartz porphyry dike into limestone, argillite, and shale of the Triassic and Jurassic Volcano Peak Formation (an equivalent of the Gabbs and Sunrise Formations). Heat and fluids from the dike metamorphosed the Mesozoic sedimentary rocks near the intrusive contact to silicified skarn. Adjacent to this contact, blue and green copper oxide minerals, including chrysocolla, malachite, and possibly turquoise, and the molybdenum mineral, powellite, formed in the fractured and oxidized intrusive. Fredle speculated that molybenite, might have formed in deeper parts of the ore body.

At the New Boston-Blue Ribbon prospect in the eastern Garfield Hills, a polymetallic skarn deposit with significant tungsten and molybdenum and lesser copper and silver values has been explored extensively by drilling. Thrust-faulted and folded marble, argillite, and hornfels of the Triassic Pamlico Formation (a variant of the Luning Formation) contain the skarn deposit. Mineralizing fluids probably related to the intrusion of a large Cretaceous quartz monzonite pluton in the Garfield Hills south and west of Black Dyke Mountain rose along limestone-tuff contacts in the Pamlico Formation and replaced the host rocks with ore minerals. Tungsten occurs near the surface as scheelite and molybdoscheelite in quartz-garnet-idocrase veins. Molybdenum occurs deeper in the ore body as molybdenite in veins with or without quartz (Frost, 1984). Copper is present at shallow depths as azurite and malachite in calc-silicate veins and as supergene chalcocite. Blue and green copper minerals, including malachite, were abundant in ore dumps at two of the mines in the Blue Ribbon group when they were visited in November 2006. Scheelite(?) was identified in the dumps.

5.14 Pamlico

Mining District Location: The Pamlico mining district as defined by Tingley (1998) covers the western most part of the Garfield Hills, including the area around Pamlico, Never Sweat, Bromide and McGill Canyons. It is located entirely in Mineral County, in parts of Tps. 7 and 8 N., Rs. 31 and 32 E. (Plate 1). The western part of the district, generally west of a north-south line through the Pamlico townsite, is in the Hawthorne Army Ammunitions Depot, and is closed to mineral entry. The area has been included in the historic Hawthorne, Silver Circle, and Clarendon mining districts, and has also been referred to as the sulfide or sulphide district (Tingley, 1998). The MCS1 segment of the MRC traverses a small part of the district in the

Soda Spring Valley near the Kincaid townsite. The most important commodity of the district is gold, though copper and silver have also been produced. The district also includes significant occurrences of uranium, barite, and iron (Tingley, 1998).

History of Discovery, Exploration, and Mining: Mineralization in the district was likely discovered at some point in the 1870s, though the earliest claim records in the area date from about 1885. The two most important areas in the district include the Pamlico area just to the northeast of lower Never Sweat Canyon, and the La Panta area about 2½ miles to the northeast. The district recorded most of its production from these two areas, primarily in gold, between 1885 and about 1890. The area apparently declined by about 1900, though minor production is reported as late as 1925 from underground workings and mine dumps in previously developed areas, and from newly developed placer areas (Archbold and Paul, 1970). Ross (1961) reports uranium prospecting north of La Panta in the mid 1950s.

Geologic Description: The western Garfield Hills are underlain primarily by a sequence of Permian- to Jurassic-age, complexly folded and metamorphosed volcanic, clastic, and carbonate rocks of the Excelsior, Gold Range, Luning, Gabbs, Sunrise, and possibly Dunlap Formations. The metavolcanic and metasedimentary rocks are locally intruded by Cretaceous quartz monzonite, and unconformably overlain by Tertiary- to Quaternary-age basaltic to rhyolitic rocks. High-angle north to north northwest-trending faults cut the area (Tingley, 1990; Ross, 1961; Archbold and Paul, 1970).

Mineral and Energy Resource Occurrence: According to Archbold and Paul (1970), mineralization in the district occurs in four primary modes:

- Gold-bearing quartz veins in the Excelsior Formation, as at the Pamlico mine area.
- Gold-bearing limonite veins and replacement bodies in limestone of the Luning Formation, as at the La Panta mine area.
- Copper-bearing skarns along the contacts of Cretaceous quartz monzonite and Luning Formation limestone, as at the Gold Bug mine.
- Gold- and argentiferous galena-bearing quartz veins in the Gold Range Formation.

Ross (1961) also reports uranium north of La Panta at the Amalgamated Uranium Co. pit, where carnotite occurs in layers in tuffaceous sandstone underlying a basalt flow. Barite occurs with

quartz and copper mineralization in the northern part of the district at the Crystal mine (Papke, 1984).

According to Archbold and Paul (1970), only partial production figures from the district are available. They estimate that the district has produced between approximately $500,000 and $1 million. Most of the production is in gold and minor silver from the Pamlico and La Panta mines. A small amount of copper was produced from the Gold Bug mine (Archbold and Paul, 1970). Minor barite production (less than 25,000 tons) is reported from the Crystal mine (Papke, 1984).

5.15 Garfield

Mining District Location: The Garfield mining district, as defined by Tingley (1998), includes Mable Mountain in the Garfield Hills of Mineral County, and covers all or parts of Tps. 6 and 7 N., Rs. 33 and 34 E.; and T. 8 N., R. 33 E. (Plate 1). The district covers parts of the historic Clarendon or Silver Circle mining districts. At its nearest point, the MCS1 segment of the MRC passes on the north side of U.S. Highway 95 within a mile of the northern edge of the Garfield district near the Acme townsite in northern Soda Spring Valley. The primary commodities in the district include silver, gold, copper, lead, tungsten and antimony (Tingley, 1998).

History of Discovery, Exploration, and Mining: Silver and gold ore was discovered in the district in 1882. Between the district discovery and the 1890s, significant gold, silver, copper, and lead production occurred from the Bluelight and Garfield mines just south of Mable Mountain. A smelter was built at Sodaville in the 1880s to process ores from the Garfield district (Brown, 2003), and a 10-stamp mill was constructed in 1890 south of the district at Garfield Spring, in part to process ore from the Garfield mine. A second period of significant mining activity occurred in the district after about 1915. Between 1915 and 1917, the Bataan mine and others located in an area about 3 miles southeast of the Garfield mine, produced copper from small skarn deposits. Later, between 1922 and 1940, the Mable mine, just northwest of the Garfield mine, produced significant amounts of silver, gold, and lead. The Bataan mine again became active in the early 1950s when it was mined for tungsten ore. During the late 1980s, Eureka Resources conducted shallow drilling exploration and road construction at the Mindora deposit, located between the Mable and Garfield mines (Tingley, 1990; Century Gold, [n.d.]). Century Gold (n.d.) reports that the property was never developed due to low gold prices in the

1990s, and as of 2003, the area was subsequently located by Nevada Sunrise, LLC and Century Gold. No production is reported from Mindora.

Geologic Description: In the vicinity of the Garfield and Mable mines and the Mindora property, Mable Mountain is underlain primarily by complexly folded and thrust-faulted Triassic metacarbonate and felsic metavolcanic rocks of the Luning Formation. At the Blue Light mine to the southwest, Luning Formation metacorbonate rocks are intruded by Cretaceous- to Tertiary age felsic rocks. The southwest slopes of Mable Mountain are underlain by complexly folded and thrust-faulted, metamorphosed, and interbedded clastics, carbonates, and volcanics of the Jurassic Dunlap Formation which are intruded by small plutons of Cretaceous-age quartz monzonite (Tingley, 1990; Oldow and Steuer, 1985).

Mineral and Energy Resource Occurrence: Silver, gold, and lead were produced from a series of three interconnected quartz veins hosted by Triassic metavolcanics and carbonates at the Garfield mine. At the Mable mine just to the northwest, a complexly faulted, east-west-striking subvertical quartz vein system in Triassic metavolcanics, carbonates, and quartzite carries native silver, lead oxides, and copper minerals. Near the Bataan mine in the southeast part of the district, sheared Jurassic limestone in fault contact with Jurassic quartzite carries values in copper and tungsten in a garnet-diopside skarn. Copper-bearing quartz veins are reported just east of the Bataan mine at a contact between silicified Jurassic conglomerate with Cretaceous granite (Tingley, 1990).

Production: Available figures from the Garfield district are generally not quantitative, are incomplete, and different sources appear to be contradictory. In 1882, the district reported production of 128 tons of ingot copper (Tingley, 1990). During the period between 1882 and 1887 several million dollars of ore shipments (of unspecified commodities) are reported from the district (Tingley, 1990). In the period of production between 1922 and 1940, Tingley (1990) reports $745,000 worth of silver, gold, and lead production from the Mable mine. An unspecified amount of copper and tungsten were produced from the Bataan and other mines between 1915 and 1917, and during 1953 and 1955 (Tingley, 1990). Ross (1961) reports total district production of $1,376,000 between 1884 and 1940. No production is reported from the Mindora property, though NBMG (2004) reports reserves of 1.0 million tons at 0.035 opt gold and 0.241 opt silver.

5.16 Ashby

***Mining District Location*:** The Ashby mining district of Tingley (1998) is located in Mineral County, about 12 miles southeast of Hawthorne, Nevada. Ross (1961) included the Ashby, Pamlico, and Lucky Boy districts of Tingley (1998) in the Hawthorne mining district. The Ashby district includes parts of Tps. 6 and 7 N., Rs. 32 and 33 E. (Plate 1). The district is situated in the Garfield Hills adjacent to Garfield Flat (Plate 2). At its closest, the Ashby district is about 6 miles south of the MCS1 segment of the MRC and U.S. Highway 95.

***History of Discovery, Exploration, and Mining*:** Because the Ashby district commonly is linked in the literature with other mining districts, it is difficult to distinguish information that applies only to the Ashby district from those that pertain to its companion districts. Ross (1961) listed 13 mines and prospects in the Hawthorne mining district, in which he included the Ashby district of Tingley (1998). By comparing Tingley's 1998 map of mining districts in Nevada with topographic and geologic maps, it was possible to place with certainty only four of the mines or groups of mines in the Hawthorne district of Ross (1961) in the Ashby district of Tingley (1998). The Ashby district's mines include the Lowman mine; the Lazy Man mine, the Wamsley mine, and the Rock Cabin mine.

The Lowman mine, in NE¼ sec. 33, T. 7 N., R. 32 E. was excavated about 1932. In that year, 42 tons of ore containing 7 percent lead and an unknown percentage of antimony were produced from the mine (Ross, 1961). The mine was excavated into limestone and volcanic rocks of the Jurassic and Cretaceous Dunlap Formation (Ross, 1961). Workings included a 100 feet long, inclined shaft, a vertical shaft, and a short adit (Ross, 1961).

Ore veins subsequently worked in the Lazy Man mine were discovered in 1933 by George A. Ashby of Hawthorne, Nevada. Between 1934 and 1937, the Lazy Man mine, in the NE¼ of sec. 27, T. 7 N., R. 32 E., produced 9,000 ounces of gold and an unknown amount of silver worth $38,000 (Ross, 1961). The mine was completed in silicified or argillized and sericitized sandstone, conglomerate and volcanic rocks of the Dunlap Formation. Workings consisted of 10 steeply inclined shafts, each ≤200 feet in length (Ross, 1961). According to Peters (2004), the mine was worked until 1941. By 1961, George Ashby had consolidated the Lazy Man mine and contiguous workings into a company called Ashby Gold Mines, Inc., which remained in business until 1963 (Peters, 2004).

The 16 Ashby claims changed hands several times between 1963 and 2003, during which time little mining was done, but exploratory drilling and rock sampling improved knowledge about the extent of mineralization on the claims (Peters, 2004). In 2003, when Fjordland Exploration, Inc., optioned the Ashby claims (now called the Lazy 1-16 claims) from Gerald W. Baughman of Reno, Nevada, it was reported that ore from old mine workings in secs. 22, 26, and 27, T. 7 N., R. 32 E., had gold contents of less than 24 g/t and silver contents of less than 3.4 g/t. Mineralization at the northern end of the old workings could be traced along strike for up to 2,100 feet (Peters, 2004).

It is not known when the Wamsley mine in SE¼ sec. 1, T. 6 N., R. 32 E. began operating. Ross (1961) reported that the mine consisted of two short shafts excavated into sandstone and conglomerate of the Dunlap Formation. The mine produced silver, antimony, and lead for an undetermined period (Ross, 1961).

Very little is known about the Rock Cabin mine, except that it is plotted on topographic and geologic maps of the Garfield Hills in SW¼ sec. 8, T. 6 N., R. 33 E. The mine is located where a Jurassic or Cretaceous diorite intrusive in the upper plate of a thrust fault is at the land surface (Oldow and Steuer, 1985). Tightly folded beds of mudstone, sandstone, conglomerate, and limestone, of Paleozoic or Mesozoic age, which are intruded by a felsic dike, comprise the lower plate of the thrust fault (Oldow and Steuer, 1985). The sedimentary rocks in this tectonic setting could be a host for ore deposits, but it is unknown whether the Rock Cabin mine penetrates the thrust fault. In fact, no information was found about mineralization or workings in the Rock Cabin mine.

Geologic Description: Geologic information in this section mostly is from a geologic map of the Garfield Hills and Garfield Flat by Oldow and Steuer (1985) that includes the eastern half of the Ashby district. Oldest rocks in the district are interbedded mudstone, feldspathic or cherty sandstone, conglomerate, and fine-grained limestone of Mesozoic and (or) Paleozoic age. These sedimentary rocks are overlain by mafic, porphyritic lava flows, flow breccias, and domes(?) of Mesozoic and (or) Paleozoic age. Overlying the volcanic rocks is the Triassic Luning Formation, which consists of interbedded chert-pebble and boulder conglomerate, cherty sandstone, graywacke, and sandy mudstone overlain by thinly to medium-bedded limestone and dolomite with subordinate sandy mudstone. Above the Luning Formation, the Triassic and Jurassic Sunrise and Gabbs Formations consist of interbedded limestone and calcareous

mudstone, which are metamorphosed to marble and hornfels near intrusive contacts. The youngest sedimentary rocks in the area are assigned to the Jurassic and Cretaceous Dunlap Formation, which consists of conglomerate, breccia, gravelly sandstone, and sandstone locally interbedded with sandy mudstone, limestone, or andesite lava flows.

The Permian(?) to Jurassic sedimentary rocks are intruded by Jurassic and Cretaceous gabbro, diorite, quartz monzonite, and undifferentiated granitic rocks. This intrusive activity accompanied thrust faulting and folding that took place during the Sevier Orogeny. Dikes and irregular masses of felsic porphyry probably represent uninterrupted igneous activity from the Cretaceous period to the Eocene epoch. Intercalated andesite and subordinate basalt lava flows and related, columnar jointed plugs are the youngest rocks in the Ashby district. They are believed to correlate with 7.2 Ma basalt flows in the Monte Cristo Range (Stewart et al., 1994) and, thus, are late Miocene in age. Like all other geologic units in the Ashby district, the andesite and basalt flows are offset by high-angle normal faults that developed during the Tertiary period.

***Mineral and Energy Resource Occurrence*:** Mineralization in the Ashby district occurs in quartz-veins cutting silicified, argillized, sericitized, or propylitically altered sedimentary and volcanic rocks of Triassic to Jurassic age. Primary ore minerals divide the deposits into two types.

In the first type, as seen in the Lazy Man mine, quartz-limonite veins, 6 inches to 2 feet wide, contain native gold and pyrite as the primary ore minerals and silver as a minor accessory (Peters, 2004). The mineral containing the silver is unknown. The presence of malachite in ore dumps (Peters, 2004) indicates that copper in the form of oxides or sulfides might be a significant accessory mineral in these deposits.

In the second type of ore deposit, lead and antimony, and not gold, are the primary ore minerals, and silver can be a significant accessory mineral. In the Wamsley mine, argentiferous bindheimite, a lead-antimony oxide, is the primary ore mineral (Ross, 1961; www.mindat.org, accessed 2007). The bindheimite is either disseminated in the veins or occurs as yellow-orange to brown, resinous streaks and lenses in these veins. In the Lowman mine, jamesonite, a lead-antimony-iron-sulfide, occurs below the oxidized zone (Ross, 1961; www.mindat.org, accessed 2007).

5.17 Pilot Mountains

Mining District Location: The Pilot Mountains mining district as defined by Tingley (1998) covers the entirety of the Pilot Mountains, and is bounded by the Bettles-Well Graham Spring road to northwest, the Esmeralda-Mineral County line to the southeast. Monte Cristo Valley and Soda Spring Valley form the northeast and southwest district boundaries, respectively. The district is located entirely in Mineral County. The area has alternately been referred to as the Pilot or Sodaville district, and includes all of the Telephone Canyon and Graham Springs mining districts. The area also includes the southern part of the larger Volcano mining district. At its nearest point, the MCS1 segment of the MRC passes within ¼ mile of the western boundary of the district along the Pilot Mountains range front in the Soda Spring Valley. The most important commodities produced from the district are mercury and tungsten, with minor production or reported occurrences of gold, copper, silver, molybdenum, antimony, turquoise, and montmorillonite (Tingley, 1998).

History of Discovery, Exploration, and Mining: A pre-existing cinnabar prospect pit was discovered by Charles Keough and Thomas Pepper in 1913 as they were chasing lost steers in the central part of the range (Ross, 1961; Hess, 2001). Significant mercury mining in the district continued intermittently at least into the 1950s (Tingley, 1990). In 1916, scheelite-bearing skarn was discovered near Graham Spring on the east slopes of the Pilot Mountains. Tungsten mining in the district occurred intermittently thereafter, continuing at least until 1956. A small gold deposit located near Eddyville on the south slopes of Pilot Peak was discovered and mined in 1932 (Tingley, 1990). Based on the results of this study, it appears that no significant mining has occurred from this district since 1956. Exploration efforts, however, have identified potential tungsten and copper resources in the district. In 1971, exploration by an unknown company identified a significant but marginally economic tungsten deposit with associated values in copper and silver in the eastern Pilot Mountains (Tingley, 1990), and NBMG (2005) reports that Cactus West identified a copper deposit at an unknown location in the district in the mid 1990s.

Between 1913 and 1952, about 5,000 flasks (approximately 380,000 lbs.) of mercury worth up to $600,000 were produced from the Pilot Mountains district (Tingley, 1990; Ross, 1961). Between 1916 and 1956, the district reported production of 24,000 (20-pound) units of WO_3 (Tingley, 1990). Total gold production from mines near Eddyville is unknown, but likely amounts to several thousand dollars (Tingley, 1990). Minor copper, zinc, lead, turquoise, and

bentonite production are also reported from the district (Morrisey, 1968; Ross, 1961; Hess, 2001).

Mosquito Consolidated Gold Mines, Ltd. is currently exploring its Pine Tree Property, located primarily in parts of secs. 7, 8, 17, and 18, T. 6 N., R. 36 E. Accounts of the ongoing exploration program on the Mosquito website, (Mosquito Gold, 2007) describe surface and subsurface geologic mapping, surface sampling, and diamond/downhole hammer drilling activities. Mosquito indicates that they have identified a complex system of three separate deposits at the Pine Tree Property; a copper-bearing skarn system, molybdenum-rhenium porphyry, and a fracture-controlled gold-silver system. A second phase of exploratory drilling and metallurgical work is planned at the site. Access to the site is currently provided via existing gravel roads which join US Highway 95 just north of Mina.

For the purpose of this report, the town of Mina, Nevada, has been included in the Pilot Mountains Mining District. Plate 2 shows a number of mining claims in the vicinity of the town of Mina. All but two of these claims consist of mill site claims, claims staked for non-mining purposes, but to support mining operations on nearby lode or placer claims. They can also be staked for the purpose of constructing and operating a custom mill, a facility that processes ore and mineral under contract for payment. The MRC traverses lands in NE¼ sec. 5 and NW¼ sec. 8, T. 6 N., R. 35 E. that contain active mill site claims. BLM land records indicate the Red Rock Annex, Martinson Mill Site, White Cloud, IERI 27, 28, 33, and 34 mill site claims are located on these tracts. These tracts of land were visited during the field reconnaissance in 2006. No existing structures or other facilities related to mining or mineral processing on the lands in the NE¼ of sec. 5 were observed. Structures and mineral processing equipment on the lands contained in the NW¼ of sec.8 was observed; however, from the condition of equipment and appearance of the structures, it is uncertain if they are currently being utilized in commercial operations. The exact location of these mill site claims in relation to the MRC is not known, they just both occupy land in the quarter sections.

We did observe a structure that appears to be a milling facility located in the SW¼ sec. 5, T. 6 N., R. 35 E., and where activity was observed during the field reconnaissance. This mill may be the property of Silver Reserve Corporation of Oakville, Ontario, Canada which is an exploration stage company in the business of exploring and if feasible, developing their mining claims in Nevada (Silver Resources Corp., 2006). In a recent SEC filing, Silver Resources list assets that

include 29 mill site claims (Red Rock Annex and IERI claims 3 through 34) and a custom milling located near the town of Mina. They state that the mill was used in the past to process ore from various sources to produce "dore" bars. Dore bars are gold and silver bars poured from molten material produced in the final stage of processing ore. Silver Reserve also lists as property numerous mining claims in Mineral and Esmeralda counties including claims located in the Silver Peak, Montezuma, Weepah, Santa Fe, and Klondyke districts, all districts located within the study area.

In addition, the alignment crosses lands contained in sec. 9 and 16, T. 6 N., R. 35 E. that contain lode claims. Theses claims are part of the Genesaret claim block. During the field reconnaissance, we briefly visited this area. No extensive mineral development or exploration activities were observed; however, there are roads and trails in the area. We were not able to find claim posts on the ground, so were unable to observe the location of the claim block with respect to the MRC.

Geologic Description: In the northern part of the range, imbricate sheets of folded Triassic Luning Formation carbonate rocks are thrust over folded thrust sheets of Jurassic Dunlap clastic and volcaniclastic rocks, which in turn are thrust over Permian-age volcanogenic turbidites of the Mina Formation. Thrust fault exposures generally trend east-west (Tingley, 1990; Oldow and Meinwald, 1992). A series of Cretaceous granodiorite-quartz monzonite stocks intrude the older Permian, Triassic, and Jurassic sediments across the central part of the range (Ross, 1961; Tingley, 1990). Miocene volcaniclastic sedimentary rocks are exposed in the southern part of the range, and Pliocene ash-flow tuff is exposed in the north part of the range. Swarms of primarily north to northwest-trending normal and right-lateral faults, likely related to the Walker Lane Belt, cut across all of the rocks in the Pilot Mountains (Ross, 1961; Tingley 1990).

Mineral and Energy Resource Occurrence: Cinnabar occurs primarily along and below the north-dipping Cinnabar Canyon and Lost Steer Thrust faults as fracture fillings, as disseminations in gouge, and as replacement bodies in footwall limestones and silicified limy shales (Tingley, 1990). The economically important tungsten skarn deposits of the district occur in a roughly 1 mile square area on the lower east margin of the Pilot Mountains. Scheelite, the primary ore mineral, occurs in skarns primarily in Triassic Luning limestones within about 100 feet of Cretaceous quartz monzonite stocks and sills (Tingley, 1990). Free gold occurs in a

quartz vein in Triassic Luning Formation volcaniclastic and carbonate rocks in the southern part of the district near Eddyville (Tingley, 1990).

5.18 Crow Springs

Mining District Location: The Crow Springs mining district stretches from the southern end of Cedar Mountain to the northern most extent of the Monte Cristo Range, in northern Esmeralda County. The district is located in parts of Tps. 4 and 5 N., Rs. 38½ and 39 E.; and in T. 6 N., Rs. 38 and 39 E. (Plate 1). The southern tip of the Crow Springs district as defined by Tingley (1998) is approximately 8.5 miles north northwest of the MN2 alternate of the MRC. The Royston District of Tingley (1998), a separate mining district in the Royston Hills East of Crow Springs, is often referred to as the Crow Springs district in literature (Tingley and Smith, 1983). The primary commodities in the district include turquoise, copper, and perlite. The geology present in the Crow Springs District does not extend into the Big Smoky Valley.

History of Discovery, Exploration, and Mining: In 1909, William Petry discovered a turquoise deposit in the SW¼ sec. 33, T. 5 N., R. 39 E. Workings at the location are alternately known as the Blue Friday, Petry, or Crow Springs Mine (Morrisey, 1968). A second turquoise occurrence was discovered by nearby in sec. 33, T. 5 N., R. 39 E. Workings at this occurrence are alternately known as the Marguerite, Star, or Copper Queen Mine.

Albers and Stewart (1972) report that Homestake Mining Co. performed an exploration program for a "disseminated copper deposit" in 1963. The drilling program, performed in sec. 36, T. 5 N., R. 39 E., reportedly did not locate an economic deposit.

A perlite deposit known as the Perlex Mine, located in sec. 5, T. 4 N., R. 39 E., was reportedly mined by the Perlex Products Corp. in 1964 and 1965 (Albers and Stewart, 1972).

Several occurrences of anomalous radiation and associated minor prospects are reported in the southern Cedar Mountains (Garside, 1973), though their exact locations are not known.

Tingley (1998) also lists gold, silver, and lead as commodities in the Crow Springs district, though the locations of associated occurrences was not indicated in available literature.

There are no quantitative accounts of the volume turquoise production from the Crow Springs district, though Morrisey (1968) indicates that production from the Marguerite/Star/Copper

Queen Mine was "...probably not more than $10,000 to $12,000." Figures for perlite production from the Perlex mine were not available.

As of March 2007, there were mining claims on portions of the south part of the Crow Springs mining district and areas to the south, all located in Tps. 4 and 5 N., R. 39 E. (Plate 2), the closest of which are 6 to 7 miles north of MRC alternative MN2.

Geologic Description: The southern part of Cedar Mountain included in the Crow Springs district includes exposures of Permian Mina Formation volcaniclastic rocks and quartzite intruded by Jurassic to Triassic rocks of the Crow Springs Pluton. The Paleozoic rocks are unconformably overlain by and faulted into contact with a sequence of Tertiary ash-flow tuffs and felsic volcaniclastic sediments, and intruded by rhyolitic plugs, dikes and flows. The bedrock geology of the Crow Springs district is not exposed along the MRC.

Mineral and Energy Resource Occurrence: The turquoise of the Crow Springs district reportedly occurs in clay-altered shear zones cutting the Permian sedimentary rocks of the Mina Formation and Jurassic to Triassic quartz monzonites and granodiorites of the Crow Springs Pluton (Morrisey, 1968; Whitebread and John, 1992). Accordingly, it appears that the nearby copper exploration program also apparently targeted the Crow Springs Pluton (Albers and Stewart, 1972; Whitebread and John, 1992). Albers and Stewart (1972) indicate that the Perlex Mine exploited glassy rock along a "selvage zone between a rhyolite and welded tuff."

5.19 Silver Star

Mining District Location: The Silver Star mining district, as defined by Tingley (1998), is located at the eastern end of the Excelsior Mountains in the vicinity of Thunder Mountain and includes Douglas and Silver Dyke Canyons. The area is bordered on the north by Garfield Flat, on the east and south by Soda Spring Valley, and on the west by Moho Mountain. Located entirely in Mineral County, the district covers parts of Tps. 5 and 6 N., R 34 E. (Plate 1). The Silver Star district encompasses all of the smaller Mina and Douglas or Camp Douglas districts. In some reports, it includes the Sodaville district, or is included in the Excelsior, Gold Mountain, Black Mountain, or Marietta districts. The MCS1 segment of the MRC passes within about 3½ miles of the eastern extent of the Silver Spring district. With reported occurrences of uranium, antimony, montmorillonite clay, manganese, and beryllium, the major commodities found in the Silver Star district are tungsten, gold, silver, lead, and copper (Tingley, 1998).

History of Discovery, Exploration, and Mining: Gold- and silver-bearing veins were discovered in the Camp Douglas area in 1893, and in surrounding areas in 1894. Prior to its decline in the 1930s, the Camp Douglas area produced gold and other metals worth an estimated $750,000 to $2 million (Garside, 1979; Tingley, 1990).

In 1915 or 1916, tungsten mineralization was discovered in the Silver Dyke Vein on existing silver claims. The tungsten deposits along the Silver Dyke Vein were mined primarily from 1916 to 1938, but limited production continued until 1945; production resumed from 1951 to 1958, and occurred again in 1972 (Tingley, 1990; Garside, 1979). Mines along the Silver Dyke Vein report produced about 1.0 to 1.3 million pounds of WO_3 (tungsten oxide).

Tingley (1990) reports exploration efforts to locate precious metal deposits in the district prior to 1990. The NBMG (2003, 2004, 2005) reports that Hecla Mining Co. conducted at least one exploratory drilling program on the Sunset claims, an area between the Sunset and Kernick mines in the southwestern part of the district. The drilling, which was performed in agreement with Cimarron Minerals Ltd., the claimholder of the property, was reported to have not found evidence of an economic deposit. No record of subsequent drilling results were found in the literature for these claims.

According to Garside (1979), more than 25,000 tons of montmorillonite clay were produced in the eastern portion of the district prior to the early 1930s. While there are active mining claims in this district, they are more than 2 miles from the MRC and all on the opposite side of U.S. Highway 95.

Geologic Description: The Camp Douglas and Thunder Mountain areas, in the eastern part of the Excelsior Range, are underlain by folded volcaniclastic and volcanic rocks of the Cretaceous-Gold Range Formation. Along the southwestern flank of the district, folded volcaniclastic rocks of the Permian Mina Formation are thrust over the Gold Range Formation. South of Thunder Mountain, the Gold Range and Mina Formations-are intruded by irregular masses and dikes of Cretaceous-diorite, quartz monzonite, quartz monzonite porphyry and granite porphyry. In other areas of the district, Permian and Cretaceous rocks are overlain by Tertiary (Oligocene to Miocene) rhyolite to andesite ash-flow tuffs and shallow intrusive rocks. The contact between the Tertiary volcanic and intrusive rocks with underlying geologic units either is an angular unconformity or a detachment fault. A series of mineralized, west- to northwest-striking,

moderately- to steeply-dipping faults cuts through Permian to Miocene rocks on the flanks of Thunder Mountain.

Mineral and Energy Resource Occurrence: In the vicinity of Camp Douglas and other areas north of Thunder Mountain, gold and silver mineralization occurs primarily in massive quartz veins hosted by Gold Range Formation volcanic and volcaniclastic rocks. The main vein occurs along a west-trending, south-dipping fault zone that is nearly 2 miles long. Mineralization in this vein consists of variable amounts of native gold; iron, copper, lead, and antimony sulfides; and oxidation products of sulfide minerals. In the northernmost part of the Camp Douglas area, native gold-bearing quartz veins are associated with northerly trending sericitized and silicified fault zones in Tertiary volcanic rocks (Tingley, 1990; Garside, 1979).

On the south side of Thunder Mountain, the Silver Dyke Vein extends in a west-northwesterly direction along a nearly 5-mile-long subvertical fault zone. The quartz-adularia vein is up to 200 feet wide. Mines along this vein produced tungsten primarily from scheelite, but they also contain native gold, gold and silver telluride minerals, and copper, molybdenum, and iron sulfide minerals (Garside, 1979; Tingley 1990).

The montmorillonite clay deposits occurring in the eastern part of the district occurs in silicified and argillized rocks in and around a latite dike east of the Kernick mine.

5.20 Sodaville

Mining District Location: The Sodaville mining district, as defined by Tingley (1998), includes a small area of about 2½ square miles extending from the town of Sodaville on the east to the foothills of the Excelsior Range on the west. The district is located entirely within Mineral County, in T. 6 N., R. 35 E. (Plate 1). The name "Sodaville" previously was used for the Pilot Mountains mining district, and the mines in the Sodaville district of Tingley (1998) historically were included in the Silver Star mining district. The MCS1 segment of the MRC passes within a mile of the eastern extent of the Sodaville district. Commodities found in the district include manganese and tungsten (Tingley, 1998).

History of Discovery, Exploration, and Mining: In 1881, Sodaville was established as a station on the Carson and Colorado Railroad. Shortly thereafter, a smelter was constructed at the site to process ore, at least in part, from the Garfield district to the northwest. The Railroad facilities in

the town were moved to nearby Mina in 1905 (Brown, 2003). According to Hess (2001), the tungsten and manganese deposit at the Black Jack mine, the only significant mine in the district, was discovered in 1916. No records of production from the Black Jack mine were found during this study. While there are active mining and millsite claims in the Sodaville district, they are approximately 2 miles away and on the opposite side of the U.S. Highway 95 from the MRC.

Geologic Description: The tungsten and manganese ore body at the Black Jack mine is located in an area underlain by the Permian Mina Formation (Garside, 1979; Speed, 1981). In this area, the Mina Formation consists of interbedded massive chert, mudstone, sandstone, and volcanogenic turbidites. The formation has been disturbed substantially by thrust faults and related folding. The tungsten-manganese ore body probably formed during the Pliocene epoch as a hot springs deposit (Hess, 2001; Shevenell and Garside, 2005).

Mineral and Energy Occurrence: Hess (2001) and Shevenell and Garside (2005) indicate that the tungsten and manganese deposit at the Black Jack mine occurs as a northeast-trending, steeply southeast-dipping vein containing chalcedony, calcite, and gypsum-selenite. The width of the vein ranges up to about 3 feet. The primary ore mineral is tungsten-bearing psilomelane.

5.21 Rhodes Marsh

***Mining District Location*:** The Rhodes Marsh mining district is located in Mineral County, 5 miles northwest of the Esmeralda County line and 5 miles south of Mina, Nevada (Tingley, 1998). The district largely coincides with Rhodes Salt Marsh, primarily in T. 5 N., R. 35 E. (Plate 1). Rhodes Salt Marsh has been known since the 1860s as a source of saline minerals, and part of the area contains patented mining claims (Papke, 1976). The marsh is bordered on its north side by Soda Spring Valley, on its east side by the Pilot Mountains, on its south side by the Candelaria Hills, and on its west and northwest sides by the Excelsior Mountains (Plate 1). U.S. Highway 95 merges with Nevada Highway 360 at Tonopah Junction, in the southwest corner of the mining district. The MCS1 segment of the MRC follows the eastern edge of the mining district (Plate 1).

History of Discovery, Exploration, and Mining: In the early 1860s, Rhodes Marsh, then called Virginia Marsh, was known to contain a variety of saline minerals at or near its surface, including salt (halite), thenardite (sodium sulfate), and borax (most of the discussion in this section is condensed from Papke, 1976). From 1862 to 1869, salt was produced from Rhodes

Marsh, initially for delivery to mills processing ore from the Comstock lode, and later, to mills at Columbus and Belmont, Nevada (Papke, 1976). Soon after borax was discovered at Teels Marsh in October 1872, the borate minerals, ulexite and borax, were found at Rhodes Marsh. By 1874, a company called Rhodes and Wasson was refining borax from ulexite and marketing a ton of borax per day. The Nevada Salt and Borax Co. is known to have produced borax and salt from Rhodes Marsh from 1882 to 1900. Borax produced from 1884 to 1888 was valued at $87,000 (Ross, 1961).

In 1928, interest developed in using mirabilite from Rhodes Marsh as a source of sodium sulfate. Mirabilite is a hydrous form of sodium sulfate that can be dissolved in water and then evaporated under controlled conditions to precipitate sodium sulfate. In 1930, Rhodes Alkali and Chemical Corp. constructed a processing plant at Rhodes Marsh and evaporation ponds from which it was expected that pure sodium sulfate could be recovered. This method proved to be ineffective. Efforts were then made to use naturally occurring sodium sulfate, thenardite, which is present in substantial quantities on the west side of the marsh. In 1932, a former borax mill was converted into a plant capable of producing 150 tons of sodium sulfate per day. Although this plant operated for less than two years after it was built (closing in 1934), at least 20,000 tons of sodium sulfate, valued at $113,000, was produced from the plant (Ross, 1961; Papke, 1976).

No production records after 1934 for any of the minerals at Rhodes Marsh were located. When the marsh was visited in October 2006, piles of white and light-gray borate or sulfate minerals were observed near ruins of a mill in the southwest corner of the marsh. The ruins of another mill were observed near a flowing well and springs in the southeast corner of the marsh. Neither active mining nor evidence of recent exploration activity was observed on the marsh; however, a search of BLM land records shows that there are authorized sodium prospecting permits on lands located 1 to 2 miles east of the MRC.

***Geologic Description*:** Although called a marsh, Rhodes Salt Marsh is actually a seasonally wet playa with a shallow water table (Papke, 1976). The playa is the topographically low point of a ground-water system that receives recharge from precipitation and snowmelt in the Excelsior Mountains, Pilot Mountains, and Candelaria Hills. Groundwater and overland flow from these highlands seep into alluvial fan and basin-fill sediments forming the playa apron. Groundwater discharges from sediments near the center of the playa to springs and flowing wells (shown in the geologic map by Speed, 1981; and observed in October 2006).

Playa sediments in Rhodes Marsh consist largely of montmorillonite clay with a swell ratio of 285 to 415 percent that accumulated with other fine-grained sediments from the erosion of surrounding highlands (Papke, 1970). This clay, which is a Quaternary deposit, is present in commercial quantities (Tingley, 1998). According to Papke (1976), Rhodes Marsh is an unusual playa because of the variety of commercial saline minerals that are known to be present there.

***Mineral and Energy Resource Occurrence*:** Despite exploration of Rhodes Marsh for more than 100 years, the distribution of saline minerals in the playa is not documented well in the literature (Papke, 1976). Halite (sodium chloride or table salt) is the most abundant saline mineral (Papke, 1976). It is omnipresent, but the purest halite occurs in a 1 square-mile area in the center of the playa (in sec. 15, T. 5 N., R. 35 E.), where it is interbedded with playa sediments and forms a surface crust (Papke, 1976). Halite was mined from surface pits in this area (Castor and Ferdock, 2004).

The borate minerals, ulexite and borax, are present in different areas of the playa from each other and the halite (Papke, 1976). Ulexite, which is more abundant than borax, occurs as rounded masses (called "cotton balls") in mud less than 2 feet below the playa surface, primarily on the west and north sides of the central halite area (Papke, 1976; Castor and Ferdock, 2004). Borax is distributed widely as a surface crust, 1 to 3 inches thick in the southern part of the playa and as crystals up to an inch in diameter in mud on the west, southwest, and southeast sides of the central halite area (Papke, 1976). Some ulexite and sodium bicarbonate (trona) occur with borax in an area southeast of the halite (Papke, 1976; Castor and Ferdock, 2004).

Thenardite lenses up to 5 feet thick occur mainly in a band that encircles most of the central halite area (Papke, 1976). The thenardite occurs as solid, transparent masses resembling ice (Papke, 1976) and as orange-brown crystals up to 3.5 inches long and 2 inches in diameter (Castor and Ferdock, 2004). The thenardite occurs beneath salt and silt layers. Mirabilite is found as disseminated crystals in a 13- to 16-foot-thick bed beneath the thenardite (Castor and Ferdock, 2004).

5.22 Candelaria

***Mining District Location*:** The Candelaria mining district is located in the Candelaria Hills, which are mostly in Mineral County and marginally in Esmeralda County (Tingley, 1998). The mining district comprises portions of Tps. 3 and 4 N., Rs. 34, 35, and 36 E.; and small portions

of T. 5 N., Rs. 34 and 35 E. (Plate 1). Physically, the Candelaria district is bordered on the north by Rhodes Marsh, on the east by the Rock Hill mining district, on the south by Columbus Marsh and the Black Horse mining district, and on the west by Nevada Highway 360.

***History of Discovery, Exploration, and Mining*:** Silver-bearing veins were discovered by Spanish prospectors in the Candelaria Hills in May 1863 (Tingley, 1990). The Columbus mining later adopted the name of the mining camp, Candelaria, grew up around the mines and was organized in 1864 (Garside and Bonham, 1984). Mining on a large scale did not begin until 1873, when the Northern Belle Company (named after one of the district's first and largest mines) constructed a 20-stamp mill at Belleville, 8 miles west of the mines (Tingley, 1990). With the completion of a second 20-stamp mill, the Northern Belle mine was able to produce enough silver to earn 1 million dollars annually from 1875 to 1885 (Tingley, 1990). Production began to decline in 1892, revived in 1916 and 1923, and was non-existent by the 1960s (Tingley, 1990).

In 1980, Candelaria Partners consolidated 47 patented and 256 unpatented mining claims and began mining from the land surface a thick oxidized zone developed on top of ore deposits formerly mined underground (Garside and Bonham, 1984; Tingley, 1990; InfoMine, accessed 2006). The new open-pit mine was named the Candelaria (silver) mine, and it was regarded as a highly successful operation (Garside and Bonham, 1984; Long et al., 1998). Kinross Gold Resources bought the mine between 1984 and 1990 (Long et al., 1998; InfoMine, accessed 2006). Indicated reserves of precious metals were 0.045 million ounces of gold and 82.8 million ounces of silver in May 2004. Kinross began closing down the Candelaria mine in November 1990 and sold it to Silver Standard Resources, of Vancouver, B.C., Canada, in 2005 (InfoMine, accessed 2006). The Candaleria Mine and associated claims are mostly located in Tps. 3 and 4 N., R. 35 E. about 5 miles east of the MRC.

From 1873 to 1996, the Candelaria mining district produced 31,245,000 tons of ore containing 167,200 ounces of gold, 63,716,000 ounces of silver, 72,000 pounds of copper, 4,158,000 pounds of lead, and 2,258,000 pounds of zinc (Long et al., 1998). In addition to having been a major silver producing district, as much as 125,000 tons of barite was produced form the district in the late 1970s and early 1980s (Papke, 1984; Tingley, 1990). Three mines about 8 miles southwest of the Candelaria town site produced barite from replacement deposits in bedded chert

of the Ordovician Palmetto Formation and limestone of the Triassic Luning Formation (Tingley, 1990).

Geologic Description: Formations in the Candelaria mining district range in age from Late Proterozoic to Pliocene (Speed and Cogbill, 1979; Stewart, 1979; Robinson and Stewart, 1984). The oldest rocks in the district are laminated to very thinly bedded, metamorphosed sedimentary rocks of the Late Proterozoic to Ordovician Campito, Poleta, Harkless, and Palmetto Formations (Stewart, 1979). These rocks consist of light- to dark-gray, greenish-gray, and pale-orange shale, phyllite, siliceous hornfels, calc-silicate hornfels, chert, limestone, and marble. They are overlain unconformably by structurally contorted, laminated to very thinly bedded, Devonian limestone, sandy limestone, chert, siltstone, shale, quartzite, and siliceous hornfels (Stewart, 1979).

Sandstone, gravelly sandstone, and conglomerate of the Permian Diablo Formation, and siltstone and mudstone of the Lower Triassic Candelaria Formation unconformably overlie the Late Proterozoic to middle Paleozoic rocks (Moller, 1987). The Pickhandle Gulch complex, of undetermined age and provenance, was emplaced by thrust faults into the area during the lower Triassic Sonoman orogeny (Moller, 1987). The Pickhandle Gulch complex, which Ferguson et al. (1954) interpreted to be the Excelsior Formation, consists of serpentine, mafic volcanic rocks, and tectonically intercalated sedimentary rocks. Cretaceous (?) dikes and sills selectively intrude the Triassic Candelaria Formation along formation contacts and thrust faults (Moller, 1987).

Episodic deposition of tuffs and lava flows began in the Candelaria district during the middle Oligocene epoch, about 27 million years ago (Speed and Cogbill, 1979; Robinson and Stewart, 1984). These middle Oligocene rocks, which are <330 feet thick, consist of ash-flow tuff intercalated with basalt flows and volcaniclastic rocks. The middle Oligocene volcanic rocks are overlain by ash-flow tuffs of the late Oligocene to early Miocene (25 to 22 Ma) Candelaria Hills sequence. The Candelaria Hills sequence consists of white, gray, yellowish-gray, brown, reddish-brown, red, orange, and salmon-pink, vitric to devitrified, nonwelded to densely welded ash-flow tuff sheets, which vary considerably in contents of phenocrysts, pumice shards, obsidian flakes, and lithic fragments. Most of the tuffs contain intervals of basal vitrophyre. The Candelaria Hills sequence, which is about 700 to 1,000 feet thick, is intercalated with basalt lava flows, andesitic lahars, and tuffaceous sedimentary rocks.

Early to middle Miocene (17.4 to 15.7 Ma) andesite, which Ferguson and others (1954) correlated with the Gilbert Andesite, unconformably overlies the Candelaria Hills sequence and is ≤700 feet thick. Ferguson and others (1954) described this geologic unit as andesite lava flows grading laterally to basalt and intercalated with andesitic breccia and agglomerate.

Late Miocene (7.3 to 5.7 Ma) fluvial and lacustrine sediments consisting of poorly to well-indurated shale, siltstone, sandstone, gravelly sandstone, conglomerate, marl, limestone, and diatomite, which are intercalated locally with nonwelded ash-flow tuff, crop out between Tonopah Junction and Redlich Summit, north of the Candelaria district. Where these sedimentary rocks crop out in and near the town of Basalt, south of the Candelaria district, GREFCO Minerals, Inc. has been mining diatomite since 1944 (Albers and Stewart, 1972).

As shown by Stewart (1979), thrust faults associated with the Lower Triassic Sonoman orogeny have disturbed the Paleozoic rocks at several places in the Candelaria district, but this disturbance also created a broad shear zone parallel to bedding in the lower part of the Candelaria Formation that influenced ore deposition (Moller, 1987). Probably after the onset of Basin-and-Range tectonics, a series of east-northeasterly trending, high-angle, normal faults offset all stratigraphic units and the Mesozoic thrust faults in the Candelaria district (Stewart, 1979).

***Mineral and Energy Resource Occurrence*:** Mineralization in the Candelaria mine is confined to the Candelaria shear zone in the lower part of the Candelaria Formation (Moller, 1987; Tingley, 1990). The zone of oxidation in this mine extends to a depth of 1,500 feet below the land surface (Garside and Bonham, 1984). Where the rocks are not oxidized, abundant veinlets of quartz containing disseminated pyrite, sphalerite, and galena occur within calcareous, silty mudstone; oxidized ore typically contains iron and manganese oxide minerals with very finely disseminated silver (Garside and Bonham, 1984; Tingley, 1990). Elsewhere in the district, where the rock has been dolomitized, sphalerite, arsenopyrite, and chalcopyrite occur in unoxidized ore; anglesite, cerussite, smithsonite, and bindhelmite occur in oxidized ore; and dolomite and rhodochrosite occur with quartz as gangue minerals (Garside and Bonham, 1984).

Ore deposits in the Candelaria Formation contain anomalously high values of lead, zinc, copper, antimony, and arsenic. Silver to gold ratios in this ore are about 400:1 (Tingley, 1990).

About 25 percent of the ore from the Candelaria mine is found in serpentine and mafic volcanic rocks of the Pickhandle Gulch complex (Tingley, 1990). This ore has a slightly lower silver to gold ratio than ore in the Candelaria Formation (Moller, 1987).

5.23 Gilbert

Mining District Location: The Gilbert mining district as defined by Tingley (1998) covers the eastern half of the Monte Cristo Range, and is located entirely within Esmeralda County. The district is alternately known as the Desert mining district and the Castle Rock mining district. Big Smoky Valley forms the approximate south and east boundary of the Gilbert district. At its nearest point in Big Smoky Valley, the MN2 alternate of the MRC passes within approximately 1.5 miles of the southeastern corner of the Gilbert mining district as defined by Tingley (1998). The primary commodities in the district include gold, silver, mercury, copper, lead, antimony, and turquoise.

History of Discovery, Exploration, and Mining: Tingley and Smith (1983) describe the early history of the Gilbert mining district:

> Little is known about the early history of the district, but it was prospected in the late 1800s and the Carrie Mine had been developed by 1880. The district's only recorded boom occurred in 1924 when the Gilbert brothers discovered high grade gold ore on the Last Hope Claims. The district was then extensively prospected but with little recorded results. The Castle Rock Mine produced one flask of mercury in 1928.

Tingley and Smith (1983) also indicate three additional periods of exploration drilling at unspecified locations in the district, occurring during 1943, during the early 1970s, and during 1981 to 1982.

A small open pit gold mine operated in the McLean Lode in the northern part of the district near the townsite of Gilbert during 1988-1989. Since 1989, several companies have conducted exploratory drilling of more than 300 holes in the area around the Gilbert townsite in an attempt to locate an extension of the McLean Lode. As of February 2006, the Gold Summit Corporation holds 214 unpatented lode claims in the district covering approximately 7 square miles. Gold Summit is also conducting exploration in the southern part of the district near Ohio Camp. As of late 2006, BLM records indicate that there are both a Notice of Intent and a Plan of Operation in

the Gilbert townsite area, as well an in the area of the Ohio Camp exploration. Except near the Boss Mine, most of the active mining claims in the Gilbert district are at least 3 miles from the MRC.

In the southeastern most corner of the district within a few miles of the MN2 alternate of the MRC, exploration drilling since 1982 has identified four gold prospects, one of which has been mined. The Boss Mine, an open pit-heap leach gold mine located approximately in NW¼ sec. 31, T. 3 N., R. 39 E., operated between 1987 and 1989 (Brown, 2003). Two other prospects are defined in this immediate area, the Black Rock Prospect, and the Berg Prospect. Brown (2003) also describes drilling efforts to the northwest of the Black Rock Prospect at the Castle Prospect during the early 1990s.

In 1999, Platoro West, Inc. acquired mineral rights to the Boss, Black Rock, Berg, and Castle properties. Later, in 2000, Seabridge Gold, Inc. entered into a mining lease agreement with Platoro to obtain a 100 percent interest in the properties. As of late 2006, a claim block and a pending Plan of Operation for the Boss Mine are located in T. 3 N., Rs. 38½ and 39 E. (Plate 2). Geographically, the holdings extend from the southwest edge of the Gilbert district across U.S. 6 to MRC alternative MN2 in sec. 32, T. 3 N., R. 39 E.

Early production figures for the Gilbert district are unclear. Prior to 1960, the total recorded production from the Gilbert district is listed at 4,465 tons or approximately $100,000 (Tingley and Smith, 1983; Albers and Stewart, 1972). A majority of this early production is from gold (Tingley and Smith, 1983). This figure also includes 1 flask of mercury produced from the Castle Rock Mine. Morrisey (1968) indicates production of approximately $300,000 from the Carrie Mine. It is unclear if this figure includes only turquoise production, or if it also includes silver and lead produced from the mine. The Boss Mine open pit operation in the southeast corner of the district reportedly produced 32,000 ounces of gold from 650,000 tons of ore between 1987 and 1989 (Brown, 2003). The open pit operation southwest of the Gilbert townsite produced 27,000 ounces of Gold between 1988 and 1989.

Geologic Description: A majority of the Gilbert district is underlain by Miocene andesitic flow rocks and breccias of the Gilbert Andesite, Miocene sedimentary rocks (including the Esmeralda or Silver Peak Formations in the south and sedimentary rocks of McLeans elsewhere), and local exposures of Miocene ash-flow tuffs of the Blair Junction Sequence. The Oligocene to Miocene

age Tuff of Castle Peak is also commonly exposed throughout the district. Below the Tertiary volcanic and sedimentary rocks, small exposures of Cambrian to Devonian age siliceous, carbonate, and volcanic rocks of the Roberts Mountain allochton (sometimes considered to be the Ordovician Palmetto Formation) are locally present. These Paleozoic sedimentary rocks are locally intruded with dikes and small plutons of Late Jurassic and Early Cretaceous granitoid rocks, most notably about 1 mile south of the Gilbert townsite (Stewart, et al., 1994; Tingley and Smith et al., 1983). The district is located along the Central Walker Lane belt. A series of discontinuous, northeast- to north-trending normal faults cut exposures on the south and east boundaries of the district, and north to north northwest-trending normal faults generally cut exposures in the northwestern part of the district (Brown, 2003, Stewart, et al., 1994).

In the area of the Boss Mine, Berg, Castle, and Black Rock prospects on the southeast margin of the district, a thin veneer of Quaternary gravel and alluvial fan deposits overlie bedrock deposits, which consist of Miocene andesite flows and rhyolite tuffs and intrusives underlain by Ordovician Palmetto Formation limey shale and chert (Seabridge Gold, 2006).

In late 1997, Marshall Oil Company drilled a dry oil exploration hole, Federal Jake No. 1, just to the southeast of the Gilbert mining district (see Section 5.47.1 of this report).

Mineral and Energy Resource Occurrence: Tingley and Smith (1983) recognize two periods of mineralization in the Gilbert district. The earlier system is a quartz vein and skarn system that developed at depth during the intrusion of the Jurassic to Cretaceous-age plutons into limestones in the Paleozoic sequence. The only significant mineralization of this type in the Gilbert district is the silver-antimony deposit at the Carrie Mine, where copper, zinc, lead, molybdenum, and silver-bearing sulfides and turquoise are present (Tingley and Smith, 1983, Morrisey, 1968).

A majority of the productive mineralization in the Gilbert District is associated with a later system of gold-bearing quartz and calcite stockworks and veins hosted in brecciated Tertiary extrusives and Paleozoic sedimentary rocks. Elemental gold is the primary ore mineral, with accessory silver chlorides and sulfides. This type of mineralization is present at the Black Rock area mines and prospects, and at a series of deposits and occurrences roughly defining a lineament extending from the McLean Lode near the Gilbert townsite to the Castle Rock Mine at the southwestern corner of the district.

5.24 Tonopah

Mining District Location: The Tonopah mining district is located at the southern end of the San Antonio Mountains (Plate 1). The district is located partly in Esmeralda County and partly in Nye County. At least 95 percent of the historical production came from a zone that is one mile long in an east-west direction, 1,200 feet wide in a north-south direction, and up to 2,000 feet deep (Bonham and Garside, 1974; Strachan, 2005). Most of the mining in this district occurred directly beneath the town of Tonopah. Current mineral exploration seems to be mostly centered on the King Tonopah vein system located within secs. 25 and 26, T. 3 N., R. 42 E., which is about 1 mile north of the most historically productive limits of the central Tonopah mines.

History of Discovery, Exploration, and Mining: The Tonopah mining district was discovered by James L. (Jim) Butler in 1900 and was worked by lessees until 1902, when Butler and his associates, Tasker L. Oddie and Wils Brougher, sold their mining properties to the Tonopah Mining Co. (Bonham and Garside, 1974). The listing of the mining company on the San Francisco Mining Exchange in April 1903, the completion of a railroad to Tonopah in June 1904, and the construction of a cyanide mill in 1906 stimulated mining activity in the Tonopah area and transformed the mining camp into a town. The mines produced steadily from 1910 to 1930, although production reached its zenith in 1918. Tonopah withstood the Great Depression, but annual production, which peaked at 9.3 million dollars in 1918, never again exceeded 1 million dollars after 1934 (Bonham and Garside, 1974). No production from the Tonopah mining district has been reported since 1961 (Brown, 2003).

Exploration activities to extend the life of the Tonopah district started as soon as production began to wane. Between 1947 and 1950, Calumet & Hecla and American Smelting and Refining Co. explored the district. Calumet & Hecla, following recommendations by Nolan (1935), concentrated its exploration in the vicinity of the 650 feet deep King Tonopah shaft, which was completed in the northern Tonopah district in 1905. Drilling by Calumet & Hecla found economic concentrations of gold (0.058 to 0.119 opt) and silver (5.3 to 22.7 opt) in two veins, the King Tonopah vein and the overlying Q vein, which intersect the King of Tonopah shaft (Strachan, 2005).

Operating on a lease from Calumet & Hecla, Summit King and Homestake Mining Cos. refurbished the King Tonopah shaft to the 300 Level, and drove a cross-cut 900 feet to the north in 1952 (Strachan, 2005). In April, 1952, Summit King-Homestake encountered "high grade"

argentite-pyrargyrite (silver minerals) in the King Tonopah vein. Despite finding and extracting about 15,000 tons of ore averaging about 0.3 opt gold and 30 opt silver, Summit King-Homestake did not develop the Q vein, and returned their lease to Calumet & Hecla in July 1954 (Strachan, 2005).

The last reported attempt to fully develop the King Tonopah vein occurred in 1958 and 1959, when the directors of U.S. Milling and Minerals formed the Tonopah King Mining Company and leased the King Tonopah mine and surrounding claims (Strachan, 2005). The company made periodic shipments of ore from 1958 to 1962, but it closed its mill after a series of fatal accidents. The King Tonopah shaft and headframe burned in the late 1960s. In 1969, Summa Corporation (Summa) consolidated ownership of most patented and unpatented mining claims within the Tonopah mining district (Brown, 2003).

Houston Oil and Minerals (Houston) acquired all of Summa's Nevada mineral properties in 1977. Houston mapped geology in the Tonopah district, conducted dump sampling and geochemical surveys, and drilled 13 core holes (Strachan, 2005). This exploration program discovered extensions of the King Tonopah and Q veins and found six new vein systems assaying up to 0.295 ounces per ton of gold and 16.3 ounces per ton of silver. Houston was purchased by Tenneco Inc. in 1979, before it could implement plans for mineral development in the Tonopah district. Tenneco did not do additional work following Houston's discoveries in the district (Strachan, 2005).

From 1901 through the mid-1950s, the central Tonopah mining district produced 1,861,200 ounces of gold and 174,152,628 ounces of silver, which in 2006 would have been worth $2,070,000,000 (Strachan, 2005).

Tonogold Resources, Inc., of La Jolla Califiifornia currently holds 73 unpatented mining claims, covering 1,460 acres in the northern Tonopah district, claims to the Tonopah Divide mine, and claims to other property in the Tonopah district. Tonogold reports that they intend to implement a two-phase exploration and drilling program to define a resource in the northern Tonopah district that is similar in size and grade to that in the central Tonopah District. Phase 1 goals include: (a) acquisition of small properties around current holdings; (b) compilation of all data from mapping, drilling, and surface prospecting; and (c) rehabilitation of the King Tonopah

workings. Phase 2 exploration and development will depend partly on what is learned during phase 1.

Vista Gold Corp. (2007) reports that it has acquired the Three Hills precious metal project located to the west side of Tonopah. Little information about this project is provided on their website other than a resource consistiong of 133,000 oz gold contained in 26,036,000 tons.

Geologic Description: The Tonopah mining district is underlain by Oligocene to early Miocene rhyolite to andesite lava flows, volcanic and sedimentary breccias, and variably welded ash-flow tuffs (geology mostly from Bonham and Garside, 1979; Strachan, 2005). Principal geologic units include the Tonopah Formation, Mizpah Formation, and Fraction Tuff.

The lower member of the Oligocene Tonopah Formation consists of orange, pink, gray, yellow, and white, lithic, welded, rhyolite ash-flow tuff and volcaniclastic siltstone and sandstone. Hydrothermal alteration in sparse surface exposures tends to be pervasive. Original minerals in the altered rocks have been replaced completely by mixtures of quartz, sericite, adularia, chlorite, albite, and calcite.

The upper member of the Tonopah Formation consists of yellow to white, flow-banded, fine-grained rhyolite lava flows and plugs. Hydrothermal alteration in sparse surface exposures tends to be pervasive. Original minerals in the altered rocks have been replaced completely by mixtures of quartz, sericite, potassium feldspar, albite, and pyrite, with hematite and goethite from oxidized pyrite coating fracture surfaces. The total thickness of the upper and lower members is 1,000 feet.

The Early Miocene Mizpah Formation consists of purplish-brown to black, porphyritic (plagioclase, biotite, and hornblende phenocrysts), andesite to rhyodacite lava flows, flow breccias, and lahars, with minor dikes and plugs. In the center of the district, original minerals in the hydrothermally altered rocks have been replaced completely by quartz, sericite, and adularia. This alteration grades outward to a propylitic assemblage of chlorite, calcite, epidote, and pyrite.

The early Miocene Fraction Tuff consists of light-gray, pinkish-gray, and brownish-gray, lithic- and pumice-shard-rich, moderately crystal-rich (quartz, plagioclase, and potassium feldspar phenocrysts in a vitric groundmass), nonwelded to densely welded, rhyolite to rhyodacite ash-flow tuff, with intervals of vitrophyre, volcaniclastic conglomerate, breccia, sandstone, and

siltstone. Near mineralized fractures and faults, the Fraction Tuff generally is hydrothermally altered to a greenish-gray, orange-gray, and light-gray to white mixture of quartz, sericite, adularia, and pyrite. Alteration grades outwardly to a propylitic assemblage of chlorite, albite, illite, montmorillonite, quartz, and calcite. The Fraction Tuff is estimated to be >600 feet thick.

The Oligocene to early Miocene geologic units are overlain by sedimentary and pyroclastic rocks of the middle Miocene Siebert Formation, are intruded by dikes, plugs, and domes of the middle Miocene Oddie and Brougher Rhyolites, and are faulted extensively. Nearly all of these geologic units are slightly to strongly altered near major faults as a result of mineralizing fluids emanating from the faults. An easterly striking, low-angle fault system related to the Tonopah Fault is hypothesized in the vicinity of the King Tonopah mine on the basis of mapped faults and mineral veins in the area of the mine (Strachan, 2005). Post-mineralization, northwest- to northeast-striking, steeply dipping faults, including the prominent Halifax Fault, displace extensions of the Tonopah Fault system several hundred feet down to the east and west.

***Mineral and Energy Resource Occurrence*:** The ore in the Tonopah mining district occurs in veins that cut Tertiary volcanic rocks ranging in composition from dacite to rhyolite (Brown, 2003). These veins are composed mostly of quartz, but they also contain varying amounts of sericite, adularia, pyrite, and rhodochrosite. High-grade minerals in the veins include argentite, polybasite, pyrargyrite, electrum, sphalerite, galena, and chalcopyrite. Volcanic rocks adjacent to the veins are altered to quartz, sericite, and adularia. This zone of potassium-silicate alteration grades outward to argillic alteration consisting of kaolinite, halloysite, sericite, and montmorillonite. Rocks in the outermost zone of alteration are propylitized.

The ore contained in a 650 feet thick zone is controlled by several sets of high-angle and low-angle, pre-mineralization faults (Brown, 2003). The ore bodies in the Tonopah District reach their highest altitude in the central part of the mining district, which is the only place in the district that they are exposed at the land surface. Exposed ore bodies are oxidized to an average depth of 100 feet, although some deeper oxidation occurs locally along faults that cut the ore bodies. Silver to gold ratios in oxidized ore are essentially the same as those in unoxidized ore, which indicates that relatively little supergene migration (enrichment) of silver or gold occurred.

The age of the bonanza silver-gold mineralization in the Tonopah mining district is well-constrained by K-Ar dating of pre-mineralization and post-mineralization rocks and

hydrothermal vein minerals as 18 to 19 Ma (Bonham and Garside, 1979). However, younger hydrothermal alteration and lower grade gold and silver mineralization occurred in the intrusive Oddie Rhyolite and in tuffaceous sedimentary rocks of the Siebert Formation that are exposed on Mount Oddie and Ararat Mountain, about ½ mile southeast of the King Tonopah shaft. These younger ore deposits have higher gold to silver ratios than the main-stage ore deposits. Very little ore has been produced to date from rocks mineralized in this later period of hydrothermal activity.

5.25 Rock Hill

***Mining District Location*:** The Rock Hill mining district is located mostly in Esmeralda County with a small portion in Mineral County in Tps. 3 and 4 N., R. 36 E. (Plate 1). The district, 8 to 14 miles northwest of Coaldale, Nevada, extends from Rock Hill, on the south, to Redlich Summit, on the north. The district is on the southeast side of the Candelaria Hills; it is bordered on the north by the Rhodes Salt Marsh basin, on the east by the Monte Cristo Range, on the south by Columbus Salt Marsh, and on the west by the main part of the Candelaria Hills, which coincides with the Candelaria mining district (Tingley and Smith, 1983). U.S. Highway 95 and the MCS-1 segment of the MRC cross from southeast to northwest through the Redlich claim block in the northern part of the Rock Hill district. This claim block is held by Miranda Gold Corp., of Vancouver, British Columbia, Canada, and it is actively being explored (NBMG, 2004; U.S. Department of Interior, LR2000 database, accessed 2007). The Rock Hill mine is 1.4 miles southwest of MCS-1 Station 3900+00.

***History of Discovery, Exploration, and Mining*:** The early history of the Rock Hill mining district probably is related to that of the adjacent Candelaria mining district. Silver-bearing veins were discovered by Spanish prospectors in the Candelaria Hills in May 1863 (Tingley, 1990). The Candelaria mining district (originally called the Columbia mining district) was organized in 1864 (Garside and Bonham, 1984), and in 2006, it was still producing ore from large reserves (Tingley, 1990).

The Rock Hill district is characterized by intermittent exploration with little or no production from mining ventures (Tingley and Smith, 1983). Workings that still existed in 1977 around the Broken Toe mine appear to indicate that mining took place in the district from 1930 to 1950, although nothing is known about these mines (Tingley and Smith, 1983). The Boak (Iron King)

mine produced a few tons of iron ore in 1952 and then shut down because of the low grade of the deposit (Tingley and Smith, 1983).

The area around the Rock Hill and Broken Toe mines was explored from about 1962 to 1982 by several mining companies using drilling and surface methods (Tingley and Smith, 1983). Several reports from this period indicate that the hectic exploration, particularly from 1977 to 1982, left behind numerous bulldozer cuts, trenches, prospect pits, and drill pads along the trace of a northeast-trending fault zone (NBMG, unpublished mining district files, accessed 2006).

The Rock Hill mine was excavated into silicified limestone skarn along the fault-influenced exploration trend in the district (NBMG, unpublished mining district files, accessed 2006). The Rock Hill mine, on 13 unpatented lode claims, consists of a 20-foot-deep shaft, a 30-foot-long adit, and placer excavations downslope from the shaft. The mine produced about 200 (20-pound) units of tungsten in 1958 and from 1972 to 1979 by lode and placer methods (Tingley and Smith, 1983). Personnel interviewed as part of this study at the Tonopah and Carson City District offices of the BLM did not know of any plans to restart operations in the vicinity of the mine. The Rock Hill mine was blocked by a fence and locked gates in December 2006.

Current exploration activities in the Rock Hill district are focused on 122 lode claims near Redlich Summit, that are held by Miranda Gold Corp. (Goodall, 2004; Miranda Gold Corporation, unpublished status report on the Redlich project, accessed 2006). The Redlich claims seem to have many of the indicators of gold mineralization. Exploration targets have been chosen with these indicators in mind. In the northeast corner of the property, an area of Tertiary fanglomerate with an unusually large amount of cobble- to boulder-sized clasts of banded, crustiform quartz is being drilled extensively, as banded quartz veins are often associated with low sulfidation epithermal gold deposits. Relying on known associations of quartz-adularia-pyrite-chalcopyrite-sericite veins with gold, exploration is being done in areas where veins of this type cut lower Paleozoic sedimentary rocks and Miocene volcanic rocks. Silicified limestone adjacent to these veins also is being explored. Because zones of steam-heated, acid-sulfate alteration are associated with gold mineralization, northerly and northwesterly trending magnetic lows coincident with zones of steam-heated alteration have been drilled in the district and were found to contain anomously large gold concentrations. A fault which thrust Triassic rocks over Permian to Ordovician rocks is being explored, possibly

because mineral deposits tend to be associated with zones of complex structure. The MRC crosses the Redlich project claim block in the center of T. 4 N., R. 36 E. Miranda Gold Corp has announced exploration has resulted in significant drill intercepts with assays greater than 0.010 opt gold on the Redich project (Miranda Gold Corp., 2006).

Geologic Description: Oldest rocks exposed in the Rock Hill district are folded, thinly bedded, light- to yellowish-gray, black, and brown argillite, shale, chert, siltstone, fine-grained sandstone, quartzite, and minor limestone of the Ordovician to Devonian(?) Palmetto Formation (Stewart et al., 1994). South of Redlich Summit, the lower Paleozoic sedimentary rocks are overlain unconformably by conglomerate of the Permian Diablo Formation. Massive chert-quartzite breccia, of Triassic age, was thrust-faulted over the Paleozoic rocks. In Jurassic or Cretaceous time, gabbro dikes (now slightly to moderately altered to greenstone) and the Granite of Redlich (ranging from quartz monzonite to granodiorite) intruded the Paleozoic sedimentary rocks. Paleozoic rocks in contact with the intrusive rocks were metamorphosed to hornfels, slate, and skarn.

During the middle Miocene epoch, 14 to 17 million years ago, light-gray to light-green, nonwelded, dacite (?) ash-flow tuffs and sedimentary rocks were deposited on the Paleozoic and Mesozoic rocks and subsequently blanketed by volcanic rocks. The volcanic rocks consist of gray to purple, finely crystalline, foliated, columnar-jointed andesite to dacite lava flows, flow breccias, lahars, volcaniclastic rocks, and ash-flow tuff. In the Tertiary period, the lava flows were eroded and mixed with other detritus to form fanglomerates. During mid- to late Tertiary time, hot fluids rose along fault conduits, altered rocks in the area, and left behind epithermal mineral deposits. During the Quaternary period, alluvial fans descended from the Candelaria Hills and Monte Cristo Range and partially concealed structural relationships among older geologic units. The fan alluvium consists of loose to very dense, unconsolidated to limonite-indurated, brown, silty, fine-grained sand, gravelly sand, and sandy gravel with calcrete intervals and abundant angular to subrounded, carbonate-coated cobbles and scattered boulders of volcanic and sedimentary rocks.

Mineral and Energy Resource Occurrence: In the vicinity of the Rock Hill and Broken Toe mines, several zones containing diverse minerals are scattered over an area about 3,000 feet long by 1,000 feet wide (Tingley and Smith, 1983). The Rock Hill mine penetrates faulted, intricately folded, and very fractured limestone of the Palmetto Formation that was metamorphosed to skarn

by a small body of Jurassic or Cretaceous granitic rocks (Stager and Tingley, 1988). Quartz veins cutting the granitic intrusive contain molybdenite. Quartz and calcite veins cutting skarn in the mine, which are 4 inches to 2 feet wide, contain the tungsten minerals, scheelite and huebnerite, together with pyrite, fluorite, muscovite, and malachite. Scheelite also occurs as disseminated crystals in silicified limestone, as thin coatings along fractures, and as sand and gravel in Pleistocene fan alluvium downslope from the mine.

5.26 Columbus Marsh

Mining District Location: The Columbus Marsh mining district includes the Columbus Marsh in northwestern Esmeralda County, in Tps. 2 and 3 N., Rs. 35, 36, and 37 E. (Plate 1). The MCS1 segment of the MRC passes just beyond the eastern margin of the district along the foot of the western Monte Cristo Range. The district and geographic locality is alternately known as Columbus Salt Marsh or Columbus Marsh Playa.

History of Discovery, Exploration, and Mining: Tingley and Smith (1983) indicate that salt was mined from the area as early as 1864. Later, in 1871, borate minerals were discovered. Small-scale mining supported the construction of multiple small borax and salt mills before 1882, by which time mining in the district had ceased (Tingley and Smith, 1983). Test drilling conducted by the USGS prior to about 1920 did not locate significant salt beds or concentrated subsurface brines (Albers and Stewart, 1972). Based on the results of this study, it appears that no significant mineral extraction activity has occurred in the district since 1882.

According to BLM Tonopah Field office personnel, there is a plan of operations for a mining operation on file with the BLM to produce food-grade calcium carbonate by processing the top 25 feet of lake sediments. The company plans to use the old Argentum mill as a processing plant for this operation. The mining claims in the Columbus Marsh district shown in Plate 2 are associated with this proposed operation.

Based on the results of this study, it appears that quantitative figures regarding borax and salt production from the Columbus Marsh district do not exist.

Geologic Description: Columbus Marsh is a playa encompassing an area of approximately 32 square miles underlain by Holocene-age muddy, sandy, and silty playa deposits and minor interbeds of evaporite minerals (Albers and Stewart, 1972; Hess, 2001). Coarse-grained alluvial

sediments originating from the surrounding highlands are present along the eastern margin of the playa, (ALG Columbus Marsh Field Data Sheets).

Mineral and Energy Resource Occurrence: The primary commodities of the district include borate minerals and halite (Tingley, 1998). Albers and Stewart (1972) report surface shows of salt along the playa margins. They also report the occurrence of thin layers of "cotton ball" ulexite within 6 inches of the surface in fine-grained sediments around the playa margin.

5.27 Coaldale

Mining District Location: The Coaldale mining district is located in Esmeralda County, about 10 miles southeast of the Mineral County line Tingley (1998). The district extends from the northern end of the Silver Peak Range on the west, across Big Smoky Valley to the southwest corner of the Monte Cristo Range on the east and includes within it the town of Coaldale. The district is located primarily in Tps. 1 and 2 N., Rs. 36 and 37 E.; and T. 3 N., R. 37 E. (Plate 1). The district is bordered on the north by the main part of the Monte Cristo Range, on the east by Big Smoky Valley, on the south by the main part of the Silver Peak Range, and on the west by Fish Lake Valley and Columbus Salt Marsh. U.S. Highways 6 and 95 and the MCS1 segment of the MRC cross the district between Blair Junction on the east and the Coaldale area on the west.

History of Discovery, Exploration, and Mining: In 1893, William Grozenger discovered coal in the middle Miocene (11 to 13 Ma) Esmeralda Formation, at the northern end of the Silver Peak Range (Toenges, et al., 1946; Robinson, et al., 1976). A description of the history, geology, and production from these coal deposits is presented in Section 5.48 of this report.

A commercial deposit of montmorillonite clay is located at the Blanco mine on the lower slopes of the Silver Peak Range, just east of Emigrant Pass (Papke, 1970; Albers and Stewart, 1972). The mine, in secs. 21 and 22, T. 1 N., R. 37 E., is about 8 miles south-southeast of Coaldale, 8 miles southwest of Blair Junction, and 6.7 miles south-southwest of the MCS1 alternate of the MRC (Plate 1). It could not be determined when the Blanco mine began operating, but it has been owned by Vanderbilt Minerals Corp. and was worked intermittently by a wholly owned subsidiary, the Western Talc Co., since 1963 (Albers and Stewart, 1972). The clay is mined from three small pits excavated in the lower part of the Esmeralda Formation. As needed, clay from the Blanco mine is shipped to a company-owned mill near Beatty, Nye County, Nevada to be crushed, ground, and stockpiled with clay from company-owned mines in Nevada, California,

and Arizona (NBMG, 2005). The stockpiled clay is then shipped to the American Colloid plant in South Dakota, where it is blended to manufacture specialty industrial products (NBMG, 2005). No recorded quantitative information on clay production was found during this study.

Uranium was discovered in the Coaldale district in 1950. Exploration lasting at least into the 1980s resulted in the discovery of several uranium occurrences around Emigrant Peak in the northern Silver Peak Range, but a commercial uranium deposit was not reported and there is no recorded uranium production from the district (Albers and Stewart, 1972; Tingley and Smith, 1983).

Tingley (1998) included two turquoise occurrences in the Monte Cristo Range within the Coaldale district. Morrisey (1968) identifies the turquoise occurrences as the Monte Cristo mine in sec. 12, T. 3 N., R. 37 E., about 8 miles northeast of the town of Coaldale, and the Blue Bell Prospect, whose exact location is not reported other than it is likely located about 4 miles north of Coaldale. About $8,000 worth of turquoise was produced from the Monte Cristo mine, and a minor amount of turquoise was produced from the Blue Bell Prospect between 1951 and 1968.

Geologic Description: In the vicinity of Emigrant Peak, at the northern end of the Silver Peak Range, siliciclastic and carbonate rocks of the Cambrian Harkless and Emigrant Formations and the Ordovician Palmetto Formation are cut by thrust faults related to the Devonian Antler Orogeny (Robinson, et al., 1976, Stewart et al., 1994). These lower Paleozoic sedimentary rocks are overlain unconformably by porphyritic rhyolite ash-flow tuffs of the early Miocene (21.5 to 22.8 Ma) Ice House Canyon Assemblage (Brown, 2003). North and east of Emigrant Peak, the Ice House Canyon assemblage is overlain unconformably by the middle Miocene (11 to 13 Ma) Esmeralda Formation (Robinson et al., 1976; Brown, 2003). The Esmeralda Formation mostly consists of siltstone, sandstone, conglomerate, shale, coal, and diatomite, but it includes tuff and other volcanic rocks (Stewart, 1989; Stewart and Diamond, 1991; Stewart et al., 1994). The Esmeralda Formation in and adjacent to Big Smoky Valley is cut by numerous high-angle faults, which Brown (2003) believe formed concurrently with the Esmeralda Formation and influenced the distribution of facies within it.

In the southern Monte Cristo Range, the oldest exposed rocks are thrust-faulted and folded siliciclastic and carbonate sedimentary rocks and intercalated mafic volcanic rocks, which resemble the Palmetto Formation of the Silver Peak Range, but range in age from Late Cambrian

to Devonian (Stewart et al., 1994). The Paleozoic rocks are overlain unconformably by volcanic rocks of the early to middle Miocene (22.2 to 15.7 Ma) Blair Junction sequence. The volcanic rocks include dacite to andesite lava flows, ash-flow tuff, related intrusive rocks, and locally interbedded conglomerate, sandstone, and siltstone. The Paleozoic and Miocene rocks are cut by complex arrays of largely east-northeast-striking and north-striking normal faults (Stewart et al., 1994).

Mineral and Energy Resource Occurrence: On lower slopes, there are thin coatings of white material in pits, possibly left behind from the removal of clay for commercial purposes. White clay also was found in a pit high on a hillside, where it appeared to be weathering from ash-fall tuff. Papke (1979) believes that all of the clay at this mine formed by ground-water alteration of nonwelded ash-fall tuff layers.

In the northern Silver Peak Range around Emigrant Peak, uranium prospects are located in Ordovician shale and limestone and in Miocene sedimentary and volcanic rocks (Garside, 1973; Tingley and Smith, 1983). Most of these prospects consist of slightly anomalous radioactivity or sparse uranium minerals; two of these occurrences are associated with spring water containing anomalous concentrations of dissolved radioactive minerals. According to Tingley and Smith (1983), the most promising uranium occurrence in the district is the Coaldale prospect, an area of hydrothermally altered, rhyolite tuff in the Miocene Ice House Canyon assemblage. In this prospect, the yellow uranium-bearing minerals, autunite and phosphuranylite, occur in chalcedony veinlets cemented with silica, as fracture coatings, and as partial fillings of cavities left by dissolution of feldspar.

According to Morrisey (1968), turquoise in the Monte Cristo mine occurs as nodules in calcareous shale. Castor and Ferdock (2004) state that turquoise in the Blue Bell mine has a deep sky-blue color and locally is spider-webbed.

5.28 Lone Mountain

Mining District Location: The Lone Mountain mining district as defined by Tingley (1998) generally includes the area encompassing all of Lone Mountain and the General Thomas Hills, as well as the western most part of the Weepah Hills, and the northern most end of Paymaster Canyon. The district is located primarily in Tps. 1, 2, and 3 N., R. 40 E.; also in T. 2 N., R. 39 E.; and Tps. 1 and 2 N., R. 41 E. (Plate 1). The district is alternately known as West Divide,

Alpine, or Dolly, and some include the entire Weepah district in the Lone Mountain district. At its nearest point, the MN2 alternate of the MRC passes within less than a half mile of the northern end of the Lone Mountain district. The district is located entirely between the MN1 and MN2 alternates of the MRC in Esmeralda County. The primary commodities of the district include silver, lead, copper, gold, zinc, turquoise, and barite (Tingley, 1998).

History of Discovery, Exploration, and Mining: During the early 1860s, miners and prospectors from Mexico prospected for gold in the Lone Mountain district. There is no account of significant production, however, until the early 1900s when the Tonopah boom brought renewed interest in the area. Between approximately 1903 and 1908, activity peaked at the Alpine mine on the northwest side of Lone Mountain. The General Thomas mine was also apparently active during this period (Bonham and Garside, 1979). Mining in the area during the 1920s and 1930s appears to have focused on the adjacent Weepah district to the west (Bonham and Garside, 1979). During the early 1960s, the Gold Eagle mine in the southern part of the district was active (Albers and Stewart, 1972). Ongoing minor turquoise production is reported from the Blue Jay or Lone Mountain mine.

Available production figures for the Lone Mountain district appear to include production from the adjacent Weepah district. Albers and Stewart indicate total production from the two districts totaling almost 250,000 tons. Tingley and Smith (1983) report production in excess of $3.5 million, primarily from gold, silver, lead, and turquoise, with at least $1.8 million attributed to the Weepah district. They also report over $200,000 in gold and base metal production from the Alpine mine area alone between 1903 and 1908.

A BLM search in late 2006 indicated three separate blocks of mining claims in the Lone Mountain district, located in the vicinity of the Alpine Mine, the General Thomas Hills, and along the northeast flank of Lone Mountain. Plans of operation are in place along the northeastern flank of Lone Mountain and at the Alpine area, and a notice of intent is active in the southern General Thomas Hills. A site visit in the fall of 2006 did not reveal any obvious or conspicuous activity, such as drilling or trenching, in these areas.

The Lone Mountain Mill, also known as Miller's Mill, is located about 15 miles west of Tonopah on the south side of U.S. Highway 6. Golden Phoenix Minerals, Inc (Golden Phoenix, 2007) reports that they signed an option to purchase the mill and the private land below it, and are

awaiting the outcome of the clearing-of-title process before proceeding. This mill is located on private land contained within secs. 2, 3, 10, 11, and 14, T. 3 N., R. 40 E. (Plate 1). The mill was reportedly built in 1981 and operated until 1985 and is currently inactive. The 1,350 tpd mill was originally constructed for the purpose of processing tailings from the Tonopah district for recovery of silver. The MRC crosses private land between the mill and the northern flanks of Lone Mountain.

Geologic Description: Lone Mountain is underlain by the Triassic to Jurassic-age Lone Mountain Pluton, composed primarily of quartz monzonite. The Lone Mountain Pluton intruded into clastic and carbonate metasediments of the Precambrian Wyman Formation and the Reed Dolomite, exposures of which are found dipping away from the Pluton on the northeast and southwest margins of the mountains, and in isolated roof pendants on the Lone Mountain. In the area extending from the northeastern spur of Lone Mountain to the General Thomas Hills, Triassic to Jurassic felsic porphyry and diorite intrusions post dating the Lone Mountain Pluton intrude Ordovician to Cambrian metasediments of the Palmetto, Harkless, and Poleta Formations. Minor exposures of Miocene welded tuff and Pliocene intrusive rhyolite are present on the northeastern margin of Lone Mountain (Albers and Stewart, 1972; Tingley and Smith, 1983).

Mineral and Energy Resource Occurrence: Mineralization of the Lone Mountain district generally occurs in skarn zones in carbonate rocks adjacent to the Lone Mountain Pluton, or as replacement bodies in dolomite. At the Alpine mine, low-grade gold occurs in granulated fault gouge, and high-grade lead-zinc-silver occurs as replacement bodies in the skarn zone of the Reed Dolomite adjacent to the Lone Mountain Pluton. In the General Thomas Hills, metallic mineralization occurs in replacement bodies along shear zones, in stockwork replacement of limestones, and in quartz veins. Later zones of supergene silver, copper, and lead mineralization occur in Cambrian limestone and metamorphosed shale intruded by diorite sills (Tingley and Smith, 1983). Albers and Stewart (1972) indicate that zinc, lead, copper, and silver ore occur in the Mule Spring Formation at the Golden Eagle mine as replacement bodies in thin limestone layers adjacent to faults. A molybdenum prospect in association with quartz veins is reported on the east side of Lone Mountain (Bonham and Garside, 1979).

5.29 Divide

***Mining District Location*:** The east-west oriented, elliptically shaped Divide mining district is located in Esmeralda County, 5 miles south of Tonopah (Tingley, 1998) and 2.4 to 3.0 miles east of MRC alternate MN2 (Plate 1). The district is at the southern end of the San Antonio Mountains, primarily in T. 2 N., Rs. 42 and 43 E. (Plate 1). The district is bordered on the north by the Tonopah mining district (also in the San Antonio Mountains); on the east by Ralston Valley; on the south by the Southern Klondyke Hills; and on the west by Montezuma Valley. U.S. Highway 95 cuts through the mining district's west side.

***History of Discovery, Exploration, and Mining*:** Gold was discovered in the Divide district in 1902, and the district was mined by lessees from then until 1912 (Dilles, 2007). Mining was centered on small gold-bearing veins on Gold Mountain until 1917 (Tingley and Smith, 1983). In that year, the Tonopah Divide Mining Company (TDMC), which was organized in 1910, discovered the Divide Lode, a large silver deposit. News of this discovery caused a mining rush to the district (Dilles, 2007). More than 350 companies were organized (on paper) to take advantage of the discovery, but in the ensuing chaos, an extensive, diversely held, and overlapping patchwork of claims in an area of only 50 square miles was staked (Bonham and Garside, 1979). However, the only property found during this boom that managed to produce consistently large amounts of ore for more than a few years was the Tonopah Divide mine (Bonham and Garside, 1979).

During the 1920s, exploration shafts were sunk, and lateral drifts were developed, but with the single exception of the TDMC, no mining company shipped more than 10,000 tons of ore (Bonham and Garside, 1979). In its peak year of 1922, the TDMC produced $552,000 worth of silver and gold (Dilles, 2007). The Divide boom ended in 1926 when the Divide Lode was exhausted, and TDMC operations were turned over to independent lessees (Dilles, 2007). Operators of surrounding claims quit soon thereafter as the silver price decreased rapidly (Dilles, 2007). Independent lessees continued to ship small quantities of silver ore to custom mills until the late 1940s (Bonham and Garside, 1979). Total production from 1910 to 1950 was 134,948 tons of ore containing 3,275,079 ounces of silver and 32,474 ounces of gold, worth $3,500,219 (Bonham and Garside, 1979). There was no recorded production in the district between 1950 and 1976 (Bonham and Garside, 1979).

Since the demonetization of silver in 1965 and the deregulation of the gold price in 1971, there has been considerable exploration and some mining for precious metals in the district. By 1975, the Cordex Exploration Co. found and delimited a property at Hasbrouck Mountain, at the western end of the district that potentially contained gold and silver deposits suitable for open-pit mining (Tingley and Smith, 1983; Dilles, 2007). In 1978, Falcon Exploration acquired the Tonopah Divide property at Gold Mountain which, also, had a potential for containing gold and silver deposits suitable for open-pit mining (Dilles, 2007). Falcon mined 100,000 tons of ore from the Tonopah Divide property between 1983 and 1985.

In 1990, Echo Bay's Gold Zone drilling program encountered discontinuous low-grade mineralization across much of the length of Gold Mountain (Dilles, 2007). In 1992, Corona Gold began drilling exploration holes at three prospects, Hasbrouck Mountain, Tonopah Divide, and Hill of Gold, but their drilling program was cut short by Corona's merger with Homestake Mining Company (Dilles, 2007). From 1996 to 1997, U.S. Mineral Corp., Euro-Nevada Corp, and Phelps-Dodge Corp. drilled exploration holes at or near Gold Mountain and Hasbrouck Mountain (Dilles, 2007). There has been no drilling in the district since 1997 (Dilles, 2007).

Vista Gold Corp. (2007) reports that they now own patented and unpatented mining claims containing the Hasbrouk Mountain Prospect, which is located in the southern portion of T. 2 N., R. 41 E. and sec. 3, T. 1 N., R. 42 E. They report a mineral resource (indicated) of 20.3 million tons containing 459,000 ounces of gold at a cutoff of 0.010 opt gold. An additional inferred resource of 172,000 opt gold is also reported.

Currently, most activity in the district is focused on consolidating mining claims to put together a methodical, district-wide exploration program (Dilles, 2007). The Tonopah Divide property, which is leased by Tonogold Resources, Inc., from the TDMC, consists of 34 patented and 106 unpatented mining claims (Dilles, 2007). This property includes Gold Mountain, the lowlands east and north, and a large area to the west adjoining Hasbrouck Mountain. Vista Nevada controls 22 patented claims and a significant block of unpatented claims covering Hasbrouck Mountain (Dilles, 2007). Metallic Ventures controls more fragmentary lands principally northwest of Gold Mountain (Dilles, 2007). About seven, separately held, patented claims, each <100 acres in area, remain between land controlled by Tonogold, Vista Nevada, and Metallic Ventures (Dilles, 2007).

***Geologic Description*:** The Divide mining district and the adjacent Tonopah mining district are situated within a Miocene volcanic center at the southern end of the San Antonio Mountains (Dilles, 2007). The oldest geologic unit in the district is the early Miocene (18.7 to 20.5 Ma) Fraction Tuff (Bonham and Garside, 1979). The Fraction Tuff consists of light-gray, lithic-rich, nonwelded to partially welded rhyodacite to rhyolite ash-flow tuff with a glassy groundmass, and intercalated ash-fall tuff. Where hydrothermally altered, the tuff is silicified and mottled orange, yellow, and red. Dilles (2007) states that an exploration hole drilled at the Tonopah Divide mine penetrated 2,000 feet of Fraction Tuff (uncorrected for dip). The geologic unit is more than 1,000 feet thick where mapped in the Tonopah district (Bonham and Garside, 1979).

The Fraction Tuff is overlain by the middle Miocene (16.9 to 17.1 Ma) Siebert Formation (Bonham and Garside, 1979). The lower part of the formation consists of silicified, tuffaceous sandstone and bouldery conglomerate derived largely from the Fraction Tuff. These sedimentary rocks are overlain by interbedded ash-flow tuff, ash-fall tuff, volcaniclastic rocks, and lacustrine sedimentary rocks. The upper part of the formation is a multi-lithic tuff. The Siebert Formation is >1,900 feet thick at Gold Mountain (Bonham and Garside, 1979). The middle Miocene (16.4 to 16.9 Ma) Oddie Rhyolite intrudes the Siebert Formation at Gold Mountain and in other areas of the district (Bonham and Garside, 1979). The middle Miocene (14.8 to 16.3 Ma) Divide Andesite intrudes the Fraction Tuff and Siebert Formation in an area extending southeast from Gold Mountain (Bonham and Garside, 1979). Middle Miocene (16.1 to 16.3 Ma) Brougher Rhyolite intrusions occur in the northern part of the mining district (Bonham and Garside, 1979). The Gold Zone-Kernick Fault system, a conspicuous set of west-northwesterly trending, high-angle, right-lateral strike-slip faults, runs through the Tonopah Divide district (Dilles, 2007).

***Mineral and Energy Resource Occurrence*:** Mineralization is associated with silicification and potassic alteration in fault and fracture-filling veins and breccia bodies along the Gold Zone-Kernick Fault system (Dilles, 2007). Most gold-silver mineralization occurs in the hanging walls of west-northwest-trending, high-angle faults (Dilles, 2007). Mineralization related to deeply penetrating oxidation occurred after movement on the Gold Zone-Kernick fault system ceased, and before westward regional tilting began (Dilles, 2007). The Fraction Tuff is the principal host rock for gold and silver-bearing veins in the mine, although silicified sandstone and conglomerate near the bottom of the Siebert Formation also contain silver and gold deposits (Dilles, 2007). Gold-bearing veins occur in the Oddie Rhyolite (Tingley and Smith, 1983). Precious metals occur in auriferous pyrite and argentiferous cerargyrite (Bonham and Garside,

1974). Other metallic minerals include galena, sphalerite, chalcopyrite, argentite, cinnabar, and covellite. Supergene minerals include powellite, ferrimolybdite, and jarosite. Constrained by ages of the mineralized Oddie Rhyolite and the non-mineralized Brougher Rhyolite, mineralization occurred about 16.4 million years ago (Dilles, 2007).

5.30 Weepah

Mining District Location: The Weepah mining district, as defined by Tingley (1998), includes the north central Weepah Hills, primarily in T. 1 N., Rs. 39 and 40 E. (Plate 1). The district is alternately known as Silverpah, and some include the entire Lone Mountain district as part of the Weepah district. At its nearest point, the MN2 alternate of the MRC passes within 4 miles of the southwestern end of the Weepah district. The district is located entirely between the MN1 and MN2 alternates of the MRC in Esmeralda County. The primary commodities of the district include gold, silver, and uranium (Tingley, 1998).

History of Discovery, Exploration, and Mining: Areas in the adjoining Lone Mountain district to the west were prospected as early as 1860s, but significant metallic mineralization in the Weepah district was not discovered until 1904 (Tingley and Smith, 1983). Early metallic mining in the district targeted high-grade surface gold deposits in the Weepah discovery, until a large low-grade gold deposit was discovered at Weepah in 1927. The Weepah mine exploited the deposit between 1935 and 1937 (Tingley and Smith, 1983). Tingley and Smith (1983) also report minor barite production in the southern part of the district between 1907 and 1919.

Available production figures for the Weepah district appear to include production from the adjacent Lone Mountain district. Albers and Stewart indicate total production from the two districts totaling almost 250,000 tons. Tingley and Smith (1983) report Weepah district production of at least $1.8 million in gold and silver. Papke (1984) indicates barite production of between 1,000 and 25,000 tons from the southern part of the district.

A BLM search in late 2006 indicated active mining claim and pending or authorized notices of intent and plans of operation in the Weepah district within T. 1 N., R. 39 E. As this area is distant from the MRC that is greater than 4 miles from alternative MN1, we did not research claim ownership in this area.

Geologic Description: The Weepah district is primarily underlain by Triassic to Jurassic age rocks of the Weepah Pluton. The medium- to coarse-grained quartz monzonite and granite of the Weepah Pluton intruded into metasediments of the Precambrian Wyman Formation, the Precambrian Reed Dolomite, and the Cambrian Campito Formation. Minor intrusions of Triassic to Jurassic-age rhyolite porphyries and diorite occur along the southern periphery of the Weepah Pluton. Following the latest stages of Mesozoic intrusion, hydrothermal fluids deposited fissure quartz veins, lenses, and stockwork replacement bodies cutting plutonic rocks and skarn zones in metasedimentary rocks.

Mineral and Energy Resource Occurrence: Mineralization of the Weepah district occurs in and near the skarn zones of Precambrian and Cambrian carbonates adjacent to the Weepah Pluton, and as bedding shears in Precambrian dolomites (Tingley and Smith, 1983). The gold mineralization at Weepah occurs in quartz veins developed along a northeast-trending shear zone, where high-grade gold-bearing sulfide bodies are present in carbonate wall rocks of the Precambrian Wyman Formation, and low grade gold ore occurs in granulated fault gouge. In oxidized areas, elemental gold occurs with quartz iron oxides and hydroxides (Tingley and Smith, 1983). In the southern part of the district, Papke (1984, p. 68) describes fine-grained barite veins in silicified limestone of the Cambrian Harkless Formation accompanied by galena, secondary copper minerals, pyrite and iron or manganese oxides. Garside (1973) reports anomalous radiation along a northeast trending fault in sedimentary rocks west of Paymaster Canyon straddling the Weepah-Lone Mountain district border. Uranium is also described at the Ape Claims north of Weepah, and at the Jet Claims located just west of the district boundary (Hess, 2001).

5.31 Klondyke

The discussion of this mining district presented in this report is substantially the same as that presented in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). The description of the location was modified to reflect the MRC alignment.

Mining District Location: The Klondyke Mining District, also known as the Southern Klondyke District, lies in the southern Klondyke Hills, primarily in T. 1 N., Rs. 42 and 43 E. This mining district is located about 10 miles south of Tonopah, near the eastern edge of the county, and is referenced in this report as Plate ID No. 31 (Plate 1). It adjoins the Divide Mining District on the

southeast and is sometimes considered a part of that district. The western portion of the Klondyke Mining District is approximately 2 miles east of the MRC. The majority of historic mining activity and existing active mining claims is in an area located west of the MRC, section MN2 on the opposite side of U.S. Highway 95.

History of Discovery, Exploration, and Mining: The district was discovered by Court and Bell in 1899 (Lincoln, 1923). Up until 1905, about $50,000 was produced from one property in the district which produced through at least 1923, the date of the report. From 1908 to 1921 it produced 11,236 tons of ore containing a total value of metals valued at $263,700. Other sources report less production from the district.

Geologic Description: Most of the deposits in the district occur in limestone of the Emigrant Formation (Middle and Upper Cambrian), which is cut by northwest-trending rhyolite dikes and intruded by irregular rhyolite bodies and one small granitic mass.

Mineral and Energy Resource Occurrence: According to Ball (1906), the deposits are of three types: (a) quartz veins, which are parallel to the bedding in the limestone and carry predominantly silver values; (b) veins along the contact of the sedimentary rocks and rhyolite dikes with values predominantly in gold; and (c) thin veins of quartz carrying silver-bearing galena and cerrusite in granite along joint fractures parallel to the bedding of the surrounding rocks. Other minerals present in small amounts are siderite, calcite, hematite, and wad.

5.32 Fish Lake Marsh

Mining District Location: The Fish Lake Marsh mining district of Tingley (1998) includes the salt flats and dry lake in the lower reaches of the Fish Lake Valley, in Tps. 1 S. and 1 N., R. 36 E. (Plate 1). This area has also been included in the historic Cottonwood mining district (Tingley, 1998). At its nearest point, the MCS1 segment of the MRC passes approximately 8 miles northwest of the northern most extent of the Fish Lake Marsh district, across the northern Silver Peak Mountains.

History of Discovery, Exploration, and Mining: Albers and Stewart (1972) indicate that the boron-bearing mineral ulexite was mined from a deposit along the east margin of Fish Lake Marsh beginning as early as 1873. Two separate plants produced borax from the ulexite deposit during the 1870s. Later, in 1939, ulexite was mined on the west margin of the northern Silver

Peak Range, approximately 3 miles east of the Fish Lake Marsh deposit (Albers and Stewart, 1972).

Quantitative production figures from the Fish Lake Marsh deposit are not available, though the historical accounts of two operational borax mills suggest significant production. The sedimentary deposit east of Fish Lake Marsh reportedly produced about 200 tons of B_2O_3 (borate) in 1939 (Albers and Stewart, 1972).

Geologic Description: Ulexite in the Fish Lake Marsh district is produced from Quaternary playa deposits in valley fill, and from Tertiary sedimentary rocks on the west margin of the northern Silver Peak Range (Albers and Stewart, 1972; Robinson, et al., 1976).

Mineral and Energy Resource Occurrence: Albers and Stewart (1972) indicate that at the Fish Lake Valley deposit, ulexite was extracted from "salty ground." They also indicate that ulexite occurs "mainly as veinlets and cotton ball aggregates" in the Tertiary sedimentary rocks on the west side of the Silver Peak Range.

5.33 Alum

***Mining District Location*:** The Alum mining district is located at Alum, Esmeralda County, in secs. 28 through 33, T. 1 N., R. 38½ E. The district, which is in the Weepah Hills, is centered on the Rulco LLC Heart of Nature mine (formerly the Alum mine). MRC alternative MN1 is just west of the district, which is located about 10 miles north of Silver Peak (Plate 1).

***History of Discovery, Exploration, and Mining*:** A deposit of sulfur and kalinite (potassium alum), was discovered about 1868 in the Weepah Hills at the site of the current Heart of Nature mine (Albers and Stewart, 1972). In 1921, the Western Chemical Co. constructed an alum-sulfur treatment plant and mined the deposit from inclined shafts, but no production was recorded by 1923 (Tingley and Smith, 1983). Attempts to work the deposit in 1939 from inclined shafts and in 1967 from an open pit, also, were unsuccessful (Tingley and Smith, 1983). Patented claims to the mine were acquired by Rulco LLC about 2000, and a permit and lease to operate the Heart of Nature mine were issued by the BLM in August 2002 (U.S. Department of Interior, LR2000 database, accessed 2007). Rulco has produced small quantities of kalinite (and possibly sulfur) from the mine since 2002 (NBMG, 2003, 2004, 2005). The Heart of Nature mine is located on

secs. 32 and 33, T. 1 N., Range 38½ E. and is within about 1 mile of MRC alternative MN1 (Plate 2).

***Geologic Description*:** The Heart of Nature (Alum) mine is excavated into pipes or chimneys of yellow, orange, red, purple, and white mottled, hydrothermally altered rhyolite, that intrude the middle Miocene (11 to 13 Ma) Esmeralda Formation (Tingley and Smith, 1983; Stewart and Diamond, 1991; Castor and Ferdock, 2004). In the area of the mine, the Esmeralda Formation is composed of laminated to very thinly bedded light-gray, greenish- to yellowish-gray, and grayish-red, tuffaceous siltstone, clayey sandstone, pebble- to cobble-conglomerate, and rhyolitic tuff (Stewart, 1989). The sedimentary and pyroclastic rocks are folded into a narrow, southeast-plunging syncline (Stewart, 1989). Beds on the limbs of the syncline dip at angles of 25 to 75 degrees to the northeast and southwest. A north-northeast-striking graben displaces the nose of the syncline downward.

***Mineral and Energy Resource Occurrence*:** Native sulfur and kalinite (potassium alum) occur in commercial quantities with cinnabar and polyhalite at the Heart of Nature mine (Castor and Ferdock, 2004). The sulfur occurs as crystals up to 5 centimeters in diameter in vugs, as coatings and fillings in fractures, and as disseminations in the hydrothermally altered rhyolite (Albers and Stewart, 1972; Tingley and Smith, 1983; Castor and Ferdock, 2004). The kalinite is associated closely with the sulfur, but occurs as white, banded veins, stringers, and ram-horn shaped masses throughout the rhyolite (Albers and Stewart, 1972; Castor and Ferdock, 2004).

5.34 Alkali Spring Valley

***Mining District Location*:** The Alkali Spring Valley mining district, as defined by Tingley (1998), includes only Alkali Spring playa, in the southern part of Montezuma (a.k.a. Alkali Spring) Valley. The district is located entirely in Esmeralda County, in Tps. 1 S. and 1 N., R. 41 E. (Plate 1). At its nearest point, the MN2 alternate of the MRC passes within 3 miles of the northeastern margin of the district. According to Tingley (1998), the lone commodity of the district is salt (halite).

History of Discovery, Exploration, and Mining: In the early 1880s, a small amount of salt was produced from brines in evaporation pits dug on the playa (Bonham and Garside, 1979). Based on the results of this investigation, it appears that no subsequent mineral exploration or extraction has occurred in the area, and that no quantitative records of production exist.

Geologic Description: The district as defined by Tingley (1998) is limited to areas underlain by Quaternary playa deposits, which consist of fine-grained sediments containing saline minerals. Water wells drilled prior to 1917 apparently encountered alternating fine-grained sand and silt above unspecified hard material at a depth of 390 feet. Briny groundwater reportedly was encountered at a depth of about 50 feet (Bonham and Garside, 1979).

Mineral and Energy Resource Occurrence: Halite-enriched brine forms in closed basins as a result of the evaporation of groundwater and surface water and the concentration of sodium and chloride ions dissolved in the water. Geothermal energy resources in the Alkali Springs Valley are discussed in Section 5.49.4 of this report.

5.35 Silver Peak

Mining District Location: The Silver Peak mining district as defined by Tingley (1998), and as described herein, includes Mineral Ridge between the town of Silver Peak and Black Canyon in the northeastern part of the Silver Peak Range in central Esmeralda County. This major mining district is also commonly known as the Mineral Ridge district, and some previous workers have included the adjacent Red Mountain district to the west as part of the Silver Peak district. The historic Minnesota district, likely located on the north slope of Mineral Ridge, is included in the Silver Peak district. The MN2 alternate of the MRC passes within a mile of the eastern boundary of the district just north of the town of Silver Peak. The major commodities produced from the district include gold, silver, and lead (Tingley, 1998).

History of Discovery, Exploration, and Mining: The below discussion summarizes a comprehensive account of the history of the Silver Peak mining district by Charles D. Zeier, included in modified form in Brown (2003). The Silver Peak mining district has intermittently produced significant amounts of gold and silver over multiple periods of mining activity since its discovery in 1864. During the first period of production between 1864 and about 1872, the town of Silver Peak was founded. The Mary and Drinkwater Mines, among others, were productive enough to support the construction of an aerial tramway to transport ore to three separate mills in Silver Peak. The area went into decline between about 1872 and 1890, during which only small-scale mining was conducted by local residents. In the 1890s, lessees worked gold deposits in the district, and many small mills were constructed on and around Mineral Ridge, including what may be the first cyanide mill in Nevada.

With the advent of the cyanidation process, and the nearby booms in Tonopah and Goldfield, the Silver Peak district saw another significant period of activity between about 1905 and 1916. During this period, the Pittsburgh Silver Peak Gold Mining Company was formed. The company connected the Drinkwater and Mary mines, and an aerial tramway was built to link the mine to the new company townsite of Blair 2 miles north of Silver Peak, where a 100-stamp mill was constructed. In 1906, an 18-mile railroad was constructed linking Silver Peak to the Tonopah and Goldfield Railroad. The Company acquired the Silver Peak Valcada Mine and associated claims in 1909, and expanded the Blair Mill to 120 stamps, making it the largest in Nevada. With steadily decreasing ore grades, however, the operation became subeconomic by 1915 and the area again went into decline until the late 1920s. Between about 1927 and 1942, several mining companies formed in the Silver Peak district, with significant work focusing on, among others, the Laddie group of claims, the Valcada property, and the Oromonte mine.

This period of activity in the district culminated with the construction of the 300-ton Cord mill in Silver Peak. Gold mining in the area ceased with the issuance of War Production Board Order L-208, which closed domestic gold mines. Following World War II, no significant mining activity occurred on Mineral Ridge until about 1975, when several mining companies began exploration for low-grade gold deposits in the Mary-Drinkwater claims and the Oromonte claims. These efforts resulted in the opening and operation of the Mineral Ridge open pit mine between 1989 and 1992. The pit was operated by Zephyr Resources Inc., and then by Homestead Minerals Corporation under lease to the Mary Mining Trust. During this period, ore from the mine was trucked 17 miles to a mill at the 16 to 1 silver mine in the Red Mountain district to the west. The mine was closed in 1992 due to the high cost of transporting the ore. The same property was operated under lease by Cornucopia for about a year during 1996 and 1997, and then by Mineral Ridge Resources (a subsidiary of Vista Gold) for less than a year during 1999 and 2000. During this time, a crusher and leach pad were built onsite. In November 2000, Golden Phoenix Minerals acquired the Mineral Ridge Mine. Golden Phoenix operated the mine between 2003 and the end of 2005. A site visit in late 2006 revealed the mine facility to be currently inactive.

As reported by Craig (2003), early gold production is difficult to estimate due to poor recordkeeping and the complex history of the district. Estimates of Silver Peak district gold production prior to 1942 range from about 387,000 to 462,000 ounces. Later production is better accounted for. Between 1989 and 1992, Zephyr and Homestead report production of 109,000

ounces of gold from 1.4 million tons of ore grading on average 0.082 oz/ton (Craig, 2003). Between 1996 and 2002, Cornucopia, Vista, and continued rinsing of the leach pads by a bankruptcy trustee yielded 58,000 ounces of gold from 1,658,000 tons of ore (Craig, 2003). NBMG (2005) reports gold production of 5,900 ounces from the Mineral Ridge mine under operation by Golden Phoenix Minerals between 2003 and 2005. Thus, total estimated gold production from the Silver Peak district is at most about 635,000 ounces.

In the Silver Peak district, silver production is of secondary importance to gold. Based on this study, it appears that silver production figures for the period prior to 1942 are not available. NBMG (2005) reports silver production from the Mineral Ridge mine in 1991 and between 1997 and 2005 at 47,358 ounces.

Based on the results of this study, it appears that figures describing production of other commodities from the Silver Peak district do not exist.

Geologic Description: The Late Proterozoic Wyman Formation crops out on the flanks and crest of Mineral Ridge. The ridge is a NW-trending, doubly plunging anticline cored by the Eocene Mineral Ridge pluton. Principal lithologies within the pluton include granodiorite, granite, pegmatite, and alaskite. Rocks of the Wyman Formation at Mineral Ridge were metamorphosed regionally and by contact with the Mineral Ridge pluton into phyllite, schist, hornfels, quartzite, marble, and calc-silicate skarn. These rocks were also sheared, brecciated, hydrothermally altered, warped into isoclinal and open folds, and faulted. The Late Proterozoic Reed Dolomite overlies the Wyman Formation in synclines on the east flank of Mineral Ridge. The Late Proterozoic Deep Springs Formation is in fault contact with the Reed Dolomite at the open-pit mine in the Brodie ore body at the Mineral Ridge Mine (Craig, 2003).

Mineral and Energy Resource Occurrence: Epithermal gold deposits generally are localized within the lower part of the Wyman Formation by shear zones related to the thrust-faulted contact with the underlying Mineral Ridge pluton. Mineralization in the Wyman Formation occurs mainly in milky quartz veins that fill shear zone fractures and generally conform to the low-angle dip of the foliation in the host rocks. These veins generally contain only small amounts of sulfides, including pyrite, sphalerite, galena, chalcopyrite, tetrahedrite, and arsenopyrite, and minerals resulting from their oxidization. Gold and electrum occur as inclusions in quartz. To a lesser extent, gold is associated with goethite and relict pyrite and is

intergrown with sphalerite, galena, and pyrite. Where they intersect brittle alaskite sills or favorable lithologies in the Wyman Formation, gold-bearing quartz veins may extend as stockwork replacements into the alaskite and Wyman Formation. Some gold and silver deposits occur in late-stage-epithermal argillized, pyrite- and marcasite-bearing breccias and banded, manganiferous quartz-calcite veins (Craig, 2003).

5.36 Red Mountain

Mining District Location: The Red Mountain mining district, as defined by Tingley (1998), is located in Esmeralda County, in Tps. 2 and 3 S., Rs. 37 and 38 E.; and T. 1 S., R. 37 E. (Plate 1). It is 4 miles west of Silver Peak, Nevada, 4.5 miles west of Nevada Highway 265, and 5 miles west of the MN1 alternate of the MRC (Plate 1). In the Silver Peak Range, the mining district is bordered on the northwest by Fish Lake Valley, on the northeast by the Silver Peak mining district (also in the Silver Peak Range), on the southeast by Clayton Valley, and on the west by the Silver Peak Range Wilderness study area (Plate 1).

History of Discovery, Exploration, and Mining: Tingley (1998) indicates that the Red Mountain mining district was discovered and organized in 1864; whereas, Keith (1977) reports that the mining district dates to 1907, when the Nivloc mine was discovered. The Nivloc mine, located in SE¼ sec. 33, T. 2 S., R. 38 E., operated from approximately 1937 to 1943. It produced ore containing 11 ounces of silver per ton and 0.05 ounce of gold per ton that was worth $2 to $3 million dollars (Keith, 1977). Total production from the mine as of 1977 was 4 million ounces of silver, 18,000 ounces of gold, 24,000 pounds of lead, 8,000 pounds of zinc, and 700 pounds of copper (Keith, 1977).

The Mohawk mine, located in NE¼ sec. 36, T. 2 S., R. 37 E., began operating about 1920, but its major production took place between 1952 and 1958 (Keith, 1977). About 2 million ounces of silver and lesser amounts of gold, lead, zinc, and copper were produced from the mine as of 1985 (Quade and Tingley, 1985). With an assumed average silver content of 13 ounces of silver per ton, the mine in 1985 was estimated to contain 95,000 ounces of silver reserves (Quade and Tingley, 1985).

Claims on the Sixteen-to-one vein were staked in the 1920s and 1930s, but a mine was not developed on these claims until the late 1970's (Keith, 1977). Because of the long time between discovery and production, >3,300 feet of tunnels, drifts, and cross-cuts were excavated while the

mine was being explored and by 1977 the mine was nearing production in 1977 (Keith, 1977). The mine contains argentite-acanthite, several other silver minerals, galena, sphalerite, and chalcopyrite (Keith, 1977). Most of the area around the mine was claimed by 1985 (Quade and Tingley, 1985).

The Tonopah tunnel consists of two adits driven by the Tonopah Mining Co. in 1935 along mineralized quartz veins (Quade and Tingley, 1985). The lower tunnel, which is 650 feet long, follows a northeast-striking, near-vertical, highly silicified and brecciated, 3 to 4 feet wide, quartz vein that forms bold outcrops across mountain and ridge slopes. Brecciation extends 5 to 6 feet into porphyritic latite on both sides of the vein. A sample from this vein contained anomalously high values of silver (500 ppm), barium, lead, zinc, copper, mercury, and strontium, and lesser values of antimony and tungsten (Quade and Tingley, 1985). No production from this mine is recorded (Keith, 1977).

Less than 1 mile north of the Mohawk mine, the Inspiration Mining Co. was expanding and mining the Sanger mine in 1985 (Quade and Tingley, 1985). Analyses of sampled rock from the mine indicated anomalously high values of silver, barium, strontium, and lead and lesser amounts of zinc, copper, and manganese. A high-grade stringer containing visible argentite, galena, and chalcopyrite assayed at 57 ounces of silver per ton (Quade and Tingley, 1985). According to Keith (1977), the Sanger mine produced small quantities of silver in the past.

Quade and Tingley (1985) describe several other mines and prospects from the district, all of which contain sub-economic quantities of ore minerals. The only additional mine in the district that has produced ore in the past is the Coyote mine. According to Keith (1977), the Coyote mine produced small quantities of silver and ceased operating by 1968. Keith states that the geology and mineralization in the Coyote mine is similar to that in the Nivloc, Mohawk, and Sixteen-to-one mines, but he does not describe the mine workings.

***Geologic Description*:** The Red Mountain mining district occurs entirely within the Silver Peak volcanic center. The oldest rocks exposed at land surface within the mining district are purple, green, gray, buff, and pink siltstone, sandstone, shale, conglomerate, and sedimentary breccia of the middle Miocene (11 to 13 Ma) Esmeralda Formation (Stewart et al, 1974; Robinson et al., 1976, Stewart, 1989). The Late Miocene (5.3 to 6.9 Ma) Silver Peak Volcanics comprise most of the rock at land surface in the mining district (Stewart et al., 1974; Robinson et al., 1976).

The oldest unit in this volcanic sequence is light-gray to greenish-gray, moderately welded, latite ash-flow tuff. Overlying this tuff is a series of white, light-brown, and gray, rhyolitic, zeolitized, lithic, nonwelded tuff sheets, lava flows, obsidian layers, and related intrusive rocks. Gray to greenish-gray and reddish-brown, latite lava flows, partially to densely welded tuff sheets, and related intrusive rocks overlie the rhyolitic volcanic rocks. Pliocene (4.8 Ma) basalt and basaltic andesite lava flows rest unconformably on the Silver Peak Volcanics (Robinson et al, 1976).

The dominant structural feature in the western part of the district is the late Miocene Silver Peak caldera. A series of northeasterly striking, steeply dipping faults cuts both caldera rocks and older rocks adjacent to the caldera. These faults are believed to have acted as conduits for hot fluids that rose to the surface with emplacement of the caldera, extensively altered intra-caldera volcanic rocks, and deposited ore minerals in the altered rocks (Quade and Tingley, 1985).

***Mineral and Energy Resource Occurrence*:** In the Red Mountain district, ore deposits consist of epithermal, steeply dipping, sheeted quartz-calcite veins bearing silver and secondary amounts of gold, lead, zinc, and copper (discussion in this section is mostly from Keith, 1977). Host rocks for the vein deposits typically are hydrothermally altered Miocene volcanic rocks that have been fractured or faulted to varying degrees. Faults and fractures are the major controlling factors for ore mineralization in the district. Zoned alteration is not associated with the ore veins, but the host rocks commonly are silicified or argillized.

The major silver mineral is argentite-acanthite; additional silver minerals include proustite, pyrargyrite, polybasite, stephanite, tetrahedrite, and stromeyerite; other metallic minerals include galena, chalcopyrite, and sphalerite; gangue minerals include quartz, calcite, barite, siderite, and manganese oxides (Quade and Tingley, 1985). At the surface, veins typically consist of friable masses of quartz seldom exceeding 6 feet in width, that have been leached of carbonate, sulfides, clays, and most silver. Supergene enrichment is not characteristic of these ore deposits.

5.37 Silver Peak Marsh

Mining District Location: Silver Peak Marsh mining includes the area covered by Silver Peak Playa, in northern Clayton Valley. The roughly elliptical-shaped playa covers an area of approximately 25-square-miles extending in a northeast-southwest direction between the southern end of Paymaster Canyon and the Silver Peak range at the town of Silver Peak. The district is located entirely in Esmeralda County, primarily in T. 2 S., Rs. 39 and 40 E.; and T. 1

S., R. 40 E. (Plate 1). This mining district is alternately known as the Clayton Valley district. The MN1 alternate of the MRC traverses along the southwestern periphery of the producing area. Lithium is the only commodity produced from the district, with reported occurrences of halite, borates, and potash (Tingley, 1998). The district is currently the only domestic source of lithium.

History of Discovery, Exploration, and Mining: Albers and Stewart (1972) indicate that prior to 1923, sub economic occurrences of borate minerals and potash were discovered on the Silver Peak Playa. They also report minor, local-scale salt mining from the playa before 1923. During the late 1950s, the Leprechaun Mining Company discovered high concentrations of lithium in subsurface brines of the playa during exploration for potassium brines (Davis and Vine, 1979). The Foote Mineral Company acquired the property in 1964, and in 1966 began commercial production of lithium via pumping and evaporative enrichment of subsurface brines (Davis and Vine, 1979). The Foote Mineral Company is now part of the Chemetall Foote Corporation, and lithium production activities are ongoing (Zampirro, 2004).

Chemetall Foote and its predecessor companies have produced lithium from the Silver Peak Marsh district since 1966. Production has occurred from each of the six above described aquifer systems. According to NBMG (2006), the Chemetall Foote operation produces lithium carbonate, lithium hydroxide monohydrate, and lithium hydroxide anhydrite. While production figures are confidential, 1998 public information indicated annual production of about 12 million pounds of lithium carbonate and 5 million pounds of lithium hydroxide.

Geologic Description: Clayton Valley is a complex, asymmetrical graben structure over which several thousand feet of normal faulted and folded basin fill sediments have accumulated. The Clayton Valley is an internally-draining basin with respect to both surface and ground waters. At Silver Peak Playa, basin-fill sediments are composed of an alternating sequence of saline chemical sediments, clay-rich detrital sediments, and minor, isolated layers of air-fall or reworked volcanic ash, all of which accumulated in low energy lacustrine and playa environments. The fine-grained lacustrine and playa sediments are intercalated with coarse-grained alluvial and lake margin sediments around the perimeter of the basin. Geophysical studies and extensive drilling indicate that basin fill sediments in the productive northeastern part of the playa dip at about 30° towards the active, down-to-the-east Paymaster Canyon and Angel

Island normal faults, which partially bound the west side of the basin (Davis and Vine, 1979; Zampirro, 2004).

Mineral and Energy Resource Occurrence: At Silver Peak Playa, commercial lithium products are derived by pumping and evaporative concentration of lithium-enriched subsurface brines. Exploration drilling, geophysical exploration, geochemical analysis, and hydrogeologic modeling conducted by Chemetall Foote and its predecessor companies indicate that lithium enriched brines are contained in several separate aquifer systems exhibiting variable extents of hydraulic interconnectivity. The aquifers are bounded laterally either by stratigraphic discontinuities or impermeable faults. Limited recharge is thought to occur via underflow in the northwestern part of the basin. Economic brines with lithium concentrations ranging from 230 to over 400 parts per million (ppm) have been pumped from 50 production wells with depths ranging from 230 to 1,160 feet.

Historically, the most economically important aquifer is the laterally-extensive and relatively shallow Main Ash Aquifer, composed of a volcanic air-fall ash layer 5 to 30 feet thick. A complex sequence of multiple, laterally-discontinuous reworked ash beds known as the Lower Aquifer System occurs below the Main Ash Aquifer. Below the Lower Aquifer System is the Lower Gravel Aquifer, composed of a laterally-continuous layer of variably sandy and silty gravel. Other identified lithium brine-bearing aquifers include very shallow, discontinuous tufa and saline aquifers, and a thick but laterally-discontinuous sequence of coarse-grained fan sediments that accumulated along the hanging wall of the Paymaster Canyon and Angel Island normal faults (Davis and Vine, 1979; Zampirro, 2004)

The source of the lithium in the brine is not well-understood, though it is hypothesized to originate either as a leachate from lithium-rich rhyolitic tuff exposed on Clayton Ridge east of the playa, or from deep-seated geothermal water flow tapping the magmatic source for the tuff (Zampirro, 2004). Concentration of lithium in the brine is thought to occur at the surface by evaporative concentration and removal of other ions via zeolite and clay authigenesis, and subsurface silicate diagenesis (Davis and Vine, 1979).

5.38 Montezuma

A discussion of the Montezuma mining district was included in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). Where

appropriate, information from that report is included in this report. This report, however, contains additional information not contained in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC. This new information includes mineral occurrences, descriptions of recent mineral exploration, and claim-staking activity near the MRC alternatives MN1 and MN3. This information was not included in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC because it was too distant from the CRC to create a potential conflict with the CRC alternate routes.

Mining District Location: The Montezuma mining district is located at the northern end of the Montezuma Range, approximately 7 miles west of the town of Goldfield, Nevada, in eastern Esmeralda County. It is referenced in this report as Plate ID No. 38 (Plate 1). The MN2 and MCS2 alternates of the MRC pass about 2 miles east of the eastern edge of the Montezuma mining district (MRC alternative MCS2 is approximately coincident with CRC alternative GF4). The majority of the mine workings associated with this mining district is located approximately 5 to 6 miles west of alternates MN2 and MCS2, on the western flanks of the Montezuma Range, and 1 to 3 miles east of alternate MN1. MRC alternate MN3 passes through the north end of the Montezuma mining district.

History of Discovery, Exploration, and Mining: The Montezuma mining district was discovered by Nagle, Carlyle, and Plunkett on 24 May 1867, and the district was organized shortly thereafter. A 10-stamp mill was brought from Yankee Blade to Montezuma in 1870 but only operated for about 4 months. The district continued active until 1887, up to which time it produced about $500,000 mainly in silver, but with some gold. In 1905, the district, was again prospected, and since then was making small intermittent shipments up until 1923 (Lincoln, 1923).

Mining claims and mineral exploration in the Montezuma mining district were not an issue for the CRC. For the MRC; however, mining claims and mineral exploration in the district are close to the various alternative rail alignments. Therefore, these claims and exploration are discussed in this section.

Recent mineral and claim staking within several miles of the MRC occur in three areas of the district. The first is about 1 mile from the alternate MN1 near the junction of alternate MN3 and MN1. These claims have been staked in the vicinity of patented mining claims that date from the

early 20th century and in which silver was the predominant mineral of interest (Albers and Stewart, 1972). A search of mining claim records indicate that in recent years, numerous claims have been staked in secs. 26, 27, and 34 through 36 of T. 1 S., R. 41 E. and secs. 2, 3, 11, and 14 of T. 2 S., R. 41 E.; however, as of March 2007 there is only one active claim in this area. The claims are located approximately ½ to 3 miles from the alignment. No descriptions of recent exploration activities were found in the course of our studies nor was evidence of recent exploration activity observed during a site visit to this area. A search of land records on the BLM's LR 2000 database indicated an authorized Plan of Operation encompassing approximately 14 acres in secs. 3 and 4 of T. 1 S., R. 41 E. near the junction of alternates MN1 and MN3. BLM Tonopah Field Station personnel were unable to provide additional information on the Plan of Operation and thought it may not actually be at the location indicated by the LR2000 records.

A second area of recent mineral exploration in the Montezuma mining district is located 2 to 3 miles southwest of Montezuma Peak near alternate MN1 and is within secs. 15 through 17 and 20 through 22 of T. 3 S., R. 41 E. These claims, the MRP and MR claims, are owned by Mariposa Resources (Mariposa Resources, 2006) and Silver Reserve Corp (Silver Reserve Corp., 2006), respectively. These claims are located within 1 mile of alternate MN1, and MN1 may pass through portions of both of these claim blocks. Mariposa Resources states that their intention was to conduct geological and geochemical studies with the object of finding an ore body containing gold (Mariposa Resources, 2006); however, they do not claim that these properties contain any minerals or resources at this time. No information on planned or recent exploration activity is reported by Silver Resources Corp. in their recent Securities and Exchange Commission filings (Silver Reserve Corp., 2006).

A third area of recent mineral exploration in the Montezuma mining district is on the west side of the district and on the east side of Malpais Mesa and extends from approximately the Nevada Eagle Mine due south to alternate MN1. Two companies, Bonaventure Enterprises, Inc. and Kinbauri Gold Corp., are conducting mineral exploration in this area. Between 1981 and 1997 other companies, including Place Amex, Freeport, Bear Creek, Dome, Bow Valley, U.S. Borax – Kennecott and North Mining, have conducted mineral exploration in this area (Bonaventure Enterprises, 2007).

Bonaventure is actively exploring for gold and silver at their Goldfield West property located about 2 to 4 miles north of alternate MN 1 on claims within portions of secs. 5, 8, 16, and 17 of T. 3 S., R. 42 E. (Bonaventure Enterprises, 2007). These claims are in the vicinity of the Nevada Eagle Mine, and Bonaventure indicates that drilling has identified a resource containing about 140,000 ounces of gold.

Kinbauri Gold Corp. is exploring for gold on their Aztec claim block within portions of secs. 19 through 21, and 26 through 28 of T. 3 S., R. 42 E. Alignment MN1 [appears?] to pass through the southern end of this claim block. Kinbauri reports that other companies have drilled shallow exploration holes on the claim block that reported anomalous gold values. They also report that the results of a geochemical soil survey indicate the presence of a major north-south trending gold anomaly located approximately ½ to 1.5 miles north of alignment MN1 (Kinbauri Gold Corp, 2007). Kinbauri does not report either resources or reserves of contained ounces of gold and silver within the Aztec claim block in the information posted on their website.

Geologic Description: Cambrian limestones, shales, and quartzites make up the principal mass of the Montezuma Hills. They have been intruded by granite, quartz-monzonite, and diorite; and are capped in places by Tertiary volcanic rocks and interbedded Siebert lakebeds (Albers and Stewart, 1972).

Mineral and Energy Resource Occurrence: The principal ore mined in the district was silver ore. The ore bodies in the silver-lead portion of the district consist of veins in limestone and shale and replacements in limestone and are predominantly in the Lower Cambrian Poleta Formation, and to a lesser extent, in the Precambrian Reed Dolomite. The gangue is chiefly quartz. The district is cut by a few felsic and mafic dikes that appear to have no relation to the ore bodies. Ore minerals at the surface include cerusite, copper, malachite, azurite, manganese oxide, and limonite. At depth the ore minerals include galena, chalcocite, and pyrite.

A mercury prospect occurs in the southern part of the district. The deposit is of the opalite type in silicic Tertiary air-fall tuff, faulted against the Deep Spring Formation. The faulted contact strikes about north 60 degrees west and dips about 30 degrees southwest locally paralleling the dip of the tuff to form a rib of opalite, approximately 450 feet long and 30 feet wide at the surface. Cinnabar is disseminated in the unsilicified tuff beds and in the opalite near the fault contact (Albers and Stewart, 1972). This prospect is located approximately 1 mile north of

alternative MN1 within sec. 16 of T. 3 S., R. 41 E. There is no reported production from this prospect (Albers and Stewart, 1972).

A commercial/recreational gemstone collecting area is located in the Gemfield portion of the district, approximately 3 miles west of U.S. Highway 95. Relatively large, northeast-southwest trending outcrops of iron-stained chalcedonic quartz have been quarried as part of mineral collecting efforts on an honor-based fee system for many years. A green common opalite, locally referred to as "Nevada jade," is also collected in this area. MRC alternatives MN2 and MCS2 traverse the land between the gemstone collecting area and U.S. Highway 95.

The nature of the mineralization in the area of anomalous gold values obtained from geochemical surveys on Kinbauri Gold Corporations Aztec claim block is not reported. Kinbauri (2007), however, reports it is contained in drusy quartz coating and filling with abundant fine veinlets of chalcedonic and crystalline quartz in a Tertiary silicified crystal tuff and jasperoid replacement bodies and tectonic breccias within the Paleozoic silicified carbonates. The suite of elements accompanying the gold mineralization is typical of epithermal precious metal deposits.

5.39 Goldfield

A discussion of the Goldfield mining district was included in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). Where appropriate, information from the CRC report is included in this report. This report, however, contains additional information not contained in the Preliminary Mineral and Energy Occurrence Report for the CRC. This new information includes mineral occurrences, descriptions of recent exploration and claim-staking activities near the MRC alternative MN2, MCS2, and MN3 that has occurred since the CRC report was prepared. Some information that was included in the CRC report has not been included in this report as it is too distant from the MRC to create a potential conflict with the MRC or describes activities of mining companies that is superseded by more recent information or is not relevant to the MRC alternative alignments.

Mining District Location: The Goldfield Mining District is located in the Goldfield Hills in eastern Esmeralda County and western Nye County, near the town of Goldfield, and is referenced in this report as Plate ID No. 39 (Plate 1). The boundaries of the Goldfield district shown on Plates 1 and 2 include the mines that reported the most gold production credited to the district in the past. The eastern portion of the district lies within the NTTR, an area closed to

claim staking. In this report, the Goldfield mining district also includes lands within T. 2 S., R. 43 E. and the western half of T. 2 S., R. 42 E. These lands include geologic features similar to the areas where the greatest gold production occurred in the district and where mining companies are currently exploring for gold deposits that may be related to the historic mines and prospects of the district.

The Goldfield mining district includes the three following areas of recent exploration activity: (a) Goldfield Main, located about 1 mile northeast of Goldfield; (b) McMahon Ridge, located about 2 miles east of Highway 95 and northeast of the town of Goldfield; and (c) Gemfield, located about 1.5 miles due north of Goldfield along U.S. Highway 95. In addition, an area referred to as the Tom Keane area (located approximately 4 to 5 miles east of Goldfield) is also the subject of recent mineral exploration efforts.

Alternative MN2 and MCS2 of the MRC pass through the western portion of the Goldfield District. Alternative MN2 enters the Goldfield mining district from the north along a route that parallels and is located about 0.25 to 0.5 mile west of U.S. Highway 95. Alternative MN2 joins alternative MCS2 (about 3 miles north of the town of Goldfield and near the Gemfield area. Alternative MCS2 is approximately coincident with portions of CRC alternative GF4. MCS2 then continues south, paralleling the highway for approximately 6 to 7 miles. This portion of the alignment is generally located about one mile west of U.S. Highway 95. South of the Gemfield area, the alignment then traverses the foot of Malpais Mesa near a public cemetery, natural springs, and the western portion of historic structures in the town of Goldfield. Approximately 1 mile south of Goldfield, alternative MCS2 crosses, from west to east, U.S. Highway 95, and continues east approximately 3 miles, then south-southeast for approximately 4 miles where it passes out of the southern extent of the Goldfield district.

History of Discovery, Exploration, and Mining: The Goldfield mining district was discovered by Harry Stimler and William Marsh on 2 December 1902. After a brief period of excitement, most of the prospectors left the camp and the original claims were allowed to lapse. A.D. Meyers and R.C. Hart located the Combination Lode on 24 May 1903. Ore was discovered on that claim the following October, shipments began in December, and the great Goldfield stampede ensued. The railroad was extended to Goldfield in 1905, at which time the population of the town was 8,000. The Goldfield Consolidated. Mines Company (GCMC) the principal company in the camp was organized by George Wingfield and George Stuart Nixon in 1906, and

its 100-stamp mill was completed in 1908. In 1908, the town of Goldfield reached its maximum population of 20,000. From 1904 to 1918, the Goldfield mining district was the most important gold-producing district in Nevada. By that time, the large known orebodies had become nearly exhausted and the production fell off rapidly (Lincoln, 1923).

The GCMC closed in December 1918, and some minor production continued during the 1920s, primarily by leaseholders. The Bradshaw Company's work of reprocessing the GCMC mill tailing was the majority of activity in the Goldfield mining district during the 1930s. Newmont discovered and mined the Newmont lode in the Goldfield Main portion of the mining district during the late 1940s and so far as it is known only sporadic small scale prospecting activity occurred in the 1950s. Several companies explored the Goldfield mining district for copper-molybdenum deposits during the 1960s. Since 1970, the Goldfield mining district has been the focus of numerous exploration ventures for gold, mainly due to the deregulation of the gold price (MVGI, 2005).

Since its discovery in 1902, more than 4.2 million ounces of gold, 1.5 million ounces of silver, and 7.7 million pounds of copper has been produced from the Goldfield Mining District. Only sporadic minor production has come from the district since the 1920s (MVGI, 2005).

American Resources Corporation and its predecessors extracted a significant tonnage of heap leach ore from the Combination, Red Top, and Jumbo open pit mines from 1988 through 1995, but production figures are uncertain. North Mining leased the exploration rights for the property in 1996, and conducted exploration activities on the property through 1998. Rea Gold Corporation acquired American Resources Corporation, but declared bankruptcy in 1998. Decommissioning Services LLV of Reno, Nevada, acquired the property interests and reclamation responsibilities of Rea Gold. Romarco Goldfield, a wholly owned subsidiary of Romarco Minerals, Inc., obtained a mining sublease, lease, and option to purchase agreement for the Decommissioning Services LLC, properties in 1999 and conducted exploration activities on the property until the company purchased the U.S. interests of Romarco Goldfield (now Metallic Goldfield) from Romarco Minerals, Inc. in April 2001. Metallic Ventures Gold, Inc. (MVGI) has been actively exploring for gold throughout the Goldfield Mining District since that time (MVGI 2005, 2006, and 2007).

District-wide exploration efforts in the Goldfield Mining District in the past was limited to a large degree by the fragmented character of the land ownership. Consolidation of mineral rights by MVGI, has recently provided MVGI with access to a larger portion of the entire district, resulting in a much more comprehensive understanding of the geology and exploration potential of the Goldfield Mining District (MVGI, 2005).

The Preliminary Mineral and Energy Resources Occurrence Report for the CRC provides a district wide description of MVGI's mineral exploration activities in the Goldfield mining district prior to the end of 2004 (Shannon & Wilson, 2005). Much of the information presented in the CRC report was obtained from MVGI's Renewal Annual Information Form for the year ended 31 December 2004 (MVGI, 2005) and pertains to the Goldfield district as a whole and not specifically to the MRC. Renewal Annual Information Forms are documents prepared by a company to provide information to the public, primarily investors, about their activities. As part of this study, we reviewed MVGI's Renewal Annual Information Forms for 2005 and 2006 and other information made available to the public on their website (http://www.metallicventuresgold.com). A summary of the information contained in these reports that is relevant to the MRC is as follows:

- MVGI (2007) reports that at the end of 2006 its Goldfield Project consists of 497 patented and 1,017 unpatented mining claims covering more than 20,600 acres. The 2006 Renewal Annual Information Form (MVGI, 2007) contains a map that shows the majority of MVGI's Goldfield property is located to the north and east of MRC alternatives MN2 and MCS2. However, alternative MCS2 passes through or near portions of the property in secs. 22, 27, and 34 of T. 2 S., R. 42 E.; sec 12 of T. 3 S., R. 42 E.; and secs. 7 and 8 of T. 3 S., R. 43 E.
- In 2005 and 2006, MVGI (2006 and 2007) conducted drilling in Gemfield gold resource area, and reported that the results of the drilling confirmed extensions of previously discovered mineralization in the Gemfield deposit. The drilling also confirmed the presence of shallow high-grade mineralization in previously drilled areas, and allowed for a better understanding of the geology, geometry, and mineralization trends of the Gemfield gold resource.
- MVGI (2007) announced the following mineral resources (measured and indicated) for the three main resource areas as follows:

Area	Classification	Tons	oz/t Au	Contained oz Au
Gemfield	Measured and Indicated	16,853,000	0.032	541,000
McMahon Ridge	Measured and Indicated	8,200,000	0.035	285,000
Goldfield Main	Indicated	6,651,000	0.038	241,800

(using 0.010 oz/t Au cut-off and 3.00 oz/t Au top cut)

- In addition to the above listed resources, MVGI (2007) announced that the three project areas contained an inferred mineral resource of 105,000 ounces of gold.
- Metallurgical studies conducted in 2004 indicate that gold contained in ore from the McMahon Ridge and Gemfield deposits are amenable to recovery by heap leach methods (MVGI, 2007).
- In September 2006, MVGI announced the results of a preliminary assessment the Gemfield and McMahon Ridge deposits by AMEC E&C Services, Inc. (Seibel et al, 2006) to review project exploration data, geological models, resource estimates, scoping-level determination of mine operating costs, preliminary open pit designs and mining rates, and a review of metallurgy and process options (MVGI, 2007). The preliminary designs prepared by AMEC are for a mining operation that would recover and estimated 452,401 oz of gold from the Gemfield and McMahon Ridge deposits by open pit mining methods over a period of nine years.
- MVGI (2006) indicates that it intends to follow the suggestions of the preliminary assessment prepared by AMEC for the McMahon Ridge and Gemfield areas and conduct a drilling program for purpose of refining the mine model and the metallurgical and geotechnical attributes of the project. In addition, they announced that they will complete additional condemnation drilling and initiate environmental studies.

Review of AMEC's report (Seibel et al., 2006) for the Gemfield and McMahon Ridge includes maps showing the proposed open pits. The proposed McMahon pit is located in secs. 19 and 20, T. 2 S., R. 43 E. about 2.5 to 3 miles east of MRC alternative MCS2. The proposed Gemfield pit is located within secs. 26 and 27 of T. 2 S., R. 42 E. and is located approximately 0.3 to 0.5 mile east of MRC alternative MCS2. AMEC's preliminary mine plan for the Gemfield deposit shows that the deposit would be developed in two phases with the second phase requiring the relocation of U.S. Highway 95 about 0.25 mile of its existing location and around the proposed pit. The proposed mine plan also shows the location of the heap leach pad for processing gold ore would be immediately south of the proposed Gemfield pit and to the east of U.S. Highway 95.

MVGI (2007) states that geologic studies of the Gemfield deposit show that the mineralization is likely to be bounded by faults, and that this implies that additional mineralization and offsets of the Gemfield deposit may be found by drilling beyond the limits of the known deposit.

MVGI (2007) indicates that it plans to continue mineral exploration activities during 2007, and it conducts its exploration activities on federal land under a Plan of Operation for the Gemfield deposit and two Notices of Intent to Conduct Mineral Exploration Activities in the Tom Keane and Adams mine areas. The Tom Keane area is located about 5 miles east of the town of Goldfield and 2 miles east of MRC alternative MCS2. The Adams mine area is located approximately between the Gemfield and McMahon Ridge areas and about 1.5 to 2 miles east of MRC alternate MCS2.

A comparison of a map showing recent mining claim activity (Plate 2) and a similar map in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005) indicates that additional claim staking activity has occurred on public lands which contain the MRC. Since the CRC report was prepared, mining claims have been staked within secs. 17 and 20 of T. 3 S., R. 43 W., lands containing MRC alternative MCS2. In the northern portion of the Goldfield mining district and since the CRC report was prepared, mining claims have been staked within secs. 1, 2, and 3 of T. 2 S., R. 42 E. near MRC alternates MN2 and MN3.

BLM land records also show that since the CRC report was prepared several mining companies (Silverthorne Exploration, Inc. and Agnico-Eagle USA, Ltd.) have obtained authorization to conduct mineral exploration activities under Notices of Intent (NOI) in the northwestern portion of the district. These NOI's include lands located approximately 1 to 2 miles from MRC alternatives MN3 and MN2 and contained within secs. 9, 11, 14 and 16, T. 2 S., R. 42 E.

Geologic Description: The geology of the district has been described comprehensively by Ransome et al. (1909) and Ashley (1974-1975) and only a brief description will be given here. The principal rocks are Miocene volcanic rocks that overlie a basement of Ordovician shale and chert (Palmetto Formation) and Mesozoic granitic rock. The principal host rocks in which ore shoots occur are the Milltown Andesite and an overlying dacite. Based on isotope studies, the age of other units are about 21.5 million years old. They are highly bleached and altered generally in a large eastward-elongated, elliptical belt that includes the principal productive part of the district. Elsewhere they have undergone only fairly weak propylitic alteration. The

bleached rocks are argillized, alunitized, and silicified. Typically, the most silicified and alunitized rock forms more or less linear ledges enclosed in soft argillized rock. The individual ledges range from a few feet to hundreds, and locally, to thousands of feet in length and from a few feet to many tens of feet in width. They occur mainly within and parallel to the margins of an eastward, elongated elliptical area, which measures about 5 to 7 miles long east-west and 3 to 4 miles north-south. It can be demonstrated that the major faulting in the district occurred prior to alteration and mineralization, and it is apparent that the ledges, which dip mostly at angles steeper than 40 degrees, reflect an elliptical fracture system, possibly the rim facture zone of a caldera.

The principal mineralized belt is a quartz-alunite ledge system that trends generally north and dips 30 to 40 degrees east, but which in detail has many peculiar bends and irregularities. The dip generally flattens with increasing depth. Individual ore bodies contained in the ledge system were typically rather small, extremely irregular in shape, and often very high in grade. According to Locke (1912), the ore bodies were much like plums in a pudding, and only 6 percent of the aggregate lode areas revealed in all the levels of the Goldfield Consolidated was occupied by ore. However, in certain areas there was more or less an alignment of ore bodies down dip so that their distribution was not completely haphazard. Nevertheless, prediction of the location and grade of ore bodies was virtually impossible. The shape of some individual ore bodies was roughly equidimensional, lenticular, plate-like, or tabular, and some were even spindle-shaped. Feeders for ore bodies were difficult to find and follow, but apparently in some places they led to the discovery of ore bodies. Very little ore was found as deep as 1,000 feet (Albers and Stewart, 1972).

The gold was almost entirely in the form of very fine-grained native gold. Famatinite, bismuthinite, and pyrite were closely associated with it in the unoxidized ore, which generally extended to within 150 feet of the surface. The gold/silver ratio was about 3 to 1. That the ore mineralization is younger than the alunitization and silicification is shown by its occurrence along fractures within the altered rock.

The Goldfield mining district in the broad sense also includes two other productive areas. One, the Sandstorm, was discovered a short while before the main district and is about a mile north of it. In the Sandstorm area, ore shoots containing native gold were localized at the intersections of fractures in rhyolitic rock. Production was probably about $1.5 million. The other productive

area was Diamondfield district. This district achieved some stature as a mining district and is described separately in some publications (Ransome et al., 1909 and Albers and Stewart, 1972); however, it is considered to be part of the Goldfield district in this report.

The Diamondfield district, is about 5 miles northeast of Goldfield in the northern segment of the elliptical belt of altered rock described in the section on the Goldfield mining district. The district is a little over a mile long, and the western part is characterized by quartz-alunite ledges that trend east and dip nearly vertical. They are enveloped by argillized Milltown Andesite. There is limited detailed published information on Diamondfield, but apparently the ore bodies in the western part of the district were irregular, plunged steeply, and contained free gold as the ore mineral and very little silver. In contrast, the ore bodies at the eastern end of the Diamondfield district were along a nearly flat fracture zone in highly silicified dacite and contained a much higher percentage of silver than any other ores in the entire Goldfield area. Total recorded production of the Diamondfield district is $52,305, but actual production may be as much as $1 to $2 million (Albers and Stewart, 1972).

A more modern interpretation of the geologic setting of the Goldfield Mining District is provided by MVGI (2005), as follows: "The Goldfield Mining District is located at the site of a complex and long-lived igneous center that is defined by eruptive vents located along a circular fault system or ring-fracture zone. The center of the ring fracture zone or core area has been domed-up by a late stage buried intrusive event that is believed to have been the source of hydrothermal fluids responsible for wall rock alteration and the metallic mineral deposits. Gold mineralization has occurred mainly along the ring-fracture zone within 600 feet of the surface in the Goldfield Main District and McMahon Ridge areas where fractures and faults have provided conduits for the mineralizing fluids. Volcanic rocks most frequently serve as host formations to mineralization along the ring fracture zone, but significant gold and copper ore has been mined from older pre-Tertiary basement rocks along the east side of the Goldfield Main District".

Mineral and Energy Resource Occurrence: The Goldfield ore deposits are irregular lodes in the fractured and highly altered country rocks. Replacement of the country rocks by quartz, kaolinite, alunite, and pyrite has occurred. The ore shoots are in the form of irregular bodies in the irregular lodes, and their limits can be determined only by assays. The principal ore bodies are in dacite, though some are in rhylolite, andesite, and latite, and low-grade ore with occasional rich shoots occurs at the latite-shale contact (Lincoln, 1923 and Albers and Stewart, 1972).

The principal gangue mineral is compact quartz derived from the silicification of volcanic rock, and associated kaolinite and alunite. The ore minerals occur mainly in the quartz, though at time, in or near alunite. They consist of fine-grained pyrite and marcasite, bismuthinite, goldfieldite, arsenical famatinite, native gold and tellurides, with minor amounts of other sulphides. Concentric shells of ore minerals around altered rock fragments are characteristic of the rich ore (Lincoln, 1923 and Albers and Stewart, 1972).

In 2005, MVGI (2005) stated that zones of high-grade gold mineralization occur in prominent fault structures and igneous dikes in the Goldfield Main, McMahon Ridge, and Gemfield deposits. These mineralized zones have a linear vein-like geometry and are referred to locally as ledges. In the case of the Gemfield Deposit the Sandstorm Rhyolite is particularly favorable for hosting disseminated gold mineralization adjacent to the high-grade silica ledges. Since the CRC report was prepared, MVGI (2007) has stated that the gold mineralization in the Gemfield deposit is actually restricted to rhyolitic lavas of the Sandstorm Rhyolite.

5.40 Railroad Springs

***Mining District Location*:** The Railroad Springs mining district is located at Railroad Pass, in Esmeralda County, about 18 miles southwest of Goldfield, Nevada (Tingley, 1998). Although small, the mining district is spread over parts of five townships: T. 4 S., Rs. 40, 40½, and 41 E.; and T. 5 S., Rs. 40 and 41 E. The mining district is bordered on the northeast by the Montezuma Range, on the southeast by Lida Valley, on the southwest by the Palmetto Mountains, and on the west and north by Clayton Valley (Plate 1). The mining district is located about 7 miles southwest of MRC alternate MN1.

***History of Discovery, Exploration, and Mining*:** According to Lincoln (1923), the first known production from the Railroad Springs mining district occurred in 1908, when one or more mines just west of Railroad Pass (most likely the Big 3 mine) shipped small lots of copper, silver, and gold ore. With a history of exploration dating to the 1920s, the Imperial mine (then known as the Helen mine), produced 2,000 to 3,000 ounces of gold in the 1930s (American Goldfields, Inc., accessed 2006). Albers and Stewart (1972) reported that total production from the district through 1960, was 56 tons of copper, silver, and gold ore worth $4,568.

Using trenching, sampling, and drilling, several companies explored the Imperial mine property from about 1982 to 1984, looking for a Carlin-style gold deposit (Tingley and Smith, 1983;

American Goldfields, Inc., 2006). Carlin-style gold deposits typically consist of very fine-grained gold and sulfides disseminated in carbonaceous rocks and associated jasperoids. Additional work in 1987 delimited a resource of > 0.05 ounce of gold per ton over an area of 2,150 square feet (American Goldfields, Inc., 2006; Miranda Gold Corporation, 2006). Miranda Gold Corp. acquired the claims to the Imperial mine property in 2002, about a year after the person who had held these claims since 1955 allowed them to lapse (Miranda Gold Corporation, 2006). American Goldfields, Inc. acquired the property in 2004 and began a new exploration program to characterize the Imperial mine ore deposit (American Goldfields, Inc., accessed 2006). In 2004 and 2005, American Goldfields drilled six boreholes into previously mined stopes and sampled rock from two vertical shafts at the two ends of the property. This phase of exploration confirmed the presence of high-grade, oxidized gold and silver ore in the mine. Subsequent drilling of 21 boreholes in a 1,500-foot-long section of the property that had not been tested previously failed to reveal any high-grade ore.

Geologic Description: The following discussion mostly is from Albers and Stewart (1972 and Workman et al., 2002). Near the Imperial mine, the lower Cambrian Campito and Poleta Formations were thrust eastward over the middle to upper Cambrian Emigrant Formation and Mule Springs Limestone, probably during the Jurassic or early Cretaceous Sevier orogeny. The formations in the upper thrust plate, the Campito and Poleta Formations, consist mostly of laminated to thinly bedded, green, gray, and brown siltstone, phyllite, and fine-grained quartzite overlain by orange to light-gray limestone with interbedded siltstone and fine-grained sandstone. Formations in the lower thrust plate, the Emigrant Formation and Mule Spring Limestone, consist of laminated to thinly bedded, variably cherty, algal, silty, and silicified limestone interbedded with subordinate fissile siltstone and shale. The Poleta Formation is hydrothermally altered extensively, and other Cambrian formations are altered to varying degrees.

Between the Jurassic and early Tertiary periods, diorite and gabbro dikes and small bodies of rhyolite intruded the Cambrian sedimentary rocks. From middle to late Tertiary time, diversely oriented, mostly high-angle, normal faults broke up the Cambrian sequence into disjointed blocks. During the Late Miocene epoch, andesite, latite, and rhyolite lava flows, flow breccias, and ash-flow tuffs partly covered the previously deposited sedimentary and igneous rocks.

Mineral and Energy Resource Occurrence: Principal commodities in this district are gold, silver, and copper (Tingley, 1998). At the Big 3 mine, on the west side of the district, hydrous

copper, lead, and zinc arsenate, carbonate, and sulfate minerals with disseminated silver occur in quartz veins cutting silicified, and brecciated quartzite and limestone of the Poleta Formation (Tingley and Smith, 1983).

The Imperial mine, in the center of the district, is located on 22 claims covering 450 acres (American Goldfields, Inc., 2006). The mine is excavated into metamorphosed and hydrothermally altered limestone and shale of the Cambrian Campito and Poleta Formations, where they have been intruded by diorite and gabbro dikes and are cut by high-angle faults (Tingley and Smith, 1983). The principal mine workings consist of vertical shafts at each end of the property with drifts and cross-cuts extending outward from each shaft. The topographically lower shaft, at the southwest end of the property, is 527 feet deep and is the main shaft. The topographically higher shaft, at the northeast end of the property, is 250 feet deep (American Goldfields, Inc., accessed 2006). Significant gold mineralization is associated with narrow jasperoid bodies that crop out and occur underground over a strike length of 9,200 feet. The Imperial mine was visited in December 2006, and both vertical shafts were observed.

At the Joshua claim, on the east side of the district, copper minerals occur in brecciated quartz veins. The veins cut thinly bedded limestone of the Cambrian Emigrant Formation, where the limestone is intruded by granitic rocks (Tingley and Smith, 1983).

5.41 Cuprite

The discussion of this mining district presented in this report is substantially the same as that presented in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). The description of the location was modified to reflect the MRC alignment.

Mining District Location: The Cuprite Mining District is located along Mount Jackson Ridge, about 12 to 15 miles south of Goldfield in Esmeralda County, and is referenced in this report as Plate ID No. 41. The district is located in parts of T. 4 S., Rs. 42 and 43 E.; and in T. 5 S., Rs. 41½, 42, and 43 E. (Plate 1). The easternmost portion of this mining district is crossed by section MN1 of the MRC, and the mining district is within 1/2 of a mile of the MCS2 section of the MRC.

History of Discovery, Exploration, and Mining: The copper ores that gave the Cuprite Mining District its name were discovered in 1905. Small amounts of these ores and of lead-silver ores have reportedly been shipped. A few shipments of sulphur were made prior to 1909, and a considerable number since (Lincoln, 1923).

At the northeastern portion of the Cuprite Mining District, west of U.S. Highway 95, the field reconnaissance performed as part of the studies for the CRC (Shannon & Wilson, 2005) indicated evidence of recent mining claims (wooden posts) as well as recent trenching and drilling. There is a geothermal well in the area. The pad has been reclaimed and this drilling appears to pre-date the precious metals exploration efforts.

There is also a silica quarry (Shannon & Wilson, 2005), within the mining district. The identity of the owner of this property was not determined in the course of these studies. Geothermal wells are recorded in the area, mostly east of U.S. Highway 95 (Plate 3). An abandoned well in this area and numerous roads were observed and appear to be associated with geothermal exploration. NBMG Map 141 (Shevenell and Garside, 2005) also indicates the presence of numerous warm and hot heat flow wells in this area.

Geologic Description: According to Ball (1906), chalcopyrite and lesser pyrite, galena, calcite, and quartz appear to have been deposited as sporadic masses in the limestone as seams along joints and as lens-shaped bodies along shear zones. The ores were altered by aqueous solutions to chalcocite, carbonates, and oxides. The limestone is apparently in part of the Mule Spring Limestone (Lower Cambrian) and the Emigrant Formation (Middle and Upper Cambrian). Gold-bearing veins in Tertiary rhyolite occur in northeast end of the district. Sulphur occurs in altered Tertiary tuffaceous sedimentary rocks and welded tuffs at the northeastern end of the district. Production from the district is apparently very small, and none has been recorded (Ball, 1906).

Mineral and Energy Resource Occurrence: The mineral deposits of the Cuprite Mining District are copper-silver-gold replacements in the Cambrian limestone and gold-bearing veins in Tertiary rhyolite. The minerals of the replacement deposits are chalcopyrite, pyrite, galena, calcite, and quartz.

Deposits of silica, sulphur, and potash have been identified (Ransome et al., 1909). One large deposit is located on top of a small hill of Siebert Conglomerate and is a nearly horizontal

stratum of white ashy material containing masses of sulphur. This white material was probably originally rhyolite tuff or glass, but is now altered to silica and alunite. A second deposit is located approximately ½ mile northeast of Cuprite and consists of altered rhyolite pumice containing alunite. Most of the silica is low alunite, and the alunite is a soda variety low in potash (Lincoln, 1923).

The background data reviewed and results of the field reconnaissance suggest the presence of a relatively large geothermal system in this area (Shannon & Wilson, 2005).

5.42 Stonewall

The discussion of this mining district presented in this report is substantially the same as that presented in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). The description of the location was modified to reflect the MRC alignment. In addition, the text has been modified to reflect recent exploration activity by Seabridge Gold, Inc. since the CRC report was prepared.

Mining District Location: The Stonewall Mining District is located on the north slope of Stonewall Mountain about 15 miles southeast of Goldfield and is referenced in this report as Plate ID No. 42 (Plate 1). The district is adjacent to the western boundary of NTTR, at the northwest periphery of Pahute Mesa. The easternmost portion of the district, in the vicinity of Stonewall Spring, straddles the NTTR boundary. The district is located in parts of T. 4 S., R. 44 E.; and T. 5 S., Rs. 43 and 44 E. Section MCS2 of the MRC traverses the westernmost portion of the Stonewall Mining District, and section MN 1 of the MRC is within ½ mile of the district.

History of Discovery, Exploration, and Mining: The Stonewall Mining District reportedly was prospected for gold and silver as early as 1905, and small shipments were made in 1911 and 1915 (Lincoln, 1923). Gold values ranged from a trace to $6 per ton. Kral (1951) reports that the Sterlog claims at the northwest corner of the Stonewall Mountain have a 240-foot shaft on a vein with silver mineralization and a 1-mile-long adit driven south from Stonewall Flat to intersect the vein 500 feet below the collar of the shaft. The adit was driven in the 1920s and the property was abandoned shortly after.

NBMG files included a field examination sheet dated 1982 in which Jack Quade visited the Stonewall Silver Mine and indicated that Stonewall Silver mines was currently conducting extensive drilling up the northwest side of Stonewall Mountain and had exposed five or six benches and new roads and a mill site at the apex of the canyon (Quade, 1982). This area is approximately ½ mile south of the Stonewall Mine and the mineralizing vein structure. The area was not visited during field reconnaissance.

According to the Seabridge Gold, Inc. news release dated March 10, 2003, the Stonewall project includes 73 claims and covers the northern flank of the Stonewall mountains, approximately 15 miles southeast of Goldfield, Nevada. During the early 1900s, the Stonewall Mining District witnessed significant precious metals production from high-grade veins, which remain untested by modern exploration. Reportedly, the current exploration focus at Stonewall is on a series of generally parallel quartz veins occupying concentric ring fractures of a resurgent Tertiary caldera. These veins range from 1 to more than 60 feet in thickness with strike lengths of up to 8,000 feet. Textural evidence suggests these veins could represent the upper levels of an epithermal bonanza deposit (Seabridge Gold, Inc., 2003). In 2004, Seabridge Gold (2004) announced that its 75 percent-owned subsidiary, Pacific Intermountain Gold (PIGCO) granted Hecla Mining Company an option to earn a 100 percent working interest in the Stonewall project by expending $750,000 in exploration expenditures over a 3-year period and paying PIGCO $250,000 in advance royalties.

Geologic Description: According to Cornwall (1972), Stonewall Mountain consists of steeply dipping rhyolitic and latitic welded tuffs intruded by quartz latite, bounded on the east by glassy rhyolite flows and plugs. Two blocks of Precambrian rocks border the intrusive quartz latite at the north end of the mountain. The welded tuffs have not been recognized outside of the mountain area. They may be concealed by younger rocks and alluvium that surrounded the mountain, or they may have been erupted into a volcano-tectonic graben and thus confined to that area. The north end of Stonewall Mountain is bounded by a steep northward-dipping normal fault with downward movement on the north side. The eastern part of the district, in the vicinity of Stonewall Spring, is underlain largely by intracaldera welded rhyolite ash-flow tuffs and silicic resurgent intrusions, which have been hydrothermally altered to propylitic mineral assemblages including quartz, adularia, albite, chlorite, illite, epidote, pyrite, and calcite.

Mineral and Energy Resource Occurrence: An east-northeast-striking, north-dipping system of quartz veins extends for about 5 miles along splays of the prominent range-bounding fault. The veins are as much as 15 feet wide and consist of banded, crustiform and drusy-comb quartz with locally abundant boxwork texture after bladed and tabular calcite. Much of the vein system comprises zones of up to about 45 feet in width of closely spaced, anastomosing and subparallel veins and cockade-crustified breccia. Fragments of banded quartz overgrown by later stages of quartz are common, indicating repeated episodes of brecciation and fracturing occurred during vein emplacement. Wall rocks are strongly adularized, silicified, and pyritized for several meters away from the vein margins. The veins are thoroughly oxidized in surface exposures (Cornwall, 1972).

Recent chemical data (Tingley et al., 1998) from surface rock-chip samples indicate the veins contain highly elevated, but sub-economic quantities of gold and silver. Concentrations of base metals and the indicator elements arsenic, antimony, mercury, tellurium, and thallium are low, even in samples containing abundant silver. Tin and selenium are low, and elevated amounts of bismuth and molybdenum are present locally.

5.43 Lida

Mining District Location: The Lida mining district as defined by Tingley (1998) includes the southeastern most part of the Palmetto Mountains, extending from Stewarts Spring on the northeast slopes of Magruder Mountain to just west of Mount Jackson. It is located in parts of Tps. 5 and 6 S., Rs. 40 and 41 E. (Plate 1). The district is alternately known as Lida Valley, Alida, or Alida Valley. Descriptions of the Lida district in Tingley and Smith (1983) and Albers and Stewart (1972) apparently include all or parts of the adjacent Tule Canyon and Palmetto mining districts in the Lida district. At its nearest point, the Lida district is located approximately 7.5 miles southwest of the MN1 alternate of the MRC, and a majority of historically productive mines in the district are more than 10 miles away from the MRC. The primary commodities of the district include silver, gold, lead, copper, and turquoise (Tingley, 1998).

History of Discovery, Exploration, and Mining: According to Tingley and Smith (1983), mineralization in the area was discovered in 1871, and stamp mills were operational in the area by 1875. An additional period of district production is reported between 1908 and 1921. Early exploration and production in the Lida district likely apparently occurred from the area south and

southeast of Lida, where Hess (2001) indicates the presence of numerous mines and prospects. Several mining companies conducted exploration for porphyry-type copper mineralization near Mount Jackson during the 1970s, but did not confirm an economic porphyry deposit (Tingley and Smith, 1983). BLM records show active mining claims in an area south and southeast of the Lida district as of late 2006 (Plate 2).

Available production figures for the Lida district appear to include production from all or part of the adjacent Tule Canyon and Palmetto districts. Through 1960, Albers and Stewart (1972) report production for this area totaling 5,573 tons of ore containing primarily silver worth $326,391. Tingley and Smith (1983) report production between 1871 and 1940 worth "slightly under $600,000." Due to the geographic uncertainties, production from within the boundaries of the Lida District as defined by Tingley (1998) is likely significantly less than the above provided figures.

Geologic Description: The western part of the Lida district, including historically productive areas, is underlain by exposures of faulted Precambrian- to Ordovician-age metasedimentary rocks. The metasedimentary rocks are intruded by Jurassic- to Tertiary-age quartz porphyry dikes and unconformably overlain and equivalent felsic extrusives (Albers and Stewart, 1972). The Mount Jackson area is underlain by intercalated Miocene age bedded tuff and andesite, with mount Jackson itself composed of a Pliocene-age rhyolite plug or dome (Albers and Stewart, 1972, p. 35).

Mineral and Energy Resource Occurrence: Historic production from the Lida district occurred from quartz or calcite veins associated with fine-grained dikes hosted by Cambrian-age limestone of the Deep Spring, Harkless, and Poleta Formations (Albers and Stewart, 1972). Veins reportedly include elemental gold and copper, hornsilver or silver-bearing galena, and other sulfides. In the vicinity of Mount Jackson, drilling indicated alteration and quartz veining with copper and molybdenum anomalies. Morrisey (1968) reports occurrences of turquoise in the Lida vicinity.

5.44 Gold Point

Mining District Location: The Gold Point mining district as defined by Tingley (1998) essentially covers the east-west to northeast-southwest trending arc of Slate Ridge in southern Esmeralda County, primarily in Tps. 6 and 7 S., Rs. 41, 41½, and 42 E. (Plate 1). The district is

alternately known as Lime Point, Hornsilver, Morning Star, or Stateline. At its nearest point, the district is located approximately 6 miles southwest of the southern terminus of the MCS2 segment of the MRC. Significant production from the Gold Point district is limited to a small area within a few miles of the Goldpoint townsite, located approximately 15 miles southwest of the southern terminus of the MCS2 segment of the MRC. The primary commodities of the district include gold, silver, lead, zinc, copper, tungsten, mercury, and uranium.

History of Discovery, Exploration, and Mining: The district was discovered in 1886 and during the late 1880s relatively minor silver production was reported from the area surrounding the Gold Point townsite. Additional gold, silver, copper, lead, and zinc were produced between 1907 and 1921 following the Goldfield boom. From 1930 to at least the early 1960s, minor intermittent production occurred from the district (Tingley and Smith, 1983).

Nearer the MRC in the eastern part of the district, Hess (2001) indicates past mercury production from the Slate Range Mine, and Albers and Stewart (1972) indicate a copper occurrence. As of late 2006, active mining claims were present in the western portion of the district in Tps. 6 and 7 S., R. 42 E. and about 4 to 5 miles east of MRC alternative BC3 (Plate 3).

Geologic Description: Productive areas near the Gold Point townsite are underlain by siltstone and carbonate rocks of the Precambrian Wyman Formation and Reed Dolomite intruded by a north-trending spur of the Jurassic Sylvania Pluton. These rocks are cut by a parallel complex of north-northwest trending fault zones, diorite dikes, and oxidized quartz veins. The geology in the historically productive area is confined to areas west of Mount Dunfee, and does not appear to extend within 10 miles of the MRC alignment. In the eastern part of the district nearer the MRC, siltstone, quartzite, and carbonate rocks of the Cambrian Harkless and Poleta formation are unconformably overlain and faulted into contact with unnamed Miocene airfall tuffs and the Pliocene Timber Mountain and Thirsty Canyon Tuffs (Albers and Stewart, 1972).

Through 1960, Albers and Stewart (1972) report total production of between approximately $750,000 and $1 million from the Gold Point district. Quantitative information regarding mercury production in the eastern part of the district reported by Hess (2001) was not identified during this investigation.

Mineral and Energy Resource Occurrence: The ore minerals in the quartz veins cutting the Proterozoic metasedimentary and Jurassic Sylvania Pluton rocks largely include silver halides,

with minor native gold, galena, and cerrusite (Albers and Stewart, 1972). Garside (1973) reports several uranium occurrences in the western part of the Gold Point district, all of which are hosted in the Precambrian Wyman Formation or Jurassic plutonic rocks. Information regarding the mercury and copper occurrences in the eastern part of the district was not identified during this investigation.

5.45 Wagner

The discussion of this mining district presented in this report is substantially the same as that presented in the Preliminary Mineral and Energy Resource Occurrence Report for the CRC (Shannon & Wilson, 2005). The description of the location has been modified to reflect the MRC alignments. No new claim staking or mineral exploration activity was identified for this district during this study since the CRC report was prepared.

Mining District Location: The Wagner Mining district is referenced in this report as Plate ID No. 45, and is located in parts of T. 6 S., Rs. 43 and 44 E. (Plate 1). The western boundary of the Wagner Mining District is approximately 1/14th of a mile east of section BC3 of the MRC alignment. The eastern boundary of the Wagner Mining District is approximately ½ mile west of section BC2 of the NRL.

History of Discovery, Exploration, and Mining: The 18 claims located near the Wagner Mining district were located in 1903 and 1904 by Frank M. Ish of Goldfield, who had sunk two 100-foot shafts on the property by October 1906. Ore material from one of the shafts was said to assay 10 to 13 percent copper and $5 to $8 in gold, and material found during assessment work on the Ish group ran 20 percent copper and $15 in gold. There were plans to ship ore from the property in 1906, but there is no record of any production at that time. The Wingfield interests sank the main shaft 453 feet deep as well as a circular shaft 100 feet deep about a year or so prior to 1912, the year in which the claims were patented under the ownership of the Wagner Copper Co. (Lincoln, 1923).

The property was drilled by Gulf Resources and subsequently by BHP in the early 1990s. Reportedly some of the holes were drilled as deep as 425 meters in a search for a buried porphyry copper system. No igneous porphyry was found in the deep holes drilled by BHP, but their drilling may not have been deep enough or was mislocated (Tingley et al., 1998). Results

of these drilling programs were not provided in the documents reviewed for the CRC report (Shannon & Wilson, 2005).

Geologic Description: The main rock type in the mining district is the Wood Canyon Formation of Late Proterozoic and Early Cambrian age. The Wood Canyon Formation in the area consists of a thick sequence of shale, quartzite, and some intercalated limestone. The Wood Canyon Formation is intruded by an andesite plug and is unconformably overlain by silicic tuffs (Tingley et al., 1998).

Mineral and Energy Resource Occurrence: Mineralization in the district is confined to the Wood Canyon Formation; the Tertiary volcanic rocks are unaltered. The mineralization occurs in brecciated quartzite; in silicified, brecciated shale; and in one locality, in kaolinized shale. Typical ores consisted of hematite-stained, brecciated quartzite cemented with clear, crystalline quartz, malachite, chrysocolla, and azurite. Recent sample analysis (Tingley et al., 1998) showed anomalous amounts of arsenic, bismuth, nickel, cadmium, mercury, antimony, zinc, cobalt, molybdenum, selenium, tellurium, uranium, tungsten, vanadium, tin, thallium, and barium in various samples.

The anomalous suite of elements of recent samples collected as part of preparing Open File Report 98-1 and the character of the mineralization (stockwork veinlets, silicified breccias in shales, quartzite, and minor carbonate replacement) characterize the Wagner Mining District as a polymetallic replacement deposit, possibly related to a buried copper porphyry (Tingley et al., 1998).

5.46 Mineral Material Resources

Mineral materials as defined in this report consist of sand and gravel and stone used for construction aggregate. Mineral materials mined in the study area consist primarily of sand and gravel; these are typically mined in relic river channels and older alluvial fans. The sand and gravel typically mined in this area is well graded, material with 5 to 15 percent passing the No. 200 sieve (Shannon & Wilson, 2007b). It is most commonly used for road construction in this area, and receives some use in the residential and mining industry for construction materials (for example, at Chemetel Foote's lithium operation). Location often is the most important factor in the acquisition of sand and gravel, and many of the borrow pits and mineral material sites in the study area are proximal to highways and roads or communities.

There is little published literature on the occurrence and use of mineral materials within the study area. To obtain an understanding of where these materials have been acquired for all purposes, we searched the Bureau of Land Management Land and Mineral Records (LR2000 database). One-hundred and thirty-five material sites were identified within a 10-mile radius of the alignment. The locations of the sites are presented in Plate 4, but are not differentiated by type in the plate (refer to Table 2 for status and case type).

In Table 2, each site has a designated case type that corresponds to the regulations or laws, which gives the BLM authority over the disposal of mineral materials as follows:

- Case type 282102 Material sites (Section 107)
- Case type 282104 Material sites (Section 317)
- Case type 282106 Material sites (Section 17)
- Case type 361113 Mineral materials-negotiated
- Case type 360413 Mineral materials-disposal sites
- Case type 362113 Mineral materials-free use permit

The negotiated sites (Case Type 360113) are used to sell aggregate rights to private industries by noncompetitive sales. In the study area, a search of BLM records did not disclose competitive mineral material sales. Noncompetitive sales must be "in the private interest", must be smaller than 300,000 cubic yards (with a few exceptions), and must have been impractical to have competitive bidding (43 CFR 3600).

The free use permits (Case Type 362113) are reserved for non-profit industries and government industries apart from transportation. These leases are free, and are granted for 10 years to the government, and one year for non-profit organizations.

The mineral material disposal sites (Case Type 360413) are community pits. These community aggregate sites may be any size, and materials are sold from these sites, at market price, for smaller or temporary jobs where a developing a completely new aggregate site would not be practical.

Three material sites codes (Case Types 282102, 282104, and 282106) refer to material sites where aggregate is used for Federal-Aid Highway construction and maintenance. These sites are typically located directly adjacent or near highways, and a right-of-way or easement usually exists from the site to the highway.

For much of the Mina Corridor, the alignments closely parallel current highways and other roads. As such, there is a high potential for conflict between the alignment and borrow pits located near these roads, where the sites, or access roads to the sites, are crossed by the MRC. To assess potential conflicts between authorized and pending mineral materials sites and the MRC, we reviewed BLM Master Title Plats.

We consider there to be a potential conflict between the MRC and a material site if the site is located within approximately 1 mile of the MRC. Such sites (with respective BLM case file numbers for each site) are contained within the following lands:

sec. 21, T. 8 N., R. 32 E.	Nvcc 0020777
secs. 20, 26, and 25, T. 8 N., R. 33 E.	Nvcc 0018248, Nvn 038418
sec. 1, T. 4 N., R. 35 E.	Nvn 059640
sec. 35, T. 4 N., R. 36 E.	Nvn 0059730
sec. 31, T. 3 N., R. 37 E.	Nvn 0059765
secs.12, 18, 19, and 20, T. 3 N., R. 40 E.	Nvn 056304, Nvcc 0020911, Nvn 004225
secs. 8 and 15, T. 2 N., R. 37 E.	Nvcc 0018482, Nvn 0059766
secs. 16, 20, and 21, T. 2 N., R. 38 E.	Nvcc 0019980, Nvcc 0022520
sec. 9, T. 1 N., R. 39 E.	Nvn 0059729, Nvcc 0019978
sec. 16, T. 1 S., R. 39 E.	Nvcc 0019981
sec. 23, T.1 S., R. 42 E.	Nvn 0001469
secs. 10, 14, 22, and 23, T. 2 S., R. 39 E.	Nvcc 0019982, Nvn 077461, Nvn 078127
sec. 7, T.2 S., R. 41 E.	Nvn 076061
sec. 3, T. 2 S., R. 42 E.	Nvn 021776
sec. 25, T. 4 S., R. 42 E.	Nvn 0066629, Nvn 0067253
sec. 30, T. 4 S., R. 43 E.	Nvn 0066629, Nvcc 0018452, Nvn 0042800

Additional information, including ownership, can be obtained by referring to Table 2.

Comparing the legal description of the authorized mineral materials sites with the geographical location of the alignment will be necessary to further define the extent and the nature of the conflict.

5.47 Oil and Gas Occurrences

Studies undertaken to assess the likelihood of the existence of petroleum in Nevada have generally been based on known production, shows of oil or gas at the surface or in exploratory wells, proximity to areas of potential source and reservoir rocks, and the thermal maturity of the source rocks (Sandberg, 1983). The Basin and Range province is a structurally and

stratigraphically complex region, and its geology with respect to petroleum resources is relatively poorly understood when compared with petroleum provinces with less complex geology and more subsurface information.

As reported by French (1994), the search for hydrocarbons in this region is source-rock driven. It must first be demonstrated that adequate source rocks exist, and then that they may have been heated enough to generate petroleum. The presence of potential traps alone is typically not enough evidence to indicate the potential for the occurrence of petroleum resources in the subsurface.

The majority of the potential source rocks in Nevada with favorable thermal maturity characteristics are located in the eastern part of the state (Harris et al., 1980). Potential source rocks in western Nevada are generally overmature with respect to petroleum generation, typically due to regional metamorphism or heating by the numerous igneous intrusions found in the area. Some Tertiary sedimentary units in this area, however, may be undermature with respect to petroleum generation potential due to the lack of deep burial.

No producing oil and gas wells exist within 10 miles of the MRC. The nearest wells in Nevada with significant production are located in Railroad Valley, approximately 80 miles east of Tonopah in northeastern Nye County. As of 2004, four exploratory holes have been drilled within 10 miles of the MRC, with only one indicating a show of gas. Three of the wells are located in the Big Smoky Valley, and one is located at the North end of Mason Valley (Hess, 2004). The MRC traverses several areas of expired or relinquished (closed) oil and gas leases, and passes near a few smaller blocks of oil and gas leases currently authorized by the BLM. The locations of exploration holes and leases are shown on Plate 3. Closed leases indicate where oil and gas companies have shown interest in tracts of land in the recent past.

5.47.1 Big Smoky Valley Leasing and Exploration

Closed oil and gas leases encompass several large tracts of land in Big Smoky and Montezuma Valleys between Coaldale and Tonopah. These closed oil and gas leases are shown in Plate 3, and the leases include all or parts of 10 townships, including:

- T. 1 N., R. 38 E.
- T. 2 N., Rs. 37, 38, and 39
- T. 3 N., Rs. 39, 40, and 41 E.

- T. 4 N., Rs. 40 and 41 N.

The MCS1 segment of the MRC passes over or within 1 mile of closed oil and gas leases just east of Coadale in secs. 13 and 14, T. 2 N., R. 37 E. The MN2 alternate of the MRC passes over or within 1 mile of closed oil and gas leases in secs. 5 and 6, T. 2 N., R. 39 E., and in several sections within T. 3 N., Rs. 39, 40, and 41 E.

Three exploratory holes were drilled in the areas covered by these closed oil and gas leases. The locations of the exploratory holes are shown in Plate 3. In 1979, Wright Exploration drilled Federal 26-1 to a total depth of 5,666 feet in SW¼ NE¼ sec. 26, T. 1 N., R. 38 E., or approximately 3,000 feet west-southwest of the MN1 alignment alternate at approximate Station 5170+00. Federal No. 26-1 was dry, and was plugged and abandoned. The hole is reported to have encountered volcanic rocks at a depth of about 5,000 feet (Hess, 2004).

Approximately 10 miles to the northeast, in NW¼ NE¼ sec. 7, T. 2 N., R. 39 E., Marshall Oil Company Drilled Federal Jake No. 1 in late 1997 to a total depth of 8,928 feet. This hole is located approximately 3,000 feet southeast of the MN2 alignment alternate at approximate Station 10680+00. The hole encountered approximately 2,300 feet of valley fill sediments underlain by Ordivician Palmetto Formation to a depth of 4,700 feet, where granite was encountered. Federal Jake No.1 was a dry hole, and was plugged and abandoned (Hess, 2004).

In June 2000, Fishlake Oil Company completed the Coaldale Well at a total depth of 5,218 feet in sec. 12, T. 2 N., R. 37 E., or about 7,000 feet north of alignment segment MCS1 at approximate Station 4605+00. Lithologic information about formation tops is not available. Fishlake Oil Company reported a show of gas in the Coaldale Well, and the hole was subsequently abandoned (Hess, 2004).

5.47.2 Mason Valley Leasing and Exploration

In 1907, Yerington Oil & Gas Company drilled an unnamed hole to a total depth of 262 feet. The dry hole, located in T. 15 N., R. 26 E., or about 4 miles north northwest of the northern terminus of the MRC, was abandoned. The hole bottomed out in "porphyritic igneous rock" below 248 feet of basin fill sands (Hess, 2004). It should be noted as this hole was drilled

prior to the enactment of the Mineral Leasing Act of 1920, and it is not associated with any oil and gas lease areas shown in Plate 3.

More recently, two oil and gas leases located in Lyon County in northern Mason Valley were relinquished in August 1984. There is no oil and gas exploration activity reported that is associated with either of the two leases. The smaller of the two leases included 400 acres in sec. 36, T. 15 N., R. 24 E., located approximately 4 miles southwest of Wabuska. The larger of the two leases includes a tract of land within all or part of nine sections in secs. 1 through 3, 10 through 15, 22 through 27, and 34 through 36, T. 15 N., R. 25 E. just northeast of Wabuska. Existing UPRR rail included in the MRC passes within a mile of this lease block. The closed leases are shown in Plate 3.

5.47.3 Existing Authorized Oil and Gas Leases

As of January 2007, the MRC does not traverse any authorized oil and gas leases; however, the MRC passes near two currently authorized leases in the Soda Spring Valley east of Mina.

The BLM authorized an oil and gas lease in sec. 3, T. 6 N., R. 35 E., or approximately 2 miles east-northeast of Mina in Mineral County in September 2006. The section including the lease is shown in Plate 3. The MCS1 segment of the MRC passes within approximately 1 mile of this lease.

Several authorized oil and gas leases are located on the north slope of the Pilot Mountains along Cinnabar and Dunlap Canyons in Mineral County. These leases were authorized by the BLM in July 2006, and include parts of T. 6 N., R. 36 E., and T. 7 N., Rs. 35 and 36 E. The locations of the sections containing the leases are shown in Plate 3. The MCS1 segment of the MRC passes within 5 miles of this lease block.

5.47.4 Past Oil and Gas Leasing Activity

Expired oil and gas leases are located in secs. 1 through 24 and 27 through 30, T. 2 N., R. 36 E. in Esmeralda County. The leases were relinquished in March 2003. The leased area covered most of the south half of Columbus Salt Marsh west of Coaldale. The MRC passes within approximately 2 miles of the northeast corner of the lands containing these leases. No exploratory drilling is reported to have occurred on these oil and gas leases.

5.48 Coal Occurrence

The NBMG (2005) reports that Nevada is not currently a coal-producing state. There are, however, a few minor coal occurrences in the state. Only one such occurrence is known along the MRC, in the Coaldale mining district. The coal occurs in secs. 28, 29, 32, and 33, T. 2 N., R. 37 E. (Toenges, et al., 1946), about 2 miles south of the MCS1 alternate of the MRC (Plate 3).

As of January 2007, there are active coal leases or permits within 10 miles of the MRC based on a search of land records contained in the BLM LR2000 database. The BLM Master Title Plat and Historical Index for T. 2 N., R. 32 E. shows that patents were issued on lands containing coal in secs. 28, 29, 32, and 33 prior to the enactment of the Mineral Leasing Act of 1920.

Four thin, poor quality coal beds ranging in thickness from approximately 4 to 21 feet thick are present in the Esmeralda Formation of the northeast Silver Peak Mountains. The coal beds are interbedded with sandstone, shale, and tuff in a stratigraphic sequence that is approximately 290 feet thick, and even the highest quality coal beds have high ash content. The coal was mined from about 12 vertical and inclined mine shafts, including the Darms Mine (Albers and Stewart, 1972; Robinson, et al., 1976). The coal beds probably are lenticular or possibly offset by faults, because they are difficult to trace between outcrops and to correlate between boreholes (Toenges, et al., 1946).

The deposit was initially discovered in 1893, and between its discovery and approximately 1920, only a few economically unsuccessful attempts were made to mine and market the coal to local railroads, smelters, and to proposed coal gas and coking operations. With the fuel and chemical shortages of World War II, the Coaldale coal occurrence again sparked a brief period of interest, starting with a mapping effort by the USGS in 1942, and a Department of the Interior appropriation for development of the resource in 1943. These efforts culminated in experimental efforts by the USBM to produce petroleum from the coal, and experimental efforts by a private chemical company to produce coal tar-derived chemicals and to use the coal in production of ammonium sulfate as a soil additive (Earl, 1997). No known coal exploration or production has occurred in the Coaldale mining district since the end of World War II.

5.49 Geothermal Resource Occurrences

Both geothermal features and leases are located along and near the MRC. A majority of the information below, on geothermal features described in the report, is derived from Shevenell and Garside (2005), an online database compiled of available Nevada geothermal literature. S&W personnel also observed geothermal leases at several locations.

5.49.1 Wabuska Marsh District – Wabuska Hot Springs

The Wabuska geothermal area is located at the northern end of the Mason Valley, approximately 8.5 miles west of the northern terminus of the MRC S1/S2 alternate. Thermal springs occur along a northeast-trending zone of faults along the southern margin of the Desert Range in secs. 14, 15, 16, and 23, T. 15 N., R, 25 E. These faults are believed to facilitate upward movement of water heated at depth by the natural geothermal gradient in the area, and not by a buried intrusive body. Evaporation of hot, saline water at the land surface left a crust containing halite, thenardite, calcite, and other saline minerals. In addition to the natural springs, several steam wells have also been drilled in this area. The two units of the Wabuska geothermal power plant became operational in 1984 and 1987, making this the first geothermal power plant in Nevada. The plant consists of two iso-pentane binary generators that produce a combined 2.2MW from a 225 Degree Farenheit (deg F) reservoir at 351 feet below the ground surface. Energy generated by this power plant is sold to Pacific Power for rural electric and industrial uses.

Since the 1980s, the BLM has issued geothermal leases in portions of T. 15 N., Rs. 25 and 26 E. All but one of the leases is now expired. Homestretch Geothermal LLC, the operator of the Wabuska Geothermal Plant, currently holds a lease on lands within secs. 14, 15, 16, 22, and 23, T. 15 N., R. 25 E. The Homestretch Geothermal LLC lease is listed with an effective date of 1 September 2006.

In addition to ongoing power generation, the Wabuska geothermal area has intermittently supported several other uses. In the early 1970s, Agri-Technology built greenhouses heated by water from the steam wells to grow vegetables, and Tad's Enterprises built a geothermal-powered ethanol plant that produced alcohol from grain in the early 1980s. Both the greenhouses and the ethanol plant have been demolished. Geothermal waters have also been

used in past efforts to raise spirulina algae as a dietary supplement, and for pilot studies to raise prawns, catfish, and tropical aquarium fish.

A website posted in late 2006 reports that "Wabuska Nevada is home to the world's first geothermally powered and heated biodiesel plant, run by Infinifuel Biodiesel" (Biodiesel Magazine, 2007). According to this website, the plant uses electricity from the Wabuska geothermal power plant. It also uses geothermal steam both to heat facilities, and as a heat source in the biodiesel production process.

5.49.2 Silver Peak Marsh District – Pearl Hot Springs

In 1967, the Pearl Hot Springs were reported to issue from the east side of the Silver Peak Marsh in sec. 25, T. 1 S., R. 40 E. at a temperature of 36.7 Degree Celcius (deg C). The MN1 alternate of the MRC Passes approximately 3.5 miles southeast of Pearl Hot Springs. The springs may issue along the trend of a major north-northeast-striking fault, though an account of the area in 1981 indicated that Pearl Hot Springs were dry. There is no documented use of Pearl Hot Springs as an energy resource. The BLM has issued Goodsprings Development Corporation a geothermal lease with an effective date of 1 June 2003, on lands within secs. 23, 25, 26, and 35, T. 1 S., R. 40 E. (Plate 2).

5.49.3 Silver Peak Marsh District – Silver Peak Hot Springs

Historic reports of Silver Peak Hot Springs describe eleven hot springs along the western edge of Silver Peak Marsh just north of the town of Silver Peak (NW¼ SE¼ SE¼ sec. 15 T. 2 S., R. 39 E.; see Plate 2). Trexler and others (1981) reported that the springs were dry in 1980. A January 2007 telephone interview with a local resident of Silver Peak (Hulsen, 2007), indicates that the Silver Peak Hot Springs are still dry. The MN1 alternate of the MRC passes approximately 1.1 miles east of Silver Peak Hot Springs.

In the Silver Peak area, anomalous water temperatures have also been described in the subsurface. Lithium-containing brines are pumped from the Silver Peak Marsh by Chemetall Foote Corp., and enriched in solar evaporation basins to produce lithium compounds. Water temperatures in these wells range from 19 to 31 deg C. Phillips Petroleum Co. drilled a series of 17 boreholes with depths ranging from 130 to 305 feet in 1974. These wells encountered water with temperatures of up to 50.4 deg C.

A visit to the area by S&W personnel in late 2006 indicated that the geothermal features in the Silver Peak area are not currently in use as an energy resource. Western Geothermal Partners, LLC has recently obtained several geothermal leases in the area, with effective dates ranging from 1 August 2003 to 1 January 2006. The MN1 alternate of the MRC traverses several of these leases located within Tps. 1 and 2 S., R. 39 E. (Plate 2). Western Geothermal is reportedly in the process of researching and verifying the possible power generation capabilities of the Silver Peak geothermal system (Nevada Division of Minerals, 2006).

5.49.4 Alkali Spring Valley District – Alkali Hot Springs

Alkali Springs, located within SW¼ SE¼ NE¼ sec. 26, T. 1 S., R. 41 E., included several seeps before an adit was driven into the hillside to consolidate spring flow during the development of the Goldfield mining district. In 1907, the temperature at the face of the adit was reported to be 60 deg C. Two springs in the area have temperatures of 60 and 50 deg C and respective flow rates of 59 and 25gpm. A brick and concrete pool 6 feet in diameter is reported to be present at the site and the water temperature is reported to be of 40 deg C. The use of Alkali Hot Springs as an energy resource has not been reported.

5.49.5 Hawthorne Area – Warm Wells

Several wells have encountered hot water at depth in the Hawthorne area. A heat flow study conducted by Trexler and others (1981) identified two areas of anomalous temperatures near Hawthorne, one area to the west of Hawthorne along the eastern frontal fault of the Wassuk Mountains, and another area just southeast of Hawthorne. Several wells in these areas encountered thermal waters with reported temperatures ranging from 24 to 99 deg C. Although no geothermal resources are currently in use, Western Geothermal Partners LLC has obtained three geothermal leases with an effective date of 1 September 2006 on lands within Tps. 7 and 8 N., R. 30 E.; and T. 8 N., R. 29 E. (Plate 2). In late 2006, a feasibility study was conducted to explore geothermal heating of the Mount Grant General Hospital in Hawthorne. The study indicated that replacement of the hospital's boiler with a geothermal heat pump was an economically feasible option. The hospital is currently obtaining permits to drill a 500-foot-deep test well (Nevada Division of Minerals, 2006)

5.49.6 Soda Spring Valley – Warm Springs

Warm springs issue from marshy ground and travertine at Sodaville, located approximately 3.5 miles south of Mina. The maximum reported temperature of the springs is 38.3 deg°C, with total flow reported at 90 gpm. As of 2003, the waters were used to heat a greenhouse that produces small crops of vegetables. As recently as 2002, a company called Desert Lobster piped the springwater into tanks where they raised freshwater crayfish until 2006 (Las Vegas Now, 2006).

5.49.7 Alum District – Warm Wells

Although the Alum District area does not currently include any current or historical use of geothermal features as energy resources, slightly anomalous well-water temperatures are described in the southern Big Smoky Valley. The 324-foot-deep Emigrant Well located within the NW¼ sec. 6, T. 1 N., R. 38 E., encountered water at temperatures of up to 26.7 deg C starting at a depth of 308 feet. Approximately 3 miles to the southeast within the NW¼ sec. 14, T. 1 N., R. 37 E., an unnamed well 546 feet deep had a reported water temperature of 21.7 deg C. Hot water of unknown temperature was reported to be encountered in the Fishlake Livestock Co. well located in SE¼ SE¼ sec. 5, T. 1 S., R. 39 E. Geothermal gradient-hole drilling in the southern Big Smoky Valley identified a possible high temperature geothermal system at depth. The gradient-holes encountered a maximum temperature of 118.3 deg C at 457 feet. The study suggests that the Alum Mine, a historic sulfur-producing mine, corresponds to the center of a potential geothermal system. Sulfur and potassium alum (dated by K-Ar methods at 0.29+/-0.01 Ma) indicate geothermal activity at or near the surface during the late Pleistocene.

Currently authorized and expired BLM geothermal leases are present in the southern Big Smoky Valley (Plate 3). The MN1 alternate of the MRC either crosses or passes near land containing leases with an effective date of 1 March 2003, in T. 1 N., Rs. 38 and 39 E. (Plate 2). This leasing activity is likely related to the anomalous subsurface water temperatures described in the area.

5.49.8 Warm Wells North of Columbus Marsh

Shevenell and Garside (2005) report a hot drill hole north of Rock Hill. Very little information is available regarding this well. In this area, the BLM has issued geothermal leases

(all but one of which is still active) within Tps. 3 and 4 N., R. 36 E. (Plate 3). The MCS1 segment of the MRC crosses lands in sec. 26, T. 4 N., R. 36 E. that contain the leases.

6.0 CONCLUSIONS

Potential conflicts between the MRC and known mineral and energy resource occurrences are summarized in Table 1 and discussed below.

A total of 45 areas were evaluated (Table 1) and classified based on results of this initial investigation with respect to whether they would likely present a low, medium, or high potential conflict to the MRC. The following summarizes results of this classification. Depending on the size of the area, geologic complexity, access, field observations, and other factors, several locations within an occurrence may have been evaluated.

Areas Classified as Having a High Probability of Conflict: In areas rated as having a high conflict, the alignment is directly on, adjacent to, or nearby documented areas of past and present mineral activity or areas where prior existing rights to minerals have been established. In these areas, the geology is, in the opinion of the investigators, likely permissive for mineral occurrences. In some cases, these areas actually contain reported ore reserves under, near, or adjacent to the proposed alignment. Areas rated as having a high potential for conflict may include areas where there are active mining claims and there is recent documented evidence of intensive and significant mineral exploration activities such as digging test pits, bulk sampling, and drilling to define mineral resources. In addition, in some of these areas, private interests have established a right to the mineral resources either through the mining and mineral leasing laws or the mineral materials sales program. For locatable minerals, these rights may have been established by staking mining claims and in some instances patenting mining claims. Patented mining claims are private property. In these areas, construction of the MRC could very likely have an impact on the development of the mineral occurrence.

Areas Classified as Having a Medium Probability of Conflict: In areas of moderate (or medium) conflict, the mineral occurrence is in proximity to the MRC, but not so far away that, in the opinion of the investigators, a conflict is likely to be created if the MRC is constructed. The conflict may include constraints on site access or the non-mining use of lands near and adjacent required for mineral development of mineral resources. Non-mining land uses might include

lands used for plant sites, waste dumps, and tailings disposal facilities. Areas of medium conflict might be areas where mineral exploration and development occurred in the past; however, the area is not currently of interest to those exploring for minerals. Areas of medium conflict may exist where there are active claims; however, the exploration consists of surface geologic, geophysical, and geochemical surveys to determine if the area contains deposits, ore reserves, or mineral occurrences of such a nature to justify more intensive levels of mineral exploration such as drilling and bulk sampling. Conflicts may also exist where the geology is favorable for mineral occurrences, even if no documented mineral occurrences near the MRC exist. In these areas, additional exploration efforts may result in the discovery of a mineral occurrence within or close enough to the alignment such that a conflict is created in the near future, i.e., by the time the MRC is constructed. In some cases, the existence of a mining or will site claim where there is no known mineral occurrence may result in a moderate conflict if the mining claim is located on lands containing the proposed alignment.

Areas Classified as Having a Low Probability of Conflict: Areas of low conflict typically occur where the mineral occurrence is far enough away from the alignment such that construction of the alignment has, in the opinion of the investigators, little chance of precluding mineral development or exploration. In addition, in some areas, the geologic environment in the vicinity of the MRC is unfavorable for mineral occurrences. Areas of low conflict typically do not have records indicating that preexisting rights to minerals have been established.

The potential for conflict may be low in some areas by virtue of land jurisdiction. These areas would include mining districts or portions of districts that are in the Hawthorne Naval Ammunitions Depot, NTTS, and the Gabbs Valley, Range WSA. These areas are currently closed to claim staking. The Walker River Paiute Tribe currently does not have a mineral exploration and development policy. This limits mineral development activity within the Walker River Indian Reservation to areas where there are active claims that pre-date the withdrawal of the reservation lands from the mining laws. In this report, some areas classified as having potential for low potential for conflict might be classified as having moderate to high potential for conflict should the land jurisdiction change or the administrative agency or organization with jurisdiction over the land change its mineral development policy.

7.0 LIMITATIONS

This study is limited to the accuracy of the background data or sources used including publications, interviews, and internet data. A significant portion of the published data for mineral occurrences used in the preparation of this report may be outdated, and discrepancies in the published data and databases, particularly regarding mine locations and history, commonly occur. Information regarding recent or ongoing minerals exploration activities obtained from the internet was not verified as part of this investigation. All mineral occurrences near to, adjacent to, or traversed by the MRC may not have been identified as part of this investigation. Additional mineral occurrences may be reported or discovered between the time of submission of this report and the construction of the MRC. This is because mineral exploration activity is ongoing, or previously publicly unavailable data may be published or otherwise made available.

Information regarding mineral occurrences obtained from personal interviews was not verified by us as part of this investigation. Information obtained from personal interviews may be based on events occurring months or years ago, may have been passed on to interviewees from other sources, or may not be an accurate present memory of the information or events. Information from published literature, particularly geologic descriptions of mineral occurrences, reports, and estimates of mineral resources quantities and grade, quality, or amenability to processing and marketing was not independently verified by us.

The *field data* sheets were prepared by the investigators to provide information for this investigation (Appendix A). The information included on these sheets frequently represents the initial observation, interpretation, recommendation, or opinion of the investigator performing the fieldwork. As this investigation progressed, some of this information may have changed or become outdated as a result of obtaining additional information during the course of this study. Therefore, the information on these sheets are to be considered preliminary and reflects the observation and opinions of the investigator and may have been or may be superseded by new information as it became or becomes available. Furthermore, the information collected by the investigators and provided on the data sheets in Appendix A was not independently checked or verified for accuracy, and different investigators observing the same area may make additional or different observations, have different opinions about the significance of site features, reach different conclusions, and make different recommendations.

An evaluation of geologic hazards, geotechnical issues for design, environmental concerns or hazards, and issues regarding groundwater or surface water quality or resources was not within the scope of this investigation. Geologic, geotechnical, hydrogeologic, and environmental issues including, but not limited to, evaluating the extent, nature, and location of surficial and underground workings, characterization of existing mine waste, and water resources distribution and availability, should be addressed as part of other studies for the MRC. Information with regard to the specific location and extent of surficial and underground mine workings contained in this report is for the purpose of estimating the extent of past mineral exploration and development in a mining district. This information should not be used for engineering or design studies, and additional studies may be required to evaluate the extent of old mine workings and associated environmental issues.

This report is intended exclusively for use by BSC for the YMP Nevada Rail Project. Any use or reuse of the findings, conclusions, or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

SHANNON & WILSON, INC.

Paul M. Godlewski, P.E.
Vice President
Project Manager

George T. Lightwood, P.E.
Associate
Task 3 Manager

DEX:PMG:GTL/gbb

REFERENCES

Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.

American Goldfields, 2006, American Goldfields Projects, Available, http://www.americangoldfields.com/projects.php, accessed 2006.

Archbold, N.L., 1969, Industrial mineral deposits - gypsum, *in* Moore, J.G., Geology and mineral deposits of Lyon, Douglas, and Ormsby Counties, Nevada: Nevada Bureau of Mines and Geology Bulletin 75, p. 34.

Archbold, N.L., and Paul, R.R., 1970, Geology and mineral deposits of the Pamlico mining district, Mineral County, Nevada: Nevada Bureau of Mines and Geology Bulletin 74, 16 p., 5 plates.

Ashley, R.P., 1974, Goldfield mining district and vicinity, in Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 49-66 plus generalized geologic map, scale 1:12,000.

Ashley, R.P., 1975, Preliminary geologic map of the Goldfield mining district, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-681, scale 1:24,000.

Beal, L.H., 1963, Investigation of titanium occurrences in Nevada: Nevada Bureau of Mines Report 3, 48 p.

Ball, S.H., 1906, Notes on ore deposits of southwestern Nevada and eastern California, *in* Emmons, S.F., and Eckels, E.C., Contributions to economic geology: U.S. Geological Survey Bulletin 285, p. 53-73.

Bingler, E.C., 1978, Geologic map of the Schurz quadrangle: Nevada Bureau of Mines and Geology Map 60, scale 1:48,000.

Biodiesel Magazine, 2007, Nevada biodiesel project to harness geothermal energy, http://www.biodieselmagazine.com/article.jsp?article_id=1207, accessed 2007.

Bonaventure Enterprises, Inc., Properties, Goldfield West Properties, Available: http://www.bonaventure.us/goldfield.htm, accessed March, 2007.

Bonham, H.F., Jr., and Garside, L.J., 1974, Tonopah mining district and vicinity in Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 42-48.

Bonham, H.F., Jr., and Garside, L.J., 1979, Geology of the Tonopah, Lone Mountain, Klondike, and Northern Mud Lake Quadrangles, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology, Bulletin 92, 142 p. and map, scale 1:48,000.

Brown, H.G., ed., 2003, Regional geology and gold deposits of the Silver Peak area: mineralization hosted by metamorphic core complexes: Reno, Nev., Geological Society of Nevada, 2003 fall field trip guidebook, Special Publication No. 38, 211 p.

Canyon Copper Corp, 2007, New York Canyon Project, Available: http://www.canyoncc.com/s/NYCanyon.asp?ReportID=113733, accessed March, 2007.

Castor, S.B., and Ferdock, G.C., 2004, Minerals of Nevada: Reno, Nev., University of Nevada Press, Nevada Bureau of Mines and Geology Special Publication 31, 560 p.

Century Gold, [n.d], Mindora property, Mineral County, Nevada: Available: http://www.centurygold.com/Mindora.html, accessed March, 2, 2007.

Cornwall, H.R., 1972, Geology and mineral deposits of southern Nye County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 77, 45 p.

Couch, B.F., and Carpenter, J.A., 1943, Nevada's metal and mineral production (1859-1940, inclusive): Nevada Bureau of Mines and Geology Bulletin 38, 159 p.

Craig, S.D., 2003, Geology and gold mineralization of the Mineral Ridge gold mine, Esmeralda County, Nevada, in Brown, H.G., ed., 2003, Regional geology and gold deposits of the Silver Peak area, Mineralization hosted by metamorphic core complexes: Reno, Nev., Geological Society of Nevada, 2003 fall field trip guidebook, Special Publication No. 38, p. 81-93.

Davis, J.R., and Vine, J.D., 1979, Stratigraphic and tectonic setting of the lithium brine field, Clayton Valley, Nevada: in Newman, G.W., and Goode, H.D., eds., Basin and Range symposium: Denver, Colo., Rocky Mountain Association of Geologists, p. 421-430.

Davis, D.A., and Tingley, J.V., 2005, Precious metals deposits of Nevada, *in* Rhoden, H.N., Steininger, R.C., and Vikre, P.G., eds., Geological Society of Nevada Symposium 2005: Windows to the World, Reno, Nevada, May 2005, p. 179–186.

Dilles, P., 2007, Tonopah Divide gold project gold exploration potential: Tonogold Resources, Inc., available at: ttp://www.tonogold.com/i/pdf/070206_Dilles_eval_Strachan_ed_Divide.pdf (accessed 4/10/2007).

Driesner, Doug, and Coyner, Alan, 2006, Major mines of Nevada 2005: Nevada Bureau of Mines and Geology Special Publication P-17, 28 p.

Earl, P.I., 1997, Discovery of coal sparked town's formation: Las Vegas Review-Journal, November 16, available: at http://www.reviewjournal.com/lvrj_home/1997/Nov-16-Sun-1997/lifestyles/6318726.html, accessed on February 7, 2007.

Ekren, E.B.; Byers, F.M., Jr.; Hardyman, R.F.; and others, 1980, Stratigraphy, preliminary petrology, and some structural features of Tertiary volcanic rocks in the Gabbs Valley and Gillis Ranges, Mineral County, Nevada: U.S. Geological Survey Bulletin 1464, 54 p.

Ekren, E.B., and Byers, F.M., Jr., 1985, Geologic map of the Win Wan Flat, Kinkaid NW, Kinkaid, and Indian Head Peak quadrangles, Mineral County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I-1578, scale 1:48,000.

Ferguson, H.G., Muller, S.W., and Cathcart, S.H., 1954, Geology of the Mina quadrangle Nevada: U.S. Geological Survey Geologic Quadrangle Map GQ-45, scale 1:125,000.

Fiannaca, M., 1987, Geology of the Santa Fe gold-silver deposit, Mineral County, Nevada in Johnson, J. L., ed., Bulk mineable precious metal deposits of the western United States: The Geological Society of Nevada, Guidebook for Fieldtrips, p. 233-239.

French, D.E., 1994, Classification and risk assessment of hydrocarbon traps of the eastern Great Basin, in Schalla, R.A., and Johnson, E.H., eds., Oil fields of the Great Basin: Reno, Nev., Nevada Petroleum Society, p. 107-114.

Frost, K. S., 1984, The New Boston-Blue Ribbon polymetallic skarn in Johnson, J. L., ed, Exploration for ore deposits in the north American cordillera: The Association of Exploration Geochemists 1984 Regional Symposium, Field Trip Guidebook, p. 25-29.

Garside, L.J., 1973, Radioactive mineral occurrences in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 81, 121 p.

Garside, L.J., 1979, Geologic map of the Camp Douglas quadrangle, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Map 63, scale 1:24,000.

Garside, L.J., and Bonham, H.F., Jr., 1984, Precious metal districts in west-central Nevada, road log/trip guide -- Candelaria Mine, Goldfield district, Tonopah district, and Bell Mountain Mine, in Johnson, J.L., ed., Exploration for ore deposits of the North American Cordillera: Association of Exploration Geochemists Regional Symposium, Reno, Nev., March 25-28, 1984, Field trip guidebook: p. 1-30.

Golden Phoenix Minerals, Lone Mountain Mill, Available: http://www.golden-phoenix.com/lone_mountain.htm, accessed March, 2007.

Goodall, Geoffrey, 2004, Summary report and exploration proposal on the Redlich gold prospect, Esmeralda County, Nevada: Report prepared by Geoffrey Goodall, Global Geological Consultants, Ltd., 25 p., January.

Hardyman, R.F., 1980, Geologic map of the Gillis Canyon quadrangle, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I-1237, scale 1:48,000.

Harris, A.G.; Warlaw, B.R.; Rust, C.C.; and Merrill, G.K., 1980, Maps for assessing thermal maturity (conodont color alteration index maps) in Ordovician through Triassic rocks in Nevada and Utah and adjacent parts of Idaho and California: U.S. Geological Survey Miscellaneous Investigation Series Map I-1249, scale 1:2,500,000.

Hess, R.H., 2001, Nevada abandoned mines database compilation update: Nevada Bureau of Mines and Geology Open File Report 01-3.

Hess, R.H., 2004, Nevada oil and gas well database (NVOILWEL): Nevada Bureau of Mines and Geology Open-File Report 04-1, 286 p., scale 1:1,000,000.

Hulsen, S., 2007, personal communication.

InfoMine, Inc.,2007, InfoMine db mining company & property database: Available: http://www.infomine.com/companies-properties, accessed 2006.

Jones, R.B., 1983, Lead deposits and occurrences in Nevada: Nevada Bureau of Mines and Geology Map 78, scale 1:1,000,000.

Jones, R.B., 1984, Zinc deposits and occurrences in Nevada: Nevada Bureau of Mines and Geology Map 85, scale 1:1,000,000.

Keith,W.J., 1977, Geology of the Red Mountain mining district, Esmeralda County, Nevada: U.S. Geological Survey Bulletin 1423, 45 p.

Kinbauri Gold Corp., 2007, Projects, Nevada Properties, Available: http://www.kinbauri-gold.com/projects/nevada.htm, accessed March, 2007.

Kral, V.E., 1951, Mineral resources of Nye County, Nevada: Nevada Bureau of Mines and Geology Bulletin 50, 223 p.

LasVegas Now, 2006, State Raids Lobster Operation, Available: http://www.klas-tv.com/Global/Story.asp?S=1357624, accessed January, 2007.

Lincoln, F.C., 1923, Mining districts and mineral resources of Nevada: Reno, Nev., Nevada Newsletter Publishing Co., 295 p.

Locke, A., 1912, The ore deposits of Goldfield, Nevada: Engineering and Mining Journal, v. 94, no. 18, p. 797-802, 843-849.

Long, K.R., DeYoung, J.H., Jr., and Ludington, D.D., 1998, Database of significant deposits of gold, silver, copper, lead, and zinc in the United States, part A: description and analysis: U.S. Geological Survey Open-File Report 98-206A,B.

Maley, T.S., 1984, Mineral Title Examination, Mineral Land Publications, Boise, Idaho.

Mariposa Resources/LTD, 2006, Form SB-2, registration of securities to be sold to the public: SEC File no. 333-137481, accession no. 1056520-6-200, filed on Sept. 20, available: http://www.sec.gov/edgar/searchedgar/companysearch.html.

Metallic Ventures Gold, Inc., 2005, Renewal annual information form for the year ended December 31, 2004: Reno, Nevada, available http://www.metallicventuresgold.com/s/RelatedReports.asp/

Metallic Ventures Gold, Inc., 2006, Renewal annual information form for the year ended December 31, 2005: Reno, Nevada, available: http://www.metallicventuresgold.com/s/RelatedReports.asp.

Metallic Ventures Gold, Inc., 2007, Renewal annual information form for the year ended December 31, 2006: Reno, Nevada, available: http://www.metallicventuresgold.com/s/RelatedReports.asp.

Mindat, 2007, Mineral and locality databases, Available: http://www.mindat.org, accessed January, 2007.

Miranda Gold Corporation, 2006, Redlich project: Available: http://www.mirandagold.com/s/Redlich.asp, accessed 2006.

Moller, S.A., 1987, Geology and mineralization in the Candelaria district, Mineral County, Nevada, *in* Johnson, J.L., ed., Bulk mineable precious metal deposits of the western United States: The Geological Society of Nevada Guidebook for field trips, p. 240-242.

Moore, J. G., 1969, Geology and mineral deposits of Lyon, Douglas, and Ormsby Counties, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 75.

Morrissey, F.R., 1968, Turquoise deposits in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 17, scale 1:1,000,000.

Mosquito Consolidated Gold Mines Limited, 2007, Pine Tree Project, Available: http://www.mosquitogold.com/s/PineTree.asp?ReportID=144395, accessed March, 2007.

Nevada Bureau of Mines and Geology, 2003, The Nevada mineral industry 2002: Nevada Bureau of Mines and Geology Mineral Industry publication MI-2002, 70 p.

Nevada Bureau of Mines and Geology, 2004, The Nevada mineral industry 2003: Nevada Bureau of Mines and Geology Mineral Industry publication MI-2003, 81 p.

Nevada Bureau of Mines and Geology, 2005, The Nevada mineral industry 2004: Nevada Bureau of Mines and Geology Mineral Industry publication MI-2004, 82 p.

Nevada Bureau of Mines and Geology, 2006, NBMG mining district files online database: Accessible: http://www.nbmg.unr.edu/mdfiles/mdfiles.htm, accessed 2006.

Nevada Department of Business and Industry, Division of Industrial Relations, 2005, Directory of Nevada mine operations, January-December 2004: Carson City, Nev., 109 p.

Nevada Division of Minerals, 2006, Oil, Gas, and Geothermal Forms and Publications, Available: http://minerals.state.nv.us/forms/forms_ogg.htm, accessed, 2006.

Nolan, T.B., 1935, The underground geology of the Tonopah mining district, Nevada: Reno, Nev., University of Nevada Bulletin, v. 29, no. 5, 49 p.

Oldow, J.S., and Meinwald, J.N., 1992, Geologic map of the Bettles Well quadrangle, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Field Studies Map FS-1, scale 1:24,000.

Oldow, J.S., and Steuer, M.R., 1985, Preliminary geologic map of the Mable Mountain Quadrangle, Mineral County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1486, scale 1:24,000.

Pan-Nevada Gold Corporation, 2003, Northern Miner discusses Thunder Mountain area, Available: http://www.pannevada.com/RA_march11_2003.htm, accessed March, 2007.

Papke, K.G., 1970, Montmorillonite, bentonite, and fuller's earth deposits in Nevada: Nevada Bureau of Mines and Geology Bulletin 76, 53 p.

Papke, K.G., 1976, Evaporites and brines in Nevada playas: Nevada Bureau of Mines and Geology Bulletin 87, 35 p.

Papke, K.G., 1979, Fluorspar in Nevada: Nevada Bureau of Mines and Geology Bulletin 93, 77 p.

Papke, K.G., 1984, Barite in Nevada: Nevada Bureau of Mines and Geology Bulletin 98, 125 p.

Papke, K.G., and Castor, S.B., 2003, Industrial mineral deposits in Nevada: Nevada Bureau of Mines and Geology Map 142, scale 1:1,000,000.

Peters, L.J., 2004, Summary technical report on the Ashby property (Lazy 1-16 claims): Vancouver, B.C., Canada, Report for Fjordland Exploration, Inc., 23 p.

Proffett, J. M. Jr. and Dilles, J. H., 1984, Geologic map of the Yerington district, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Map 77, scale 1:24,000.

Quade, Jack, 1982, Stonewall Mt. Silver Mine: Nevada Bureau of Mines and Geology, NBMG mining district files online database: Accessible: http://www.nbmg.unr.edu/mdfiles/mdfiles.htm, accessed 2006.

Quade, Jack, and Tingley, J.V., 1985, Reconnaissance geochemical assessment of mineral Resources in the Silver Peak survey area, west central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 85-1, 258 p.

Ransome, F.L.; Emmons, W.H.; and Garrey, G.H., 1909, The geology and ore deposits of Goldfield, Nevada: U.S. Geological Survey Professional Paper 66, 258 p. Reheis, M.C., 1991, Geologic map of the late Cenozoic deposits and faults in the western part of the Rhyolite Ridge 15' quadrangle, Esmeralda County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I-2183, scale 1:24000.

Robinson, P.T. and Stewart, J.H., 1984, Uppermost Oligocene and lowermost Miocene ash-flow tuffs of western Nevada: U.S. Geological Survey, Bulletin 1557, 53 p.

Robinson, P.T., Stewart, J.H., Moiola, R.J., and Albers, J.P., 1976, Geologic map of the Rhyolite Ridge quadrangle, Esmeralda County, Nevada: U.S. Geological Survey, Geologic Quadrangle Map GQ-1325, scale 1:62,500.

Ross, D. C., 1961, Geology and mineral deposits of Mineral County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 58, 98 p. and map, scale 1:250,000.

Sandberg, C.A., 1983, Petroleum potential of wilderness lands in Nevada, in Petroleum potential of wilderness lands in the western United States: U.S. Geological Survey Circular 902, p. H1 - H11.

Satkoski, J. J., Lambeth, R. H., White, W. W., 111, and Dunn, M.D., 1985, Field inventory of mineral resources and compilation of exploration data, Walker River Indian Reservation, Nevada: U.S. Bureau of Mines Report BIA No. 21-11, available: http://www.nbmg.unr.edu/mdfiles/mdfiles.htm

Schilling, J.H., 1980, Molybdenum deposits and occurrences in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Map 66, scale 1:1,000,000.

Schrader, F., 1947, Mining districts in the Carson Sink region, Nevada: U.S. Geological Survey Open-File Report 47-17, 523 p.

Seabridge, Gold, Inc., 2003, Seabridge Gold options Stonewall to Placer Dome: news release dated March 10.

Seabridge Gold, Inc., 2004, Seabridge Gold reports 1st quarter financial results: news release dated May 28.

Seabridge Gold, 2006, Nevada Exploration, Available: http://www.seabridgegold.net/PNevHigh.htm, accessed March, 2007.

Seibel, G.E., Long. S.D., Kennedy, B.D., and Carew, T.J., 2006, Preliminary assessment, Gemfield and McMahon Ridge deposits, Goldfield district, Nevada: Report prepared by AMEC E&C Services, project no. 150318, for Metallic Ventures, Inc., September.

Shannon & Wilson, Inc., 2005, Preliminary mineral and energy resource occurrence report, Caliente rail corridor, Yucca Mountain project, Nevada submittal no. 7.8, rev 0: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-20102-034, for Bechtel SAIC Company, LLC, Las Vegas, Nev., June 23.

Shannon & Wilson, Inc., 2006a, Ballast quarry report, rev. 0, Caliente rail corridor, Yucca Mountain project, Nevada, submittal no. 8.6: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-20102-108, for Bechtel SAIC Company, LLC, Las Vegas, Nev., March 8.

Shannon & Wilson, Inc., 2006b, Preliminary geotechnical report, Caliente Rail Corridor, Yucca Mountain project, Nevada, submittal no. 8.6, rev. 0: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-20102-112, for Bechtel SAIC Company, LLC, Las Vegas, Nev., 2 volumes, March 14.

Shannon & Wilson, Inc., 2007a, Ballast quarry report, Mina rail corridor, Yucca Mountain project, Nevada, submittal no. 7.32, rev. 0: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-20102-225, for Bechtel SAIC Company, LLC, Las Vegas, Nev., March 13.

Shannon & Wilson, Inc., 2007b, Preliminary geotechnical report, Mina rail corridor, Yucca Mountain project, Nevada, submittal no. 7.28, rev. 0: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-20102-214, for Bechtel SAIC Company, LLC, Las Vegas, Nev., April 24.

Shevenell, Lisa, and Garside, L.J., 2005, Nevada geothermal resources (2nd ed.): Nevada Bureau of Mines and Geology Map 141, scale 1:750,000.

Silver Reserve Corp., 2006, Form SB-2, registration of securities to be sold to the public: SEC File no. 333-139619, accession no. 1144204-6-54138, filed on Dec. 22, available: http://www.sec.gov/edgar/searchedgar/companysearch.html.

Smith, P. L.; Tingley, J. V.; Bentz, J. L.; and others, 1983, A mineral inventory of the Esmeralda-Stateline resource area, Las Vegas district, Nevada: Nevada Bureau of Mines and Geology Open-File Report 83-11, 174 p.

Speed, R.C., 1981, Preliminary geologic map of the Sodaville quadrangle, Mineral County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1300, scale 1:24,000.

Speed, R.C. and Cogbill, A.H., 1979, Cenozoic volcanism of the Candelaria region, Nevada: Boulder, Colo., Geological Society of America Bulletin, part 1, v. 90, p.143-145; Part 2, v.90, p. 456-493.

Stager, H.K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 105, 256 p.

Stewart, J.H., 1979, Geologic map of Miller Mountain and Columbus quadrangles, Mineral and Esmeralda Counties, Nevada: U.S. Geological Survey, Open-File Report OFR-79-1145, scale 1:24,000.

Stewart, J.H., 1981b, Geology map of the Basalt quadrangle, Mineral County, Nevada: U.S. Geological Survey, Open-File Report OF 81-369, scale 1:24,000.

Stewart, J.H., 1988, Tectonics of the Walker Lane belt, western Great Basin: Mesozoic and Cenozoic deformation in a zone of shear, *in* Ernst, W. G., ed., Metamorphism and crustal evolution of the western United States: Englewood Cliffs, N.J., Prentice Hall, Rubey volume 7, p. 683-713.

Stewart, J.H., 1989, Description, stratigraphic sections, and maps of middle and upper Miocene Esmeralda formation in Alum, Blanco Mine, and Coaldale areas, Esmeralda County, Nevada: U.S. Geological Survey, Open-File Report OFR-89-324, 27 p. and 1:62,500-scale map.

Stewart, J.H., 1999, Geologic map of the Carson City 30 x 60 minute quadrangle, Nevada: Nevada Bureau of Mines and Geology Map 118, scale 1:100,000.

Stewart, J.H., and Diamond, D.S., 1991, Changing patterns of extensional tectonics; overprinting of the basin of the middle and upper Miocene Esmeralda Formation in western Nevada by younger structural basins, in Wernicke, B. P., ed., Basin and Range extensional tectonics near the latitude of Las Vegas, Nevada: Boulder, Colo., Geological Society of America, Memoir 176, Chapter 22, p. 447-475.

Stewart, J.H., Johannesen, D.C., and Dohrenwend, J.C., 1981, Geologic map of the Hawthorne quadrangle, Mineral County, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-1277, scale 1:62,500.

Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500.

Stewart, J.H., Reynolds, M.W., Johannesen, D.C., and Dohrenwend, J.C., 1981c, Geologic map of the Mount Grant quadrangle, Lyon and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-1278, scale 1:62,500.

Stewart, J.H., Robinson, P.T., Albers, J.P., and Crowder, D.F., 1974, Geologic map of the Piper Peak quadrangle, Nevada-California: U.S. Geological Survey, Geologic Quadrangle Map GQ-1186, scale 1:62,500.

Stoddard, C.K., and Carpenter, J.A., 1950, Mineral resources of Storey and Lyon Counties, Nevada: Reno, Nev., University of Nevada Geology and Mining Series no. 49, University of Nevada Bulletin v. 44, no. 1, 115 p.

Strachan, D.G., 2005, Mining history, geology, and economic potential of the King Tonopah vein system, northern Tonopah district, Nye County, Nevada: Report prepared by D.G. Strachan, Gardnerville, Nev., for Tonogold Resources, Inc., La Jolla, Calif., 13 p., March.

Tingley, J. V., 1990, Mineral resource inventory, Bureau of Land Management, Carson City District, Nevada: Nevada Bureau of Mines and Geology Open-File Report 90-1, 259 p
Tingley, J. V., 1998, Mining districts of Nevada (2nd ed.): Nevada Bureau of Mines and Geology Report 47, 128 p.

Tingley, J. V., 1998, Mining districts of Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 47, 128 p.

Tingley, J. V.; Castor, S. B.; Weiss, S. I.; and others, 1998, Mineral and energy resource assessment of the Nellis Air Force Range: Nevada Bureau of Mines and Geology Open File Report 98-1, 2 v.

Tingley, J. V. and Maldonado, Florian, 1983, Investigation of the mineral potential of the Clipper Gap, Lone Mountain-Weepah, and Pipe Spring plutons, Nevada: Nevada Bureau of Mines and Geology Open File Report 83-8, 106 p.

Tingley, J.V., and Smith, P.L., 1983, A mineral inventory of the Shoshone-Eureka Resource Area, Battle Mountain District, Nevada: Nevada Bureau of Mines and Geology Open-File Report 83-3, 104 p.

Toenges, A.L.; Turnbull, L.A.; and Schoff, J.M.; and others, 1946, Exploration, composition, and washing, burning and gas-producer tests of coal occurring near Coaldale, Esmeralda County, Nevada: U.S. Bureau of Mines Technical Paper 687, 79 p.

Trexler, D.T.; Koenig, B.A.; Flynn, T.; and others, 1981, Low-to-moderate temperature geothermal resource assessment for Nevada, area specific studies, final report, June 1, 1980-August 30, 1981: Reno, Nevada, Nevada Bureau of Mines and Geology, prepared for the U.S. Department of Energy, Division of Geothermal Energy, under contract DE-AC08-79NV10039.

U.S. Bureau of Land Management, 2003, 43 CFR 3600: Mineral materials disposal: Washington, D.C., U.S. Government Printing Office.

U.S. Bureau of Land Management, 2007, Land and mineral records-LR2000 system: Available: http://www.blm.gov/lr2000, accessed 2007.

U.S. Department of Interior Bureau of Land Management, 2007, Land and mineral records-LR2000 system: Available: http://www.blm.gov/lr2000, accessed 2007.

U.S. Department of the Interior, Bureau of Land Management, 2007, Notice of proposed withdrawal and opportunity for public meeting; Nevada: 72 FR 1235-1239, January 10.

U.S. Geological Survey, 2007, Ground-water data for the nation: on the internet, Available: http://waterdata.usgs.gov/nwis/gw, accessed January, 2007.

Utterback, W. C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: Walker River Paiute Tribe, 176 p

Vanderburg, W.O., 1937, Reconnaissance of mining districts in Mineral County, Nevada: U.S. Bureau of Mines Information Circular 6941, 79 p.

Vanderburg, W. O., 1940, Reconnaissance of mining districts in Churchill County, Nevada: U.S. Bureau of Mines Information Circular 7093, 57 p.

Vista Gold Corp., 2007, Hasbrouck-Three Hills Project available: http://www.vistagold.com/hasbrouck.php (accessed 4/10/09).

Wendt, C.J., and Albino, G.V., 1993, Porphyry copper map of Nevada: Nevada Bureau of Mines and Geology Map 100, scale 1:1,000,000.

Whitebread, D.H., and John, D.A., 1992, Geologic map of the Tonopah 1o by 2o quadrangle, central Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1877-A, scale 1:250,000.

Willden, Ronald, and Speed, R. C., 1974, Geology and mineral deposits of Churchill County, Nevada: Nevada Bureau of Mines and Geology Bulletin 83, 95 p.

Workman, J.B.; Menges, C.M.; Page, W.R.; and others, 2002, Geologic map of the Death Valley ground-water model area, Nevada and California: U.S. Geological Survey Miscellaneous Field Studies Map MF-2381-A, scale 1:250,000.

Zampirro, Danny, 2004, Hydrogeology of Clayton Valley brine deposits, Esmeralda County, Nevada, *in* Castor, S.B., Papke, K.G., and Meeuwig, R.O., eds., Betting on industrial minerals, Betting on industrial minerals, 39th Forum on the Geology of Industrial Minerals, Reno/Sparks, Nev., 2003, Proceedings: Nevada Bureau of Mines and Geology Special Publication no. 33, p. 271-280.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES

OCCURRENCE				CONFLICT	
AREA / MINING DISTRICT	COUNTY	ID No. on Plates 1 and 2	INFORMATION SOURCE	PROBABILITY	RATIONALE
Desert Mountains	Lyon	1	Literature Search	Low	• Based on the results of this study, it appears that no significant recent or historic mineral or energy exploration/mining has occurred from this district. • Alignment (MCS0) passes more than 3 miles from district.
Wabuska Marsh	Lyon	2	Field Reconnaissance Literature Search	Moderate	• Alignment (MCS0) passes over or within 1 mile of authorized or pending geothermal lease(s) (secs. 14 through 16 and 22 through 23, T. 15 N., R. 25 E.). • Alignment (MCS0) passes within 1 mile of operational geothermal power generation plant at Wabuska (NE 1/4 Sec. 21, T. 15 N., R. 25 E.). • Based on amount of past leasing, this area has received much interest for geothermal energy.
Holy Cross	Churchill / Mineral	3	Field Reconnaissance Literature Review	Moderate	• The western portion of the mining district is in the Walker River Indian Reservation. • Privately held mining claims less than 1 mile west alignment S6 in Camp Terrill area. •Past gold and silver production from historic mines area and potentially historic structures in the Camp Terrill Area near alignment S6. •Utterback (2002) concluded that additional exploration efforts may be worthwhile in the vicinity of the Pyramid-Black Butte group of claims in the Terrill Mountains. •Area rated moderate due to close proximity of alignment S6 due to presence of historical mining activities and active mining claims near Camp Terrill. • Satkaski (1985) listed Camp Terril Area as "Moderate" priority area for additional exploration.
Benway	Lyon	4	Field Reconnaissance Literature Review	Low	• The mining district is entirely in the Walker River Indian Reservation. • No active mining claims in district. • MRC Alternate S5 passes approximately 1.5 miles east of Afterthought Prospect and alternate S4 passes approximately 2 miles south of Afterthought Prospect. • Neither Utterback (2002) nor Satkoski (1985) recommended additional work at the Afterthought Project. • Utterback (2002) did not recommend further exploration efforts for mesothermal veins north of Afterthought Prospect area; however, areas south (vicinity of MRC alternative S4) might be important for copper porphyry or skarn systems. • Area rated low as WRPT does not currently have a minerals policy; however, area might be rated moderate if WRPT develops a minerals policy in the future and MRC Alignment S4 is selected.
Yerington	Lyon	5	Literature Review	Low	• Alignment (MCS0, S1/S2, S3) passes more than 9 miles from major historic and recent copper-producing mines (Yerington mine and others) and recent exploration activity (Nevada Copper, Pumpkin Hollow). • Existing rail and US Hwy Alternate 95 pass between historically important mines and alignment (MCS0, S1/S2, S3). • Alignment (MCS0, S1/S2, S3) passes more than 4 miles from nearest active mining claims in T. 14 N., Rs. 24 and 25 E.
Red Ridge	Mineral	6	Literature Review	Low	• The mining district is entirely in the Walker River Indian Reservation. • No active mining claims in district. • North end of district contains uranium occurrences and past mining claim activity in this area located approximately 1 to 3 miles east of the alignment. • Utterback (2002) recommended additional exploration work in south end of district in sec. 3, T. 13 N., R. 30 E., where previous exploration holes were drilled to test for mineralization and alteration at depth. • Area rated low as WRPT does not currently have a minerals policy; however, area might be rated moderate if WRPT develops a minerals policy in the future and MRC Alignment S6 is selected.
Calico Hills	Mineral	7	Literature Review	Low	• The mining district is entirely in the Walker River Indian Reservation. • No active mining claims in the district. • MRC Alignment S4/S5 and S1/S3 passes within about 1 mile of the Calico iron-copper skarn deposit. • Calico deposit contains an estimated 200 million tons of 40% iron and 0.08% copper; however considered too low grade (copper) to be economic. • Area rated low as WRPT does not currently have a minerals policy; however, area might be rated moderate if WRPT develops a minerals policy in the future and MRC Alignment S4 is selected. • Utterback (2002) recommended that the area should be considered for additional exploration drilling and considered the area favorable for exploration of copper skarn and porphyry copper deposits.
Mountain View	Mineral	8	Literature Review	Low	• The eastern portion of the mining district is within the Walker River Indian Reservation. • Utterback (2002) considers areas on north end of district in the vicinity of the Black Mountain prospect in the north end of Wassuk Range an attractive area for porphyry copper deposits; however, these areas are typically greater than 3 to 5 miles east of MRC alternative S2. • No recent reported mining claim activity (Plate 2) on lands off the reservation.
Double Springs Marsh	Mineral	9	Literature Review	Low	• Area is entirely in the Walker River Indian Reservation. • No active mining claims or mineral leases in district. • Only reported mineral production is small quantity of trona from playa surface in late nineteenth century.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES

OCCURRENCE				CONFLICT	
AREA / MINING DISTRICT	COUNTY	ID No. on Plates 1 and 2	INFORMATION SOURCE	PROBABILITY	RATIONALE
Buckley	Mineral	10	Field Reconnaissance Literature Review	Low	• Portion of the mining district nearest MRC is within the Walker River Indian Reservation and no active mining claims in this portion of the district. • Nearest prospect with historical production is the Joe Hicks Mine located in sec 13, T. 12 N., R. 29 E., about 1 mile east of MRC Alignment S6; however, while Utterback (2002) did not recommend further work at this prospect; additional mineral exploration was recommended to the south. • Most prospects in district with historical production and exploration activity typically greater than 3 miles away from alignment (Copper Hills). • Utterback (2002) recommended that the area should be considered for additional exploration drilling and considered the area favorable for exploration of copper skarn and porphyry copper deposits. • Area rated low as WRPT does not currently have a minerals policy; however, area might be rated moderate if WRPT develops a minerals policy in the future and MRC Alignment S6 is selected.
Mount Grant	Mineral	11	Literature Review	Low	• MRC passes more than 3 miles from nearest active mining claims (northeast of Hawthorne). • Alignment follows existing rail route adjacent to district, and is separated from district by Walker Lake and US Hwy 95. • MRC passes more than 5 miles from nearest authorized or pending geothermal lease(s) (southwest of Hawthorne).
Fitting	Mineral	12	Literature Review	Low	• MRC passes within 1 mile active mining claims (W. 1/2, sec. 18, T. 8 N., R. 34 E.,) but more typically 3 miles from active mining claims elsewhere along southern margin of Gillis Range. • Only minor historic production reported from district, active claims in vicinity of mineral occurrence. • MRC alignment close to existing rail alignment.
Santa Fe	Mineral	13	Field Reconnaissance Literature Search	High	• MRC passes within 1 mile of historic copper occurrences, mine workings, and shafts. • MRC passes within 1 mile of ongoing and recent drilling exploration program for copper skarn and copper-molybdenum porphyry systems (New York Canyon area east of Luning). • MRC passes through claim block owned by Canyon Copper Corp in T. 8 N, Rgs. 34 and 35 E. and in vicinity of proposed plant area. • MRC passes between US Hwy 95 and New York canyon claims and exploration sites.
Pamlico	Low	14	Literature Review	Low	• MRC passes within 1 mile of minor historic barite-producing mine (Crystal mine; sec. 21, T. 8 N., R. 32 E.). • MRC passes within 2 miles of active mining claims (secs. 30 and 31, T. 8 N., R. 32 E.). • US Hwy 95 passes between MRC and district.
Garfield	Mineral	15	Literature Review	Low	• MRC passes more than 4 miles from nearest active mining claims (primarily in secs. 19 through 36, T. 7 N., R. 33 E.). • U.S. Hwy 95 passes between MRC and district.
Ashby	Mineral	16	Literature Review	Low	• MRC passes more than 6 miles from nearest active mining claims in district (secs. 22, 26 and 27, T. 7 N., R. 32 E.). • District on other side of Garfield Hills and distant from MRC.
Pilot Mountains	Mineral	17	Literature Review	Moderate	• MRC passes through lands containing active mill site claims in secs. 5 and 9, T. 6 N., R. 35 E. • Potential conflict rated moderate due to possible conflict with existing mill site claims; otherwise potential conflict would be rated low. • MRC passes within 4 miles of authorized or pending notice of intent (Mosquito Consolidated Gold Mines; sec. 18, T. 6 N., R. 36 E.) with active copper/molybdenum exploration project (Mosquito Consolidated Gold Mines; Pine Tree project). • MRC passes within 1 mile of authorized oil and gas lease(s) (sec. 3, T. 6 N., R. 35 E.).
Crow Springs	Esmeralda	18	Literature Review	Low	• MRC passes more than 6 miles from nearest active mining claims in T. 4 N., R. 39 E. • MRC is distant from district, recent exploration activity and historical production.
Silver Star	Mineral	19	Literature Review	Low	• MRC passes more than 2 miles from nearest active mining claims in district (west of Sodaville). • MRC is separated from district by US Hwy 95.
Sodaville	Mineral	20	Literature Review	Low	• MRC passes within 2 miles of active millsite and lode claims west of Sodaville (secs. 31 and 32, T. 6 N., R. 35 E.). • Active claims are in areas of historical production that are on the opposite side of US highway 95 from MRC.
Rhodes Marsh	Mineral	21	Literature Review	Low	• MRC passes 2 miles east of authorized or pending sodium prospecting permit(s) in center of district. • MRC traverses geology that is unfavorable for the occurrence of evaporite mineral concentrations as found in the Rhodes Marsh district. • No significant mineral or energy exploration/mining has occurred in this district in approximately 70 years, based on results of this study.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES

OCCURRENCE				CONFLICT	
AREA / MINING DISTRICT	COUNTY	ID No. on Plates 1 and 2	INFORMATION SOURCE	PROBABILITY	RATIONALE
Candelaria	Mineral	22	Literature Review	Low	• MRC passes more than 5 miles from major historic and recent mining areas in district, most notably, the Candelaria mine (T. 3 N., R. 35 E.). • With respect to major historically productive parts of the district (Candelaria mine area), the MRC passes within 3 miles of authorized or pending plan(s) of operation, and more than 3 miles away from active mining claims (secs. 19 through 36, T. 4 N., R. 35 E. and secs. 1 through 18, T. 4 N., R. 35 E.). • MRC passes more than three miles from active mining claims and authorized or pending plans of operation in southern part of district (secs. 7 and 8, T. 3 N., R. 36 E.) where turquoise is the primary mineral of interest. • MRC passes over or within 1 mile of two active mining claims (sec. 36, T. 5 N., R. 35 E.); however, no documented mineral occurrences were identified with these claims. • MRC is separated from entirety of Candelaria district by US Hwy 95.
Gilbert	Mineral	23	Field Reconnaissance Literature Search	High	• MRC passes within 1 mile of recently productive gold mine and associated authorized or pending plan(s) of operation (Boss mine; sec. 31, T. 3 N., R. 39 E.). • MRC passes within 1 mile of active mining claims associated with recently explored gold prospects (Black Rock, Berg, and Castle prospects, secs. 19 through 36, T. 3 N., R. 39 E.). • MRC passes over or within 1 mile of a tract of authorized or pending oil and gas lease(s) (secs. 5 and 6, T. 2 N., R. 39 E.). • MRC passes within 1 mile of recent dry oil exploration hole (Federal Jake No. 1; NE 1/4 sec. 7, T. 2 N., R. 39 E.). • MRC passes over or within 1 mile of a tract of authorized or pending sodium prospecting permit(s) (secs. 32 and 33, T. 3 N., R. 39. E.; sec. 5, T. 2 N., R. 39 E.).
Tonopah	Nye	24	Field Reconnaissance Literature Search	Low	• MRC passes about 4 miles away from areas with active mining claims (secs. 19 through 21 and 28 through 33, T. 3 N., R. 42 E.). • MRC passes about 4 miles away from areas with authorized or pending notice(s) of intent (secs. 19, 30 through 32, T. 3 N., R. 42 E.). • Recent mineral exploration activity including (Tonogold, and Vistagold, Inc.) associated with this major historic silver producing district is distant from MRC.
Rock Hill	Mineral	25	Field Reconnaissance Literature Search	High	• Miranda Gold is conducting ongoing mineral exploration activity for gold deposits (Redlich Prospect) within proximity to MRC. • MRC traverses active mining claims associated with the Miranda Gold Redlich project in which significant gold mineralization has been reported. • MRC passes over or within 1 mile of authorized or pending notice(s) of intent (secs. 21, 22, 27 and 28, T. 4 N., R. 36 E.), associated with the Miranda Gold Redlich project. • MRC passes over or within 1 mile of authorized or pending geothermal lease(s) (secs. 19 through 36, T. 4 N., R. 36 E. and secs. 1 through 18, T. 3 N., R. 36 E.).
Columbus Marsh	Esmeralda	26	Field Reconnaissance Literature Search	Low	• MRC passes within 1 mile of active mining claims (covering a majority of the district). Claims consist of placer claims associated with Calcium Carbonate mining project. • MRC traverses geology that is unfavorable for the occurrence of evaporite mineral concentrations as found in the Columbus Marsh district. • MRC passes over or within 1 mile of authorized or pending geothermal lease (sec. 12, T. 3 N., R. 36 E.). • MRC passes within 2 miles of active oil and gas lease(s) (secs. 1 through 24 and 27 through 30, T. 2 N., R. 36 E.).
Coaldale	Esmeralda	27	Field Reconnaissance Literature Search	Low	• MRC passes within 1 mile of active mining claims (secs. 17 through 20, T. 1 N., R. 37 E.); no documented occurrences were identified in this area. • MRC passes within 3 miles of recent dry oil exploration hole (Coaldale well; sec. 12, T. 2 N., R. 37 E.). • MRC passes over or within 1 mile of authorized or pending oil and gas lease(s) (secs. 1 through 2 and 11 through 14, T. 2 N., R. 37 E.). • There is little reported recent interest in coal deposits located within the district. • MRC passes more than 6 miles from authorized or pending notice of intent (Blanco mine; sec. 22, T. 1 N., R. 37 E.). • Major highways (US Hwys 6 and 95, and Nevada Hwy 265) pass between alignment and Blanco Mine and active mining claims.
Lone Mountain	Esmeralda	28	Field Reconnaissance Literature Search	Low	• MRC passes over or within 1 mile of a large tract of closed oil and gas lease(s) (T. 3 N., R. 39 through 41 E.). • MRC passes approximately 3 miles from active mining claims (secs. 19, 30, and 31, T. 3 N., R. 41 E.; secs. 24, 25, and 36, T. 3 N., R. 40 E.; sec. 6, T. 2 N., R. 41 E.; secs. 10 and 11, T. 2 N., R. 39 E.). • MRC passes approximately 3 miles from authorized or pending notice(s) of intent (secs. 10 through 14, T. 2 N., R. 39 E.; secs. 1 and 12, T. 2 N., R. 40 E.). • MRC passes over a tract of closed sodium prospecting permit(s) (secs. 32 and 33, T. 3 N., R. 39 E.; sec. 5, T. 2 N., R. 39 E.). • MRC passes between Lone Mountain district and US Hwy 6/95. • MRC passes through private land associated with the Lone Mountain Mill; however mill is not currently operating.
Divide	Esmeralda	29	Field Reconnaissance Literature Search	Low	• MRC passes approximately 3 miles from nearest active mining claim in district (possibly owned by Vista Gold). • MRC passes more than 3 miles from historically productive areas in the district (Tonopah Divide mine; sec. 26, T. 2 N., R. 42 E.). • Areas of active exploration by Vista Gold are distant from the MRC. • The MRC is separated from most historically productive areas in the district by US Hwy 95.
Weepah	Esmeralda	30	Literature Review	Low	• MRC passes more than 4 miles from authorized or pending notice(s) of intent (secs. 23, 24, and 26, T. 1 N., R. 39 E.), and more than 3 miles away from nearest active mining claims (secs. 4 through 6, T. 1 S., R. 40 E.). • MRC is distant, typically more than 3 miles away, from active claims and areas to historical production.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES

OCCURRENCE				CONFLICT	
AREA / MINING DISTRICT	COUNTY	ID No. on Plates 1 and 2	INFORMATION SOURCE	PROBABILITY	RATIONALE
Klondyke	Esmeralda	31	Literature Review	Low	• MRC passes over or within 1 mile of pending plan of operation filed by Falcon Exploration in 1983 (secs. 29 and 30, T. 1 N., R. 42 E.). This plan of operation is likely associated with abandoned millsite claims in the same sections. In the past, numerous placer claims (now abandoned) were also located in this area. No other mineral occurrences are identified with these claims. • MRC passes within 1 mile of lode and placer claims (secs. 19 and 21, T. 1 N., R. 42 E.), however no mineral occurrence was identified to be associated with these claims. • Active mining claims and authorized or pending notices of intent (secs 4 through 9, 16 through 21, and 28 through 33, T. 1 S., R. 43 E. and secs 1 through 3, 10 through 15, 22 through 27, and 34 through 36, T. 1 S., R. 42 E.) near the historically productive areas in the district are separated from MRC by US Hwy 95.
Fish Lake Marsh	Esmeralda	32	Literature Review	Low	• MRC passes more than 5 miles from the nearest active mining claims, authorized or pending oil and gas lease(s), and authorized or pending geothermal lease(s), all of which are separated from the alignment by the Silver Peak Range. • MRC is distant, more than 7 miles, from district and on opposite side of US Hwy 265.
Alum	Esmeralda	33	Field Reconnaissance Literature Search	High	• MRC passes within 1 mile of Rulco LLC Heart of Nature Mine (sec. 29, T. 1 N., R. 38½ E.). • MRC passes within 1 mile of active mining claims (secs. 32 and 33, T. 1 N., R. 38½ E.; sec. 6, T. 1 S., R. 39 E.). • MRC passes within 1 mile of authorized or pending geothermal lease(s) (secs. 30 through 32, T. 1 N., R. 38½ E.) • MRC passes within 1 mile of authorized or pending potassium prospecting permit(s) (secs. 30-32, T. 1 N., R. 38½ E.; secs. 4, 5, 9, T. 1 S., R. 39 E.). • Alignment traverses large tract of closed geothermal lease(s) between areas south of Blair Junction and the town of Silver Peak.
Alkali Spring Valley	Esmeralda	34	Literature Review	Low	• No significant recent or historic mineral or energy exploration/mining appears to have occurred from this district.
Silver Peak	Esmeralda	35	Field Reconnaissance Literature Search	High	• MRC passes within 1 mile of active lode and placer mining claims in T. 2 S., R. 39 E.; and T. 1 S., R. 39 E. • MRC passes within 1 mile of authorized or pending geothermal lease(s) (sec. 34, T. 1 S., R. 39 E.; secs. 3, 10, 14, and 15, T. 2 S., R. 39 E.). • Alignment traverses large tract of closed geothermal lease(s) between areas south of Blair Junction and the town of Silver Peak. • Mineral Ridge Mine, a recently active gold mine, is located about 2 or 3 miles east of MRC (MN1) on the crest of Mineral Ridge in the northeast Silver Peak Range. • Silver Peak Range is area of current interest for gold exploration. • MRC passes over areas containing mill tailings near Blair.
Red Mountain	Esmeralda	36	Literature Review	Low	• MRC passes more than 5 miles from authorized plans of operation associated with 16 to 1 mine (and possibly others) in much of T. 3 S., R. 38 E., and in secs. 31 through 34, T. 2 S., R. 38 E. • MRC passes approximately 5 miles from nearest active mining claims in district in T. 3 S., R. 38 E., and T. 2 S., R. 38 E. • No significant production has been recorded from the Red Mountain district since the 1980s. • The MRC is separated from the Red Mountain district by Nevada Hwy 265 and is on the opposite side of Silver Peak Range.
Silver Peak Marsh	Esmeralda	37	Literature Review	High	• MRC passes over or within 1 mile of active mining claims in T. 2 S., R. 39 E., and plan(s) of operation in T. 2 S., R. 39 E.; and T. 2 S., R. 40 E. associated with a major lithium-producing operation (Chemetall Foote). • MRC passes within 1 mile of Chemetall Foote lithium processing plant in the town of Silver Peak and between plant site and evaporation ponds. • MRC passes within 1 mile of authorized or pending geothermal lease(s) (sec. 34, T. 1 S., R. 39 E.; secs. 3, 10, 14, and 15, T. 2 S., R. 39 E.). • MRC passes within 1 mile of authorized or pending sodium (secs. 14 and 23, T. 2 S., R. 39 E.) and potassium (sec. 1, T. 3 S., R. 39 E.; secs. 5 and 6, T. 3 S., R. 40 E.; and sec. 32, T. 2 S., R. 40 E.) prospecting permit(s). • Alignment traverses large tract of closed geothermal lease(s) between areas south of Blair Junction and the town of Silver Peak.
Montezuma	Esmeralda	38	Field Reconnaissance Literature Search	Moderate	• MRC (alignment MN1) passes within 2 to 5 miles of an authorized Notice of Intent and active mining claims associated with ongoing gold exploration drilling (Bonaventure Enterprises Inc. Goldfield West area; secs. 5, 8, and 17, T. 3 S., R. 42 E.). • MRC (alignment MN1) passes over active mining claims, and approximately 1 mile south of authorized notices of intent associated with an ongoing gold exploration drilling and surface geochemical sampling project (Kinbauri Gold Corp. Aztec Claims; secs. 29 and 30, T. 3 S., R. 42 E.). • MRC (alignment MN1) passes near or through claim blocks in southmost portions of T. 3 S., R. 41 E. (Mariposa Resources, Ltd. and Silver Reserve Corp.) • Mercury occurrences in sec. 16, T. 3 S., R. 41 E., located about 1 mile from alignment; although no production or recent interest has been reported. • MRC (near junction of MN1, MN3) passes within 1 mile of active and patented mining claims near junction of MN1 and MN3. NBMG reports indicate the patented claims are located on quartz veins containing silver and gold. A field visit revealed no indications of recent exploration activity. • Discussions with the BLM indicate that the plan of operations shown in Secs. 3 and 4, T. 2 S., R. 41 E. are erroneously plotted; its actual location is many miles from the MRC.

TABLE 1
SUMMARY OF MINERAL OCCURRENCES

OCCURRENCE				CONFLICT	
AREA / MINING DISTRICT	COUNTY	ID No. on Plates 1 and 2	INFORMATION SOURCE	PROBABILITY	RATIONALE
Goldfield	Esmeralda	39	Field Reconnaissance Literature Search	High	• Favorable geologic environment for the occurrence of large bulk minable precious metal and copper ore deposits with history of successful and ongoing mineral exploration projects. • Historic and major precious metal and copper producing area in Nevada with approximately 4.2 million ounces of gold, 1.4 million ounces of silver, and 3800 tons of copper credited to the district. • MRC Alternatives MN2 and MCS2 traverse lands containing numerous active mining claims, and patented mining claims in T. 2 S., R. 42 E.; T. 3 S., R. 42 E.; and T. 3 S., R. 43 E. that are either on or within 1 mile of the alignment. • MRC Alignment MCS2 traverses the Gemfield area of the Goldfield District, Metallic Ventures, Inc. report that this area contains ore reserves with approximately 540,000 ounces of gold. • Metallic Ventures, Inc. has completed a preliminary assessment for development of an open pit mine in the Gemfield Area. This assessment shows that resource occurs on both the east and west sides of Highway 95 in secs. 22, 23, 26, and 27, T. 2 S., R. 42 E. Development of the resource on both sides of the highway would involve relocating the highway to the west possibly in the vicinity of the proposed MRC alignment. • MRC alternate MN2, passes through and near active mining claims and authorized notices of intent on north side of district and immediately north of Metallic Ventures, Inc.'s Gemfield deposit.
Railroad Springs	Esmeralda	40	Field Reconnaissance Literature Search	Low	• MRC passes more than 8 miles from active mining claims in district. • MRC is distant from mining district.
Cuprite	Esmeralda	41	Literature Review	High	• The MRC alignment MN1 passes within approximately 1 mile of areas containing favorable rock types for mineralization. • Active mining claims are located within 1 mile of the MRC in secs. 30 and 31, T. 4 S., R. 43 E. • MRC passes across or close to two NDOT Mineral Materials Sites in sec. 25, T. 4 S., R. 43 E. • Relatively recent production of silica from quarry located near MRC. • The presence of relatively large geothermal system, past geothermal leasing activity, and evidence of previous geothermal exploration efforts near the alignment. • Copper, silver, gold, sulfur, clay, silica, and geothermal resources have been identified in the area in the vicinity of the MRC. • This area was rated as having medium to high potential for conflict between the NRL and the Cuprite district in the CRC report (Shannon & Wilson, 2005).
Stonewall	Nye	42	Literature Review	Low	• The western limit of the Stonewall mining district is located to the east of the MRC alignment MN1. • The potential for conflict was rated low in for mineral report for CRC (Shannon & Wilson, 2005), so the rating for potential conflict would not change in the absence of new claim or reported mineral exploration activity. • No new mining claim activity or mineral exploration has been reported for district since CRC report was prepared. • Recent mineral exploration activity and mining claims in this district are located more than approximately 3 miles east of the MRC.
Lida	Esmeralda	43	Literature Review	Low	• MRC passes more than 10 miles from active mining claims in district. • MRC is distant from the mining district
Gold Point	Esmeralda	44	Literature Review	Low	• MRC passes more than 6 miles from active mining claims in district in vicinity of historic copper and mercury occurrences. • MRC passes more than 13 miles from historically productive mines in Gold Point district. • MRC is distant from mining district.
Wagner	Nye	45	Literature Review	Moderate	• MRC alignment BC2 and BCB pass close to the district. • Area drilled for porphyry copper mineralization in early 1990s. • Area considered being favorable for mixed oxide and sulfide copper ore and a buried porphyry copper deposit (Shannon & Wilson, 2005b). • This area was rated as having medium potential for conflict between the NRL and the Wagner district in the CRC report (Shannon & Wilson, 2005b).

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Esmeralda	Mineral Material Sales	NVCC 0023402	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	3/17/1948	1N	35E	21	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 004711	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	8/27/1970	1N	35E	19	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0023403	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	3/17/1949	1N	36E	6	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0019978	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/16/1936	1N	38E	9	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0019979	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/16/1936	1N	38E	35	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0059729	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	4/29/1963	1N	38E	9	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0020876	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	7/18/1940	1N	39E	10	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0001468	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	5/17/1950	1N	42E	27	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0019981	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/16/1936	1S	39E	16	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 076061	GOLDFIELD CONTRACTING	361113	Mineral Materials Negotiated	APLN WITHDRAWN	2/10/2003	1S	41E	25	WITHDRAWN
Esmeralda	Mineral Material Sales	NVN 0001469	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	5/17/1950	1S	42E	23	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0022522	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	1/24/1947	2N	35E	20	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 005320	NV DEPT OF TRANS	282102	Mineral Material Site (Sec 107)	ROW GRANTED-ISSUED	5/12/1971	2N	35E	24	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0023404	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	3/17/1949	2N	36E	32	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0018482	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	9/3/1935	2N	37E	8	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0059766	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	4/29/1963	2N	37E	15	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0019980	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	AUTH AMENDED/MODIFIED	2/22/1983	2N	38E	16,21	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0022520	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	10/24/1988	2N	38E	16,17,20	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 038189	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	9/28/1983	2N	38E	12,13	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0059728	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	4/29/1963	2N	38E	32	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 080671	SANTANA LLC	361113	Mineral Materials Negotiated	APLN REJ/DENIED	9/6/2005	2N	39E	10,11,12,13 ,14,15,24	REJECTED
Esmeralda	Mineral Material Sales	NVN 080671	SANTANA LLC	361113	Mineral Materials Negotiated	APLN REJ/DENIED	9/6/2005	2N	40E	19,20	REJECTED

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Esmeralda	Mineral Material Sales	NVCC 0019982	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	12/10/1936	2S	39E	10	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 059030	CHEMETALL FOOTE CORP	361113	Mineral Materials Negotiated	EXPIRED	7/10/1995	2S	39E	22	EXPIRED
Esmeralda	Mineral Material Sales	NVN 077461	ESMERALDA CNTY RD DEPT	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	8/5/2003	2S	39E	22	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 078126	CHEMETALL FOOTE CORP	361113	Mineral Materials Negotiated	EXPIRED	8/23/2005	2S	39E	13	EXPIRED
Esmeralda	Mineral Material Sales	NVN 078127	CHEMETALL FOOTE CORP	361113	Mineral Materials Negotiated	EXPIRED	8/23/2005	2S	39E	13,14,23	EXPIRED
Esmeralda	Mineral Material Sales	NVN 081455	CHEMETALL FOOTE CORP	361113	Mineral Materials Negotiated	APLN RECD	2/2/2006	2S	39E	13	PENDING
Esmeralda	Mineral Material Sales	NVN 081456	CHEMETALL FOOTE CORP	361113	Mineral Materials Negotiated	APLN RECD	2/2/2006	2S	39E	13,14,23	PENDING
Esmeralda	Mineral Material Sales	NVN 076808	ESMERALDA CNTY RD DEPT	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	4/9/2003	2S	41E	7	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 004654	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	8/24/1979	2S	42E	2,11	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 021776	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	8/24/1979	2S	42E	3,4	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 060264	ESMERALDA CNTY	362113	Mineral Materials Free Use Permit Government	EXPIRED	7/8/1998	2S	42E	28	EXPIRED
Esmeralda	Mineral Material Sales	NVN 076807	ESMERALDA CNTY RD DEPT	362113	Mineral Materials Free Use Permit Government	EXPIRED	4/8/2006	2S	42E	11	EXPIRED
Esmeralda	Mineral Material Sales	NVN 078984	BOWMAN GEORGIA	361113	Mineral Materials Negotiated	EXPIRED	11/23/2006	2S	42E	29	EXPIRED
Esmeralda	Mineral Material Sales	NVN 001472	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	CLOSED	2/28/2005	2S	42E	23	CLOSED
Esmeralda	Mineral Material Sales	NVN 081072	ESMERALDA CNTY RD DEPT	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	12/12/2005	2S	42E	28	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0059765	TANNER BOB	361113	Mineral Materials Negotiated	CASE CLOSED	6/1/1989	3N	37E	29	CLOSED
Esmeralda	Mineral Material Sales	NVN 0059765	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	POST AUTH APLN RECD	5/20/1993	3N	37E	31	PENDING, ACCESS RD
Esmeralda	Mineral Material Sales	NVN 060070	NYE CNTY ROAD DEPT	362113	Mineral Materials Free Use Permit Government	EXPIRED	7/30/1996	3N	38E	28	EXPIRED
Esmeralda	Mineral Material Sales	NVCC 0018373	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	11/14/1934	3N	39E	20	AUTHORIZED

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Esmeralda	Mineral Material Sales	NVCC 0018374	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	11/14/1934	3N	39E	10	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0018375	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	11/14/1934	3N	39E	12	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 056304	FHWA	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	10/11/1994	3N	39E	12,13	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 056304	FHWA	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	10/11/1994	3N	40E	18,19,20,28 ,29	AUTHORIZED, NO ACREAGE CHANGE
Esmeralda	Mineral Material Sales	NVCC 0018376	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	11/14/1934	3N	40E	5	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0018377	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	11/14/1934	3N	40E	3	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0020909	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/23/1940	3N	40E	7	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0020910	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/17/1940	3N	40E	8	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0020911	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/15/1940	3N	40E	12	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 004225	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	3/10/1970	3N	40E	12	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0020912	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/15/1940	3N	41E	15,22	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0060306	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	5/24/1963	3N	41E	15	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 050131	BOB BOTTOM INC	361113	Mineral Materials Negotiated	CASE CLOSED	2/12/1991	3N	42E	27	CLOSED
Esmeralda	Mineral Material Sales	NVCC 0018451	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	AUTH AMENDED/MODIFIED	6/22/1935	3S	42E	24,25	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0021052	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	9/12/1941	3S	42E	24	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0059730	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	4/29/1963	4N	36E	35	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 059640	SUNRISE VALLEY RV PK.	361113	Mineral Materials Negotiated	CASE CLOSED	5/1/1995	4N	35E	1	CLOSED
Mineral	Mineral Material Sales	NVN 059384	KINROSS CANDELARIA	361113	Mineral Materials Negotiated	CASE CLOSED	1/8/1998	4N	35E	31	CLOSED
Esmeralda	Mineral Material Sales	NVN 0066629	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	12/16/1965	4S	42E	25	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0067253	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	6/23/1966	4S	42E	25	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0067318	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	7/12/1966	4S	42E	11,12	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0066629	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	12/16/1965	4S	43E	30	AUTHORIZED

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Esmeralda	Mineral Material Sales	NVCC 0018452	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/22/1935	4S	43E	30	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0042800	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	12/22/1931	4S	43E	30	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0018453	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/22/1935	5S	43E	17	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 004142	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	POST AUTH APLN RECD	4/2/1999	5S	43E	8,17	PENDING
Esmeralda	Mineral Material Sales	NVN 004143	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	2/12/1970	5S	43E	20	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 061602	AF	362113	Mineral Materials Free Use Permit Government	EXPIRED	10/7/1997	5S	43E	17	EXPIRED
Esmeralda	Mineral Material Sales	NVN 0044166	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	5/4/1960	6S	41E	1	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 0048516	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	5/4/1960	6S	41E	6	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0018449	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/22/1935	6S	43E	8	AUTHORIZED
Esmeralda	Mineral Material Sales	NVCC 0018450	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/22/1935	6S	43E	21	AUTHORIZED
Esmeralda	Mineral Material Sales	NVN 004602	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	7/2/1970	6S	43E	21	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0027842	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/10/1958	12N	26E	19,30	AUTHORIZED
Lyon	Mineral Material Sales	NVCC 0018153	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	1/16/1934	13N	25E	16,716	AUTHORIZED
Lyon	Mineral Material Sales	NVN 039767	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	4/27/1984	13N	25E	33	AUTHORIZED
Lyon	Mineral Material Sales	NVN 03976701	BLM	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	4/27/1984	13N	25E	33	AUTHORIZED
Lyon	Mineral Material Sales	NVN 03976702	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	4/27/1984	13N	25E	33	AUTHORIZED
Lyon	Mineral Material Sales	NVN 083048	WALKER RIVER IRRIGATION DIST	362113	Mineral Materials Free Use Permit Government	APLN RECD	12/4/2006	13N	25E	33	PENDING
Lyon	Mineral Material Sales	NVN 0005923	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	8/28/1951	13N	25E	25	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0006557	NV DEPT OF TRANS	282102	Mineral Material Site (Sec 107)	AUTH AMENDED/MODIFIED	10/21/1983	13N	25E	28	AUTHORIZED

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Lyon	Mineral Material Sales	NVN 0057055	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	4/13/1961	13N	26E	31	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0061273	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	11/21/1963	13N	26E	17	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0061397	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	12/4/1964	13N	26E	17	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0065188	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	2/10/1965	13N	26E	11	AUTHORIZED
Lyon	Mineral Material Sales	NVCC 0018219	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	9/22/1983	14N	25E	19,20	AUTHORIZED, PUT UN ACT OF 8/27/58
Lyon	Mineral Material Sales	NVN 063028	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	12/9/1998	14N	25E	19	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0065125	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	11/10/1964	14N	26E	36	AUTHORIZED
Lyon	Mineral Material Sales	NVN 006512501	BLM	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	11/10/1964	14N	26E	36	AUTHORIZED
Lyon	Mineral Material Sales	NVN 006512502	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	11/10/1964	14N	26E	36	AUTHORIZED
Lyon	Mineral Material Sales	NVCC 0018428	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	AUTH AMENDED/MODIFIED	10/26/1983	15N	25E	5,8	AUTHORIZED
Lyon	Mineral Material Sales	NVN 011025	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	1/16/1975	15N	25E	12	AUTHORIZED
Lyon	Mineral Material Sales	NVN 075396	NV DEPARTMENT OF WILDLIFE	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	12/13/2001	15N	25E	12	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0060523	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	7/9/1963	15N	25E	5,6	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0060524	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	7/25/1963	15N	25E	17	AUTHORIZED
Lyon	Mineral Material Sales	NVN 0060525	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	7/18/1963	15N	25E	30	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0053824	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	6/20/1960	10N	29E	17	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0053825	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	6/20/1960	10N	29E	5	AUTHORIZED

TABLE 2
MINERAL MATERIAL SITES

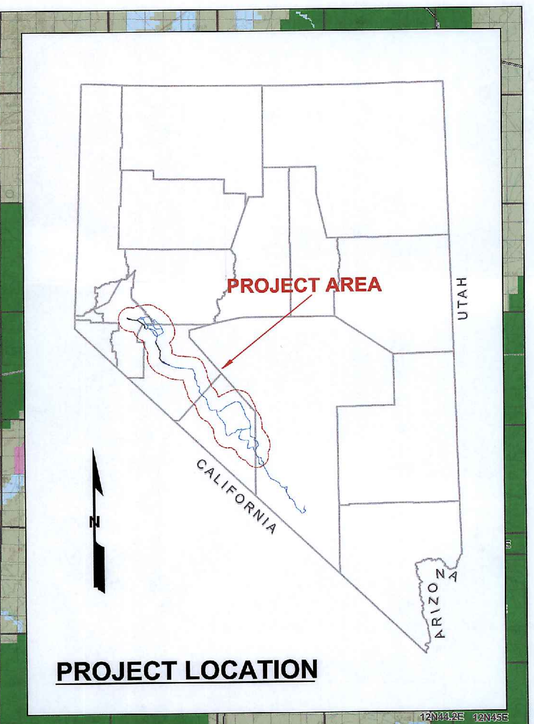
COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Mineral	Mineral Material Sales	NVN 0043868	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	4/26/1960	11N	29E	20	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0043869	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	4/22/1960	11N	29E	6	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0059928	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	3/13/1963	11N	29E	28,29	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0019527	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	4/9/1936	13N	28E	21	AUTHORIZED
Mineral	Mineral Material Sales	NVN 082644	GOEKEN STEVE	361113	Mineral Materials Negotiated	APLN RECD	1/13/2006	3N	34E	8	PENDING
Mineral	Mineral Material Sales	NVN 0013829	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	12/9/1953	3N	34E	5	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0018243	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/22/1934	5N	35E	9	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0018429	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	5/21/1935	5N	35E	34	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0013831	NV DEPT OF TRANS	282102	Mineral Material Site (Sec 107)	ROW GRANTED-ISSUED	12/9/1953	5N	35E	31	AUTHORIZED
Mineral	Mineral Material Sales	NVN 076640	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	PMT-LIC ISSUED	11/24/2003	6N	33E	9	AUTHORIZED
Mineral	Mineral Material Sales	NVN 076641	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	APLN RECD	7/25/2002	6N	33E	6	PENDING
Mineral	Mineral Material Sales	NVCC 0018244	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/11/1934	6N	35E	17,717	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0018245	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/11/1934	6N	35E	7,707	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0058612	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	6/30/1981	6N	35E	6	AUTHORIZED, ADD ACCESS ROAD
Mineral	Mineral Material Sales	NVCC 0018246	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/22/1934	7N	34E	14	AUTHORIZED
Mineral	Mineral Material Sales	NVN 038459	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	ROW GRANTED-ISSUED	11/18/1983	7N	34E	14,714	AUTHORIZED
Mineral	Mineral Material Sales	NVN 076637	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	PMT-LIC ISSUED	4/1/2003	7N	34E	15	AUTHORIZED
Mineral	Mineral Material Sales	NVN 076638	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	PMT-LIC ISSUED	7/24/2003	7N	34E	15	AUTHORIZED
Mineral	Mineral Material Sales	NVN 079634	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	APLN RECD	11/15/2004	7N	34E	9	PENDING
Mineral	Mineral Material Sales	NVN 082016	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	APLN RECD	5/11/2006	7N	34E	15	PENDING
Mineral	Mineral Material Sales	NVN 082656	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	APLN RECD	1/3/2006	7N	34E	9	PENDING
Mineral	Mineral Material Sales	NVCC 0018448	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/22/1935	8N	30E	20	AUTHORIZED

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Mineral	Mineral Material Sales	NVN 038203	NV DEPT OF TRANS	282102	Mineral Material Site (Sec 107)	ROW GRANTED-ISSUED	9/21/1983	8N	30E	25,26	AUTHORIZED
Mineral	Mineral Material Sales	NVN 0061009	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	7/22/1963	8N	30E	23	AUTHORIZED
Mineral	Mineral Material Sales	NVN 006100901	BLM	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	7/22/1963	8N	30E	23	AUTHORIZED
Mineral	Mineral Material Sales	NVN 006100902	BLM	361113	Mineral Materials Negotiated	PMT-LIC ISSUED	7/22/1963	8N	30E	23	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0020777	NV DEPT OF TRANS	282104	Mineral Material Site (Sec 317)	AUTH AMENDED/MODIFIED	12/7/1988	8N	32E	21	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0018248	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/22/1934	8N	33E	20	AUTHORIZED
Mineral	Mineral Material Sales	NVN 038418	NV DEPT OF TRANS	282102	Mineral Material Site (Sec 107)	ROW GRANTED-ISSUED	11/3/1983	8N	33E	25,26	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0018247	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	10/22/1934	8N	34E	33,34	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0021185	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/8/1942	8N	34E	15	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0021186	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/19/1942	8N	34E	33,34,734	AUTHORIZED
Mineral	Mineral Material Sales	NVN 050540	MINERAL CNTY	362113	Mineral Materials Free Use Permit Government	CASE CLOSED	3/30/1994	8N	34E	35	CLOSED
Mineral	Mineral Material Sales	NVN 076636	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	PMT-LIC ISSUED	4/1/2003	8N	35E	8	AUTHORIZED
Mineral	Mineral Material Sales	NVN 079635	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	APLN RECD	11/15/2004	8N	35E	7,18	PENDING
Mineral	Mineral Material Sales	NVN 077691	MINERAL CNTY	362113	Mineral Materials Free Use Permit Government	APLN RECD	9/11/2003	9N	29E	35	PENDING
Mineral	Mineral Material Sales	NVN 0061008	BLM	360413	Mineral Materials Disposable sites (Saleable Free use permits)	PMT-LIC ISSUED	7/22/1963	9N	30E	16	AUTHORIZED
Mineral	Mineral Material Sales	NVN 006100801	BLM	362113	Mineral Materials Free Use Permit Government	PMT-LIC ISSUED	7/22/1963	9N	30E	16	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0021187	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/10/1942	9N	34E	36	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0021188	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/8/1942	9N	34E	34	AUTHORIZED

TABLE 2
MINERAL MATERIAL SITES

COUNTY	COMMODITY	SERIAL NUMBER	PROPRIETOR	CASE TYPE	CASE TYPE DESCRIPTION	ACTION	ACTION DATE	TOWNSHIP	RANGE	SECTION	NOTES
Mineral	Mineral Material Sales	NVN 076639	MILESTONE MINERALS INC	361113	Mineral Materials Negotiated	PMT-LIC ISSUED	7/24/2003	9N	34E	35	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0021189	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/8/1942	9N	35E	8,9	AUTHORIZED
Mineral	Mineral Material Sales	NVCC 0021190	NV DEPT OF TRANS	282106	Mineral Material Site (Sec 17)	ROW GRANTED-ISSUED	6/17/1942	9N	35E	31	AUTHORIZED



PROJECT LOCATION

LEGEND

- Township Designation (3N36E)
- Field Sites Visited (MT6019)
- Mining Districts

JURISDICTION

- City and County Parks
- U.S. Department of Defense
- U.S. Department of Energy
- Fish and Wildlife Service
- Native American Reservation
- National Park Service
- Nevada State Lands
- Private Lands / Allotments
- U.S. Forest Service
- Wilderness Study Area
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation

RAIL STUDY RELATED FEATURES

- Existing Rail
- Mina Corridor Potential Alignments
- Mina/Caliente Corridor Potential Alignments
- MN1 — Mina Alignment Designator
- SR3 — Mina/Caliente Alignment Designator
- Mineral And Energy Occurrence Report Study Area

SOURCES AND NOTES

1. Rail Study Related Features and Public Land Survey data provided by BSC-T06-00-238 rev09 (10/13/06).
2. Jurisdictional GIS data provided by BSC - GIS Baseline Data Dictionary (October, 2006) .
3. Coordinates and projection in UTM, NAD 83, zone 11, feet.
4. Township designations on this plate are referenced by the number of tiers north or south and number of ranges east or west from the Mount Diablo Meridian and Base Line. For example, Township 6 North, Range 36 East, Mount Diablo Meridian is designated as 3N36E.

N

0 5 10 15 20

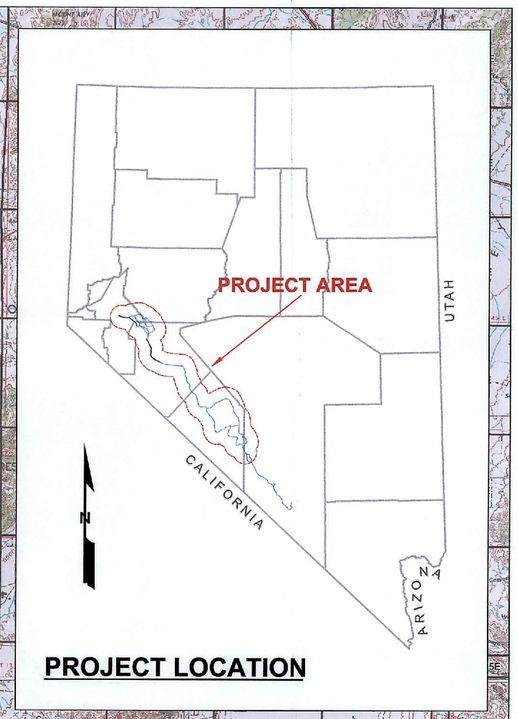
Scale in Miles

YUCCA MOUNTAIN PROJECT
NEVADA RAIL CORRIDOR
PHASE 1a MINA ROUTE

Mineral And Energy Resources Occurrence Report

PROJECT ALIGNMENT AND LAND JURISDICTION
PLATE 1

Filename: 21-1-20102-233 Plate-1 PROJECT ALIGNMENT AND LAND JURISDICTION.mxd Created Using: ArcMap 9.2 Date Printed: 27-Jul-07 BRL



PROJECT LOCATION

LEGEND

- 3N36E — Township Designation
- MT6019 — Field Sites Visited
- Mining Districts

RAIL STUDY RELATED FEATURES

- Existing Rail
- Mina Corridor Potential Alignments
- Mina/Caliente Corridor Potential Alignments
- MN1 — Mina Alignment Designator
- SR3 — Mina/Caliente Alignment Designator
- Mineral And Energy Occurrence Report Study Area

MINERAL RESOURCE RELATED LAND STATUS

- Active Mining Claims (Includes Lode, Placer, and Mill Sites) (at least one per section)
- Surface Management Notice of Intent - Authorized and Pending (at least one per section)
- Surface Management Plan of Operations - Authorized and Pending (at least one per section)

SOURCES AND NOTES

1. Rail Study Related Features and Public Land Survey data provided by BSC - T06-00-238 rev09 (10/13/06).
2. Mining Claim data obtained from BLM Land & Mineral Records System http://www.blm.gov/lr2000 in March, 2007.
3. Surface Management (Notice Of Intent And Plan Of Operation) data obtained from BLM Land & Mineral Records System (LR2000) http://www.blm.gov/lr2000 in January, 2007.
4. Township designations on this plate are referenced by the number of tiers north or south and number of ranges east or west from the Mount Diablo Meridian and Base Line. For example, Township 6 North, Range 36 East, Mount Diablo Meridian is designated as 3N36E.

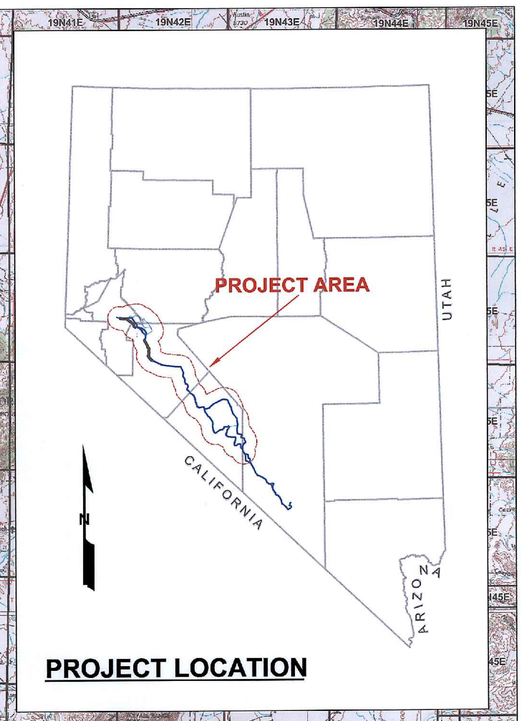
YUCCA MOUNTAIN PROJECT
NEVADA RAIL CORRIDOR
PHASE 1a MINA ROUTE

Mineral And Energy Resources Occurrence Report

MINING DISTRICTS AND MINING CLAIMS
PLATE 2

0 5 10 15 20
Scale in Miles

Filename: 21-1-20102-233 Plate-2 MINING DISTRICTS AND MINING CLAIMS.mxd Created Using: ArcMap 9.2 Date Printed: 27-Jul-07 BRL



PROJECT LOCATION

LEGEND

- 3N36E — Township Designation
- MT6019 — Field Sites Visited

RAIL STUDY RELATED FEATURES

- Existing Rail
- Mina Corridor Potential Alignments
- Mina/Caliente Corridor Potential Alignments
- MN1 — Mina Alignment Designator
- SR3 — Mina/Caliente Alignment Designator
- Mineral And Energy Occurrence Report Study Area

LAND STATUS AND ENERGY RELATED FEATURES

Oil and Gas Leases
(at least one per section)
- Authorized and Pending
- Closed

Geothermal Leases
(at least one per section)
- Authorized and Pending
- Closed

Oil and Gas Wells
- Dry Hole
- Gas Show
- Oil and Gas Show
- Oil Show

Geothermal Features
- Permitted Wells
- Direct - Use Applications
- Hot Heat Flow Wells (> 100 C/km)
- Hot Spring (> 37C)
- Hot Well (> 37C)
- Warm Heat Flow Wells (< 100 C/km)
- Warm Spring (<= 37C)
- Warm Well (<= 37C)

SOURCES AND NOTES

1. Rail Study Related Features and Public Land Survey data provided by BSC - T06-00-238 rev09 (10/13/06).
2. Oil/Gas Occurrences data obtained from Nevada Oil and Gas Well Database Map (NBMG Open-File Report 01-7), http://www.nbmg.unr.edu/lists/oil/oil.htm in January, 2007.
3. Geothermal Occurrences data obtained from Geothermal Resources of Nevada interactive map (simplified version of NBMG Map 141, Nevada Geothermal Resources), http://www.nbmg.unr.edu/geothermal/gthome.htm in April, 2007.
4. Oil/Gas and Geothermal Lease data obtained from BLM Land & Mineral Records System (LR2000), http://www.blm.gov/lr2000 in January, 2007.
5. Township designations on this plate are referenced by the number of tiers north or south and number of ranges east or west from the Mount Diablo Meridian and Base Line. For example, Township 6 North, Range 36 East, Mount Diablo Meridian is designated as 3N36E.

YUCCA MOUNTAIN PROJECT
NEVADA RAIL CORRIDOR
PHASE 1a MINA ROUTE

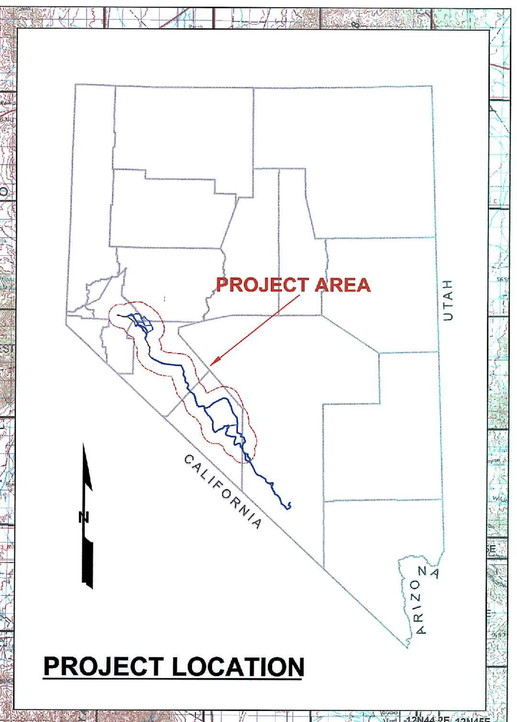
Mineral And Energy Resources Occurrence Report

ENERGY RESOURCE OCCURRENCES AND LEASES
PLATE 3

0 5 10 15 20
Scale in Miles

N

Filename: 21-1-20102-233 Plate-3 ENERGY RESOURCE OCCURRENCES AND LEASES.mxd Created Using: ArcMap 9.2 Date Printed: 27-Jul-07 BRL



PROJECT LOCATION

LEGEND

- 3N36E — Township Designation
- MT6019 — Field Sites Visited

RAIL STUDY RELATED FEATURES

- Existing Rail
- Mina Corridor Potential Alignments
- Mina/Caliente Corridor Potential Alignments
- MN1 — Mina Alignment Designator
- SR3 — Mina/Caliente Alignment Designator
- Mineral And Energy Occurrence Report Study Area

MINERAL RESOURCE RELATED LAND STATUS

Mineral Material Sites
(at least one per section)
- Authorized and Pending
- Closed

Potassium Prospecting Permits
(at least one per section)
- Authorized and Pending
- Closed

Sodium Prospecting Permits
(at least one per section)
- Authorized and Pending
- Closed

SOURCES AND NOTES

1. Rail Study Related Features and Public Land Survey data provided by BSC - T06-00-238 rev09 (10/13/06).
2. Potassium and Sodium Permit data, and Mineral Material Sales data obtained from BLM Land & Mineral Records System (LR2000), http://www.blm.gov/lr2000 in January, 2007.
3. Township designations on this plate are referenced by the number of tiers north or south and number of ranges east or west from the Mount Diablo Meridian and Base Line. For example, Township 6 North, Range 36 East, Mount Diablo Meridian is designated as 3N36E.

N

0 5 10 15 20

Scale in Miles

YUCCA MOUNTAIN PROJECT
NEVADA RAIL CORRIDOR
PHASE 1a MINA ROUTE

Mineral And Energy Resources Occurrence Report

MINERAL MATERIAL SITES AND INDUSTRIAL MINERAL PROSPECTING PERMITS
PLATE 4

Filename: 21-1-20102-233_Plate-4_MINERAL_MATERIAL_SITES_AND_INDUSTRIAL_MINERAL_PROSPECTING_PERMITS.mxd Created Using: ArcMap 9.2 Date Printed: 27-Jul-07 BRL

APPENDIX A

FIELD DATA SUMMARIES

APPENDIX A

FIELD DATA SUMMARIES

TABLE OF CONTENTS

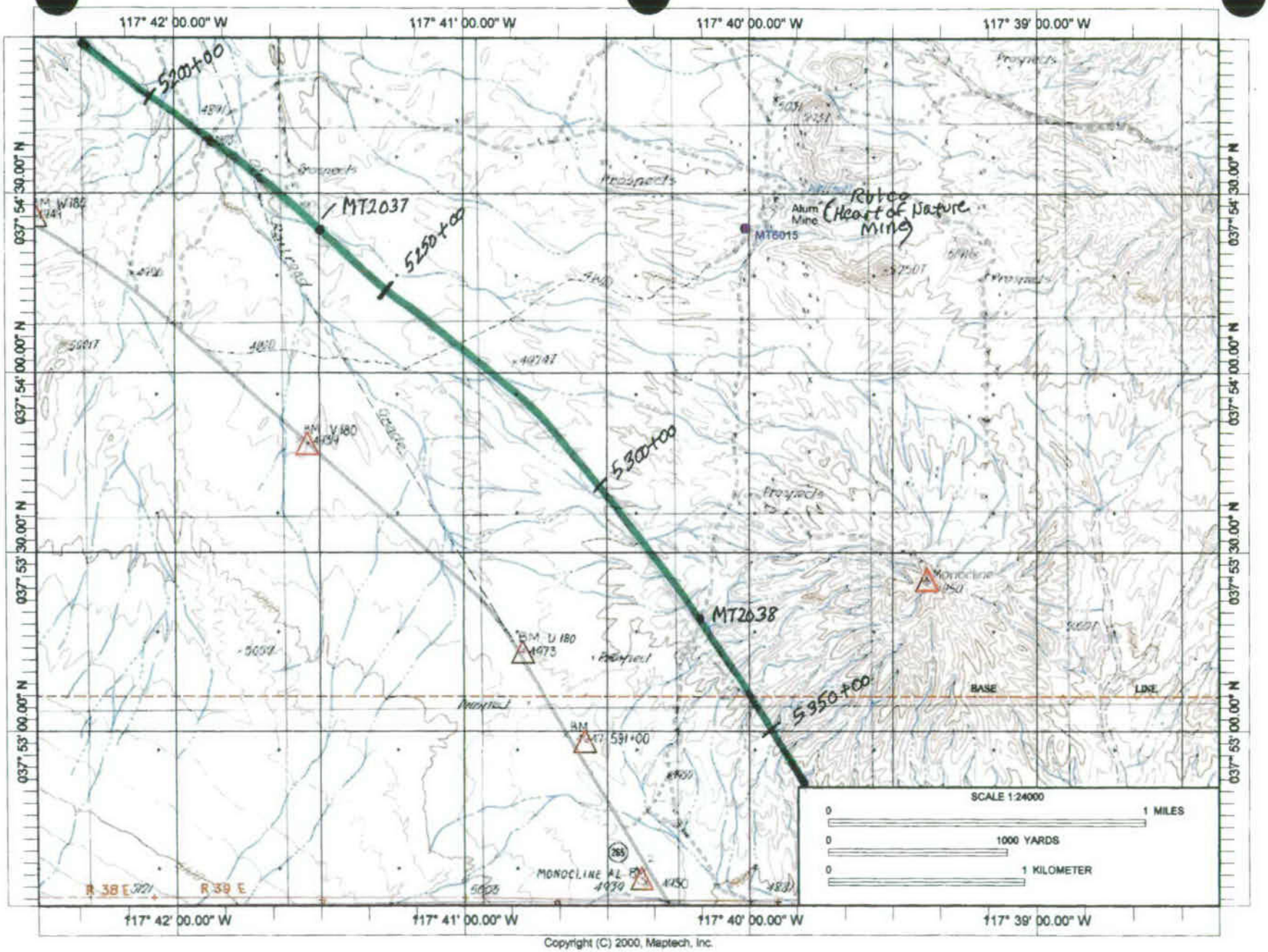
LIST OF MINING DISTRICTS VISITED DURING FIELD RECONNAISSANCE

District – Waypoint	Page No.
Alum – MT6015	A-1
Benway – MT8143	A-4
Buckley – MT8138	A-5
Buckley – MT8139	A-6
Buckley – MT8146	A-7
Coaldale – MT6014	A-8
Columbus Marsh – MT1087	A-11
Columbus Marsh – MT 6013	A-13
Divide – MT6025	A-15
Gilbert – MT6019	A-18
Gilbert – MT6020	A-22
Gilbert – MT6020A	A-24
Goldfield – MT6022	A-27
Goldfield – MT7007	A-30
Goldfield – MT7010	A-31
Holy Cross – MT8138	A-32
Holy Cross – MT8141	A-34
Holy Cross – MT8237	A-35
Lone Mountain – MT6021	A-36
Montezuma – MT6023	A-39
Montezuma – MT7018	A-43
Pilot Mountain – MT 6009	A-44
Pilot Mountain – MT 6012	A-45
Railroad Springs – MT6024	A-46
Red Ridge – MT8140	A-49
Rock Hill – MT6027	A-50
Rock Hill – MT6028	A-53
Santa Fe – MT1063	A-57
Santa Fe – MT6002	A-60
Santa Fe – MT6004	A-63
Santa Fe – MT6006	A-66
Silver Peak – MT6017	A-69

District – Waypoint	Page No.
Silver Peak Marsh – MT6016	A-73
Tonopah – MT6026	A-77
Wabuska Marsh – MT6001	A-81
Walker River Indian Reservation Interview	A-82

INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: Rulco Heart of Nature (Alum) mine		
DATE: 11/30/06	OWNER OR LESSEE: Rulco (?)		
TIME: 17:15	**MINING DISTRICT: Alum**		
WEATHER: Sunny and cold	COUNTY: Esmeralda		
WAYPOINT: MT6015	LATITUDE: N. 37.90670^0	LONGITUDE: W. 117.66682^0	ALTITUDE: 5,008 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T1N, R38.5E S28-33			
GEOGRAPHIC AREA: Southern part of Weepah Hills			
GEOGRAPHIC DESCRIPTION: The mine is located in a hilly area dissected by numerous, WNW to NW trending washes, that drain to Big Smokey Valley. Summit altitudes of hills in the vicinity of the mine generally range from 5,150 to 5,350 feet AMSL. Washes at the farthest extent of prospect pits on the west side of the area are at an altitude of about 4,980 feet AMSL. Thus, total relief in the area ranges from about 170 to 370 feet.			
LOCAL GEOLOGIC UNIT: Middle Miocene (11-13 Ma) Esmeralda Formation			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks (Tsv)			
LITHOLOGIC DESCRIPTION: The entire Esmeralda Formation crops out in the Weepah Hills, but only unit E of Stewart (1989) is present in the mine area. This unit is composed of intertonguing fine-textured and coarse-textured facies. The fine-textured rocks consist of light-greenish-gray to yellow-gray, laminated to very thinly bedded, tuffaceous siltstone, clayey sandstone, and minor tuff. These rocks have a frothy weathered surface, which indicates a large content of swelling clays. The coarse-textured rocks consist mostly of light-gray, greenish-gray, and grayish-red pebble to cobble conglomerate with clasts of limestone, phyllitic siltstone, quartzite, chert, quartz, and mafic igneous rocks. Clasts typically are angular to subangular. Fine to coarse-grained sandstone commonly occurs where the fine-textured and coarse-textured facies occur together in thinly alternating intervals. At the mine, especially on its east side, the rocks are mottled yellow, reddish-orange, red, purple, and white, which is indicative of hydrothermal alteration.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Sedimentary rocks of the Esmeralda Formation at the mine are folded into a narrow, northwest-trending, southeast-plunging syncline. Beds on the north limb generally strike NE and dip 30-75^0 SE, whereas beds on the south limb generally strike 25-70^0 NE. A NNE-striking graben downdrops the nose of the fold at the mine.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: In late Miocene to Pliocene time, hydrothermal fluids rose along syntectonic faults that created the graben at the nose of the Heart of Nature mine syncline. These fluids changed the color of the Esmeralda Formation to the brilliant hues seen at the mine, altered tuffaceous sedimentary rocks and tuff partly to clay minerals, including the aluminum- and potassium-rich clay, kalinite, and caused sulfur crystals to precipitate into vugs of naturally pumiceous or cavitated rock.			
COMMODITIES: alum and sulfur			
OPERATING AND ABANDONED FACILITIES: Deposits of alum in the form of a clay mineral, potassium alum kaolinite (a hydrated potassium aluminum sulfate also known as kalinite) and native sulfur are obtained from an open-pit mine in the Miocene Esmeralda Formation.			

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine is ≤1 mile NE of MZ-1 station 5250+00		
PHOTOGRAPHS		
NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6015_ALG_0348_30Nov06.jpg	MT6015	Pan NW of Rulco Heart of Nature open-pit, alum and sulfur mine, which is excavated into the Miocene Esmeralda Formation in the Weepah Hills. (AG705-707)
MT6015_ALG_0349_30Nov06.jpg	MT6015	View north of the Rulco Heart of Nature open-pit mine. (AG708)
MT6015_ALG_0350_30Nov06.jpg	MT6015	View NE of the Rulco Heart of Nature mine and tailings. (AG709)
CONTACTS: N/A		
REFERENCES: Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Stewart, J.H., 1989, Description, stratigraphic sections, and maps of middle and upper Miocene Esmeralda formation in Alum, Blanco Mine, and Coaldale areas, Esmeralda County, Nevada: U.S. Geological Survey, Open-File Report OFR-89-324, 27 p. and 1:62,500-scale map; Papke, K.G., and Castor, S.B., 2003, Industrial mineral deposits in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Map 142, scale 1:1,000,000; Nevada Department of Business and Industry, Division of Industrial Relations, 2005, Directory of Nevada mine operations, January-December 2004: Carson City, Nev., 109 p.		
ADDITIONAL COMMENTS:		



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Afterthought Prospects	
DATE: 2/28/07		OWNER OR LESSEE: Walker River Indian Reservation	
TIME:		**MINING DISTRICT: Benway**	
WEATHER: Cold, partially overcast		COUNTY: Churchill and Mineral	
GEOGRAPHIC AREA:		GEOGRAPHIC COORDINATES (T, R, S): T14N, R28E, S1,2,11,12,13,14,24 and	
WAYPOINT: MT8143	LATITUDE: N 39.081064°	LONGITUDE: W 118.811688°	ALTITUDE: ~5000 ft AMSL
GEOGRAPHIC DESCRIPTION: Located in small mountain range west of Long Valley, east of Sunshine Flat, north of the Calico Hills, and south of the Desert Mountains.			
LOCAL GEOLOGIC UNIT: Cretaceous granite (Utterback, 2002)			
REGIONAL GEOLOGIC UNIT: Cretaceous granite (Utterback, 2002)			
LITHOLOGIC DESCRIPTION: Equigranular to porphyritic, coarse-grained granite (Utterback, 2002)			
LOCAL GEOLOGIC UNIT: Triassic limestone (Luning Formation?) (Utterback, 2002)			
REGIONAL GEOLOGIC UNIT: Triassic limestone (Luning Formation?) (Utterback, 2002)			
LITHOLOGIC DESCRIPTION: Dark gray to black, limonitic or recrystallized limestone (Utterback, 2002).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Cretaceous granite intruded into Triassic limestone. A number of extensive veins of altered rock and quartz cut both limestone and granite (Tingley, 1990).			
RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization formed by combination of contact metamorphism and solutions originating from intrusive bodies.			
COMMODITIES: Explored for copper, silver, gold, and sulfide ore with discouraging results.			
OPERATING AND ABANDONED FACILITIES: Two sites were visited in the Afterthought Prospect area. One site consisted of a prospect pit which was approximately 7 feet deep, 8 feet wide, and 12 feet long. A second site consisted of a vertical mine shaft and small spoils pile. No facilities were observed and the 4WD road that accesses the site is was in poor condition. Prospect area consists of numerous pits and mines shafts that were probably abandoned around 1974 (Utterback, 2002).			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: Afterthought prospect sites visited during reconnaissance were located approximately 1.5 miles north of bypass alignment S4, station 10800+00. Other prospects observed on topographic maps are within approximately 1.0 mile of the alignment.			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8143_PHZ_216_28Feb07.jpg	MT8143	Prospect pit (PZ667).
MT8143_PHZ_217_28Feb07.jpg	MT8143	North into hills that contain numerous prospects and few mine shafts associated with Afterthought Prospects (PZ668).
MT8144_PHZ_218_28Feb07.jpg	MT8144	Mine shaft (PZ669).
MT8144_PHZ_219_28Feb07.jpg	MT8144	Northeast over ridge probably representing quartzite dike (PZ670).
MT8144_PHZ_220_28Feb07.jpg	MT8144	View west over mine towards alluvial fans in vicinity of mine (PZ671).
MT8144_PHZ_221_28Feb07.jpg	MT8145	View northeast over access to Afterthought Prospects. Road is in poor condition (PZ672).

CONTACTS:

REFERENCES: Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.; Tingley, J. V., 1998, Mining districts of Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 47, 128 p.;

ADDITIONAL COMMENTS:

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Red Granite Mine	
DATE: 2/28/07		OWNER OR LESSEE: Walker River Indian Reservation	
TIME: 8:30 AM		**MINING DISTRICT: Buckley Mining District**	
WEATHER: Cold, partially overcast		COUNTY: Mineral	
GEOGRAPHIC AREA: Gillis Range		GEOGRAPHIC COORDINATES (T, R, S): T12N, R30E	
WAYPOINT: MT8138	LATITUDE: N 38.937242°	LONGITUDE: W 118.622710°	ALTITUDE: 4600 ft

GEOGRAPHIC DESCRIPTION: Located in the Gum Drop Hills in the northeastern portion of the Gillis Range.

LOCAL GEOLOGIC UNIT: Cretaceous (?) granite with quartz veins.

REGIONAL GEOLOGIC UNIT: Cretaceous (?) granite of the Red Granite mine of Hardyman (1980)

LITHOLOGIC DESCRIPTION: Red-brown, medium- to coarse-grained granite with potassium feldspar, quartz, biotite, and plagioclase. Scattered to abundant quartz veins.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Granite of the Red Granite mine consists of a relatively isolated exposure of granite surrounded, and probably buried, by Tertiary volcanic rocks and Quaternary alluvium. Relation of this granite body to the local Tertiary volcanic rocks is poorly understood.

RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization occurs along quartz veins.

COMMODITIES: Silver, gold, iron, and copper.

OPERATING AND ABANDONED FACILITIES: Mine shaft consists of opening approximately 3 feet wide and 5 feet tall that is exposed at base of 8-foot deep pit. Old wooden ladder lies next to mine opening. Otherwise, no other visible remains of equipment or facilities were observed. Road to Red Granite mine consist of 4WD road in moderate condition.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine complex is about 1.5 miles south of bypass alignment S-6 station 11650+00.

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8138_PHZ_206_28Feb07.jpg	MT8138	View east towards mine shaft (PZ1404).
MT8138_PHZ_207_28Feb07.jpg	MT8138	View north over mine (PZ1405).
MT8138_PHZ_208_28Feb07.jpg	MT8138	View south over hills in vicinity of mine (PZ1406).

CONTACTS: N/A

REFERENCES: Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.; Hardyman, R. F., 1980, Geologic map of the Gillis Canyon Quadrangle, Mineral County, Nevada, U.S. Geological Survey Miscellaneous Investigations Series Map I-1237, scale 1:48,000.

ADDITIONAL COMMENTS: Outside of established mining district, included as part of Buckley Mining District because of proximity and similarity to rock types.

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Centipede Mine	
DATE: 2/28/07		OWNER OR LESSEE: Walker River Indian Reservation	
TIME: 9:00 AM		**MINING DISTRICT: Buckley Mining District**	
WEATHER: Cold, partially overcast		COUNTY: Mineral	
GEOGRAPHIC AREA: Gillis Range		GEOGRAPHIC COORDINATES (T, R, S): T13N R30E	
WAYPOINT: MT8139	LATITUDE: N 38.924097°	LONGITUDE: W 118.538278°	ALTITUDE: ~4400 ft AMSL
GEOGRAPHIC DESCRIPTION: Located in the Gum Drop Hills in the northeastern portion of the Gillis Range.			
LOCAL GEOLOGIC UNIT: Diorite (Hardyman, 1980)			
REGIONAL GEOLOGIC UNIT: Cretaceous hornblende diorite porphyry (Hardyman, 1980)			
LITHOLOGIC DESCRIPTION: Brown gray to gray, fine-grained diorite porphyry with plagioclase and hornblende phenocrysts (Hardyman, 1980).			
LOCAL GEOLOGIC UNIT: Shale			
REGIONAL GEOLOGIC UNIT: Triassic shale-argillite (Hardyman, 1980).			
LITHOLOGIC DESCRIPTION: Dark gray to black, fine grained, thinly laminated siltstones and argillites (Hardyman, 1980).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Unable to access site.			
RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization occurs along quartz veins.			
COMMODITIES: Silver, gold, iron, and copper.			
OPERATING AND ABANDONED FACILITIES: Unable to access to Centipede mine due to poor condition of 4WD road leading to mine area. The road does not currently appear to be used for mining activities.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine complex is about 5 miles southeast of bypass alignment S-6 station 11830+00.			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8139_PHZ_209_28Feb07.jpg	MT8139	View southwest towards Centipede Mine. Mine located on west side of highest peak in photo (PZ1407)

CONTACTS: N/A
REFERENCES: Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.; Hardyman, R. F., 1980, Geologic map of the Gillis Canyon Quadrangle, Mineral County, Nevada, U.S. Geological Survey Miscellaneous Investigations Series Map I-1237, scale 1:48,000.
ADDITIONAL COMMENTS: Outside of established mining district, included as part of Buckley Mining District because of proximity and similarity to rock types.

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Joe Hicks Mine	
DATE: 2/28/07		OWNER OR LESSEE: Walker River Indian Reservation	
TIME:		**MINING DISTRICT: Buckley**	
WEATHER: Cold, partially overcast		COUNTY: Mineral	
GEOGRAPHIC AREA: Gillis Range		GEOGRAPHIC COORDINATES (T, R, S): T12N, R30E, S13	
WAYPOINT: MT8146	LATITUDE: N 38.919549°	LONGITUDE: W 118.752129°	ALTITUDE: ~4100 ft AMSL
GEOGRAPHIC DESCRIPTION: On the northwestern margin of the Gillis Range.			
LOCAL GEOLOGIC UNIT: Metaandesite of Excelsior Formation (?)			
REGIONAL GEOLOGIC UNIT: Metaandesite of Excelsior Formation (?)			
LITHOLOGIC DESCRIPTION: Dark olive black metaandesite with mesothermal veins (Utterback, 2002).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Metaandesite is exposed at the surface in the vicinity of the mine (Utterback, 2002). Nearby, formation is overlain unconformably by limestone and lower Tertiary volcanic rocks.			
RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization is associated with mesothermal veins in the metaandesite.			
COMMODITIES: Copper, silver, and gold			
OPERATING AND ABANDONED FACILITIES: Unable to access Joe Hicks mine due to poor condition of 4WD roads. Mine was probably active between 1920 and 1950 (Utterback, 2002).			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Joe Hicks mine is located approximately 1 mile east of bypass alignment S6, station 11510+00.			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8146_PHZ_222_28Feb07.jpg	MT8146	View east towards mountains and approximate location of Joe Hicks Mine (PZ672).

CONTACTS:

REFERENCES: Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.

ADDITIONAL COMMENTS:

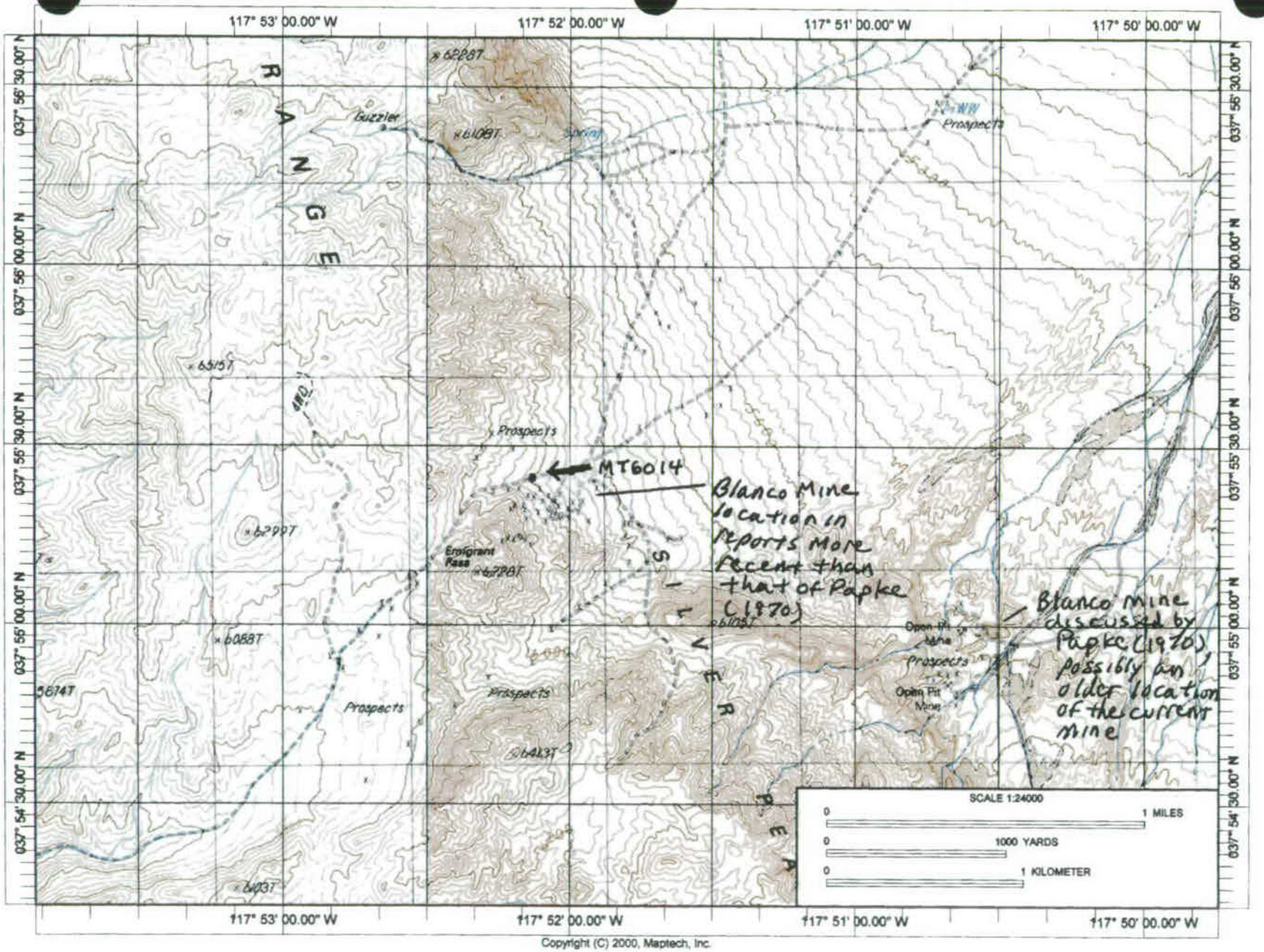
INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: Blanco mine		
DATE: 11/30/06	OWNER OR LESSEE: Vanderbilt Minerals Corp.		
TIME: 13:25	**MINING DISTRICT: Coaldale**		
WEATHER: Sunny and cold	COUNTY: Esmeralda		
WAYPOINT: MT6014	LATITUDE: N. 37.92160^0	LONGITUDE: W. 117.86919^0	ALTITUDE: 5,902 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T1N, R37E S21 and 22			
GEOGRAPHIC AREA: East side of Emigrant Pass, Silver Peak Range			
GEOGRAPHIC DESCRIPTION: The mine is located on the lower slopes of the Silver Peak Range, on the east side of Emigrant Pass. At an altitude of 6,050 ft AMSL, Emigrant Pass is a relatively low divide. On the east side of the pass, the land slopes NE toward Big Smokey Valley with an average gradient of about 16 percent. The area in which the mining and prospecting are concentrated has been disturbed by numerous trenches and pits, that typically are <10 feet deep.			
LOCAL GEOLOGIC UNIT: Esmeralda Formation			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks (Tsv)			
LITHOLOGIC DESCRIPTION: At the Blanco mine, the Esmeralda Formation readily can be divided into three stratigraphic intervals: (1) an upper unit of light-gray, light-greenish-gray, dusky-yellow, pale-olive, and grayish-orange, fine- to medium-grained, clayey sandstone, interbedded with clayey siltstone and conglomerate (~1300 feet thick); (2) a middle unit of yellowish-gray, white, and pale-olive, crystal-poor, lithic-poor, pumiceous, NW ash-flow or ash-fall tuff (~125 feet thick); and (3) a lower unit of yellowish-gray, light-gray, pale-olive, grayish-orange, light-orange, and red, mostly silty to clayey, fine-grained sandstone, clayey siltstone, and claystone, with subordinate conglomerate, medium to coarse-grained sandstone, and volcanic breccia (~715 feet thick). Intervals within the formation are thinly to thickly (indistinctly) bedded.			
LOCAL GEOLOGIC UNIT: Early Miocene (22 Ma) Candelaria (?) Tuff			
REGIONAL GEOLOGIC UNIT: Early Miocene rhyolite and rhyodacite ash-flow tuff and ash-fall tuff (Tt3)			
LITHOLOGIC DESCRIPTION: Cliff-forming, light-red and yellowish-gray, crystal-rich (quartz, feldspar, and biotite phenocrysts), welded, rhyolitic ash-flow tuff, with common flattened pumice fragments; weathers very pale orange with abundant iron-oxide staining; about 200 feet thick and underlain by black vitrophyre.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): The Esmeralda Formation unconformably overlies the Candelaria (?) Tuff. Pebbles and blocks of Candelaria (?) Tuff are found in the lower foot of the overlying formation, indicating that erosion of the tuff occurred prior to deposition of the Esmeralda Formation. Beds in the Esmeralda Formation generally dip eastward or northeastward at angles of 20-30^0. A high-angle fault cuts the Esmeralda about 1900 feet above the base of the section at the Blanco mine.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: The lower unit of the Esmeralda Formation contains swelling clay (montmorillonite) in nearly every stratigraphic interval. It is likely that weathering and soil formation concentrate clay naturally occurring in sedimentary and volcanic rocks of the Esmeralda Formation at the mine. However, at least some of the clay at the mine formed by alteration of nonwelded ash-fall(?) tuff in the Esmeralda, because grayish-white clay was found in place as an alteration product of this tuff during the site visit in November 2006.			
COMMODITIES: Montmorillonite clay			
OPERATING AND ABANDONED FACILITIES: At the site, numerous exploration and extraction(?) trenches and pits have been excavated into the slopes leading up to Emigrant Pass, and tailings piles and debris are scattered throughout the area. In many of the excavations, rock surfaces are colored orange and red, indicative of alteration to iron oxides and clay. On lower slopes, there are thin coatings of white material in pits, possibly left behind from the removal of sought-after montmorillonite clay. White clay, also, was found in a pit high on a hillside, where it appeared to be weathering from ash-fall tuff. Processing facilities were not observed at the site.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine is about 6.7 miles SSW of MCS-1 station 4500+00			

PHOTOGRAPHS		
NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6014_ALG_0339_30Nov06.jpg	MT6014	View south of Blanco mine excavation into altered sedimentary rocks and tuff of the Miocene Esmeralda Formation. (AG 690)
MT6014_ALG_0340_30Nov06.jpg	MT6014	Pan NE to SE of Blanco mine trenches, pits, and tailings piles; Monte Cristo Range and Lone Mountain in the distance. (AG 691-692)
MT6014_ALG_0342_30Nov06.jpg	MT6014	View SW showing an open-pit mine excavated into nonwelded tuff of the Esmeralda Formation at Emigrant Pass. (AG 694)
MT6014_ALG_0343_30Nov06.jpg	MT6014	Stockpiled bentonite clay and outcrops of the Esmeralda Formation (BLM photo). (AG 695)
MT6014_ALG_0344_30Nov06.jpg	MT6014	View SE of trench excavated into altered tuff or sedimentary rock of Miocene Esmeralda Formation. (AG 698)
MT6014_ALG_0345_30Nov06.jpg	MT6014	Close-up view of altered rocks exposed in the trench. (AG 699)
MT6014_ALG_0346_30Nov06.jpg	MT6014	Clayey alteration of layered rocks exposed in trench walls. (AG 700)
MT6014_ALG_0347_30Nov06.jpg	MT6014	Veined, argillized, and contorted rocks exposed in trench wall. (AG 701)

CONTACTS: N/A

REFERENCES: Papke, K.G., 1970, Montmorillonite, bentonite, and fuller's earth deposits in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 76, 53 p.; Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Robinson, P.T., Stewart, J.H., Moiola, R.J., and Albers, J.P., 1976, Geologic map of the Rhyolite Ridge quadrangle, Esmeralda County, Nevada: U.S. Geological Survey, Geologic Quadrangle Map GQ-1325, scale 1:62,500; Stewart, J.H., 1989, Description, stratigraphic sections, and maps of middle and upper Miocene Esmeralda formation in Alum, Blanco Mine, and Coaldale areas, Esmeralda County, Nevada: U.S. Geological Survey, Open-File Report OFR-89-324, 27 p. and 1:62,500-scale map; Nevada Department of Business and Industry, Division of Industrial Relations, 2005, Directory of Nevada mine operations, January-December 2004: Carson City, Nev., 109 p.

ADDITIONAL COMMENTS:


117° 53' 00.00" W
117° 52' 00.00" W
117° 51' 00.00" W
117° 50' 00.00" W
037° 56' 30.00" N
037° 56' 00.00" N
037° 55' 30.00" N
037° 55' 00.00" N
037° 54' 30.00" N
RANGE
SILVER PEA
Buzzier
Spring
Prospects
MT6014
Blanco Mine location in reports more recent than that of Papke (1970)
Blanco Mine discussed by Papke (1970), possibly an older location of the current mine
Emigrant Pass
Open Pit Mine
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon		MINE OR OTHER FEATURE: Columbus Salt Marsh borate and halite mines	
		OWNER OR LESSEE: Unknown	
DATE: 10/14/06			
TIME: 10:00		**MINING DISTRICT: Columbus Marsh**	
WEATHER: partly cloudy, cool		COUNTY: Esmeralda	
WAYPOINT: MT1087	LATITUDE: N. 38.045136^0	LONGITUDE: W. 117.99090^0	ALTITUDE: 4,521 ft AMSL

GEOGRAPHIC COORDINATES (T, R, S): T 2 N, R 36 E, S08 NE

GEOGRAPHIC AREA: Columbus Salt Marsh

GEOGRAPHIC DESCRIPTION: Columbus Salt Marsh is a nearly circular, relatively flat playa with an area of about 30 square miles. The center of the playa is at an altitude of about 4,504 feet AMSL. The playa is bordered on the north and east by the Monte Cristo Range, on the south by the Volcanic Hills, and on the west by the Candelaria Hills. Washes draining adjacent highlands seep into the playa sediments. Being the lowest point in a closed hydrologic basin, the playa has a shallow water table. Springs, shallow or flowing wells, marsh grass, and sparse salt brush are common around the periphery of the playa.

LOCAL GEOLOGIC UNIT: Quaternary alluvium

REGIONAL GEOLOGIC UNIT: Quaternary playa sediments (Qp)

LITHOLOGIC DESCRIPTION: Soft to dense, tan, light-gray, light-green, and reddish-brown, fine-grained sand, silt, and clay. Sodium and boron salt minerals are interbedded with these sediments and form a puffy, saline crust on the playa.

LOCAL GEOLOGIC UNIT: Quaternary alluvium

REGIONAL GEOLOGIC UNIT: Early to middle Pleistocene fan alluvium (Qao)

LITHOLOGIC DESCRIPTION: Interbedded, very dense, reddish-brown poorly sorted, gravelly sand and sandy gravel, with calcium carbonate layers and cement; overlain by≤1 foot of eolian, loose, fine- to medium-grained sand.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Columbus Salt Marsh is bordered on its east side by early and middle Pleistocene alluvial fans that extend south and west from the Monte Cristo Range. These alluvial fans, which are dissected by numerous shallow to moderately deep washes, end abruptly at the margins of the salt marsh. The Mina route takes advantage of this discontinuity by ascending and staying on the Monte Cristo Range alluvial fans to avoid the unstable soils that underlie Columbus Salt Marsh.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: The surface of Columbus Salt Marsh is encrusted with saline minerals that consist largely of halite. Halite and other evaporite minerals also are interbedded with the fine-grained sediments that underlie the salt marsh. One of these minerals, ulexite, can be refined to produce borax. Ulexite is a hydrated sodium-calcium borate that occurs as rounded masses (locally called cotton balls) in layers within a foot of the land surface at several places within the salt marsh.

COMMODITIES: Halite (sodium chloride) and borax (hydrated sodium borate)

OPERATING AND ABANDONED FACILITIES: Halite was first produced from Columbus Salt Marsh in 1864. Ulexite was discovered in the marsh 1871, and during the next ten years, at least nine facilities were constructed to produce borax from ulexite. Remains of borax and halite processing facilities were observed at or near waypoint MT1087 when the salt marsh was visited in October 2006. These artifacts included collapsed buildings, a tower, trenches, and a large evaporation pond. No active salt mining or production facilities were observed during this site visit.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: At alignment MCS-1 station 4150+00, Columbus Salt Marsh is only 3,000 feet west of the Mina route (Waypoint MT1087 is 5.9 miles west of the Mina route).

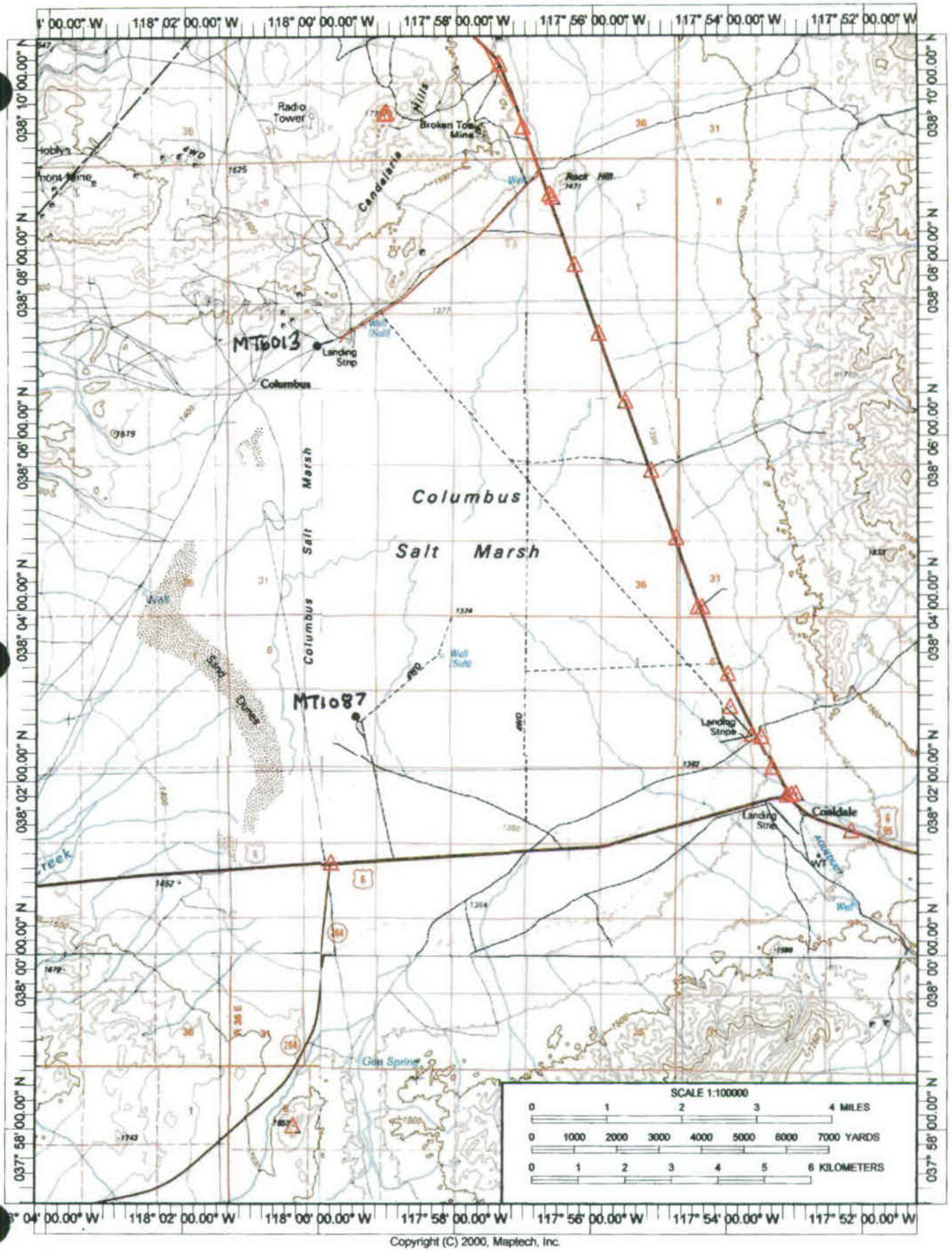
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT1087_ALG_0279_14Oct06.jpg	MT1087	Tower and collapsed boron and sodium salt processing buildings at remains of a borax processing plant, SE part of Columbus Salt Marsh. (AG 614)
MT1087_ALG_0280_14Oct06.jpg	MT1087	View NE of Monte Cristo Range from Columbus Salt Marsh. (AG 615)
MT1087_ALG_0283_14Oct06.jpg	MT1087	Evaporation pond for recovering boron and sodium salts in SE part of Columbus Salt Marsh. (AG 618)
MT1087_ALG_0285_14Oct06.jpg	MT1087	View NW of playa sediments and evaporite layers exposed in a trench excavated to recover salt minerals from Columbus Marsh. (AG 620)
MT1087_ALG_0286_14Oct06.jpg	MT1087	Fine-grained sediments and evaporite minerals exposed in a trench excavated to recover salt minerals from Columbus Marsh. (AG 622)

CONTACTS: Some information provided by BLM Tonopah Field Office personnel.

REFERENCES: Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Papke, K.G., 1976, Evaporites and brines in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 87, 35 p.; Stewart, J.H., 1979, Geologic map of Miller Mountain and Columbus quadrangles, Mineral and Esmeralda Counties, Nevada: U.S. Geological Survey, Open-File Report OFR-79-1145, scale 1:24,000; Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500.

ADDITIONAL COMMENTS:



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Columbus Marsh calcium carbonate mine and Argentum mill	
		OWNER OR LESSEE: Columbus S.M. LLC	
DATE: 11/30/06			
TIME: 10:01		**MINING DISTRICT: Columbus Marsh**	
WEATHER: Sunny and cold		COUNTY: Esmeralda	
WAYPOINT: MT6013	LATITUDE: N. 38.11741^0	LONGITUDE: W. 117.99528^0	ALTITUDE: 4,558 ft AMSL

GEOGRAPHIC COORDINATES (T, R, S): T3N, R36E, S17 NE

GEOGRAPHIC AREA: Columbus Salt Marsh near the abandoned town of Columbus, Nev.

GEOGRAPHIC DESCRIPTION: Columbus Salt Marsh is a nearly circular, relatively flat playa with an area of about 30 square miles. The center of the playa is at an altitude of about 4,504 feet AMSL. The playa is bordered on the north and east by the Monte Cristo Range, on the south by the Volcanic Hills, and on the west by the Candelaria Hills. Washes draining adjacent highlands seep into the playa sediments. Being the lowest point in a closed hydrologic basin, the playa has a shallow water table. Springs, shallow or flowing wells, marsh grass, and sparse salt brush are common around the periphery of the playa.

LOCAL GEOLOGIC UNIT: Quaternary alluvium

REGIONAL GEOLOGIC UNIT: Quaternary playa sediments (Qp)

LITHOLOGIC DESCRIPTION: Soft to dense, tan, light-gray, light-green, and reddish-brown, fine-grained sand, silt, and clay with interbedded and interstitial calcium carbonate. Evaporite minerals form a puffy, crust on the playa.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Columbus Salt Marsh is the low point of a closed hydrologic basin. Fine-grained sediments and evaporite minerals accumulate in the basin, as washes draining nearby mountains seep into the basin-fill sediments, and runoff carried by these washes evaporates.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Nothing was observed during the site visit to establish that calcium carbonate deposits exist, although these deposits might have been identified by drilling. Nothing can be said about how these deposits relate to local geologic features.

COMMODITIES: Calcium carbonate

OPERATING AND ABANDONED FACILITIES: Based on discussions with the BLM, we understand that a plan of operations was submitted to the BLM and approved to remove the top 25 feet of playa sediments, to dissolve the clay in hydrochloric acid, with sodium hydroxide added to control pH, in order to produce 300 tons/day of relatively pure, food-grade calcium carbonate. The old Argentum mill would be renovated to process the clay. The clay waste would be backfilled with unsaturated tailings. The processing water would be decanted and recycled; saline water would be directed to an evaporation basin. The property is fenced off, and it is hard to tell if this plant is still operating, because plant structures appear to be somewhat deteriorated, and no activity was observed on the day that the site was visited.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: About 5 miles west of MCS-1 station 4100+00

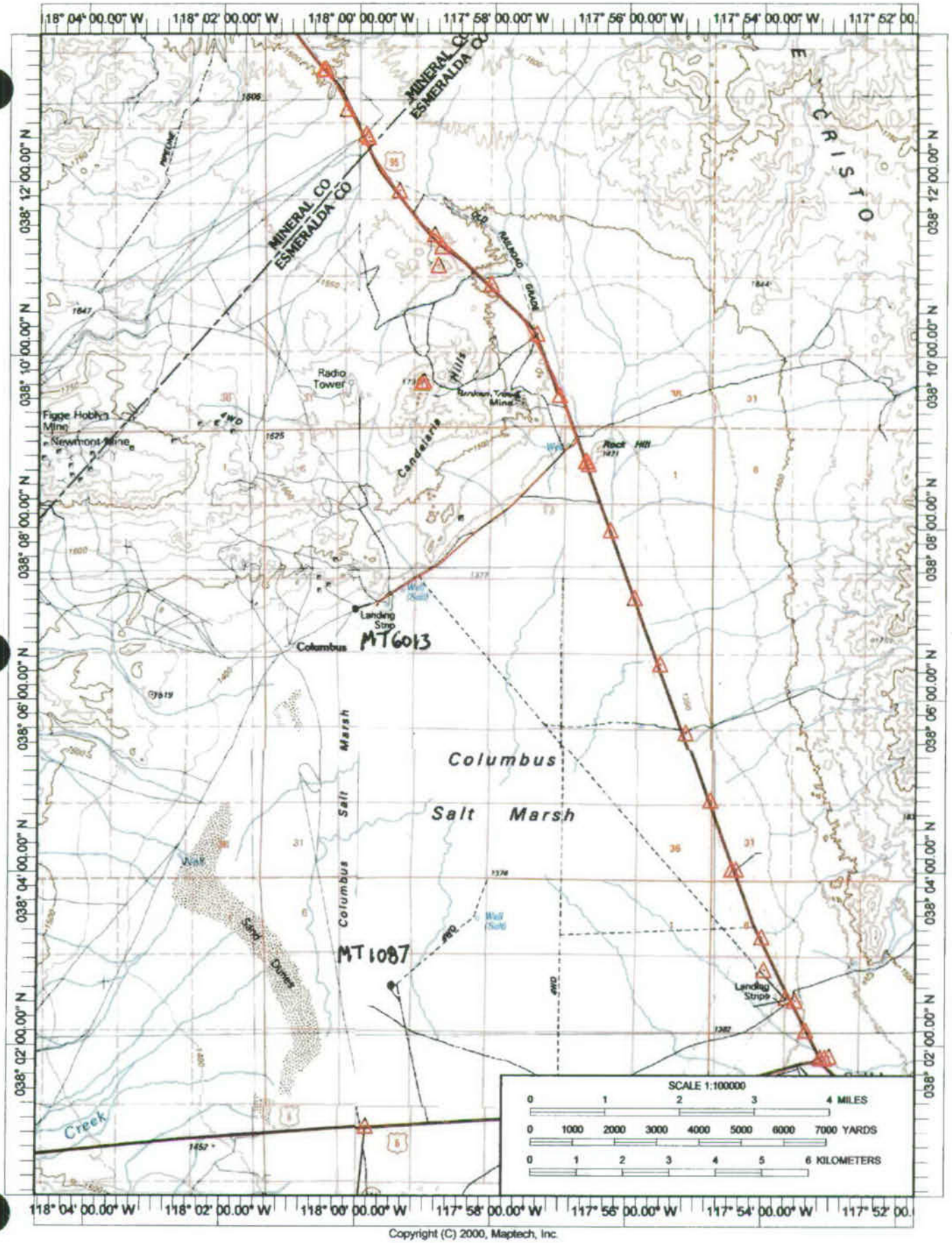
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6013_ALG_0337_30Nov06.jpg	MT6013	View SW of evaporation ponds at Columbus Marsh calcium carbonate mine, Northern Columbus Salt Marsh (White Mountains and Boundary Peak in Distance) (AG 688)
MT6013_ALG_0338_30Nov06.jpg	MT6013	View NE of Argentum Calcium carbonate processing plant and clay tailings, northern Columbus Marsh near the former town of Columbus. (AG 689)

CONTACTS: Some information was provided by BLM Field Office personnel.

REFERENCES: Stewart, J.H., 1979, Geologic map of Miller Mountain and Columbus quadrangles, Mineral and Esmeralda Counties, Nevada: U.S. Geological Survey, Open-File Report OFR-79-1145, scale 1:24,000; Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500; U.S. Bureau of mining regulation and reclamation, 2002, Application for water pollution control permit NEV98104: accessed 2006 at http://ndep.nv.gov/admin/public11.htm.

ADDITIONAL COMMENTS:



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Tonopah Divide gold project	
DATE: 12/04/06		OWNER OR LESSEE: Tonogold Resources, Inc.	
TIME: 12:45		**MINING DISTRICT: Divide**	
WEATHER: Sunny and cold		COUNTY: Esmeralda	
WAYPOINT: MT6025	LATITUDE: N. 38.00184^0	LONGITUDE: W. 117.24127^0	ALTITUDE: 5,965 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T2N, R42E, S26-27			
GEOGRAPHIC AREA: Mining centered at Gold Mountain, in the San Antonio Mts, 6 miles SW of Tonopah along US-95			
GEOGRAPHIC DESCRIPTION: The Tonopah Divide property comprises 34 patented mining claims and 124 unpatented claims covering a 5-square-mile area around Hasbrouck Peak and Gold Mountain. The mine is located in an area of low mountains. Hasbrouck Peak has a summit altitude of 6,273 feet AMSL, and Gold Mountain rises to about 6,650 feet AMSL. Between these and other mountains and hills, the land is dissected by washes that drain SW to Alkali Spring Valley. The lowest altitude of about 5,450 feet occurs west of Hasbrouck Peak, where the main washes leave the area, and U.S. Highway 95 crosses through the Tonopah Divide claim block.			
LOCAL GEOLOGIC UNIT: Middle Miocene Oddie Rhyolite			
REGIONAL GEOLOGIC UNIT: Miocene rhyolite lava flows, flow breccia, and intrusive rocks (Tvr)			
LITHOLOGIC DESCRIPTION: Flow-banded, intrusive rhyolite containing 10-15% phenocrysts of quartz, sanidine, sodic plagioclase, and minor biotite.			
LOCAL GEOLOGIC UNIT: Middle Miocene Siebert Formation			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks (Tsv)			
LITHOLOGIC DESCRIPTION: The lower part of the formation consists of silicified, tuffaceous sandstone and bouldery conglomerate derived largely from the Fraction Tuff. These sedimentary rocks are overlain by interlayered ash-flow tuff, ash-fall tuff, volcaniclastic rocks, and lacustrine sedimentary rocks, The upper part of the formation is a multi-lithic tuff . The Siebert Formation is >1,900 feet thick at Gold Mountain.			
LOCAL GEOLOGIC UNIT: Early Miocene Fraction Tuff			
REGIONAL GEOLOGIC UNIT: Early Miocene rhyolite and rhyodacite ash-flow and ash-fall tuffs (Tt3)			
LITHOLOGIC DESCRIPTION: High-strength, light-gray, mottled orange, yellow, and red where silicified from hydrothermal alteration, slightly to very altered, rhyodacitic to rhyolitic, lithic-rich, nonwelded to partially welded ash-flow tuff with a glassy groundmass, and intercalated ash-fall tuff; more than 1,000 feet thick. Where examined closely, hydrothermally altered rock contained veins of red pyrargyrite(?), gray acanthite(?) and yellow barite(?).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): The oldest geologic unit mapped at Gold Mountain is the early Miocene (18.7-20.5 Ma) Fraction Tuff. The Fraction Tuff is overlain by sedimentary, volcaniclastic, and pyroclastic rocks of the middle Miocene (16.9-17.1 Ma) Siebert Formation. The upper part of Gold Mountain is an intrusive plug of middle Miocene (16.4-16.9 Ma) Oddie Rhyolite. Contemporaneously with intrusion of the Oddie Rhyolite, the Divide Andesite intruded the Fraction Tuff and Siebert Formation in an area extending SE from Gold Mountain. Middle Miocene (16.1-16.3 Ma) Brougher Rhyolite intrusions occur in the northern part of the mining district. The Gold Zone-Kernick Fault system, a conspicuous set of WNW-trending, high-angle, right-lateral strike-slip faults, runs through the Tonopah Divide district.			

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization is associated with silicification and potassic alteration in fault and fracture-filling veins and breccia bodies along the Gold Zone-Kernick Fault system. Most gold-silver mineralzation occurs in the hanging walls of WNW trending, high-angle faults. Mineralization related to deeply penetrating oxidation occurred after movement on the Gold Zone-Kernick faults ceased, and before westward regional tilting began. The Fraction Tuff is the principal host rock for gold and silver-bearing veins in the mine, although silicified sandstone and conglomerate near the bottom of the Siebert Formation also contain silver and gold deposits. Gold-bearing veins occur in the Oddie Rhyolite. Precious metals occur in auriferous pyrite and argentiferous cerargyrite. Other metallic minerals include galena, sphalerite, chalcopyrite, argentite, cinnabar, and covellite. Supergene minerals include powellite, ferrimolybdite, and jarosite. Constrained by ages of the mineralized Oddie Rhyolite and the non-mineralized Brougher Rhyolite, mineralization occurred about 16.4 million years ago.

COMMODITIES: Gold and silver

OPERATING AND ABANDONED FACILITIES: Gold Mountain, especially on its north side, shows signs of a long history of mining and prospecting. Artifacts of mining in the form of shafts, pits, trenches, and debris extend from the mountain to adjacent flats and nearby hills. Most mining in the Divide district occurred between 1918 and the late 1940's. From the 1970's until 1985, interest in gold recovery prompted a succession of companies to develop open-pit mines and cyanide leaching facilities. From 1990 to 1996, several mining companies conducted exploration drilling programs at the Tonopah Divide mine. Currently, most activity in the district is focused on delineating gold resources for renewed mining. In March 2006, Tonogold Resources began a program to explore and operate the Tonopah Divide mine.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: Hasbrouck Mountain is 3.5 miles east of MZ-2 station 11950+00.

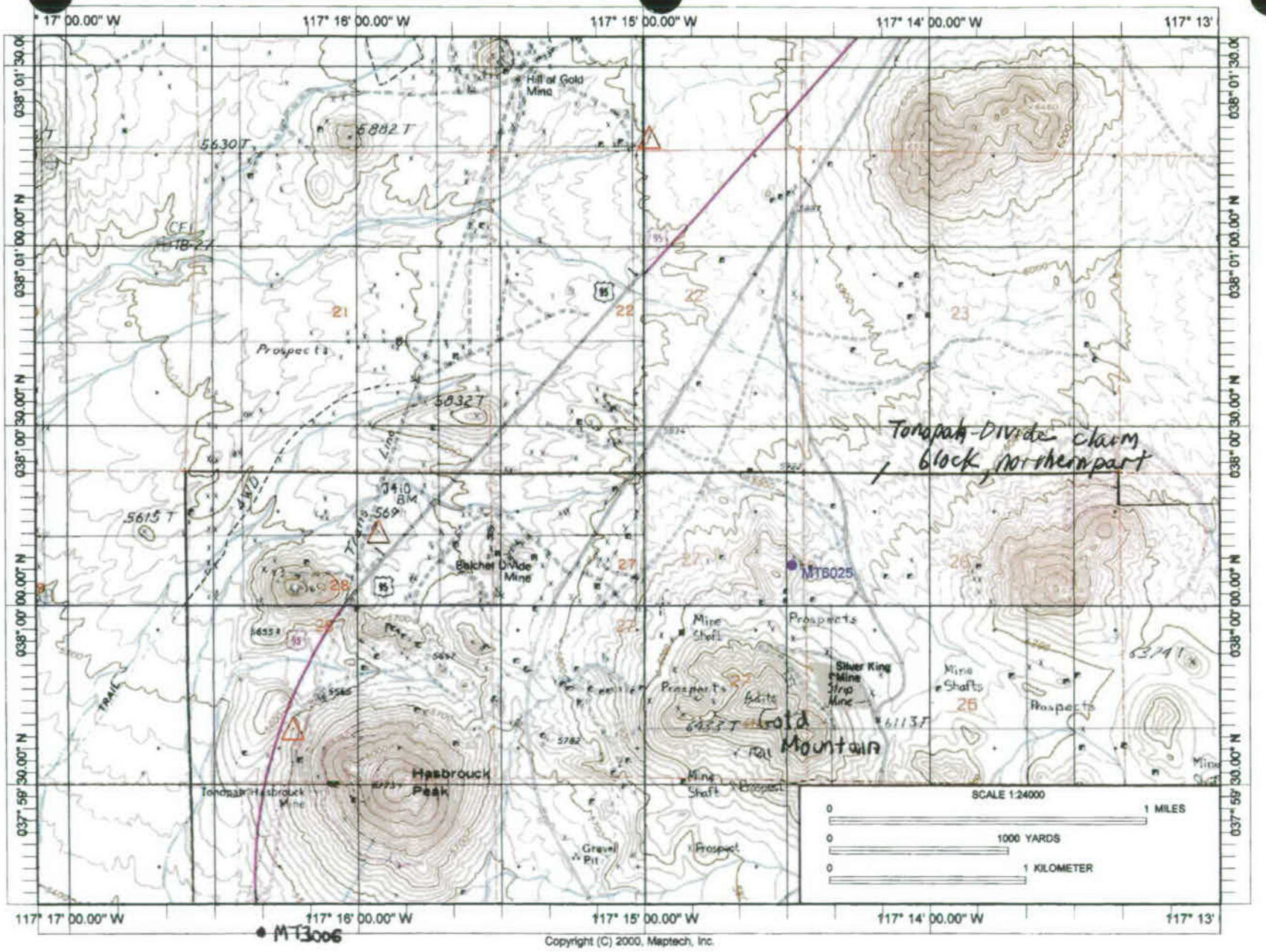
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6025_ALG_0386_04Dec06.jpg	MT6025	View ENE of exploration trenches and a dome of Oddie Rhyolite. (AG760)
MT6025_ALG_0387_04Dec06.jpg	MT6025	View ENE of abandoned mine shaft and a hill underlain by a dome of Miocene Oddie Rhyolite. (AG761)
MT6025_ALG_0388_04Dec06.jpg	MT6025	View south of the Tonopah Divide mine in the Miocene Fraction Tuff and Sielbert Formation. (AG762)
MT6025_ALG_0389_04Dec06.jpg	MT6025	Aerial view of the Tonopah Divide mine at Gold Mountain, about 6 miles south of Tonopah. (AG764)

CONTACTS: N/A

REFERENCES: Bonham, H.F., Jr., and Garside, L.J., 1974, Road log and trip guide Carver Station-Tonopah district, in Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 6-13; Whitebread, D.H., and John, D.A., 1992, Geologic map of the Tonopah 1° by 2° quadrangle, central Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1877-A, scale 1:250,000; Tingley, J. V., 1990, Mineral resource inventory, Bureau of Land Management, Carson City District, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 90-1, 259 p.; Tingley, J. V., 1998, Mining districts of Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 47, 128 p.; Tonogold Resources website, accessed 2006 at http://www.tonogold.com.

ADDITIONAL COMMENTS: Tonogold also is evaluating the King Tonopah gold deposit at Tonopah, although exploration drilling there is reported to have not progressed far enough yet to be definitive. Strachan (2005) discusses geology, known mineralization, and planned exploration efforts at this site.


117° 17' 00.00" W
117° 16' 00.00" W
117° 15' 00.00" W
117° 14' 00.00" W
117° 13'
038° 01' 30.00" N
038° 01' 00.00" N
038° 00' 30.00" N
038° 00' 00.00" N
037° 59' 30.00" N
Hill of Gold Mine
5882 T
5630 T
CFI
Prospects
5832 T
Tonopah-Divide claim block, northern part
5615 T
Balcher Divide Mine
MT6025
Mine Shaft
Prospects
Silver King Mine
Strip Mine
Mine Shafts
Gold Mountain
Hasbrouck Peak
Tonopah-Hasbrouck Mine
Gravel Pit
Prospect
SCALE 1:24000
0
1 MILES
1000 YARDS
1 KILOMETER
MT3006
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		FEATURE: Monte Cristo project	
DATE: 12/02/06		OWNER OR LESSEE: Gold Summit Corp.	
TIME: 10:14		**MINING DISTRICT: Gilbert**	
WEATHER: Sunny, cold		COUNTY: Esmeralda	
WAYPOINT: MT6019	LATITUDE: N. 38.18357^0	LONGITUDE: W. 117.70850^0	ALTITUDE: 5,948 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T3N, R38E, S1-2; T4N, R38E, S13-15, 22-27, & 34-36; and T4N, R38½ E, S18,19, & 30			
GEOGRAPHIC AREA: Monte Cristo Range			
GEOGRAPHIC DESCRIPTION: The Monte Cristo project is located in the Monte Cristo Range, where the mining town of Gilbert once stood. The project in February 2006 comprised 214 unpatented lode claims covering an area of about 7 square miles. The Monte Cristo Range in the vicinity of the project consists of low mountains and narrow intermontane valleys. Peak altitudes are about 6,500 to 7,000 feet AMSL. Valley floors are ≤500 feet below nearby mountain tops. The area is drained by washes that are dry during most of the year.			
LOCAL GEOLOGIC UNIT: Late Miocene (7.2 Ma) basalt			
REGIONAL GEOLOGIC UNIT: Pliocene and Miocene basalt and basaltic andesite lava flows (Tb)			
LITHOLOGIC DESCRIPTION: Black, vesicular, generally porphyritic basalt lava flows			
LOCAL GEOLOGIC UNIT: Late to Middle Miocene (<16 Ma) sedimentary rocks of McLeans and undivided sedimentary rocks			
REGIONAL GEOLOGIC UNIT: Pliocene to middle Miocene sedimentary rocks (Tsy)			
LITHOLOGIC DESCRIPTION: Light-orange, yellowish-gray, white, and brown to light-brown, laminated to thinly bedded shale, shaly siltstone, clayey to non-clayey, fine-grained sandstone, diatomite, sparse limestone, and nonwelded tuff; locally altered hydrothermally and in places entirely silicified.			
LOCAL GEOLOGIC UNIT: Middle Miocene (15-15.7 Ma) Gilbert Andesite and upper unit of Blair Junction sequence			
REGIONAL GEOLOGIC UNIT: Late to middle Miocene intermediate lava flows, flow breccias, and lahars (Ta4)			
LITHOLOGIC DESCRIPTION: Dark-gray to black, reddish-brown, and brown, fine-grained to porphyritic basaltic andesite, andesite, and dacite lava flows, lahars, and flow breccias; columnar jointing in the Gilbert Andesite.			
LOCAL GEOLOGIC UNIT: Middle (16.6 Ma) Miocene tuff unit of Blair Junction sequence			
REGIONAL GEOLOGIC UNIT: Middle Miocene rhyolite to rhyodacite ash-flow tuff and ash-fall tuff (Tt4)			
LITHOLOGIC DESCRIPTION: White, generally lithic-, pumice-, and crystal-rich, vitric, nonwelded tuff			
LOCAL GEOLOGIC UNIT: Early Miocene (19-20 Ma) older rhyolite and porphyritic rhyolite			
REGIONAL GEOLOGIC UNIT: Miocene rhyolite lava flows and flow breccia with subordinate intrusive rocks (Tvr)			
LITHOLOGIC DESCRIPTION: Pale-red and yellowish-gray, sparsely to abundantly porphyritic (quartz, plagioclase, sanidine, ± hornblende, biotite, magnetite, and sphene), flow-banded rhyolite lava flows and breccia, occurring as shallow intrusions and local lava flows.			
LOCAL GEOLOGIC UNIT: Early Miocene (22 Ma) lower unit of the Blair Junction sequence			
REGIONAL GEOLOGIC UNIT: Early Miocene lava flows, flow breccias, and lahars of intermediate composition (Ta3)			
LITHOLOGIC DESCRIPTION: Dark-gray to brown, fine-grained to porphyritic, andesite to dacite lava flows, tuff breccias, and lahars, intruded by rhyodacite to dacite dikes, sills, and small, irregularly shaped bodies.			
LOCAL GEOLOGIC UNIT: Early Miocene (22 Ma) lower unit of the Blair Junction sequence			

REGIONAL GEOLOGIC UNIT: Early Miocene lava flows, flow breccias, and lahars of intermediate composition (Ta3)
LITHOLOGIC DESCRIPTION: Dark-gray to brown, fine-grained to porphyritic, andesite to dacite lava flows, tuff breccias, and lahars, intruded by rhyodacite to dacite dikes, sills, and small, irregularly shaped bodies.
LOCAL GEOLOGIC UNIT: Oligocene (24 Ma) Castle Peak Tuff
REGIONAL GEOLOGIC UNIT: Oligocene ash-flow and ash-fall tuffs of silicic to intermediate composition (Tt2)
LITHOLOGIC DESCRIPTION: White, generally crystal-rich (mostly plagioclase, sanidine, quartz, biotite, and magnetite), lithic-rich, nonwelded to densely welded ash-flow tuff, with phenocrysts commonly altered hydrothermally to sericite and calcite
LOCAL GEOLOGIC UNIT: Mississippian carbonate rocks
REGIONAL GEOLOGIC UNIT: Mississippian sedimentary rocks (Ms)
LITHOLOGIC DESCRIPTION: Yellowish- to light-brown and light-gray, thickly bedded limestone and dolomite with lenses of black chert.
LOCAL GEOLOGIC UNIT: Cambrian to Devonian siliceous and volcanic rocks
REGIONAL GEOLOGIC UNIT: Ordovician to Devonian sedimentary and volcanic rocks (DOsv)
LITHOLOGIC DESCRIPTION: Black, light-gray, and light-brown thinly bedded chert, argillite, shale, siltstone and fine-grained, silty sandstone with minor thinly to massively bedded limestone intervals.
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Formations widely exposed in the Gilbert area include Ordovician to Devonian, deep-water marine, fine-grained clastic rocks (DOsv); Mississippian carbonate rocks (Ms); the Oligocene Castle Peak Tuff (Tt2); andesite to dacite lava flows and related rocks of the Oligocene to Miocene Blair Junction sequence and Gilbert andesite (Ta3 andTa4); early Miocene rhyolite (Tvr); middle Miocene sedimentary rocks (Tsy); and late Miocene basalt flows (Tb). According to Stewart et al. (1994), the geology consists of interfingering Oligocene to late Miocene basalt, andesite, dacite, and rhyolite lava flows, lahars, ash-flow tuffs, and sedimentary rocks, that are underlain by Ordovician to Pennsylvanian sedimentary rocks. Isolated faults of short extent do not affect the distribution of geologic units.
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mine Development Associates (MDA) report that most gold deposits are located within Tertiary andesite in contact with Tertiary rhyolite along a 7.5-mile-long, NNE-trending fault zone, but Stewart et al. (1994) report that mines in the area mostly are aligned with inliers of Devonian and Ordovician sedimentary rocks where they are surrounded by hydrothermally altered Oligocene ash-flow tuff. MDA reports that the extensively explored and mined McLean Lode is located within brecciated, silicified, and argillized andesite. However, Stewart et al. (1994) report that the McLean Lode occurs in altered Miocene sedimentary rocks. MDA reported that the McLean lode is 1,300 feet long and 3-36 feet wide for 1,000 feet in the direction of dip and that it is truncated at both ends by northwesterly striking faults. Gold in the McLean pit is associated with pyrite and acanthite to some extent, but it mostly occurs in native form within quartz-adularia-sericite veins. The McLean lode is reported to contain ~69,000 ounces of Au and 203,000 ounces of Ag.
COMMODITIES: Gold and silver

OPERATING AND ABANDONED FACILITIES: The project's unpatented lode claims have been the focus of gold and silver exploration and small-scale mining since 1924. Several mine shafts, ore chutes, and small to large tailings dumps from the historic mining era were observed in the area around the Gilbert town site when it was visited in December 2006. About 1 mile SW of Gilbert, a small open-pit mine is located in hydrothermally altered yellow, red, orange, purple, gray, and white Miocene sedimentary rocks (unit Tsy) and Oligocene ash-flow tuff (unit Tt2). This mine was operated from 1988 to 1989 and produced 27,000 ounces of gold by heap leach methods. Between 1989 and 2006, several companies explored the area around the pit to locate an extension of the McLean lode. By 2006, at least 326 exploration holes had been drilled in the northern part of the Gilbert district. Past mining in the project area extended at least as far south as Ohio Camp, where Gold Summit Corp. is now focusing exploration for high-grade gold-silver deposits, but time did not permit inspecting this area.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Gilbert town site, at the heart of the district, is ~10.5 miles NNW of MZ-2 station 10600+00.

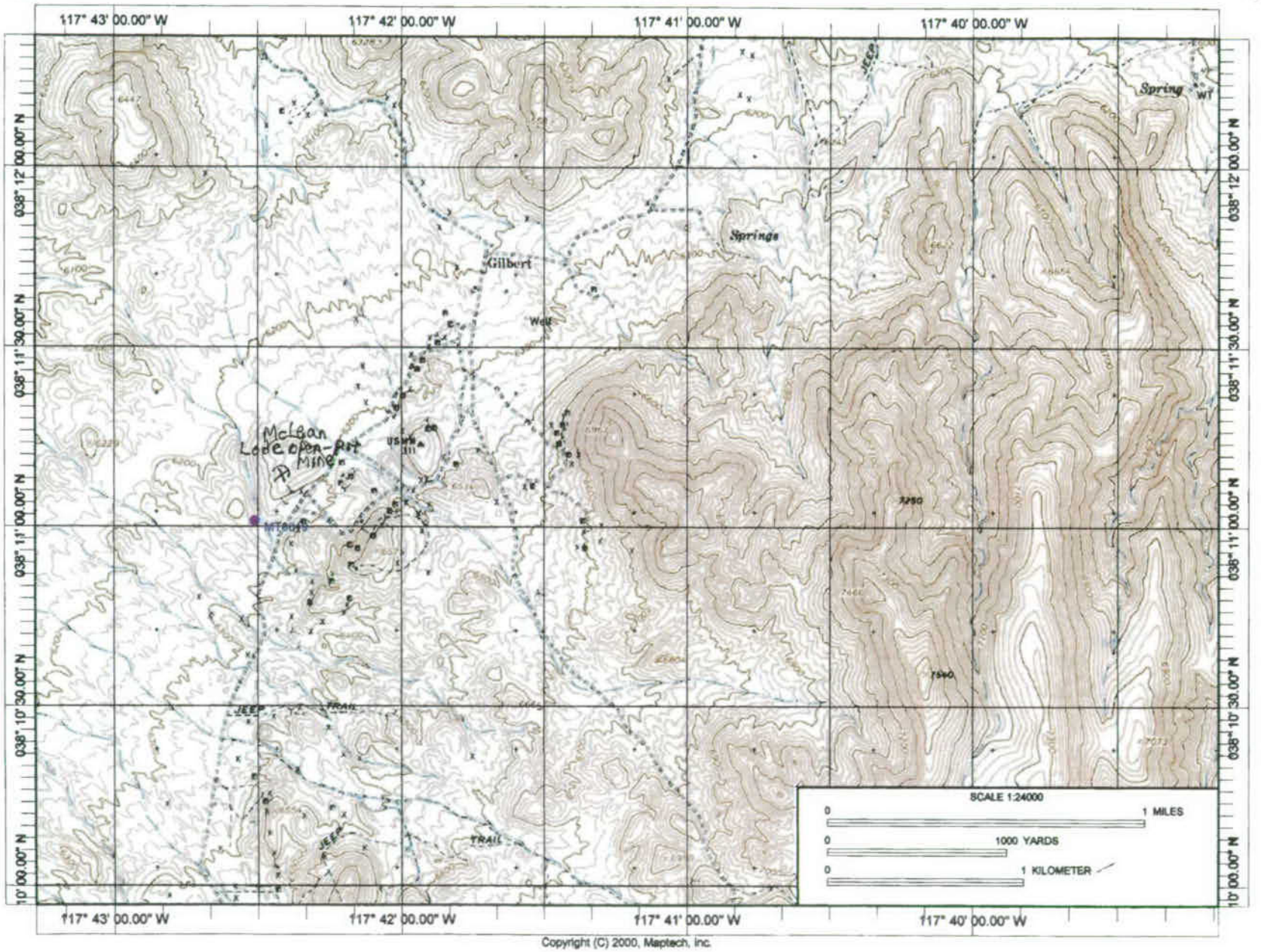
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6019_ALG_0360_02Dec06.jpg	MT6019	Monte Cristo project, McLean open-pit mine in hydrothermally altered andesite (AG721)
MT6019_ALG_0361_02Dec06.jpg	MT6019	Monte Cristo project, McLean open-pit mine in hydrothermally altered andesite (AG722)
MT6019_ALG_0362_02Dec06.jpg	MT6019	Monte Cristo project, hydrothermally altered, brecciated andesite with quartz-pyrite veins, cropping out on a ledge that extends into the open-pit mine (AG723)
MT6019_ALG_0363_02Dec06.jpg	MT6019	Mine shaft in Monte Cristo project area, volcanic buttes in background near the Gilbert town site (AG724)
MT6019_ALG_0364_02Dec06.jpg	MT6019	Monte Cristo Project mine shaft, ore chute, and tailings (AG725)
MT6019_ALG_0365_02Dec06.jpg	MT6019	Monte Cristo project mine building on top of tailings dump (AG727)
MT6019_ALG_0366_02Dec06.jpg	MT6019	Monte Cristo project, ore chute and tailings (AG729)
MT6019_ALG_0367_02Dec06.jpg	MT6019	Monte Cristo Project mine shaft, ore chute, and tailings (AG730)

CONTACTS: N/A

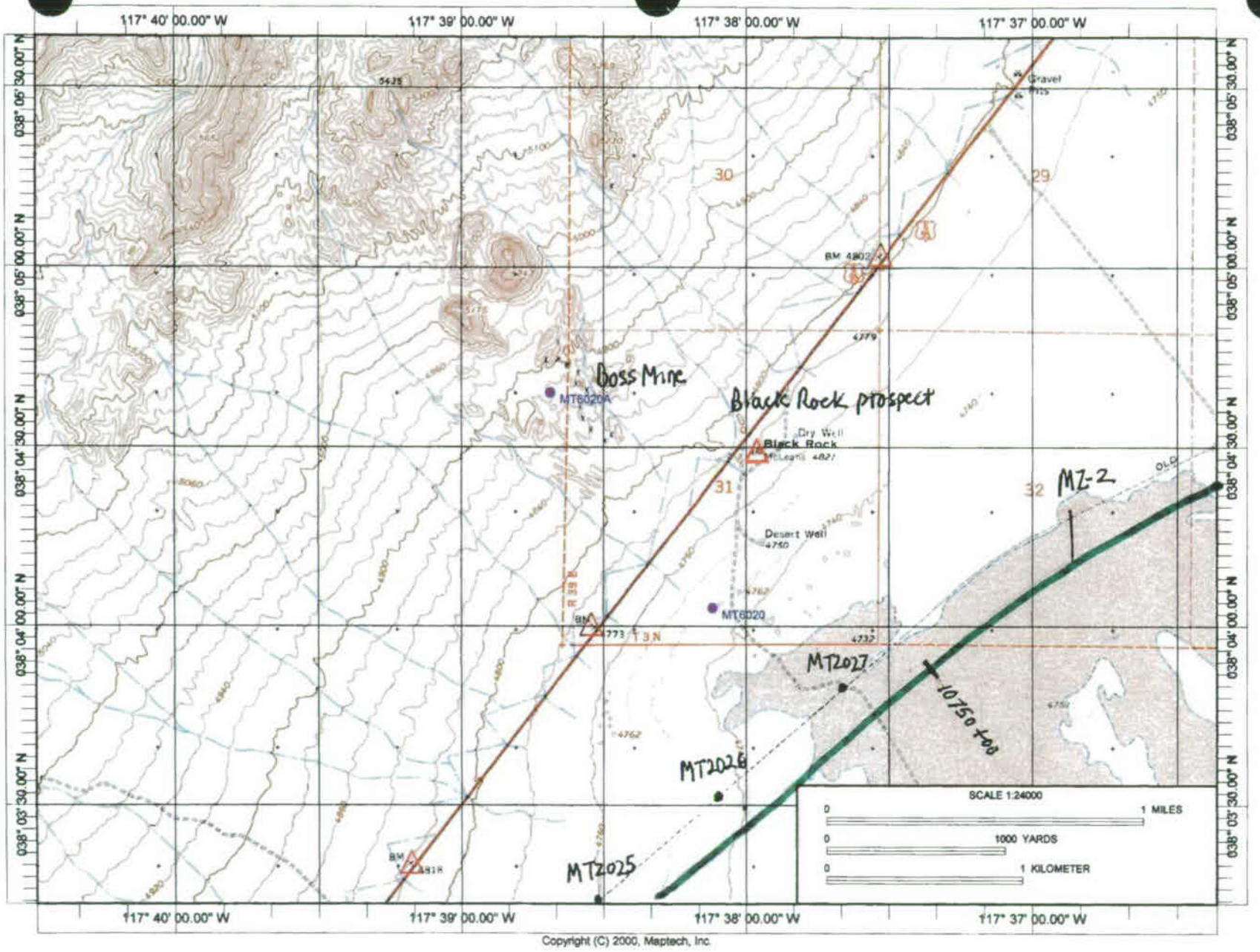
REFERENCES: Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500; J.V. Tingley, 2005, Metals, *in* Meeuwig, R.O., ed., The Nevada mineral industry 2004: Reno, Nev., Nevada Bureau of Mines and Geology Special Publication MI-2004, p.13-30; Mine Development Associates, 2006.

ADDITIONAL COMMENTS:



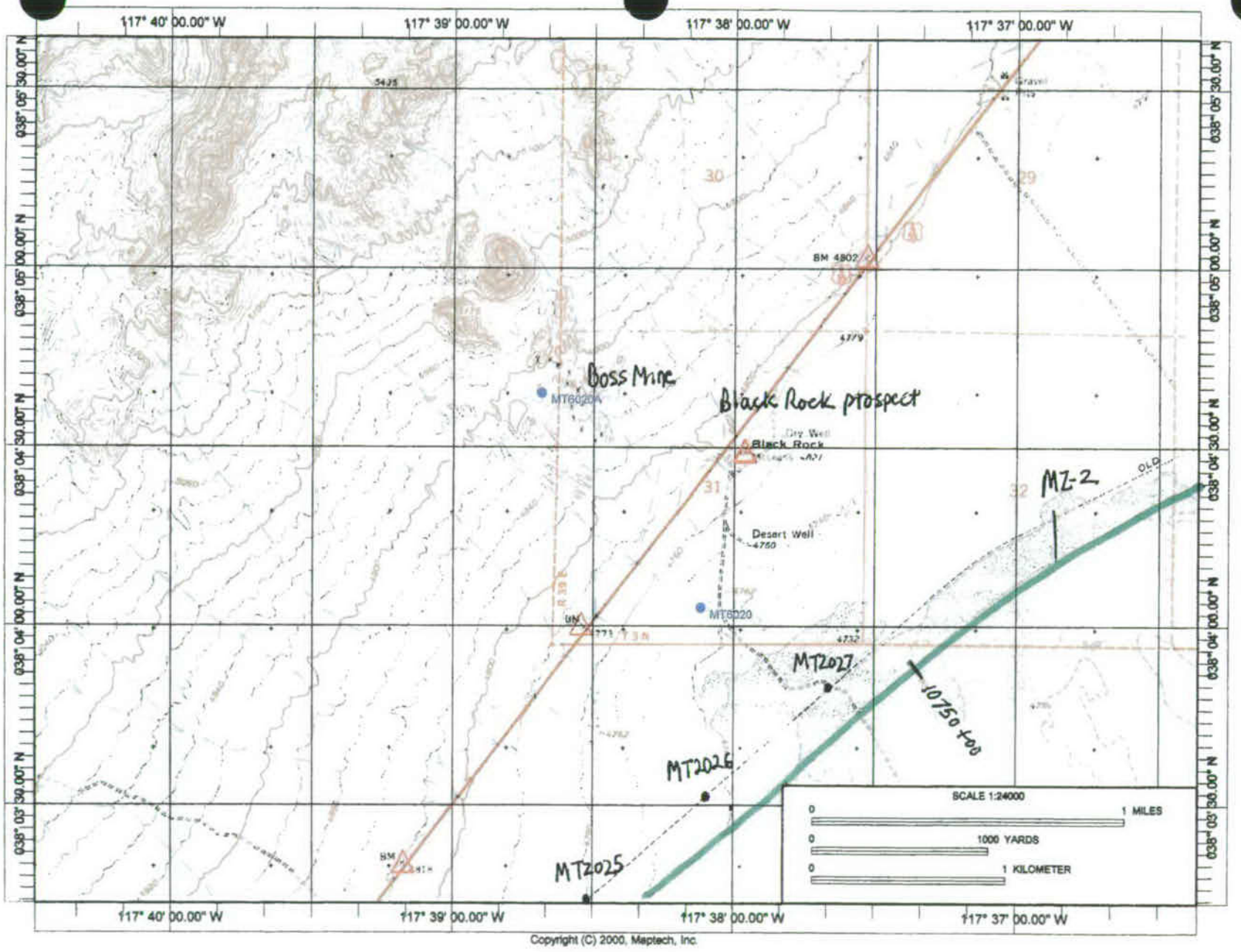
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		FEATURE: Castle-Black Rock project, Black Rock Prospect	
DATE: 12/02/06		OWNER OR LESSEE: Seabridge Gold, Inc.	
TIME: 12:51		**MINING DISTRICT: Gilbert**	
WEATHER: Sunny, cold		COUNTY: Esmeralda	
WAYPOINT: MT6020	LATITUDE: N. 38.06747^0	LONGITUDE: W. 117.63523^0	ALTITUDE: 4,709 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T3N, R39E, S31 SW			
GEOGRAPHIC AREA: Big Smoky Valley			
GEOGRAPHIC DESCRIPTION: The prospect is located on the NE edge of Big Smoky Valley, where the distal edge of an alluvial fan sloping SE from the Monte Cristo Range merges with the valley-fill alluvium. Small hills, such as Black Rock, and low ridges occur in the transition zone. The top of Black Rock is at an altitude of 4,821 feet AMSL; a ridge between Black Rock and the valley floor, where waypoint MT6020 was obtained, crests at about 4,762 feet AMSL; and the valley floor is at an altitude of 4,732 feet AMSL. Thus, relief in the area of Black Rock is about 90 feet.			
LOCAL GEOLOGIC UNIT: Devonian to Cambrian siliceous and volcanic rocks of Stewart et al (1994); also identified as Ordovician Palmetto Formation (See, for example, Tingley, 2005)			
REGIONAL GEOLOGIC UNIT: Devonian to Ordovician sedimentary and volcanic rocks (DOsv)			
LITHOLOGIC DESCRIPTION: Black argillite and chert; small barite rosettes present in cavities; locally brecciated; cut by a stockwork of quartz-calcite veins, that commonly are stained by iron oxides; veins generally 4-12 inches wide and dipping steeply to the northeast.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): The Devonian to Ordovician sedimentary and volcanic rocks crop out over an area <150 feet in diameter. A northwest-trending, high-angle fault cuts through the outcrop area. The extent of this geologic unit beneath surrounding alluvium is unknown.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Gold occurs in stockwork quartz-calcite veins and along the fault cutting through the outcrop area.			
COMMODITIES: Gold			
OPERATING AND ABANDONED FACILITIES: A 16- to 20-foot-deep shaft, several pits, and rotary drill holes were observed at the prospect by NBMG personnel in July 1982. Homestake Mining Co. reports that they discovered gold mineralization south of Black Rock in an exploration hole drilled in 1987, indicating a potential for an ore body to extend continuously from Black Rock. The current holder of claims to the Black Rock prospect has an exploration program planned that would involve drilling between this prospect and three prospects nearby which it controls and considers "underexplored" - the Castle prospect (to the NE), the Boss prospect (to the NW), and the Berg prospect (north of the Boss prospect). All prospects have been drilled previously, and a small open-pit mine was excavated on the Boss prospect to evaluate the potential for gold production. A modeling study based on 139 drill holes reported a gold resource of 215,000 ounces and an additional inferred resource of 93,000 ounces among the four prospects.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: US-6/95 at Black Rock is 5,000 feet NW of MZ-2 station 10750+00.			
PHOTOGRAPHS			
NUMBER	WAYPOINT	SUBJECT (Note direction of view)	
N/A	N/A	N/A	
CONTACTS: N/A			
REFERENCES: Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500; Brown, H.G., ed., 2003, Road logs and references, *in* Regional geology and gold deposits of the Silver Peak area - Mineralization hosted by metamorphic core complexes: Reno, Nev., Geological Society of Nevada, 2003 fall field trip guidebook, Special Publication No. 38, p.19-47; J.V. Tingley, 2005, Major precious metal deposits, *in* Meeuwig, R.O., ed., 2005, The Nevada mineral industry 2004: Reno, Nev., Nevada Bureau of Mines and Geology Mineral Industry publication MI-2004, p. 31-49; Nevada Bureau of Mines and Geology, accessed 2006, Nevada mining district files: available on the internet at http://www.nbmg.unr.edu; Seabridge Gold, Inc., accessed 2007, Castle-Black Rock project, Nevada: available on the internet at http://www.seabridgegold.net.			
ADDITIONAL COMMENTS: More information about the Castle and Berg prospects can be obtained from Seabridge Gold's website (listed in the References section). The Boss mine is discussed on another data sheet.			


117° 40' 00.00" W
117° 39' 00.00" W
117° 38' 00.00" W
117° 37' 00.00" W
038° 05' 30.00" N
038° 05' 00.00" N
038° 04' 30.00" N
038° 04' 00.00" N
038° 03' 30.00" N
Boss Mine
Black Rock prospect
MT6020A
MT6020
Black Rock
Dry Well
Desert Well
4750
BM 4802
BM 4773
BM 4818
MZ-2
MT2027
MT2026
MT2025
10750 400
30
29
31
32
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		FEATURE: Castle-Black Rock project, Boss mine prospect	
DATE: 12/05/06		OWNER OR LESSEE: Seabridge Gold, Inc.	
TIME: 09:40		**MINING DISTRICT: Gilbert**	
WEATHER: Sunny, warm		COUNTY: Esmeralda	
WAYPOINT: MT6020A	LATITUDE: N. 38.07751^0	LONGITUDE: W. 117.64475^0	ALTITUDE: 4,775 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T3N, R38E, S36 NE			
GEOGRAPHIC AREA: Monte Cristo Range			
GEOGRAPHIC DESCRIPTION: The Boss Mine is located on the lower slopes of the Monte Cristo Range where small hills protrude from a SW-sloping alluvial fan. Small hills above the mine have a maximum altitude of 5,000 feet AMSL. US-6/95 below the mine is at an altitude of 4,770 feet AMSL. The difference in altitude between these points is 230 feet.			
LOCAL GEOLOGIC UNIT: Early Miocene lower unit of the Blair Junction sequence of Stewart et al (1994)			
REGIONAL GEOLOGIC UNIT: Early Miocene lava flows, flow breccias, and lahars of intermediate composition (Ta3)			
LITHOLOGIC DESCRIPTION: Dark-gray to brown, fine-grained to porphyritic, andesite to dacite lava flows, tuff breccias, and lahars, intercalated with rhyolitic, nonwelded to welded ash-flow tuff, and intruded by rhyolite to andesite dikes, sills, and small, irregularly shaped bodies. Hydrothermal alteration is most pervasive adjacent to northwest-trending faults and fractures, which are believed to have been conduits for the mineralizing solutions. The alteration is zoned outward from quartz-illiite in the center of the ore deposit to illite, montmorillonite, and finally chlorite-calcite. The altered rock is mottled red, yellow, orange, and gray within the pit and is light-gray with orange and brown banding on the fringes of the ore body. Pyrite replaced by hematite is common within the deposit. Veins with well-developed quartz crystals lining vugs or finely crystalline quartz run through the rock.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): The lower unit of the Blair Junction sequence is the only geologic unit mapped by Stewart et al (1994) at the Boss mine. A northwest-trending, high-angle fault cuts through rocks exposed in the mine.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Gold occurs in stockwork microcrystalline quartz-pyrite veins concentrated near contacts between andesite lava flows and rhyolite intrusives and along the northwest-trending fault running through the mine area.			
COMMODITIES: Gold			
OPERATING AND ABANDONED FACILITIES: The relatively small Boss mine was excavated in the 1980's by Falcon Exploration to determine if a viable gold resource was present in the area. Between 1987 and 1989, Falcon produced 32,000 ounces of gold from 650,000 tons of ore (average concentration 0.058 ounces of gold per ton of ore). While Falcon's successors have conducted exploration programs to expand the known resource, the mine has remained idle. Facilities constructed to support the mining and processing of ore, such as a heap leach pad, remain in place.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Boss mine at waypoint MT6020A is 1.5 miles NW of MZ-2 station 10750+00.			

PHOTOGRAPHS		
NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6020A_ALG_0394_05 Dec06.jpg	MT6020A	Boss mine heap leach pad (AG774)
MT6020A_ALG_0395_05 Dec06.jpg	MT6020A	Pan W to NW of Boss mine tailings (AG775-778)
MT6020A_ALG_0396_05 Dec06.jpg	MT6020A	Aerial view of Boss open-pit mine and heap leach pad (AG779)
MT6020A_ALG_0397_05 Dec06.jpg	MT6020A	Boss open-pit gold mine and Monte Cristo Range (AG781-785)
MT6020A_ALG_0398_05 Dec06.jpg	MT6020A	Boss open-pit gold mine (AG786-789)
CONTACTS: N/A		
REFERENCES: Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500; Brown, H.G., ed., 2003, Road logs and references, *in* Regional geology and gold deposits of the Silver Peak area -Mineralization hosted by metamorphic core complexes: Reno, Nev., Geological Society of Nevada, 2003 fall field trip guidebook, Special Publication No. 38, p.19-47; J.V. Tingley, 2005, Major precious metal deposits, *in* Meeuwig, R.O., ed., 2005, The Nevada mineral industry 2004: Reno, Nev., Nevada Bureau of Mines and Geology Mineral Industry publication MI-2004, p. 31-49; Seabridge Gold, Inc., accessed 2007, Castle-Black Rock project, Nevada: available on the internet at http://www.seabridgegold.net.		
ADDITIONAL COMMENTS:		


117° 40' 00.00" W
117° 39' 00.00" W
117° 38' 00.00" W
117° 37' 00.00" W
38° 05' 30.00" N
38° 05' 00.00" N
38° 04' 30.00" N
38° 04' 00.00" N
38° 03' 30.00" N
Boss Mine
Black Rock prospect
MZ-2
MT2027
MT2026
MT2025
10750 +00
MT6020A
MT6020
Black Rock
Desert Well
4750
BM 4802
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Gemfield prospect	
DATE: 12/03/06		OWNER OR LESSEE: Metallic Ventures, Inc.	
TIME: 09:30		**MINING DISTRICT: Goldfield**	
WEATHER: Sunny and cold		COUNTY: Esmeralda	
WAYPOINT: MT6022	LATITUDE: N. 37.72635^0	LONGITUDE: W. 117.24395^0	ALTITUDE: 5,602 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T2S, R42E, S26, 27, 34, and 35			
GEOGRAPHIC AREA: Goldfield, Nev., Montezuma Valley, about 1 mile west of the summit of Columbia Mt			
GEOGRAPHIC DESCRIPTION: The Gemfield prospect is located at the eastern edge of Montezuma Valley, a flat-bottomed basin between the Goldfield Hills on the east and Malpais Mesa on the west. The valley is drained by Big Wash and a well-developed network of tributary washes, which are dry for most of the year. The Gemfield prospect extends from the west side of US-95 east about 4,500 feet to Columbia Mountain, on the western edge of the Goldfield Hills. Relief in this area, excluding 6,097-foot-tall Columbia Mountain, is about 140 feet.			
LOCAL GEOLOGIC UNIT: Remnant alluvial fan deposits (QTg) and pediment deposits (QTp)			
REGIONAL GEOLOGIC UNIT: Quaternary-Tertiary alluvium (QTa)			
LITHOLOGIC DESCRIPTION: Remnant alluvial fan deposits consist of very dense, reddish- to yellowish-brown, slightly gravelly, silty sand, sand, gravelly sand, and sandy gravel, loosely to moderately indurated by calcium carbonate. Pediment deposits consist of medium-dense to dense, brown to brownish-yellow, slightly gravelly, medium- to coarse-grained sand, gravelly sand, and sandy gravel, unconsolidated to poorly cemented with limonite.			
LOCAL GEOLOGIC UNIT: Early Miocene (21.5 Ma) Milltown Andesite			
REGIONAL GEOLOGIC UNIT: Early Miocene lava flows, flow breccias, and lahars of intermediate composition (Ta3)			
LITHOLOGIC DESCRIPTION: Moderate- to very high-strength, brownish-gray to dark-gray, porphyritic, foliated andesite and minor basaltic andesite lava flows with very closely to widely spaced, mineralized fractures. Where slightly to moderately altered, the rock is mottled and streaked orange, white, yellow, and green.			
LOCAL GEOLOGIC UNIT: Oligocene (28.6 Ma) Sandstorm Formation			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks (Tsv)			
LITHOLOGIC DESCRIPTION: Banded, porphyritic rhyolite lava flows, small rhyolite plugs, crystal-rich (quartz and sanidine), welded ash-flow tuff, ash-fall tuff, volcanic breccia, and lenticular beds of gray to black tuffaceous shale; ubiquitous hydrothermal alteration, increasing in intensity from propylitic or argillic to silicic; ferromagnesian minerals altered completely to clay minerals and iron oxides.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Oldest known rocks in the Gemfield area are erosional remnants of the Ordovician Palmetto Formation and small bodies of Jurassic quartz monzonite, which might extend from a pluton centered beneath the Goldfield Caldera. Active during the Oligocene and early Miocene, the Goldfield Caldera erupted thick rhyolite to andesite lava flows and tuff. The Kendall Tuff and Sandstorm Formation were deposited in the Gemfield area during the Oligocene. The Milltown Andesite was deposited in this area during the Miocene. Toward the end of early Miocene time, gold deposits formed in altered volcanic and sedimentary rocks. Early to late Miocene volcanic rocks deposited throughout the Goldfield area do not extend into the Gemfield area because of pre-Pliocene erosion. Faulting during the Tertiary period down-dropped the Milltown Andesite relative to the Sandstorm Formation at Gemfield, creating a horst, which was covered as Pliocene to Holocene alluvium accumulated.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: At Gemfield, a volcanic-hosted, epithermal gold deposit of the high-sulfidation, quartz-alunite type occurs within a northerly trending horst, that is concealed by 10-700 feet of Quaternary-Tertiary alluvium. Faults bound the horst on its east, west, and south sides. The gold deposit, which trends N 30-35^0 E, is 2,400 feet long parallel to the strike of the horst-bounding faults and up to 1,200 feet wide perpendicular to these faults. Alteration and mineralization are stratabound within the Oligocene Sandstorm Formation. The host rocks are porphyritic rhyolite lava flows. Ore zones within them are cumulatively about 100-200 feet thick. High-grade ore contains auriferous pyrite in stratiform, silicified "ledges". Significant amounts of low-grade disseminated gold are present in "haloes" of argillized and propylitically altered rhyolite surrounding the high-grade ore.			
COMMODITIES: Gold and lesser amounts of silver, copper, and lead			

OPERATING AND ABANDONED FACILITIES: Gold was discovered in the area of the Sandstorm and Kendall mines at Goldfield near the present-day Gemfield prospect in late 1902, and the first shipment of ore produced from mines at Goldfield occurred about a year later. Significant gold production from the district continued through 1919, but production declined considerably in following years. NBMG records indicate that the Goldfield district produced 4.19 million ounces of gold, 1.45 million ounces of silver, 7.67 million pounds of copper, and 51.7 thousand pounds of lead between 1903 and 1960 from numerous mines scattered throughout a 40 square-mile area. Since deregulation of the gold price in 1971, cyanide heap-leaching of ore obtained from mine dumps, mill tailings, and three open-pit mines produced about 59,000 ounces of gold, while exploration activity increased. Metallic Ventures began exploring for gold within the district in 2001. In 2002, Metallic purchased the Gemfield deposit, which was discovered by Kennecott in 1992 by pediment drilling. Between 2002 and 2005, Metallic drilled 235 holes to delineate this ore body. Economic scoping is being done to begin mining this deposit.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Gemfield claim block is about 800 feet east of the GF4 alternate at Goldfield

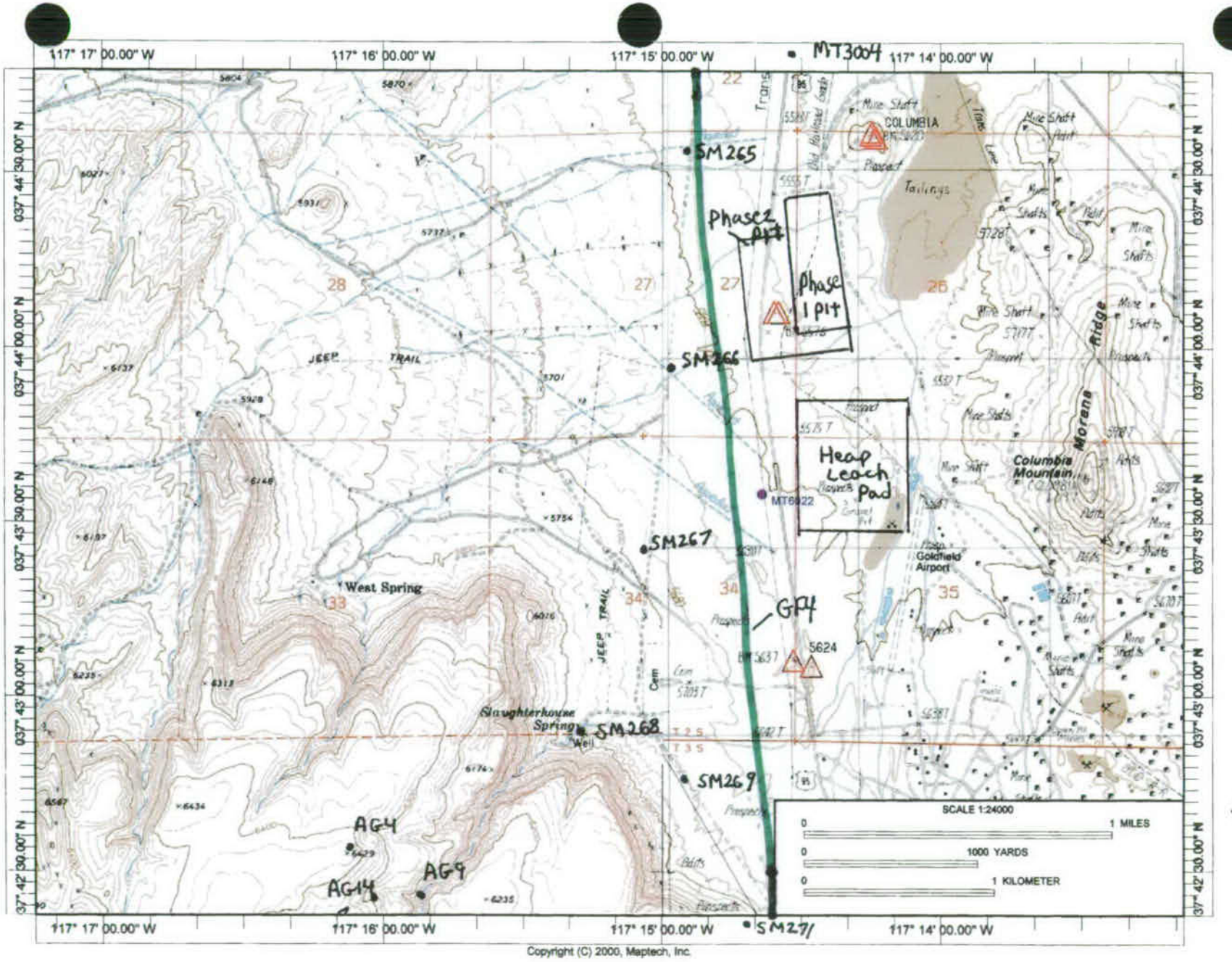
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6022_ALG_0372_03 Dec06.jpg	MT6022	Columbia Mountain (EL 6,097 feet AMSL) at south end of Gemfield prospect, Goldfield Hills, Goldfield, Nevada (AG736-738)
MT6022_ALG_0373_03 Dec06.jpg	MT6022	Gemfield area, Montezuma Valley, looking NNE to remains of GFCMC mill (AG739-741)
MT6024_ALG_0374_03 Dec06.jpg	MT6022	Montezuma V where Gemfield prospect crosses US-95 (AG741-743)

CONTACTS: N/A

REFERENCES: Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Ashley, R.P., 1974a, Road log and trip guide Goldfield district, in Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 14-21; Ashley, R.P., 1974b, Goldfield mining district, in Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 49-66 plus generalized geologic map, scale 1:12,000. Ashley, R.P., 1975, Preliminary geologic map of the Goldfield mining district, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-681, scale 1:24,000.

ADDITIONAL COMMENTS: Metallic Ventures, Inc., currently is evaluating three properties in the Goldfield mining district - Gemfield, McMahon Ridge, and Goldfield Main. This report focuses on the Gemfield prospect.


117° 17' 00.00" W
117° 16' 00.00" W
117° 15' 00.00" W
117° 14' 00.00" W
37° 44' 30.00" N
37° 44' 00.00" N
37° 43' 30.00" N
37° 43' 00.00" N
37° 42' 30.00" N
MT3004
SM265
SM266
SM267
SM268
SM269
SM27/
Phase2 pit
Phase 1 pit
Heap Leach Pad
MT6922
COLUMBIA
Tailings
Morena Ridge
Columbia Mountain
Goldfield Airport
West Spring
Slaughterhouse Spring
Well
JEEP TRAIL
GP4
5624
AG4
AG9
AG14
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Copyright (C) 2000, Maptech, Inc.

FIELD DATA REPORT

INVESTIGATOR: Bill Laprade		MINE OR OTHER FEATURE: NDOT Pit ES 04-01	
		Lessee: NDOT from BLM	
DATE: 2/19/07			
TIME: 11:05		**MINING DISTRICT: Goldfield**	
WEATHER: Clear and cold		COUNTY: Esmeralda	
WAYPOINT: MT7007	LATITUDE:	117,14',10"W	ALTITUDE: 5,300'
GEOGRAPHIC COORDINATES (T, R, S): T2S, 42E, Sec. 11			
GEOGRAPHIC AREA:			
GEOGRAPHIC DESCRIPTION: Basin flats north of Goldfield and just east of US 95; relatively level. Excavation about 400 to 500 feet square with material stockpile.			
LOCAL GEOLOGIC UNIT: Qao			
REGIONAL GEOLOGIC UNIT: Qao			
LITHOLOGIC DESCRIPTION: Brown, slightly silty, gravelly, fined to coarse SAND, trace clay, trace cobbles.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): No structure; basin fill for probably hundreds of feet deep and no adjacent geologic units.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: N/A			
COMMODITIES: Sand and gravel borrow for road building			
OPERATING AND ABANDONED FACILITIES: None			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: T			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT7007_WTL_0369_19Feb07	MT7007	Gravel pit excavation, reclaimed; looking south
MT7007_WTL_0370_19Feb07	MT7007	Stockpiles on north side of pit; looking north

CONTACTS:			
REFERENCES:			
ADDITIONAL COMMENTS:			

FIELD DATA REPORT

INVESTIGATOR: Bill Laprade		MINE OR OTHER FEATURE: NDOT Pit ES 04-09	
		Lessee: NDOT from BLM	
DATE: 2/19/07			
TIME: 12:30		**MINING DISTRICT: Goldfield**	
WEATHER: Clear and cold		COUNTY: Esmeralda	
WAYPOINT: MT7010	LATITUDE: 37,47',15"N	LONGITUDE: 117,15',45"W	ALTITUDE: 5,360'
GEOGRAPHIC COORDINATES (T, R, S): T2S, 42E, Sec. 4			
GEOGRAPHIC AREA: North of Goldfield			
GEOGRAPHIC DESCRIPTION: Very slightly sloping distal part of alluvial fan (origin Montezuma Range) north of Goldfield, west of US 95 and 1/4 mile south of Silver Peak Road. Fan slopes down to north. Pit drifts into slightly higher part of fan on west.			
LOCAL GEOLOGIC UNIT: Qao			
REGIONAL GEOLOGIC UNIT: Qao			
LITHOLOGIC DESCRIPTION: Brown, slightly silty to silty, gravelly, fined to coarse SAND, trace cobbles. About 1/4 of clasts are crusted with calcrete.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): No structure; basin fill for probably hundreds of feet deep and no adjacent geologic units.			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: N/A			
COMMODITIES: Sand and gravel borrow for road building			
OPERATING AND ABANDONED FACILITIES: None; pit explored, but does not appear to have been used as active pit.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: T			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT7010_WTL_0376_1 9Feb07	MT7010	Close-up of small mound from test pit excavation
MT7010_WTL_0377_1 9Feb07	MT7010	Small mound from test pit excavation

CONTACTS:
REFERENCES:
ADDITIONAL COMMENTS:

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Camp Terrill	
DATE: 2/23/07 and 3/6/07		OWNER OR LESSEE: Walker River Indian Reservation	
TIME:		**MINING DISTRICT: Holy Cross**	
WEATHER: Cold, partially overcast		COUNTY: Churchill	
GEOGRAPHIC AREA: Terrill Mnts.		GEOGRAPHIC COORDINATES (T, R, S): T14N R29E S12	
WAYPOINT: MT8138	LATITUDE: N 39.089502°	LONGITUDE: W 118.697025°	ALTITUDE: ~4400 ft AMSL

GEOGRAPHIC DESCRIPTION: Located along the eastern front of the Terrill Mountains. Where high relief of the Terrill Mountains give way to more subdued topography of alluvial fans to the east.

LOCAL GEOLOGIC UNIT: Tertiary dacite

REGIONAL GEOLOGIC UNIT: Tertiary dacite

LITHOLOGIC DESCRIPTION: Dacite observed in the vicinity of Camp Terrill consists of a light to medium gray, porphyritic rock with biotite, plagioclase, and quartz phenocrysts.

LOCAL GEOLOGIC UNIT: Tertiary rhyolitic tuff

REGIONAL GEOLOGIC UNIT: Tertiary rhyolitic tuff

LITHOLOGIC DESCRIPTION: Extrusive rhyolite units, including flows, tuffes, and welded tuffs.

LOCAL GEOLOGIC UNIT: Jurassic Gabbro

REGIONAL GEOLOGIC UNIT: Jurassic Gabbro

LITHOLOGIC DESCRIPTION: As observed in outcrops to the north of Camp Terrill, gabbroic units in this area are dark gray to black and coarse-grained.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Rhyolitic tuffs lay on top of a gabbro body. Locally, the rhyolitic tuff is unconformably overlain by dacite flows.

RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization occurred along small veins in altered dacite and at the contact of dacite with the rhyolite tuffs.

COMMODITIES: Silver, gold, and manganese ore.

OPERATING AND ABANDONED FACILITIES: Facilities observed in field appeared to be abandoned and consisted of at least 5 mine shafts and numerous prospect pits. Several stone and concrete foundations in poor condition were observed. Remnants of wooden structures, rusty cans, car parts, and water tanks litter the surface in the vicinity of the mines. Mine shafts are generally surrounded by barb-wire fences.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: Railroad alignment passes through Camp Terrill and less than 300 feet from mine shafts at station 11270+00 along bypass segment S6.

PHOTOGRAPHS		
NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8036_PHZ_054_23Feb07.jpg	MT8036	View east at mine shaft (PZ1252).
MT8036_PHZ_055_23Feb07.jpg	MT8036	View west at mine shaft (PZ1253).
MT8037_PHZ_056_23Feb07.jpg	MT8037	View south over prospect pits (PZ1254)
MT8038_PHZ_057_23Feb07.jpg	MT8038	View south at prospect pit (PZ1255).
MT8232_PHZ_407_06Mar07.jpg	MT8232	Mine shaft (PZ1593)
MT8232_PHZ_408_06Mar07.jpg	MT8232	Mine shaft (PZ1594)
MT8232_PHZ_409_06Mar07.jpg	MT8232	Mine shaft (PZ1595)
MT8232_PHZ_410_06Mar07.jpg	MT8233	Mine shaft (PZ1596)
MT8232_PHZ_411_06Mar07.jpg	MT8233	View northeast over Camp Terrill (PZ1597)
CONTACTS:		
REFERENCES: Tingley, J. V., 1998, Mining districts of Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 47, 128 p.; Ross, D. C., 1961, Geology and Mineral Deposits of Mineral County, Nevada, Nevada Bureau of Mines and Geology Bulletin 58, 98 p.; Moore, J. G., 1969, Geology and mineral resources of Lyon, Douglas, and Ormsby Counties, Nevada, Nevada Bureau of Mines and Geology Bulletin 75, 45 p.		
ADDITIONAL COMMENTS:		

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Black Butte Mine	
DATE: 2/28/07		OWNER OR LESSEE: Silver Trend Mining Company of Coeur d'Alene, Idaho	
TIME:		**MINING DISTRICT: Holy Cross**	
WEATHER: Cold, partially overcast		COUNTY: Churchill	
GEOGRAPHIC AREA: Terrill Mnts.		GEOGRAPHIC COORDINATES (T, R, S): T14N, R29E, S11	
WAYPOINT: MT8141	LATITUDE: N 39.089150°	LONGITUDE: W 118.712493°	ALTITUDE: 4840 feet
GEOGRAPHIC DESCRIPTION: Located on ridge within the Terrill Mountains approximately 0.5 mile west of the range front.			
LOCAL GEOLOGIC UNIT: Rhyolitic tuff			
REGIONAL GEOLOGIC UNIT: Tertiary rhyolitic tuff			
LITHOLOGIC DESCRIPTION: Biotite rhyolite pumice tuff-breccia and welded tuff (Moore, 1969).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Quartz veins cut rhyolitic tuff.			
RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization occurred along narrow, epithermal quartz veins, with small and scattered ore grade zones (Utterback, 2002)			
COMMODITIES:			
OPERATING AND ABANDONED FACILITIES: Mine consists of vertical shaft with remnants of a wooden shaft structure. Remnants of a wooden track were observed approximately 1000 feet south of the mine.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine complex is about 0.5 miles west of bypass alignment S6, station 11240+00. The claim associated with the Black Butte mine may extend into the project corridor; however, claim posts with notices were not observed. Maps contained in Utterback (2002) indicate that active claims lie about 1000 feet west of the alignment.			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8141_PHZ_211_28Feb07.jpg	MT8141	View west up access trail to mine shaft (PZ662).
MT8141_PHZ_212_28Feb07.jpg	MT8141	View northwest at entrance to mine shaft (PZ663).
MT8141_PHZ_213_28Feb07.jpg	MT8141	View north over mine shaft and surrounding mountains (PZ664).
MT8141_PHZ_214_28Feb07.jpg	MT8141	View south down to wooden track structure remnants (PZ665).
MT8142_PHZ_215_28Feb07.jpg	MT8142	View west towards mine showing inaccessibility to mine by car (PZ666).

CONTACTS:

REFERENCES: Moore, J. G., 1969, Geology and mineral resources of Lyon, Douglas, and Ormsby Counties, Nevada, Nevada Bureau of Mines and Geology Bulletin 75, 45 p.; Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.

ADDITIONAL COMMENTS:

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Pyramid Mine	
DATE: 3/6/07		OWNER OR LESSEE: Silver Trend Mining Company	
TIME:		**MINING DISTRICT: Holy Cross**	
WEATHER: Cold, partially overcast		COUNTY: Churchill	
GEOGRAPHIC AREA: Terrill Mnts.		GEOGRAPHIC COORDINATES (T, R, S): T14N, R29E, S10	
WAYPOINT: MT8237	LATITUDE: N 39.104894	LONGITUDE: W 118.720133	ALTITUDE: ~4330 ft AMSL
GEOGRAPHIC DESCRIPTION: Located within the Terrill Mountains approximately 0.7 miles west of the range front.			
LOCAL GEOLOGIC UNIT: Rhyolitic tuff			
REGIONAL GEOLOGIC UNIT: Tertiary rhyolitic tuff			
LITHOLOGIC DESCRIPTION: Biotite rhyolite pumice tuff-breccia and welded tuff (Moore, 1969).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Quartz veins cut rhyolitic tuff.			
RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Mineralization occurred along narrow, epithermal quartz veins, with small and scattered ore grade zones (Utterback, 2002)			
COMMODITIES: Silver and gold.			
OPERATING AND ABANDONED FACILITIES: Unable to reach Pyramid mine due to poor condition of access road. Road consists of 4WD track which has been modified by channel activity at the range front.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Pyramid mine is located approximately 0.75 miles southwest of bypass alignment S6, station 11210+00. The claim associated with the Pyramid mine may extend into the project corridor; however, claim posts with notices were not observed. Maps contained in Utterback (2002) indicate that active claims lie about 1000 feet west of the alignment.			
PHOTOGRAPHS			
NUMBER	WAYPOINT	SUBJECT (Note direction of view)	
MT8237_PHZ_420_06 Mar07.jpg	MT8237	Southwest into mountains and approximate location of Pyramid Mine (PZ1606)	
CONTACTS:			
REFERENCES: Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.; Moore, J. G., 1969, Geology and mineral resources of Lyon, Douglas, and Ormsby Counties, Nevada, Nevada Bureau of Mines and Geology Bulletin 75, 45 p.; Moore, J. G., 1969, Geology and mineral resources of Lyon, Douglas, and Ormsby Counties, Nevada, Nevada Bureau of Mines and Geology Bulletin 75, 45 p.			
ADDITIONAL COMMENTS:			

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Small mine 1 mile NW of the General Thomas Mine	
DATE: 12/02/06		OWNER OR LESSEE: Recent claims staked, but the owner is unknown.	
TIME: 16:00		**MINING DISTRICT: Lone Mountain**	
WEATHER: Fading, late afternoon light, cold		COUNTY: Esmeralda	
WAYPOINT: MT6021	LATITUDE: N. 37.96437^0	LONGITUDE: W. 117.42832^0	ALTITUDE: 6,195 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T1N, R40E, S01 SE			
GEOGRAPHIC AREA: General Thomas Hills			
GEOGRAPHIC DESCRIPTION: The mine is located in the NW corner of the General Thomas Hills, on a steep escarpment above Paymaster Canyon. The hills, which actually are a rugged plateau, are bordered on the west by Paymaster Canyon, on the south by Alkali Flat, and on the east by Alkali Spring (a.k.a. Montezuma) Valley. On the north, the hills merge with Lone Mountain. Summit altitudes of the highest hills between the visited mine and the large General Thomas mine range from 6,613 to 6,677 feet AMSL. The General Thomas Hills are moderately dissected by washes draining east to Alkali Spring Valley and west to Paymaster Canyon. Paymaster Canyon below the visited mine is at an altitude of 5,700 feet AMSL. Total relief in the area of the visited mine is about 900 feet.			
LOCAL GEOLOGIC UNIT: Cretaceous quartz monzonite			
REGIONAL GEOLOGIC UNIT: Cretaceous to Jurassic granitic rocks (KJg)			
LITHOLOGIC DESCRIPTION: Cretaceous light-gray, phaneritic, fine- to medium-grained, granite to quartz monzonite dikes and plugs, that might be extensions of the Lone Mountain pluton.			
LOCAL GEOLOGIC UNIT: Cretaceous diorite and gabbro dikes and sills			
REGIONAL GEOLOGIC UNIT: Cretaceous to Jurassic mafic intrusive rocks (KJm)			
LITHOLOGIC DESCRIPTION: Cretaceous diorite porphyry dikes and sills with phenocrysts of plagioclase, biotite, and hornblende in a fine-grained, crystalline groundmass. Dikes are pervasively propylitized, and little unaltered rock remains. Mafic minerals are partially or completely altered to chlorite, epidote, clinozoisite, and sericite; plagioclase is albitized or replaced by sericite, epidote, and calcite; potassium feldspar is altered to kaolinite.			
LOCAL GEOLOGIC UNIT: Lower Cambrian Harkless Formation			
REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (CZs)			
LITHOLOGIC DESCRIPTION: Olive and greenish-gray, laminated to very thinly bedded, siliceous siltstone, siltstone, and limestone, with an upper interval of interbedded quartzite, siltstone, sandy limestone, and limestone; metamorphosed nearly everywhere to dark-brown, black, and olive hornfels, phyllite, and schist with minor thinly laminated, gray to black quartzite and recrystallized, grayish-blue limestone.			
LOCAL GEOLOGIC UNIT: Lower Cambrian Poleta Formation			
REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (CZs)			
LITHOLOGIC DESCRIPTION: Interbedded, indistinctly to very thinly bedded, gray, mottled orange, fine-grained to medium-crystalline limestone; greenish-gray, olive, brown, and yellowish-brown siltstone; and light-brown and light-orange, fine-grained quartzite and sandstone grading to siltstone. Shale and limestone in many areas are metamorphosed to dark-colored phyllite and light-colored, calc-silicate skarn. Samples of ore from dumps, possibly from deeper in the mine, consisted largely of quartz crystals, but barite, pyrite, and idocrase(?) also were identified in these samples. Along a road leading to upper levels of the mine, an outcrop of intrusive rock, which might have been quartz monzonite, was seen.			

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): In the General Thomas Hills, Middle Cambrian to Ordovician sedimentary rocks of the Mule Spring, Emigrant, and Palmetto Formations were thrust north over the lower Cambrian Poleta and Harkless Formations. In the lower plate, the Poleta and Harkless Formations were folded around the southern end of the Lone Mountain quartz monzonite pluton. As this pluton was emplaced during the Cretaceous period, doming accompanied by normal faulting occurred. Heat and fluids from the Lone Mountain pluton and related dikes, sills, and plugs of aplite, pegmatite, trachyte, diorite, gabbro, and lamprophyre metamorphosed nearby Cambro-Ordovician rocks into phyllite, schist, quartzite, hornfels, calc-silicate skarn, and marble. As a result of Basin-and-Range extension and the tectonics of the Walker-Lane structural belt, faulting reached its zenith in the General Thomas Hills during the Tertiary period.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Extensional faulting during the Tertiary period brought with it hot, mineral-rich fluids that altered volcanic and sedimentary rocks and left behind metallic mineral deposits in shear zones cutting calc-silicate skarns, in stockwork replacements of carbonate rocks, and in ubiquitous quartz veins. In the oxidizing environment at and near land surface, supergene mineral deposits enriched in copper and lead formed in metamorphosed Cambrian shale and limestone that had been intruded by diorite dikes.

COMMODITIES: Silver, lead, and subordinate copper

OPERATING AND ABANDONED FACILITIES: This mine has several levels, which are reachable by different roads, either up from Paymaster Canyon or down from the plateau-like surface of the General Thomas Hills. The mine now consists of many partially collapsed shafts, trenches, pits and tailings dumps. Based on the character and extent of these workings, the mine is estimated to date from the 1920's.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine is about 5.5 miles SW of MZ-2 station 12000+000

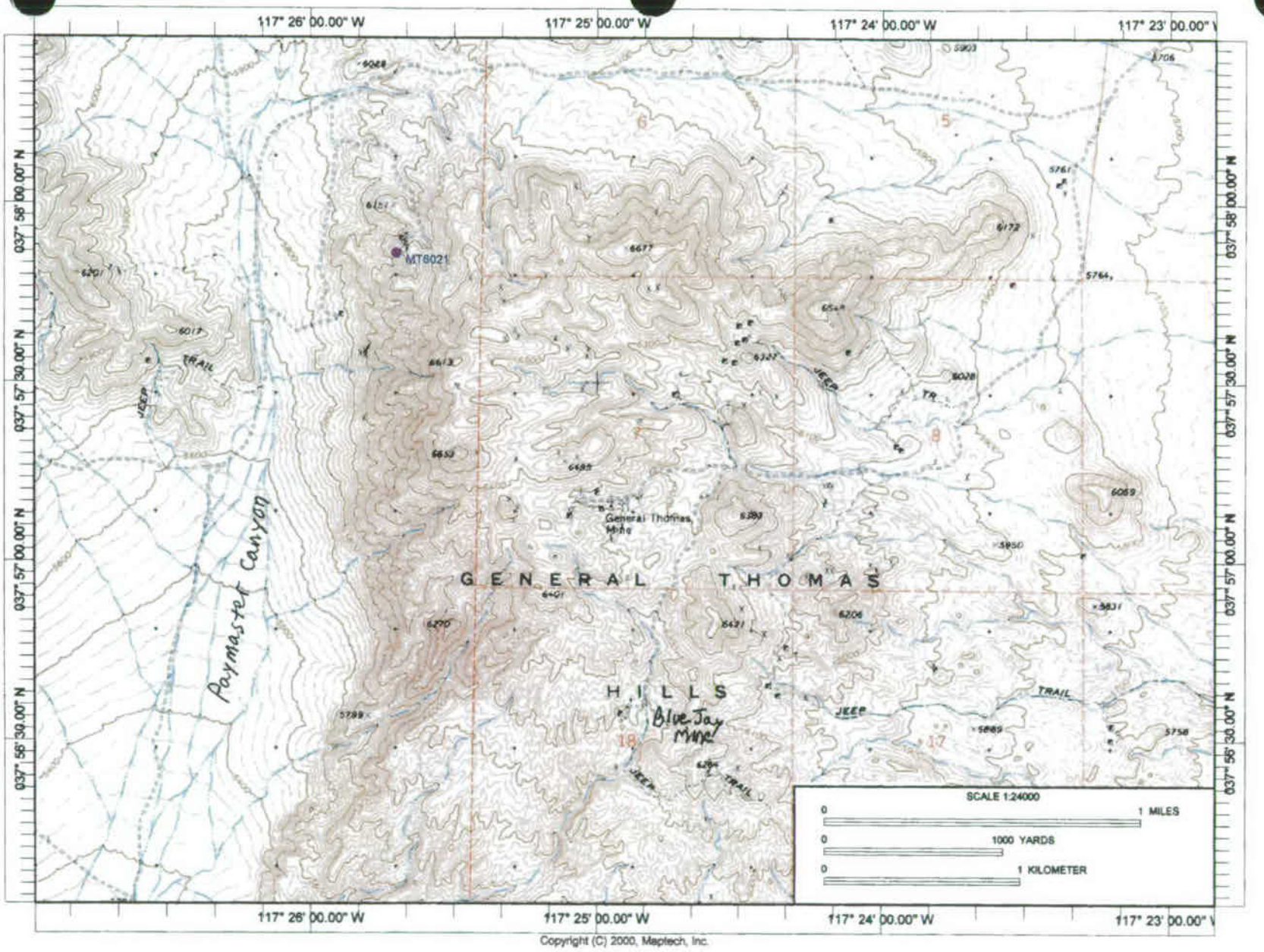
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6021_ALG_0368_02Dec06.jpg	MT6021	Trench exposing contact metamorphosed shale and limestone of the Cambrian Poleta Formation (AG731)
MT6021_ALG_0369_02Dec06.jpg	MT6021	View west of Lone Mountain and mine workings in the Cambrian Poleta Formation (AG733)
MT6021_ALG_0370_02Dec06.jpg	MT6021	Collapsed ore chute & mine shaft, General Thomas Hills (AG734)
MT6021_ALG_0371_02Dec06.jpg	MT6021	Outcrop of skarn in the Cambrian Poleta Formation at small mine in General Thomas Hills (AG735)

CONTACTS: N/A

REFERENCES: Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Tingley, J. V., and Maldonado, Florian, 1983, Investigation of the mineral potential of the Clipper Gap, Lone Mountain-Weepah, and Pipe Spring plutons, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open File Report 83-8, 103 p.; Smith, P.L., and Tingley, J.V., 1983, A mineral inventory of the Esmeralda-Stateline resource area, Las Vegas district, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 83-11, 174 p.; Maldonado, Florian, 1984, Bedrock geologic map of the Lone Mountain pluton area, Esmeralda County, Nevada: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1533, scale 1:24,000.

ADDITIONAL COMMENTS: Attempts were made to find the Blue Jay mine, which actively produces turquoise from calcareous shale, and the General Thomas mine, now inactive, but once the largest mine in the General Thomas Hills. Fading light made these attempts unsuccessful. The mine that was visited has similar geology to the other two mines.


117° 26' 00.00" W
117° 25' 00.00" W
117° 24' 00.00" W
117° 23' 00.00" W
37° 58' 00.00" N
37° 57' 30.00" N
37° 57' 00.00" N
37° 56' 30.00" N
MT8021
Paymaster Canyon
GENERAL THOMAS
HILLS
Blue Jay Mine
General Thomas Mine
TRAIL
JEEP
TR
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: Nevada Eagle mine		
	OWNER OR LESSEE: Bonaventure Enterprises, Inc.		
DATE: 12/03/06			
TIME: 11:10	**MINING DISTRICT: Montezuma**		
WEATHER: Sunny and cold	COUNTY: Esmeralda		
WAYPOINT: MT6023	LATITUDE: N. 37.71265^0	LONGITUDE: W. 117.29215^0	ALTITUDE: 6,352 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T3S, R42E, S05 NW			
GEOGRAPHIC AREA: Montezuma Range, 3.9 miles southwest of the intersection of US-95 and Cemetery Road at Goldfield, along a dirt road that curves around the north end of Malpais Mesa.			
GEOGRAPHIC DESCRIPTION: The Nevada Eagle mine is located in the valley of an unnamed, north-draining wash, between Malpais Mesa on the east, and the Montezuma Range on the west. Below the mine, the floor of the wash is at an altitude of 6,300 feet AMSL. A satellite peak of Malpais Mesa 0.3 mile east of the mine rises to an altitude of 6,567 feet AMSL. Montezuma Peak, the summit of the Montezuma Range, is at an altitude of 8,373 feet AMSL 3.3 miles SW of the mine. Total relief within the vicinity of the Nevada Eagle mine, thus, is 2,073 feet.			
LOCAL GEOLOGIC UNIT: Late Miocene (7.5-7.6 Ma) Tuff of Stonewall Flat			
REGIONAL GEOLOGIC UNIT: Tuff of Stonewall Flat (Tst)			
LITHOLOGIC DESCRIPTION: The Tuff of Stonewall Flat at Malpais Mesa and in the adjacent Goldfield Hills consists of low to very-high-strength, gray, pink, purple, brown, and brick-red, nonwelded to densely welded, crystal-poor to crystal-rich, lithic-rich (including pumice shards), trachyte, rhyolite, and comendite ash-flow tuff. Bedding ranges from slabby to indistinct (massive). Fractures are very closely to widely spaced. The tuff commonly forms columnar-jointed caprock on mesas underlain by less resistant formations. At the Nevada Eagle mine, an outcrop of this geologic unit was so hydrothermally altered that its original characteristics were hard to discern. Colored yellow, red, purple, orange, and light-gray by chemical reactions involving sulfide minerals, the altered rock was veined throughout with quartz, calcite, and iron oxides. In places, relict texture resembled that of a crystal-lithic or lithic tuff. It could not be determined whether this intense alteration was typical of rock in the mine or related to several faults present nearby at the land surface.			
LOCAL GEOLOGIC UNIT: Late Miocene (7.8 Ma) Basalt of Malpais Mesa			
REGIONAL GEOLOGIC UNIT: Pliocene and Miocene basalt and basaltic andesite lava flows (Tb)			
LITHOLOGIC DESCRIPTION: The Basalt of Malpais Mesa, which is about 100-150 feet thick, generally is medium- to dark-gray, porphyritic (with a finely crystalline groundmass), non-vesicular, and fresh to slightly weathered (typically containing a light gray or brown weathering rind). Fractures are very closely to widely spaced. The rock generally has very high strength, but the quality deteriorates in the upper part of the unit where megabreccia (basalt boulders in a disturbed matrix) and shear zones probably related to several similarly oriented faults in the area are interlayered with sound rock. The shear zones strike N 10-30^0 E and a dip of 77-80^0 NW. In general, basalt in this geologic unit tends to weather to rounded boulders and grus-like gravel.			
LOCAL GEOLOGIC UNIT: Middle Miocene (<11 Ma) Pozo Formation			
REGIONAL GEOLOGIC UNIT: Pliocene to middle Miocene sedimentary rocks (Tsy)			
LITHOLOGIC DESCRIPTION: The Pozo Formation consists of poorly consolidated, fluvially deposited conglomerate and sandstone derived mostly from erosion of volcanic rocks.			
LOCAL GEOLOGIC UNIT: Middle Miocene (13-17 Ma) Siebert Formation			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks			
LITHOLOGIC DESCRIPTION: On lower slopes of Malpais Mesa, the Siebert Formation consists of moderate to high-strength, brownish- to greenish-yellow, yellowish- to grayish-green, green, and light-gray, fresh to moderately weathered, commonly friable, fine-grained sandstone, gravelly sandstone, and conglomerate, with closely to widely spaced fractures. The formation is permeable and is the source of several springs on the east side of Malpais Mesa. The formation is prone to slumping, possibly because of periodic rises in pore-water pressure.			
LOCAL GEOLOGIC UNIT: Middle Miocene (13-17 Ma) rhyolitic ash-fall tuff and tuff breccia			
REGIONAL GEOLOGIC UNIT: Middle Miocene rhyolite to rhyodacite ash-flow and ash-fall tuffs (Tt4)			

LITHOLOGIC DESCRIPTION: In the Montezuma Range, a large area of rhyolitic ash-fall tuff and tuff breccia appears to be stratigraphically continuous with the Siebert Formation. Although this geologic unit was not seen, outcrops of tuff from the Siebert Formation in the Goldfield Hills northeast and east of the Nevada Eagle mine were examined. In the north Goldfield Hills, the Siebert Formation contains medium-high to high strength, pinkish-beige, lithic-rich, rhyolitic, nonwelded ash-fall tuff with closely to medium-spaced fractures. In the central Goldfield Hills, sandstone and conglomerate in the Siebert Formation are intercalated with low to moderate strength, light-gray to white, biotite-rich, lithic-rich, rhyolitic, nonwelded ash-fall tuff with closely to very widely spaced fractures.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Cambrian and Ordovician limestone and dolomite, which have been penetrated in exploration holes, are overlain throughout the Nevada Eagle mine area by middle to late Miocene lava flows, tuff, and volcaniclastic rocks. On the west side of the area, the Tertiary cover consists of middle Miocene rhyolite ash-fall tuff and tuff breccia, overlain by erosional remnants of the late Miocene Tuff of Stonewall Flat. In the center of the area, where surface structures of the Nevada Eagle mine are located, middle Miocene ash-fall tuff and tuff breccia are enveloped by middle to late Miocene Pozo Formation sediments, overlain by Tuff of Stonewall Flat remnants, and cut by numerous high-angle faults. The most prominent of these faults strike NNE to NNW, and a secondary set strikes NE. One of the latter faults is only 700 feet east of the Nevada Eagle mine at the land surface. On the east side of the area, Malpais Mesa is capped by late Miocene basalt flows, which are underlain by cliff-forming Tuff of Stonewall Flat and slope-forming Siebert Formation. Malpais Mesa is crossed by several NNE to NNW and NE-striking faults.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Several thousand feet of underground drifts reportedly follow fault zones in Paleozoic through Tertiary geologic units. Mineralization occurs in jasperoid ore bodies within Paleozoic limestone, in quartz veins and stockworks penetrating tuff, and as disseminations within volcaniclastic sediments. Best grades occur in metal-sulfide-bearing quartz veins. The largest tonnages occur within tuffaceous sandstone beds. Exploration through May 2005, including electrical and magnetic surveys and 10 boreholes drilled at the Nevada Eagle mine, has shown that mineralization in the Nevada Eagle mine is related to a NW trending fault that dips 50-65 ^{0} NE and a previously unidentified structure that runs parallel to this fault.

COMMODITIES: Gold and silver

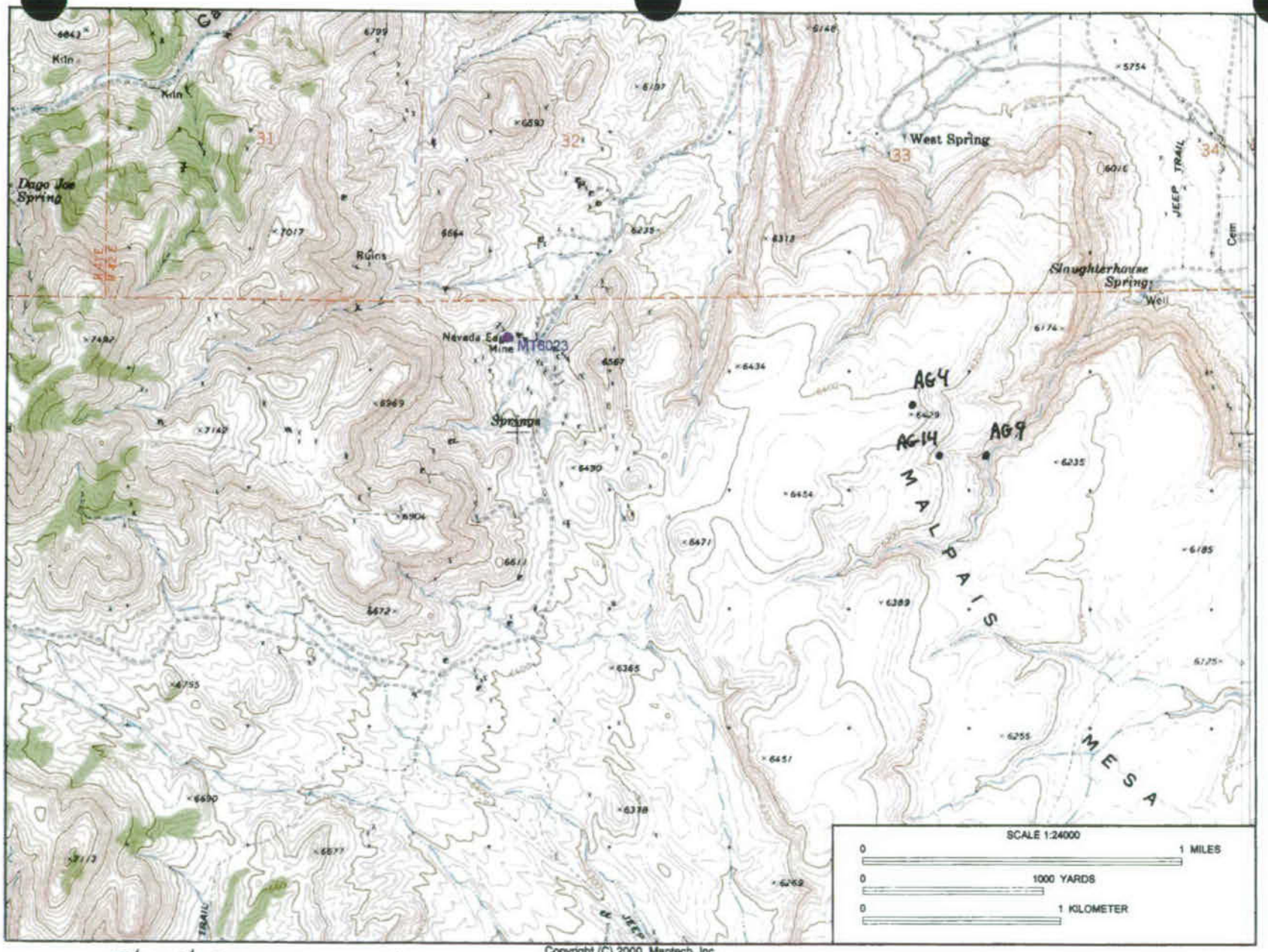
OPERATING AND ABANDONED FACILITIES: The Goldfield West area has been explored for gold and silver since the late 1800's. Small quantities of gold and silver were produced from the Nevada Eagle mine in the early 1900's. From 1981 to 1998, Bear Creek, Kennecott, Placer Amex, FMC, U.S. Borax, and North Mining explored the northern part of the claim block, while Freeport, Echo Bay, Placer Dome and Bow Valley explored the southern part of the claim block. A total of 154 holes were drilled within an area of about 5 square miles. Since 2004, the current claim holder has prepared a geologic map at a scale of 1:10,000, conducted airborne magnetic and electrical surveys, collected rock and soil samples for geochemical analysis, and drilled 37 additional exploration holes. The drilling has indicated a resource of about 140,000 ounces of gold at two locations, and follow-up drilling is planned. When the mine was visited in 2006, all that could be seen of it was a tailings pad, two fenced-off vertical shafts, small piles of tailings, a few tanks, prospect pits, and claim stakes.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Nevada Eagle mine is 2.6 miles from the GF4 alignment west of Goldfield along an unpaved road.

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6023_ALG_0375_03 Dec06.jpg	MT6023	View NW of two vertical mine shafts surrounded by a tailings pad, Nevada Eagle mine shafts, Montezuma Range (AG744)
MT6023_ALG_0376_03 Dec06.jpg	MT6023	View east of cyanide-treated tailings and a treatment tank, with prospect pits on the west side of Malpais Mesa in the background, Nevada Eagle mine, Malpais Mesa (AG745)
MT6023_ALG_0377_03 Dec06.jpg	MT6023	Outcrop of hydrothermally altered Miocene tuff or tuff breccia at the mine at Nevada Eagle mine (AG746)

MT6023_ALG_0378_03 Dec06.jpg	MT6023	View NW of tailings in the foreground and an area of recent exploratory drilling on east slope of Montezuma Range in the background (AG747)
CONTACTS: N/A		
REFERENCES: Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Nevada Bureau of Mines and Geology Nevada mining district files, accessed 2006 at http://www.nbmg.unr.edu.		
ADDITIONAL COMMENTS: The Goldfield West property consists of 49 unpatented lode claims in T3S, R42E, S5, 8, 16, 17, and 20.		



Copyright (C) 2000, Maptech, Inc.

The three waypoints shown on Malpais Mesa and 4 others are discussed in Shannon & Wilson, Inc. (2006)

FIELD DATA REPORT

INVESTIGATOR: Bill Laprade	MINE OR OTHER FEATURE: Claim		
	OWNER OR LESSEE: Silver Thorne Exploration		
2/19/2007			
TIME:4:00	**MINING DISTRICT: Montezuma**		
WEATHER: Clear, cold	COUNTY: Esmeralda		
WAYPOINT:MT7018	LATITUDE: 37,47',45"N	LONGITUDE: 117,21',30"W	ALTITUDE: 5,300'
GEOGRAPHIC COORDINATES (T, R, S): T2S, 41E, Sec. 3			
GEOGRAPHIC AREA: Northern foothills of Montezuma Range			
GEOGRAPHIC DESCRIPTION: 1 mile south of Alkali Hot Spring, bisected by power line road; on alluvial fans sloping down to the north toward Alkali Hot Spring.			
LOCAL GEOLOGIC UNIT: Qao			
REGIONAL GEOLOGIC UNIT: Qao			
LITHOLOGIC DESCRIPTION: Brown, slightly silty to silty, gravelly, fined to coarse SAND, trace cobbles. Probably underlain by Harkless Formation (interbedded phylitic siltstone, dolomite, limestone, and sandstone)			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): No structure is mapped, but alluvial fan deposits overlie Harkless Formation (?)			
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Silver (?) prospect in underlying bedrock (unknown lithology).			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): No structure is mapped, but alluvial fan deposits overlie Harkless Formation (?)			
OPERATING AND ABANDONED FACILITIES: Many rows of white plastic stakes are visible, but none contain identifying papers. No signs of excavations or structures.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: South of alignment about one mile			

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT7018_WTL_0387_19Feb07	MT7018	Old plastic pipe claim markers in "plan of operation" area
MT7019_WTL_0388_19Feb07	MT7019	"Plan of operation" area; no markers or ground disturbances

CONTACTS: None
REFERENCES: Workman, 2002; Albers and Stewart, 1972.
ADDITIONAL COMMENTS:

FIELD DATA REPORT

INVESTIGATOR: George Lightwood	MINE OR OTHER FEATURE: Mill Sites/Placer Claims
DATE: 11/29/06	OWNER OR LESSEE: Various
TIME: 13:45	**MINING DISTRICT: Pilot Mountains**
WEATHER: Clear, Cool	COUNTY: Mineral
WAYPOINT: MT6009, MT6010, MT6011	ALTITUDE: 4560

GEOGRAPHIC COORDINATES (T, R, S): secs 5, 7, 8 and 17. T. 6 N., R. 35 E., Mount Diablo Meridian

GEOGRAPHIC AREA: Mina, Nevada, East of US Hwy 95

GEOGRAPHIC DESCRIPTION: Near the town of Mina, Nevada. The BLM LR2000 indicates numerous Mill Sites on the following parcels: NE 1/4 and SW 1/4, sec. 5; SW 1/4, sec. 5; NE 1/4 Sec. 7; NE 1/4 and NW 1/4, sec. 8; and NE 1/4, sec. 17, in T. 6 N., R. 35 E., Mount Diablo Meridan. In addition, there are 4 Placer Claims in SW 1/4, sec. 5, T. 6N., R. 35 E.

LOCAL GEOLOGIC UNIT: Qal and Qpl (Ross, 1961)

REGIONAL GEOLOGIC UNIT: N/A

LITHOLOGIC DESCRIPTION: Quarternary Alluvial Deposits consisting of Qal and Qpl. Qal is chiefly valley fill and Pleistocene lake beds, Qpl ia clay and saline playa deposits (Ross, 1961).

MINERALS AND ENERGY RESOURCES: Mill Sites and Placer Claims

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: N/A

COMMODITIES: None, no occurrences of placer minerals (gold, scheelite, or carbonate minerals) mentioned in Ross (1961).

OPERATING AND ABANDONED FACILITIES: We stopped at several places (Waypoints MT 6009, MT6010, and Mt 6011) in the town of Mina to observe land and structures that might be associated with mill and placer claims.

At MT6009, observed land in NE 1/4, sec. 5 T6N, R35E. BLM LR2000 database shows one mill site claim (Red Rock Annex), located in this 1/4 section. No structures or other features associated with mineral processing or non-mining uses of land were observed.

At MT6010, we observed small corrugated steel mill building, a trailer, filled sacks, and barrels that may be associated with mill sites (IERI Mill Site Claims) listed in SW 1/4 sec. 5, T6N, R35E in BLM's LR2000 database. Activity was observed around mill building. Four active placer claims also listed, but no mining activity was observed.

At MT6011, observed land in NE 1/4, Sec. 8. BLM LR2000 databases shows 6 active mill site claims in this parcel (IERI 27, 28, 33 and 34, White Cloud, and Martinsin Mill Site). Observed several structures, including trailer and quarset hut, barrels, mining and milling equipment, ect. Equipment does not appear operational nor are there signs of stock piles, tailings, ect. that would suggest ongoing milling activities or any use of land associated with mining operations.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: MRC goes through 2-quarter sections that contain mill site claims according to the BLM LR2000. These quarter sections are NE 1/4 Sec. 5 and NE 1/4 Sec. 8, T6N, R35E. While no structures exist that appear to be related to mineral processing facilities, we do not know the location of Mill Sites on parcels.

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
N/A	N/A	N/A

CONTACTS: N/A

REFERENCES: Ross, D.C., 1961, Geology and Mineral Deposits of Mineral County, Nevada. NBM&G Bulletin 58.

ADDITIONAL COMMENTS: Dan Erbes, Mineral Specialist with BLM Carson City District, stated he was unaware of any mineral processing facilities in the Mina area with long term custom milling contracts. Dan thought activity at mill in SW 1/4 sec. 5 (IERI Claims) may be related to cleanup activity and other post-milling activities.

FIELD DATA REPORT

INVESTIGATOR: George Lightwood and Art Geldon		MINE OR OTHER FEATURE: Gennesaret Claim Block	
DATE: 11/29/06		OWNER OR LESSEE: Ardys Davenport (Claimant)	
TIME: 15:00		**MINING DISTRICT: Pilot Mountains District**	
WEATHER: Clear, Cool		COUNTY: Mineral	
WAYPOINT: MT6012	LATITUDE: N/A	LONGITUDE: N/A	ALTITUDE: 5000

GEOGRAPHIC COORDINATES (T, R, S): secs 10 and 15, T. 6 N., R. 35 E., Mount Diablo Meridian

GEOGRAPHIC AREA: 2 Miles East of Mina, Nevada

GEOGRAPHIC DESCRIPTION: Western front of Pilot Mountains at top of alluvial fans on east side of Soda Springs Valley.

LOCAL GEOLOGIC UNIT: Trj, Trl, and Tre (Ross, 1961)

LITHOLOGIC DESCRIPTION: Ross shows units as follows:
1) Tre - Triassic, Excelsior Fm, intermediate to felsic volcanic rocks
2) Tre - Triassic, Luning Fm, limestone, dolomite, and shale
3) TrJ - Triassic Gabbs and Sunrise formation, Interculated shale and limestone.

LOCAL GEOLOGIC UNIT: Qal (Ross, 1961)

LITHOLOGIC DESCRIPTION: At top of alluvial fan, valley fill, and slope wash.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Ross shows east front of Pilot Mountains bounded by fault, downthrown to west. Diverse lithologies observed at site including volcanic rocks, shale, and limestones. Cale-silicate minerals (Wollastonite) in veins in limestone.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Unknown

COMMODITIES: unknown; Historic Hg, Cu, and Au Prospects in Pilot Mountain District 1 to 2 miles to south and west.

OPERATING AND ABANDONED FACILITIES: Art Geldon found what appeared to be drill cuttings on small knob to southwest of waypoint. Did not observe much mineral exploration related disturbance or claim stakes. Roads and trails are present in this area.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: BLM LR 2000 Database shows 1 - Lode claim (Gennesaret #10) in SE 1/4, Sec 9 and NE 1/4 sec 16, T6N, R35E. The MRC goes through these 1/4 sections. Gennesaret #10, is a part of larger claim block. We did not observe claim posts or indications of recent mineral exploration activity except for possible drill hole cuttings, roads, and trails.

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
N/A	N/A	N/A

CONTACTS: N/A

REFERENCES: Ross, D.C., 1961, Geology and Mineral Deposits of Mineral County, Nevada, NBM&G Bulletin, 58.

INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: Imperial mine		
DATE: 12/03/06	OWNER OR LESSEE: American Goldfields, Inc.		
TIME: 15:28	**MINING DISTRICT: Railroad Springs**		
WEATHER: Sunny and cold	COUNTY: Esmeralda		
WAYPOINT: MT6024	LATITUDE: N. 37.51889^0	LONGITUDE: W. 117.51408^0	ALTITUDE: 6,818 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): in T4S, R40E, S35 SW			
GEOGRAPHIC AREA: Palmetto Mountains, 1.5-1.9 miles southeast of Railroad Pass			
GEOGRAPHIC DESCRIPTION: The Imperial mine is located southeast of Railroad Pass in the rugged, forested terrain of the Palmetto Mountains, 18 miles southwest of Goldfield, Nev. The mine consists of 22 claims, covering about 450 acres between Clayton Valley to the northwest and Lida Valley to the southeast. Peak altitudes of mountains near the mine range from 6,590 to 7,444 ft AMSL. Washes incised into these mountains, which mostly drain northeast to Clayton Valley, are at an altitude of about 5,800 ft AMSL below the easternmost shaft on the mine property.			
LOCAL GEOLOGIC UNIT: Upper Cambrian Emigrant Formation and Mule Spring Limestone			
REGIONAL GEOLOGIC UNIT: Upper Cambrian carbonate rocks (Cc)			
LITHOLOGIC DESCRIPTION: Laminated to thinly bedded, variably cherty, algal, oolitic, silty, and silicified limestone interbedded with subordinate fissile siltstone and shale			
LOCAL GEOLOGIC UNIT: Middle Cambrian Harkless Formation			
REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (PZs)			
LITHOLOGIC DESCRIPTION: Interbedded sandstone, siltstone, and thinly bedded limestone; overlain by argillite and shale			
LOCAL GEOLOGIC UNIT: Lower Cambrian Poleta Formation			
REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (PZs)			
LITHOLOGIC DESCRIPTION: Interbedded gray, light-greenish-gray, olive, yellowish-brown, light-brown, brown, grayish-orange, and light-orange oolitic limestone, fine-grained to medium-crystalline limestone, siltstone, phyllitic siltstone, and fine-grained sandstone grading to limy sandstone and quartzite. Much of this rock is so altered that original rock types cannot be determined.			
LOCAL GEOLOGIC UNIT: Lower Cambrian and Late Proterozoic Campito Formation			
REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (PZs)			
LITHOLOGIC DESCRIPTION: Dark-greenish- to olive-gray, yellowish-gray, light-brown, and grayish-red, very fine-grained quartzite and minor siltstone, characteristically weathering black or stained orange from iron oxides; overlain by laminated to thinly bedded, greenish-gray siltstone that commonly is metamorphosed to greenish-yellow to olive phyllite. The cleavage of the phyllite typically is at an angle to bedding and more prominent. Hydrothermal alteration is less extensive in this formation than in the overlying Campito Formation.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Near the Imperial mine, the Lower Cambrian Campito and Poleta Formations were thrust eastward over the Middle to Upper Cambrian Emigrant Formation and Mule Springs Limestone, probably during the Jurassic or early Cretaceous period. Between the Jurassic and early Tertiary periods, diorite and gabbro dikes and small bodies of rhyolite intruded the Cambrian sedimentary rocks. From middle to late Tertiary time, diversely oriented, mostly high-angle, normal faults broke up the Cambrian sedimentary rocks into disjointed blocks. During the Late Miocene epoch, andesite, latite, and rhyolite lava flows, flow breccias, and ash-flow tuffs partly covered the previously deposited sedimentary and igneous rocks. Concurrent with Tertiary faulting and magmatic activity, Cambrian sedimentary rocks were metamorphosed and hydrothermally altered.			

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Gold, silver, and copper-bearing quartz veins occur at the Imperial mine in metamorphosed and hydrothermally altered limestone and shale of the Cambrian Campito and Poleta Formations, where they have been intruded by diorite and gabbro dikes and cut by high-angle faults. Previous exploration identified significant gold mineralization associated with narrow jasperoid bodies that crop out and occur underground over a strike length of 9,200 feet. During 2004, American Goldfields drilled six boreholes into an area that had been mined underground extensively and intersected stopes containing thin intervals of high-grade gold ore. In late 2004 and early 2005, American Goldfields confirmed the presence of high-grade gold and silver ore in previously mined areas by sampling rock from the two vertical mine shafts on the property. Subsequent drilling of 21 boreholes in a 1,500-long section that had not been tested previously failed to reveal any high-grade ore. American Goldfields interprets exploration results as an indication that the property might contain a "Carlin-style" gold deposit.

COMMODITIES: Gold and silver

OPERATING AND ABANDONED FACILITIES: The Imperial mine property was walked west to east along its entire length, culminating in inspection of the main shaft and waste dumps pad. A vertical shaft ≤250 feet deep, another vertical shaft ≤527 feet deep, a caved adit, prospect pits, ore piles, tailings pads, and outcrops of hydrothermally altered rock were observed. The Imperial mine has a history of intermittent exploration and mining dating to the 1920's. Exploration work in the 1980's included trenching, sampling, and drilling of 48 shallow boreholes. American Goldfields, Inc., has been exploring the mine property by sampling rock from mine shafts and by drilling, but it has failed to report any high-grade gold or silver ore in previously untested areas of the property.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Imperial mine is about 10 miles SW of MZ-1 station 880+00.

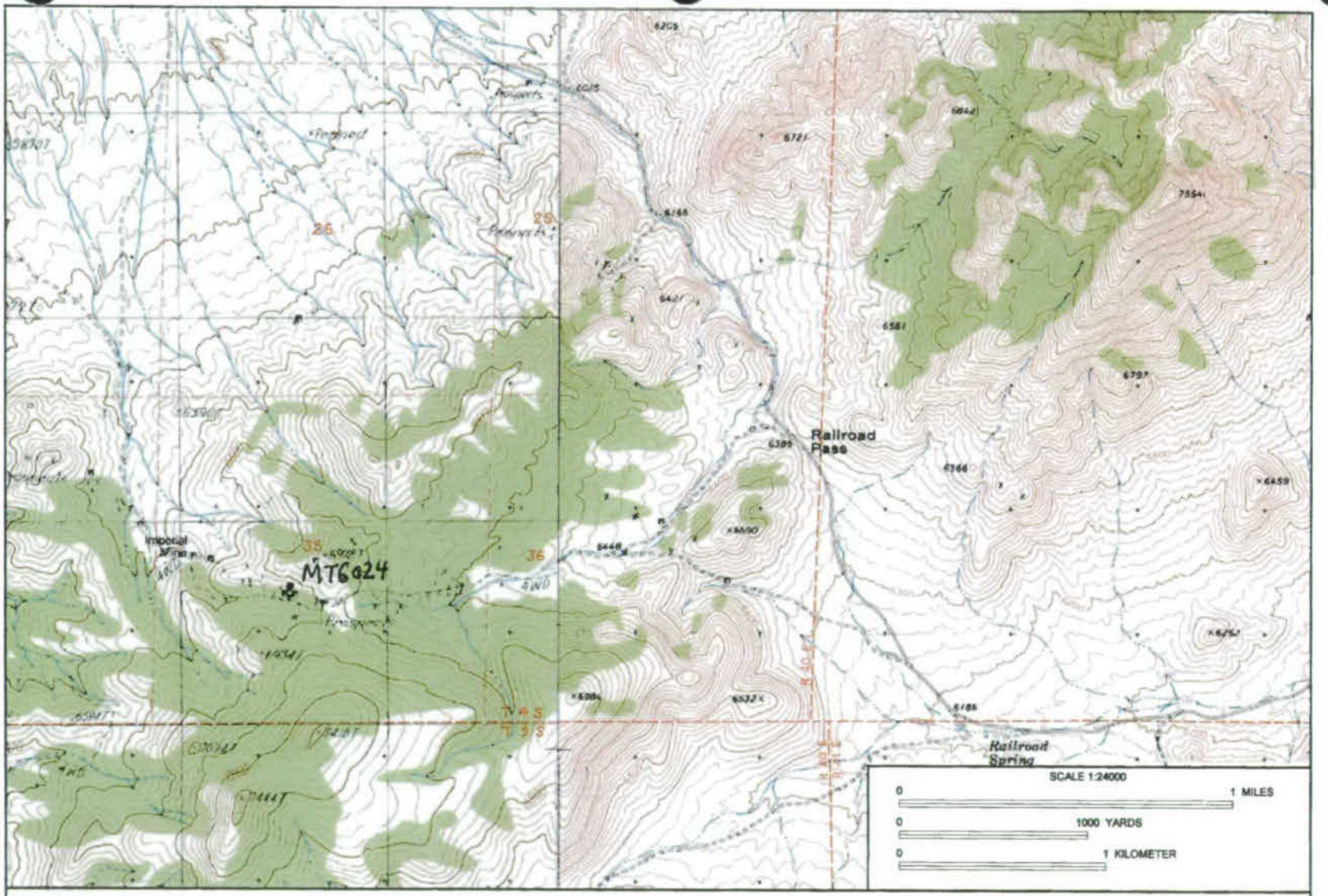
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6024_ALG_0379_03Dec06.jpg	MT6024	Vertical mine shaft at the Imperial mine, showing mineralization of altered Cambrian sedimentary rocks (AG748)
MT6024_ALG_0380_03Dec06.jpg	MT6024	Altered Cambrian sedimentary rocks above a collapsed mine shaft at the Imperial mine (AG749)
MT6024_ALG_0381_03Dec06.jpg	MT6024	Imperial mine tailings pad in Palmetto Mountains (AG751)
MT6024_ALG_0382_03Dec06.jpg	MT6024	Imperial Mine shaft excavated into altered Cambrian sedimentary rocks of the Emigrant or Poleta Formation (AG754)
MT6024_ALG_0383_03Dec06.jpg	MT6024	Imperial mine ore (AG756)
MT6024_ALG_0384_03Dec06.jpg	MT6024	Sunset over Imperial mine tailings pad (AG757)
MT6024_ALG_0385_03Dec06.jpg	MT6024	Imperial mine tailings pad (AG759)

CONTACTS: N/A

REFERENCES: Albers, J.P., and Stewart, J.H., 1972, Geology and mineral deposits of Esmeralda County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 78, 80 p.; Smith, P.L., and Tingley, J.V., 1983, A mineral inventory of the Esmeralda-Stateline resource area, Las Vegas district, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 83-11, 174 p; Meeuwig, R.O., ed., 2005, The Nevada mineral industry 2004: Reno, Nev., Nevada Bureau of Mines and Geology Mineral Industry publication MI-2004, 82 p; American Goldfields, Inc., unpublished data, accessed 2006, at http://www.americangoldfields.com.

ADDITIONAL COMMENTS



Name: LIDA WASH
Date: 12/29/2006
Scale: 1 inch equals 2000 feet

Location: 037° 33' 17.76" N 117° 29' 39.93" W NAD 27

Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Paul Zehfuss and Nell Beedle		MINE OR OTHER FEATURE: Red Ridge prospect	
DATE: 2/28/07		OWNER OR LESSEE: Walker River Indian Reservation	
TIME:		**MINING DISTRICT: Red Ridge**	
WEATHER: Cold, partially overcast		COUNTY: Mineral	
GEOGRAPHIC AREA: Red Ridge		GEOGRAPHIC COORDINATES (T, R, S): T13, R30, S13	
WAYPOINT: MT8140	LATITUDE: N 38.966506°	LONGITUDE: W 118.580174°	ALTITUDE: ~4285 ft AMSL

GEOGRAPHIC DESCRIPTION: Located in the southwestern portion of Red Ridge that forms the southern margin of Rawhide Flats.

LOCAL GEOLOGIC UNIT: Tertiary volcanic rocks (Utterback, 2002)

REGIONAL GEOLOGIC UNIT: Tertiary volcanic rocks (Utterback, 2002)

LITHOLOGIC DESCRIPTION: Rhyodacite, dacite, quartz latite, rhyolite and welded tuff (Utterback, 2002).

LOCAL GEOLOGIC UNIT: Cretaceous granite (Utterback, 2002)

REGIONAL GEOLOGIC UNIT: Cretaceous granite (Utterback, 2002)

LITHOLOGIC DESCRIPTION: Equigranular to porphyritic, coarse-grained granite (Utterback, 2002).

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Unable to visit site due to lack of access. Spatial relations unknown.

RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Unknown.

COMMODITIES: Unknown.

OPERATING AND ABANDONED FACILITIES: Unknown. No visible access to prospect area was recognized during field reconnaissance.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: Red Ridge prospect area is located approximately 1 to 2 miles east of the bypass alignment S6 station 117100+00.

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT8140_PHZ_210_28Feb07.jpg	MT8140	View north towards Red Ridge prospect (PZ661)

CONTACTS: N/A

REFERENCES: Utterback, W.C., 2002, Geology and mineral deposit potential of the Walker River Indian Reservation, Nevada: report prepared by Gold Properties Services for the Walker River Paiute Tribe, Schurz, NV, 176 p.

ADDITIONAL COMMENTS: Very little information was uncovered for the Red Ridge Prospect. Its exact location, condition, and mineralogic significance are not known.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Rock Hill and Broken Toe mines	
DATE: 12/05/06		OWNER OR LESSEE: Miranda Gold Corp.	
TIME: 11:50-12:30		**MINING DISTRICT: Rock Hill**	
WEATHER: Sunny and warm		COUNTY: Esmeralda	
WAYPOINT: MT6027	LATITUDE: N. 38.16508^0	LONGITUDE: W. 117.95399^0	ALTITUDE: ~4,740 ft AMSL
WAYPOINT: MT6029	LATITUDE: N. 38.15501^0	LONGITUDE: W. 117.94922^0	ALTITUDE: 4,618 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T4N, R36E, S34			
GEOGRAPHIC AREA: Candelaria Hills SE of Redlich Summit, about 10 miles NW of Coaldale, NV			
GEOGRAPHIC DESCRIPTION: The Rock Hill and Broken Toe mines and related mine workings are located in a hilly area adjacent to a Holocene to late Pleistocene alluvial fan that slopes NE from the Candelaria Hills. The Candelaria Hills fan merges in the vicinity of US-95 with a very large, lower-gradient, early to middle Pleistocene, alluvial fan that slopes SE off the Monte Cristo Range. The Rock Hill mine and the Mina rail corridor are located on the Monte Cristo Range fan. The Candelaria Hills alluvial fan is slightly dissected by east to ENE-draining washes, whereas the larger Monte Cristo Range fan is moderately dissected by SE-draining washes. Hilltops in the area of the Rock Hill and Broken Toe mines range from 4,988 to 5,164 feet AMSL. The lowest point in the area, where waypoint MT6029 was obtained on the Monte Cristo Range fan, is at 4,620 feet AMSL. Hence, relief in the area is about 550 feet.			
LOCAL GEOLOGIC UNIT: Quaternary alluvium			
REGIONAL GEOLOGIC UNIT: Early to middle Pleistocene fan alluvium (Qao)			
LITHOLOGIC DESCRIPTION: Loose to very dense, unconsolidated to limonite-indurated, reddish-brown, grayish-brown, and brown, silty, fine-grained sand, gravelly sand, and sandy gravel with calcrete intervals and abundant angular to subrounded, carbonate-coated cobbles and scattered boulders of volcanic and sedimentary rocks; covered with well-developed desert pavement and, in places, eolian sand and silt.			
LOCAL GEOLOGIC UNIT: Cretaceous or Jurassic Granite of Redlich			
REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic granitic rocks (KJg)			
LITHOLOGIC DESCRIPTION: Quartz monzonite porphyry and granodiorite, mottled yellow, orange, purple, gray, brown, and black from extensive hydrothermal alteration and oxidation of sulfides to iron and manganese oxides; extensively fractured (brecciated), with psilomelane, iron oxides, and gossan coating fractures; pervasively cut by mineralized quartz veins and shear zones. Original texture destroyed by alteration.			
LOCAL GEOLOGIC UNIT: Devonian to Cambrian sedimentary and volcanic rocks (Ordovician Palmetto Fm)			
REGIONAL GEOLOGIC UNIT: Devonian to Ordovician sedimentary and volcanic rocks (Dosv)			
LITHOLOGIC DESCRIPTION: Unit Dosv in the area of the Rock Hill and Broken Toe mines consists of sandstone, shale, limestone, and dolomite, that are metamorphosed in contact with the granite of Redlich to hornfels, slate, and skarn. The sedimentary rocks are cut by numerous very fractured, sulfide-bearing, quartz-calcite veins, with malachite coating fracture surfaces. Sedimentary rocks cut by these veins are heavily stained from oxidation of sulfide minerals within the veins.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Oldest rocks exposed in the area of the Rock Hill and Broken Toe mines are tightly folded Devonian to Ordovician marine sedimentary rocks. One or more gabbro dikes intruded the Devonian to Ordovician sedimentary rocks in Jurassic or Cretaceous time. The Granite of Redlich (mostly quartz monzonite to granodiorite) intruded the Paleozoic sedimentary rocks during the Jurassic or Cretaceous period and metamorphosed rocks in contact to hornfels, slate, and skarn. Also in the Mesozoic era, Permian to Triassic volcanic and sedimentary rocks near present-day Conglomerate Hill were thrust over Devonian to Ordovician sedimentary rocks. As driving forces for the thrusting apparently waned southward, blocks entirely composed of Devonian to Ordovician sedimentary rocks were thrust intraformationally in opposing directions. Hot fluids most likely rose along faults, altered rocks in the area, and left behind a variety of epithermal mineral deposits during the Tertiary period. During the Quaternary period, alluvial fans descended from the Candelaria Hills and Monte Cristo Range and partially concealed structural relationships among older geologic units.			

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: In the vicinity of the Rock Hill and Broken Toe mines, several zones containing diverse minerals are scattered over an area about 3,000 feet long by 1,000 feet wide. The Rock Hill mine penetrates faulted, intricately folded, and very fractured Devonian to Ordovician limestone, that was metamorphosed to skarn by a small body of Jurassic or Cretaceous granitic rocks. Quartz veins cutting the granitic intrusive contain molybdenite. Quartz and calcite veins cutting skarn in the Rock Hill mine, which are 4 inches to 2 feet wide, contain the tungsten minerals, scheelite and huebnerite, together with pyrite, fluorite, muscovite, and malachite. Scheelite also occurs as disseminated crystals in silicified limestone, as thin coatings along fractures, and as sand and gravel in Pleistocene fan alluvium downslope from the mine.

COMMODITIES: Tungsten, molybdenum, copper

OPERATING AND ABANDONED FACILITIES: The Rock Hill mine area, which consists of 13 unpatented lode claims, was explored from about 1962 to 1982 by several mining companies using drilling and surface methods. Exploration, which was especially intense from 1977 to 1982, destroyed most of the former workings around the Broken Toe mine, which appeared to date from 1930 to 1950. Several reports from this period indicate that the exploration left behind numerous bulldozer cuts, trenches, prospect pits, and drill pads along the trace of a NE-trending fault zone. The Rock Hill mine was excavated into silicified limestone skarn along this fault trend. The mine consists of a 20-feet-deep shaft, a 30-feet-long adit, and placer excavations downslope from the shaft. The mine produced about 200 units (1 unit = 20 Lbs) of tungsten in 1958 and from 1972 to 1979 by lode and placer methods. Nobody interviewed at the Tonopah and Carson City District offices of the BLM knew of plans to restart operations in the mine area.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The Rock Hill mine is 1.4 miles SW of MCS-1 station 3900+00. The east boundary of the claim block is as close to MCS-1 as 1,700 feet in the vicinity of the Rock Hill mine.

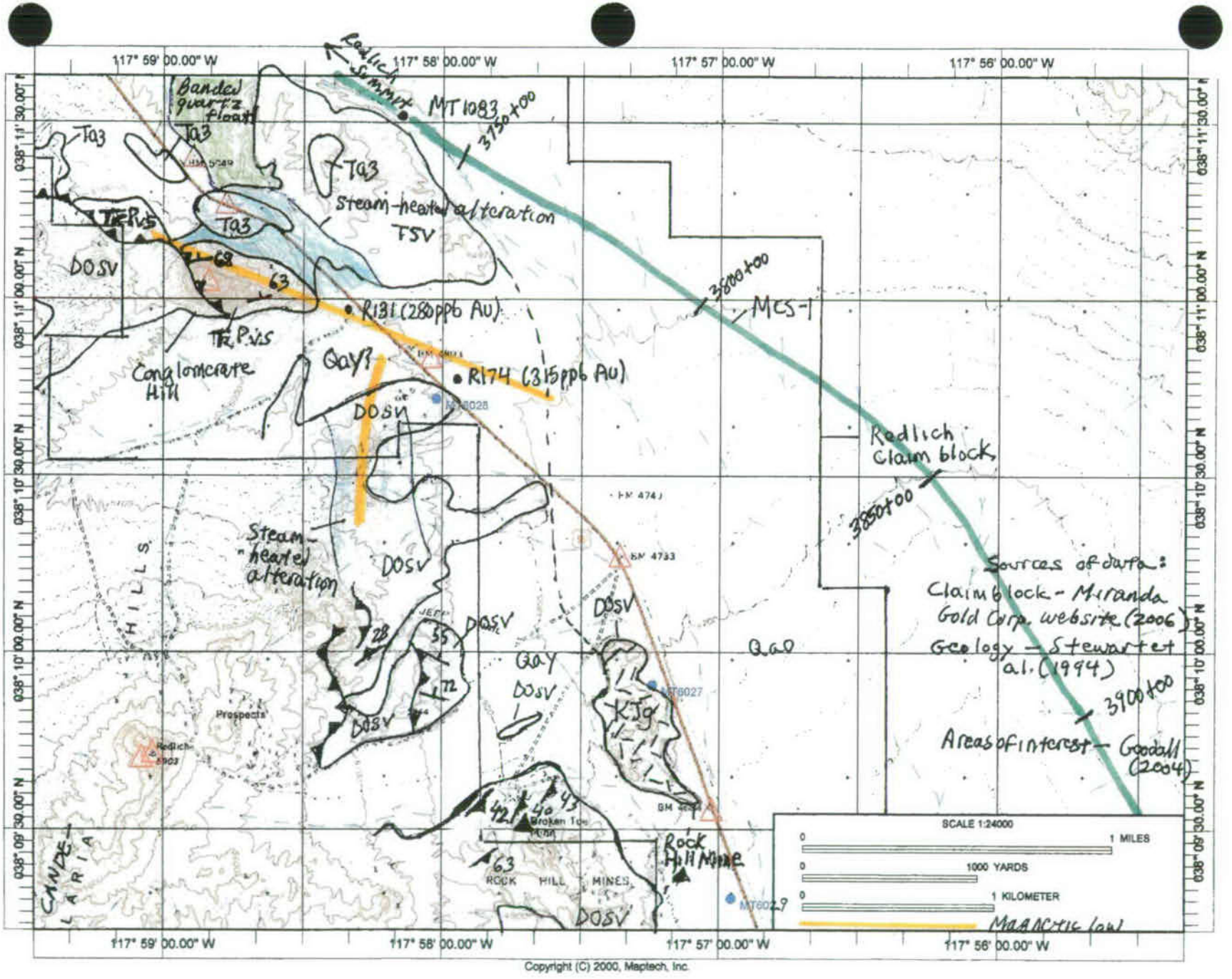
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6027_ALG_0399_05 Dec06.jpg	MT6027	Road cut in extensively fractured and altered Cretaceous Granite of Redlich, with prominent shear zones (AG790)
MT6029_ALG_0403_05 Dec06.jpg	MT6029	View west of Rock Hill mine in Devonian to Ordovician sedimentary rocks, Rock Hill mining district (AG795)
MT6029_ALG_0404_05 Dec06.jpg	MT6029	View north of exploration trench excavated in scheelite (tungsten) bearing alluvium north of the Rock Hill placer mine; hill of Cretaceous Granite of Redlich in the distance (AG796)

CONTACTS: N/A

REFERENCES: Smith, P.L., and Tingley, J.V., 1983, A mineral inventory of the Esmeralda-Stateline resource area, Las Vegas district, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 83-11, 174 p; Stager, H.K., and Tingley, J. V., 1988, Tungsten deposits in Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 105, 256 p.; Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500; Nevada Bureau of Mines and Geology, accessed 2006, unpublished mining district files: available on the internet at http://www.nbmg.unr.edu.

ADDITIONAL COMMENTS: Although they are located in the Redlich claim block, the Rock Hill and Broken Toe mines are discussed separately from other possible exploration targets in the claim block because of their history as working mines.


117° 59' 00.00" W
117° 58' 00.00" W
117° 57' 00.00" W
117° 56' 00.00" W
038° 11' 30.00" N
038° 11' 00.00" N
038° 10' 30.00" N
038° 10' 00.00" N
038° 09' 30.00" N
Redlich Summit
MT1083
3750+00
Banded quartz float
Ta3
Steam-heated alteration
TSV
DOSV
68
63
R131 (280ppb Au)
3800+00
MCS-1
Conglomerate Hill
Qay?
R174 (315ppb Au)
Redlich Claim block
3850+00
Steam-heated alteration
DOSV
Sources of data:
Claim block - Miranda Gold Corp. website (2006)
Geology - Stewart et al. (1994)
Qao
Qay
KJg
3900+00
Areas of interest - Goodall (2004)
Prospects
Redlich
Broken Toe Mine
Rock Hill Mine
ROCK HILL MINES
CANDELARIA HILLS
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Magnetic low
Copyright (C) 2000, Maptech, Inc.

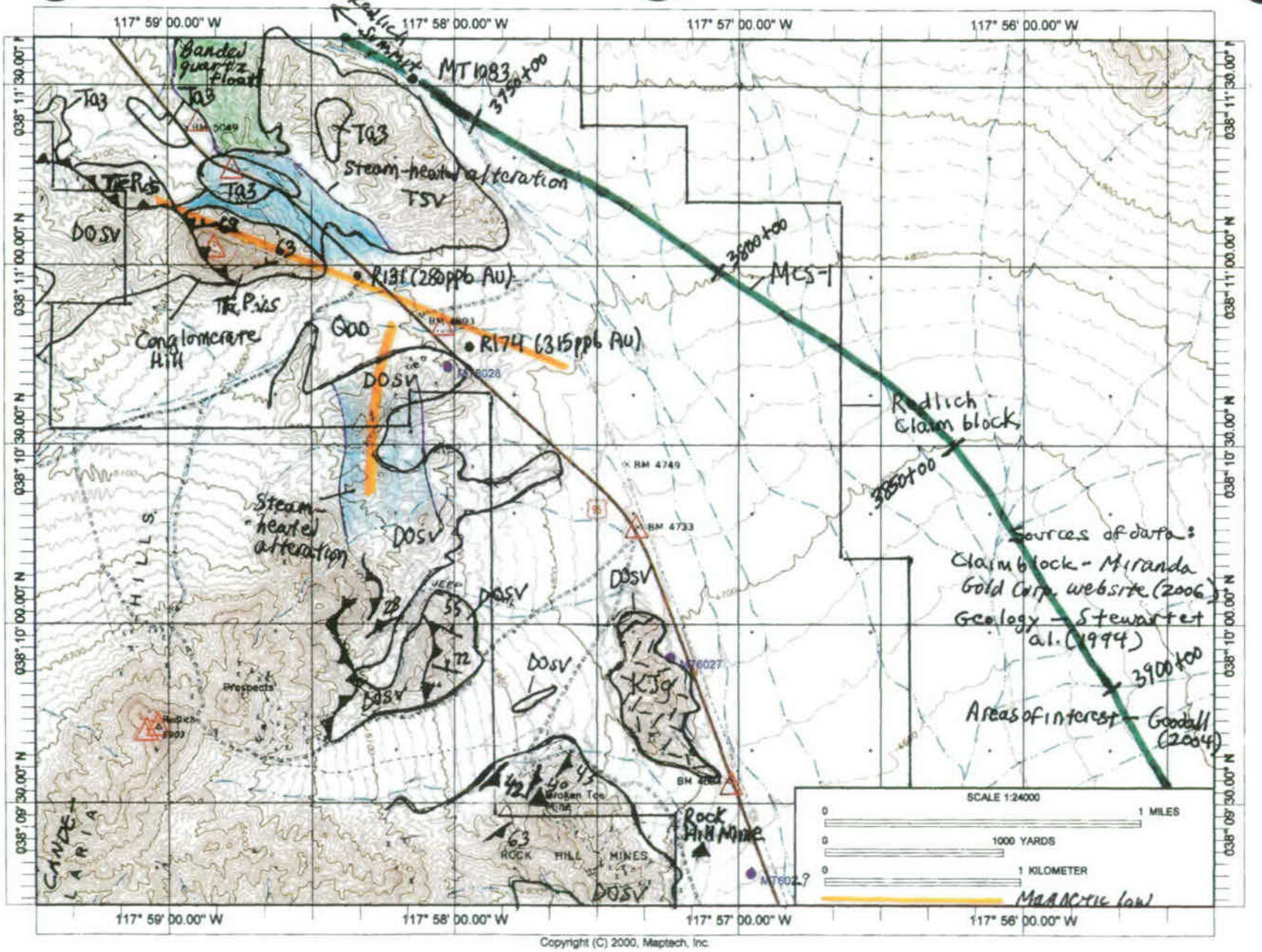
INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Redlich claims	
DATE: 12/05/06		OWNER OR LESSEE: Miranda Gold Corp.	
TIME: 11:10-11:50		**MINING DISTRICT: Rock Hill**	
WEATHER: Sunny and warm		COUNTY: Esmeralda	
WAYPOINT: MT6028	LATITUDE: N. 38.17862^0	LONGITUDE: W. 117.96702^0	ALTITUDE: 4,871 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T4N, R36E, S16-17, 20-23, and 26-29			
GEOGRAPHIC AREA: Candelaria Hills SE of Redlich Summit, about 10 miles NW of Coaldale, NV			
GEOGRAPHIC DESCRIPTION: The 122 lode claims that comprise the Redlich project are located in an area of the Candelaria Hills where low hills are separated from each other by Holocene to late Pleistocene alluvial fans, that slope in all directions away from the hills. On the east side of the claim block, alluvial fans from the Candelaria Hills merge with a very large, lower-gradient, early to middle Pleistocene, alluvial fan that slopes south to SE from the Monte Cristo Range. The Candelaria Hills are slightly dissected by washes that curve around the north end of the hills and eventually trend SE. The larger Monte Cristo Range fan is moderately dissected by washes that drain south to SSE. U.S. Highway 95 and the Mina rail corridor run through the claim block. All areas actively being explored are located SW of the MRC. Conglomerate Hill, the highest hill in the area, has a summit altitude of 5,530 feet AMSL; other hilltops typically range from 5,100 to 5,350 feet AMSL. The lowest point in the area, on the Monte Cristo Range alluvial fan near waypoint MT6027, is at 4,700 feet AMSL. Hence, relief in the area is about 830 feet.			
LOCAL GEOLOGIC UNIT: Quaternary alluvium			
REGIONAL GEOLOGIC UNIT: Early to middle Pleistocene fan alluvium (Qao)			
LITHOLOGIC DESCRIPTION: Loose to very dense, unconsolidated to limonite-indurated, reddish-brown, grayish-brown, and brown, silty, fine-grained sand, gravelly sand, and sandy gravel with calcrete intervals and abundant angular to subrounded, carbonate-coated cobbles and scattered boulders of volcanic and sedimentary rocks; covered with well-developed desert pavement and, in places, eolian sand and silt.			
LOCAL GEOLOGIC UNIT: Middle Miocene (15-16 Ma) andesite of Candelaria Hills			
REGIONAL GEOLOGIC UNIT: Late to middle Miocene intermediate lava flows, flow breccias, and lahars (Ta4)			
LITHOLOGIC DESCRIPTION: High to very high-strength, andesite to dacite lava flows, flow breccia, lahars, volcaniclastic rocks, and ash-flow tuff, with closely to widely spaced fractures, ≤4 feet apart. A columnar-jointed lava flow observed in the Candelaria Hills NW of the Redlich claims was medium-gray (weathering reddish-brown), finely crystalline, foliated, and fresh to slightly weathered andesite. Overlying this flow was purple (weathering olive-brown), crystal-rich, lithic-poor, slightly lithophysal (vesicular), foliated, fresh to moderately weathered, dacitic(?), densely welded ash-flow tuff.			
LOCAL GEOLOGIC UNIT: Middle Miocene (16-17 Ma) sedimentary and volcanic rocks, undivided			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks (Tsv)			
LITHOLOGIC DESCRIPTION: High to very high-strength, light-gray to light-green, crystal-rich (plagioclase, hornblende, and biotite phenocrysts in a fine-grained matrix), fresh to slightly weathered, nonwelded dacite(?) ash-flow tuff, which erodes readily to gravelly talus. Talus contains large concentrations of banded quartz and is believed to conceal sedimentary rocks that are stained orange-brown from steam-heated alteration. Fractures in small outcrops appear to be very closely to medium-spaced (≤1 foot apart).			
LOCAL GEOLOGIC UNIT: Cretaceous gabbro dikes			
REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic mafic intrusive rocks (KJm)			
LITHOLOGIC DESCRIPTION: Gabbro, mottled dark-gray, orange, purple, and dark-greenish-yellow from slight to moderate hydrothermal alteration, veined with calcite, and cut by shear zones filled with calcite and clayey gouge.			
LOCAL GEOLOGIC UNIT: Mesozoic or Paleozoic sedimentary breccia (Triassic Excelsior Formation)			
REGIONAL GEOLOGIC UNIT: Triassic and Permian metamorphic, sedimentary, and volcanic rocks (TrPvs)			
LITHOLOGIC DESCRIPTION: Massive chert-quartzite breccia			
LOCAL GEOLOGIC UNIT: Permian Diablo Formation			
REGIONAL GEOLOGIC UNIT: Permian and Pennsylvanian sedimentary rocks (PPs)			

LITHOLOGIC DESCRIPTION: Sandstone, gravelly (chert-quartz-clast) sandstone, and conglomerate
LOCAL GEOLOGIC UNIT: Devonian to Cambrian sedimentary and volcanic rocks (Ordovician Palmetto Fm)
REGIONAL GEOLOGIC UNIT: Devonian to Ordovician sedimentary and volcanic rocks (Dosv)
LITHOLOGIC DESCRIPTION: Thinly bedded, light-gray to black chert and argillite, black shale, light-brown siltstone grading to fine-grained sandstone, sparse to abundant yellowish-gray, fine to coarse-grained quartzite, and minor limestone; metamorphosed in contact with the granite of Redlich to hornfels, slate, and skarn; cut by numerous very fractured, sulfide-bearing, quartz and calcite veins; heavily stained locally from oxidation of sulfide minerals within veins.
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Oldest rocks exposed in the area of the Redlich claims are folded Devonian to Ordovician marine sedimentary rocks, which are overlain unconformably south of Redlich Summit by conglomerate in the Permian Diablo Formation. Sedimentary breccia deposited during the Triassic period, was later thrust over the Paleozoic rocks. In Jurassic or Cretaceous time, gabbro dikes and the Granite of Redlich (ranging from quartz monzonite to granodiorite) intruded the Paleozoic sedimentary rocks. Paleozoic rocks in contact with this intrusive were metamorphosed to hornfels, slate, and skarn. During the middle Miocene epoch, 14-17 million years ago, ash-flow tuffs and sedimentary rocks were deposited, subsequently blanketed by andesite lava flows, and then partially exposed as the lava flows were eroded and mixed with other detritus to form fanglomerates. During mid- to late Tertiary time, hot fluids rose along fault conduits, altered rocks in the area, and left behind epithermal mineral deposits. During the Quaternary period, alluvial fans descended from the Candelaria Hills and Monte Cristo Range.
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Quartz-adularia-pyrite-chalcopyrite-sericite veins cutting lower Paleozoic sedimentary rocks and Miocene volcanic rocks contain anomalous quantities of gold. Silicified limestone adjacent to these veins contains erratically distributed quantities of disseminated gold. Both types of deposits are related to northerly and northwesterly trending zones of steam-heated, acid-sulfate alteration. Northerly and northwesterly trending magnetic lows associated with zones of steam-heated alteration have been drilled and were found to contain anomously large gold concentrations in two boreholes (R131 and R174). In the NE corner of the property, an area of Tertiary fanglomerate with an unusually large amount of cobble- to boulder-sized clasts of banded, crustiform quartz is being drilled extensively, because banded quartz veins in this area are associated with gold deposits. Another area receiving attention is the fault which thrust Triassic rocks over Permian to Ordovician rocks. Considerable sericite (which is associated with gold in quartz veins) is found at the surface along this structure.
COMMODITIES: Gold
OPERATING AND ABANDONED FACILITIES: Because fences with locked gates prevented access to the property, all observations were made from U.S. Highway 95. From the highway, no mine shafts or adits were observed. Bulldozer cuts and prospect pits could be seen on the south side of Conglomerate Hill. The surface area below and NE of Redlich Summit appears to have been disturbed by shallow excavations.
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: Alignment MCS-1 passes through the Redlich claims and is ≤1,000 to 4,000 feet away from areas that are actively being explored for gold deposits.

PHOTOGRAPHS

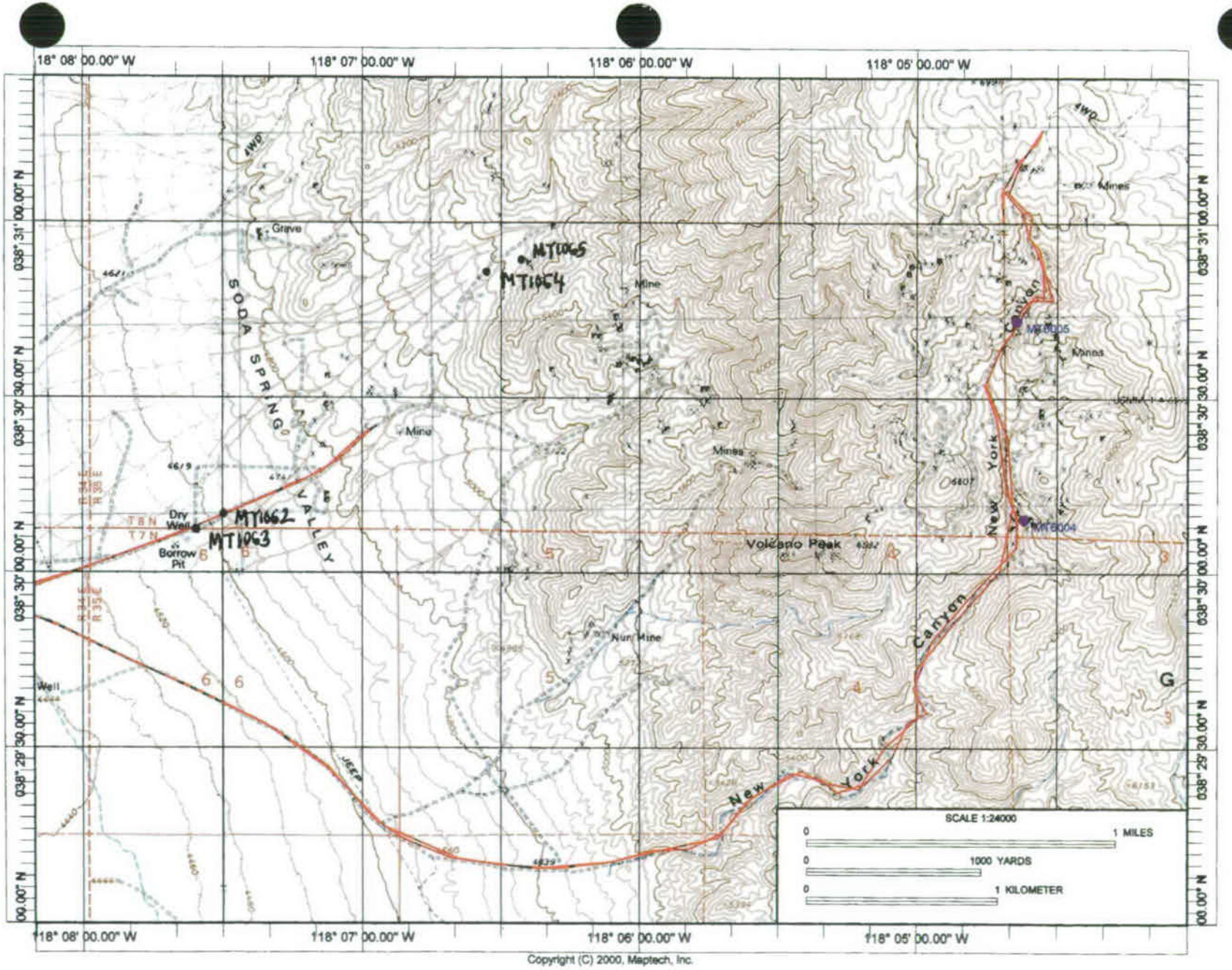
NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT1083_ALG_0263_13 Oct06.jpg	MT1083	View west of nonwelded ash-flow tuff adjacent to the Mina rail corridor in the Redlich claim block (AG601)
MT6028_ALG_0400_05 Dec06.jpg	MT6028	Slightly altered gabbro dike cutting Devonian to Ordovician sedimentary rocks exhibiting steam-heated alteration (AG791)
MT6028_ALG_0401_05 Dec06.jpg	MT6028	View north of Conglomerate Hill, underlain by Devonian to Ordovician sedimentary rocks and Permian (?) sedimentary breccia (AG792)
MT6028_ALG_0402_05 Dec06.jpg	MT6028	View NE from Redlich Summit of an area being drilled for gold anomalies because of large amounts of banded quartz float (AG794)

CONTACTS: N/A
REFERENCES: Smith, P.L., and Tingley, J.V., 1983, A mineral inventory of the Esmeralda-Stateline resource area, Las Vegas district, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 83-11, 174 p.; Stewart, J.H., Kelleher, P.C., and Zorich, E.A., 1994, Geologic map of the Monte Cristo Range area, Esmeralda and Mineral Counties, Nevada: U.S. Geological Survey, Miscellaneous Field Studies Map MF-2260, scale 1:62,500; Goodall, Geoffrey, 2004, Summary report and exploration proposal on the Redlich gold prospect, Esmeralda County, Nevada: Global Geological Consultants, Ltd., 25 p.; Miranda Gold Corp., accessed 2006, unpublished status report on Redlich project: available on the internet at http://www.mirandagold.com; Nevada Bureau of Mines and Geology, accessed 2006, unpublished mining district files: available on the internet at http://www.nbmg.unr.edu.
ADDITIONAL COMMENTS:


117° 59' 00.00" W
117° 58' 00.00" W
117° 57' 00.00" W
117° 56' 00.00" W
038° 11' 30.00" N
038° 11' 00.00" N
038° 10' 30.00" N
038° 10' 00.00" N
038° 09' 30.00" N
Redlich Summit
MT 1983
3750+00
3800+00
3850+00
3900+00
MCS-1
Redlich Claim block
Banded quartz float
Tq3
Steam-heated alteration
TSV
TERvs
DOSV
R131 (280ppb Au)
R174 (315ppb Au)
Conglomerate Hill
Qoo
Steam-heated alteration
HILLS
Prospects
KJg
Rock Hill Mine
ROCK HILL MINES
CANDELARIA
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Magnetic low
Sources of data:
Claim block - Miranda Gold Corp. website (2006)
Geology - Stewart et al. (1994)
Areas of interest - Goodell (2004)
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon	MINE OR OTHER FEATURE: Mildred and Copper Queen claims		
DATE: 10/11/06	OWNER OR LESSEE: Claim filed by James Fredle, Ridgecrest, CA; now in a claim block being evaluated by Aberdene Mines, Ltd.		
TIME: 08:45			
WEATHER: Sunny and cool			
COUNTY: Mineral			
MINING DISTRICT: Santa Fe	GEOGRAPHIC COORDINATES (T, R, S): T18N, R35E, S31 SW		
WAYPOINT: MT1063	LATITUDE: N. 38.50204^0	LONGITUDE: W. 118.12645^0	ALTITUDE: 4,582 feet AMSL
GEOGRAPHIC AREA: West side of Gabbs Valley Range, where the range merges with Soda Spring Valley			
GEOGRAPHIC DESCRIPTION: The mine shaft is located on an alluvial fan that slopes SW toward Soda Spring Valley. The alluvial fan is moderately dissected by washes less than 10 feet deep that slope west to SW toward Soda Spring Valley. These washes carry seasonal runoff and are dry for most of the year.			
LOCAL GEOLOGIC UNIT: Older fan alluvium			
REGIONAL GEOLOGIC UNIT: Early to middle Pleistocene fan alluvium (Qao)			
LITHOLOGIC DESCRIPTION: Near the mine shaft, the fan alluvium is very dense, light-brown, slightly silty, sandy gravel (GP) with common to abundant cobbles and rare to scattered boulders to 18 inches in diameter. The angular to subrounded clasts are formed from sedimentary and volcanic rocks, and many are coated with calcium carbonate.			
LOCAL GEOLOGIC UNIT: Tertiary feldspar porphyry intrusive			
REGIONAL GEOLOGIC UNIT: Tertiary intrusive rocks (Ti)			
LITHOLOGIC DESCRIPTION: White to buff, porphyritic intrusive rock containing feldspar phenocrysts. In the former mine dumps at the site, this material was sparsely to very fractured and slightly to very stained with iron oxide. The oxidized intrusive contained abundant blue and green copper oxide minerals and a molybdenum mineral identified by laboratory analyses to be powellite.			
LOCAL GEOLOGIC UNIT: Jurassic and Triassic Volcano Peak Formation (also called Sunrise and Gabbs Formations)			
REGIONAL GEOLOGIC UNIT: Jurassic and Triassic locally metamorphosed sedimentary rocks (JTRs)			
LITHOLOGIC DESCRIPTION: Dark-gray, thinly bedded, fine-grained limestone and light-brown, fossiliferous limestone interbedded with calcareous mudstone, argillite, and minor sandstone.			
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): No rock crops out at or near the mine shaft. A contact between the Volcano Peak Formation and a Tertiary porphyritic intrusive beneath a veneer of Pleistocene fan alluvium was hypothesized from the distribution of material in the former mine dumps..			
MINERALS AND ENERGY RESOURCES: The unpublished report written by James Fredle and submitted to NBMG contains a cross-section that postulates the relation of mineralization to geologic units known to crop out in the hills east and south of the alluvial fan. In this interpretation, intrusion of porphyry metamorphosed the Mesozoic sedimentary rocks near the intrusive contact to silicified skarn. Adjacent to this contact, blue and green copper oxide minerals, including chrysocolla, malachite, and possibly turquoise, and the molybdenum mineral, powellite, formed in the fractured and oxidized intrusive.			
COMMODITIES: Copper and molybdenum			
OPERATING AND ABANDONED FACILITIES: There is a 224-ft deep vertical mine shaft adjacent to a wide, bladed, dirt and gravel road. The shaft is shored with wood and contains a ladder. A report on file with the NBMG indicates that the shaft formerly was surrounded by a large tailings pile containing abundant blue and green copper oxide minerals.			
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine shaft is 700 feet WSW of MCS-1 station 2417+00 and about 50 feet vertically below the alignment.			

PHOTOGRAPHS		
NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT1062_ALG_0184_10Oct06.jpg	MT1062	View NW along MCS-1 on Gabbs Valley Range alluvial fan (AG505)
MT1062_ALG_0185_10Oct06.jpg	MT1062	View SW to Soda Spring Valley along the Gabbs Valley Range alluvial fan (AG506)
MT1062_ALG_0186_10Oct06.jpg	MT1062	Pleistocene sandy gravel underlying Gabbs Valley Range alluvial fan near the mine shaft (AG507)
MT1063_ALG_0187_11Oct06.jpg	MT1063	View west of a vertical mine shaft excavated into Gabbs Valley range fan alluvium, Mildred & Copper Queen claims (AG508)
MT1063_ALG_0188_11Oct06.jpg	MT1063	Warning sign posted on fence around vertical mine shaft excavated through fan alluvium to a copper-molybdenum ore body (AG509)
MT1064_ALG_0189_11Oct06.jpg	MT1064	Folded and faulted Triassic Luning Formation at the head of the alluvial fan (AG510)
CONTACTS: N/A		
REFERENCES: Ekren, E.B., and Byers, F.M., Jr., 1985a, Geologic map of the Gabbs Mountain, Mount Ferguson, Luning, and Sunrise Flat quadrangles, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I-1577, scale 1:48,000; Oldow, J.S., and Dockery, H.A., 1993, Geologic map of the Mina quadrangle, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Field Studies Map FS-6, scale 1:24,000; Fredle, James, undated, Information on the Mildred and Copper Queen No. 1 and No. 2 claims, Santa Fe mining district, Mineral County:		
ADDITIONAL COMMENTS:		


118° 08' 00.00" W
118° 07' 00.00" W
118° 06' 00.00" W
118° 05' 00.00" W
038° 31' 00.00" N
038° 30' 30.00" N
038° 30' 00.00" N
038° 29' 30.00" N
038° 29' 00.00" N
MT1065
MT1064
MT1062
MT1063
MT1005
MT1004
SODA SPRING VALLEY
New York Canyon
Volcano Peak
Dry Well
Borrow Pit
Well
Mine
Mines
Grave
Num Mine
JEEP
4WD
SCALE 1:24000
1 MILES
1000 YARDS
1 KILOMETER
Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: New Santa Fe mines, a consolidation of several older mines, including the Isabella mine.	
DATE: 11/28/06		OWNER OR LESSEE: Homestake Mining Co. operated an open-pit mine and processed ore by heap leaching from 1991 to approxomately 1996.	
TIME: 09:56			
WEATHER: Sunny and cold			
COUNTY: Mineral			
MINING DISTRICT: Santa Fe		GEOGRAPHIC COORDINATES (T, R, S): T8N, R35E, S06 and T9N, R34E, S36	
WAYPOINT: MT6002	LATITUDE: N. 38.58176^0	LONGITUDE: W. 118.12229^0	ALTITUDE: 5,827 feet AMSL
WAYPOINT: MT6003	LATITUDE: N. 38.59809^0	LONGITUDE: W. 118.10794^0	ALTITUDE: 6,331 feet AMSL

GEOGRAPHIC AREA: Calvada Pass, Todd Mountain, Gabbs Valley Range

GEOGRAPHIC DESCRIPTION: Calvada Pass is bordered by low mountain peaks, with summit altitudes that approach 7,000 feet AMSL. Washes drain ephemerally west to Soda Spring Valley and east to Giroux Valley. Relief in the area of the mines is about 2,000 feet.

LOCAL GEOLOGIC UNIT: Oligocene (26.3-28 Ma) Guild Mine Member of Mickey Pass Tuff

REGIONAL GEOLOGIC UNIT: Oligocene ash-flow and ash-fall tuffs of silicic to intermediate composition (Tt2)

LITHOLOGIC DESCRIPTION: Light-red, densely welded, crystal-rich (quartz, potassium feldspar, plagioclase feldspar, biotite, and pyroxene), rhyolitic ash-flow tuff, grading downward to crystal-poor, rhyodacitic ash-flow tuff. Alteration is common. Altered rhyolitic tuff is pastel yellow, green, and tan, whereas the altered rhyodacitic tuff is dark rusty brown.

LOCAL GEOLOGIC UNIT: Cretaceous quartz monzonite

REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic granitic rocks (KJg)

LITHOLOGIC DESCRIPTION: At waypoint MT1059, the rock is very high to high-strength, light-gray, medium-grained phaneritic, fresh to moderately weathered, quartz monzonite with ~10% biotite. Weathering along three prominent, rectangular fracture sets results in rounded to subrounded outcrops with orange, brown, red, and light-gray weathering rinds, that can be several inches thick. Although fractures are closely to very widely spaced, most are 1-3 feet apart.

LOCAL GEOLOGIC UNIT: Triassic Luning Formation

REGIONAL GEOLOGIC UNIT: Jurassic and Triassic locally metamorphosed sedimentary rocks (JTRs)

LITHOLOGIC DESCRIPTION: A section of Luning Formation near MT6002 (at waypoint MT1065), estimated to be about 33 feet thick, consists of interbedded, generally medium-high to very high-strength, white, light-gray, and dark-gray, laminated to thickly bedded, finely to coarsely crystalline, dolomitic limestone and limestone (locally recrystallized to marble), and shaly, fine-grained, calcareous dolomite. Thin seams of reddish-orange and yellow-weathering, cherty(?) limestone occur within shaly dolomite intervals. Fractures are extremely closely to medium-spaced (<1 inch to 2 feet apart), with an RQD estimated to be <50% in the measured section. At MT6002, emplacement of quartz monzonite metamorphosed and metasomatized the Luning Formation into white and brown, coarsely crystalline marble and grayish-green skarn, containing garnet, pyrite, and chalcopyrite.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): About 70 million years ago, quartz monzonite and other granitic plutons intruded and metamorphosed Mesozoic rocks (mainly the Triassic Luning Formation) along intrusive contacts, creating areas of skarn at the interface between the igneous and sedimentary rocks. Hot solutions replaced sedimentary rocks with gold, silver, and other metals in economic quantities along the margins of plutons. Subsequently, Oligocene and early Miocene tuff sheets spread over previously deposited sedimentary and igneous rocks. Basin-and Range and younger high-angle faults offset and tilted older rocks, starting in mid-Miocene time.

MINERALS AND ENERGY RESOURCES: Economic gold-silver deposits occur as sheeted and pipe-like bodies within a 50-1,000-feet wide breccia zone in carbonate rocks of the Luning Formation. This breccia consists of finely to coarsely crystalline, gray and brown limestone and marble, that have been variably argillized, sericitized, dolomitized, and silicified. Economic oxide mineralization occurs only in areas of highly faulted and fractured rock within the breccia zone. Precious metals occur as native gold, electrum, and argentum (?); associated minerals include pyrite, marcasite, chalcopyrite, stibnite, and cinnabar; gangue and skarn minerals include jasperoid, quartz, barite, calcite, garnet, and epidote.

COMMODITIES: Gold, silver, and mercury

OPERATING AND ABANDONED FACILITIES: Dan Erbys, a minerals specialist at the BLM office in Carson City, reported that active drilling is occurring at the Isabella mine, just west of the Santa Fe mine, and that interest in reviving activity at the Wildhorse Canyon and Isabella mines and the Zapot topaz claim has been expressed.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: From its intersection with U.S. 95 at Luning, Nev., Nevada Highway 361 proceeds NNE up an alluvial fan descending from the Gabbs Valley Range. The road makes an abrupt turn to the east at the north end of Todd Mountain, and, from there, it rises steadily toward Calvada Summit. Near this summit, partially reclaimed workings of the Santa Fe mine are visible on the south side of the highway. At this point, the road is about 6 miles NE of MCS-1 station 2200+00 and about 7 miles north of Luning.

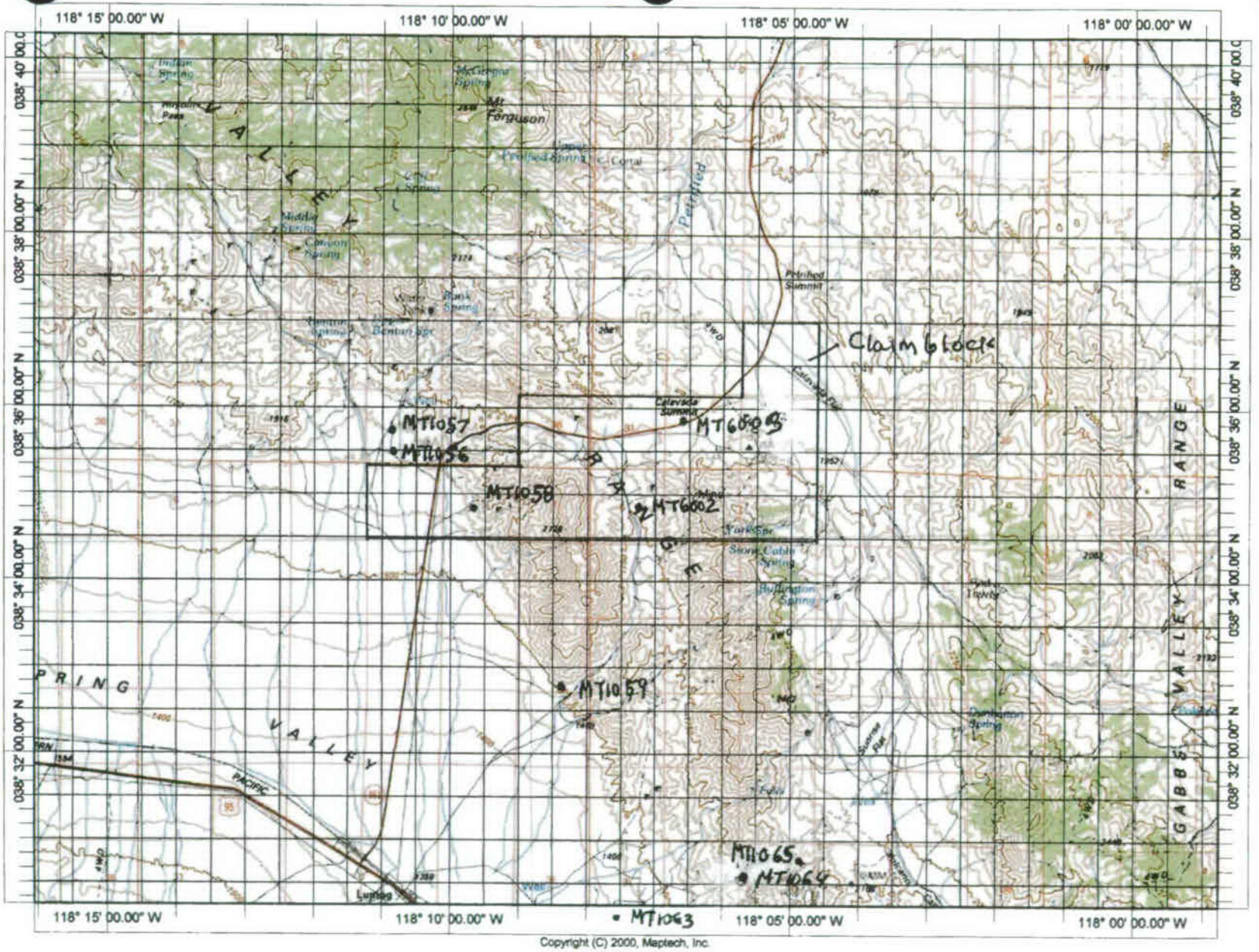
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT1057_ALG_0167_10Oct06.jpg	MT1057	Altered Oligocene Mickey Pass Tuff and Jurassic diorite, Todd Mountain (AG486)
MT1059_ALG_0176_10Oct06.jpg	MT1059	Cretaceous quartz monzonite pluton, Todd Mountain, SW of the New Santa Fe mine (AG496)
MT1064_ALG_0189_11Oct06.jpg	MT1064	View NE of folded and faulted limestone in the Triassic Luning Formation, Todd Mountain (AG510)
MT1065_ALG_0190_11Oct06.jpg	MT1065	Outcrop of limestone, dolomitic limestone, and shaly dolomite in the Luning Formation (AG511)
MT6002_ALG_0316_28Nov06.jpg	MT6002	New Santa Fe mine in JTrs, reclaimed tailings, south side of Highway 361 (AG655)
MT6004_ALG_0314_28Nov06.jpg & MT6002_ALG_0315_28Nov06.jpg	MT6002	Pan NW of reclaimed tailings, leach pond, & power facilities in JTrs, Santa Fe mine (AG652) New Santa Fe mine, leech pond, tailings & power lines in JTrs (AG654)
MT6002_ALG_0317_28Nov06.jpg	MT6002	View east of hydrothermally altered limestone in the Triassic Luning Formation, Todd Mountain (AG656)
MT6002_ALG_0318_28Nov06.jpg	MT6002	View west of Isabella(?) mine tailings from the New Santa Fe mine (AG658)
MT6003_ALG_0319_28Nov06.jpg	MT6003	View south of open-pit mine in hydrothermally altered Luning Formation (AG659)

CONTACTS: David A. Davis, Nevada Bureau of Mines and Geology, Reno, Nevada

REFERENCES: Ekren, E.B., and Byers, F.M., Jr., 1985a, Geologic map of the Gabbs Mountain, Mount Ferguson, Luning, and Sunrise Flat quadrangles, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I-1577, scale 1:48,000; Fiannaca, M., 1987; Geology of the Santa Fe gold-silver deposit, Mineral County, Nevada, in Johnson, J. L., ed., Bulk mineable precious metal deposits of the western United States: The Geological Society of Nevada, Guidebook for Fieldtrips, p. 233-239; Tingley, J. V., 1990, Mineral resource inventory, Bureau of Land Management, Carson City District, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 90-1, 259 p.; Long, K.R., DeYoung, J.H., Jr., and Ludington, D.D., 1998, Database of significant deposits of gold, silver, copper, lead, and zinc in the United States, Part A: Description and analysis: U.S. Geological Survey Open-File Report 98-206A, 60 p. and an online database; Davis, D.A, 2005, Active metal and industrial mineral mines in Nevada – 2004: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report OF-05-12.

ADDITIONAL COMMENTS: Waypoints MT1057, MT1059, MT1064, and MT1065 were obtained during geotechnical field reconnaissance; information about these waypoints can be found in in the geotechnical reconnaissance report.



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: New York Canyon mines		
DATE: 11/28/06	OWNER OR LESSEE: In March 2004, Aberdene Mines, Ltd. acquired the rights to explore 4,890 acres of mining claims held by Nevada Sunrise LLC in New York Canyon. In July 2004, Aberdene acquired 18 patented mining claims held by Jaycor Mining Co. in this same area. A note inside a film canister nailed to a claimstake confirmed that Nevada Sunrise was a claim holder in this area.		
TIME: 14:13			
WEATHER: Sunny and cold			
COUNTY: Mineral			
MINING DISTRICT: Santa Fe	GEOGRAPHIC COORDINATES (T, R, S): T8N, R35E, S34		
WAYPOINT: MT6004	LATITUDE: N. 38.50242^0	LONGITUDE: W. 118.07787^0	ALTITUDE: 6,139 feet AMSL
WAYPOINT: MT6005	LATITUDE: N. 38.51194^0	LONGITUDE: W. 118.07828^0	ALTITUDE: 6,466 feet AMSL.

GEOGRAPHIC AREA: New York Canyon, Todd Mountain, Gabbs Valley Range

GEOGRAPHIC DESCRIPTION: New York Canyon is incised into a hilly area on the west side of the Gabbs Valley Range. Peak altitudes range from about 6,920 feet AMSL at the northern end of the mining area to 6,582 feet AMSL on Volcano Peak, at the southern end of the mining area. New York Canyon gradually becomes more deeply incised from the upper to the lower end of the mining area. Relief exceeds 500 feet where the canyon emerges from the area.

LOCAL GEOLOGIC UNIT: Late Miocene (5.3-6.9 Ma) latite lava flows

REGIONAL GEOLOGIC UNIT: Late to middle Miocene lava flows, flow breccias, and lahars of mostly intermediate composition (Ta4)

LITHOLOGIC DESCRIPTION: at wpts MT1010 and MT1011, unit Ta4 generally consists of moderate to very high-strength, dark-gray to black, glassy to finely crystalline, fresh to moderately weathered, silica-veined, latite lava flows, with closely to moderately spaced fractures. In shear zones, fractures are very closely to closely spaced. With more fracturing, the latite becomes less resistant and tends to break down readily to talus and colluvium.

LOCAL GEOLOGIC UNIT: Cretaceous quartz monzonite

REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic granitic rocks (KJg)

LITHOLOGIC DESCRIPTION: At waypoint MT1059, the rock is very high to high-strength, light-gray, medium-grained phaneritic, fresh to moderately weathered quartz monzonite with ~10% biotite. Rectangular fractures are closely to very widely spaced, with most fractures 1-3 feet apart. Weathering along the three prominent fracture sets results in rounded to subrounded outcrops, typically with an orange, brown, red, and light-gray rind, that is several inches thick.

LOCAL GEOLOGIC UNIT: Jurassic and Triassic Sunrise, Gabbs, and Luning Formations

REGIONAL GEOLOGIC UNIT: Jurassic and Triassic locally metamorphosed sedimentary rocks (JTRs)

LITHOLOGIC DESCRIPTION: The Sunrise, Gabbs, and Luning Formations consist of thinly to very thickly bedded, interlayered, gray, black, and brown, argillaceous, cherty, sandy, ferruginous, fine- to coarse-grained limestone, dolomitic limestone, and dolomite, carbonaceous shale, and shale. Emplacement of a Cretaceous quartz monzonite pluton metamorphosed and metasomatized the sedimentary rocks into white and brown, coarsely crystalline marble, grayish-green calc-silicate skarn, and argillite, partially or completely destroying original sedimentary textures.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): About 70 million years ago, quartz monzonite and other granitic plutons intruded and metamorphosed the Jurassic and Triassic Sunrise, Gabbs, and Luning Formations along intrusive contacts, creating areas of skarn at the interface between the igneous and sedimentary rocks. Subsequently, Oligocene and Miocene tuff sheets spread over previously deposited sedimentary and igneous rocks. Basin-and Range and younger high-angle faults offset and tilted older rocks, starting in mid-Miocene time. Becoming vertical to overturned near thrust faults, bedding in the Mesozoic sedimentary rocks generally strikes NW and dips 40-80^0 SW.

MINERALS AND ENERGY RESOURCES: Hydrothermal alteration and mineralization of the contact-metamorphosed sedimentary rocks occurred in association with emplacement of a Cretaceous quartz monzonite pluton, Late Miocene latite lava flows, and Basin-and-Range-style, high-angle faults, which produced a polymetallic skarn type of ore deposit. The main copper minerals are chrysocolla, malachite, azurite, and cuprite, which occur with garnet, calcite, diopside, hematite, limonite, hemimorphite, magnesite, chalcocite, chalcopyrite, and pyrite. As in the upper Santa Fe district, gold and silver might occur as native gold and electrum, but it is more likely that they occur mostly in metal sulfides, such as pyrite, chalcopyrite, and galena. Molybdenum minerals in the area include molybdenite and powellite.

COMMODITIES: Copper, gold, silver, and molybdenum

OPERATING AND ABANDONED FACILITIES: The New York Canyon area has a long history of exploration, development, and production dating to 1875. Mines, prospect pits, mining roads, ore chutes, and claim stakes dot hillsides throughout the canyon. Two randomly selected abandoned mines were examined closely. Both had multiple shafts. Both mines were developed in white, greenish-gray, greenish-yellow, and brown, extensively fractured skarn. Both mines contained float rich in blue and green copper oxide minerals, and at one mine, a nearly vertical copper-oxide vein several feet wide was observed cutting through skarn. Exploration of New York Canyon during the late 1960's and mid 1970's by several mining companies delineated a copper oxide deposit centered on Longshot Ridge and a copper sulfide deposit centered in the area of the Copper Queen mine. Aberdene Mines, Ltd., actively is evaluating these two deposits for the feasibility of mining them. This company currently controls 1,003 claims covering more than 20,000 acres in the New York Canyon area.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: MCS-1 runs through the project between stations 2340+00 and 2535+00

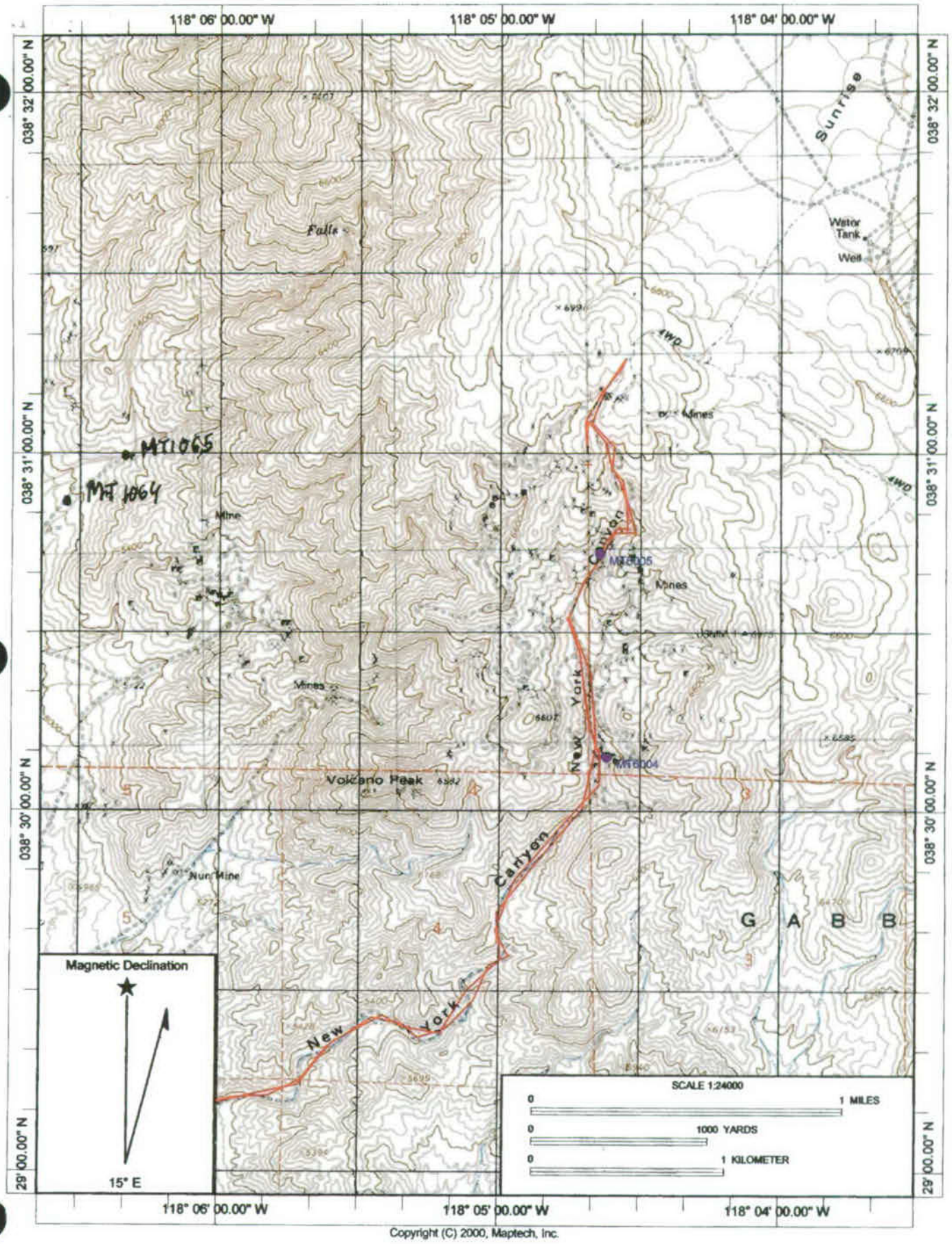
PHOTOGRAPHS

NUMBER	WAYPOINT		SUBJECT (Note direction of view)
MT6004_ALG_0320_28Nov06.jpg	MT6004		Lowermost mine in New York Canyon, about 0.75 mile east of Volcano Peak; Nevada Sunrise claim (AG661)
MT6004_ALG_0322_28Nov06.jpg	MT6004		One of many adits in a mine excavated into skarn cut by veins containing copper oxide minerals (AG665)
MT6004_ALG_0323_28Nov06.jpg	MT6004		Skarn cut by a wide vein containing blue and green copper oxide minerals (AG666)
MT6004_ALG_0325_28Nov06.jpg	MT6004		Two adits completed in skarn to intersect copper veins (AG669)
MT6004_ALG_0326_28Nov06.jpg	MT6004		Adit excavated into a vein containing copper oxide minerals (AG670)
MT6005_ALG_0327_28Nov06.jpg	MT6005		Ore chute and tailings at a mine in upper New York Canyon (AG671)

CONTACTS: N/A

REFERENCES: Ekren, E.B., and Byers, F.M., Jr., 1985a, Geologic map of the Gabbs Mountain, Mount Ferguson, Luning, and Sunrise Flat quadrangles, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I-1577, scale 1:48,000; Oldow, J.S., and Dockery, H.A., 1993, Geologic map of the Mina quadrangle, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Field Studies Map FS-6, scale 1:24,000; Tingley, J.V., 2005, Metals, *in* Meeuwig, R.O., ed., Mineral Industry publication MI-2004: Reno, Nev., Nevada Bureau of Mines and Geology, p. 13-30; Aberdene Mines Ltd website, last accessed in 2006.

ADDITIONAL COMMENTS:



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINES: Blue Ribbon Mines (aka New Boston-Blue Ribbon prospect)	
DATE: 11/29/06		OWNER OR LESSEE: FRM Minerals and Conoco developed the Blue Ribbon mines, but ceased production there in 1988. Nevada Sunrise now holds claims to some or all these mines (note left at a witness post where wpt MT6008 was taken).	
TIME: 10:52		**MINING DISTRICT: Santa Fe**	
WEATHER: Sunny and cold		COUNTY: Mineral	
WAYPOINT: MT6006	LATITUDE: N. 38.48403^0	LONGITUDE: W. 118.19992^0	ALTITUDE: 5,098 ft AMSL
WAYPOINT: MT6007	LATITUDE: N. 38.47649^0	LONGITUDE: W. 118.21216^0	ALTITUDE: 5,583 ft AMSL
WAYPOINT: MT6008	LATITUDE: N. 38.47684^0	LONGITUDE: W. 118.21314^0	ALTITUDE: 5,629 ft AMSL

GEOGRAPHIC COORDINATES (T, R, S): T7N, R34E, S08 SE

GEOGRAPHIC AREA: North of Black Dyke Mountain in the eastern Garfield Hills

GEOGRAPHIC DESCRIPTION: The Blue Ribbon mines are about 2 miles SW of Luning, Nevada. The terrain leading to the mines slopes SW toward Soda Spring Valley at gradients of 9-10 percent. The land is moderately dissected by washes that carry seasonal and storm runoff and are dry for most of the year. South and west of the mines, the land rises abruptly to satellite peaks of Black Dyke Mountain, which have summit altitudes of 6,000-7,000 feet AMSL. Two miles south of the Blue Ribbon mines, Black Dyke Mountain rises to a summit altitude of 7,331 feet AMSL.

LOCAL GEOLOGIC UNIT: Miocene andesite

REGIONAL GEOLOGIC UNIT: Late to middle Miocene intermediate lava flows, flow breccias, and lahars (Ta4)

LITHOLOGIC DESCRIPTION: Dark-gray, porphyritic andesite lava flows and plugs, with amphibole, pyroxene, and feldspar phenocrysts in a fine-grained groundmass.

LOCAL GEOLOGIC UNIT: Cretaceous and Jurassic(?) quartz monzonite and undifferentiated granitic rocks

REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic granitic rocks (KJg)

LITHOLOGIC DESCRIPTION: A small body of Cretaceous quartz monzonite about 1 mile NW of the Blue Ribbon mine consists of fine- to coarse-grained quartz monzonite with phenocrysts of potassium feldspar. A Cretaceous and Jurassic(?) composite pluton south and west of Black Dyke Mountain consists of medium-grained quartz monzonite and undifferentiated granitic rocks.

LOCAL GEOLOGIC UNIT: Cretaceous and Jurassic Dunlap Formation

REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic variably metamorphosed sedimentary and volcanic rocks (KJvs)

LITHOLOGIC DESCRIPTION: Terrigenous clastic rocks mostly consisting of chert, carbonate, and volcanic breccias, quartzose, arkosic, and feldspathic sandstones, mudstone, siltstone, and minor limestone.

LOCAL GEOLOGIC UNIT: Triassic Pamlico Formation (grading to Luning Formation)

REGIONAL GEOLOGIC UNIT: Triassic and Permian commonly metamorphosed sedimentary and volcanic rocks (TRPvs)

LITHOLOGIC DESCRIPTION: Thinly to very thickly bedded, light- to dark-gray, medium- to coarsely crystalline limestone and sandy limestone (commonly metamorphosed to white marble); porphyritic lava flows and vitric-crystal ash-flow tuff (commonly metamorphosed to hornfels); and varicolored argillite with pyrite crystals. At the two mines visited, outcropping rock was mapped as Pamlico or Luning Formation, but original sedimentary or volcanic textures were destroyed by contact-metamorphism and hydrothermal alteration. The rock was considered to be calc-silicate skarn.

LOCAL GEOLOGIC UNIT: Permian Black Dyke Formation

REGIONAL GEOLOGIC UNIT: Triassic and Permian commonly metamorphosed sedimentary and volcanic rocks (TRPvs)

LITHOLOGIC DESCRIPTION: Dark-colored, mafic lava flows, dikes, and plugs; massive breccia; and subordinate conglomerate, gravelly sandstone, and sandstone.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Starting in the early Jurassic period, the Permian Black Dyke Formation and the Triassic Pamlico and Luning Formations were folded and thrust southward to southeastward over upper parts of the Pamlico and Luning Formations and the Jurassic and Cretaceous Dunlap Formation. During and after the thrust faulting, a largely quartz monzonite pluton intruded the Permian and older Mesozoic rocks. During the Tertiary period, andesite lava flows spread over the area, as NW-trending strike-slip faults associated with Walker-Lane tectonics and northerly striking faults associated with Basin-and-Range extension increased structural complexity. The area has an ENE structural fabric, because the numerous thrust faults and normal faults transecting it predominantly strike ENE, and bedding in the Mesozoic rocks tends to align itself with the strike of the these faults. Bedding in the Mesozoic rocks, which generally dips 40-850 north, steepens and becomes overturned approaching thrust faults flanking the north side of Black Dyke Mountain. A NNW-striking, high-angle fault truncates the structural fabric of the Blue Ribbon mine area about 0.75 mile west of these mines.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Thrust-faulted and folded marble, argillite, and hornfels of the Triassic Pamlico and Luning Formations contain a polymetallic skarn deposit, that has been explored extensively by drilling. Mineralizing fluids probably related to the intrusion of a large Cretaceous quartz monzonite pluton in the Garfield Hills south and west of Black Dyke Mountain rose along limestone-tuff contacts and replaced the host rocks with ore minerals. Tungsten occurs near the surface as scheelite and molybdo-scheelite in quartz-garnet-idocrase veins. Molybdenum occurs deeper in the ore body as molybdenite in veins with or without quartz. Copper is present at shallow depths as azurite and malachite in calc-silicate veins and as supergene chalcocite. Blue and green copper minerals, including malachite, were abundant in ore dumps at the two mines that were visited; scheelite was identified tentatively in these dumps; and molybdenite was not found.

COMMODITIES: Tungsten, molybdenum, and lesser copper values

OPERATING AND ABANDONED FACILITIES: The first mine seen in the cluster had a partially caved adit, ore car tracks running from the adit, and a tailings dump. In the next wash to the west, there is a shored-up vertical shaft leading down to a cross drift and tailings piled around the shaft. The largest mine shaft observed, which is at the head of a wash, has a headframe. A tailings dump extends from the headframe area, and prospect pits are dug into the sides of the wash. At least six large shafts are present along mining roads west of the headframe, according to maps and aerial photos.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The nearest of the Blue Ribbon mines is about 4 miles NE of MCS-1 station 2200+00

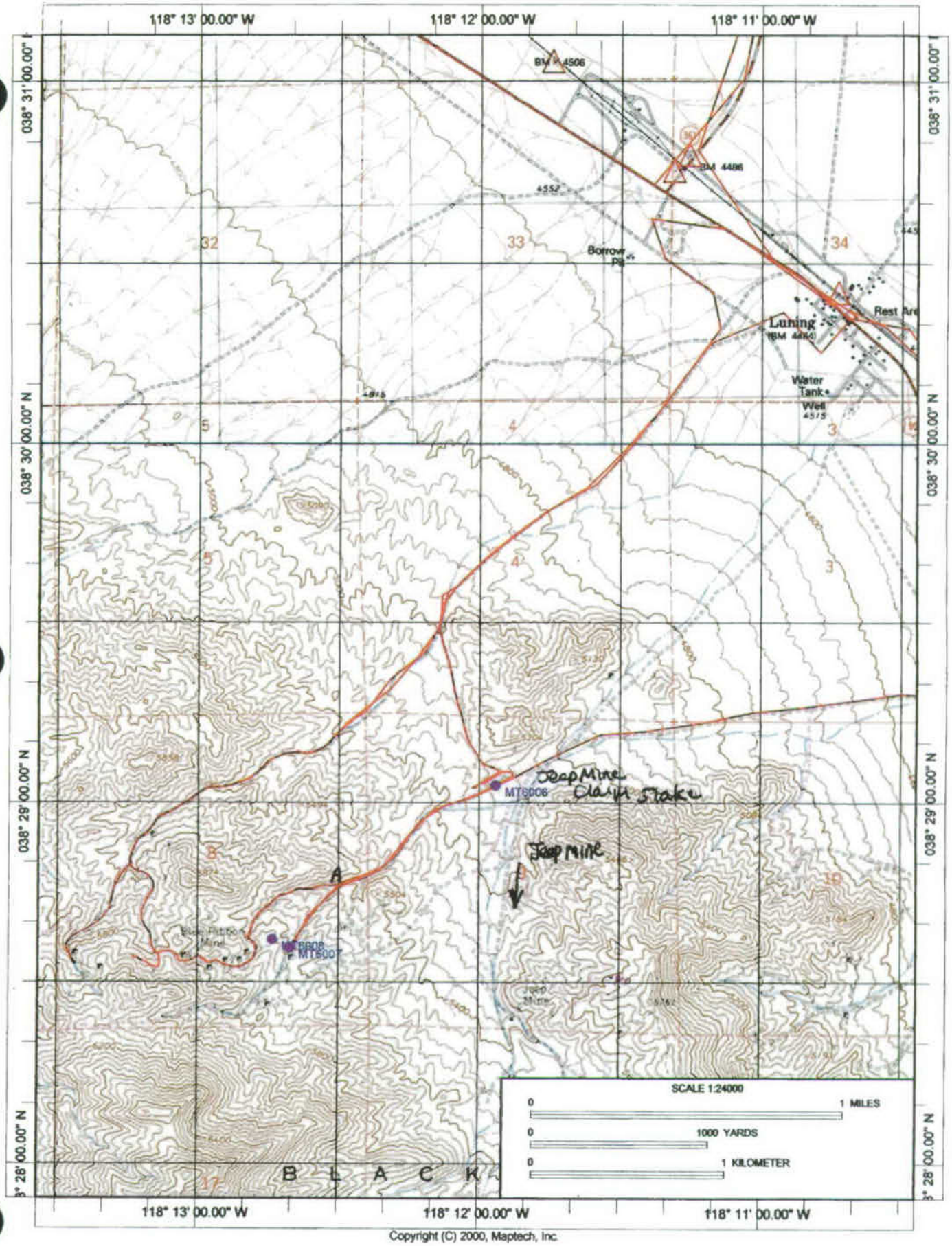
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6006_ALG_0328_29Nov06.jpg	MT6006	View SW of near-vertical to overturned beds of the Dunlap Formation in thrust plates on the north flank of Black Dyke Mountain, SW of the Blue Ribbon mines, Jeepmine claim posts in foreground (AG672)
MT6007_ALG_0329_29Nov06.jpg	MT6007	Blue Ribbon mine partially caved adit, ore car tracks, and tailings (AG673)
MT6007_ALG_0330_29Nov06.jpg	MT6007	View NE of Blue Ribbon mine tailing, Soda Spring Valley playa, and Gabbs Valley Range (AG675)
MT6008_ALG_0331_29Nov06.jpg	MT6008	Vertical mine shaft in the Blue Ribbon mine cluster in JTrs polymetallic skarn (AG676)
MT6008_ALG_0332_29Nov06.jpg	MT6008	View west of headframe in main cluster of Blue Ribbon mines (AG677)

CONTACTS: N/A

REFERENCES: Frost, K. S., 1984, The New Boston-Blue Ribbon polymetallic skarn in Johnson, J. L., ed., Exploration for ore deposits in the north American cordillera: The Association of Exploration Geochemists 1984 Regional Symposium, Field Trip Guidebook, p. 25-29; Oldow, J.S., and Speed, R.C., 1985, Preliminary geologic map of the Mina NW quadrangle, Mineral County, Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF-1487, scale 1:24,000; Tingley, J. V., 1990, Mineral resource inventory, Bureau of Land Management, Carson City District, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Open-File Report 90-1, 259 p.

ADDITIONAL COMMENTS: The main cluster of mines in the Blue Ribbon group is in the next valley west from where mine #1 (wpt MT6007) is located. Waypoint MT6008 was taken in this valley at 11:27, where the first mine shaft was encountered while walking toward the main mine cluster.



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: Mineral Ridge mine		
DATE: 12/01/06	OWNER OR LESSEE: Golden Phoenix Minerals, Inc.		
TIME: 17:15	**MINING DISTRICT: Silver Peak**		
WEATHER: Sunny and cold	COUNTY: Esmeralda		
WAYPOINT: MT6017	LATITUDE: N. 37.79650^0	LONGITUDE: W. 117.72625^0	ALTITUDE: 7,362 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): in T2S, R38E, S01, 02, and 12; T2S, R39E, S06			
GEOGRAPHIC AREA: Mineral Ridge, Silver Peak Range, 4 miles NW of Silver Peak, Nevada			

GEOGRAPHIC DESCRIPTION: The mine complex that is called the Mineral Ridge mine by its present owners is located on the crest and northeast flank of Mineral Ridge that is a southeasterly trending spur of the Silver Peak Range. Mineral Ridge is bordered on the north by a divide between Big Smokey and Clayton Valleys, on the east and south by Clayton Valley, and on the west by the main part of the Silver Peak Range. The ridge rises to an altitude of 7,481 ft AMSL. The forested summit of the ridge is hilly, and the flanks are ruggedly dissected by NE and SW draining washes.

LOCAL GEOLOGIC UNIT: Late Proterozoic Wyman Formation

REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (PZs)

LITHOLOGIC DESCRIPTION: In the mine area, the Wyman Formation, which is 1,120 feet thick, has been metamorphosed regionally up to almandine-amphibolite facies, but the formation locally exhibits retrogade matamorphism, as indicated by the presence of chlorite, albite, and chloritoid. The formation consists in ascending order of: (1) Calcareous phyllite, mylonitic marble, and lenses of blue-gray, finely crystalline, calcite marble (the main ore host), intruded by pegmatitic muscovite-biotite alaskite, diabase sills, and both barren and gold-bearing quartz veins; (2) Extensively folded, thinly bedded, black to greenish-brown (weathering brown), granoblastic, schistose, calc-silicate hornfels (skarn) and mica schist, intruded by alaskite sills; and (3) phyllite, phyllitic limestone, dolomite, and minor finely crystalline quartzite. At waypoint MT6017, southwest of the mine in the Brodie ore deposit, outcropping phyllite, believed to be in the upper part of the Wyman Formation, has medium-high-strength when struck with a rock hammer, is greenish-gray (weathering brown, red, orange, yellow-green, and gray), and has well-developed slaty cleavage.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): The Late Proterozoic Wyman Formation crops out on the flanks and crest of Mineral Ridge. The ridge is a NW trending, doubly plunging anticline cored by the Eocene Mineral Ridge pluton. Principal lithologies within the pluton include granodiorite, granite, pegmatite, and alaskite. Rocks of the Wyman Formation at Mineral Ridge were metamorphosed regionally and by contact with the Mineral Ridge pluton into phyllite, schist, hornfels, quartzite, marble, and calc-silicate skarn. These rocks, also, were sheared, brecciated, hydrothermally altered, warped into isoclinal and open folds, and faulted. The Late Proterozoic Reed Dolomite overlies the Wyman Formation in synclines on the east flank of Mineral Ridge. The Late Proterozoic Deep Springs Formation is in fault contact with the Reed Dolomite at the open-pit mine in the Brodie ore body. Lithologic layering, schistosity, and the axial planes of isoclinal folds, on the average, similarly strike N 30^0 E and dip 35^0 SE.

RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Epithermal gold deposits generally are localized within the lower part of the Wyman Formation by shear zones related to the thrust-faulted contact with the underlying Mineral Ridge pluton. Mineralization in the Wyman Formation occurs mainly in milky quartz veins that fill shear zone fractures and generally conform to the low-angle dip of the foliation in the host rocks. These veins generally contain only small amounts of sulfides, including pyrite, sphalerite, galena, chalcopyrite, tetrahedrite, and arsenopyrite, and minerals resulting from their oxidization. Gold and electrum occur as inclusions in quartz. To a lesser extent, gold is associated with goethite and relict pyrite and is intergrown with sphalerite, galena, and pyrite. Where they intersect brittle alaskite sills or favorable lithologies in the Wyman Formation, gold-bearing quartz veins may extend as stockwork replacements into the alaskite and Wyman Formation. Some gold and silver deposits occur in late-stage-epithermal argillized, pyrite- and marcasite-bearing breccias and banded, manganiferous quartz-calcite veins.

COMMODITIES: gold and silver

OPERATING AND ABANDONED FACILITIES: Gold deposits at Mineral Ridge have been mined periodically since 1864 and have been mined by open-pit methods since 1989. Golden Phoenix Minerals, Inc. acquired rights to several gold deposits and consolidated them in 2000 into the Mineral Ridge mine. The Mineral Ridge mine incorporates the Mary and Drinkwater mines and the Brodie, Gold Wedge, Blue Lite, and Solberry prospects. Prospects being worked were defined by drilling and other exploration activities to have a potential to produce gold economically. Total reserves at the Mineral Ridge mine through 2002 were estimated to be 2.7 million tons of ore with an average grade of 0.079 ounces of gold per ton. Ore from the mine is processed by the heap leaching method. The mine suspended operations in late 2005 or early 2006.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The mine complex is about 3-5 miles west of alignment MZ-1 station 5700+00

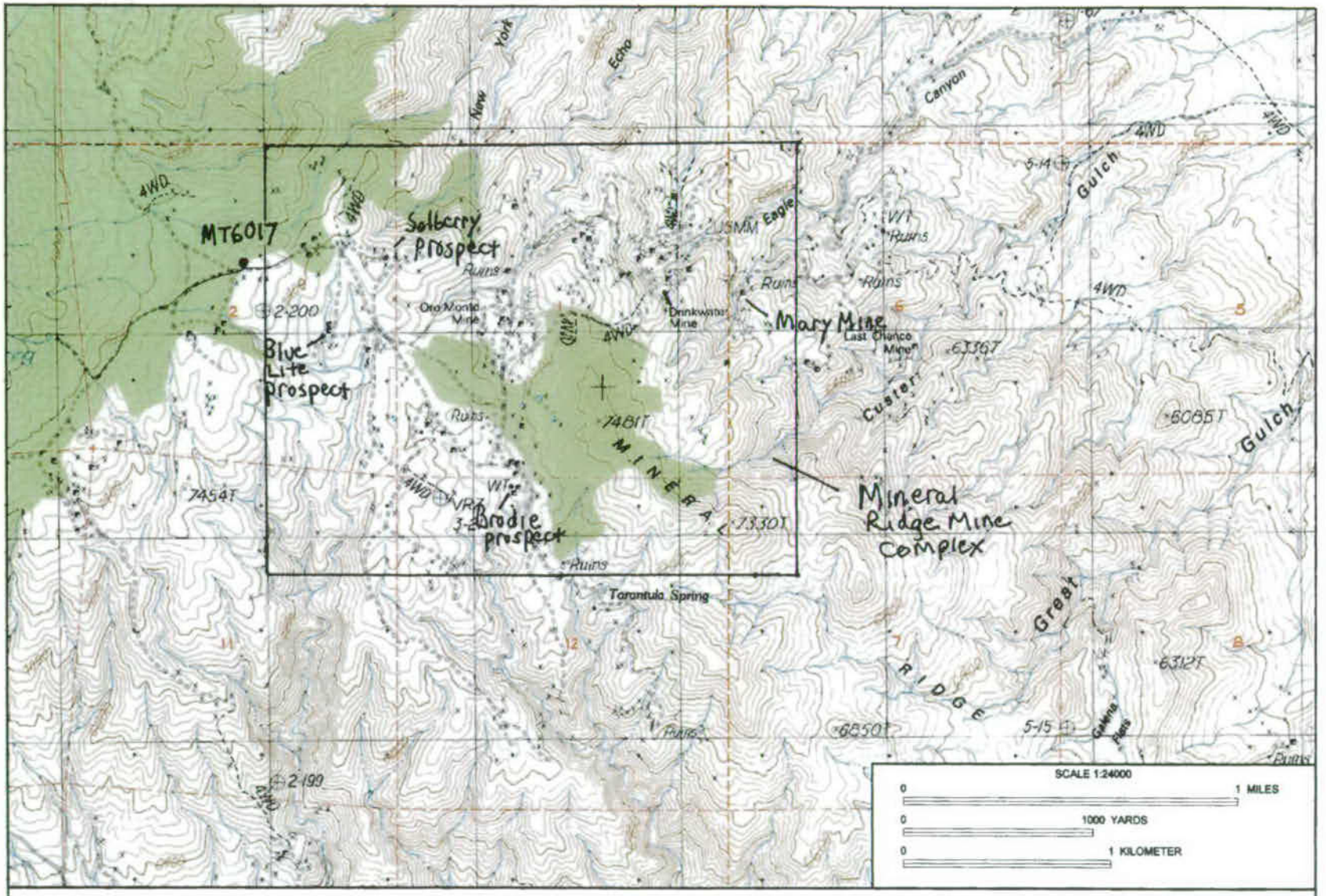
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6017_ALG_0354_01Dec06.jpg	MT6017	Pan SE of Brodie pit, leachpad, mine buildings, and Wyman Fm outcrops (AG712-713)
MT6017_ALG_0355_01Dec06.jpg	MT6017	Phyllite in Late Proterozoic Wyman Fm NE of the mine in the Brodie deposit (AG714)
MT6017_ALG_0356_01Dec06.jpg	MT6017	Aerial view of the Mineral Ridge mine complex, from the Brodie mine on the west to the Mary and Drinkwater mines on the east (AG714a)

CONTACTS: N/A

REFERENCES: Craig, S.D., 2003, Geology and gold mineralization of the Mineral Ridge gold mine, Esmeralda County, Nevada, in Brown, H.G., ed., 2003, Regional geology and gold deposits of the Silver Peak area, Mineralization hosted by metamorphic core complexes: Reno, Nev., Geological Society of Nevada, 2003 fall field trip guidebook, Special Publication No. 38, p. 81-93; Nevada Department of Business and Industry, Division of Industrial Relations, 2005, Directory of Nevada mine operations, January-December 2004: Carson City, Nev., 109 p.; Strachan, D.G., 2005, Geology and drill targets North Springs gold prospect, Mineral Ridge mining district, Esmeralda County, Nevada: La Jolla, Calif., Tonogold Resources, Inc., 18 p.

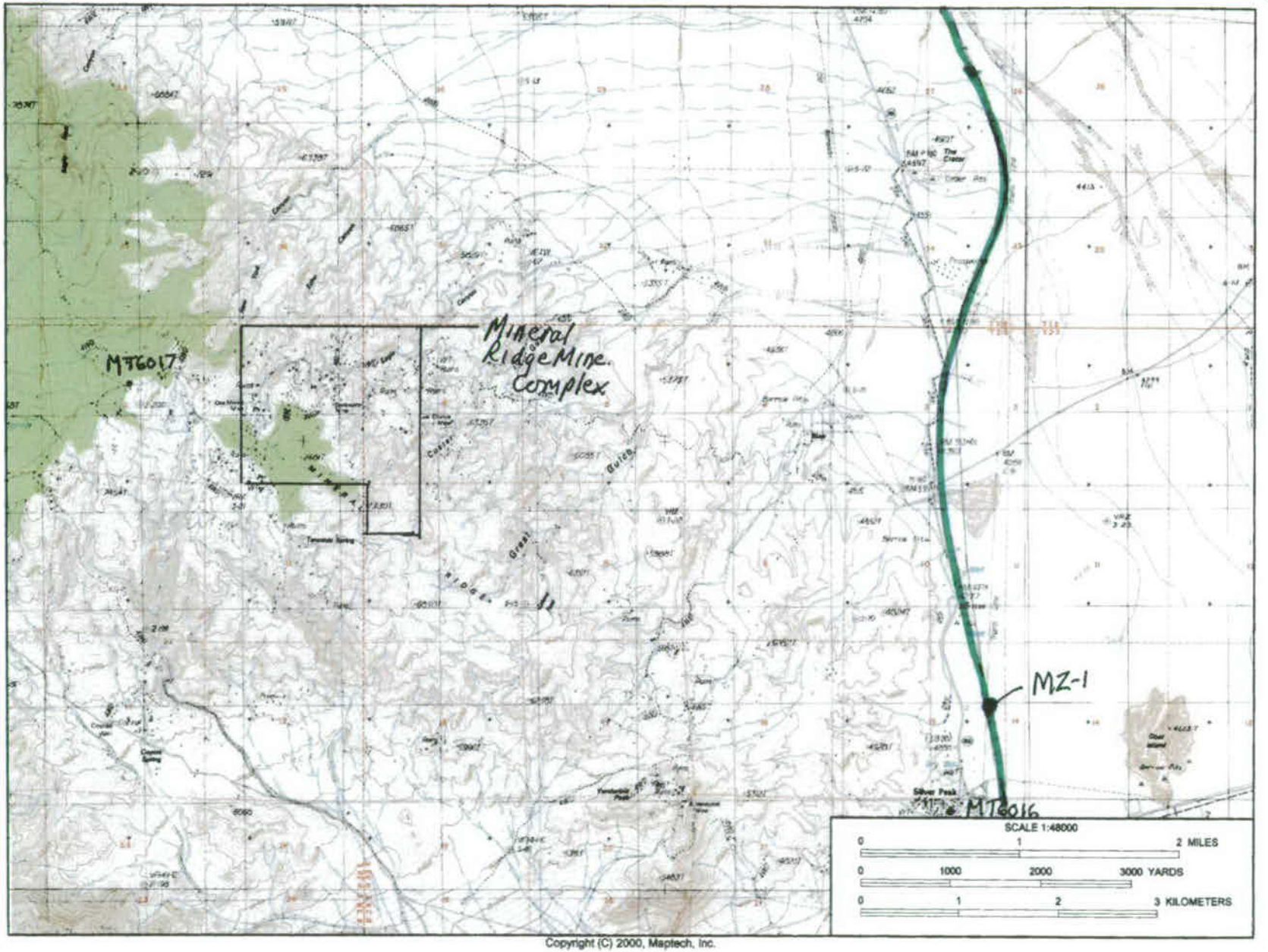
ADDITIONAL COMMENTS:



Name: SILVER PEAK
Date: 12/29/2006
Scale: 1 inch equals 2000 feet

Location: 037° 47' 20.25" N 117° 42' 18.40" W NAD 27

Copyright (C) 2000, Maptech, Inc.



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood	MINE OR OTHER FEATURE: Silver Peak Marsh lithium mine		
DATE: 12/01/06	OWNER OR LESSEE: Chemetall Foote Corp.		
TIME: 12:18	**MINING DISTRICT: Silver Peak Marsh**		
WEATHER: Sunny and cold	COUNTY: Esmeralda		
WAYPOINT: MT6016	LATITUDE: N. 37.75132^0	LONGITUDE: W. 117.63824^0	ALTITUDE: 4,298 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T1S, R40E S26-28; T2S, R39E, S01, 12, 13, and 21-25; and T2S, R40E, T2S, R40E S01-11, 15-20, and 29-32.			
GEOGRAPHIC AREA: Silver Peak Marsh, a hydrologically closed (internally drained) basin in the northern part of Clayton Valley.			
GEOGRAPHIC DESCRIPTION: Silver Peak Marsh is an elliptically shaped playa with an area of about 25 square miles. The playa has an average altitude of about 1,300 feet AMSL. Silver Peak Marsh and the rest of Clayton Valley are bordered on the north by the Weepah Hills, on the east by Paymaster Ridge and Clayton Ridge, on the south by the Montezuma Range and Palmetto Mountains, and on the west by the Silver Peak Range. Washes draining adjacent highlands seep into the sediments filling Clayton Valley and Silver Peak Marsh. Being the lowest point in a closed hydrologic basin, Silver Peak Marsh has a shallow water table. Springs, shallow or flowing wells, marsh grass, and salt brush are common around the periphery of the playa. A prominent outlier of bedrock from the adjacent highlands, Angel Island, forces a dogleg to the east in the shape of the marsh. Small bedrock outliers, Goat Island and Alcatraz Island protrude the marsh sediments near the town of Silver Peak. Once a thriving town of several thousand people, Silver Peak is rapidly dwindling in population and now is home to no more than a few hundred people.			
LOCAL GEOLOGIC UNIT: Late Miocene to Pliocene (4.8-6.9 Ma) upper member of Esmeralda Formation of Davis (1981); Weepah unit of Stewart (1989); and the Cave Spring Formation.			
REGIONAL GEOLOGIC UNIT: Pliocene (4.8 Ma) basalt (Tb); and Pliocene to Late Miocene (≤5.8 to 15.7 Ma) sedimentary rocks (Tsy)			
LITHOLOGIC DESCRIPTION: Pliocene to Late Miocene (4.8-6.9 Ma) sedimentary rocks in the area were deposited mostly in lakes, playas, and stream channels. The thinly to medium-bedded sedimentary rocks consist mostly of pink, pinkish-gray, light-gray, gray, light-greenish-gray, pale olive-gray, pale-yellow, brown, and white, commonly tuffaceous mudstone, siltstone, sandstone, and pebble to boulder conglomerate. Opaline mudstone, diatomite, travertine, ash-flow tuff, ash-fall tuff, tuff breccia, and olivine-bearing basalt occur locally. The mostly non-resistant rocks in this geologic unit tend to weather into badlands. Resistant rock types, such as silicified conglomerate and basalt, characteristically weather to ledges that protrude from or cap slopes.			
LOCAL GEOLOGIC UNIT: Late Miocene (<6.0 to 6.9 Ma) Argentite Canyon Formation and Rhyolite Ridge Tuff of Oldow et al (2003)			
REGIONAL GEOLOGIC UNIT: Late Miocene (5.9-6.3 Ma) Silver Peak Volcanics (Tsp)			
LITHOLOGIC DESCRIPTION: Rhyolite to rhyodacite, variably lithic- and crystal-rich, nonwelded to welded ash-flow tuff and porphyritic lava flows			
LOCAL GEOLOGIC UNIT: Middle Miocene (11-13 Ma) Silver Peak Formation or Esmeralda Formation			
REGIONAL GEOLOGIC UNIT: Pliocene to middle Miocene sedimentary rocks (Tsy)			
LITHOLOGIC DESCRIPTION: Gray, yellow, and orange conglomerate, sandstone, siltstone, mudstone, shale, and limestone, becoming tuffaceous in upper layers.			
LOCAL GEOLOGIC UNIT: Oligocene to Early Miocene (25 to 18 Ma) Ice House Canyon assemblage			
REGIONAL GEOLOGIC UNIT: Early Miocene and Oligocene sedimentary rocks (Tso); Early Miocene rhyolite and rhyodacite ash-flow and ash-fall tuffs (Tt3); and Early Miocene andesite lava flows, flow breccias, and lahars (Ta3)			
LITHOLOGIC DESCRIPTION: Basal conglomerate derived from Paleozoic rocks; a middle (21.5-22.8 Ma) unit composed of nonwelded to welded, rhyolite ash-flow tuff; and an upper unit consisting of andesite lava flows, lahars, and debris flows.			

LOCAL GEOLOGIC UNIT: Cretaceous and Jurassic granitic rocks
REGIONAL GEOLOGIC UNIT: Cretaceous and Jurassic granitic rocks (KJg) and Tertiary intrusive rocks (Ti)
LITHOLOGIC DESCRIPTION: Gray, pink, and orange quartz monzodiorite, quartz monzonite, monzonite, granodiorite, and granite plutons; gabbro, diorite, andesite, quartz porphyry, rhyolite, aplite, and alaskite dikes, plugs, and stocks; includes the Cretaceous and Jurassic Weepah, Palmetto, Palmetto Wash, and Dyer plutons and the Eocene Mineral Ridge pluton.
LOCAL GEOLOGIC UNIT: Ordovician and Cambrian sedimentary rocks
REGIONAL GEOLOGIC UNIT: Ordovician and upper Cambrian sedimentary rocks (Os and Cc)
LITHOLOGIC DESCRIPTION: Claystone, shale, siltstone, and limestone, with subordinate dolomite, sandstone, chert, and barite; commonly metamorphosed regionally or by contact with plutons to slate, phyllite, hornfels, calc-silicate hornfels (skarn), and quartzite.
LOCAL GEOLOGIC UNIT: Cambrian and Late Proterozoic sedimentary rocks
REGIONAL GEOLOGIC UNIT: Middle and lower Cambrian and Late Proterozoic sedimentary rocks (CZs)
LITHOLOGIC DESCRIPTION: Thinly to very thickly bedded argillite, claystone, siltstone, sandstone, quartzite, finely to coarsely crystalline limestone, sandy limestone, and dolomite; metamorphosed slightly to significantly to phyllite, schist, calc-silicate hornfels, siliceous hornfels, and marble.
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Silver Peak Marsh is a half-graben, in which sedimentary and volcanic rocks of the middle Miocene (11-13 Ma) Esmeralda Formation accumulated syntectonically with Basin-and-Range extensional faulting. Most faults that transect Clayton Valley and adjacent highlands strike north to north-northeast, dip at high angles, and offset sedimentary and volcanic rocks down to the west. On the east side of Silver Peak Marsh, the major fault bounding the half-graben is the >25-mile-long Paymaster Fault. Geologic units cropping out around Silver Peak Marsh, most of which unconformably underlie or overlie the Esmeralda Formation, include: (1) Late Proterozoic to Ordovician, variably metamorphosed sedimentary rocks; (2) Cretaceous to Eocene, lquartz monzonite to granodiorite plutons; (3) Oligocene to early Miocene andesite lava flows, flow breccias, and lahars and rhyolite to rhyodacite tuff; (4) Late Miocene, nonwelded to welded, rhyolite to rhyodacite ash-flow tuff and porphyritic lava flows; and (5) Late Miocene to Pliocene fluvial and lacustrine sedimentary rocks with tuff, tuff breccia, and basalt.
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Many beds of sandstone and shale have undergone extensive diagenesis and contain calcite, gypsum, halite, analcime, hectorite (lithium smectite), montmorillonite, clinoptilolite, phillipsite, and opal as replacement minerals or chemical precipitates. Hectorite, the only lithium mineral in the basin-fill sediments, is believed to have formed by coprecipitation with calcite from ephemeral lakes. Large concentrations of lithium in ground water from Silver Peak Marsh most likely resulted from weathering of lithium-rich tuffaceous mudstone and tuff in the upper Esmeralda Formation of Davis (1981). Some lithium enrichment might be the result of ion exchange between brines and clay minerals. Most lithium production to date has come from the main ash aquifer, the uppermost of six aquifers in the basin-fill sediments. It is anticipated that the lower gravel aquifer will become the main source of lithium in the future. Chemetall Foote Corp. has acquired prior rights to most of the ground-water in Clayton Valley to meet its water needs.
COMMODITIES: Lithium carbonate (used in ceramics, specialty glass, and pharmaceuticals), lithium hydroxide monohydrate (used in grease and batteries), anhydrous lithium hydroxide (used for carbon dioxide adsorption), and minor halite (sodium chloride).
OPERATING AND ABANDONED FACILITIES: Water is pumped at rates of 30-325 gpm from 50 wells completed to depths of 230 to 1,160 feet. Water temperatures in these wells range from 67 to 97 ^{0}F. Pumped water is discharged to a complex of 20 ponds covering 4,150 acres. Water in these ponds is allowed to evaporate for 12-18 months to produce brines with the requisite concentrations of dissolved lithium and other ions.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: Alignment MZ-1 cuts through Clayton Valley between stations 5600+00 and 6500+00. It crosses through the mine complex between stations 5800+00 and 5900+00

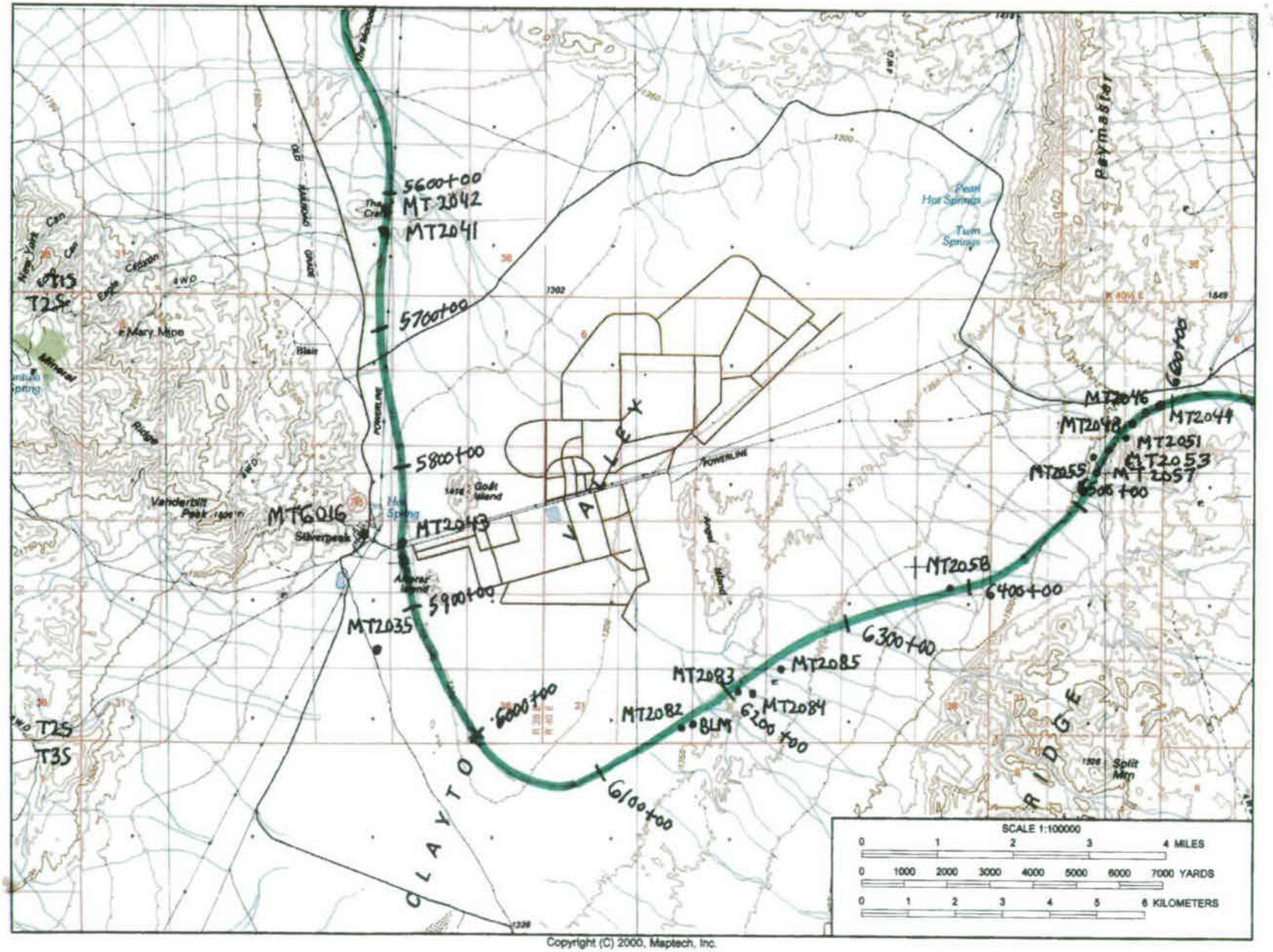
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6016_ALG_0351_01Dec06.jpg	MT6016	View NE of plant facilities at the Chemetall Foote Corp. at Silver Peak Marsh, with Clayton Ridge and the Montezuma Range in the distance
MT6016_ALG_0352_01Dec06.jpg	MT6016	View west of the processing plant from the lithium mine operations office in Silver Peak, NV (AG711)
MT6016_ALG_0353_01Dec06.jpg	MT6016	Aerial view of mine processing and evaporation ponds in Silver Peak Marsh and surrounding areas of Clayton Valley (AG711a)

CONTACTS: Sherry L. Hulsteen, Supervisory Hydrologist, and Kevin D. Keck, Administrative Manager; (Interviewed for this report on December 1, 2006, at plant site in Silver Peak, Nevada)

REFERENCES: Davis, J.R., 1981, Late Cenozoic geology of Clayton Valley, Nevada, and the genesis of lithium enriched brine: Austin, Texas, University of Texas, unpublished Ph.D. dissertation, 234 p.;

ADDITIONAL COMMENTS: Waypoint MT6016 taken at the Chemetall Foote Corp. operations office, Silver Peak, NV, in the SW corner of Silver Peak Marsh



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: King Tonopah vein system	
DATE: 12/04/06		OWNER OR LESSEE: Tonogold Resources, Inc.	
TIME: 16:30		**MINING DISTRICT: Tonopah**	
WEATHER: Sunny and cold		COUNTY: Nye	
WAYPOINT: MT6026	LATITUDE: N. 38.08572^0	0	ALTITUDE: 6,145 ft AMSL
GEOGRAPHIC COORDINATES (T, R, S): T3N, R42E, S25-26			
GEOGRAPHIC AREA: San Antonio Mountains at Tonopah			
GEOGRAPHIC DESCRIPTION: The King Tonopah property comprises 73 unpatented mining claims covering 1,460 acres about ¾ mile north of Tonopah and ½ mile NW of the summit of Ararat Mountain. The mine is located in the San Antonio Mountains, just north of a drainage divide between west- and east-draining washes. Altitudes in the area range from 6,664 feet on the summit of Ararat Mountain to 6,100 feet AMSL at the Belle of Tonopah mine. Thus, relief in the area is about 560 feet.			
LOCAL GEOLOGIC UNIT: Middle Miocene (16.1-16.3 Ma) Brougher Rhyolite			
REGIONAL GEOLOGIC UNIT: Miocene rhyolite lava flows, flow breccia, and intrusive rocks (Tvr)			
LITHOLOGIC DESCRIPTION: Light-gray, pink, and light-orange, flow-banded, porphyritic (phenocrysts of quartz, sanidine, sodic plagioclase, and biotite in a fine-grained to glassy groundmass), generally unaltered intrusive rhyolite domes.			
LOCAL GEOLOGIC UNIT: Middle Miocene (16.4-16.9 Ma) Oddie Rhyolite			
REGIONAL GEOLOGIC UNIT: Miocene rhyolite lava flows, flow breccia, and intrusive rocks (Tvr)			
LITHOLOGIC DESCRIPTION: Pinkish-gray and pale-orange, locally flow-banded, sparsely porphyritic, slightly to intensely altered intrusive rhyolite domes and plugs. The intensely altered rock is a silicified aggregate of quartz, sericite, and disseminated pyrite.			
LOCAL GEOLOGIC UNIT: Middle (13-17 Ma) Miocene Siebert Formation			
REGIONAL GEOLOGIC UNIT: Miocene and Oligocene volcanic, volcaniclastic, and sedimentary rocks (Tsv)			
LITHOLOGIC DESCRIPTION: Volcaniclastic conglomerate, sandstone, and siltstone deposited in streams and shallow lakes, with subordinate ash-flow tuff, ash-fall tuff, tuff breccia, and other pyroclastic rocks; >300 feet thick.			
LOCAL GEOLOGIC UNIT: Early Miocene (17.1-20.5 Ma) Fraction Tuff			
REGIONAL GEOLOGIC UNIT: Early Miocene rhyolite and rhyodacite ash-flow and ash-fall tuffs (Tt3)			
LITHOLOGIC DESCRIPTION: Light-gray, pinkish-gray, and brownish-gray, (greenish-gray, orange-gray, and light-gray to white where hydrothermally altered), rhyolite to rhyodacite, lithic- and pumice-shard-rich, moderately crystal-rich (quartz, plagioclase, and potassium feldspar crystals in a vitric groundmass), nonwelded to densely welded ash-flow tuff, with intervals of vitrophyre and volcaniclastic conglomerate, breccia, sandstone, and siltstone; generally hydrothermally altered, with quartz-sericite-adularia-pyrite alteration near mineralized fractures and faults grading outward to chlorite, albite, illite, montmorillonite, quartz, and calcite (propylitic) alteration; >600 feet thick.			
LOCAL GEOLOGIC UNIT: Early Miocene West End Rhyolite and Extension Breccia			
REGIONAL GEOLOGIC UNIT: Tertiary intrusive rocks (Ti)			
LITHOLOGIC DESCRIPTION: Rhyolitic, light-green, fine to medium-grained porphyry with a fine- to medium-grained groundmass and red, coarse-grained autobreccia, emplaced together as sills along the Tonopah Fault.			

LOCAL GEOLOGIC UNIT: Early Miocene (20.5 Ma) Mizpah Formation
REGIONAL GEOLOGIC UNIT: Early Miocene lava flows and breccias of intermediate composition (Ta3)
LITHOLOGIC DESCRIPTION: Purplish-brown to black, porphyritic (plagioclase, biotite, hornblende) andesite to rhyodacite lava flows, flow breccias, and lahars, with minor dikes and plugs; pervasively altered hydrothermally in the center of the district to a mixture of quartz, sericite, and adularia; grades outward to propylitized (chlorite-calcite-epidote alteration) and pyritized andesite; 2,000 feet thick.
LOCAL GEOLOGIC UNIT: upper member of Oligocene Tonopah Formation
REGIONAL GEOLOGIC UNIT: Oligocene lava flows and flow breccias of intermediate composition (Ta2)
LITHOLOGIC DESCRIPTION: Yellow to white, flow-banded, fine-grained rhyolite lava flows and plugs; pervasive hydrothermal alteration in sparse surface exposures to mixtures of quartz, sericite, potassium feldspar, albite, and pyrite, with hematite and goethite from oxidized pyrite coating fracture surfaces; with lower member, 1,000 feet thick.
LOCAL GEOLOGIC UNIT: lower member of Oligocene Tonopah Formation
REGIONAL GEOLOGIC UNIT: Oligocene ash-flow and ash-fall tuffs of silicic to intermediate composition (Tt2)
LITHOLOGIC DESCRIPTION: Orange, pink, gray, yellow, and white, rhyolitic, lithic and vitric-lithic, welded ash-flow tuff and volcaniclastic siltstone and sandstone; pervasive hydrothermal alteration in sparse surface exposures to mixtures of quartz, sericite, adularia, chlorite, albite, and calcite.
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): The Tonopah District in the vicinity of the King Tonopah mine is underlain by Oligocene to early Miocene rhyolite to andesite lava flows, volcanic and sedimentary breccias, and variably welded ash-flow tuffs of the Tonopah Formation, Mizpah Formation, and Fraction Tuff. These geologic units are overlain by volcaniclastic and pyroclastic rocks of the middle Miocene Siebert Formation, intruded by dikes, plugs, and domes of the middle Miocene Oddie and Brougher Rhyolites, and faulted extensively. An easterly striking, low-angle fault system related to the Tonopah Fault is hypothesized in the vicinity of the King Tonopah mine on the basis of mapped faults and mineral veins in the area of the mine. Post-mineralization, northwest- to northeast-striking, steeply dipping faults, including the prominent Halifax Fault, offset extensions of the Tonopah Fault system several hundred feet down to the east and west. Nearly all geologic units in the area of the King Tonopah mine are slightly to strongly altered as a result of mineralizing fluids emanating from faults and other structures.
RELATION OF MINERALS AND ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: The King Tonopah epithermal vein system consists of the near-vertical King Tonoph vein and five other steeply dipping ore veins. Intense, quartz-sericite-adularia alteration centered on conduits for fluids related to ore deposition grades outward to chlorite-calcite-albite (propylitic) alteration. Silver and, to a lesser extent, gold occur in assemblages of the hypogene minerals: chalcopyrite, galena, sphalerite, argentite, pyrargyrite, polybasite, pyrite, wolframite, and electrum. The early Miocene Mizpah Formation contains the principal host rocks for silver and gold mineralization, although gold-silver veins are associated with intrusions of middle Miocene Oddie Rhyolite. Most gold-silver mineralization probably occurred about 19 million years ago, during deposition of the early Miocene Fraction Tuff. Ore grades variously have been reported as 0.30 ounces of gold and 30 ounces of silver per ton of ore or 0.02 ounces of gold and 20 ounces of silver per ton of ore.
COMMODITIES: Silver and gold

OPERATING AND ABANDONED FACILITIES: Three prospect shafts were sunk into the King Tonopah vein system between 1905 and 1960: the Umatilla, Belle of Tonopah, and King Tonopah shafts. The Umatilla shaft, about 3,035 feet WSW of the King Tonopah shaft, extends to a depth of 1,200 feet, where it intersects a north-south drift that is 2,460 feet long. The Belle of Tonopah shaft, about 1,200 feet WSW of the King Tonopah shaft, is 470 feet deep and contains no known cross-drifts. The King of Tonopah shaft was at least 650 feet deep and contained cross-drifts at the 200-, 300-, and 550-foot levels and a winze between the 300- and 650-foot levels. The shaft and headframe for this mine were destroyed by a fire in 1962. Since 1948, a succession of mining companies has explored the property, drilling 32 boreholes and excavating a small-open-pit mine to define the resource. Years of exploration produced small quantities of gold and silver and left behind tailings and refuse. The current claim holder plans to rehabilitate the King of Tonopah mine workings and to drill as many as 20 exploration holes to complete characterizing the resource before starting to mine the property.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The King of Tonopah mine is ~8 miles NE of MZ-2 station 11710+00.

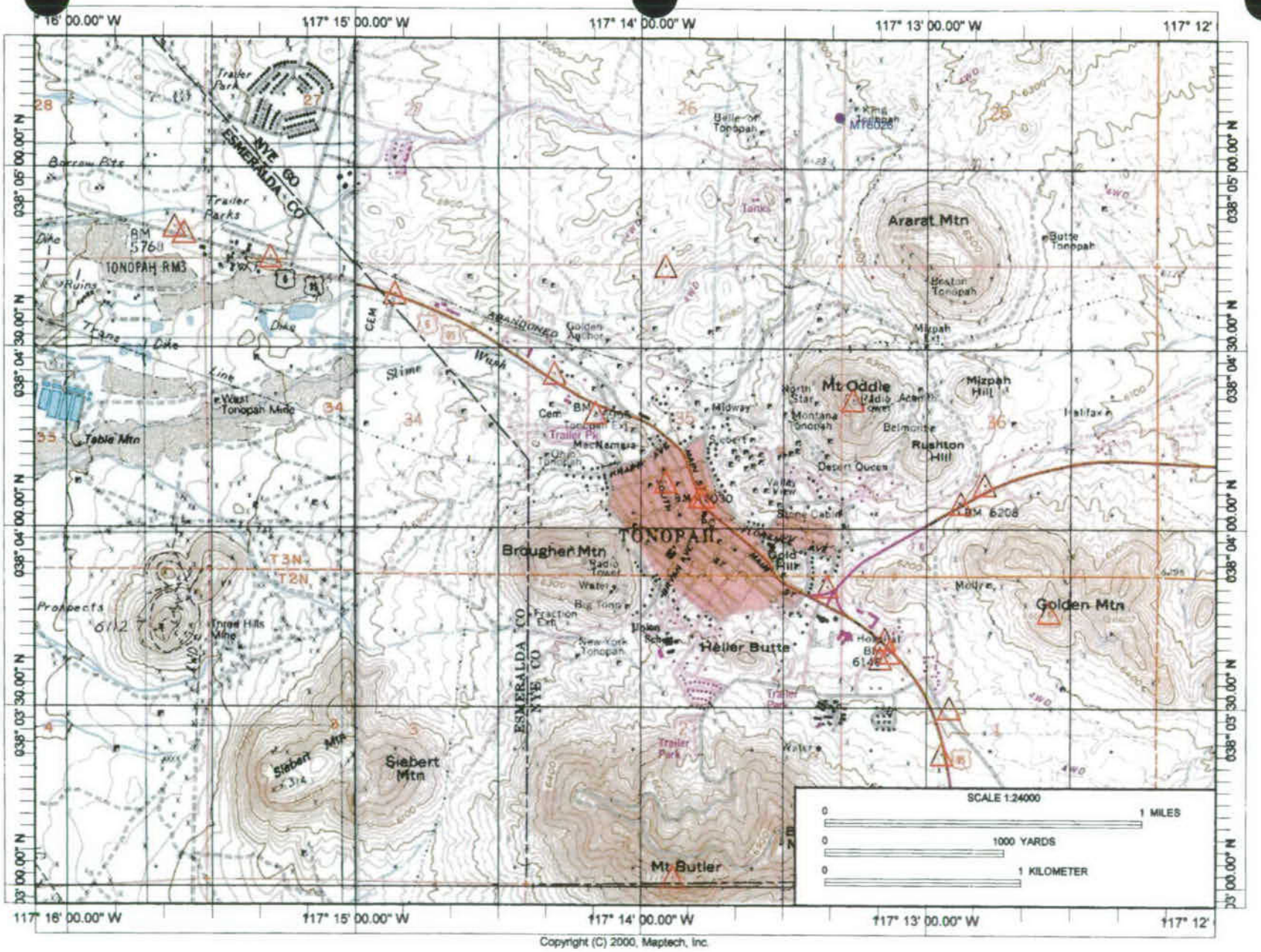
PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6026_ALG_0390_04 Dec06.jpg	MT6026	View east of sorted ore from mines in the King Tonopah vein system, including a small open-pit mine in the background (AG766)
MT6026_ALG_0391_04 Dec06.jpg	MT6026	Vertical mine shaft in King Tonopah vein system (AG767)
MT6026_ALG_0392_04 Dec06.jpg	MT6026	Vertical mine shaft and tailings in the King Tonopah vein system (AG768)
MT6026_ALG_0393_04 Dec06.jpg	MT6026	View west of tailings from mines in the King Tonopah vein system and the city of Tonopah at sunset (AG769)

CONTACTS: N/A

REFERENCES: Bonham, H.F., Jr., and Garside, L.J., 1974, Road log and trip guide Carver Station-Tonopah district, *in* Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 6-13; Bonham, H.F., Jr., and Garside, L.J., 1974, Tonopah mining district and vicinity *in* Guidebook to the geology of four Tertiary volcanic centers in central Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Report 19, p. 42-48; Kleinhampl, F.J., and Ziony, J.I., 1984, Mineral resources of northern Nye County, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 99B, 243 p.; Strachan, D.G., 2005, Mining history, geology, and economic potential of the King Tonopah vein system, northern Tonopah district, Nye County, Nevada: La Jolla, Calif., Report for Tonogold Resources, Inc., 13 p.

ADDITIONAL COMMENTS: Tonogold Resources, Inc., also is evaluating the Tonopah-Divide mine in the Tonopah area. This mine is discussed in a separate field data sheet.



Copyright (C) 2000, Maptech, Inc.

INVESTIGATOR: Art Geldon and George Lightwood		MINE OR OTHER FEATURE: Wabuska Hot Springs	
DATE: 11/27/06		OWNER OR LESSEE: Homestretch Geothermal	
TIME: 15:45		**MINING DISTRICT: Wabuska Marsh**	
WEATHER: Cold, partially overcast		COUNTY: Lyon	
GEOGRAPHIC AREA: Mason Valley		GEOGRAPHIC COORDINATES (T, R, S): T15N, R25E, S15 & 16	
WAYPOINT: MT6001	LATITUDE: N 39.16388^0	LONGITUDE: W 119.18144^0	ALTITUDE: 4,318 ft AMSL

GEOGRAPHIC DESCRIPTION: The hot springs occur in a salt marsh near the northern margin of Mason Valley, 1.2-1.6 miles N to NE of the town of Wabuska, NV. The springs can be reached by Alternate US-95 and short dirt roads leading to private property on which the Homestretch Geothermal plant facilities are located.

LOCAL GEOLOGIC UNIT: Quaternary playa and hot spring deposits

REGIONAL GEOLOGIC UNIT: Quaternary playa deposits (Qp)

LITHOLOGIC DESCRIPTION: Near the surface of the salt marsh, 6-8 feet of saline clay is overlain by a crust consisting of sodium sulfate (thenardite), sodium chloride (halite), calcium carbonate (calcite), calcium sulfate, and other minerals. The surface crust ranges from soft to hard and, locally, contains clear crystals of thenardite. Hot springs issue from circular mounds of unspecified composition.

SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Playa and salt marsh deposits are widespread in Mason Valley. The broad, flat-bottomed valley, with several areas of closed depressions containing alkali flats, gives the impression that ephemeral or perennial bodies of water repeatedly filling and draining in response to changes in climate might have shaped the terrain.

RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: The hot springs coincide with a NE trending zone of faults, which Stewart (1999) called the Wabuska lineament. These faults are believed to facilitate upward movement of water heated at depth by the natural geothermal gradient in the area, and not by a buried intrusive body. Evaporation of hot, saline water at the land surface left a crust containing halite, thenardite, calcite, and other saline minerals.

COMMODITIES: Hot water (59-108^0 C), thenardite, and halite

OPERATING AND ABANDONED FACILITIES: Several buildings and other structures were observed on the grounds of Homestretch Geothermal during a brief visit. According to two workers interviewed at the site, all facilities observed were related to operation of a nearby power plant. Energy generated by this power plant is sold to Pacific Power for rural electric use. Structures related to former commercial operations dependant on the hot springs, such as a former power plant (Magma Power Co.), a greenhouse (Agri-Technology Corp.), and an ethanol manufacturing plant (Tad's Enterprises), have been torn down.

RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The hot springs are 8.5 miles NW of MRR alternate SZ-1/2, station 10000+00. However, they are very close to the preferred site for a rail yard. Hence, it is possible that construction and operation of the rail yard, where preferred, would impact negatively continuing use of the hot springs in commercial endeavors.

PHOTOGRAPHS

NUMBER	WAYPOINT	SUBJECT (Note direction of view)
MT6001_ALG_0312_27 Nov06.jpg	MT6001	View NE of geothermal plant and Wabuska Hot Springs operating facilities (AG651)
MT6001_ALG_0313_27 Nov06.jpg	MT6001	View north of Wabuska Hot Springs and Desert Mountain (NBMG photo) (AG651a)
MT1015_ALG_0027_06 Oct06.jpg	MT1015	View north of a canal and UPRR tracks near the proposed site of a rail yard for the MRR (AG311b)

CONTACTS: N/A

REFERENCES: Moore, J. G., 1969, Geology and mineral deposits of Lyon, Douglas, and Ormsby Counties, Nevada: Reno, Nev., Nevada Bureau of Mines and Geology Bulletin 75, 45 p. and 1:250,000-scale geologic map; Shevenell, Lisa, and Garside, L.J., 2005, Nevada geothermal resources, second edition: Reno, Nev., Nevada Bureau of Mines and Geology Map 141, scale 1:750,000 [available on the internet at http://www.nbmg.unr.edu].

ADDITIONAL COMMENTS: This site has had a long history of ever-changing uses for the hot springs. It is reasonable to expect this pattern of land use to continue. It also is possible that mining of saline minerals present in the playa sediments might become economically feasible some day.

FIELD DATA REPORT	
INVESTIGATOR: Matthew T. Grizzell	MINE OR OTHER FEATURE: Walker River Indian Reservation; Meeting with Geologists, Dept.of Interior, Bureau of Indian Affairs, Division of Energy & Mineral Development (DEMD) in Lakewood, Colorado office.
DATE: April 9, 2007	OWNER OR LESSEE: Walker River Paiute Tribe
TIME: 0900 - 1000 MDT	MINING DISTRICT: Benway, Buckley, Calico Hills, Double Springs Marsh, Holy Cross, Mountain View, Red Ridge
GEOGRAPHIC AREA: Walker River Indian Reservation	
COUNTY: Mineral, Lyon, Churchill	
GEOGRAPHIC COORDINATES (T, R, S) Covers many townships within Tps. 11 through 15 N., Rs. 25 through 30 E.	
SITE GEOGRAPHIC DESCRIPTION: Stretches from the northern Gillis Range and Gum Drop hills on the south to the Barnett Hills and Campbell Valley on the north. Includes part of the northern Wassuk Range on the West.	
SITE GEOLOGY (SPATIAL RELATIONS OF GEOLOGIC UNITS AND STRUCTURE): Structural basement is composed of Triassic to Jurassic-age metavolcanics and metasediments of the Excelsior and Luning Formations are intruded by Jurassic and Cretaceous-age intrusive bodies (primarily felsic compositions). Basement rocks are typically covered by a sequence of Tertiary-age felsic to intermediate composition ash-flow tuffs, lava flows, and hypabyssal intrusives. The Triassic to Tertiary-age rocks are cut by numerous thrust, stricke-slip, normal, and oblique faults relating to several periods of tectonic disruption. Approximately 75% of the land surface in the reservation is covered by Quaternary alluvial and lacustrine deposits overlying the Triassic to Tertiary bedrock units.	
MINERALS AND ENERGY RESOURCES: According to Lynne Carpenter, Dave Hummer, and Bob Just (DEMD geologists), there is no active or planned mining or exploration operations are known at this time on the Walker River Indian Reservation (the tribe currently does not have a mineral development policy). They indicate that the most promising metal exploration target in the reservation (Copper Hill and West Copper hill skarn/porphyry copper deposits) were recently studied in a M.S. thesis by Eric Eckberg (Colorado School of Mines, 2006). This thesis is probably not publically available. Eckberg concluded that these deposits are likely marginally economic in current market conditions. The DEMD geologists also indicated vast potential for crushed-rock aggregate (and possibly railroad ballast) resources from Mesozoic-age equigranular-textured and unaltered intrusive bodies in the Wassuk Range. The DEMD geologists requested a copy of the S&W MRC Ballast Quarry report for their records.	
Lynne Carpenter further indicated that vast resources of sand and gravel (mineral materials) are present in Quaternary alluvial deposits on the Reservation. She also mentioned that she had not seen (and was unaware) of trona or similar evaporite deposits on the Reservation that may be useful as industrial mineral resources. The DEMD staff had not studied geothermal or energy resources on the Reservation.	
COMMODITIES: Copper occurrences (Copper Hill/West Copper Hill), crushed rock aggregate/railroad ballast (Mesozoic intrusive bodies in Wassuk Range), mineral material resources (Quaternary alluvial deposits).	
RELATION OF MINERALIZATION OR ENERGY RESOURCES TO GEOLOGIC UNITS AND STRUCTURE: Copper deposits (copper porphyry systems hosted in Jurassic to Creataceous intrusive bodies at depth, and copper/iron/tungsten skarns hosted by Jurassic to Cretaceous intrusives and adjacent Triassic calcareous wall rocks), crushed rock aggregate/railroad ballast (Mesozoic intrusive bodies in Wassuk Range), mineral material resources (Quaternary alluvial deposits).	
RELATION OF RESOURCE TO RAILROAD ALIGNMENTS: The MRC route traverses within 1 mile of a potential crushed rock aggregate or ballast resource in Cretaceous quartz monzonite of White Mountain at sec. 5, T. 13 N., R. 28 E. Existing rail of the MCS1 segment of the MRC traverses within 3 miles of the Copper Hill/West Copper Hill deposits. Potential mineral material resources are located in quaternary alluvial deposits (~75% of land area in Reservation).	
CONTACTS: (1) Lynne Carpenter, Geologist, Bureau of Indian Affairs, Division of Energy & Mineral Development; (2) Bob Just, Geologist (same agency); (3) Dave Hummer, Geologist (same agency). Phone Number: (303) 969-5270	
ADDITIONAL COMMENTS: The DEMD geologists mention a governmental "Buy Indian Policy" that they indicate may require use of ballast from the Reservation if such a resource is developed at the time of MRC construction. They also indicate that shared use of the MRC may be beneficial to future mineral activities on the Reservation. A comprehensive bibliography of mineral-related literature pertaining to the Reservation was provided, as well as a 1976 DEMD report by Albers and Magill.	

APPENDIX B

PHOTOGRAPHS FROM FIELD RECONNAISSANCE (ON CD)

PHOTO ID	WAYPT	ROUTE	STATION	OFFSET (FEET)	DIRECTION	COMMENT	SOURCE	DATE
MT1015_ALG_0027_06Oct06.jpg	MT1015	S6	10000+00.	-36786		View north of a canal and UPRR tracks near the proposed site of a rail yard for the MRR	ALG	10/6/2006
MT1015_SMP_0021_06Oct06.jpg	MT1015	S6	10000+00.	-36786	NE	west of Wabuska yard at existing RR line	SMP	10/6/2006
MT1015_SMP_0022_06Oct06.jpg	MT1015	S6	10000+00.	-36786	NW	west of Wabuska yard at existing RR line	SMP	10/6/2006
MT1015_SMP_0023_06Oct06.jpg	MT1015	S6	10000+00.	-36786	N	view of erosion around RR culvert	SMP	10/6/2006
MT1057_ALG_0165_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		View downwash in Gabbs Valley Range	ALG	10/10/2006
MT1057_ALG_0166_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		KJg granite outcrops	ALG	10/10/2006
MT1057_ALG_0167_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Altered Oligocene Mickey Pass Tuff and Jurassic diorite, Todd Mountain	ALG	10/10/2006
MT1057_ALG_0168_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Alteration in possible fault zone at granite-diorite contact	ALG	10/10/2006
MT1057_ALG_0169_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Typical weathering of KJg granite	ALG	10/10/2006
MT1057_ALG_0170_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Typical rectangular fractures in granite	ALG	10/10/2006
MT1057_ALG_0171_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Weathered granite in contact with diorite	ALG	10/10/2006
MT1057_ALG_0172_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Weathered granite slope	ALG	10/10/2006
MT1057_ALG_0173_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809		Tarantula on Qc alluvium	ALG	10/10/2006
MT1057_SMP_0102_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809	N	Granite outcrop showing J1, J2, J3 in SMP's notes	SMP	10/10/2006
MT1057_SMP_0103_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809	N	Closeup of granite outcrop showing J1, J2, J3 in SMP's notes	SMP	10/10/2006
MT1057_SMP_0104_10Oct06.jpg	MT1057	MCS1	2206+83.	-22809	SW	tarantula	SMP	10/10/2006
MT1059_ALG_0176_10Oct06.jpg	MT1059	MCS1	2300+29.	-7144		Cretaceous quartz monzonite pluton, Todd Mountain, SW of the New Santa Fe mine	ALG	10/10/2006
MT1059_ALG_0177_10Oct06.jpg	MT1059	MCS1	2300+29.	-7144		Coarse detritus at head of GV Range fan	ALG	10/10/2006
MT1062_ALG_0184_10Oct06.jpg	MT1062	MCS1	2416+67.	-104	NW	View NW along MCS-1 on Gabbs Valley Range alluvial fan	ALG	10/10/2006
MT1062_ALG_0185_10Oct06.jpg	MT1062	MCS1	2416+67.	-104	SE	View SW to Soda Spring Valley along the Gabbs Valley Range alluvial fan	ALG	10/10/2006
MT1062_ALG_0186_10Oct06.jpg	MT1062	MCS1	2416+67.	-104		Pleistocene sandy gravel underlying Gabbs Valley Range alluvial fan near the mine shaft	ALG	10/10/2006
MT1062_SMP_0106_10Oct06.jpg	MT1062	MCS1	2416+67.	-104	SW	test hole in Qao	SMP	10/10/2006
MT1063_ALG_0187_11Oct06.jpg	MT1063	MCS1	2416+51.	728		View west of a vertical mine shaft excavated into Gabbs Valley range fan alluvium, Mildred & Copper Queen claims	ALG	10/11/2006
MT1063_ALG_0188_11Oct06.jpg	MT1063	MCS1	2416+51.	728		Warning sign posted on fence around vertical mine shaft excavated through fan alluvium to a copper-molybdenum ore body	ALG	10/11/2006
MT1063_SMP_0107_11Oct06.jpg	MT1063	MCS1	2416+51.	728	SW	abandoned mine shaft	SMP	10/11/2006
MT1064_ALG_0189_11Oct06.jpg	MT1064	MCS1	2395+74.	-5859	NE	View NE of folded and faulted limestone in the Triassic Luning Formation, Todd Mountain		10/11/2006
MT1064_SMP_0108_11Oct06.jpg	MT1064	MCS1	2395+74.	-5859	NE	Luning Fm., folding (anticline) and thrust fault visible	SMP	10/11/2006
MT1065_ALG_0190_11Oct06.jpg	MT1065	MCS1	2392+85.	-7141		Outcrop of limestone, dolomitic limestone, and shaly dolomite in the Luning Formation	ALG	10/11/2006
MT1065_ALG_0191_11Oct06.jpg	MT1065	MCS1	2392+85.	-7141	S	SW-dipping Luning Fm Ls & dolomite	ALG	10/11/2006
MT1065_SMP_0109_11Oct06.jpg	MT1065	MCS1	2392+85.	-7141	SW	limestone outcrop	SMP	10/11/2006
MT1065_SMP_0110_11Oct06.jpg	MT1065	MCS1	2392+85.	-7141	N	Luning Fm., folding (anticline) and thrust fault visible, from top of limestone outcrop	SMP	10/11/2006
MT1083_ALG_0261_13Oct06.jpg	MT1083	MCS1	3739+40.	91	N	View N from MCS1 of wash incised into Monte Cristo Range fan alluvium	ALG	10/13/2006
MT1083_ALG_0262_13Oct06.jpg	MT1083	MCS1	3739+40.	91		Qao fan alluvium	ALG	10/13/2006
MT1083_ALG_0263_13Oct06.jpg	MT1083	MCS1	3739+40.	91		View west of nonwelded ash-flow tuff adjacent to the Mina rail corridor in the Redlich claim bloc	ALG	10/13/2006
MT1083_ALG_0264_13Oct06.jpg	MT1083	MCS1	3739+40.	91		NW ash-flow tuff in Tsv	ALG	10/13/2006
MT1083_ALG_0265_13Oct06.jpg	MT1083	MCS1	3739+40.	91	NW	View NW on MCS1 of old RR grade and wash	ALG	10/13/2006
MT1083_ALG_0266_13Oct06.jpg	MT1083	MCS1	3739+40.	91	SE	View SE along MCS1	ALG	10/13/2006
MT1083_SMP_0153_13Oct06.jpg	MT1083	MCS1	3739+40.	91	NE	old RR grade, approx. 20-25 degree slope	SMP	10/13/2006
MT1083_SMP_0154_13Oct06.jpg	MT1083	MCS1	3739+40.	91	NW	old RR grade, approx. 25-27 degree slope	SMP	10/13/2006
MT1083_SMP_0155_13Oct06.jpg	MT1083	MCS1	3739+40.	91	E	test hole in Qao	SMP	10/13/2006
MT1083_SMP_0156_13Oct06.jpg	MT1083	MCS1	3739+40.	91	S	foreground hill is welded tuff (gray color)	SMP	10/13/2006
MT1087_ALG_0279_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		Tower and collapsed boron and sodium salt processing buildings at remains of a borax processing plant, SE part of Columbus Salt Marsh	ALG	10/14/2006
MT1087_ALG_0280_14Oct06.jpg	MT1087	MCS1	4277+74.	29104	NE	View NE of Monte Cristo Range from Columbus Salt Marsh	ALG	10/14/2006
MT1087_ALG_0281_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		Junk art on the marsh	ALG	10/14/2006
MT1087_ALG_0282_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		Trench excavated into marsh for mining salt	ALG	10/14/2006
MT1087_ALG_0283_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		Evaporation pond for recovering boron and sodium salts in SE part of Columbus Salt Marsh	ALG	10/14/2006
MT1087_ALG_0284_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		Evaporite tailings on Columbus Marsh	ALG	10/14/2006

PHOTO ID	WAYPT	ROUTE	STATION	OFFSET (FEET)	DIRECTION	COMMENT	SOURCE	DATE
MT1087_ALG_0285_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		View NW of playa sediments and evaporite layers exposed in a trench excavated to recover salt minerals from columbus Marsh	ALG	10/14/2006
MT1087_ALG_0286_14Oct06.jpg	MT1087	MCS1	4277+74.	29104		Fine-grained sediments and evaporite minerals exposed in a trench excavated to recover salt minerals from Columbus Marsh	ALG	10/14/2006
MT1087_SMP_0160_14Oct06.jpg	MT1087	MCS1	4277+74.	29104	W	Columbus Salt Marsh; berms surrround trenches	SMP	10/14/2006
MT1087_SMP_0161_14Oct06.jpg	MT1087	MCS1	4277+74.	29104	W	trench in Columbus Salt Marsh	SMP	10/14/2006
MT6001_ALG_0312_27Nov06.jpg	MT6001	S6	10000+00.	-44187		View NE of geothermal plant and Wabuska Hot Springs operating facilities	ALG	11/27/2006
MT6001_ALG_0313_27Nov06.jpg	MT6001	S6	10000+00.	-44187	N	View north of Wabuska Hot Springs and Desert Mountain (NBMG photo)	ALG	11/27/2006
MT6002_ALG_0315_28Nov06.jpg	MT6002	MCS1	2303+62.	-20865	NW	New Santa Fe mine, leech pond, tailings & power lines in JTrs	ALG	11/28/2006
MT6002_ALG_0316_28Nov06.jpg	MT6002	MCS1	2303+62.	-20865		New Santa Fe mine in JTrs, reclaimed tailings, south side of Highway 361	ALG	11/28/2006
MT6002_ALG_0317_28Nov06.jpg	MT6002	MCS1	2303+62.	-20865		View east of hydrothermally altered limestone in the Triassic Luning Formation, Todd Mountain	ALG	11/28/2006
MT6002_ALG_0318_28Nov06.jpg	MT6002	MCS1	2303+62.	-20865	W	View west of Isabella(?) mine tailings from the New Santa Fe mine	ALG	11/28/2006
MT6003_ALG_0319_28Nov06.jpg	MT6003	MCS1	2306+78.	-27901	S	View south of open-pit mine in hydrothermally altered Luning Formation	ALG	11/28/2006
MT6004_ALG_0314_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550	NW	Pan NW of reclaimed tailings, leach pond, & power facilities in JTrs, Santa Fe mine	ALG	11/28/2006
MT6004_ALG_0320_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		Lowermost mine in New York Canyon, about 0.75 mile east of Volcano Peak; Nevada Sunrise claim	ALG	11/28/2006
MT6004_ALG_0321_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		NY Canyon mine shaft in JTrs polymetallic skarn	ALG	11/28/2006
MT6004_ALG_0322_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		One of many adits in a mine excavated into skarn cut by veins containing copper oxide minerals	ALG	11/28/2006
MT6004_ALG_0323_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		Skarn cut by a wide vein containing blue and green copper oxide minerals	ALG	11/28/2006
MT6004_ALG_0324_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		NY Canyon mine copper vein cutting JTrs skarn	ALG	11/28/2006
MT6004_ALG_0325_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		Two adits completed in skarn to intersect copper veins	ALG	11/28/2006
MT6004_ALG_0326_28Nov06.jpg	MT6004	MCS1	2473+08.	-12550		Adit excavated into a vein containing copper oxide minerals	ALG	11/28/2006
MT6005_ALG_0327_28Nov06.jpg	MT6005	MCS1	2440+92.	-13847		Ore chute and tailings at a mine in upper New York Canyon	ALG	11/28/2006
MT6006_ALG_0328_29Nov06.jpg	MT6006	MCS1	2163+82.	17223	NW	View SW of near-vertical to overturned beds of the Dunlap Formation in thrust plates on the noth flank of Black Dyke Mountain, SW of the Blue Ribbon mines, Jeepmine claim posts in foreground	ALG	11/28/2006
MT6007_ALG_0329_29Nov06.jpg	MT6007	MCS1	2130+89.	20217		Blue Ribbon mine partially caved adit, ore car tracks, and trailings	ALG	11/28/2006
MT6007_ALG_0330_29Nov06.jpg	MT6007	MCS1	2130+89.	20217	NE	View NE of Blue Ribbon mine tailing, Soda Spring Valley playa, and Gabbs Valley Range	ALG	11/28/2006
MT6008_ALG_0331_29Nov06.jpg	MT6008	MCS1	2128+00.	20111		Vertical mine shaft in the Blue Ribbon mine cluster in JTrs polymetallic skarn	ALG	11/28/2006
MT6008_ALG_0332_29Nov06.jpg	MT6008	MCS1	2128+00.	20111		View west of headframe in main cluster of Blue Ribbon mines	ALG	11/28/2006
MT6012_ALG_0333_29Nov06.jpg	MT6012	MCS1	2886+58.	-3446	NE	JTrs limestone in Gabbs Valley Range	ALG	11/29/2006
MT6012_ALG_0334_29Nov06.jpg	MT6012	MCS1	2886+58.	-3446	NE	JTrs in Gabbs Valley Range from Pilot Mts	ALG	11/29/2006
MT6012_ALG_0335_29Nov06.jpg	MT6012	MCS1	2886+58.	-3446	SE	Hydrothermally altered JTrs on west side of Pilot Mts	ALG	11/29/2006
MT6012_ALG_0336_29Nov06.jpg	MT6012	MCS1	2886+58.	-3446	NE	Hydrothermally altered JTrs on west side of Pilot Mts	ALG	11/29/2006
MT6013_ALG_0337_30Nov06.jpg	MT6013	MCS1	4033+28.	23581	SW	View SW of evaporation ponds at Columbus Marsh calcium carbonate mine, Norther Colombus Salt Marsh (White Mountains and Boundary Peak in Distance)	ALG	11/30/2006
MT6013_ALG_0338_30Nov06.jpg	MT6013	MCS1	4033+28.	23581	NE	View NE of Argentum Calcium carbonate processing plant and clay tailings, northern Columbus Marsh near the former town of Colombus	ALG	11/30/2006
MT6014_ALG_0339_30Nov06.jpg	MT6014	MCS1	4502+84.	36587		View south of Blanco mine excavation into altered sedimentary rocks and tuff of the Miocene Esmeralda Formation	ALG	11/30/2006
MT6014_ALG_0340_30Nov06.jpg	MT6014	MCS1	4502+84.	36587	ENE	Pan NE to SE of Blanco mine trenches, pits, and tailings piles; Monte Cristo Range and Lone Mountain in the distance	ALG	11/30/2006
MT6014_ALG_0341_30Nov06.jpg	MT6014	MCS1	4502+84.	36587	NW	Blanco mine, claim stakes on upper slopes	ALG	11/30/2006
MT6014_ALG_0342_30Nov06.jpg	MT6014	MCS1	4502+84.	36587	NW	View SW showing an open-pit mine excavated into nonwelded tuff of the Esmeralda Formation at Emigrant Pass	ALG	11/30/2006
MT6014_ALG_0343_30Nov06.jpg	MT6014	MCS1	4502+84.	36587		Stockpiled bentonite clay and outcrops of the Esmeralda Formation (BLM photo)	ALG	11/30/2006
MT6014_ALG_0344_30Nov06.jpg	MT6014	MCS1	4502+84.	36587	NE	View SE of trench excavated into altered tuff or sedimentary rock of Miocene Esmeralda Formation	ALG	11/30/2006
MT6014_ALG_0345_30Nov06.jpg	MT6014	MCS1	4502+84.	36587		Close-up view of altered rocks exposed in the trench	ALG	11/30/2006
MT6014_ALG_0346_30Nov06.jpg	MT6014	MCS1	4502+84.	36587		Clayey alteration of layred rocks exposed in trench walls	ALG	11/30/2006
MT6014_ALG_0347_30Nov06.jpg	MT6014	MCS1	4502+84.	36587		Veined, argillized, and contorted rocks exposed in trench wall	ALG	11/30/2006

PHOTO ID	WAYPT	ROUTE	STATION	OFFSET (FEET)	DIRECTION	COMMENT	SOURCE	DATE
MT6015_ALG_0348_30Nov06.jpg	MT6015	MN1	5313+69.	-4882	N	Pan NW of Rulco Heart of Nature open-pit, alum and sulfer mine, which is excavated into the Miocene Esmeralda Formation in the Weepah Hills.	ALG	11/30/2006
MT6015_ALG_0349_30Nov06.jpg	MT6015	MN1	5313+69.	-4882	NE	View north of the Rulco Heart of Nature open-pit mine	ALG	11/30/2006
MT6015_ALG_0350_30Nov06.jpg	MT6015	MN1	5313+69.	-4882		View NE of the Rulco Heart of Nature mine and tailings	ALG	11/30/2006
MT6016_ALG_0351_01Dec06.jpg	MT6016	MN1	5883+63.	3852		View NE of plant facilities at the Chemetall Foote Corp. at Silver Peak Marsh, with Clayton Ridge and the Montezuma Range in the distance	ALG	12/1/2006
MT6016_ALG_0352_01Dec06.jpg	MT6016	MN1	5883+63.	3852		View west of the processing plant from the lithium mine operations office in Silver Peak, NV	ALG	12/1/2006
MT6016_ALG_0353_01Dec06.jpg	MT6016	MN1	5883+63.	3852		Aerial view of mine processing and evaporation ponds in Silver Peak Marsh and surrounding areas of Clayton Valley	ALG	12/1/2006
MT6017_ALG_0354_01Dec06.jpg	MT6017	MN1	5708+23.	26927		Pan SE of Brodie pit, leachpad, mine buildings, and Wyman Fm outcrops	ALG	12/1/2006
MT6017_ALG_0355_01Dec06.jpg	MT6017	MN1	5708+23.	26927		Phyllite in Late Proterozoic Wyman Fm NE of the mine in the Brodie deposit	ALG	12/1/2006
MT6017_ALG_0356_01Dec06.jpg	MT6017	MN1	5708+23.	26927		Aerial view of the Mineral Ridge mine complex, from the Brodie mine on the west to the Mary and Drinkwater mines on the east	ALG	12/1/2006
MT6018_ALG_0357_01Dec06.jpg	MT6018	MN1	5224+23.	39116		North Spring prospect, Silver Peak Range	ALG	12/1/2006
MT6018_ALG_0358_01Dec06.jpg	MT6018	MN1	5224+23.	39116		Cambrian Mule Spring Limestone, North Spring prospect	ALG	12/1/2006
MT6018_ALG_0359_01Dec06.jpg	MT6018	MN1	5224+23.	39116		Silver Peak Volcanics underlying Rhyolite Ridge	ALG	12/1/2006
MT6019_ALG_0360_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo project, McLean open-pit mine in hydrothermally altered andesite	ALG	12/2/2006
MT6019_ALG_0361_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo project, McLean open-pit mine in hydrothermally altered andesite	ALG	12/2/2006
MT6019_ALG_0362_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo project, hydrothermally altered, brecciated andesite with quartz-pyrite viens, cropping out on a ledge that extends into the open-pit mine	ALG	12/2/2006
MT6019_ALG_0363_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Mine shaft in Monte Cristo project area, volcanic buttes in background near the Gilbert town site	ALG	12/2/2006
MT6019_ALG_0364_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo Project mine shaft, ore chute, and tailings	ALG	12/2/2006
MT6019_ALG_0365_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo project mine building on top of tailings dump	ALG	12/2/2006
MT6019_ALG_0366_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo project, ore chute and tailings	ALG	12/2/2006
MT6019_ALG_0367_02Dec06.jpg	MT6019	MN2	5380+50.	-49263		Monte Cristo Project mine shaft, ore chute, and tailings	ALG	12/2/2006
MT6020A_ALG_0394_05Dec06.jpg	MT6020A	MN2	5339+21.	-7465		Boss mine heap leach pad	ALG	12/5/2006
MT6020A_ALG_0395_05Dec06.jpg	MT6020A	MN2	5339+21.	-7465	WNW	PAN W TO NW OF Boss mine tailings	ALG	12/5/2006
MT6020A_ALG_0396_05Dec06.jpg	MT6020A	MN2	5339+21.	-7465		Aerial view of Boss mine	ALG	12/5/2006
MT6020A_ALG_0397_05Dec06.jpg	MT6020A	MN2	5339+21.	-7465	N	Boss open-pit gold mine and Monte Cristo Range	ALG	12/5/2006
MT6020A_ALG_0398_05Dec06.jpg	MT6020A	MN2	5339+21.	-7465	N	Boss open-pit gold mine	ALG	12/5/2006
MT6021_ALG_0368_02Dec06.jpg	MT6021	MN2	6579+60.	28899		Trench exposing contact metamorphosed shale and limestone of the Cambrian Poleta Formation	ALG	12/2/2006
MT6021_ALG_0369_02Dec06.jpg	MT6021	MN2	6579+60.	28899	W	View west of Lone Mountain and mine workings in the Cambrian Poleta Formation	ALG	12/2/2006
MT6021_ALG_0370_02Dec06.jpg	MT6021	MN2	6579+60.	28899		Collapsed ore chute & mine shaft, General Thomas Hills	ALG	12/2/2006
MT6021_ALG_0371_02Dec06.jpg	MT6021	MN2	6579+60.	28899		Outcrop of skarn in the Cambrian Poleta Formation at small mine in General Thomas Hills	ALG	12/2/2006
MT6022_ALG_0372_03Dec06.jpg	MT6022	MN2	7498+47.	-9186	E	Columbia Mountain (EL 6,097 feet AMSL) at south end of Gemfield prospect, Goldfield Hills, Goldfield, Nevada	ALG	12/3/2006
MT6022_ALG_0373_03Dec06.jpg	MT6022	MN2	7498+47.	-9186	NE	Gemfield area, Montezuma Valley, looking NNE to remains of GFCMC mill	ALG	12/3/2006
MT6023_ALG_0375_03Dec06.jpg	MT6023	MN2	7498+47.	18871		View NW of two vertical mine shafts surrounded by a tailings pad, Nevada Eagle mine shafts, Montezuma Range	ALG	12/3/2006
MT6023_ALG_0376_03Dec06.jpg	MT6023	MN2	7498+47.	18871		View east of cyanide-treated tailings and a treatment tank, with prospect pits on the west side of Malpais Mesa in the background, Nevada Eagle mine, Malpais Mesa	ALG	12/3/2006
MT6023_ALG_0377_03Dec06.jpg	MT6023	MN2	7498+47.	18871		Outcrop of hydrothermally altered Miocene tuff or tuff breccia at the mine at Nevada Eagle mine	ALG	12/3/2006
MT6023_ALG_0378_03Dec06.jpg	MT6023	MN2	7498+47.	18871		View NW of tailings in the foreground and an area of recent exploratory drilling on east slope of Montezuma Range in the background	ALG	12/3/2006
MT6024_ALG_0374_03Dec06.jpg	MT6024	MN1	7304+96.	62644	N	Montezuma V where Gemfield prospect crosses US-95	ALG	12/3/2006
MT6024_ALG_0379_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Vertical mine shaft at the Imperial mine, showing mineralization of altered Cambrian sedimentary rocks	ALG	12/3/2006
MT6024_ALG_0380_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Altered Cambrian sedimentary rocks above a collapsed mine shaft at the Imperial mine	ALG	12/3/2006
MT6024_ALG_0381_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Imperial mine tailings pad in Palmetto Mountains	ALG	12/3/2006
MT6024_ALG_0382_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Imperial Mine saft excavated into altered Cambrian sedimentary rocks of the Emigrant or Poleta Formation	ALG	12/3/2006

PHOTO ID	WAYPT	ROUTE	STATION	OFFSET (FEET)	DIRECTION	COMMENT	SOURCE	DATE
MT6024_ALG_0383_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Imperial mine ore	ALG	12/3/2006
MT6024_ALG_0384_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Sunset over Imperial mine tailings pad	ALG	12/3/2006
MT6024_ALG_0385_03Dec06.jpg	MT6024	MN1	7304+96.	62644		Imperial mine tailings pad	ALG	12/3/2006
MT6025_ALG_0386_04Dec06.jpg	MT6025	MN2	6613+56.	-26512		View ENE of exploration trenches and a dome of Oddie Rhyolite	ALG	12/4/2006
MT6025_ALG_0387_04Dec06.jpg	MT6025	MN2	6613+56.	-26512		View ENE of abandoned mine shaft and a hill underlain by a dome of Miocene Oddie Rhyolite	ALG	12/4/2006
MT6025_ALG_0388_04Dec06.jpg	MT6025	MN2	6613+56.	-26512		View south of the Tonopah Divide mine in the Miocene Fraction Tuff and Sielbert Formation	ALG	12/4/2006
MT6025_ALG_0389_04Dec06.jpg	MT6025	MN2	6613+56.	-26512		Aerial view of the Tonopah Divide mine at Gold Mountain, about 6 miles south of Tonopah	ALG	12/4/2006
MT6026_ALG_0390_04Dec06.jpg	MT6026	MN2	6427+82.	-41022		View east of sorted ore from mines in the King Tonopah vein system, including a small open-pit mine in the background	ALG	12/4/2006
MT6026_ALG_0391_04Dec06.jpg	MT6026	MN2	6427+82.	-41022		Vertical mine shaft in King Tonopah vein system	ALG	12/4/2006
MT6026_ALG_0392_04Dec06.jpg	MT6026	MN2	6427+82.	-41022		Vertical mine shaft and tailings in the the King Tonopah vein system	ALG	12/4/2006
MT6026_ALG_0393_04Dec06.jpg	MT6026	MN2	6427+82.	-41022		View west of tailings from mines in the King Tonopah vein system and the city of Tonopah at sunset	ALG	12/4/2006
MT6027_ALG_0399_05Dec06.jpg	MT6027	MCS1	3827+60.	5881		Road cut in extensively fractured and altered Cretaceous Granite of Redlich, with prominent shear zones	ALG	12/5/2006
MT6028_ALG_0400_05Dec06.jpg	MT6028	MCS1	3773+64.	3666		Slightly altered gabbro dike cutting Devonian to Ordovician sedimentary rocks exhibiting steam-heated alteration	ALG	12/5/2006
MT6028_ALG_0401_05Dec06.jpg	MT6028	MCS1	3773+64.	3666	N	View north of Conglomerate Hill, underlain by Devonian to Ordovician sedmincntary rocks and Permian (?) sedimentary breccia	ALG	12/5/2006
MT6028_ALG_0402_05Dec06.jpg	MT6028	MCS1	3773+64.	3666	NE	View NE from Redlich Summit of an area being drilled for gold anomalies because of large amounts of banded quartz float	ALG	12/5/2006
MT6029_ALG_0403_05Dec06.jpg	MT6029	MCS1	3895+51.	6460	NW	View west of Rock Hill mine in Devonian to Ordovician sedimentary rocks, Rock Hill mining district	ALG	12/5/2006
MT6029_ALG_0404_05Dec06.jpg	MT6029	MCS1	3895+51.	6460	N	View north of exploration trench excavated in scheelite (tungsten) bearing alluvium north of the Rock Hill placer mine; hill of Cretaceous Granite of Redlich in the distance	ALG	12/5/2006
MT7007_WTL_0369_19Feb07.jpg	MT7007	MN2	7368+23.	-3496		Gravel pit excavation reclaimed.	WTL	2/19/2007
MT7007_WTL_0370_19Feb07.jpg	MT7007	MN2	7368+23.	-3496		Stock piles on north side of NDOT Pit ES 04-01.	WTL	2/19/2007
MT7010_WTL_0376_19Feb07.jpg	MT7010	MN3	418+43.	-2834		Closeup of small mound from test pit excavation.	WTL	2/19/2007
MT7010_WTL_0377_19Feb07.jpg	MT7010	MN3	418+43.	-2834		Overview of small mound from test pit excavation.	WTL	2/19/2007
MT7018_WTL_0387_19Feb07.jpg	MT7018	MN3	619+14.	12062	S	Looking south along line of at least 7 claim markers.	WTL	2/19/2007
MT7019_WTL_0388_19Feb07.jpg	MT7019	MN3	680+71.	3891	N	Looking north along 1/4 section of mapped area.	WTL	2/19/2007
MT8036_PHZ_0054_23Feb07.jpg	MT8036	MCS1	1000+00.	-1909	E	View of mine shaft	PHZ	2/23/2007
MT8036_PHZ_0055_23Feb07.jpg	MT8036	MCS1	1000+00.	-1909	W	View of mine shaft	PHZ	2/23/2007
MT8037_PHZ_0056_23Feb07.jpg	MT8037	MCS1	1000+00.	-1909	S	View of prospect pit	PHZ	2/23/2007
MT8038_PHZ_0057_23Feb07.jpg	MT8038	MCS1	1000+00.	-1909	S	View of prospect pit	PHZ	2/23/2007
MT8138_PHZ_0206_28Feb07.jpg	MT8138	MCS1	1000+00.	-1909		View of mine opening	PHZ	2/28/2007
MT8138_PHZ_0207_28Feb07.jpg	MT8138	MCS1	1000+00.	-1909	N	View over mine	PHZ	2/28/2007
MT8138_PHZ_0208_28Feb07.jpg	MT8138	MCS1	1000+00.	-1909	S	View towards hills forming north part of Gillis Range	PHZ	2/28/2007
MT8139_PHZ_0209_28Feb07.jpg	MT8139	MCS1	1000+00.	-1909	SW	View towards Centipede Mine	PHZ	2/28/2007
MT8140_PHZ_0210_28Feb07.jpg	MT8140	MCS1	1000+00.	-1909	N	View towards Red Ridge West Prospect	PHZ	2/28/2007
MT8141_PHZ_0211_28Feb07.jpg	MT8141	MCS1	1000+00.	-1909		Photo of 4WD road	PHZ	2/28/2007
MT8141_PHZ_0212_28Feb07.jpg	MT8141	MCS1	1000+00.	-1909		View of Black Butte mine shaft	PHZ	2/28/2007
MT8141_PHZ_0213_28Feb07.jpg	MT8141	MCS1	1000+00.	-1909	N	View over shaft and Terrill Mountains	PHZ	2/28/2007
MT8141_PHZ_0214_28Feb07.jpg	MT8141	MCS1	1000+00.	-1909	S	View down to wooden track structure remnants	PHZ	2/28/2007
MT8142_PHZ_0215_28Feb07.jpg	MT8142	MCS1	1000+00.	-1909	W	View toward Black Butte mine	PHZ	2/28/2007
MT8143_PHZ_0216_28Feb07.jpg	MT8143	MCS1	1000+00.	-1909		View of prospect pit in vicinity of Afterthought Prospects	PHZ	2/28/2007
MT8143_PHZ_0217_28Feb07.jpg	MT8143	MCS1	1000+00.	-1909	N	View into hills that host numerous pits of Afterthought Prospects	PHZ	2/28/2007
MT8144_PHZ_0218_28Feb07.jpg	MT8144	MCS1	1000+00.	-1909		View of mine shaft in vicinity of Afterthought Prospects	PHZ	2/28/2007
MT8144_PHZ_0219_28Feb07.jpg	MT8144	MCS1	1000+00.	-1909		View of ridge representing possible dike running ~NE	PHZ	2/28/2007
MT8144_PHZ_0220_28Feb07.jpg	MT8144	MCS1	1000+00.	-1909	W	View over mine toward fans	PHZ	2/28/2007

PHOTO ID	WAYPT	ROUTE	STATION	OFFSET (FEET)	DIRECTION	COMMENT	SOURCE	DATE
MT8145_PHZ_0221_28Feb07.jpg	MT8145	MCS1	1000+00.	-1909		View of road	PHZ	2/28/2007
MT8146_PHZ_0222_28Feb07.jpg	MT8146	MCS1	1000+00.	-1909		View towards Joe Hicks Mine	PHZ	2/28/2007
MT8232_PHZ_0407_06Mar07.jpg	MT8232	MCS1	1000+00.	-1909		View of eastern mine shaft at Camp Terrill	PHZ	3/6/2007
MT8232_PHZ_0408_06Mar07.jpg	MT8232	MCS1	1000+00.	-1909		View of middle mine shaft at Camp Terrill	PHZ	3/6/2007
MT8232_PHZ_0409_06Mar07.jpg	MT8232	MCS1	1000+00.	-1909		View of western mine shaftat Camp Terrill	PHZ	3/6/2007
MT8233_PHZ_0410_06Mar07.jpg	MT8233	MCS1	1000+00.	-1909		View of fourth mine shaft at Camp Terrill	PHZ	3/6/2007
MT8233_PHZ_0411_06Mar07.jpg	MT8233	MCS1	1000+00.	-1909	NE	View of Camp Terrill mine area	PHZ	3/6/2007
MT8237_PHZ_0420_06Mar07.jpg	MT8237	MCS1	1000+00.	-1909	SW	View uphill into area of Pyramind Mine	PHZ	3/6/2007

NOTES:
Positive (+) offset is right of the alignment when looking in the direction of increasing station

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SPECIAL INSTRUCTION SHEET

1. QA: N/A

This is a placeholder page for records that cannot be scanned.

2. Record Date	3. Accession Number
07/27/2007	ATTN to: ENG.20070910.0024
4. Author Name(s)	**5. Authorization Organization**
N/A	Shannon & Wilson

6. Title/Description
Mineral & Energy Resource Occurrence Report Mina Rail Corridor, APPENDIX B: Photographs

7. Document Number(s)	8. Version Designator
V0-CY05-NHC4-00197-00026-001	004

9. Document Type	10. Medium
Media DATA	2 CD's

11. Access Control Code
N/A

12. Traceability Designator
V0-CY05-NHC4-00197-00026-001-004

13. Comments
CD's: 1 Original & 1 copy

Validation of complete file transferred. All files copied. Software used: Corel Photo-Paint 8.0

THIS IS AN ELECTRONIC ATTACHMENT

14. RPC Electronic Media Verification

XREF MOL.20070918.0423

SEP 2 1 2007 TChurch / BSC-BS

MD5 Validation

A#: ENG.20070910.0024

dir.txt

```
 Volume in drive D is 27 July 2007,AppxB
 Volume Serial Number is CEBA-BEA9

 Directory of D:\

08/13/2007  05:40p      <DIR>          MinaMinOccRpt,AppxB-Photos
               0 File(s)              0 bytes

 Directory of D:\MinaMinOccRpt,AppxB-Photos

08/13/2007  05:40p      <DIR>          .
08/16/2007  12:03p      <DIR>          ..
08/03/2007  10:23a               177,152 21-1-20102-233-APX B-PHOTO LOG-Rev1.xls
08/02/2007  04:51p      <DIR>          Photos
               1 File(s)        177,152 bytes

 Directory of D:\MinaMinOccRpt,AppxB-Photos\Photos

08/02/2007  04:51p      <DIR>          .
08/13/2007  05:40p      <DIR>          ..
01/16/2007  03:10p             2,689,654 MT1015_ALG_0027_06Oct06.jpg
01/05/2007  11:08a               574,082 MT1015_SMP_0021_06Oct06.jpg
01/05/2007  11:08a               694,995 MT1015_SMP_0022_06Oct06.jpg
01/05/2007  11:09a               750,317 MT1015_SMP_0023_06Oct06.jpg
01/16/2007  03:10p               748,404 MT1057_ALG_0165_10Oct06.jpg
01/16/2007  03:10p               999,783 MT1057_ALG_0166_10Oct06.jpg
01/16/2007  03:10p               763,178 MT1057_ALG_0167_10Oct06.jpg
01/16/2007  03:10p               722,383 MT1057_ALG_0168_10Oct06.jpg
01/16/2007  03:10p               755,987 MT1057_ALG_0169_10Oct06.jpg
01/16/2007  03:10p             2,675,524 MT1057_ALG_0170_10Oct06.jpg
01/16/2007  03:10p               773,079 MT1057_ALG_0171_10Oct06.jpg
01/16/2007  03:10p               738,421 MT1057_ALG_0172_10Oct06.jpg
01/16/2007  03:10p               197,933 MT1057_ALG_0173_10Oct06.jpg
01/05/2007  11:21a               695,904 MT1057_SMP_0102_10Oct06.jpg
01/05/2007  11:21a               851,900 MT1057_SMP_0103_10Oct06.jpg
01/05/2007  11:21a               806,908 MT1057_SMP_0104_10Oct06.jpg
01/16/2007  03:10p             1,151,888 MT1059_ALG_0176_10Oct06.jpg
01/16/2007  03:10p               735,360 MT1059_ALG_0177_10Oct06.jpg
01/16/2007  03:10p               744,948 MT1062_ALG_0184_10Oct06.jpg
01/16/2007  03:10p               679,206 MT1062_ALG_0185_10Oct06.jpg
01/16/2007  03:10p               729,096 MT1062_ALG_0186_10Oct06.jpg
01/05/2007  11:21a               755,911 MT1062_SMP_0106_10Oct06.jpg
01/16/2007  03:11p               771,325 MT1063_ALG_0187_11Oct06.jpg
01/16/2007  03:11p               659,502 MT1063_ALG_0188_11Oct06.jpg
01/05/2007  11:21a               799,823 MT1063_SMP_0107_11Oct06.jpg
01/16/2007  03:11p               770,871 MT1064_ALG_0189_11Oct06.jpg
01/05/2007  11:21a               566,557 MT1064_SMP_0108_11Oct06.jpg
01/16/2007  03:10p               745,344 MT1065_ALG_0190_11Oct06.jpg
01/16/2007  03:10p               762,846 MT1065_ALG_0191_11Oct06.jpg
01/05/2007  11:21a               657,433 MT1065_SMP_0109_11Oct06.jpg
01/05/2007  11:21a               661,951 MT1065_SMP_0110_11Oct06.jpg
01/16/2007  03:10p               753,431 MT1083_ALG_0261_13Oct06.jpg
01/16/2007  03:10p             2,626,335 MT1083_ALG_0262_13Oct06.jpg
01/16/2007  03:10p               744,003 MT1083_ALG_0263_13Oct06.jpg
01/16/2007  03:10p               787,227 MT1083_ALG_0264_13Oct06.jpg
01/16/2007  03:10p               766,019 MT1083_ALG_0265_13Oct06.jpg
01/16/2007  03:10p               726,492 MT1083_ALG_0266_13Oct06.jpg
01/05/2007  11:27a               608,916 MT1083_SMP_0153_13Oct06.jpg
01/05/2007  11:27a               696,207 MT1083_SMP_0154_13Oct06.jpg
01/05/2007  11:27a               880,122 MT1083_SMP_0155_13Oct06.jpg
01/05/2007  11:27a               442,679 MT1083_SMP_0156_13Oct06.jpg
01/16/2007  03:11p               657,167 MT1087_ALG_0279_14Oct06.jpg
01/16/2007  03:11p               967,606 MT1087_ALG_0280_14Oct06.jpg
```

01/16/2007	03:11p	624,469	MT1087_ALG_0281_14Oct06.jpg
01/16/2007	03:11p	700,908	MT1087_ALG_0282_14Oct06.jpg
01/16/2007	03:11p	2,924,146	MT1087_ALG_0283_14Oct06.jpg
01/16/2007	03:11p	732,972	MT1087_ALG_0284_14Oct06.jpg
01/16/2007	03:11p	725,427	MT1087_ALG_0285_14Oct06.jpg
01/16/2007	03:11p	781,001	MT1087_ALG_0286_14Oct06.jpg
01/05/2007	11:27a	401,591	MT1087_SMP_0160_14Oct06.jpg
01/05/2007	11:28a	499,210	MT1087_SMP_0161_14Oct06.jpg
01/16/2007	03:11p	651,076	MT6001_ALG_0312_27Nov06.jpg
01/16/2007	03:11p	884,772	MT6001_ALG_0313_27Nov06.jpg
01/16/2007	03:11p	357,878	MT6002_ALG_0315_28Nov06.jpg
01/16/2007	03:11p	723,765	MT6002_ALG_0316_28Nov06.jpg
01/16/2007	03:11p	753,557	MT6002_ALG_0317_28Nov06.jpg
01/16/2007	03:11p	2,465,329	MT6002_ALG_0318_28Nov06.jpg
01/16/2007	03:11p	923,186	MT6003_ALG_0319_28Nov06.jpg
01/16/2007	03:11p	285,266	MT6004_ALG_0314_28Nov06.jpg
01/16/2007	03:11p	774,971	MT6004_ALG_0320_28Nov06.jpg
01/16/2007	03:11p	759,344	MT6004_ALG_0321_28Nov06.jpg
01/16/2007	03:11p	773,686	MT6004_ALG_0322_28Nov06.jpg
01/16/2007	03:11p	440,310	MT6004_ALG_0323_28Nov06.jpg
01/16/2007	03:11p	562,699	MT6004_ALG_0324_28Nov06.jpg
01/16/2007	03:11p	772,824	MT6004_ALG_0325_28Nov06.jpg
01/16/2007	03:11p	709,407	MT6004_ALG_0326_28Nov06.jpg
01/16/2007	03:11p	668,088	MT6005_ALG_0327_28Nov06.jpg
01/16/2007	03:11p	725,053	MT6006_ALG_0328_29Nov06.jpg
01/16/2007	03:11p	517,640	MT6007_ALG_0329_29Nov06.jpg
01/16/2007	03:11p	771,250	MT6007_ALG_0330_29Nov06.jpg
01/16/2007	03:11p	739,075	MT6008_ALG_0331_29Nov06.jpg
01/16/2007	03:11p	757,471	MT6008_ALG_0332_29Nov06.jpg
01/16/2007	03:11p	787,927	MT6012_ALG_0333_29Nov06.jpg
01/16/2007	03:11p	329,662	MT6012_ALG_0334_29Nov06.jpg
01/16/2007	03:11p	765,393	MT6012_ALG_0335_29Nov06.jpg
01/16/2007	03:11p	763,871	MT6012_ALG_0336_29Nov06.jpg
01/16/2007	03:11p	777,025	MT6013_ALG_0337_30Nov06.jpg
01/16/2007	03:11p	733,962	MT6013_ALG_0338_30Nov06.jpg
01/16/2007	03:11p	655,088	MT6014_ALG_0339_30Nov06.jpg
01/16/2007	03:11p	590,343	MT6014_ALG_0340_30Nov06.jpg
01/16/2007	03:11p	667,069	MT6014_ALG_0341_30Nov06.jpg
01/16/2007	03:11p	756,459	MT6014_ALG_0342_30Nov06.jpg
01/16/2007	03:11p	618,684	MT6014_ALG_0343_30Nov06.jpg
01/16/2007	03:11p	709,465	MT6014_ALG_0344_30Nov06.jpg
01/16/2007	03:11p	812,884	MT6014_ALG_0345_30Nov06.jpg
01/16/2007	03:11p	690,640	MT6014_ALG_0346_30Nov06.jpg
01/16/2007	03:11p	734,379	MT6014_ALG_0347_30Nov06.jpg
01/16/2007	03:11p	800,929	MT6015_ALG_0348_30Nov06.jpg
01/16/2007	03:11p	552,655	MT6015_ALG_0349_30Nov06.jpg
01/16/2007	03:11p	689,362	MT6015_ALG_0350_30Nov06.jpg
01/16/2007	03:11p	672,828	MT6016_ALG_0351_01Dec06.jpg
01/16/2007	03:11p	711,215	MT6016_ALG_0352_01Dec06.jpg
01/16/2007	03:11p	271,104	MT6016_ALG_0353_01Dec06.jpg
01/16/2007	03:11p	416,480	MT6017_ALG_0354_01Dec06.jpg
01/16/2007	03:11p	675,312	MT6017_ALG_0355_01Dec06.jpg
01/16/2007	03:11p	993,961	MT6017_ALG_0356_01Dec06.jpg
01/16/2007	03:11p	1,200,805	MT6018_ALG_0357_01Dec06.jpg
01/16/2007	03:11p	1,045,935	MT6018_ALG_0358_01Dec06.jpg
01/16/2007	03:11p	783,123	MT6018_ALG_0359_01Dec06.jpg
01/16/2007	03:11p	729,903	MT6019_ALG_0360_02Dec06.jpg
01/16/2007	03:11p	738,286	MT6019_ALG_0361_02Dec06.jpg
01/16/2007	03:11p	690,762	MT6019_ALG_0362_02Dec06.jpg
01/16/2007	03:11p	770,548	MT6019_ALG_0363_02Dec06.jpg
01/16/2007	03:11p	730,908	MT6019_ALG_0364_02Dec06.jpg
01/16/2007	03:11p	765,901	MT6019_ALG_0365_02Dec06.jpg
01/16/2007	03:11p	649,434	MT6019_ALG_0366_02Dec06.jpg

01/16/2007	03:11p	1,210,679 MT6019_ALG_0367_02Dec06.jpg
01/16/2007	03:11p	356,705 MT6020A_ALG_0394_05Dec06.jpg
01/16/2007	03:11p	707,422 MT6020A_ALG_0395_05Dec06.jpg
01/16/2007	03:11p	1,241,115 MT6020A_ALG_0396_05Dec06.jpg
01/16/2007	03:11p	407,983 MT6020A_ALG_0398_05Dec06.jpg
01/16/2007	03:11p	654,896 MT6020a_ALG_0397_05Dec06.jpg
01/16/2007	03:11p	706,575 MT6021_ALG_0368_02Dec06.jpg
01/16/2007	03:11p	984,194 MT6021_ALG_0369_02Dec06.jpg
01/16/2007	03:11p	823,394 MT6021_ALG_0370_02Dec06.jpg
01/16/2007	03:11p	903,173 MT6021_ALG_0371_02Dec06.jpg
01/16/2007	03:11p	538,567 MT6022_ALG_0372_03Dec06.jpg
01/16/2007	03:11p	829,706 MT6022_ALG_0373_03Dec06.jpg
01/16/2007	03:11p	759,527 MT6023_ALG_0375_03Dec06.jpg
01/16/2007	03:11p	773,378 MT6023_ALG_0376_03Dec06.jpg
01/16/2007	03:11p	774,419 MT6023_ALG_0377_03Dec06.jpg
01/16/2007	03:11p	759,481 MT6023_ALG_0378_03Dec06.jpg
01/16/2007	03:11p	621,817 MT6024_ALG_0374_03Dec06.jpg
01/16/2007	03:11p	748,508 MT6024_ALG_0379_03Dec06.jpg
01/16/2007	03:11p	593,523 MT6024_ALG_0380_03Dec06.jpg
01/16/2007	03:11p	747,706 MT6024_ALG_0381_03Dec06.jpg
01/16/2007	03:11p	740,105 MT6024_ALG_0382_03Dec06.jpg
01/16/2007	03:11p	756,933 MT6024_ALG_0383_03Dec06.jpg
01/16/2007	03:11p	473,460 MT6024_ALG_0384_03Dec06.jpg
01/16/2007	03:11p	707,844 MT6024_ALG_0385_03Dec06.jpg
01/16/2007	03:11p	770,768 MT6025_ALG_0386_04Dec06.jpg
01/16/2007	03:11p	677,443 MT6025_ALG_0387_04Dec06.jpg
01/16/2007	03:11p	778,945 MT6025_ALG_0388_04Dec06.jpg
01/16/2007	03:11p	200,765 MT6025_ALG_0389_04Dec06.jpg
01/16/2007	03:11p	739,695 MT6026_ALG_0390_04Dec06.jpg
01/16/2007	03:11p	591,999 MT6026_ALG_0391_04Dec06.jpg
01/16/2007	03:11p	615,180 MT6026_ALG_0392_04Dec06.jpg
01/16/2007	03:11p	929,991 MT6026_ALG_0393_04Dec06.jpg
01/16/2007	03:11p	738,441 MT6027_ALG_0399_05Dec06.jpg
01/16/2007	03:11p	714,141 MT6028_ALG_0400_05Dec06.jpg
01/16/2007	03:11p	483,794 MT6028_ALG_0401_05Dec06.jpg
01/16/2007	03:11p	139,189 MT6028_ALG_0402_05Dec06.jpg
01/16/2007	03:11p	394,242 MT6029_ALG_0403_05Dec06.jpg
01/16/2007	03:11p	601,228 MT6029_ALG_0404_05Dec06.jpg
02/19/2007	12:08p	299,931 MT7007_WTL_0369_19Feb07.jpg
02/19/2007	12:08p	307,141 MT7007_WTL_0370_19Feb07.jpg
02/19/2007	01:26p	304,845 MT7010_WTL_0376_19Feb07.jpg
02/19/2007	01:26p	295,216 MT7010_WTL_0377_19Feb07.jpg
02/19/2007	05:06p	334,372 MT7018_WTL_0387_19Feb07.jpg
02/19/2007	05:19p	318,022 MT7019_WTL_0388_19Feb07.jpg
02/22/2007	05:37p	197,253 MT8036_PHZ_0054_23Feb07.jpg
02/22/2007	05:37p	240,325 MT8036_PHZ_0055_23Feb07.jpg
02/22/2007	05:48p	392,255 MT8037_PHZ_0056_23Feb07.jpg
02/22/2007	05:54p	334,298 MT8038_PHZ_0057_23Feb07.jpg
02/27/2007	10:34a	435,536 MT8138_PHZ_0206_28Feb07.jpg
02/27/2007	10:34a	365,824 MT8138_PHZ_0207_28Feb07.jpg
02/27/2007	10:34a	325,086 MT8138_PHZ_0208_28Feb07.jpg
02/27/2007	11:19a	242,299 MT8139_PHZ_0209_28Feb07.jpg
03/08/2007	03:08p	599,558 MT8140_PHZ_0210_28Feb07.jpg
03/08/2007	03:08p	325,160 MT8141_PHZ_0211_28Feb07.jpg
03/08/2007	03:08p	376,422 MT8141_PHZ_0212_28Feb07.jpg
03/08/2007	03:08p	350,717 MT8141_PHZ_0213_28Feb07.jpg
03/08/2007	03:08p	393,986 MT8141_PHZ_0214_28Feb07.jpg
03/08/2007	03:08p	324,809 MT8142_PHZ_0215_28Feb07.jpg
03/08/2007	03:08p	370,613 MT8143_PHZ_0216_28Feb07.jpg
03/08/2007	03:08p	327,432 MT8143_PHZ_0217_28Feb07.jpg
03/08/2007	03:08p	393,769 MT8144_PHZ_0218_28Feb07.jpg
03/08/2007	03:08p	331,133 MT8144_PHZ_0219_28Feb07.jpg
03/08/2007	03:08p	358,826 MT8144_PHZ_0220_28Feb07.jpg

```
                                    dir.txt
03/08/2007  03:08p               316,480 MT8145_PHZ_0221_28Feb07.jpg
03/08/2007  03:08p               293,374 MT8146_PHZ_0222_28Feb07.jpg
03/05/2007  12:19p               322,400 MT8232_PHZ_0407_06Mar07.jpg
03/05/2007  12:20p               441,983 MT8232_PHZ_0408_06Mar07.jpg
03/12/2007  10:40a               339,663 MT8232_PHZ_0409_06Mar07.jpg
03/12/2007  10:40a               387,991 MT8233_PHZ_0410_06Mar07.jpg
03/05/2007  12:26p               323,627 MT8233_PHZ_0411_06Mar07.jpg
03/05/2007  02:50p               316,776 MT8237_PHZ_0420_06Mar07.jpg
             177 File(s)    122,459,443 bytes

     Total Files Listed:
             178 File(s)    122,636,595 bytes
               6 Dir(s)               0 bytes free
```